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Explaining Demographic Trends in Teenage Fertility, 1980 -1995

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Context: The teenage birthrate rose sharply in the late 1980s and early 1990s, and then declined in the 1990s. Attempts to explain these changes have failed to account for the changing environment in which adolescents live.

Methods: Data from the 1995 cycle of the National Survey of Family Growth are used to compare the experiences of three cohorts of teenage females in the 1980s and 1990s. A life-course framework is used to examine trends in characteristics of adolescents and adolescent mothers over time, and event-history analyses are conducted to determine which characteristics are associated with the risk of a teenage birth in each cohort. A comparison of the predicted probabilities from hazard analyses shows how changes in the context of adolescence across the cohorts help explain changes in the probability of a teenage birth over time.

Results: Factors associated with the increase in the teenage birthrate in the 1980s include negative changes in family environments (such as increases in family disruption) and an increase in the proportion of teenagers having sex at an early age. Factors associated with the recent decline in the teenage birthrate include positive changes in family environments (such as improvements in maternal education), formal sex education programs and discussions with parents about sex, stabilization in the proportion of teenagers having sex at an early age and improved contraceptive use at first sex. Sexually experienced teenagers in the mid-1990s were younger, on average, at first sex than were their counterparts in the 1980s, and thus are at an increased risk of a teenage birth. Partner factors, including nonvoluntary first sexual experiences, were not associated with the risk of a adolescent birth in any cohort.

Conclusions: Programs to further reduce the teenage birthrate should take into account the role of family stability, parent-child communication, sex education programs and engagement in school, as well as attempt to reduce the proportion of adolescents having sex at an early age and to improve contraceptive use. The increasing risk levels among sexually experienced teenagers suggest that current programs may be reducing sexual activity among adolescents already at a low risk of a teenage birth, without addressing the needs of those at highest risk.

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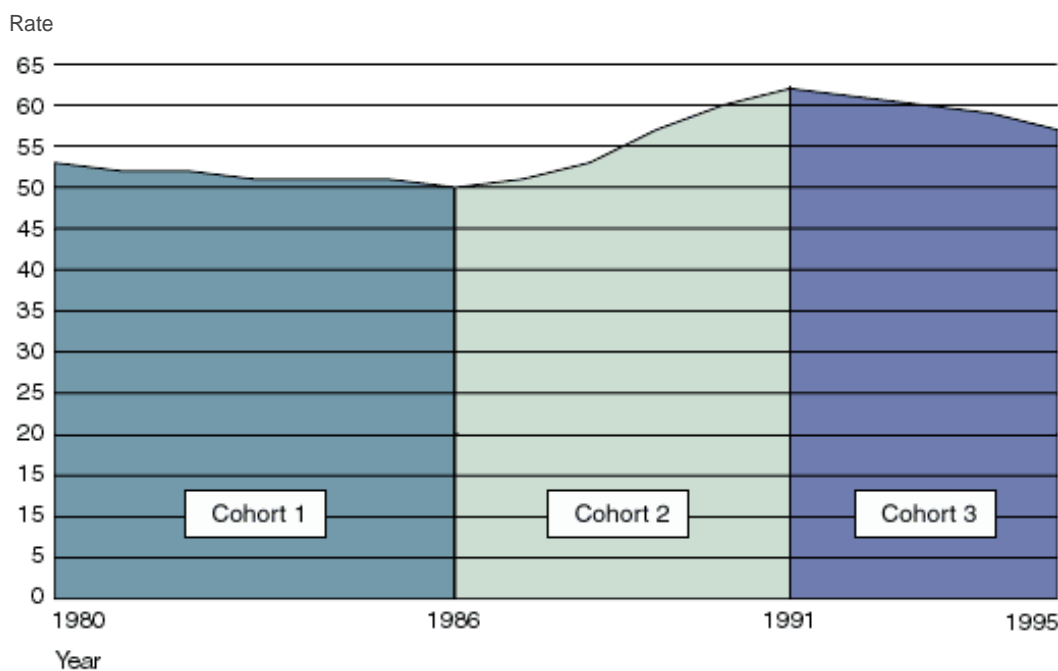
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18%. Competing hypotheses have been advanced to explain this decline, with some observers claiming that abstinence programs are responsible¹ and others arguing that the greatest part of the decline is due to improved contraceptive use.² The studies used to support these claims are limited, however, because they focus on only two proximate determinants of teenage pregnancy and childbearing, and they do not use a historical approach.

An examination of trends over the last several decades shows that the decline in the adolescent birthrate followed a dramatic and unprecedented increase of nearly 25% between 1986 and 1991. Thus, rates in the late 1990s are just starting to approach the levels of the mid-1980s.³ Neither the increase nor the decline in the adolescent birthrate appears to have been driven by changes in abortion rates: The abortion rate decreased from 42.3 per 1,000 teenage women in 1986 to 37.6 per 1,000 in 1991, when the teenage birthrate was just beginning to decline. But as birthrates fell, the abortion rate continued to decline, reaching 30.0 per 1,000 in 1995.⁴

Until recently, limited data have been available to assess factors associated with trends in teenage birthrates across the two periods. The research described in this article examines data from the 1995 cycle of the National Survey of Family Growth (NSFG). It uses a life-course perspective to follow the experiences of three cohorts of teenage mothers in the 1980s and 1990s (see Figure 1), comparing adolescent mothers who had a birth between 1987 and 1991—a period of dramatic fertility increases—with the cohort of women who became teenage mothers during the period immediately prior to the rise in teenage birthrates and the cohort of women who had a birth between 1992 and 1995—a period of declining birthrates.

Figure 1. Births per 1,000 females aged 15-19 in three cohorts of adolescents, 1980-1995



We have generated eight hypotheses to help explain these trends in fertility among U.S. teenagers. These hypotheses focus on the effects of changes in sexual activity and contraceptive use, but also encompass the effects of changes in the demographic context of individual teenage women, their family and their sexual partners. The effects of these factors may suggest policy approaches aimed at continuing the decline in adolescent fertility.

Framework

A life-course approach provides a framework for assessing how demographic changes may have contributed to recent trends in teenage childbearing. The transition to adulthood represents one aspect of life-course research and reflects a process that may include completing school, entering the labor force, forming a relationship and becoming a parent. Making the transition to parenthood during adolescence can have negative effects on women and on their children.⁵

Three central concepts of the life-course perspective are age, period and cohort. The age of individuals and the period of time during which they live influence their life experiences. The concept of the cohort adds to the life-course perspective an understanding of the unique experiences of groups of people born during the same period. As each cohort develops and ages, it experiences a unique segment of history, making a cohort comparison a useful mode of analysis for studying lives during times of social change.⁶ Thus, we use an intercohort approach to address changes in the context of adolescence and teenage motherhood in the 1980s and 1990s.

