Volume Title: Risky Behavior among Youths: An Economic Analysis

Volume Author/Editor: Jonathan Gruber, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-31013-2

Volume URL: http://www.nber.org/books/grub01-1

Publication Date: January 2001

Chapter Title: The Sexual Activity and Birth-Control Use of American Teenagers

Chapter Author: Phillip B. Levine

Chapter URL: http://www.nber.org/chapters/c10689

Chapter pages in book: (p. 167 - 218)

4

The Sexual Activity and Birth-Control Use of American Teenagers

Phillip B. Levine

Pregnancies among America's teenagers have caught our attention as one of the nation's greatest troubles. A Gallup poll conducted on 23 and 24 May 1999 found that 7 percent of those surveyed reported that youth/teen pregnancy was "the most important problem facing this country today" (Gallup Organization 1999). It was the fifth most common specific problem reported. The concern about teen pregnancy has even led to national goals regarding its reduction. The first family planning objective stated in *Healthy People 2000,* written in 1990, is to "reduce pregnancies among females aged 15–17," and additional goals include increased abstinence along with reduced activity and increased contraceptive use among those adolescents who do engage in intercourse (U.S. DHHS 1999a). Similar goals have been proposed for the next decade in *Healthy People 2010* (U.S. DHHS 1999b).

In fact, statistics regarding teen pregnancy are quite startling. Each year, roughly 10 percent of women between the ages of fifteen and nineteen and 6 percent of women between the ages of fifteen and seventeen get pregnant (Henshaw 1999). Approximately half these pregnancies result in a live birth. The share of teen women who become pregnant each year is considerably higher in the United States than it is in other developed countries. Rates in England and Canada are half the level and rates in Japan one-tenth the level of those in the United States (Alan Guttmacher Institute 1998). The high rate of teen pregnancy is a particularly American prob-

Phillip B. Levine is associate professor of economics at Wellesley College and a research associate of the National Bureau of Economic Research.

The author thanks Marcellus Andrews, Jon Gruber, Ann Velenchik, and conference and preconference participants for their helpful suggestions and Joyce Abma, Gil Crouse, Bob Schoeni, Sharon Terman, and Tori Velkoff for their assistance in acquiring and using the data.

lem, which rules out the possibility that teens are simply too young to control their sexual activity and/or too shortsighted to use contraception. Social factors must come into play.

Researchers from many academic disciplines, including anthropology, demography, developmental psychology, and sociology, have contributed to the literature attempting to identify the factors that lead to teen pregnancy. From these perspectives, teens' sexual activity and use of contraceptives is governed by their stage of development, which is dependent on a complicated array of factors influencing them since birth (and potentially even before that). Within this framework, particular acts are viewed as spontaneous and irrational, and teen pregnancies are viewed as "mistakes." Economists have rarely contributed to the study of teen sexual activity and birth-control use directly but have examined the determinants of teen fertility. The contribution of economic analysis in that context is that it provides a focus on the costs and benefits of particular decisions and applies more sophisticated statistical techniques to the study of the topic.

The purpose of this paper is to review the theory and empirical evidence regarding teens' sexual activity and birth-control use with an emphasis on the contribution that economic analysis can make. In section 4.1, I present a series of descriptive statistics designed to document recent trends in these activities for the population as a whole and for racial/ethnic subgroups. Section 4.2 will present a review of prior research, including both theoretical contributions across disciplines and previous empirical work that has estimated models of the determinants of sexual activity and birth-control use. Section 4.3 will report an analysis of two data sets that are designed to accomplish two different goals. First, examination of cross-sectional data can provide correlational evidence regarding who engages in sexual activity and uses birth control. Second, I use state-level data over time attempting to identify whether changes in "prices" affect these activities, where prices are measured by economic conditions, AIDS incidence, welfare generosity, and the restrictiveness of abortion policy. The results of this analysis indicate that some prices do indeed matter; if engaging in sexual activity is "more expensive" through, say, an improved labor market or an increased probability of contracting AIDS, then teenagers are less likely to have sex and/or more likely to use contraception. Section 4.4 will review the evidence on the effect of teen childbearing on the subsequent well-being of women. Section 4.5 concludes by discussing the implications of this analysis for public policy.

4.1 Recent Trends

4.1.1 Pregnancies, Abortions, and Births

Perhaps part of the recent public attention paid to the sexual activity of teens can be attributed to the rather unusual trends that have occurred

over the past decade or so in birth-, abortion, and pregnancy rates. As reported in figure 4.1*A*, after years of slowly declining teen birthrates, the late 1980s saw a sudden reversal in which the rate of births to women aged fifteen to nineteen jumped from about fifty per thousand women in this age group to sixty-two by 1991. Just as suddenly, that trend reversed, and teen birthrates have fallen back to about the level observed before the increase, at fifty-one births per thousand women aged fifteen to nineteen

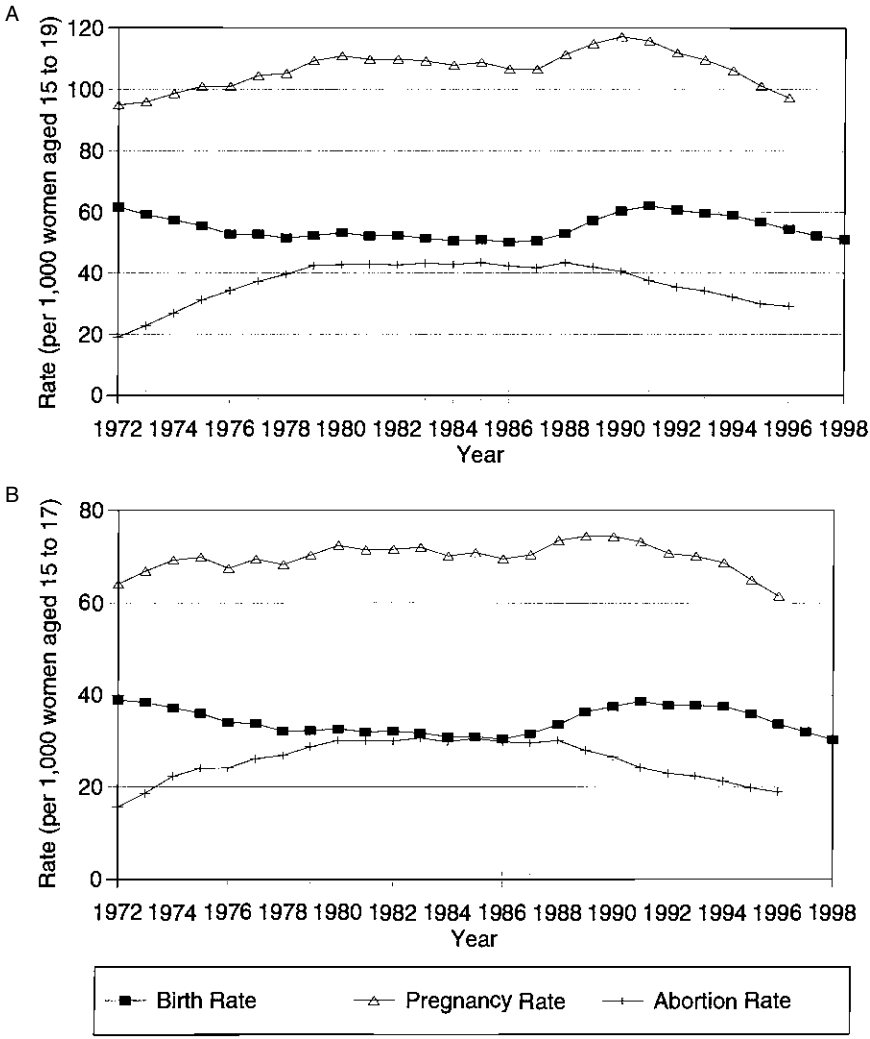

Fig. 4.1 Birth-, pregnancy, and abortion rates for women: *A*, aged 15–19; *B*, aged 15–17
Sources: Henshaw (1999); Ventura, Matthews, and Curtin (1999).

in 1998. The use of abortion, on the other hand, used to follow inversely the trend in births; decreases in teen birthrates through the late 1980s were matched by increases in the use of abortion services by these women. Over the last decade or so, however, abortions have become less and less common among teens, indicating that, since 1991, both abortions and births have fallen simultaneously. If fewer women are aborting and fewer women are giving birth, then it must be the case that pregnancies are falling even more rapidly. In fact, a constructed pregnancy rate (one that simply adds the birth- and abortion rate and factors in a fixed rate of miscarriages) for teens shows a dramatic decline, falling from 115 pregnancies per thousand teenage women in 1991 to ninety-seven in 1996, a 16 percent decline over only five years. Figure 4.1*B*, shows that similar trends are observed among fifteen- to seventeen-year-old women.

These data can be used to decompose the decline in births into one component attributable to risky sexual activity and one attributable to abortion behavior if we assume that the probability of becoming pregnant if one engages in risky sexual activity and the probability of a miscarriage are assumed to be constant. Between 1991 and 1996, the birthrate fell from 62.1 to 54.4, a 12 percent decline. If the abortion rate remained unchanged, one would have expected the birthrate to have fallen by 16 percent, or 133 percent of the decline, on the basis of a reduction in risky sexual activity. The fact that abortion became less prevalent offset this effect, increasing the odds of giving birth conditional on a pregnancy by 4 percent. A similar decomposition can be conducted for the rise in birthrates between 1986 and 1991, when the birthrate rose by 24 percent from 50.2 to 62.1. About two-thirds of this increase can be attributed to a reduction in abortion and one-third to an increase in risky sexual activity.

