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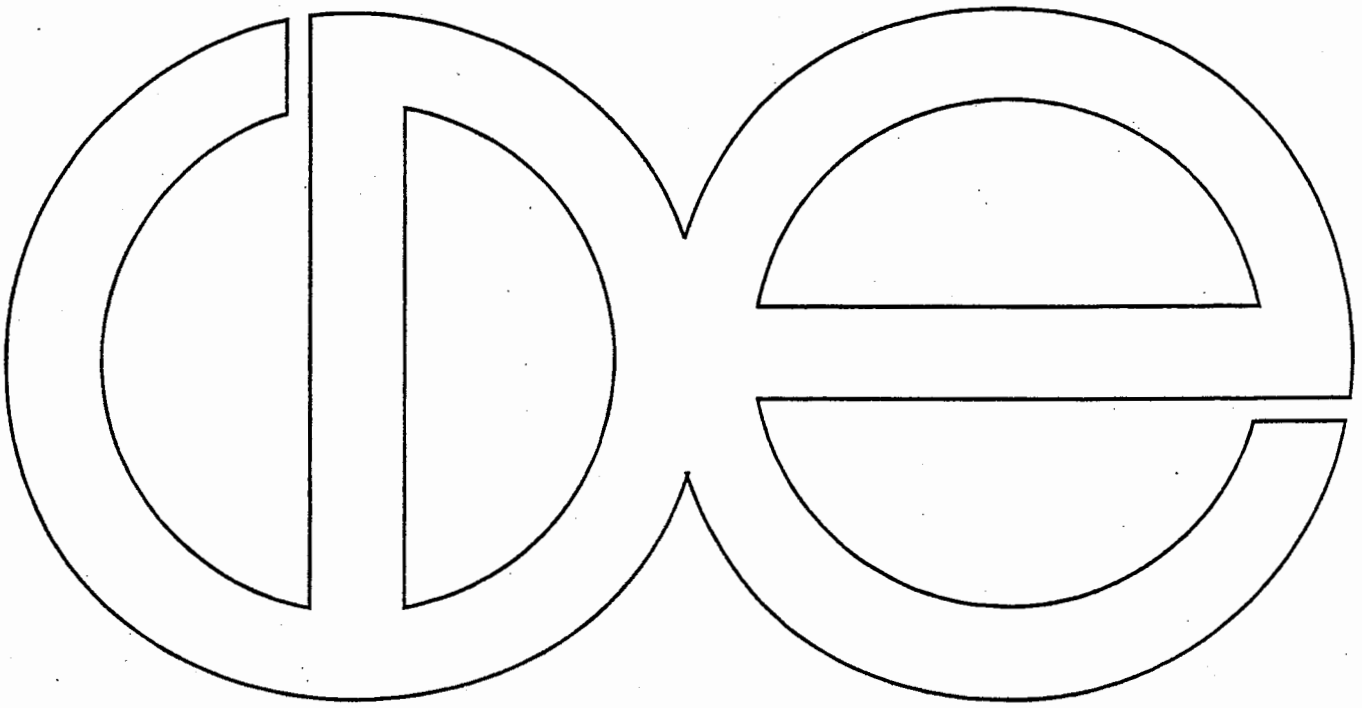

THE SUBSEQUENT FERTILITY OF ADOLESCENT MOTHERS IN THE UNITED STATES

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ABSTRACT

This paper describes recent patterns in the subsequent fertility of women in the United States by comparing rates of second and higher-order births for women with teen and nonteen first births. We expand upon previous work by paying particular attention to issues related to the *spacing* of second births. We pose and answer three questions concerning the pace and tempo of second and higher-order births. First, is an early first birth associated with a quicker overall pace of second births? Second, is an early first birth associated with higher second birth rates during the first few months postpartum? And third, does an early first birth or a closely spaced second birth speed the pace of higher-order births? For black women, we find that a first birth before age eighteen speeds the overall pace of second births by about 25 percent, and that part of this overall difference is due to a doubling of the pace of second births in the first 15 months postpartum. For white women, we find no association between a first birth before age eighteen and the overall pace of second births, but a strong positive association between an adolescent first birth and the pace of second births in the 15 months postpartum, and a negative association at longer durations. For black and white women, an early age at first birth is associated with a faster pace of third births, an effect that appears to persist for fourth births. However, a closely spaced second birth is at least as strongly associated with a fast pace of third and later births as is an adolescent first birth. These results suggest substantial spacing effects on second and higher-order births that, in several instances, outweigh effects of a teen first birth. We discuss implications of these findings for policies concerning teen childbearing and argue for special attention to pregnancy prevention in the six months immediately following a first birth.

This paper describes recent patterns in the subsequent fertility of women in the United States by comparing rates of second and higher-order births for women with teen and nonteen first births. We expand upon previous work by paying particular attention to issues related to the *spacing* of second births. We pose and answer three questions concerning the pace and tempo of second and higher-order births. First, is an early first birth associated with a quicker overall pace of second births? Second, is an early first birth associated with higher second birth rates during the first few months postpartum? And third, does an early first birth or a closely spaced second birth speed the pace of higher-order births?

The subsequent fertility of women who begin childbearing during their teen years has concerned both social scientists and policy makers because adolescent childbearing is plausibly linked to socioeconomic disadvantage for such women and their children (Hofferth 1987). Although the association between socioeconomic disadvantage and early childbearing appeared to diminish during the 1970s and 1980s as the total subsequent fertility of adolescent mothers declined (Furstenberg, Brooks-Gunn, and Morgan 1987), issues concerning teen childbearing remain of keen interest to policy makers and researchers (Maynard 1997), in part because of the prevalence of repeat births within two years of a first birth (Kalmuss and Namerow 1994).

In this study, we begin by confirming that the pace of second- and higher-order births to women who begin childbearing in their years has indeed converged to that for women who begin childbearing at older ages. To identify differences that may exist even if overall fertility is the same for women of different ages at first birth, we examine birth rates specific to each parity and incorporate controls for marital status and social background. Our second objective is to address the issue of close birth spacing. By studying birth rates at different durations after a previous birth, we describe age patterns in close birth spacing. We then study higher parities to determine

if closely spaced second births are themselves associated with the pace of subsequent fertility.

BACKGROUND

Numerous studies report that women who begin childbearing during adolescence subsequently experience poorer social and economic outcomes than women who begin childbearing at older ages. For example, Hofferth (1987) concludes her review of the literature on the social and economic consequences of teen childbearing by stating that "All the studies cited are consistent in at least one regard. All find an additional negative impact of early childbearig on later economic well-being after adjusting for background and other prior differences." (Hofferth 1987: 143). Children of such women have also been found to be at higher risk of social disadvantage (Baldwin and Cain 1980; Haveman, Wolfe, and Peterson 1997; Moore, Morrison, and Greene 1997). Researchers, however, have typically interpreted these associations cautiously, since attempts to attribute causal significance to the effects of early childbearing on a woman's subsequent socioeconomic attainment are complicated by the fact that important aspects of the socioeconomic disadvantages of many such women may be unobserved by researchers. In addition, researchers have noted substantial variability in the subsequent life course trajectories of teen mothers (Furstenberg et al., 1987; Geronimus and Korenman 1993; Hofferth 1987). Thus, while some question the causal role of adolescent childbearing in reproducing poverty across generations (see, e.g., the exchange between Geronimus and Korenman [1993], and Hoffman, Foster, and Furstenberg [1993]), virtually all social scientists acknowledge a strong association between adolescent childbearing and subsequent socioeconomic disadvantage

One way in which adolescent childbearing might plausibly limit a woman's life chances involves the effect of early childbearing on subsequent fertility. In the 1960s and early 1970s,

women who began childbearing as teenagers had higher rates of subsequent fertility and larger completed family sizes than women who began childbearing at later ages (Trussell and Menken 1978; Bumpass et al. 1978). All else being equal, the responsibility for extra children would typically impede an adolescent mother's pursuit of educational, social, and career goals. By the 1980s, however, mothers of all ages were spacing their births more widely. Wineberg and McCarthy (1989) examined U.S. fertility with 1985 data and found that adolescent mothers had second births at essentially the same rate as older mothers. McElroy and Moore (1997) recently estimated that the difference in average completed fertility between younger mothers and older mothers is about half a child.

Some researchers have suggested that exposure time could explain the remaining differential fertility of teen mothers in comparison to older mothers. For example, Morgan (1996) found that age at first birth no longer predicts the pace of subsequent births over the next five years, but noted that overall fertility differences can still exist because younger mothers are exposed to additional fertility for a longer time. According to this argument, age-related declines in fecundability, coupled with the additional exposure of teenage mothers, play a major role major in the differential fertility of women who begin childbearing at different ages. In a non-age-related analysis of differential fertility, Yamaguchi and Ferguson (1995) emphasized a different aspect of exposure by modeling the decision to stop having children using statistical procedures and a variety of model assumptions to distinguish spacing and stopping behavior, with "stopping" assumed to be an irreversible decision. However, stopping behavior depends on actions such as the use of contraceptive sterilization. Furstenberg et al. (1987) note that, for at least some young mothers, the decision or ability to obtain a contraceptive sterilization is influenced by factors other than a desire for no more children.