The demographic context of teenage childbearing is constantly changing. Thus, girls who entered adolescence in the mid-1990s faced a different environment than did those who were teenagers in the 1980s. For example, the percentage of teenagers growing up in a two-parent family declined from 77% in 1980 to 69% in 1995.⁷

Another life-course principle is that life transitions, such as the transition to parenthood, can be understood only within the context of the institutions and relationships in which a person is involved. Numerous studies have found evidence that teenage parenthood is affected by variables from multiple contexts, including family background, individual characteristics and partner factors.⁸ Understanding changes in teenage motherhood will thus involve assessing changes in multiple contexts that influence adolescent behavior.

- *Family background.* Many aspects of family background affect teenage childbearing, including race and ethnicity, parental education and income, family structure and religiosity.⁹ Family disruption or instability, reflected by changes in parents' marital status, also influences adolescent and nonmarital childbearing.¹⁰

- *Individual and school characteristics.* Adolescent fertility is related not only to educational attainment but to individual educational performance and engagement in school.¹¹ Sex education in school is associated with increasing knowledge, but has minimal effects on behavior.¹² The effects of sex education on sexual behavior are difficult to assess, in large part because the content of sex education curricula varies widely, including topics ranging from reproductive health to abstinence education. In addition, the types of sex education targeted to adolescents have changed over time, especially in response to the AIDS epidemic.¹³

Two proximate determinants of teenage fertility are the timing of first sexual intercourse and the effective use of contraceptives. Younger teenagers who are sexually active are less likely to practice contraception effectively and spend a longer time at risk of an adolescent birth.¹⁴ In contrast, sexually active teenagers who

consistently use a contraceptive have reduced odds of an unintended birth.¹⁵

• *Partner characteristics.* Teenagers who have had nonvoluntary sexual experiences are more likely to be sexually active at an early age and to engage in behaviors that place them at a greater risk of adolescent childbearing.¹⁶ Those who were youngest at first sex appear to be the group most likely to have had nonvoluntary sexual experiences.¹⁷ Recent research indicates that the proportion of young teenage mothers with an older male partner may have been exaggerated;¹⁸ however, adolescent females with much older male partners are at a greater risk of early pregnancy.¹⁹ In addition, recent research suggests that a substantial minority of teenagers are involved in nonromantic sexual relationships, which are associated with such risky sexual behaviors as failure to use contraceptives.²⁰

Data

The research discussed in this article used 1995 NSFG data to compare three cohorts of women who passed through adolescence between 1980 and 1995. The NSFG, conducted by the National Center for Health Statistics, is designed to provide estimates of factors affecting the U.S. birthrate and the reproductive health of U.S. women of childbearing age. The total of 10,847 interviews completed in 1995 included an oversample of Hispanic women.

Cohort Definitions

We created three retrospective cohorts to include all respondents who were aged 12-19* and living in the United States at some point during the three time periods: 1980-1986 (Cohort 1), 1987-1991 (Cohort 2) and 1992-1995 (Cohort 3).[†] For some, membership in a cohort was short (e.g., lasting only one month, from age 19 years, 11 months, until age 20), while others contributed multiple months. A woman who did not experience a teenage birth could be in two or even three cohorts; for example, a woman who was 12 in 1986 would have been in her teenage years in all three periods. The samples include 4,883 women who were adolescents in 1980-1986, 3,672 in 1987-1991 and 2,168 in 1992-1995. Although the comparison cohorts overlap, women who became teenage mothers between 1980 and 1995 are included in only one cohort, depending on the year in which they had their first birth. There were 580 teenage mothers in Cohort 1, 387 in Cohort 2 and 234 in Cohort 3.

The dependent variable is measured as age, in months, at first teenage birth. For women who did not have a teenage birth during a given period, the dependent variable was measured either as age, in months, at the end of the period (e.g., December 1986 for Cohort 1) or as age 20 for those who turned 20 during the period. Recent trend data suggest that rates of repeat birth among teenagers have declined to a greater extent than rates of first birth.²¹ However, for modeling purposes, we test only factors associated with the risk of a first teenage birth across the three cohorts. Because of underreporting of abortion in individual-level surveys, our analyses focus on births instead of pregnancies.²²

HYPOTHESES AND MEASURES

A combination of the changing context of adolescence and changes in factors that are associated with teenage births across three cohorts may help explain demographic

trends in teenage fertility. Thus, we developed eight hypotheses related to family, individual and partner factors to explain the increase in teenage birthrates in the middle to late 1980s (between Cohorts 1 and 2) and the subsequent decline in the 1990s (between Cohorts 2 and 3). The variables used to test each hypothesis are shown in Tables 1 and 2. (Those listed in Table 2 apply only to sexually experienced adolescents.)

Family Background

- *Hypothesis 1: Family environment.* A decline in the percentage of children raised in two-parent families or an increase in family turbulence and divorce²³ would lead to an increase in the teenage birthrate.

- *Hypothesis 2: Racial and ethnic composition.* Because black and Hispanic adolescents have higher birthrates than do white adolescents,²⁴ an increase in the proportion of U.S.-born teenagers who belong to racial and ethnic minorities would increase the teenage birthrate. (Birthrates among Hispanic adolescents born elsewhere are lower than rates among those born in the United States).²⁵

We created several measures to assess the level of turbulence teenagers had experienced in their living situation as they grew up. One explores whether the respondent grew up in an intact family (living with both of her biological or adoptive parents) or another stable family situation (e.g., with a single biological parent) from the time she was born until she moved out of her family household, conceived or reached age 20. This variable also examines the number of changes in living situation that the respondent experienced (including parental separation, divorce, marriage, remarriage or moving in with another parent or with a grandparent). Because a respondent could be part of more than one cohort, measures of family type and timing of parental divorce are cohort-specific. The measure of race and ethnicity allows for a comparison of U.S.-born and foreign-born Hispanics for each cohort, based on the timing of immigration.

Education and Sex Education

- *Hypothesis 3: Dropout status.* Increases in educational engagement—or declines in dropout rates²⁶—among adolescents are associated with reductions in the teenage birthrate.

- *Hypothesis 4: Sex education.* Increases in access to sex education at early ages, along with expansions of sex education programs to include education about HIV and AIDS,²⁷ would increase teenagers' motivation to practice contraception and would therefore lower adolescent fertility.