Although data on abortions are not available by race/ethnicity, patterns in birthrates are quite different across different groups. Figure 4.2 shows birthrates for fifteen- to nineteen- and fifteen- to seventeen-year-old women by race and ethnicity. Any trends in these figures within groups are overshadowed by the huge disparity in teen birthrates across groups. In the peak years of the early 1990s, black, non-Hispanic teens were three times as likely to give birth as were white, non-Hispanic teens. Since then, birthrates for all groups have fallen, but the decline for black, non-Hispanic teens has been precipitous. In 1991, 119 teen births per thousand women in this group were recorded; in just six years, that level had fallen to ninety-one in 1997, a 24 percent decline. An even greater relative decline occurred for younger black, non-Hispanic teens. In 1990, there were eighty-seven births per thousand fifteen- to seventeen-year-old women in this group, and this level fell by 28 percent to sixty-three births. Declines are also observed for Hispanic and white, non-Hispanic teen women over the last few years, but nothing as dramatic as that witnessed for black, non-Hispanic teens. The decline for black, non-Hispanic teens is so large that, even though they make up only about 15 percent of all female teens,

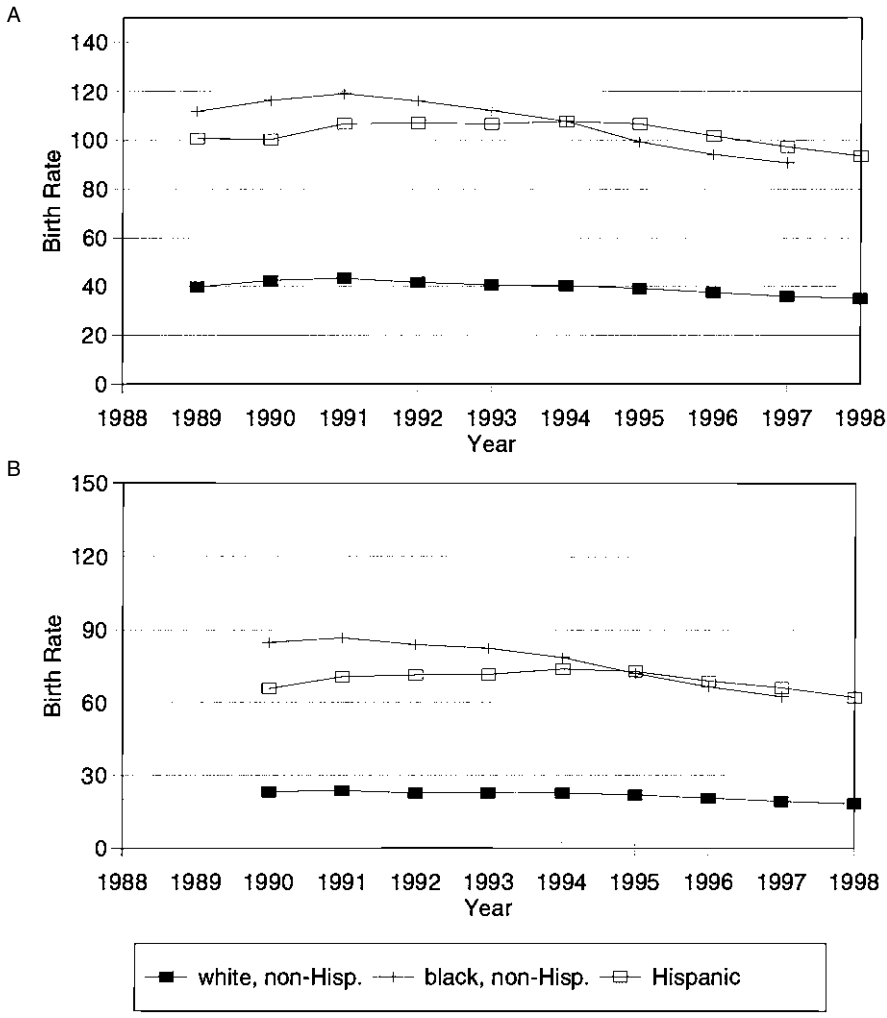

Fig. 4.2 Birthrates for women by race/ethnicity: *A*, aged 15–19; *B*, aged 15–17
Sources: Ventura, Martin, et al. (1999); Ventura, Matthews, and Curtin (1999).

they account for about 45 percent of the decline in the overall teen birthrate between 1991 and 1997.[1]

The public concern about the level of teen pregnancies and births can perhaps be attributed to the fact that the share of teen births that take place outside marriage has skyrocketed over the past several decades. Figure 4.3*A* shows that the fraction of births to unmarried mothers has increased for all women but particularly so for teens. For nonteens, few

1. This estimate is based on data presented in Ventura et al. (1995) and Ventura, Martin, et al. (1999a).

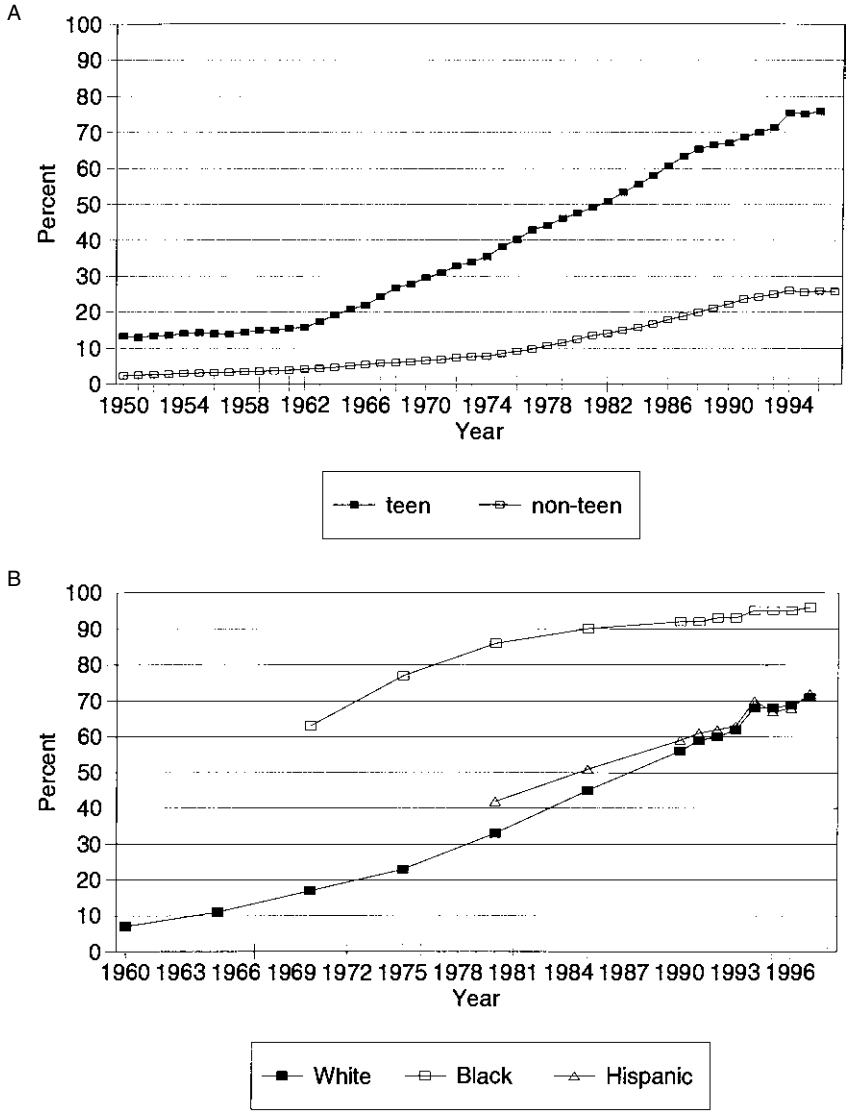

Fig. 4.3 ***A*, The percentage of teen and nonteen births to unmarried mothers; *B*, the percentage of teen births to unmarried mothers by race/ethnicity**

Sources: A, DHHS (1995, 1998); Ventura et al. (1996); Ventura et al. (1997, 1998); Ventura, Martin, et al. (1999); and author's calculations; *B*, DHHS (1995, 1998); Ventura, Martin, et al. (1999).

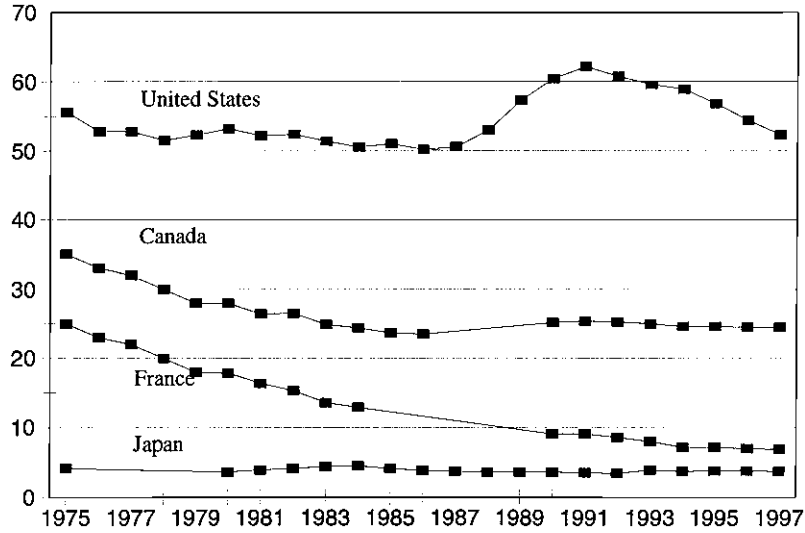

Fig. 4.4 Teen fertility rates in the United States and other industrialized countries
Source: U.S. Bureau of the Census, International Data Base.

births to unmarried mothers occurred until the 1960s, and then the fraction grew slowly before leveling off at about one-quarter by the 1990s. For teens, on the other hand, 15 percent of births in 1960 were to unmarried mothers, but that rate rose to 78 percent by 1997. Moreover, racial differences in teen births are dramatic, as shown in figure 4.3*B*. Currently, virtually all births to black teens are outside marriage.[2]

These statistics on teen pregnancies, abortions, and fertility stand in stark contrast to the experiences of other developed countries. Figure 4.4 reports trends in teen (age fifteen to nineteen) fertility rates for the United States, Canada, France, and Japan going back to 1975. Clearly, a high birthrate for teenage women is a particularly American phenomenon. Even in 1975, the teen birthrate in the United States was high—at over fifty-five births per thousand teenage women—relative to the other countries. Canada was the next highest, with a rate of only thirty-five, and, in Japan, there were only four births per thousand teenage women. Over the next two decades, however, downward trends are apparent in Canada and France, while Japan remained at a very low level.[3] By 1997, the teen birth-

2. Statistics for whites and blacks are inclusive of Hispanics. Data for white and black non-Hispanics are available only for the last decade or so and are not reported in order to provide a longer time series.

3. An analysis of the determinants of the decline in Canada and France is beyond the scope of this paper. One potential explanation for the decline, that a greater use of abortion has reduced teen fertility, can be ruled out at least for Canada, however. In Canada throughout most of the 1970s and 1980s, the teen abortion rate was roughly constant—at about

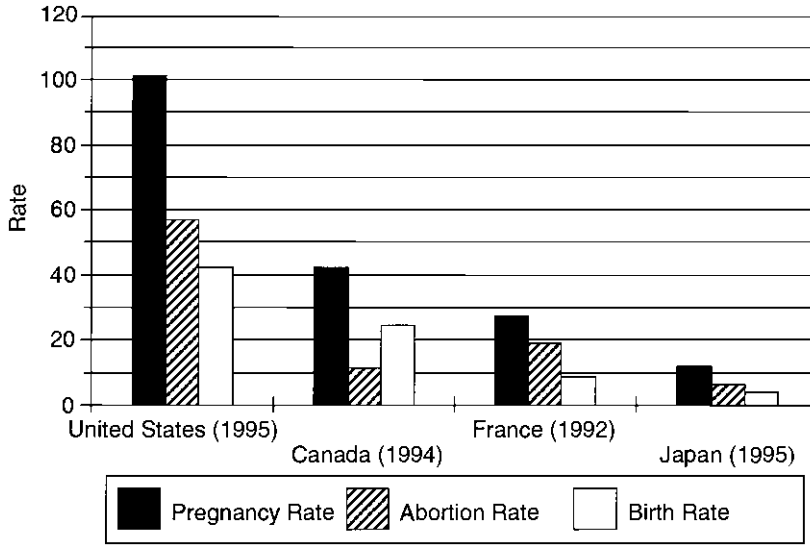

Fig. 4.5 Birth-, abortion, and pregnancy rates in the United States and other developed countries
Source: UN Department of Economic and Social Affairs (various years).

rate in the United States still stood at about fifty-two, while Canada's rate had fallen to less than half that, at twenty-five. Teen births in France became as uncommon as they were in Japan over the period. Consistent with these trends, abortions and pregnancies are considerably lower in these other developed countries compared to the United States. Figure 4.5 shows that pregnancies among teens in the United States are more than twice as common as in Canada and ten times more likely than in Japan. The abortion rate is also three times or more greater than that observed in these other countries, but births still remain considerably higher.