Another literature has investigated the association between early childbearing, the tempo of fertility, and completed family size by focusing on closely spaced births among adolescent mothers. Aggregate analyses suggest that teenage mothers are more likely than older mothers to have second births in the first 24 months after the first birth (Kalmuss and Namerow 1994; Mott 1986), and data from a sample of teen mothers in the Baltimore area hints at a link between closely spaced second births and later fertility (Furstenberg et al., 1987). Closely spaced births have been implicated in economic disadvantage for the mother (Polit and Kahn 1986) as well as for children, including problematic infant health (Jekel et al. 1975; Miller 1991; Hollander 1995), child maltreatment (Flanagan et al. 1995; Zuravin 1991), poorer educational outcomes (Powell and Steelman 1993; Marjoribanks 1994), and less access to economic resources (Powell and Steelman 1995). Repeat pregnancy rates are often used to gauge the overall success of social programs for adolescent mothers (Balassone 1988; examples include Stevens-Simon et al. 1997; Maynard and Rangarajan 1994; Erickson 1994), with such programs usually reporting repeat birth rates between 25 and 50 percent for the first two years postpartum.

DATA AND METHODS

Our interest in the duration structure of second and later births, particularly during the period immediately following a first birth for adolescent mothers, makes strenuous demands on data. Consequently, we used several complementary data sets in our analyses: the 1979 – 1994 waves of the National Longitudinal Survey of Youth (NLSY), the June 1990 Current Population Survey (CPS), and DHHS Vital Statistics on Natality (VSN) for 1991 – 1993. The NLSY is a national probability sample of 12,686 men and women in the United States who were 14 to 22 years old in 1979. We excluded males, the poor white subsample, and the military subsample, but retained

women from the black oversample. NLSY respondents have been interviewed yearly through 1994, by which time the respondents were aged 29 to 37. Retention for the sample we analyze is almost 90% through 1994. The NLSY contains a full fertility history and also contains extensive data on respondents' social, economic, and family backgrounds.

Because our analyses condition on a first birth, we restrict our sample of women to those with at least one birth. We cleaned the NLSY fertility histories by checking respondents' childbearing reports for each interview in which fertility data were obtained. In the 1982 – 1986, 1988, 1990, 1992, and 1994 waves, NLSY respondents were asked to verify the date of birth (day, month, and year) for all children. We found relatively few discrepancies in reported dates of births, with the majority or problems involving discrepancies in day of birth and births reported in different orders across waves. When discrepancies occurred, we used the date of birth most frequently reported and hand-cleaned the remaining few cases (less than one percent) where this rule did not produce an unambiguous date of birth. We dropped three cases with a spacing between the first two births of nine months or less. The resulting sample contains 1339 white nonhispanic women and 1094 black nonhispanic women with at least one child.

The June 1990 CPS provides retrospective fertility histories for a much larger sample of women than the NLSY, but includes far less background data for respondents. We analyzed 10,232 white nonhispanic women and 1,801 nonhispanic black women who had a first birth (including twin and other multiple births) in 1975 or later. As in the NLSY, we dropped CPS cases that reported birth intervals of nine months or less. Fertility data in the CPS appear somewhat less reliable than corresponding data in the NLSY, with noticeable yearly heaping for CPS birth intervals, especially at two-year intervals.

The 1991 – 1993 VSN provides information on interval since last birth, gestational

period, and birth order. We used these data to cross-check our estimates of closely spaced second birth rates from the far smaller NLSY and CPS samples. We used individual-level data from the 1991 and 1992 VSN to determine the mother's ethnicity and age for all first births in the United States in 1991 and 1992. We combined these data on first births with data for all second births that occurred in 1993 within 24 months of a first birth, and used these combined data to calculate rates of closely spaced second births for each yearly age at first birth. As in the CPS, the VSN exhibits some heaping at yearly intervals and a small proportion of births at improbably close birth spacings. The VSN also is missing interval records for almost 5 percent of second births in 1993 (62,976 out of 1,290,731 births), but the probability of a missing interval record appears to be uncorrelated with age at first birth.

Statistical Models. To contrast timing and spacing effects of first births on subsequent fertility, we conduct separate analyses of second and later births. In analyzing second birth risks, we specified both the main effect of age at first birth and the interaction of age at first birth with duration since first birth; the latter interaction implies a nonproportional hazard model. This strategy lets us estimate both effects on the risk of a second birth of timing (i.e., age at first birth) and spacing (i.e., higher risks at close spacings for women with a teen first birth). In analyzing third and fourth birth risks, we employed a somewhat different strategy by specifying a main effect of age at first birth and a main effect of a closely-spaced second birth. Because there are relatively few births after parity three in the NLSY and CPS, we omit the interaction of age at first birth and duration in our analyses of third and fourth births.[1] Because of marked differences in fertility patterns, we conducted separate analyses for white and black women in both the

[1] We treat women with multiple (i.e., twin) births the same as women with single births, except that we censor respondents immediately after a multiple birth. We assume that the baseline hazard for single births and multiple births differs by a single multiplicative constant, but constrain effects of observed covariates (and unobserved

NLSY and CPS. We do not analyze data for hispanic women because of insufficient sample sizes in the NLSY and CPS.

Duration dependence. At each parity, we modeled duration dependence in birth risks using the same flexible parametric specification. Typically, the risk of a next birth is close to zero for the first nine months following usual gestational durations, increases during the ensuing 12 months, peaks during a normatively "ideal" interval of about two or three years postpartum, and declines at longer durations. We employed a splined piecewise Gompertz specification (see, e.g., Newman and McCullough 1984; Wu and Martinson 1993; Wu 1996), which provides a continuous function for the risk of a subsequent birth and which permits a fairly straightforward interpretation of close spacing effects.

We specified the baseline risk using four duration intervals: 10 to 15 months, 16 to 21 months, 22 to 45 months, and 46 or more months. To simplify our analyses, we assumed that the risk of a subsequent birth is zero during the first 9 months following a birth.[2] Given a typical gestation period of nine months, these birth intervals correspond to interpregnancy intervals of 1 – 6 months, 7 – 12 months, 1 – 3 years, and more than three years. We chose these intervals rather than intervals based on 12-month durations to offset some of the duration heaping observed in the CPS and to ease interpretation of interpregnancy spacing. More specifically, for a woman who has achieved parity p, her baseline hazard function has the following form:

$$log\ h_p(t) = b_{op} + c_{op}t + b_{1p}X_1 + c_{1p}X_1t + b_{2p}X_2 + c_{2p}X_2t + b_{3p}X_3 + c_{3p}X_3t$$

where t denotes duration (in months) of the previous birth, and where

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covariates in models for unobserved heterogeneity) to be equal for women with single and multiple births. Multiple births accounted for about one percent of all births in both the NLSY and the CPS.

[2] Recall that we dropped respondents who report a birth within 9 months of a preceding birth. In other analyses, we retained these cases and estimated separate coefficients for the interval 1 to 9 months with no noteworthy changes in any results. These results are available upon request from the first author.

$X_1 = 1$ during 10 to 15 months after a birth (very close spacing) and 0 otherwise;

$X_2 = 1$ during 16 to 21 months after a birth (close spacing) and 0 otherwise;

$X_3 = 1$ during 46 or more months after a birth (long spacing) and 0 otherwise;

where 22 to 45 months is the excluded category, subject to the spline constraints

$$b_{1p} + 15c_{1p} = b_{2p} + 15c_{2p} ;$$

$$b_{2p} + 21c_{2p} = b_{0p} + 21c_{0p} ;$$

$$b_{0p} + 46c_{0p} = b_{3p} + 46c_{3p} .$$

Age at first birth and spacing between the first two births. In addition to duration, our other key variables concern age at first birth and the duration between a first and second birth. We measure age at first birth using four categories (17 or younger, 18 to 19, 20 to 24, and 25 or older) to compare the pace of subsequent fertility for women who began childbearing at different ages. In modeling higher-order parities, we specified effects of the spacing between the first and second birth on third and fourth birth risks. We define these spacing effects using four categories: 10 to 15 months, 16 to 21 months, 22 to 45 months, and 46 or more months. Note that these categories coincide with those for duration dependence in our analyses of second birth risks.

Background controls. For all parity transitions, we included a rough control for marital status using a dichotomous variable equal to one if the woman was unmarried at the time of her first birth. Because the effect of marriage on fertility may differ for teen and nonteen mothers, we interacted marital status with age at first birth in our models of second births. In our NLSY analyses only, we controlled for various background factors: characteristics of the respondent's mother (years of schooling and age at first birth), whether the respondent lived with both biological parents at age 14, SEI of the respondent's father or other adult male in the household when the respondent was age 14, and the respondent's number of siblings.

RESULTS

Descriptive statistics. Table 1 provides descriptive statistics on the association between age at first birth and the mean number of children. We examine means in the NLSY and CPS by race and age at first birth for U.S. women who had a first child in the late 1970s or early 1980s. We restrict attention to NLSY women who had a first birth on or before 1984 and CPS women who had a first birth between January 1975 and June 1980. For each respondent, we assess the the number children born ten years after a first birth in order to equalize the duration of exposure across categories of age at first birth. (In our hazard analyses below, we do not impose these sample or exposure restrictions.) Computing mean numbers of children in this way has several drawbacks: it reduces sample size, tells us only about women who had a first birth around 1980, and, in the NLSY, eliminates most women who had a first birth after age 25. In addition, some women (especially those who began childbearing early) will have children more than ten years after a first birth. The descriptive statistics in Table 1 do not reflect such births.[3]

[Table 1 about here.]

Despite these shortcomings, the descriptive results give a consistent picture of the relationship between age at first birth and total fertility. For all age groups and in both data sources, women with a first child average more than one but less than two additional children. Within this range, subsequent fertility declines as age at first birth increases. White nonhispanic women who begin childbearing at age 17 or younger have about 1.44 (NLSY) or 1.40 (CPS) additional children in the following ten years. Subsequent fertility is lower, but not much lower, for white nonhispanic women who have their first births at older ages. The largest observed

[3] It is difficult to estimate fertility beyond ten years postpartum in the NLSY because there are relatively few such women and because the sample at risk in this period is heavily weighted towards women with a teen first birth. For these few women, subsequent fertility between 10 and 20 years postpartum is roughly 0.3 children for whites and 0.4 children for blacks. We have no comparable crude estimates for NLSY women of other ages at first birth.

difference in fertility (0.33 children) occurs in the CPS for women with a first birth at age 17 or younger versus women with a first birth at age 25 or older.