Because of the retrospective nature of the analyses, a cohort-specific measure of dropout status is our only measure of educational engagement (Table 1). Measures of formal sex education include having received two or more forms of education about birth control methods, sexually transmitted diseases (STDs) or abstinence in school, a church or a community center. We also include measures of discussions between the respondent and her parents before she was 18 about how pregnancy occurs, birth control methods and STDs. In the most recent cohort, 90% of adolescents aged 15-16 reported already having received formal sex education, and the percentages of

adolescents of that age who reported having discussed sex with their parents in each cohort are similar to percentages reported for the full sample (not shown).

Table 1. Weighted percentage of or mean value for all respondents aged 18-19 at end of cohort period and for teenage mothers, by selected characteristics, according to cohort

Characteristic	All			Mothers		
	Cohort 1	Cohort 2	Cohort 3	Cohort 1	Cohort 2	Cohort 3
	(N=929)	(N=841)	(N=840)	(N=580)	(N=387)	(N=234)
HYPOTHESIS 1						
Family environments						
Daughter of a teenage mother	36.9	36.7	34.7	55.4	56.1	56.5
Mean no. of children in family	3.9	3.3	3.0***	4.9	3.8	3.6***
Family type/changes in living situation						
No change, 2 biological parents	57.4	53.4	50.3***	43.5	33.7	36.0*
No change, other family situation	4.7	6.9	4.8	8.6	13.9	8.7
1 change	21.4	16.8	19.6	26.2	24.9	23.6
2 changes	7.2	12.9	13.2	12.6	13.9	16.3
3 changes	4.0	4.7	6.8	6.0	5.9	9.4
>=4 changes	5.3	5.3	5.4	3.2	7.7	6.1
Age at parental divorce						
0-5	7.2	8.9	15.4**	8.6	15.3	17.3**
6-10	8.6	8.8	7.7	10.3	9.8	8.4
>=11	8.2	7.2	8.6	12.5	8.1	9.1
Parents never married	6.4	8.6	8.2	9.8	15.7	16.3
Parents never divorced	69.6	66.5	60.2	58.8	51.2	48.9
Mother's education when respondent was aged <=19 years	12.0	12.3	12.7***	10.4	11.0	11.1**
Mother's work status when respondent was 5-15						
Full-time	43.1	48.3	52.2***	48.3	53.9	62.6**
Part-time†	20.1	20.3	22.4	19.4	13.7	12.3
No work for pay	36.6	31.3	25.1	32.3	32.4	25.1
Church attendance at age 14						
Never/rarely	40.8	42.2	45.8	47.3	48.8	53.3
Once a week	39.1	39.7	36.1	34.6	33.0	31.1
More than once a week	20.1	18.1	18.1	18.0	18.2	15.7
HYPOTHESIS 2						
Race/ethnicity						
U.S.-born Hispanic	6.9	8.7	9.1	13.4	11.5	12.6
Foreign-born Hispanic	3.0	3.4	2.2	3.7	6.2	5.2
Non-Hispanic black	14.9	14.7	15.8	25.6	25.2	28.9
Non-Hispanic other	3.4	4.5	3.4	2.3	4.0	2.9
Non-Hispanic white	71.8	68.7	69.5	55.0	53.2	50.3
HYPOTHESIS 3						
Dropout status						
Dropped out of high school	9.2	9.0	10.4	32.3	26.0	21.1**
HYPOTHESIS 4						
Sex education						
Discussions with parent before age 18						
Birth control methods	48.2	56.2	63.0***	38.7	48.3	56.8***
STDs	35.4	45.0	61.3***	30.7	38.6	52.6***
How pregnancy occurs	58.9	61.3	71.6***	44.1	49.0	55.3*

>=2 forms of formal sex education before age 18	71.2	82.2	92.7***	63.1	69.2	86.3***
HYPOTHESIS 5						
Timing of first intercourse						
Age at menarche	12.7	12.6	12.4***	12.4	12.3	12.3
Had sex by age 15	25.2	31.3	31.0**	49.3	58.4	56.8*
*Time trend across all three cohorts is significant at *p<.05. **Time trend across all three cohorts is significant at p<.01. ***Time trend across all three cohorts is significant at p<.001. †Includes mothers who worked full time during part of the period. <i>Note:</i> For percentage distributions, the indicator of significance is with the first category in the distribution.						

Sexual Experience and Contraceptive Use

- *Hypothesis 5: Sexual experience.* Changes in the percentage of teenagers who are sexually experienced²⁸ are positively associated with changes in adolescent fertility.
- *Hypothesis 6: Contraceptive use.* Increases in the use of contraceptive methods²⁹ among adolescents would lead to a decline in the teenage birthrate.

We include measures of the timing of first sexual intercourse and of whether the teenager or her partner used any method of contraception at first sex. Because the data are retrospective, we could not include measures of the frequency of sexual activity or of the consistency of contraceptive use over time.

Partners

- *Hypothesis 7: Nonvoluntary sex.* Given the link between nonvoluntary sexual experiences and other high-risk sexual behaviors, an increase in the percentage of teenagers whose first sexual experience was nonvoluntary would increase the adolescent birthrate.
- *Hypothesis 8: Partner characteristics.* An increase in the proportion of adolescent females with adult sexual partners would increase teenage fertility. In addition, an increase in the proportion of teenagers who are engaging in sex in the context of less-committed relationships would be associated with an increase in the adolescent birthrate.

Our measure of nonvoluntary first sex is based on women's reports of whether their first sexual experience was nonvoluntary or a rape. Other partner characteristics are measures of the respondent's first voluntary sexual partner. (Detailed information on nonvoluntary first partners was not collected.) Because of the retrospective nature of the cohort approach, we cannot measure characteristics of a teenager's most recent partner; we therefore include characteristics of the first sexual partner as a proxy for the characteristics of the teenager's most recent partner.

The factors that we hypothesize to be associated with the increase in the teenage birthrate from Cohort 1 to Cohort 2 include deteriorating family environments, increases in minority representation in the population, a decline in age at first sex and increases in the prevalence of nonvoluntary sexual experience, in the proportion of adolescents with adult male partners and in the prevalence of noncommitted sexual relationships. Factors that we believe are related to the decline in the birthrate between Cohorts 2 and 3 include a reduction in the birthrate of black teenagers, declining dropout rates, increasing access to sex education, a later age at first sex and a larger

percentage of adolescents practicing contraception.