4.1.2 Sexual Activity and Birth-Control Use

These trends in births and pregnancies among teens suggest that changes must be occurring in levels of sexual activity and/or birth-control use over time. In fact, public pronouncements of such patterns have been put forth by the U.S. Department of Health and Human Services over the last few years. In 1997, Donna Shalala, the secretary of this department, proclaimed: "The long-term increase in teenage sexual activity may finally have stopped" (NCHS Press Office 1997). In 1998, she went further, stat-

fifteen per thousand teen women—until a Canadian Supreme Court ruling in 1988 increased the availability of abortion (Miller, Wadhera, and Henshaw 1997). Thereafter, the abortion rate rose to 21.5 by 1993. The timing of this trend is inconsistent with the reduction in teen births displayed in fig. 4.4.

ing: "For the first time in two decades, fewer young people are engaging in sexual behavior. . . . It is truly good news for all of us involved in the lives of America's teenagers" (CDC Press Office 1998). Both press releases also cite evidence of increased contraceptive use.

Although evidence of such trends does exist, it is not quite as transparent as one would expect given these assessments. Two main sources of data are used to track trends in sexual activity and birth-control use for American teens. The National Survey of Family Growth (NSFG) is administered to women of childbearing age (fifteen to forty-four) but is large enough that a separate analysis of teens (fifteen to nineteen as well as fifteen to seventeen) to track national trends is feasible. Comparable surveys were conducted in 1982, 1988, and 1995.[4] The second source of data is the Youth Risk Behavior Survey (YRBS), which has been administered biannually starting in 1991 to a nationally representative sample of roughly fifteen thousand ninth- through twelfth-grade boys and girls. The estimates reported will pertain only to the girls in the YRBS.[5] All the statistics displayed in the figures presented below can be found in table 4.1.

These data, however, do not show widespread trends toward decreased sexual activity and greater birth-control use.[6] Figure 4.6*A* displays the available evidence on the percentage of teens who have engaged in sexual activity in the preceding three months. Although Secretary Shalala's assessment that "fewer young people are engaging in sexual behavior"—is technically correct, the evidence is not particularly strong. Among those fifteen to nineteen in the NSFG data (the evidence used to support her assertion), a large decline was observed between 1988 and 1995, which followed a large increase between 1982 and 1988. But the 1995 level is only 0.2 percentage points lower than the 1982 level. Moreover, evidence from the same source showed virtually no recent change among those fifteen to seventeen; between 1988 and 1995, the percentage who engaged in sexual activity fell by 0.2 percentage points. Estimates from the YRBS data show that girls in high school became more sexually active through 1995 before decreasing their sexual activity between 1995 and 1997.

Broad evidence of general declines in sexual activity is also weak when one considers whether teens have ever engaged in sexual activity. Figure 4.6*B* shows that the YRBS data do indicate a decrease between 1995 and 1997 and that the 1997 level is lower than that observed in any of the previous years. The NSFG data show a very slight decrease in the percent-

4. NSFG surveys conducted in the 1970s are not comparable because they were administered only to married women.

5. For purposes of comparability with the NSFG data, the estimates from the YRBS reported here will be restricted to those for girls. In subsequent analyses of the YRBS reported below, however, I will take advantage of the availability of information on both boys and girls from that survey.

6. All the estimates reported here have been computed by the author, but those reported by Abma and Sonenstein (1998) and Terry and Manlove (1999) are comparable.

Table 4.1 **Sexual Activity and Contraceptive Use by Race/Ethnicity**

	NSFG: Ages 15–19			NSFG: Ages 15–17			YRBS			
	1982	1988	1995	1982	1988	1995	1991	1993	1995	1997
					Sexual Activity Ever					
All	46.9	52.5	51.1	32.2	37.7	38.0	50.8	50.1	52.1	47.7
White	44.4	52.2	59.0	29.7	35.5	35.3	47.1	47.4	49.0	44.0
Black	58.9	61.0	60.0	44.1	50.5	48.3	75.9	70.4	67.0	65.6
Hispanic	49.9	46.9	56.5	34.4	34.1	50.4	43.3	48.3	53.3	45.7
					Sexual Activity in Past 3 Months					
All	40.0	46.1	39.8	26.8	30.9	27.7	38.2	37.5	40.4	36.5
White	37.1	43.1	39.3	25.2	27.8	25.9	35.9	35.2	38.5	35.1
Black	53.6	50.8	45.8	38.8	39.5	33.9	55.3	53.2	50.6	47.3
Hispanic	42.2	31.5	45.2	22.0	20.4	39.0	32.8	37.9	39.3	33.2
					No Contraceptive Use during First Intercourse					
All	51.8	34.9	24.6	59.8	31.8	24.1	N.A.	N.A.	N.A.	N.A.
White	44.1	30.6	18.9	51.8	25.7	19.0	N.A.	N.A.	N.A.	N.A.
Black	64.1	46.6	31.7	68.8	45.0	28.0	N.A.	N.A.	N.A.	N.A.
Hispanic	77.1	44.5	42.7	87.7	39.0	38.5	N.A.	N.A.	N.A.	N.A.
					No Contraceptive Use during Last Intercourse in Past Three Months					
All	N.A.	22.9	30.6	N.A.	26.8	33.2	18.1	16.2	17.3	14.9
White	N.A.	20.2	28.2	N.A.	22.7	29.6	13.6	13.7	13.1	12.9
Black	N.A.	32.0	29.7	N.A.	41.4	27.1	26.9	22.7	18.3	17.8
Hispanic	N.A.	32.1	44.4	N.A.	30.9	53.7	29.0	23.1	34.9	30.3
					Pregnancy Risk[a]					
All	N.A.	9.8	12.2	N.A.	7.7	9.2	6.9	6.0	6.9	5.4
White	N.A.	8.7	11.1	N.A.	6.3	7.7	4.9	4.8	5.0	4.5
Black	N.A.	16.3	13.6	N.A.	16.3	9.2	14.7	12.0	9.1	8.4
Hispanic	N.A.	10.1	20.1	N.A.	6.3	21.0	9.5	8.7	13.7	10.0

Source: Author's calculations from the 1982, 1988, and 1995 NSFG and the 1991, 1993, 1995, and 1997 YRBS.

Note: Race/ethnic groups are mutually exclusive. Sample weights were used in estimation so that all statistics are representative for the particular subgroup of the nation's population. Owing to sample-size limitations, some estimates (particularly those for birth-control use for Hispanics and for the younger age category) are somewhat imprecise. N.A. = not available.

[a]Sexually active in past three months and no contraceptive use during last intercourse.

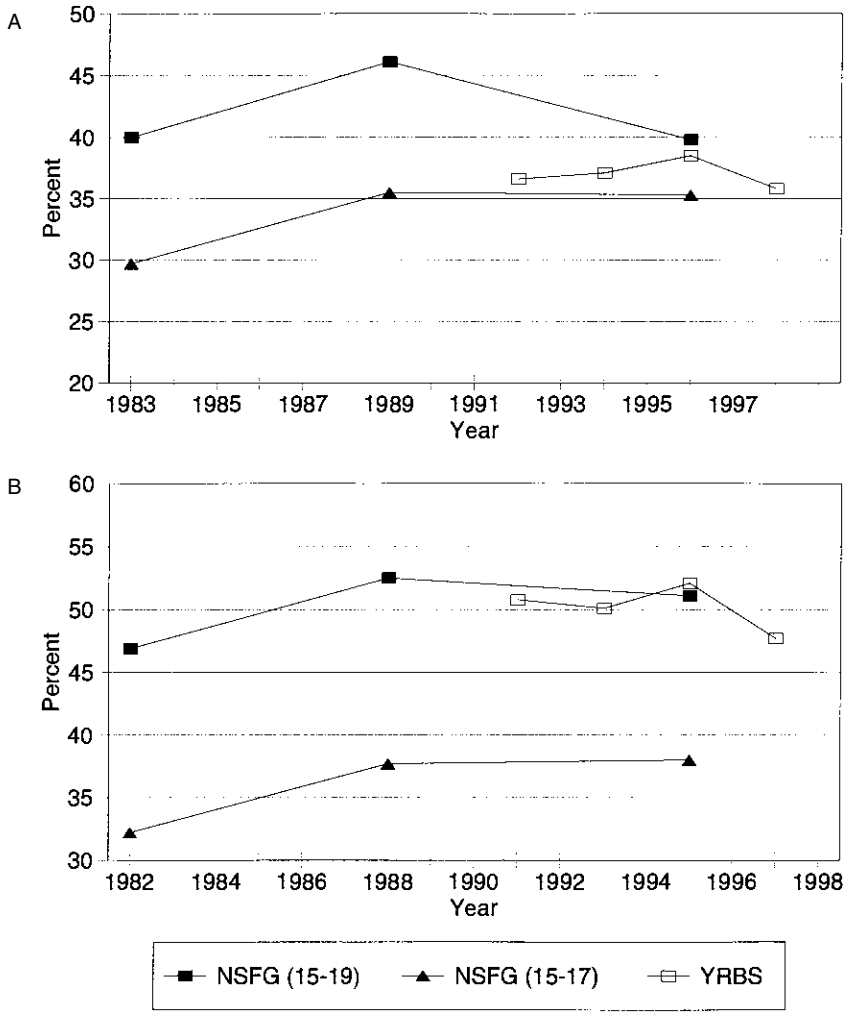

Fig. 4.6 ***A*, The percentage of teens who have had sexual intercourse in the past 3 months; *B*, the percentage of teens who have ever had sexual intercourse**
Source: Author's calculations from the NSFG and the YRBS.

age of ever sexually active women among fifteen- to nineteen-year-olds between 1988 and 1995, but the rate in 1995 is still almost 5 percentage points higher than that observed in 1982. Moreover, younger teens continue to be increasingly likely to have ever engaged in sexual activity through 1995.