This effect of age at first birth on subsequent fertility is more pronounced for black women. Black nonhispanic women with a first birth at age 17 or younger have about 1.64 (NLSY) or 1.61 (CPS) additional children in the succeeding ten years. By comparison, black women age 20 to 24 at first birth have only 1.14 (NLSY) or 1.17 (CPS) additional children. Thus, for black women, delaying age at first birth by about 5 years is associated with about a 0.5 child difference in subsequent fertility.

The last two columns in Table 1 show the contributions of different birth orders to the mean number of children born ten years following a first birth. For example, the mean number of children born to white nonhispanic women in the NLSY with a first birth at age 17 or younger is 2.44. This mean can be decomposed by parity into 1.00 births at parity 1 (because all women in our analyses have had a first birth), 0.86 at parity 2, and 0.58 at all higher parities. Over all age groups and races, the second parity constitutes a larger share of subsequent fertility than all later parities in the first ten years following a first birth. While third and later births are relatively infrequent, they nevertheless represent most of the difference in total fertility for women of different ages at first birth. For example, the mean number of second births to white nonhispanic women is identical for women age 17 or younger at first birth versus age 20 to 24 at first birth (0.86 versus 0.86 in the NLSY, 0.83 versus 0.83 in the CPS), but the mean number of third and later births differs systematically with age at first birth (0.58 versus 0.43 in the NLSY, 0.57 versus 0.47 in the CPS).

Table 2 provides descriptive statistics for the association between the spacing between the first two births and the mean number of children. We present descriptive statistics by race and

duration between the first and second births. As in Table 1, we equalize the duration of exposure using a ten year reference period; thus, in Table 2, we compute the mean number of children at ten years following a *second* birth.

[Table 2 about here.]

The results in Table 2 suggest that subsequent fertility is strongly associated with the spacing of first and second births. White nonhispanic women with a second birth that occurs 10 to 15 months after a first birth average between 1.12 and 1.38 additional births in the ten years following a second birth. By contrast, white nonhispanic women with a second birth that occurs 22 to 45 months after a first birth average between 0.59 and 0.76 additional births in the ten years following a second birth. Similarly, black women with a second birth that occurs 10 to 15 months after a first birth average between 1.45 and 1.81 additional births in the ten years following a second birth, while black women a second birth that occurs 22 to 45 months after a first birth average between 0.99 and 1.08 additional births.

Tables 1 and 2 suggest that *small* differences in the spacing between first and second births generate, on average, as many extra births per woman as *large* differences in women's age at first birth. For example, in Table 1, the mean number of children born to white women aged 17 or younger at first birth is about 0.15 children greater than the mean number of children born to white women aged 20 to 24 at first birth; the comparable difference for black women is 0.5 children. In Table 2, the mean number of children born to white women with a second birth interval of 15 months or less is 0.4 to 0.8 children greater than the mean number of children to white women with a second birth of 22 to 45 months; the comparable difference for black women is 0.5 to 0.7 children. These comparisons are descriptive in nature and do not control for

other characteristics of women that may influence subsequent fertility.[4] In addition, the comparison of mean numbers of children in Tables 1 and 2 involves women of different parities, which may generate biases in observed differentials. That is, conditioning on parity 2 as in Table 2 may select on higher fertility women, thus upwardly biasing differences in Table 2 relative to Table 1. On the other hand, conditioning on parity 1 as in Table 1 should in principle let one observe fertility differences across a wider range of parities, which would presumably upwardly bias differences in Table 1 relative to Table 2. Nevertheless, these comparisons hint at an association between closely-spaced second births and subsequent fertility that may be at least as large as that between a teen birth and subsequent fertility.

Table 3 provides descriptive statistics for fertility timing, marriage, and family background variables used in our hazard analyses; we report descriptive statistics by race and age at first birth. Table 3 suggests a strong association between age at first birth and marital status at first birth, as well as various associations between age at first birth and the background variables. These results thus reinforce the possibility that the associations between total fertility, age at first birth, and the spacing of second births observed in Tables 1 and 2 may be artifacts of not controlling for compositional differences in these populations.

[Table 3 about here.]

Nonparametric Analyses of Second Birth Transitions. Figures 1.1 and 1.2 present

[4]Because women with a teen first birth have a higher proportion of closely spaced second births than women with a nonteen first birth in Table 1, it is possible that the association between closely spaced second births on third and later births in Table 2 occurs because a closely spaced second birth is a proxy for an adolescent first birth. Our subsequent parametric analyses, which disentangle these two factors, show that this is not true, but one might also note that for the CPS, only about 10 percent of white nonhispanic mothers had a first birth by age 17, with most closely spaced second births occurring to women aged 20 or older at first birth. Black women are more likely to have had a first birth by age 17 (about 25 percent in the CPS), so this issue is a greater concern for blacks. The sample design of the NLSY means that a higher proportion of NLSY women with a teen birth are represented in our descriptive tables, but also means that among women with a *widely* spaced second birth, only those who were very young at first birth will be at risk of a third or later birth at both short and long birth intervals.

nonparametric estimates of the duration-specific monthly risk of a second birth by age at first birth for white nonhispanic women in the CPS and NLSY.[5] For CPS women (Figure 1.1), the hazard rate for women who have a first birth at age 18 or earlier (solid curve) rises quickly to a peak of about 2.5 second births per 100 women per month at approximately 18 months following a first birth. The hazard rate for these women remains at roughly this level until roughly 48 months following a first birth, after which it declines slightly. By contrast, the hazard rate for women who have a first birth at ages 19 to 24 and after 25 (heavy dashed curve and dashed curve, respectively) rises to a peak of about 3 second births per 100 women per month between roughly 22 and 45 months following a first birth. Similar patterns hold for white women in the NLSY (Figure 1.2). Thus, in both the CPS and NLSY, the rate of second births is more highly peaked for white women with a nonteen first birth than for white women with a teen first birth.

[Figure 1 about here.]

Figure 1.1 also suggests that the association between age at first birth and the rate of second births may vary with duration. For CPS women the hazard rate in the first 21 months is higher for women with a first birth at age 18 or earlier than for women with a first birth at ages 19 or older; at later durations, the pattern is reversed. For NLSY women, the hazard rate in the first 15 months is higher for women with a teen first birth than for women with a nonteen first birth; this pattern is again reversed at later durations. At durations beyond 48 months, the curve for women with a teen first birth falls in between the curves for women with nonteen first births in the CPS but not the NLSY; note, however, that relatively few women remain at risk at these durations.

Figures 2.1 and 2.2 present corresponding estimates for black women. As for whites,

[5] In Figures 1 and 2 only, we use three categories for age at first birth rather than the four categories used in our

results from both the CPS and NLSY suggest increased risks at short durations for women with teen first births. For white women, this pattern reverses at later durations. For black women, this pattern does not reverse; thus, at later durations, second birth risks for women with a teen first birth remain higher than for women with a nonteen first birth.

[Figure 2 about here.]

Parametric Analyses of Second Births. To examine in greater detail the patterns suggested by Figures 1 and 2, we turn to our formal parametric models. Table 4 presents hazard regression results for second births to white nonhispanic women who have achieved parity 1. We compare results from the NLSY and CPS in Models 1 through 3; in Model 4, we control for background variables that are available only in the NLSY. To conserve space, we suppress estimated duration parameters in this and subsequent tables.[6] The intercept refers to the second birth rate (on a log scale) at 22 months postpartum in the baseline hazard; other coefficients represent contrasts from this baseline. In all models, the intercept implies a rate of about 3 second births per 100 women per month, which agrees with the pattern observed in Figure 1.

[Table 4 about here.]

Model 1 specifies only the main effects of duration and age at first birth on the risk of a second birth. In both the NLSY and CPS, estimates from Model 1 show that women who initiate childbearing at age 17 or younger have slightly lower second birth risks than women in the omitted category who begin childbearing between ages 20 and 24. Second birth risks are also slightly lower for women who have a first birth between ages 18 and 19 compared to the women

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subsequent hazard analyses because of the relatively small numbers of second births that occur before age 17.

[6]Overall, the estimates exhibit expected patterns of duration dependence, with second birth risks low and rising from 10 to 15 months following a first birth, peaking around 22 to 45 months (the omitted category), and declining subsequently. These estimates are available on request from the first author.

in the omitted category. Note, however, that these differences are not statistically significant in either the NLSY or CPS. Indeed, Model 1 suggests only one statistically significant age effect for women with a first birth at age 25 or older in the CPS.

Model 2 specifies a nonproportional model that interacts the dummy variables for age at first birth with the duration parameters, which lets the pattern of duration dependence differ for women who begin childbearing at different ages. Because the omitted category in the interaction terms refers to second birth risks for women with a teen birth at 22 to 45 months following a first birth, the main effect of (for example) a teen first birth now references the 22 to 45 month interval. Estimated coefficients are negative and significant in both the NLSY and CPS; hence, these results suggest that, all else being equal, white nonhispanic women who begin childbearing at age 17 or younger have a "peak" rate of second births that is lower than white women who begin childbearing at ages 20 to 24. In addition, the main effect for women with a first birth after age 25 is close to zero and not significant in both the NLSY and CPS.