METHODS

To test these hypotheses, we first examine trends in the characteristics of adolescents and adolescent mothers over time, using bivariate chi-square and Generalized Linear Model analyses.[‡] Then, using multivariate models, we examine characteristics that are significantly associated with the risk of a teenage birth in the three cohorts. Finally, using predicted probabilities, we examine how changes in the context of being a teenager affect the probability of an adolescent birth across the three cohorts.

The multivariate analyses are based on proportional hazard models, which determine what characteristics are associated with the risk of a teenage birth in each of the three cohorts. Proportional hazards modeling produces unbiased estimates of parameters in the presence of censored data and uses information available for the large proportion of adolescents who had not had a birth by the end of each cohort (censored cases).³⁰ This analytic strategy also allows us to specify the age of the teenager at the start of each cohort period in order to include information from the beginning of the cohort period only.

One way to interpret results of proportional hazard models is to compare the predicted probabilities of a teenage birth derived from those models. Predicted probabilities allow us to test whether changes in characteristics of adolescents over time explain trends in the teenage birthrate. To control for the stratified sample design of the NSFG, all results presented include design effects to adjust standard errors of estimates, using SUDAAN.³¹

RESULTS

Descriptive Analyses

Overall, 18% of adolescents in Cohort 2 and 14% of those in Cohorts 1 and 3 had a birth during the cohort period (not shown). Table 1 portrays the demographic context of adolescence by showing how family and individual characteristics of teenagers in general and of adolescent mothers in particular changed across the three cohorts. The first set of columns in the table includes characteristics of women who were teenagers during the majority of each period (measured as those who were aged 18-19 in the final year of the period) to standardize the samples by age and allow for intercohort comparisons. The second set of columns compares characteristics of teenage mothers in the three cohorts. Significance tests reflect overall associations across all three cohorts.

For example, the percentage of teenagers living in stable, intact families declined significantly, from 57% in Cohort 1 to 53% in Cohort 2 and to 50% in Cohort 3. A similar trend is apparent among teenage mothers, who were even less likely to live in an intact family: The proportion dropped from 44% in Cohort 1 to 36% in Cohort 3. In addition, a higher proportion of all teenagers in the most recent cohort had parents who were divorced (32% in Cohort 3 vs. 24-25% in Cohorts 1 and 2).

Trends in other aspects of family environment are also evident. For example, maternal education increased across the three cohorts. Moreover, family size declined, and respondents' mothers were more likely to work full-time. Several factors, including the

proportion of respondents who were daughters of teenage mothers, church attendance among teenagers and the racial and ethnic composition of the population, did not change significantly across the three cohorts.

Among teenage mothers (but not among all adolescents), steady declines occurred in the percentage dropping out of school while at risk of a first teenage birth (before conceiving, reaching age 20 or reaching the end of the cohort period). Sex education, including receipt of formal sex education and discussions with parents about sex education, shows a dramatic increase across the three cohorts. For example, among respondents in Cohort 3, receipt of two or more forms of sex education was almost universal in the overall sample (93%) and was extremely common among teenage mothers (86%). In addition, 61-72% of the overall sample in Cohort 3 reported discussions with their parents about aspects of sex education—including how pregnancy occurs, contraceptive methods and STDs—levels substantially higher than those in Cohort 1 (35-59%).

The percentage of all teenagers who had had sex by age 15 increased between Cohorts 1 and 2 (from 25% to 31%) and then remained stable in Cohort 3. Among sexually experienced adolescents (Table 2), the proportion who had had sex by age 15 increased from 40% in Cohort 1 to 50% in Cohort 3, and age at first sex declined. This pattern suggests that the more recent cohorts of sexually experienced teenagers are at even greater risk of giving birth before age 20.

Table 2. Weighted percentage of or mean value for all sexually experienced respondents and teenage mothers, by selected characteristics, according to cohort						
Variable	All			Mothers		
	Cohort 1	Cohort 2	Cohort 3	Cohort 1	Cohort 2	Cohort 3
	(N=610)	(N=633)	(N=542)	(N=580)	(N=387)	(N=234)
HYPOTHESIS 5						
Timing of first intercourse						
Age at first sex	15.8	15.6	15.2***	15.4	14.9	15.0***
Had sex by age 15	39.8	43.9	49.9***	49.3	58.4	56.8*
HYPOTHESIS 6						
Contraceptive use						
Used a method at first sex	58.8	65.0	76.1***	38.4	44.7	63.4***
HYPOTHESIS 7						
Nonvoluntary sex						
First sex was nonvoluntary	9.3	10.7	8.5	12.5	13.0	6.9*
Partner characteristics						
Age of partner	19.9	19.0	18.4*	19.7	20.4	19.4
Age difference between respondent and partner	2.6	2.4	2.3	3.2	3.2	3.0
Relationship with partner						
Just met/friends/went out once in a while	24.3	24.9	20.4	25.4	29.0	26.2
Going steady/engaged	75.7	75.1	79.6	74.6	71.0	73.8
*Time trend across all three cohorts is significant at p<.05. ***Time trend across all three cohorts is significant at p<.001.						

Age at menarche declined across cohorts in the overall sample, but not among teenage mothers (Table 1), while contraceptive use at first sex increased dramatically in both groups (Table 2). The proportion of sexually experienced teenagers who had used a

contraceptive method at first sex increased from 59% in Cohort 1 to 76% in Cohort 3; that proportion rose among teenage mothers as well, but was lower in all three cohorts than the levels for the overall sample.

Adolescent women in recent cohorts were no more likely to report having had a nonvoluntary or unwanted first sexual experience than were those in earlier cohorts, although the proportion of teenage mothers who reported nonvoluntary first sex declined across cohorts (Table 2). Some 9-11% of all teenagers reported that their first sexual experience had been nonvoluntary. The average age of the respondents' first sexual partners declined from 19.9 years in Cohort 1 to 18.4 years in Cohort 3, but the average age difference between the teenagers and their first partner remained stable at 2.3-2.6 years. Further, the proportion of teenagers whose first sexual partner was only a friend or someone they had just met did not change. There were no significant changes over time in partner characteristics for teenage mothers.

Multivariate Event-History Analyses

Table 3 shows the results of three multivariate event-history models for each cohort in the overall sample. These results reflect patterns of stability and change in family, individual and partner characteristics that are associated with the risk of a teenage birth. The use of multiple models allows us to test the main effects of variables for each of our hypotheses. For example, we may expect that family background will have a strong overall effect on the risk of a first teenage birth, but that this effect will operate through other variables such as educational attainment and the timing of first intercourse. Thus, the first model in Table 3 examines only the effects of family background and race and ethnicity. Model 2 controls for family background characteristics to test the effects of dropout status and sex education. Likewise, Model 3 controls for family background, dropout status and sex education to test the effects of timing of first intercourse.