Estimates of the use of birth control also provide mixed findings for the population as a whole. All statistics regarding birth-control use are reported here as the fraction who did *not* use contraception at a particular

incident rather than the more traditionally reported figures of those who did use contraception. This decision was made because it is the failure to use contraception that places the woman at risk of becoming pregnant and that is the focus of this paper. Figure 4.7*A* displays the available evidence on the likelihood of failing to use contraception during the last intercourse in the past three months.[7] Data from the YRBS show decreases through the 1990s. On the contrary, the NSFG data show an increase between 1988 and 1995 (this information is not available from the NSFG for 1982). A reconciliation is perhaps possible if a dramatic upward trend in the late 1980s followed a sharp rebound in the early 1990s; neither data set provides sufficient information to test this hypothesis.[8]

The reported increase in the failure to use birth control based on the NSFG data is particularly surprising in the light of recent advances in contraceptive technology. Highly effective, longer-term contraceptive methods, including Norplant and Depo Provera, have recently become available.[9] Although these new methods have been adopted by a significant number of teens, their use has largely been among those who might have used the Pill otherwise. Figure 4.7*B* shows the methods used during last intercourse by women fifteen to nineteen who have engaged in sexual activity in the past three months. It indicates that 7.7 percent of these women used either Norplant or Depo Provera in 1995 (these methods were not listed as options in 1988). Most other forms of contraception were used at roughly the same rate, with the important exception of the Pill. In 1988, 41.5 percent of teenage women used this effective form of contraception, but that level fell to 23.3 percent in 1995. This fall was not compensated for by the increased use of new contraceptive methods; the difference is made up by those not using any method at all (on the basis of these data).

7. It is evident that estimates from the YRBS data are substantially lower rate than those from the NSFG samples. A potential explanation for this finding rests in the particular questions asked in the two surveys. The YRBS appears quite specific in indicating that some form of birth control should have been used by asking, "The last time you had sexual intercourse, what one method did you or your partner use to prevent pregnancy?" Estimates from the NSFG are derived from a less-directed approach (where respondents are asked whether they used a series of types of contraception), one that may have been better able to illicit a response that no form was used. Another potential explanation is that the YRBS is conducted in school while the NSFG is conducted in home and that that difference may affect the reporting of sensitive behaviors. Regardless of the differences in levels, estimates over time should still provide trends that can legitimately be compared.

8. I have spoken with representatives of the Centers for Disease Control (CDC) about this apparent contradiction. Although they have confirmed finding similar patterns in their own analyses, they too have been unable to resolve the apparent inconsistency across data sources.

9. This discussion ignores the introduction of the *morning-after pill,* otherwise known as *emergency contraception,* because such methods were not approved for use by the U.S. Food and Drug Administration until February 1997, after the date for which statistics are being reported in this paper. Nevertheless, the use of emergency contraception is still uncommon. A recent survey found that only 1 percent of all women of reproductive age have ever used it and that only 11 percent even know that it exists and is available for use (Kaiser Family Foundation 1997).

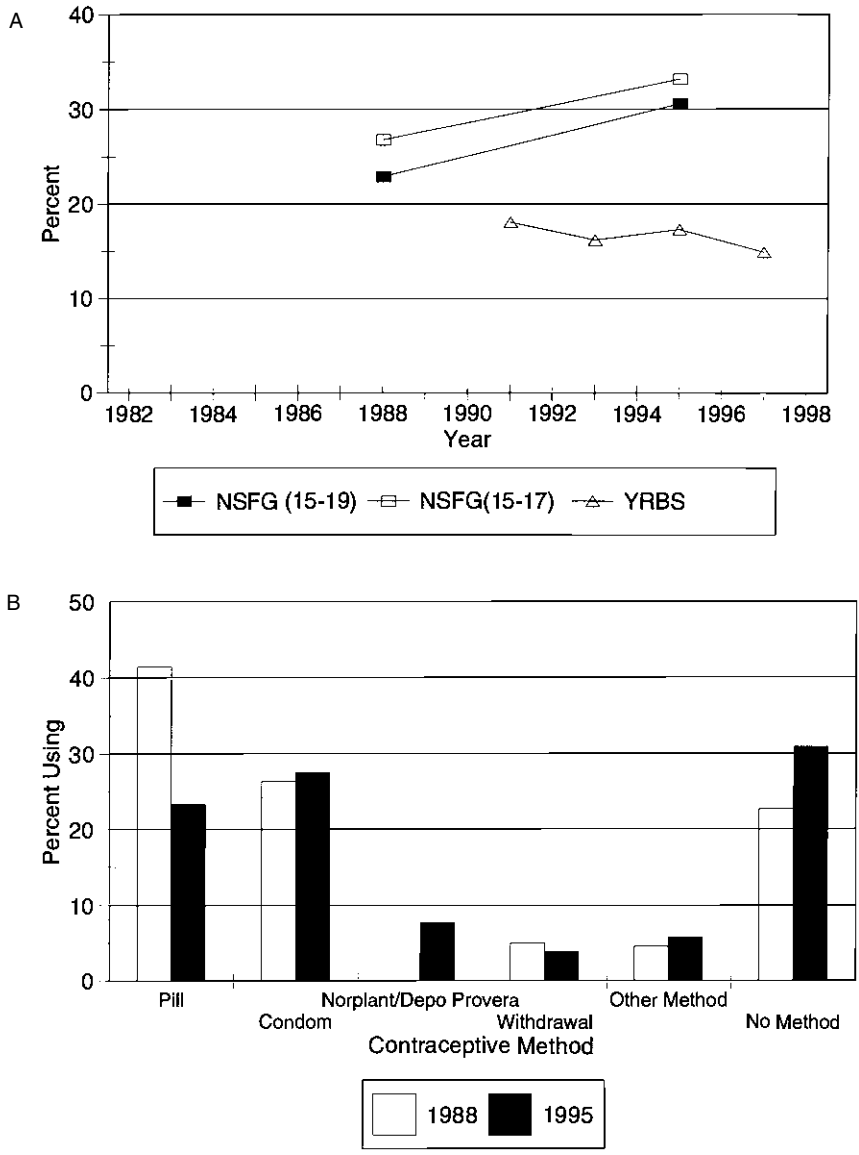

Fig. 4.7 ***A*, The percentage of teens who failed to use contraception during last intercourse in the past 3 months; *B*, contraceptive methods used during last intercourse by 15–19-year-old women; *C*, the percentage of teens who failed to use contraception during first intercourse**

Source: A, Author's calculations from the NSFG and the YRBS; *B*, Terry and Manlove (1999); *C*, author's calculations from the NSFG.

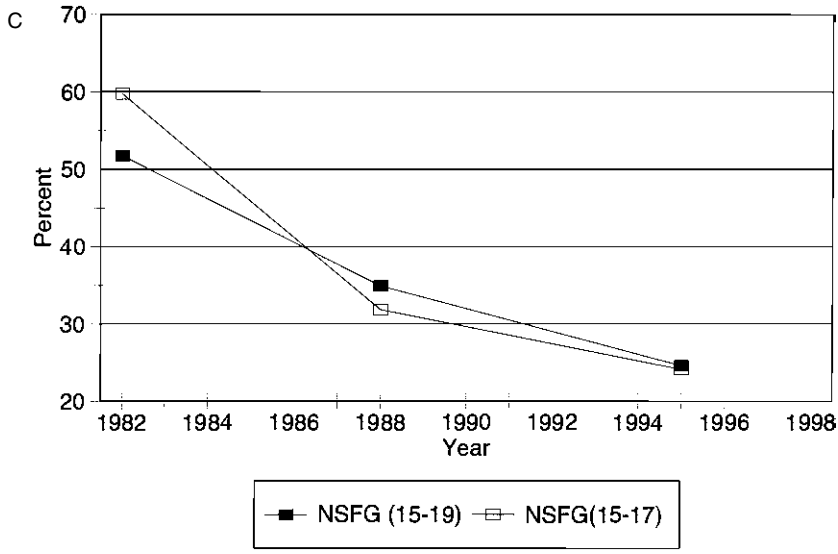

Fig. 4.7 (cont.)

On the other hand, fewer and fewer teens appear to undertake their first sexual encounter without using contraception. Figure 4.7*C* reports these data for both age groups of the NSFG data (no comparable data are available in the YRBS); the reduction has been dramatic. In 1982, more than half of teens in both age groups did not use any contraception during first intercourse. In 1995, however, only about one-quarter failed to do so. Although this trend is important, it is probably not as good a predictor of the risk of becoming pregnant as is birth-control use at last intercourse since the latter is probably a better gauge of typical practices for a larger proportion of sexual activity.

To approximate the risk of pregnancy that a typical teen faces at a point in time, the data on sexual activity in the past three months along with the failure to use contraception during the last intercourse in the past three months are combined to create a statistic representing the joint probability of the two behaviors. This statistic, to which I refer as the *pregnancy risk,* constitutes the probability that in the past three months a teenage girl had sex and did not use contraception, placing her at risk of becoming pregnant. It is a useful statistic because it incorporates abstinence as a form of contraception. On the other hand, because it captures only failure to use contraception during the last intercourse, it is likely to understate the fraction of teens who are truly at risk of getting pregnant.[10] Nevertheless,

10. Moreover, the three-month window that it uses is shorter than the annual window with which births, abortions, and pregnancies are typically measured. For both these reasons, a comparison of pregnancy risk to the pregnancy rate will incorrectly make it appear that a huge fraction of teens are at risk of becoming pregnant.

trends in this statistic would seem to be strongly correlated with the true fraction at risk.

The estimated pregnancy risk across samples over time is reported in figure 4.8. As one would expect on the basis of the earlier patterns of sexual activity in the past three months and contraceptive use during the last intercourse over that period, trends in pregnancy risk between the two surveys conflict. The NSFG data indicate an increase in pregnancy risk between 1988 and 1995, but the YRBS shows a decline between 1991 and 1997. Again, these findings may not be inconsistent if an upward trend in the late 1980s reversed in the early 1990s. Nevertheless, they do not present a clear picture regarding changes over time in the risk that teens face of becoming pregnant.

These results for sexual activity, birth-control use, and pregnancy risk do not appear to coincide with the evidence on pregnancies and births presented earlier. The rapid decline in these outcomes through the 1990s would certainly suggest that a reduction in sexual activity and an increase in contraceptive use should be readily apparent in these data, but they are not.