Estimated interactions provide the most striking findings from Model 2. For white nonhispanic women, we find evidence of substantially higher second birth risks during the period immediately following a first birth for women who began childbearing at age 17 or younger. In both the NLSY and CPS, we observe large, positive, and significant coefficients for the interaction of the youngest age category and earliest duration category. Thus, higher second birth risks are concentrated at extremely short birth intervals -- during the first 15 months following a first birth, corresponding to a mere 6-month interpregnancy interval for the youngest category of teen mothers, for whom the rate of very closely spaced second births (10 – 15 months) is more than double the rate for women age 20 to 24 at first birth..

Model 3 adds a control for marital status -- whether the respondent was unmarried at the

birth of her first child. This reduces the absolute magnitude of the main effects of age at first birth for the two categories (less than 17, 18 to 19) relative to estimates in Models 1 or 2, but these effects remain statistically significant in both the NLSY and CPS. Thus, only a small part of the lower peak rate of second births to white women with a teen first birth appears due to the fact that they are less likely to be married at the time of first birth.

The interaction effects for age at first birth and spacing in Model 3 are largely unaffected when controlling for marital status. As expected, the main effect of being unmarried at first birth status is negative and significant in both the NLSY and the CPS (-0.40 and -0.50), implying an overall lower rate of nonmarital versus marital fertility. The interaction of marital status and a teen first birth is positive in both the NLSY and CPS (0.18 and 0.20), which suggests that the higher fertility within marriage holds less for women with a teen first birth; note, however, that this interaction is significant only in the CPS.

Model 4 adds family background controls available only in the NLSY. The main effect of a first birth by age 17 diminishes by about 25 percent in absolute magnitude and is no longer statistically significant; there are also small changes in the main effects in other age categories. Thus, the greater social disadvantage of women with a teen first birth may account for part of the lower peak rate of second births observed for these women. Note, however, that the interactions of duration and age at first birth are virtually identical in Models 3 and 4. Thus, controlling for the greater social disadvantage of women with a first birth at age 17 or younger does *not* appear to account for the higher rate of very closely spaced second births observed for these women.[7]

[7] These models control for effects of dummy variables for missing data on the background variables (results not reported). In other analyses, we include interactions between the background variables in Model 4 and (a) age at first birth and (b) the duration parameters. Including these interactions alters parameter estimates slightly but does not affect our main qualitative findings. Estimates for missing data and for these supplemental analyses are available upon request.

Effects of the background variables are consistent with expectations. White nonhispanic women from socially *advantaged* family backgrounds (i.e., women with more educated mothers, with fathers who have higher status occupations, who resided with both biological parents at age 14, and whose mothers were older at first birth) have a higher overall rate of second births. We also observe the usual positive association between fertility and number of siblings.

Table 5 presents parallel analyses for black nonhispanic women. Estimates of the intercept parameter vary somewhat across data sets and models, but imply a rate of two second births per hundred women per month at 22 months after a first birth. Model 1 suggests an overall association between age at first birth and the risk of a second birth; note that this finding differs from that observed for white nonhispanic women. In particular, black women with a first birth by age 17 have a somewhat higher overall rate of second births (0.26 and 0.24 in the NLSY and CPS, respectively) than black women aged 20 to 24 at first birth; these contrasts are significant in both the NSLY and CPS. In Model 2, we no longer observe significant main effects of age at first birth, but do observe some significant interactions. As for whites, black women with a first birth at age 17 or younger have significantly higher risks of a second birth in the interval between 10 and 15 months following a first birth. We also observe higher risks for very closely spaced second births for black women who had a first birth between ages 18 and 19; this interaction is significant in the NLSY but not significant in CPS. The remaining interaction terms for women who had a first birth after age 25 are difficult to interpret, in part due to small numbers of such women in the CPS and NLSY.

[Table 5 about here.]

Model 3 adds controls for marital status at first birth. As for whites, black nonhispanic women who are unmarried at first birth have significantly lower risks of a second birth; however,

we do not observe significant effects of the interaction between marital status at first birth and age at first birth, in part because of the small number of married black teen mothers in these data. Standard errors are inflated for some parameters (for example, the main effects for the first two categories for age at first birth), but both standard errors and parameter estimates remain unchanged for our key finding - the higher risk of a very closely spaced second birth to women who had a first birth at age 17 or younger. Controlling for the background variables in Model 4 does not change estimated coefficients or tests of significance. As for white women, number of siblings has a positive and significant effect on second birth risks. The effects of the remaining background variables have the opposite sign from those for white women, which suggests higher rates of second births to black women from *disadvantaged* backgrounds; note, however, that none of these effects is statistically significant.

Analyses of Third and Fourth Births. We now turn to analyses of subsequent fertility after the second birth, with a particular focus on the effects of age at first birth and a closely spaced second birth on the pace of third and fourth births. The number of cases decreases at each parity, so we necessarily simplify our analyses compared to the models for second births. In modeling third birth risks, we specify duration dependence with the same splined piecewise gompertz specification used in our previous analyses of second births, but again to conserve space we do not report estimated duration parameters.[8] We also include proportional effects of age at first birth, the spacing between a first and second birth, and marital status at first birth, but exclude interactions of age at first birth with other variables.

Table 6 presents results for white nonhispanic women. Estimates of the intercept parameters imply a relatively low rate of third births – just above one third birth per hundred

[10] Estimates available on request from the first author.

women per month in the "peak" interval of 22 months following a second birth. Model 1 specifies main effects of age at first birth on the rate of third births. White nonhispanic women with a first birth by age 17 have a substantially higher pace of third births than women with a first birth at ages 20 to 24. Estimates range between 0.33 (CPS) and 0.41 (NLSY), which correspond to increases in the relative risk of between 40 and 50 percent. Women who begin childbearing at age 25 or older appear to have the slowest pace of third and higher-order births, although this effect is statistically significant only in the CPS.[9]

[Table 6 about here.]

Models 2 through 4 present effects of second birth spacing, marital status at first birth, and family background on the rate of third births. The results from these models can be summarized as follows. First, the effect of a closely spaced second birth on third births is at least as large as than the effect of age at first birth; effects are significant across all models and in both the NLSY and CPS. Second, there is a positive association between third birth risks and a nonmarital first birth, which reverses the negative association observed for second birth risks.[10] Finally, controlling for marital status at first birth and the background variables does not account for the effects of age at first birth or the spacing between a first and second birth on the rate of third births.

Table 7 presents results for black nonhispanic women. Results are roughly comparable to those for white women. As in Table 6, estimates for the intercept parameters imply relatively low

[9] Coefficients for the 25 and over category are less likely to be statistically significant in the NLSY because very few NLSY respondents had exceeded age 30 by the time of the 1994 interview. We ran separate models for the CPS sample in which we excluded cases which did not match the NLSY birth cohorts. Some of the CPS coefficients for the 25 and older category became more similar to the NLSY coefficients, but the much smaller sample size also inflated the standard errors, so it is difficult to draw conclusions about the effects of differences in the age structures of the samples.

[10] Rindfuss and Parnell (1989) have noted that the fertility effects of marriage diminished at higher parities. Our results are consistent with their findings, although our measure of marital status is less precise than theirs.

third birth rates – somewhat above 1 percent at 22 months after a second birth. We observe a strong, positive, and statistically significant association between a teen first birth and the pace of third births; this association implies a peak rate of third births of about two such births per hundred women per month to women with a first birth at age 17 or younger. Both a closely spaced second birth and a nonmarital first birth are also associated with higher third birth risks; however, neither association is always statistically significant. A teen first birth appears to have a somewhat larger effect on third births for black women than for white women, while a closely spaced second birth appears to have a somewhat larger effect for white women; however, standard errors are too large to reliably estimate such black-white differences.[11]

[Table 7 about here.]

Table 8 presents results for fourth births. Due to the smaller numbers of women at risk of a fourth birth, we restrict our analyses to white nonhispanic women in the CPS. A teen first birth, a closely spaced second birth, and a nonmarital first birth are all positively associated with fourth birth rates, although the effect of a teen first birth is not statistically significant. Second births that occur 10 to 15 months after a first birth have particularly large effects on fourth birth risks.[12] Overall, these results suggest that, for white nonhispanic women, the age and spacing factors influencing third birth rates have similar effects on fourth birth rates.

[Table 8 about here.]

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[11] Comparing the duration parameters for second and third births shows that the third birth rate declines more rapidly beyond 22 months postpartum than the second birth rate. This implies that the probability of a second birth three or more years following a first birth is substantially higher than the probability of a third birth three or more years following a second birth. The declining rate of third births after 22 months is thus one factor which limits the proportion of women who have third births.

[12] We obtained very large standard errors when analyzing fourth births for white women in the NLSY and for black women in the CPS and NLSY. These analyses produce results that nevertheless agree substantially with the results shown in Table 8, although for black women, fourth birth risks may be more strongly associated with a teen first birth than a closely spaced second birth.

Second Births in the Vital Statistics on Natality. Overall, our findings suggest a strong association between an adolescent first birth and an extremely closely spaced second birth as well as a strong association between an extremely closely spaced second birth and later fertility. However, because relatively few women have an adolescent first birth followed by a closely spaced second birth, we assessed the robustness of our results in a series of additional sensitivity analyses. See the appendix for further details.