Table 3. Odds ratios from proportional hazard analyses predicting a first teenage birth among all adolescents, by selected characteristics, according to cohort

Characteristic	Cohort 1 (N=4,883)	Cohort 2 (N=3,672)	Cohort 3 (N=2,168)
MODEL 1			
Hypothesis 1: Family environments			
Daughter of teenage mother	1.44***	1.66***	1.65**
No. of children in family	1.06**	1.04	1.02
Family type/changes in living situation			
Stable, 2 biological parents	1.00	1.00	1.00
Stable, other family situation	1.79**	2.96***	1.31
1 change	1.18	2.16***	1.08
2 changes	1.49*	2.32***	1.61
3 changes	2.01**	2.26**	1.52
>=4 changes	0.88	2.31*	1.27
Age at parental divorce			
Did not divorce	1.00	1.00	1.00
0-5	0.96	1.07	1.24
6-10	1.34	0.75	0.98
>=11	1.28	0.58*	1.10

Parents never married	1.22	1.01	1.05
Mother's education	0.91***	0.94**	0.91***
Mother's work status			
No work for pay	1.00	1.00	1.00
Full-time	1.25	0.99	1.44
Part-time†	1.29	0.70	0.69
Church attendance at age 14			
Never or rarely	1.00	1.00	1.00
Once a week	0.72**	0.76*	0.68*
More than once a week	0.84	0.87	0.71
Hypothesis 2: Race/ethnicity			
Non-Hispanic white	1.00	1.00	1.00
U.S.-born Hispanic	2.07***	1.56*	1.40
Foreign-born Hispanic	1.03	1.63	1.75
Non-Hispanic black	1.92***	1.67**	2.42***
Non-Hispanic other	0.80	1.20	0.79
<i>Satterwhite adjusted chi-square</i>	224.02***	131.92***	84.23***
<i>Degrees of freedom</i>	21	21	21
MODEL 2‡			
Hypothesis 3: Dropout status			
Dropped out of high school	2.78***	2.10***	2.09***
Hypothesis 4: Sex education			
Discussions with parents before age 18			
Birth control methods	0.92	1.10	1.02
STDs	1.27	1.09	1.27
How pregnancy occurs	0.78	0.64*	0.54**
>=2 forms of formal sex education before age 18	0.95	0.77*	0.95
<i>Satterwhite adjusted chi-square</i>	307.22***	156.71***	95.78***
<i>Degrees of freedom</i>	18	18	18
MODEL 3§			
Hypothesis 5: Timing of first intercourse			
Had sex by age 15	2.46***	3.00***	2.59***
Age at menarche	0.94	0.96	0.99
<i>Satterwhite adjusted chi-square</i>	316.71***	169.81***	102.20***
<i>Degrees of freedom</i>	20	20	20

*p<.05. **p<.01. ***p<.001. †Includes mothers who worked fulltime during part of the period. ‡Model controls for being the daughter of a teenage mother, the number of children in the family, family type/changes in living situation, mother's education and race and ethnicity. §Model is restricted to adolescents who were 16 or older at the end of the cohort period and controls for being the daughter of a teenage mother, the number of children in the family, family type/changes in living situation, mother's education, race and ethnicity, dropout status, discussions with parents and receipt of sex education. Ns are 3,728 for Cohort 1; 2,513 for Cohort 2; and 1,904 for Cohort 3.

• **Family background.** In Model 1, several family characteristics show significant effects on the risk of a first teenage birth. In each cohort, for example, black adolescents had a greater risk of a teenage birth than did whites after the effects of other background factors were accounted for, although the size of the effects differed across cohorts. U.S.-born Hispanic teenagers in Cohort 1 and Cohort 2 had a greater risk of a birth than did non-Hispanic whites, but foreign-born Hispanics did not. An additional analysis among Hispanic respondents (not shown) found that, in Cohort 1 only, being U.S.-born had a stronger effect than being foreign-born on the risk of a first

teenage birth.

Some family characteristics had a consistent effect across cohorts. In each cohort, daughters of teenage mothers had a greater risk of giving birth before age 20, and higher maternal education and regular church attendance lowered that risk. Other factors lost significance across the cohorts. A greater number of children was associated with an increased risk of a birth in Cohort 1, possibly reflecting fewer financial and social and emotional resources available for each child;³² that effect was no longer significant in Cohorts 2 or 3. The effects of Hispanic origin and family type also lost significance across the three cohorts. After controlling for family type and stability, the timing of divorce had a minimal effect, except for an unexpected buffering effect of divorce after age 10 in Cohort 2.

• *Individual and school characteristics.* Model 2 includes measures of dropout status and sex education, net of family background characteristics.⁵ In each cohort, adolescents who had dropped out of school had a risk of teenage birth more than twice that among teenagers who remained in school. In Cohorts 2 and 3, respondents who reported having discussed with their parents how pregnancy occurs had a significantly reduced risk of giving birth before age 20. In addition, while the odds associated with receiving two or more forms of sex education were less than 1.0 in each cohort, having done so significantly lowered the risk of a teenage birth only in Cohort 2.

Model 3, which was limited to women aged 16 or older at the end of each cohort period, controlled for all of the background variables included in Model 2. The results show that having had sex at a young age was strongly associated with the risk of a first teenage birth in each cohort (odds ratios of 2.5-3.0). Age at menarche, on the other hand, had no statistically significant effects.

The analyses in Table 4 (page 172) were restricted to sexually experienced adolescents (those who had ever had sex by the end of each cohort). Model 4 shows that the effects of family background and individual characteristics in this sample differed slightly from those in the full sample of teenagers. For example, maternal age at first birth did not have a significant effect, and the effects of family type, maternal education and dropping out of school were weaker. In addition, discussions with parents about STDs were associated with a marginally increased risk of a birth for sexually experienced teenagers in Cohort 1 ($p=.062$) and Cohort 3 ($p=.051$), perhaps reflecting discussions that occurred after the teenagers were already at risk of an early pregnancy.