To reconcile these findings, one must recall that the trends in births were considerably stronger for blacks than for whites and Hispanics. In fact, evidence consistent with these trends by race/ethnicity is observed, as reported in table 4.1 above. Several measures of sexual activity for black, non-Hispanic women have decreased rather dramatically, while similar statistics for white, non-Hispanic and Hispanic teenage women show no such patterns. For instance, estimates from the NSFG indicate that the

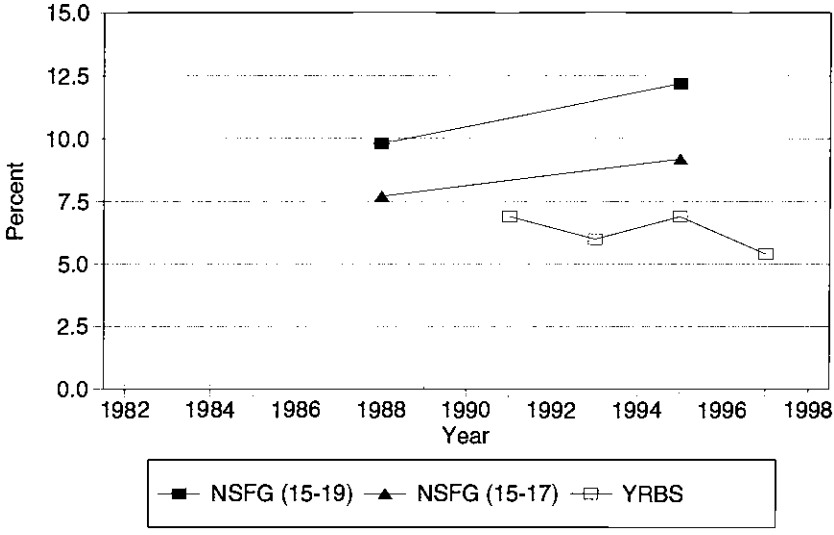

Fig. 4.8 The percentage of teens who are at risk for pregnancy
Source: Author's calculations from the NSFG and the YRBS.

share of black, non-Hispanic women aged fifteen to nineteen who have been sexually active in the past three months fell from 53.6 percent in 1982, to 50.8 percent in 1988, to 45.8 percent in 1995. Similar findings are observed for those fifteen to seventeen in the NSFG and for school-age girls from the YRBS. Results are less supportive of this trend when considering whether women have ever engaged in sexual activity, but that measure is probably less indicative of the risk of pregnancy than is sexual activity in the past three months. On the other hand, little evidence of decreased sexual activity among white, non-Hispanic and Hispanic women is observed in any of the data (if anything, there is evidence of an increase in activity for Hispanics).

Moreover, fewer black, non-Hispanic women engage in sexual activity without using contraceptives. During first intercourse, rates of use have jumped significantly for all demographic groups. But contraceptive use during the last intercourse in the past three months has risen strongly only for black, non-Hispanic women. In the YRBS, for instance, one-quarter of school-age girls in this group failed to use birth control during their last intercourse in 1991, but that rate fell continuously to 18 percent by 1997. Perhaps most striking is the evidence on the constructed pregnancy-risk measure. For both the younger teens from the NSFG between 1988 and 1995 and the school-age teens in the YRBS between 1991 and 1997, the risk of pregnancy was cut almost in half. On the basis of all the findings reported above, one can see that the national trend toward lower teen birthrates is largely driven by a reduction in births to black, non-Hispanic women and that the trend for that group is consistent with those women's reduction in sexual activity and increased reliance on contraception, reducing their risk of becoming pregnant.

4.2 Review of the Literature on Teen Sexuality

The models of the determinants of teen sexuality and use of contraception that economists have put forward are considerably different from those introduced in the other social sciences. This section will provide a brief overview of these perspectives and offer a framework for characterizing their differences. I will then describe recent advances in the field of behavioral economics that can provide something of a synthesis of the two contrasting approaches. Finally, I will briefly review the empirical literature that attempts to identify those factors that are related to sexual activity and contraceptive use.

4.2.1 Alternative Theoretical Perspectives

The models to which noneconomists subscribe tend to be very intricate and factor in the effect of a multitude of potential components that affect developmental outcomes, including teen sexuality, and may well affect each other (see Brooks-Gunn and Furstenberg 1989; Hardy and Zabin

1991; Brooks-Gunn and Paikoff 1997). For instance, Hardy and Zabin (1991) present a life-course model in which these factors are broadly decomposed into those that are biological or health related and those that pertain to one's environment or family. Each of these categories contains a large number of factors. Within biological/health factors, indicators of the child's health go back from before birth (i.e., mother's nutrition status, drug use, etc.), through infancy and childhood (i.e., congenital deficits, accidents, nutrition, etc.), and into adolescence (i.e., sexual maturation, mental health, etc.). Family and environmental factors include characteristics of the individual's parents and family (i.e., parents' education, parenting skills, family composition, etc.), available resources (i.e., economic resources, support networks, etc.), community characteristics (i.e., crime, education quality, family patterns, etc.), and peers and the media (i.e., friends' characteristics, exposure to movies/television, etc.). These factors are allowed to interact with each other. Beyond this extensive set of characteristics, other factors, such as stressful life events, are also included in the model. All these components contribute to a complex process by which developmental outcomes of children, such as teen sexual activity, are determined.

Economic models, in contrast, rely on the rationality of the individual decision maker; decisions are made on the basis of a comparison of the benefits and costs of the alternatives (see Leibowitz, Eisen, and Chow 1986; Lundberg and Plotnick 1995; and Kane and Staiger 1996).[11] Interestingly, specific models of sexual activity and birth-control use are rarely provided. The literature on fertility in general, and teen fertility in particular, traditionally includes models that begin with the decision to become pregnant, simply treating abstinence from sex as the ultimate means of avoiding an undesirable pregnancy. Within this framework, women "choose" to become pregnant if the benefits of a pregnancy are greater than its costs. These costs typically involve what one gives up by becoming pregnant, costs that are lower if, for instance, welfare benefits are higher or labor market conditions are weaker. A similar approach of comparing costs and benefits may be applied to the specific decision to engage in sexual activity or to use contraception among those who are sexually active.

This framework is best represented in the form of a "game tree," as shown in figure 4.9. Women are presented with a set of decisions that must be made, and each decision leads to a new "branch" of the tree where additional decisions are required. In the context of fertility behavior, women must choose whether to engage in sexual activity. Those who do so must decide whether to use contraception. Their decision at this stage leads to varying probabilities of becoming pregnant (defined here to be p_1 if they

11. Akerlof, Yellen, and Katz (1996) provide an alternative type of economic model that describes bargaining power between men and women within relationships to propose an explanation for the growth in out-of-wedlock births over the past few decades.

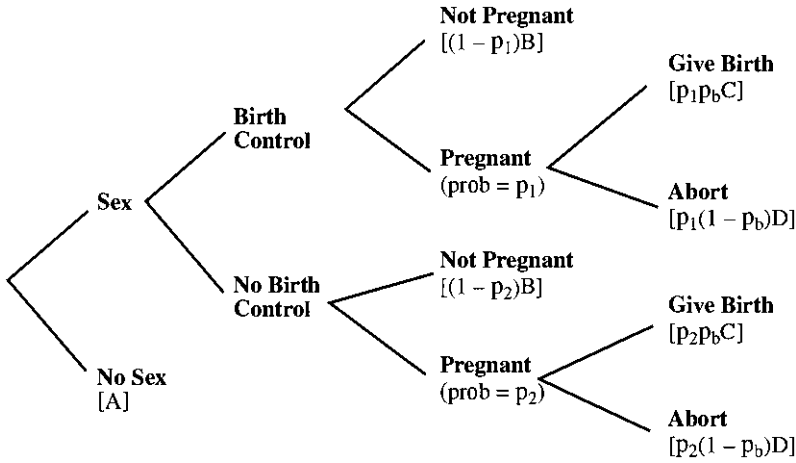

Fig. 4.9 Teen sexuality decision tree

use contraception and p_2 if they do not, where p_2 is greater than p_1), but, in both cases, it is possible that a pregnancy would result.[12] If pregnant, the woman must decide whether to abort her pregnancy or carry it to term and chooses to give birth with probability p_t. A more complicated version could also include the decision to get married, which enters the decision tree at various points (e.g., before the decision to engage in sexual activity or after a pregnancy results).

This representation of the decision-making process is not exclusive to economics since the diagram itself may be thought of as a simple sequencing of events. The difference between economics and other disciplines is that economists associate with each outcome a particular cost/benefit that individuals take into consideration in their decision making. In fact, the costs and benefits incurred at the later stages are assumed to be taken into consideration when decisions are made at the earlier stages of the game tree. For example, if abortion policy becomes more restrictive and, hence, more expensive for teens, then these costs should be incorporated into the decision regarding whether to engage in sexual activity.

4.2.2 Comparison and Synthesis of Models

An important distinction between the economic and the noneconomic models involves the degree to which an adolescent girl has the ability to make rational decisions (Lowenstein and Furstenberg 1991). Develop-

12. In the decision tree represented in fig. 4.9, the actual payoff if one engages in sexual activity and becomes pregnant is the same regardless of whether or not contraception is used (equal to *B*). One could argue that psychic costs would be greater if birth control is used, but this simplification does not affect the analytic framework and is maintained here. Similar arguments could be made regarding the actual payoffs to giving birth or aborting (equal to *C* or *D*).

mental models of sexuality describe a series of stages in which girls age through puberty, adolescence, and their later teenage years with a greater ability to make such decisions. According to these models, this ability is limited in the earlier teenage years for most girls, and sexual encounters tend to be spontaneous. These beliefs are expressed by Moore et al. (1995), who write: "There is abundant evidence . . . that sex is irrational, in the sense that it is often not planned, but impulsive. This is especially true for first sexual experience. Another way that the data seem to support a 'sex as irrational' premise is the pattern of time inconsistency, in which teens (and others) often plan to 'just say no' but end up saying 'yes,' and most teens think the best age to begin having sex is later than the age when they began" (p. 11). Within this framework, teen pregnancies are viewed as unavoidable mistakes. The economics literature may express concern regarding teens' abilities to make rational decisions but typically circumvents the problem by arguing that the difference between teens and adults is that teens have a "higher rate of time preference," through which the benefits incurred at the moment are valued more highly than the (potentially) high costs that may be incurred some time in the future (see Leibowitz, Eisen, and Chow 1986).

Recent advances in the field of behavioral economics may provide an appropriate middle ground on which the two sets of models may be reconciled. For instance, O'Donoghue and Rabin (1999) present a model of behavior in which rational individuals make decisions on the basis of the relevant benefits and costs but may still choose to act in ways that appear to be spontaneous. In their model, the benefits and costs that are incurred in the future are discounted in the same way as they would be in standard economic models, but individuals place heightened value on those rewards received right at the moment. On the basis of such a model, engaging in unprotected sexual activity today would be more likely since today's benefit is disproportionally weighted even in the face of potentially large future costs. On the other hand, teens may still state a preference not to engage in sexual activity at some future point because the heavy weight placed on immediate gratification would be absent. This sort of model maintains the assumption of rationality in that individuals are maximizing their utility, but it also allows for a form of spontaneity. In fact, such a model would yield additional predictions that are consistent with those from other fields. One would expect that, as teens get older and gain experience regarding their sexuality, they may be able to make more forward-looking decisions (like acquiring birth control) so that they are not placed in a position in which immediate desires overrule longer-term costs.

4.2.3 Empirical Correlates

An extensive review of the literature on teen sexual activity, contraceptive use, and fertility is available in Moore et al. (1995). That review uncovers a multitude of factors that have been found to be correlated with the

initiation of sexual activity, including older age, age at menarche, pubertal status, frequent church attendance, supportive family relationships, educated parents, school performance, living in a single-parent household, using alcohol or other drugs, dating young, and having sexually active siblings and friends. Similar characteristics are related to contraceptive use during first intercourse. The emphasis on factors such as these is consistent with noneconomists' models of teen sexual activity in that a complex array of interrelated factors that affect a child's development should also be related to their sexual behavior.