Although our results suggest that women with a teen first birth have a higher rate of very closely spaced second births than women with a nonteen first birth, our estimates of the magnitude of this difference may be imprecise because of the small number of closely-spaced second births to teen mothers in the NLSY and CPS. To further address this issue, we examined individual-level data from the Vital Statistics on Natality (VSN). We took all closely-spaced second births recorded in 1993 and combined these with synthetic cohorts of first births that occurred between 1991 and 1993. The very large sample sizes in these data allow us to more precisely examine the association between age at first birth and closely spaced second births. Figure 3 presents two curves that plot age at first birth against the proportion of women with a closely spaced second birth; the solid curve refers to second births that occur 10 to 15 months after a first birth, while the dashed curve refers to second births that occur 10 to 24 months after a first birth. The solid curve indicates about 9 percent of women aged 15 at first birth had a second birth 10 to 15 months after a first birth, with the percentage of closely spaced second births declining by about 5 percent to 4 percent at later ages at first birth. The dashed curve exhibits a similar relationship, with about 27 percent of women aged 15 at first birth having a second birth 10 to 24 months after a first birth, declining by about 10 percent to 17 percent at later ages at first birth. Overall, women with a teen first birth are roughly twice as likely to have a second birth 10

to 15 months after the first birth as women with a nonteen first birth, a ratio that is consistent with estimates from our hazard regressions, which suggested that a teen first birth was associated with at least a doubling of the rate of second births 10 to 15 months after a first birth. Recall that about 5 percent of VSN records (62,976 out of 1,290,731 births) are missing data on the interval between a first and second birth in 1993; hence, our estimates are likely to provide a lower bound for the proportion of women with closely spaced second births.

[Figure 3 about here]

Family planning programs often construe a closely spaced second birth as one occurring within 24 months of a first birth. Figure 3 shows that the probability of a closely spaced second birth is roughly 10 percent higher for teens than nonteens under this conventional definition and about 5 percent higher under our more restrictive definition (10 to 15 months following a first birth). Thus, although relatively few second births occur within 15 months of the first birth, this initial 10 to 15 month period of risk accounts for about half of the absolute teen/nonteen difference in the proportion of women who have second birth within 24 months of a first birth.

DISCUSSION

Past research has found little effect of a teen or adolescent first birth on the overall rate of second births (Wineberg and McCarthy 1989) or subsequent fertility (Morgan 1996) for recent cohorts of U.S. women. Our analyses generally replicate this finding. We find some differences by race, with a teen first birth having a small, negative, and not significant effect on the overall pace of second births for white nonhispanic women and a modest, positive effect for black women. But even among blacks, for whom the teen/nonteen difference is most pronounced, black women who have a first birth after age 25 are still likely to proceed to a second birth, albeit at a slower

average pace compared to black women who have a teen first birth. It is important to realize that these teen/nonteen differences in second birth *rates* imply only small differences in the *proportions* of these women who proceed to a second birth; this is because rates of second births (and durations of exposure) remain high both for women with teen and nonteen first births. If the pace of overall fertility were to continue to slow for all women (Morgan 1996), it is possible that second birth rates could become a more important determinant of completed family size, but this is not the case as of the early 1990s.

While our analyses replicate findings from previous research, we also extend these findings by demonstrating that the overall association between a teen first birth and the risk of a second birth varies significantly with duration. Compared to women with a nonteen first birth, women with a teen first birth have higher risks of a second birth in the period immediately following a first birth, and similar or lower risks at later durations. This interaction between a teen first birth and duration is evident for both black and white women. It is large and positive at 10 to 15 months postpartum, smaller at 16 to 21 months postpartum, and, for whites, negative at 22 months or later postpartum. The period of 10 to 15 months postpartum corresponds to an interpregnancy interval of one to six months; in this brief interval, women with a teen first birth have risks of a second birth that are about twice as large as those for women with a nonteen first birth.

Our results suggest that women with a teen first birth experience higher rates of closely spaced second births than women with a nonteen first birth. What might be the consequences of this finding for completed family size? The answer to this question is complicated, because effects are likely to vary with parity and because a teen first birth has both direct and indirect effects on third and fourth birth risks. In terms of the numbers of women achieving parity 2,

differences in the risk of a second birth at short durations are of little consequence because most women proceed to a second birth. However, the indirect effect of a teen first birth on third and fourth birth risks via the higher rates of closely spaced second births to women with a teen first birth may be of greater consequence at the population level. We return to this point below.

Our study contains several findings concerning third and later birth rates. A first concerns the effects of a teen first birth on third and fourth births. While we find that a teen first birth has little or no effect on the overall pace of second births, we find that a teen first birth is associated with a higher overall rate of third and fourth births. Previous studies have typically examined, for example, the total numbers of children born in a ten year period following a first birth. In such previous studies, homogeneity in second birth rates between women with a teen and nonteen first birth may have concealed heterogeneity between these groups at higher parities. Note that differences in *rates* at higher parities are conceptually distinct from differences in *exposure*, but rate differentials would magnify the demographic consequences of exposure differentials.

This overall association between age at first birth and higher order birth rates accounts for much of the aggregate association between a teen first birth and high subsequent fertility. Overall rates of third and later births are low relative to second birth rates; consequently, third and later births are relatively uncommon, except among certain groups of women. It is important to remember, however, that while teen mothers currently bear more children than other women, historical comparisons suggest that current levels of completed fertility are lower in recent birth cohorts of women than in past cohorts. For example, although black women with a teen first birth are often considered to be a high fertility group, our samples of these black women appear headed towards an average completed family size of perhaps 3.1 children, about the mean fertility for *all* U.S. women (childless included) born during the 1930s (King and Lutz 1988).

In addition to the effect of a teen first birth on third and fourth birth rates, we find strong effects of a short interval between a first and second birth on later birth rates. On average, a closely spaced second birth appears to increase third and fourth birth rates at least as much as a teen first birth. This result is consistent with observations by Furstenburg et al. (1987) that closely spaced second births are associated with subsequent fertility among teen mothers, but our results suggest that the association between a closely spaced second birth and third and fourth birth rates holds for all women, regardless of their age at first birth. This association has only a limited effect on total fertility because fewer women have closely spaced second births than have a teen first birth, but it is still remarkable that closely spaced second births have received so much less attention than teen childbearing.

Because a teen first birth predicts a closely spaced second birth, a teen first birth will have both a direct effect on higher third and fourth birth rates, and an indirect effect via a closely spaced second birth. However, this indirect effect has only small consequences for completed family size. While women with a teen first birth have much higher second birth rates in the first 10 to 15 months following a first birth than women with a nonteen first birth, less than 10 percent of women with a teen first birth have a closely spaced second birth. As a result, the contribution of extremely close second birth spacing on completed family size is small in the aggregate.[13] However, for an individual woman, experiencing both a teen first birth and an extremely closely spaced second birth implies a substantially larger completed family size. In addition, it is

13 We used estimates from our hazard analyses to simulate effects on completed family size if rates of a second birth within 10 to 15 months of a first birth were identical for women with a teen and nonteen first birth. Our simulations suggest reductions in average family size in the ten years following a first birth by about .03 children for white nonhispanic women with a teen first birth and by about .05 children for black women with a teen first birth. See Table 1 for comparison. One might also posit an indirect effect of a teen first birth on third and fourth birth risks via its effect on second births at 16 to 21 months following a first birth. However, the effect of a teen birth at 16 to 21 months duration is typically not significant.

plausible that women who have both a teen first birth and a closely spaced second birth may be less likely than other teen mothers to complete high school, to participate in the labor force, and to be disadvantaged in other ways affecting both themselves and their children; As a result, experiencing both a teen first birth and an extremely closely spaced second birth may have consequences beyond the narrow demographic issue of completed family size.

Although our analyses demonstrate that the timing of early births is associated with the timing and prevalence of later births, this association may be spurious because of factors not available in these data. Previous studies have shown that family structure and other socioeconomic factors are important determinants of adolescent childbearing. In our analyses, we control for available measures of family background and find that the effects of age and timing of early births on subsequent fertility are not greatly altered by these controls. Still, adolescent births, closely spaced births, and high birth rates at later parities are correlated with social disadvantage; hence controlling for other dimensions of social disadvantage might account for the timing effects we observe.

Other unobserved factors may affect the timing and prevalence of births. One such factor is a desire for, or orientation towards, larger family size; others include ineffective or inconsistent contraception, factors that may raise the risk of an *unintended* birth. Our NLSY analyses include controls for number of siblings in the woman's family of origin, which is positively correlated with measures of ideal family size (Axinn, Clarkberg, and Thornton 1994). Moreover, a large fraction of teen first births and closely spaced second births are reported as unintended, which undermines, in part, arguments that women who desire large numbers of children choose to begin childbearing during their teen years or to space their first and second births within 15 months of one another. Factors related to unintended births are, we believe, more likely to alter the results

we report, because a teen first birth, closely spaced second births, and births at higher-order parities are often unintended. Thus, our results may simply identify women who are especially liable to the risks of these behaviors.

Our findings carry potential policy implications for programs that attempt to reduce repeat pregnancies among adolescent women. Typically, pregnancy prevention programs have targeted repeat pregnancies during the first 24 months following a first birth. To succeed, such programs must account for a wide array of young women's living, work, interpersonal, and neighborhood circumstances (Erickson 1994). In addition, our results suggest that second birth rates are not significantly different for women with teen and nonteen first births by the end of this 24 month interval. Perhaps as a result, studies of adolescent fertility have often had difficulty identifying specific factors that raise the risk of a closely spaced second birth.

Our results suggest that targeting prevention in a narrower 10 to 15 interval, rather than a broader 24 month interval, may be desirable in several ways. First, policy interventions targeted at the first 15 months postpartum may be simpler and more effective than interventions aimed at the first 24 months. Repeat pregnancies within this 10 to 15 month period coincide with the first six months postpartum; hence, repeat pregnancies in this period involve straightforward contraceptive and health issues that pertain to all women but that may be particularly relevant to young mothers.[14] Second, the consequences of closely spaced births on the health and socioeconomic status of young children are likely to be most serious for the most closely spaced births. Third, targeting the first six months postpartum could reduce closely spaced second births irrespective of the actual causal structure of such births, i.e. whether a teen first birth increases a woman's vulnerability to a rapid repeat pregnancy, or whether a teen first birth occurs most often

to women who are, for other reasons, vulnerable to a rapid repeat pregnancy. Clearly, reducing the prevalence of closely spaced second births will not address the wide array of social disadvantage faced by teen mothers, but these disadvantages are conceptually distinct from those that accompany rapid repeat births, and so might be best addressed as such.