Table 4. Odds ratios from proportional hazard analyses predicting a first teenage birth among sexually experienced adolescents, by selected characteristics, according to cohort

Characteristic	Cohort 1 (N=2,493)	Cohort 2 (N=1,776)	Cohort 3 (N=1,241)
MODEL 4			
Hypothesis 1: Family environments			
Daughter of a teenage mother	1.16	1.23	1.34
No. of children in family	1.06*	1.05	1.02
Family type/changes in living situation			
Stable, 2 biological parents	1.00	1.00	1.00
Stable, other family situation	1.74**	1.90**	0.90
1 change	1.15	1.35	0.85
2 changes	1.19	1.32	1.41

3 changes	1.71*	1.07	1.29
>=4 changes	0.80	1.28	1.18
Mother's education	0.95***	0.97	0.94*
Hypothesis 2: Race/ethnicity			
Non-Hispanic white	1.00	1.00	1.00
U.S.-born Hispanic	2.32***	1.61*	1.81**
Foreign-born Hispanic	1.27	2.28**	1.99
Non-Hispanic black	1.89***	1.70**	2.24***
Non-Hispanic other	1.28	1.50	0.89
Hypothesis 3: Dropout status			
Dropped out of high school	1.82***	1.53*	1.51
Hypothesis 4: Sex education			
Discussions with parents before age 18			
Birth control methods	0.80	0.94	0.76
STDs	1.35	1.31	1.55
How pregnancy occurs	0.92	0.63*	0.61*
>=2 forms of formal sex education before age 18	0.99	0.83	0.85
Hypothesis 5: Timing of first intercourse			
Age at first sex	0.88***	0.82**	0.85***
Age at menarche	0.92**	0.92*	0.98
Hypothesis 6: Contraceptive use			
Contraceptive use at first sex	0.63***	0.67**	0.83
<i>Satterwhite adjusted chi-square</i>	291.42***	184.79***	96.41***
<i>Degrees of freedom</i>	21	21	21
MODEL 5†			
Hypothesis 7: Nonvoluntary sexual experiences			
First sex was nonvoluntary	0.77	0.72	0.53
Hypothesis 8: Partner characteristics at first sex			
Age difference between respondent and partner	1.02	1.04	1.01
Relationship with partner			
Just met/friends/went out once in a while	0.82	0.94	1.03
Going steady/engaged	1.00	1.00	1.00
<i>Satterwhite adjusted chi-square</i>	273.95***	182.78***	88.68***
<i>Degrees of freedom</i>	23	23	23
*p<.05. **p<.01. ***p<.001. †Controls for all independent variables in Model 4 except contraceptive use at first sex.			

An older age at first sex was associated with a reduced risk of a first teenage birth in each cohort, and contraceptive use at first sex was associated with a reduced risk in Cohorts 1 and 2. A later age at menarche was also associated with a reduced risk of adolescent fertility in Cohorts 1 and 2.

•*Partner factors.* Model 5 examines differing effects of partner factors, including nonvoluntary first sexual experiences.** After family background and individual characteristics were controlled for, nonvoluntary sex had no significant effects in any cohort. The age difference between the respondent and her first partner was associated with a marginally increased risk of a teenage birth in Cohort 2 (p=.092). In Cohort 1, adolescents who had just met their first sexual partner or viewed him as only a friend had a marginally reduced risk of a teenage birth (p=.083), which may reflect the positive relationship between being engaged and the risk of a birth.

The adjusted chi-square for the multivariate models is highest for Cohort 1 and lowest for Cohort 3, indicating that the variables created for these hypotheses best explain variance in the earliest cohort.¹¹

Multivariate Predicted Probabilities

To test whether the changing context of adolescence has contributed to trends in the teenage birthrate, we examine the predicted probability of having a birth during the teenage years for each of the three cohorts. Predicted probabilities are estimated probabilities of a birth among adolescents in each cohort, given the average characteristics of their cohort (from Tables 1 and 2) and the factors that are significantly associated with outcomes (from the proportional hazard models in Tables 3 and 4).³³

• *Changes from Cohort 1 to Cohort 2.* Table 5 (page 173) compares the predicted probability of a teenage birth for respondents in Cohort 1 and Cohort 2. The first column shows the predicted probability of a birth among adolescents who had the average characteristics of teenagers in Cohort 1. For example, teenagers with the average family background and racial and ethnic characteristics of Cohort 1 had a 15% predicted probability of a teenage birth, given the effects of factors found to be significant in Model 1 (Table 3). In contrast, adolescents with the average characteristics of Cohort 2 had a 17% probability of a teenage birth (Column 4).

Table 5. Predicted probability of a first teenage birth among all adolescents and sexually experienced adolescents with the average characteristics of Cohort 1 and Cohort 2, by characteristic, according to effects of those characteristics on each cohort				
Characteristic	Cohort 1 effects		Cohort 2 effects	
	Cohort 1	Cohort 2	Cohort 1	Cohort 2
ALL TEENAGERS				
Model 1				
Family environment	14.6	14.4	16.9	16.9
Positive changes†	14.6	13.8*	17.5	16.9*
Negative changes†	14.6	15.1	16.3	16.9*
Race/ethnicity	14.6	14.8	16.7	16.9
Model 2				
Dropout status	13.6	13.6	16.3	16.2
Sex education and discussions with parents	13.6	13.4	16.9	16.2
Sex education, discussions with parents and positive changes in family environment	13.6	12.9*	17.4	16.2*
Model 3				
% having sex before age 15	11.9	12.6*	13.5	14.3
having sex before age 15 and negative changes in family environment	11.9	12.9*	13.2	14.3*
SEXUALLY EXPERIENCED TEENAGERS				
Model 4				
Age at first sex	21.2	21.5	24.0	24.6
Contraceptive use at first sex	21.2	20.6	25.3	24.6
Contraceptive use at first sex and positive changes in family environment	21.2	19.6*	26.2	24.6*
Model 5				
% with nonvoluntary first sex	21.5	21.5	25.2	25.1
Partner characteristics	21.5	21.4	25.2	25.1

*Variable is significant at $p < .10$ and explains at least 25% of the difference between the two cohorts. †Includes percentage of sample who were daughters of teenage mothers, number of children in family and mother's education. ‡Number of changes in living situation and parental divorce.

The middle columns test the hypothesis that changes in family, individual and partner characteristics may help explain an increase in the teenage birthrate. The second column of data shows the predicted probability of a teenage birth for Cohort 1, if the adolescents had the family characteristics of Cohort 2 teenagers, when other characteristics are held constant. Thus, the first row indicates that if the adolescents in Cohort 1 had the family background characteristics of Cohort 2 (with race and ethnicity held constant), they would have a slightly (but not significantly) lower predicted probability of a teenage birth (14.4% vs. 14.6%).

Similarly, the third column shows the predicted probability of a birth before age 20 for Cohort 2, if those teenagers had the family characteristics of Cohort 1 (16.9% in Column 3, the same as in the fourth column).^{†‡} In general, the patterns of direction and significance in the two sets of columns are similar.