Unfortunately, statistical difficulties plague the interpretation of many of the results. In particular, many of the variables considered are either jointly determined with sexual activity and contraceptive use or correlated with other unobservable factors that may also be related to these behaviors, preventing a causal interpretation. For example, the factors that influence drug and alcohol use are also likely to influence decisions to engage in sexual activity and use birth control.[13] Therefore, finding a positive relation between drug or alcohol use and, say, sexual activity does not imply that drinking may lead to having sex. Alternatively, children raised in families that invest less in them (in the form of time or other resources) may be more likely to become sexually active and to perform worse in school. Such a relation would invalidate a causal interpretation of the effect of school performance on sexual activity.

Economists have rarely conducted empirical studies regarding sexual activity and contraceptive use; they have more commonly studied the determinants of fertility with a particular emphasis on the effect of policies that alter the costs of having children. This emphasis is consistent with an economic model that emphasizes rationality and the fact that one might expect to observe behavioral responses to changes in the incentives facing individuals. I will focus this review on those costs that can be considered as determinants of sexual activity and contraceptive use, including labor market conditions, AIDS incidence, abortion access, and welfare policies.

Regarding labor market conditions, Butz and Ward (1979) and Macunovich (1995) estimated the relation between the gains from work for women and their level of fertility, although neither of these papers focuses specifically on teenage women. Although Butz and Ward report evidence supporting the proposition that the timing of childbearing is negatively correlated with changes in earnings, Macunovich disputes that finding because of data and econometric problems. In particular, she argues that wage changes bring about both income and substitution effects that make it difficult to predict the optimal response to a change in wage. A higher wage increases the return to work (the substitution effect) but also pro-

13. Recent work by Dee (1999), however, has specifically dealt with the econometric problems in this particular example.

vides additional income that can enable one to "consume" more (the income effect). Below, I will evaluate the responsiveness of fertility to changes in job availability (through the employment-to-population ratio), not the wage. Since the effect of labor market conditions on the decision to bear children for those without jobs is solely a function of the substitution effect, one might predict that an improved labor market would lower the teen fertility rate.

The effect of the AIDS epidemic on sexual behavior was not considered to be within the domain of economics until the work of Philipson and Posner (1993) and Ahituv, Hotz, and Philipson (1996). These papers argue quite forcefully that economics studies the response of individuals to incentives and that AIDS provides a strong incentive for those potentially at risk of AIDS to alter their sexual practices in response. They also find empirical evidence supporting the position that those most at risk of contracting AIDS have indeed become more likely to engage in safe sex. Although these papers do not focus on teens, the fact that most teen sexual activity occurs outside marriage and potentially with multiple partners implies that one could extend their analysis to indicate that teens should either become more likely to practice abstinence or become more likely to use condoms should they be sexually active.

Research on the effects of abortion access on fertility behavior has grown considerably over the past few years (see Levine, Trainor, and Zimmerman 1996; Kane and Staiger 1996; and Matthews, Ribar, and Wilhelm 1997). Earlier research on abortion access had restricted its focus to the effect on abortion demand, and the results generally supported the notion that the demand curve for abortion services is downward sloping; an increase in the cost reduces the demand (see Blank, George, and London 1996; and Haas-Wilson 1996). The major advance is that more recent work provides empirical tests of the proposition that changes in abortion access could also affect the likelihood of pregnancy. Results typically confirmed that restricted abortion access lowered the demand for abortion services but found no evidence of an increase in births, which must mean that pregnancies declined. One could then infer that sexual activity and/or contraceptive use was affected, but no direct test of these behaviors was provided owing to data limitations.

Economists have long been contributors to the research on the effects of welfare generosity on nonmarital fertility. That literature is reviewed by Moffitt (1998), who states that the conventional wisdom based on the evidence existing earlier in the decade was that welfare receipt had no effect on fertility behavior but that more recent work suggests that a relation may indeed exist. Little of this work is directed specifically at teenagers, but a disproportionate share of welfare recipients began their spells by giving birth as teens, suggesting that we may expect to see some effect for teens as well. To date, relatively little research has examined the effect of

welfare reform on teen fertility. Most of the recent work that has been conducted has focused on the results of one particular provision, the family cap, among many reforms instituted simultaneously. The family cap eliminates the benefit increase that would otherwise result if a woman on welfare had an additional child. Research on the family cap has also provided mixed evidence regarding its effect (Argys, Averett, and Rees, in press; Fairlie and London 1997; O'Neill 1994; and Camasso et al. 1999). The only work of which I am aware that has examined the effect of a wide-ranging set of welfare reforms is that by Horvath and Peters (1999), who find that the introduction of reforms led to declines in nonmarital fertility among teens. Additional research supporting this finding would be required, however, before one could make strong conclusions regarding the effect of welfare reform on teen fertility.

An important implication of these findings is that evidence does seem to support the position that changes in the costs of childbearing affect teen fertility behavior. This has obvious implications for teen sexual activity and birth-control use, but direct evidence of such effects is largely unavailable at present. Part of the subsequent empirical analysis will address this omission in the literature.

4.3 Empirical Analysis

4.3.1 Analysis of Demographic Correlates

This section of the paper will employ cross-sectional data to analyze the individual factors that are related to sexual activity and use of contraception among those who have engaged in sexual activity. The data to be employed here are the first wave of the National Longitudinal Survey of Adolescent Health (AddHealth), which was conducted in 1994–95. The public-release version of these data contains information on 6,504 boys and girls in grades 7–12. Tremendous detail is available on these individuals, including demographics, scores on a test of cognitive ability (the Peabody Picture Vocabulary Test [PPVT]), grades in school, characteristics of the child's mother and household, and extensive attitudine variables, which will be used here to determine the correlates of teen sexual activity and contraceptive use.[14]

Results of this analysis are reported separately for girls and boys in tables 4.2 and 4.3, respectively. The first row of these tables provides estimates of the percentage of students who engaged in sexual activities that

14. Characteristics of mothers were obtained from a separate questionnaire. Interviewers were clearly instructed to attempt to gather information from the respondent's mother (or other mother-type figure), not the father, and the vast majority of parents responding to this part of the survey were mothers. The sample is limited to those students between the ages of twelve and eighteen.

Table 4.2 **Correlates of Teen Sexual Activity and Contraception for Girls, Probit Derivatives (standard errors in parentheses)**

Variable	Sexual Intercourse Ever		Sexual Intercourse in Past Three Months		No Contraception during First Intercourse		No Contraception during Last Intercourse		Pregnancy Risk	
	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+		
Weighted percentage engaging in activity	37.6	50.9	35.0	47.7	32.4	32.5	35.7	34.6	12.5	16.5
Student's characteristics										
Age	.079	.063	.076	.056	−.022	.032	−.014	.003	.026	.019
	(.017)	(.026)	(.016)	(.026)	(.026)	(.030)	(.027)	(.031)	(.009)	(.014)
Black non-Hispanic	.098	.066	.098	.044	−.114	−.073	−.058	−.018	.019	.016
	(.032)	(.043)	(.031)	(.043)	(.039)	(.044)	(.043)	(.050)	(.018)	(.025)
Hispanic	−.012	−.044	−.021	−.053	.092	−.019	.103	.092	.029	.027
	(.039)	(.051)	(.038)	(.049)	(.062)	(.063)	(.063)	(.067)	(.025)	(.031)
Grade in school	.071	.074	.061	.070	−.019	−.041	−.010	−.018	.007	.005
	(.017)	(.024)	(.017)	(.024)	(.026)	(.029)	(.027)	(.029)	(.009)	(.013)
PPVT, standardized score (× 10)	−.001	−.002	.013	.003	−.055	−.033	−.052	−.024	−.007	−.004
	(.009)	(.013)	(.009)	(.012)	(.015)	(.017)	(.015)	(.017)	(.005)	(.007)
GPA (if computable)	−.118	−.135	−.105	−.120	−.040	−.014	−.037	−.014	−.042	−.035
	(.016)	(.023)	(.015)	(.022)	(.024)	(.027)	(.025)	(.028)	(.008)	(.012)
Catholic	−.069	−.049	−.060	−.061	−.067	−.059	−.071	−.085	−.037	−.050
	(.027)	(.036)	(.026)	(.035)	(.042)	(.043)	(.044)	(.044)	(.013)	(.018)
No religion reported	−.042	−.046	−.027	−.040	.120	.145	.127	.122	.031	.048
	(.033)	(.055)	(.033)	(.054)	(.055)	(.064)	(.056)	(.063)	(.023)	(.036)
Attends religious services at least once per week	−.138	−.062	−.130	−.060	.056	.023	.083	.048	−.016	.005
	(.022)	(.032)	(.022)	(.032)	(.039)	(.042)	(.040)	(.044)	(.012)	(.019)

(*continued*)

Table 4.2 (continued)

Variable	Sexual Intercourse Ever		Sexual Intercourse in Past Three Months		No Contraception during First Intercourse		No Contraception during Last Intercourse		Pregnancy Risk	
	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+		
Family background										
Mother's age (× 10)	−.004	.013	−.003	.016	−.006	−.044	−.007	−.017	−.002	−.009
	(.020)	(.028)	(.020)	(.027)	(.030)	(.039)	(.030)	(.035)	(.012)	(.017)
Mother high school graduate	−.009	.007	−.018	−.016	.079	.098	.133	.147	.037	.054
	(.039)	(.052)	(.037)	(.051)	(.059)	(.066)	(.061)	(.066)	(.022)	(.033)
Mother attended some college	.019	.082	.017	.079	.032	.020	.142	.130	.044	.068
	(.045)	(.059)	(.044)	(.058)	(.068)	(.074)	(.072)	(.078)	(.030)	(.043)
Mother college graduate	−.018	.039	−.043	.017	.042	.068	.090	.126	.015	.057
	(.045)	(.062)	(.043)	(.061)	(.074)	(.082)	(.076)	(.084)	(.027)	(.043)
Mother worked in past year	.037	.038	.064	.055	.030	−.031	.044	−.006	.033	.011
	(.032)	(.044)	(.029)	(.044)	(.052)	(.058)	(.053)	(.057)	(.016)	(.026)
Mother married	−.047	−.078	−.049	−.063	.003	−.046	−.003	−.014	−.011	−.011
	(.031)	(.043)	(.031)	(.042)	(.045)	(.048)	(.046)	(.049)	(.018)	(.025)
Mother's age at first marriage	−.003	−.006	−.004	−.005	−.002	−.004	−.001	−.002	−.001	−.001
	(.021)	(.003)	(.002)	(.003)	(.003)	(.003)	(.003)	(.003)	(.001)	(.002)
Mother receiving public assistance	.030	.048	.034	.089	.059	−.020	.179	.095	.069	.083
	(.051)	(.067)	(.050)	(.065)	(.071)	(.071)	(.076)	(.081)	(.036)	(.051)
Household income less than $10,000	.033	.027	.044	.004	−.028	−.077	−.087	−.143	−.009	−.061
	(.057)	(.078)	(.056)	(.077)	(.074)	(.073)	(.073)	(.071)	(.027)	(.031)
Household income between $10,000 and $30,000	−.031	−.081	−.023	−.062	.033	−.025	−.017	.015	−.012	−.011
	(.035)	(.049)	(.035)	(.048)	(.055)	(.058)	(.056)	(.062)	(.019)	(.027)
Household income between $50,000 and $100,000	−.046	−.048	−.028	−.031	−.040	−.059	−.074	−.086	−.031	−.040
	(.032)	(.045)	(.031)	(.044)	(.052)	(.052)	(.050)	(.053)	(.016)	(.023)
Household income greater than $100,000	−.071	−.105	−.057	−.107	−.077	−.105	−.166	−.165	−.055	−.085
	(.049)	(.072)	(.049)	(.069)	(.086)	(.080)	(.077)	(.078)	(.020)	(.023)