Although the consequence of very closely spaced second births for aggregate fertility is modest, a policy emphasis on repeat births within 15 months a teen first birth could still address non-negligible numbers of a subgroup of considerable interest to policy makers. According to U.S. Vital Statistics for the calendar year 1993, second births within 15 months of a teen first birth occurred to roughly 15,000 women with a first birth by age 17 and over 10,000 women with a first birth at age 18 or 19. At first glance, this may appear to be only a small fraction of the nearly 4 million births at all parities. However, these 25,000 second births involve 25,000 mothers and 25,000 older siblings, and will eventually be followed by more than 25,000 younger siblings, given predicted fertility beyond parity 2. Consequently, second births that occur even within the narrow interval of 10 to 15 months following a teen first birth will affect upwards of 100,000 people per year in a disadvantaged segment of the U.S. population.

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[14] For example, Glasier et al. (1996) present evidence that health care providers provide inadequate contraceptive advice postpartum.

APPENDIX

We conducted a series of additional analyses to assess the sensitivity of results to alternative model assumptions. These results are available from the first author upon request. One set of models controlled for unmeasured heterogeneity in second births, third births, and combined second through fourth births using a procedure due to Heckman and Singer (1984). Results yielded estimates comparable to those we report for all age and spacing parameters. In a second set of models, we censored women in the NLSY when they reported a contraceptive sterilization for themselves or for their partners. We observed smaller but still significant effects of age at first birth on third and higher birth rates; these results may indicate that women with a teen first birth obtain a sterilization more slowly at each parity than are women with a nonteen first birth. The coefficients for effects of the spacing between a first and second birth and marital status on higher order birth rates were also slightly reduced in these models. In a third set of models, we (a) retained some cases that we had previously dropped because of questionable data quality, and (b) respecified categories for age at first birth and duration. None of these changes altered the coefficients or standard errors by more than a small amount. Lastly, we experimented with alternative functional forms for the baseline hazard. When we modeled the baseline hazard using a piecewise exponential function, the effect of an adolescent first birth on a second birth at 10 to 15 following a first birth was smaller in all models and not significant for NLSY blacks. However, model fit under a piecewise exponential baseline is significantly poorer than under the splined piecewise Gompertz baseline, in part because a piecewise exponential baseline does not adequately model rapid changes in the underlying hazard rate in intervals of interest such as at durations of 10 to 15 months following a first birth.

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Table 1: Descriptive Statistics for Subsequent Fertility of Women with at Least One Birth, by Race and Age at First Birth: Mean Number of Children Ten Years after a First Birth.

Race	Survey	Age at 1st birth	**Mean Number of Children**	Standard Error	Sample Size	**Mean Number of Children by Parity:** 2nd Children	3rd and later Children
White							
	NLSY	17 or younger	**2.44**	.11	129	.86	.58
		18 – 19	**2.33**	.09	177	.85	.48
		20 – 24	**2.29**	.07	285	.86	.43
		25 +	**2.26**	.19	35	.80	.46
	CPS	17 or younger	**2.40**	.06	376	.83	.57
		18 – 19	**2.40**	.05	590	.84	.56
		20 – 24	**2.30**	.03	1656	.83	.47
		25 +	**2.07**	.03	1354	.73	.34
Black							
	NLSY	17 or younger	**2.64**	.08	288	.88	.76
		18 – 19	**2.45**	.08	217	.82	.63
		20 – 24	**2.14**	.07	222	.76	.38
		25 +	**2.11**	.37	9	.89	.22
	CPS	17 or younger	**2.61**	.10	180	.82	.79
		18 – 19	**2.54**	.10	147	.80	.74
		20 – 24	**2.17**	.07	211	.79	.38
		25 +	**2.08**	.10	119	.72	.36

Notes:

NLSY 1979-1994 sample includes nonhispanic women with a first birth 1974-1984 and at least ten years of fertility data after the first birth.

CPS June 1990 sample includes nonhispanic women with a first birth 1975-1980. Parity progression after the fourth birth is estimated from the 3rd to 4th birth parity progression ratio.

Table 2: Mean Number of Children Ten Years after a Second Nontwin Birth, for Women with at Least Two Births, by Race and Interval between First and Second Birth.

Race	Survey	1st to 2nd birth interval	**Mean Number of Children**	Standard Error	Sample Size
White					
	NLSY	10 - 15 months	**3.12**	.19	33
		16 - 21	**3.02**	.15	48
		22 - 45	**2.76**	.07	152
		46 +	**2.67**	.11	54
	CPS	10 - 15 months	**3.38**	.09	174
		16 - 21	**3.01**	.06	274
		22 - 45	**2.59**	.03	861
		46 +	**2.55**	.08	97
Black					
	NLSY	10 - 15 months	**3.45**	.16	55
		16 - 21	**3.35**	.15	62
		22 - 45	**2.99**	.08	142
		46 +	**2.88**	.09	103
	CPS	10 - 15 months	**3.81**	.20	46
		16 - 21	**3.48**	.22	32
		22 - 45	**3.08**	.11	86
		46 +	**2.84**	.26	13

Notes:

NLSY 1979-1994 sample includes nonhispanic women with at least eight years of fertility data after the second birth.

CPS June 1990 sample includes nonhispanic women with a first birth 1975 or later and with at least eight years of fertility data after the second birth.. Parity progression after the fourth birth is estimated from the 3rd to 4th birth parity progression ratio.

Table 3: Descriptive Statistics for Covariates, Women with One or More Births, 1979–1994 National Longitudinal Survey of Youth and June 1990 Current Population Survey.

White nonhispanic women	Age at First Birth					
	17 or younger		18 or 19		20 or older	
	NLSY	CPS	NLSY	CPS	NLSY	CPS
Interval between 1st and 2nd birth						
10 to 15 months	.10	.07	.06	.07	.04	.05
16 to 21 months	.10	.13	.07	.11	.09	.09
Marital status						
unmarried at first birth	.40	.60	.29	.42	.12	.15
Background characteristics						
r's mother's education (years)	10.40		10.69		11.94	
r's father's SEI score	28.97		34.71		38.28	
nonintact family at age 14	.31		.29		.22	
number of siblings	3.64		3.73		3.10	
mother's age at first birth	20.74		20.55		22.06	
Sample size	136	725	191	1285	1007	8222

Black nonhispanic women	Age at First Birth					
	17 or younger		18 or 19		20 or older	
	NLSY	CPS	NLSY	CPS	NLSY	CPS
Interval between 1st and 2nd birth						
10 to 15 months	.09	.13	.07	.08	.06	.07
16 to 21 months	.14	.13	.10	.11	.07	.07
Marital status						
unmarried at first birth	.92	.96	.82	.86	.56	.59
Background characteristics						
r's mother's education (years)	9.91		10.49		11.08	
r's father's SEI score	23.73		23.35		25.48	
nonintact family at age 14	.55		.56		.43	
number of siblings	5.40		5.22		4.67	
mother's age at first birth	19.44		20.04		20.52	
	309	461	237	396	548	944

Notes:
NLSY 1979 – 1994 sample includes nonhispanic women born 1957 – 1964.
CPS 6/90 sample includes nonhispanic women with a first birth 1975 – 1980.

Table 4: Effects of Age at First Birth and Other Covariates on the Duration-Specific Risk of a Second Birth. Nonhispanic White Women, 1979 – 1994 National Longitudinal Survey of Youth and June 1990 Current Population Survey.

Variable	Model 1		Model 2		Model 3		Model 4
	NLSY	CPS	NLSY	CPS	NLSY	CPS	NLSY
intercept	-3.59	-3.48	-3.60	-3.52	-3.54	-3.43	-3.58
Age at first birth							
17 or younger	-.06	-.05	-.39*	-.25*	-.37*	-.17*	-.30
	(.11)	(.05)	(.17)	(.07)	(.18)	(.08)	(.18)
18 to 19 years	-.02	-.03	-.01	-.16*	-.01	-.13*	.04
	(.09)	(.04)	(.13)	(.06)	(.14)	(.06)	(.14)
20 to 24 years (omitted category)							
25 or older	-.04	-.16*	.01	-.02	-.02	-.05	-.07
	(.08)	(.03)	(.10)	(.04)	(.10)	(.04)	(.10)
Age at first birth and duration interactions							
17 or younger, 10 – 15 months			1.79*	.98*	1.79*	1.00*	1.80*
			(.34)	(.15)	(.34)	(.15)	(.34)
16 – 21 months			.39	.27	.39	.28*	.40
			(.36)	(.14)	(.36)	(.14)	(.36)
22 – 45 months (omitted category)							
46+ months			.32	.17	.32	.14	.34
			(.23)	(.11)	(.23)	(.11)	(.23)
18 to19 years, 10 – 15 months			.54	.74*	.55	.75*	.54
			(.37)	(.12)	(.37)	(.12)	(.37)
16 – 21 months			.11	.14	.11	.15	.11
			(.30)	(.11)	(.30)	(.11)	(.30)
22-45 months (omitted category)							
46+ months			-.13	.13	-.13	.12	.14
			(.19)	(.09)	(.19)	(.09)	(.19)
25 or older, 10 – 15 months			.12	.06	.13	.07	.11
			(.29)	(.09)	(.29)	(.09)	(.30)
16 – 21 months			.08	-.31*	.08	-.30*	.06
			(.22)	(.08)	(.22)	(.08)	(.22)
22 – 45 months (omitted category)							
46+ months			-.26	-.52*	-.25	-.52*	-.24
			(.17)	(.06)	(.17)	(.06)	(.17)

Table 4: (continued)

Variable	Model 1		Model 2		Model 3		Model 4
	NLSY	CPS	NLSY	CPS	NLSY	CPS	NLSY
Marital status at birth of first child and age at first birth interactions							
unmarried at first birth					-.40*	-.50*	-.36*
					(.12)	(.04)	(.13)
teen mother, unmarried at first birth					.18	.20*	.10
					(.18)	(.07)	(.18)
Background characteristics							
mother's education							.03 (.02)
father's SEI / 10							.04* (.02)
nonintact family at age 14							-.10 (.08)
number of siblings							.07* (.02)
mother's age at first birth							.02* (.01)
Log likelihood	-4803	-33609	-4789	-33524	-4782	-33432	-4764

Notes: Standard errors in parentheses. Intercept indicates log baseline birth rate at 22 months duration. See text for definitions of samples, variables, and details on the analytical models.