The advantage of using predicted probabilities is that this method allows us to input aggregate population characteristics, based on women who were teenagers in each cohort, to provide a cohort-level and population-level probability of a teenage birth. The disadvantage is that predicted probabilities do not specifically replicate a population-level adolescent birthrate, and the probabilities and changes in probabilities are tied to specific models. Thus, although changes in predicted probabilities allow us to examine whether certain characteristics appear to be associated with an increasing or a declining predicted probability of a teenage birth, they do not allow us to test the relative contributions of the hypotheses.

The change in family characteristics over time includes factors that changed in ways likely to increase teenage births (e.g., a decline in the percentage of adolescents growing up in intact families and an increase in family turbulence) and factors that changed in ways likely to contribute to a decrease (e.g., higher levels of maternal education and declining family size). The analyses in Table 5 show that positive changes in family characteristics between Cohorts 1 and 2 are associated with a decline in predicted probabilities (from 14.6% to 13.8%). However, negative changes in family environments between the two cohorts led to an increased predicted probability (from 14.6% to 15.1%). Thus, the overall nonsignificant impact of family environment reflects a combination of positive and negative changes over time.

The predicted probabilities for Model 2 show the effects of dropout status and sex education. The predicted probabilities of adolescent birth were not affected by the changing proportion of teenagers who dropped out of school. Changes in sex education, including formal classes and discussions with parents about how pregnancy occurs, were associated with a decline in the predicted probability of a teenage birth, but only in combination with more positive family environments.

In Model 3, we see an increase in the predicted probability of a teenage birth based on the increasing proportion of adolescents having sex at an early age. There is an even greater increase in predicted probabilities (from 11.9% to 12.9%) when the effects of early sexual activity are combined with those of the negative changes in family environments that occurred between the two cohorts.

For sexually experienced adolescents, Models 4 and 5 provide no explanation for the increase in the risk of a teenage birth between Cohorts 1 and 2. In fact, Model 4 shows some evidence of a decline, based on improved contraceptive use at first sex and positive changes in family environments. In Model 5, changes in partner characteristics, including nonvoluntary sexual experiences, age difference between partners and type of relationship, appear to have had no effect on the predicted probability of a teenage birth between Cohorts 1 and 2.

• *Changes from Cohort 2 to Cohort 3.* Table 6 (page 174) compares the predicted probabilities for Cohorts 2 and 3. ^{SS} In all models, the predicted probability of a teenage birth was greater for Cohort 3 than for Cohort 2. This result reflects trends in the adolescent birthrate, because although the birthrate declined over the period for Cohort 3, it was still higher than the birthrate at the beginning of the period for Cohort 2 (see Figure 1).

Table 6. Predicted probability of a first teenage birth among all adolescents and sexually experienced adolescents aged 15 or older with the average characteristics of Cohorts 2 and 3, by characteristic, according to the effects of those characteristics on each cohort				
Characteristic	Cohort 2 effects		Cohort 3 effects	
	Cohort 2	Cohort 3	Cohort 2	Cohort 3
ALL TEENAGERS				
Model 1				
Family environment	16.5	16.2	17.4	17.0
Positive changes†	16.5	15.8*	18.0	17.0*
Negative changes†	16.5	16.9	16.7	17.0
Race/ethnicity	16.5	16.4	16.9	17.0
Model 2				
Dropout status	15.9	16.0	17.1	17.2
Sex education and discussions with parents	15.9	14.9*	18.5	17.2*
Sex education, discussions with parents and positive family environments	15.9	14.4*	19.3	17.2*
Model 3				
% having sex before age 15	14.6	14.5	15.9	15.8
% having sex before age 15 and negative family environments	14.6	14.6	15.7	15.8
SEXUALLY EXPERIENCED TEENAGERS				
Model 4				
Age at first sex	23.8	25.1*	26.7	28.1*
Contraceptive use at first sex	23.8	22.8	28.7	28.1
Contraceptive use at first sex and positive family environments	23.8	22.4	29.2	28.1
Model 5				
% with nonvoluntary first sex	24.2	24.3	27.5	27.9
Partner characteristics	24.2	24.4	28.0	27.9
*Variable is significant at $p < .10$ and explains at least 25% of the difference between the two cohorts. †Includes percentage of sample who were daughters of teenage mothers, number of children in family and mother's education. ‡Number of changes in living situation and parental divorce.				

Even so, several of our hypotheses were confirmed. In Models 1 and 2, we see significantly lower predicted probabilities associated with wider exposure to sex

education (including discussions with parents and formal sex education classes) and an even greater decline when wider exposure to sex education is combined with positive changes in family environments. As in Table 5, the lack of a significant overall effect of changes in family environment between Cohorts 2 and 3 masks counterbalancing effects of positive and negative changes.*†

Changes in the proportion of the overall sample beginning sexual activity at an early age between Cohorts 2 and 3 made no significant difference in the predicted probability of a teenage birth. However, among sexually experienced teenagers (in Models 4 and 5), an overall decline in age at first sex between the two cohorts led to an increase in the predicted probability of a birth. Thus, although the proportion of adolescents who became sexually experienced at an early age was stable from Cohort 2 to Cohort 3, those who had sex did so, on average, at an earlier age. The increase in predicted probability resulting from an earlier age at first sex was counterbalanced by increased contraceptive use and improved family environments, which are related to a predicted decrease in the probability of a teenage birth among sexually experienced teens. Changes in factors related to partners, including nonvoluntary sexual experiences, did not lead to a change in the predicted probability of a birth.

DISCUSSION

The demographic context of adolescence has changed over time, and many family and individual characteristics are associated with an increased or decreased likelihood of a teenage birth for each cohort. Factors related to partners were not associated with the risk of a birth in any cohort. However, our analyses confirmed several hypotheses on the effects of changes in the composition of cohorts of teenagers between the early 1980s and the mid-1990s, as well as those of changing associations between characteristics and outcomes.

The Overall Sample

In the full sample of teenagers, negative changes in family environment (including increases in family turbulence) and an increase in the proportion of adolescents having sex at an early age were associated with an increase in the teenage birthrate between Cohorts 1 and 2. However, positive changes, such as improvements in family environment, partially offset that increase. Among sexually experienced teenagers, age at first sex declined slightly between Cohorts 1 and 2, but contraceptive use at first sex and family environment improved; overall, these changes led to a decline in births in this group.

Two factors were associated with the decline in the birthrate of the overall sample from Cohort 2 to 3—sex education and discussions about sex with parents, and positive changes in family environment (e.g., improvements in maternal education). In addition, the proportion of teenagers having sex by age 15 stabilized between Cohort 2 and 3, reversing the trend toward earlier sexual exposure.