Own attitudes/expectations/knowledge										
Friends respect you more if you have sexual intercourse		−.012 (.074)		.007 (.072)		.106 (.070)		−.035 (.091)		−.024 (.039)
Partner loses respect for you if you have sexual intercourse		−.139 (.038)		−.159 (.037)		.082 (.060)		.087 (.063)		−.021 (.022)
Getting pregnant would be one of the worst things		−.195 (.039)		−.170 (.040)		−.032 (.044)		−.208 (.047)		−.147 (.031)
Likely to go to college		−.064 (.041)		−.060 (.040)		−.062 (.047)		−.042 (.048)		−.033 (.025)
Percentage correct on knowledge quiz		.004 (.001)		.005 (.001)		−.001 (.001)		−.003 (.001)		.0001 (.001)
Parents' attitudes										
Mother disapproves of having sex at this time		−.227 (.039)		−.201 (.039)		−.020 (.040)		−.084 (.041)		−.080 (.026)
Mother disapproves of birth-control use at this time		−.202 (.031)		−.186 (.031)		.150 (.050)		.091 (.050)		−.025 (.019)
Risk perceptions										
Little or no probability of pregnancy in single incident		−.003 (.042)		−.009 (.041)		.177 (.055)		.125 (.056)		.049 (.028)
Little or no probability of pregnancy over entire month		.132 (.041)		.102 (.042)		.029 (.048)		.007 (.050)		.028 (.027)
Sample size	3,023	1,830	3,050	1,836	1,107	874	1,049	831	3,050	1,836

Source: Author's calculations from Wave I of AddHealth.

Note: The models estimated also include dummy variables indicating whether grade data were available to compute GPA, whether household income was reported, and whether mother's characteristics are available. In cols. 7–9, the universe is restricted to those girls who have ever engaged in sexual intercourse. In cols. 10–12, the universe is restricted to those girls who have had intercourse in the past three months.

Table 4.3 **Correlates of Teen Sexual Activity and Contraception for Boys, Probit Derivatives (standard errors in parentheses)**

	Sexual Intercourse Ever		Sexual Intercourse in Past Three Months		No Contraception during First Intercourse		No Contraception during Last Intercourse		Pregnancy Risk	
Variable	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+
Weighted percentage engaging in activity	38.9	50.3	34.0	44.7	34.0	33.0	30.2	30.3	10.3	13.5
Student's characteristics										
Age	.083	.067	.080	.068	−.022	.002	.022	.010	.028	.018
	(.168)	(.025)	(.015)	(.024)	(.023)	(.027)	(.022)	(.029)	(.008)	(.014)
Black non-Hispanic	.257	.169	.218	.116	.015	.031	−.036	−.019	.034	.015
	(.033)	(.042)	(.032)	(.042)	(.042)	(.048)	(.042)	(.050)	(.017)	(.025)
Hispanic	.043	−.006	.071	.046	.135	.037	.034	−.007	.027	.005
	(.040)	(.052)	(.038)	(.050)	(.058)	(.064)	(.057)	(.062)	(.022)	(.028)
Grade in school	.033	−.002	.028	−.004	.013	.008	−.016	.005	−.000	.000
	(.017)	(.022)	(.016)	(.022)	(.023)	(.025)	(.023)	(.026)	(.008)	(.012)
PPVT, standardized score (× 10)	−.017	−.016	−.003	−.006	−.002	−.000	−.001	−.002	−.004	−.007
	(.009)	(.013)	(.008)	(.013)	(.014)	(.016)	(.001)	(.002)	(.004)	(.007)
GPA (if computable)	−.108	−.090	−.101	−.088	−.009	.010	−.037	−.029	−.036	−.033
	(.015)	(.021)	(.014)	(.021)	(.023)	(.026)	(.023)	(0.027)	(.008)	(.012)
Catholic	−.032	−.050	−.030	−.063	−.008	.041	.012	−.007	−.005	−.020
	(.029)	(.037)	(.027)	(.036)	(.045)	(.052)	(.047)	(.051)	(.014)	(.020)
No religion reported	.062	.020	.080	.048	.071	.070	.064	.037	.040	.021
	(.037)	(.051)	(.035)	(.049)	(.050)	(.059)	(.052)	(.059)	(.022)	(.029)
Attends religious services at least once per week	−.099	−.050	−.075	−.028	.021	.071	.024	.040	−.014	.005
	(.024)	(.034)	(.022)	(.033)	(.039)	(.046)	(.041)	(.047)	(.012)	(.020)

Family background										
Mother's age (× 10)	.005	.018	.000	.005	.009	−.023	−.011	−.034	−.001	−.009
	(.021)	(.028)	(.020)	(.028)	(.029)	(.031)	(.031)	(.034)	(.010)	(.016)
Mother high school graduate	−.013	−.035	.028	−.000	.036	.059	.026	.027	.014	.004
	(.039)	(.052)	(.037)	(.051)	(.055)	(.062)	(.058)	(.062)	(.021)	(.029)
Mother attended some college	−.031	.012	.015	.050	.038	.096	−.028	.016	−.006	.013
	(.043)	(.059)	(.042)	(.058)	(.065)	(.074)	(.065)	(.074)	(.023)	(.035)
Mother college graduate	−.093	−.036	−.052	−.009	−.040	.015	.071	.102	−.006	.040
	(.045)	(.062)	(.043)	(.060)	(.070)	(.081)	(.080)	(.087)	(.023)	(.041)
Mother worked in past year	.012	.015	.006	.003	.015	.039	−.024	−.043	−.007	−.016
	(.032)	(.045)	(.029)	(.043)	(.049)	(.054)	(.052)	(.058)	(.016)	(.024)
Mother married	−.113	−.047	−.093	−.030	.002	−.019	−.017	−.030	−.028	−.021
	(.033)	(.044)	(.031)	(.043)	(.045)	(.050)	(.046)	(.051)	(.017)	(.024)
Mother's age at first marriage	−.002	−.011	−.004	−.010	−.006	−.008	−.004	−.007	−.002	−.005
	(.002)	(.004)	(.002)	(.003)	(.003)	(.004)	(.003)	(.036)	(.001)	(.002)
Mother receiving public assistance	.019	−.017	.002	−.010	−.070	−.097	.006	−.025	.000	−.015
	(.052)	(.076)	(.047)	(.071)	(.057)	(.061)	(.067)	(.076)	(.023)	(.033)
Household income less than $10,000	−.043	−.075	−.069	−.124	.097	.125	−.037	−.067	−.023	−.048
	(.053)	(.078)	(.048)	(.069)	(.085)	(.107)	(.079)	(.091)	(.022)	(.030)
Household income between $10,000 and $30,000	.010	−.022	.016	.022	.008	−.020	−.020	−.104	.002	−.036
	(.035)	(.047)	(.033)	(.047)	(.052)	(.057)	(.051)	(.053)	(.018)	(.022)
Household income between $50,000 and $100,000	−.012	−.010	−.007	−.008	.010	−.009	−.060	−.123	−.016	−.051
	(.034)	(.044)	(.032)	(.043)	(.057)	(.060)	(.053)	(.052)	(.016)	(.021)
Household income greater than $100,000	−.090	−.170	−.058	−.152	−.057	−.026	−.099	−.109	−.044	−.073
	(.054)	(.064)	(.051)	(.060)	(.095)	(.108)	(.085)	(.092)	(.019)	(.024)
Own attitudes/expectations/knowledge										
Friends respect you more if you have sexual intercourse		.101		.107		.101		.099		.072
		(.038)		(.038)		(.045)		(.047)		(.026)
Partner loses respect for you if you have sexual intercourse		−.146		−.137		.115		−.009		−.029
		(.043)		(.042)		(.074)		(.075)		(.024)

(*continued*)

Table 4.3 (continued)

Variable	Sexual Intercourse Ever		Sexual Intercourse in Past Three Months		No Contraception during First Intercourse		No Contraception during Last Intercourse		Pregnancy Risk	
	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+	Full Sample	Age 15+
Getting pregnant would be one of the worst things		−.011 (.045)		−.144 (.044)		−.121 (.051)		−.115 (.052)		−.087 (.031)
Likely to go to college		−.122 (.036)		−.068 (.035)		−.076 (.041)		−.050 (.043)		−.039 (.021)
Percentage correct on knowledge quiz		.003 (.001)		.003 (.001)		−.001 (.001)		.000 (.001)		.001 (.0004)
Parents' attitudes										
Mother disapproves of having sex at this time		−.199 (.034)		−.171 (.035)		.062 (.040)		.012 (.042)		−.029 (.022)
Mother disapproves of birth-control use at this time		−.091 (.036)		−.098 (.035)		.065 (.055)		.075 (.056)		−.007 (.022)
Risk perceptions										
Little or no probability of pregnancy in single incident		.024 (.037)		.045 (.036)		.113 (.045)		.050 (.045)		.036 (.021)
Little or no probability of pregnancy over entire month		.054 (.035)		.052 (.034)		.032 (.042)				
Sample size	2,795	1,734	2,832	1,747	1,135	866	1,021	792	2,831	1,746

Source: Author's calculations from Wave I of AddHealth.

Note: The models estimated also include dummy variables indicating whether grade data were available to compute GPA, whether household income was reported, and whether mother's characteristics are available. In cols. 7–9, the universe is restricted to those boys who have ever engaged in sexual intercourse. In cols. 10–12, the universe is restricted to those boys who have had intercourse in the past three months.

may lead to a pregnancy. Responses for boys and girls are generally similar.[15] For the full sample, 37.6 percent of girls and 38.9 percent of boys have ever had sexual intercourse, and 35 percent of the girls and 34 percent of the boys have done so in the past three months. Roughly one-third of sexually active girls and boys failed to use contraception during first intercourse as well as during their last sexual encounter in the past three months. On the basis of the behaviors of girls in the past three months, the risk of pregnancy is estimated to be 12.4 percent. For boys, the risk of a partner's pregnancy is 10.3 percent. Among just those boys and girls aged fifteen and over, sexual activity is somewhat more common, but contraceptive use is not.

The remainder of tables 4.2 and 4.3 presents probit estimates of the relation between each of these outcomes and a series of characteristics of teens and their families. Two separate models are estimated here for each of the five different outcomes. The first includes the full sample of girls and boys and includes just demographics and mother's/household characteristics, which are more likely to be exogenous to the behaviors being studied. Responses to attitudine/expectations questions are also considered in the second model, but the sample is restricted to those between the ages of fifteen and eighteen since many of these questions were asked only of this older group.[16] These variables are examined separately because teens' responses to these questions may be influenced by their behavior (i.e., they are endogenous).