Sources: White nonhispanic women with at least one birth, 1979 – 1994 NLSY (n=1339) and June 1990 CPS (n=10232).

* $p<.05$

Table 5: Effects of Age at First Birth and Other Covariates on the Duration-Specific Risk of a Second Birth. Nonhispanic Black Women, 1979 – 1994 National Longitudinal Survey of Youth and June 1990 Current Population Survey.

Variable	Model 1		Model 2		Model 3		Model 4
	NLSY	CPS	NLSY	CPS	NLSY	CPS	NLSY
intercept	-4.04	-3.87	-4.03	-3.83	-3.90	-3.62	-4.06
Age at first birth							
17 or younger	.26*	.24*	.10	.01	.26	-.11	.25
	(.09)	(.08)	(.13)	(.12)	(.20)	(.19)	(.19)
18 to 19 years	.10	.15	.07	.18	.19	.06	.19
	(.09)	(.08)	(.14)	(.12)	(.19)	(.18)	(.19)
20 to 24 years (omitted category)							
25 or older	-.11	-.30*	-.20	-.23	-.25	-.09	-.24
	(.13)	(.09)	(.19)	(.12)	(.19)	(.13)	(.19)
Age at first birth and duration interactions							
17 or younger, 10 – 15 months			.92*	.97*	.91*	.98*	.90*
			(.26)	(.20)	(.26)	(.20)	(.26)
16 – 21 months			.22	.14	.22	.15	.21
			(.26)	(.22)	(.26)	(.22)	(.26)
22 – 45 months (omitted category)							
46+ months			.07	.16	.06	.16	.05
			(.17)	(.16)	(.17)	(.16)	(.17)
18 to19 years, 10 – 15 months			.62*	.24	.61*	.25	.60
			(.30)	(.23)	(.30)	(.23)	(.30)
16 – 21 months			-.09	-.16	-.10	-.15	-.10
			(.31)	(.23)	(.31)	(.23)	(.31)
22-45 months (omitted category)							
46+ months			-.04	-.10	-.03	-.12	-.03
			(.18)	(.17)	(.18)	(.17)	(.18)
25 or older, 10 – 15 months			.63	-.02	.63	-.14	.64
			(.37)	(.27)	(.37)	(.27)	(.37)
16 – 21 months			-.51	-.63*	-.54	-.62*	-.53
			(.43)	(.28)	(.45)	(.28)	(.45)
22 – 45 months (omitted category)							
46+ months			.31	-.67*	.32	-.67*	.33
			(.27)	(.20)	(.27)	(.20)	(.27)

Table 5: (continued)

Variable	Model 1		Model 2		Model 3		Model 4
	NLSY	CPS	NLSY	CPS	NLSY	CPS	NLSY
Marital status at birth of first child and age at first birth interactions							
unmarried at first birth					-.22*	-.31*	-.23*
					(.10)	(.09)	(.11)
teen mother, unmarried at first birth					-.09	.22	-.13
					(.17)	(.17)	(.18)
Background characteristics							
mother's education							-.02 (.01)
father's SEI / 10							-.04 (.04)
nonintact family at age 14							.10 (.07)
number of siblings							.03* (.01)
mother's age at first birth							-.01 (.01)
Log likelihood	-4350	-5933	-4340	-5911	-4336	-5904	-4326

Notes: Standard errors in parentheses. Intercept indicates log baseline birth rate at 22 months duration. See text for definitions of samples, variables, and details on the analytical models.

Sources: Black nonhispanic women with at least one birth, 1979 – 1994 NLSY (n=1094) and June 1990 CPS (n=1801).

$p<.05$

Table 6: Effects of Age at First Birth, Closely Spaced Second Births, and Other Covariates on the Duration-Specific Risk of a Third Birth. White Nonhispanic Women, 1979-1994 National Longitudinal Survey of Youth and June 1990 Current Population Survey.

Variable	Model 1		Model 2		Model 3		Model 4	
	NLSY	CPS	NLSY	CPS	NLSY	CPS	NLSY	
intercept	-4.477	-4.366	-4.513	-4.514	-4.563	-4.528	-4.517	
Age at 1st birth:								
17 or younger	.41*	.33*	.47*	.29*	.40*	.25*	.40*	
	(.15)	(.07)	(.15)	(.07)	(.15)	(.08)	(.16)	
18 – 19 years	.21	.28*	.26	.26*	.24	.24*	.23	
	(.14)	(.06)	(.14)	(.06)	(.14)	(.06)	(.14)	
20 – 24 years (omitted category)								
25 or older	-.03	-.35*	-.09	-.34*	-.06	-.33*	-.09	
	(.15)	(.05)	(.15)	(.05)	(.15)	(.05)	(.16)	
Interval between first and second birth								
10 – 15 months			.53*	.68*	.53*	.68*	.51*	
			(.18)	(.07)	(.18)	(.07)	(.18)	
16 – 21 months			.53*	.49*	.55*	.49*	.51*	
			(.15)	(.06)	(.15)	(.06)	(.15)	
22 – 45 months (omitted category)								
46 or more months			-.34*	-.28*	-.37*	-.32*	-.34*	
			(.14)	(.06)	(.14)	(.06)	(.14)	
Marital status at birth of first child								
unmarried at first birth					.34*	.10	.29*	
					(.13)	(.06)	(.14)	
Background characteristics								
mother's education							-.00	(.03)
father's SEI /10							.03	(.04)
nonintact family at age 14							-.10	(.13)
number of siblings							.07*	(.03)
mother's age at first birth							-.01	(.02)
Log likelihood	-2070	-12525	-2053	-12452	-2048	-12450	-2040	

Notes: Standard errors in parentheses. See text for definitions of samples, variables, and details on the analytical models. Intercept indicates log monthly birth rate at 22 months duration.
* $p < .05$
Sources: Nonhispanic white women with two or more births, 1979-1994 National Longitudinal Survey of Youth (n=910) and June 1990 Current Population Survey (n=6215)

Table 7: Effects of Age at First Birth, Closely Spaced Second Births, and Other Covariates on the Duration-Specific Risk of a Third Birth. Black Nonhispanic Women, 1979-1994 National Longitudinal Survey of Youth and June 1990 Current Population Survey.

Variable	Model 1		Model 2		Model 3		Model 4
	NLSY	CPS	NLSY	CPS	NLSY	CPS	NLSY
intercept	-4.54	-4.21	-4.47	-4.27	-4.55	-4.43	-4.69
Age at 1st birth:							
17 or younger	.45*	.51*	.45*	.45*	.41*	.38*	.35*
	(.12)	(.12)	(.12)	(.12)	(.13)	(.12)	(.13)
18 – 19 years	.32*	.36*	.33*	.35*	.32*	.31*	.26
	(.13)	(.13)	(.13)	(.13)	(.13)	(.13)	(.14)
20 – 24 years (omitted category)							
25 or older	-.47	-.25	-.55	-.24	-.53	-.20	-.54
	(.29)	(.16)	(.29)	(.16)	(.30)	(.16)	(.30)
Interval between first and second birth							
10 – 15 months			.24	.56*	.24	.56*	.25
			(.16)	(.13)	(.16)	(.13)	(.16)
16 – 21 months			.14	.28*	.15	.28*	.17
			(.15)	(.13)	(.15)	(.13)	(.15)
22 – 45 months (omitted category)							
46 or more months			-.28*	-.20	-.28*	-.19	-.27*
			(.12)	(.12)	(.12)	(.12)	(.12)
Marital status at birth of first child							
unmarried at first birth					.11	.24*	.11
					(.13)	(.12)	(.13)
Background characteristics							
mother's education							-.04* (.02)
father's SEI /10							-.11 (.07)
nonintact family at age 14							.12 (.10)
number of siblings							.02 (.02)
mother's age at first birth							-.00 (.01)
Log likelihood	-2375	-2598	-2367	-2582	-2367	-2580	-2360

Notes: Standard errors in parentheses. See text for definitions of samples, variables, and details on the analytical models. Intercept indicates log monthly birth rate at 22 months duration
* $p < .05$

Sources: Nonhispanic black women with two or more births, 1979-1994 National Longitudinal Survey of Youth (n=793) and June 1990 Current Population Survey (n=1122)

Table 8: Effects of Age at First Birth, Closely Spaced Second Births, and Marital Status at First Birth on the Duration-Specific Risk of a Fourth Birth. White Nonhispanic Women, June 1990 Current Population Survey.