Thus, improved communication between parents and teenagers, along with the expansion of sex education, appears to have contributed to declines in the adolescent birthrate in the 1990s. Teenagers are much more likely to have had discussions with their parents about sex education issues, such as pregnancy, contraception and STDs, and communication with parents about how pregnancy occurs appears to have had a

buffering effect on the risk of a first teenage birth in two of the three cohorts. We posit that discussions about how pregnancy occurs are initiated prior to or during early adolescence and reflect an overall level of parent-child communication that is associated with a reduced risk of a birth. These results are in line with findings based on the National Survey on Adolescent Health (Add Health) that indicate that greater parent-child connectedness is associated with delays in sexual initiation among teenagers.³⁴ Teenagers are also increasingly likely to receive multiple types of sex education, which is associated with the risk of a teenage birth in Cohort 2.

The family environments of adolescents have changed over time. Although the proportion of teenagers growing up in an intact family declined across the three cohorts, and the incidence of divorce increased, positive changes also occurred, including an increase in maternal education and a decline in family size (which are associated with a reduced risk of a teenage birth). These positive changes offset the detrimental effect of family turbulence. In addition, some factors related to family environment lost significance over time, suggesting a diminished effect of family size, family type and family turbulence in the 1990s, although this may be the result of a smaller sample in Cohort 3. The models show more consistent effects of positive changes in family environment (especially maternal education). As expected, changes in the proportion of teenagers in the overall sample having sex were associated with stabilization in the probability of an adolescent birth between Cohorts 2 and 3.

Sexually Experienced Teenagers

When analyzing changes in the teenage birthrate, it is important to distinguish between adolescents who are sexually experienced and those who have not yet had sex. Among sexually experienced teenagers, improvements in contraceptive use at first sex were associated with a reduction in the birthrate between Cohorts 2 and 3. We found a dramatic overall increase in the percentage of adolescents using any contraceptive method at first sexual intercourse, which led to a reduced risk of a birth in all cohorts.

Because of the cohort construction of this sample, we were unable to examine the effects of recent contraceptive use. However, recent research indicates that among sexually active female teenagers, contraceptive use at most recent sex has declined over time.³⁵ This finding suggests that current cohorts of sexually experienced adolescents are at greater risk of a birth before age 20 than were sexually experienced teenagers in the late 1980s.

In addition, despite stabilization in the proportion of all teenagers who had ever had sex, the average age at first sex among sexually experienced adolescents declined between Cohorts 2 and 3, leading to a substantial increase in the predicted probability of a teenage birth. This finding is consistent with results of recent research indicating that the proportion of teenagers who have had sex before age 15 has increased since the late 1980s, a change that may be associated with an increased risk of teenage birth in future cohorts.³⁶ In addition, another study found that although the proportion of males who were currently sexually active has declined over time, those who are sexually active are engaged in more frequent sexual activity and are at an even higher risk of causing pregnancy.³⁷

Among sexually experienced teenagers, unlike the case for the overall sample,

discussions with parents about STDs were associated with a marginally increased risk of a birth before age 20. This finding supports results from the Add Health survey suggesting that teenagers may discuss certain issues with their parents only after engaging in high-risk behavior.³⁸

The possibility that today's sexually experienced adolescents are at an increased risk of a birth before age 20 suggests that different types of programs are needed for different groups of teenagers. Abstinence programs may be reaching low-risk adolescents, leaving a cohort of sexually experienced teenagers who are at greater risk of a birth. These higher-risk teenagers, who become sexually experienced at an early age, may require more intensive interventions. Without specifically addressing the needs of a higher-risk population of sexually experienced teenagers or improving their levels of contraceptive use, the United States may not continue to show a decline in teenage fertility.

Factors Not Associated with Change

Certain family, individual and partner characteristics that are widely believed to contribute to changes in the risk of a teenage birth were not, in fact, associated with predicted changes in the teenage birthrate. For example, racial and ethnic composition and dropout status were strongly associated with the risk of an adolescent birth in the multivariate event-history models. However, because they did not change significantly over time, they did not explain trends in teenage birthrates. In addition, partner characteristics were only marginally associated with the risk of a teenage birth, so they did not help explain trends in birthrates. These findings may reflect our inability to capture characteristics of the most recent sexual partner with a retrospective cohort approach.

This study contributes to existing research by testing multiple hypotheses on factors including the effects of changes in sexual activity and contraceptive use, as well as in family, individual and partner characteristics. Findings suggest that fostering a stable family environment, promoting discussions between teenagers and their parents, and keeping teenagers engaged in school, as well as discouraging early sexual activity and encouraging use of effective contraceptive methods, may help lower teenage fertility in the United States. In addition, future programs should consider the pregnancy prevention needs of high-risk, sexually experienced teenagers, as well as abstinence promotion for lower-risk adolescents.

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*Because the average age at menarche for respondents in the three cohorts ranged from 12.4 to 12.7 years, the term "teenager" is loosely defined as any respondent who was at least 12 years old at some point in the cohort.

†Women who were adolescent mothers in a prior cohort, however, were not included. For example, a woman who had a teenage birth at age 15 in 1979 was not included in Cohort 1, even though she was 16 in 1980, because she was no longer at risk of a first teenage birth.

‡Missing data on variables used for analyses were minimal. Variables with missing data were assigned mean or modal values and flagged if data for more than 5% of the sample in any cohort were missing. Missing information had no significant effects on outcomes.

§Family background controls for Models 2-5 include race and ethnicity, being the daughter of a teenage mother, number of children in the family, family type and mother's education.

**Model 5 does not include contraceptive use variables, because they are reported only for first voluntary sexual experiences.

†‡Because of the short time span for Cohort 3, the age range of the sample is narrower, and the sample size is smaller. However, the Satterwhite adjusted chi-squares take both sample size and predictive power into account and are generally smaller than Wald chi-squares (see: reference 31).

‡‡In some cases, the predicted probabilities in the middle columns reflect changes in a single variable (e.g., dropout status). In other cases, they reflect changes in multiple variables (e.g., family background characteristics). See Table 1 for the specific variables included in each hypothesis.

§§Because the youngest teenagers interviewed in 1995 were aged 15, we can predict the risk of a birth only for adolescents aged 15 or older for this cohort. To match the characteristics of this sample, we restricted the predicted probabilities of Cohort 2 to teenagers at risk of a birth at age 15 or older.

*†Analyses not shown here indicate a significant difference between estimates for positive and negative

changes in family environments.