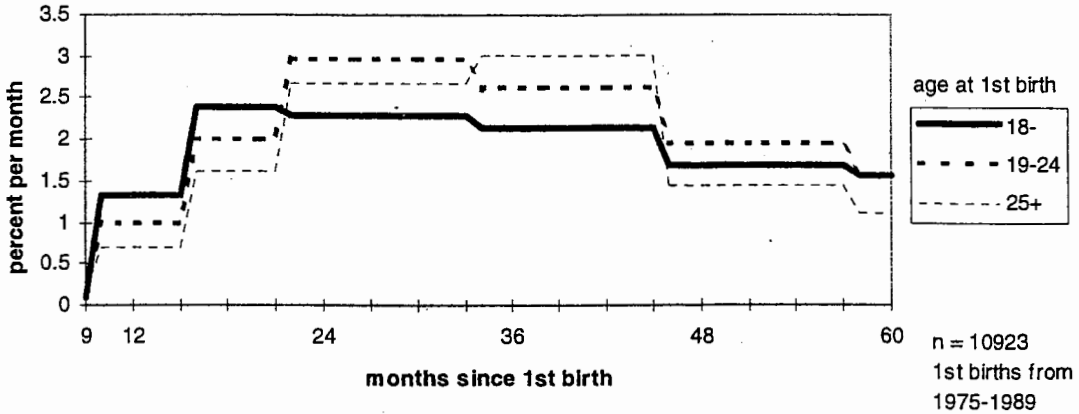
Variable	Model 1 CPS	Model 2 CPS	Model 3 CPS
intercept	-4.47	-4.59	-4.65
Age at 1st birth:			
17 or younger	.20	.21	.08
	(.14)	(.14)	(.15)
18 – 19 years	.18	.17	.11
	(.12)	(.12)	(.11)
20 – 24 (omitted category)			
25 or older	-.16	-.15	-.14
	(.11)	(.11)	(.11)
Interval between first and second birth			
10 – 15 months		.53*	.57*
		(.12)	(.12)
16 – 21 months		.34*	.35*
		(.11)	(.11)
22 – 45 months (omitted category)			
46 or more months		-.24	-.26
		(.15)	(.15)
Marital status at birth of first child			
unmarried at first birth			.35*
			(.11)
Log likelihood	-3108	-3092	-3087

Notes: Standard errors in parentheses. See text for definitions of samples, variables, and details on the analytical models. Intercept indicates log monthly birth rate at 22 months duration
* $p < .05$

Source: Nonhispanic white women with three or more births,
June 1990 Current Population Survey (n=1962)

Figure 1.1

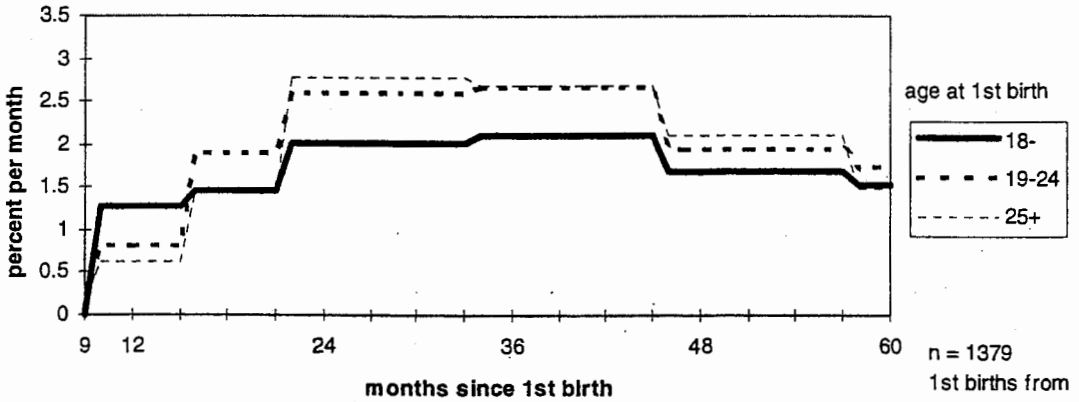
Monthly chance of a 2nd birth by age at 1st birth: White nonhispanic women, June 1990 CPS



n = 10923
1st births from
1975-1989

Figure 1.2

Monthly chance of a 2nd birth by age at 1st birth: White nonhispanic women, NLSY 1979-1994



n = 1379
1st births from
~1975-1993

Figure 2.1

Monthly chance of a 2nd birth by age at 1st birth: Black women, June 1990 CPS

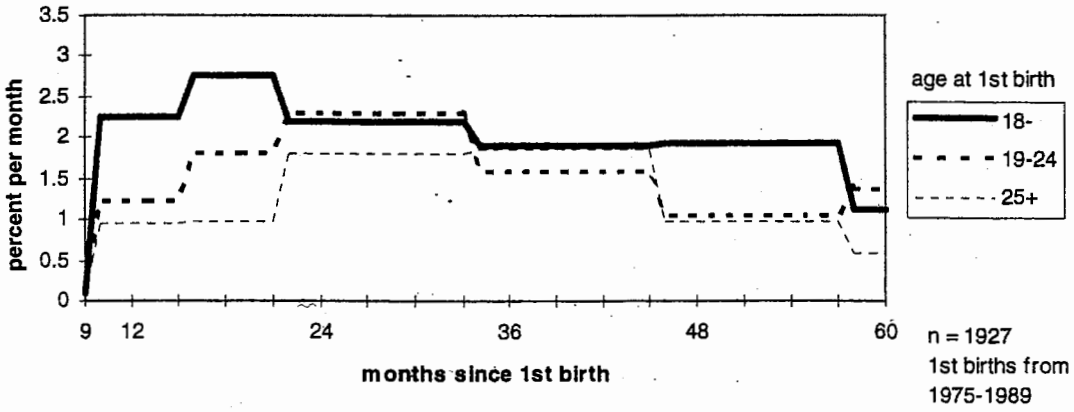


Figure 2.2

Monthly chance of a 2nd birth by age at 1st birth: Black women, NLSY 1979-1994

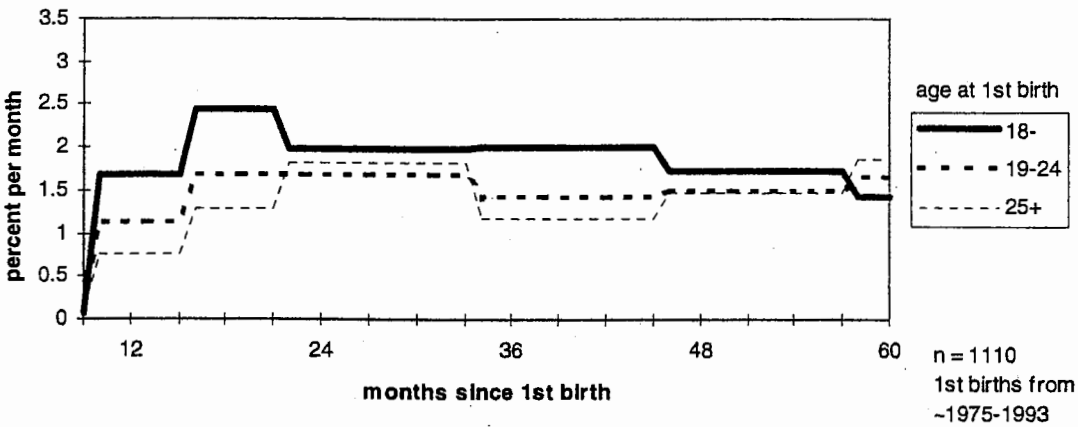
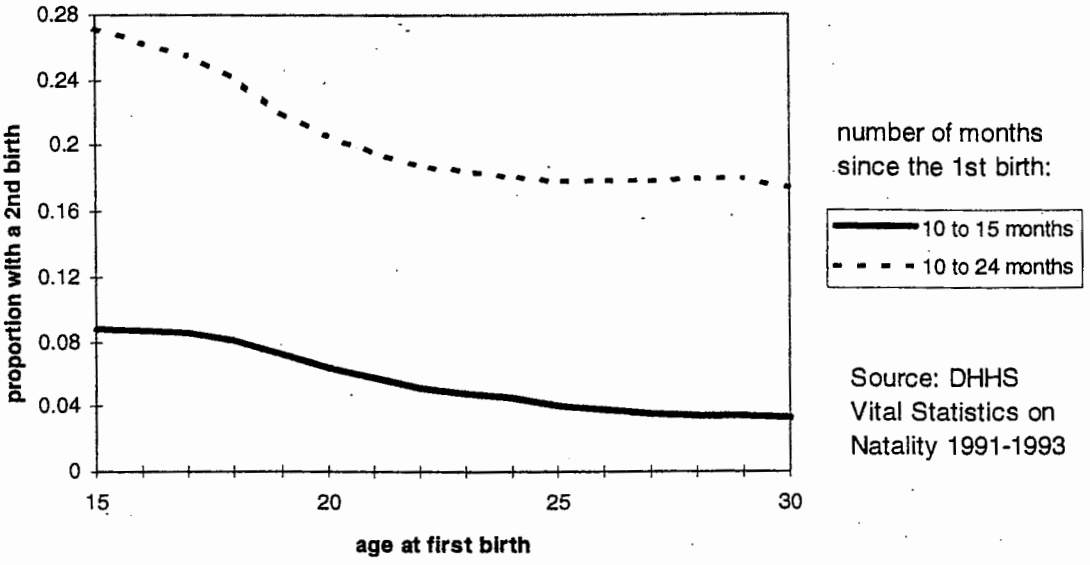


Figure 3 **Percent of U.S. First-Time Mothers with a Closely Spaced Second Birth, By Age at First Birth**



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