For girls (table 4.2), estimates from models of sexual activity are quite similar regardless of whether the activity relates to the past three months or ever. Many of the girls' characteristics are significantly related to sexual activity, which is more likely among those who are older, in a higher grade, perform worse in school, are a religion other than Catholic, and do not attend religious services on a weekly basis. An additional year of age and of schooling increases the likelihood of having sex by 6–8 percentage points, depending on the measure of sexual activity and the age composition of the sample. Every additional tenth of a point in a girl's GPA reduces her likelihood of sexual activity by 11–14 percent. On the other hand, once one controls for the girl's own characteristics, few of the attributes of her mother or her household are significantly related to sexual activity.

In models that include potentially endogenous variables representing attitudes, expectations, and risk perceptions, these variables are also observed to be significantly related to the likelihood of sexual activity. Girls

15. One reason why this finding may not be obvious is that about one-third of the partners of sexually active women aged fifteen to seventeen are two or more years older than the women themselves are (Darroch, Landry, and Oslak 1999).

16. For purposes of comparison with the first set of models in tables 4.2 and 4.3, I have also estimated models for those aged fifteen to eighteen excluding the attitudine/expectations variables and obtained similar results.

who report that getting pregnant would be one of the worst things to happen to them are roughly 20 percentage points less likely to engage in sexual activity. Both measures of parents' disapproval yield similar estimates. On the other hand, those who view little or no risk of pregnancy from sexual activity over an entire month are 13 percentage points more likely to have sex. Of course, the concern regarding interpretation of these relations as being causal is that, for instance, girls who regularly engage in sex may downplay their concerns regarding pregnancy, the level of their parents' disapproval, or their perceived risk of pregnancy to be consistent with their own behavior.

Compared to models of sexual activity recently or ever, results from models of contraceptive use indicate some differences in the factors that are correlated with a girl's behavior. In fact, in a multivariate context, very little is significantly related to contraceptive use during first intercourse. Black, non-Hispanic girls are less likely to fail to use contraception, as are those who score higher on the available aptitude test. Those who report no religion are significantly less likely to have failed to use contraception. In models that include attitudine/expectations measures, girls who reported that their mothers disapproved of birth-control use and those who perceived there to be little or no probability of getting pregnant after a single act were more likely to have failed to use contraception as well. Among the multitude of other characteristics reported, none of the others are found to be significantly related to contraceptive use during first intercourse. Ironically, girls who report that getting pregnant would be one of the worst things that could happen to them were no more likely to use contraception than others.

Models of failure to use contraception during last intercourse, on the other hand, find that many personal and family-background characteristics are important correlates. Test scores, religion, mother's education, receipt of public assistance, and family income are all found to contribute to the failure to use contraception during last intercourse. Many of the attitudine/expectations variables are significant as well. In fact, those women who report that getting pregnant would be the worst thing that could happen to them are 20 percentage points less likely to have failed to use contraception (i.e., more likely to use contraception) during their last intercourse.

A potential explanation that would be consistent with the divergent findings between the two measures of contraceptive use could involve the spontaneity of the act. If first intercourse is more likely to be an unplanned event, then contraception would be more likely to be used randomly. On the other hand, once girls begin having sex more frequently, the activity becomes more planned, and appropriate precautions may be more likely to be used by those who want to take them. Such an interpretation is consistent with the earlier discussion of the contribution of economics to

modeling sexual activity in that spontaneity need not be ruled out but, once the activity becomes repeated, one would expect a greater degree of rationality.

The final set of models reported in table 4.2 reports the factors related to a teenage girl's *pregnancy risk,* which I have defined as the likelihood that a girl has had sexual intercourse in the past three months and did not use contraception during her last intercourse in that period. Econometric models of pregnancy risk have important advantages compared to the more traditional approach of separately examining sexual intercourse and the use of birth control. First, estimates of the relation between a personal characteristic and sexual activity may contradict the estimated relation between that characteristic and the use of contraception, making it more difficult to determine whether a girl with that trait is more or less likely to be at risk of becoming pregnant. For instance, among the full sample of AddHealth respondents, those who attend religious services at least once per week are less likely to have engaged in sexual activity in the past three months (reducing their pregnancy risk), but those who did have sex were less likely to use contraception (increasing their pregnancy risk). Estimates from the pregnancy-risk models can indicate which of the two effects dominates or whether the two are perfectly offsetting.[17]

Moreover, estimates from models of contraceptive use among the sample of respondents engaging in sexual activity are subject to sample-selection bias. For instance, suppose that the AIDS epidemic led many risk-averse individuals to choose abstinence over sexual activity with some form of contraception. If the less risk averse did not change their behavior, the sample of sexually active girls would contain a larger fraction of those who do *not* use contraception, and one might inappropriately conclude that AIDS reduces the use of birth control. A model of pregnancy risk for which the target population is all teenage girls avoids this selection problem.

Results from these models are reported in the final two columns of table

17. Of course, one could also derive the effect of the two separate effects on the pregnancy risk. To see this, define the share of respondents who have had sexual intercourse during the last three months to be $P(\text{sex}) = S/N$, where S is the number having sex, and N is the sample size. Then define the probability of failing to use contraception conditional on having sex as $P(\text{fail}) = F/S$, where F is the number failing to use contraception. Then the risk of pregnancy $P(\text{preg}) = P(\text{sex}) \times P(\text{fail}) = F/N$. The derivative of $P(\text{preg})$ with respect to any variable, X, is obtained by the product rule

$$\frac{\partial[P(\text{preg})]}{\partial X} = P(\text{fail}) * \frac{\partial[P(\text{sex})]}{\partial X} + p(\text{sex}) * \frac{\partial[P(\text{fail})]}{\partial X}.$$

Standard errors for these estimates would have to be calculated using the delta method. Defining a pregnancy rate, then estimating models of its determinants directly, is much simpler. Estimates from these pregnancy-risk models may differ slightly from the formula just derived because probit derivatives are estimated at the value of the sample mean for each variable rather than estimating separate derivatives for each person and then taking the mean.

4.2. For the full sample, they indicate that pregnancy risk increases with age, having a working mother, and having a mother who receives public assistance and falls with school performance, being Catholic, and being at the top of the income distribution. In the model of older teens that includes potentially endogenous variables, the results further indicate that pregnancy risk is lower for those who view a pregnancy as one of the worst things that could happen to them and whose mothers disapprove of them having sex at this time. The perception that pregnancy is unlikely is positively associated with pregnancy risk, but the estimate is not statistically significant.

Estimates from comparable models for boys are presented in table 4.3. Regarding sexual activity, a few relevant distinctions in the results between boys and girls are noteworthy. First, racial differences are far more pronounced among the boys than among the girls. For instance, black, non-Hispanic boys are 25 percent more likely to report having engaged in sexual activity ever relative to white, non-Hispanic boys. The comparable gap for girls is only 10 percent. Second, in models that include attitudes and expectations, boys who report that their friends will respect them more if they have sexual intercourse are 10 percentage points more likely to have engaged in sexual activity. No such effect is observed for girls. Here, in particular, it is important to raise the caveat of endogeneity in attitudes. Regarding contraceptive use during last intercourse, the main difference between boys and girls is the influence of mother's characteristics. In particular, mother's level of education and welfare receipt are important determinants of contraceptive use during last intercourse for girls but not for boys.

4.3.2 Analysis of "Prices"

This section of the paper will examine the effect of increases in costs associated with becoming pregnant and giving birth on teenagers' patterns of sexual activity, contraceptive use, and pregnancy risk. These costs can be thought of as an increase in the price of having sex and/or failing to use contraception and can be monetary or otherwise in nature. The hypothesis that is being examined here is that increases in the cost will reduce the likelihood of having sex and increase the likelihood of using contraception.

The specific costs that I will use in this analysis include labor market conditions, the incidence of AIDS, the generosity of the welfare system, and abortion restrictions in place in a teenager's state of residence.[18] Labor

18. Another potential policy variable that could be important in determining sexual activity and contraceptive use is sex education in schools, which could reduce information deficiencies for teens making these decisions. For instance, Oettinger (1999) uses data on individual enrollment in sex-education classes and finds that taking such classes increases the likelihood of becoming sexually active earlier but has only a weak effect on the likelihood of

market conditions represent a price in the form of an opportunity cost. In periods when job opportunities are limited, the cost of becoming pregnant is lower because the opportunity cost associated with a reduced ability/willingness to work is lower at that time. The incidence of AIDS represents a clear cost since greater levels of sexual activity without the use of condoms can impose substantial health risks. If welfare benefits are more generous and/or easier to get, the cost of a pregnancy is lower because the government will pay some modest living expense in that event. Finally, restricted abortion access may reduce one's ability to abort an unwanted pregnancy, making it more costly to become pregnant in the first place. The estimated effect of these costs on fertility behavior based on past research was reviewed earlier. To the extent that they are related to fertility, they may also be related to sexual activity and birth-control use, yet no previous research of which I am aware examines these relations.

In the subsequent analyses, for purposes of completeness all models will be estimated separately for boys and girls.[19] Although most of the costs considered would affect girls more than boys (with AIDS being a possible exception), it is unclear how these costs would be related to boys' sexual activity. On the one hand, one might consider boys as acting something like a control group. If costs that are imposed only on girls have an estimated effect on the sexual activity of both boys and girls, then perhaps the finding is spurious. Alternatively, because high school boys are the likely (but not exclusive) sex partners of high school girls, one may expect to see spillovers in the sense that, if something affects girls' likelihood of engaging in sexual activity, it will also affect boys' likelihood.

To determine whether sexual activity and birth-control use are related to their costs, I use 1991, 1993, 1995, and 1997 YRBS data, described previously. Although personal characteristics of the respondents in these data are quite limited, their particular advantage for the present purpose is the availability of state-of-residence identifiers for each respondent. This information allows me to link state-level data for the relevant year to the costs examined. I obtained state-level employment-to-population ratios for teenagers directly from the U.S. Bureau of Labor Statistics.[20] The data on

an earlier pregnancy. I have chosen not to consider sex education in the present analysis for two reasons. First, I am unable to identify enrollment in sex-education classes for individuals in the YRBS data, and I have been unable to piece together state-level data for sex-education requirements for all the survey years available. Second, as described below, geographic identification using the YRBS data is limited because of the number of states repeatedly covered by the survey, suggesting that a more parsimonious specification may be preferable.

19. Obviously, boys face no pregnancy risk themselves but do face the risk of getting a girl pregnant. For ease of exposition, in the remainder of the discussion I will discuss pregnancy risk symmetrically with the implication that, for boys, it should be interpreted in the appropriate way.

20. These data reflect unpublished estimates from the Current Population Survey (CPS) and were provided directly from the Local Area Unemployment Statistics division of the Bureau of Labor Statistics.

AIDS incidence come from the CDC and measure the number of AIDS cases per 100,000 population in the state (see U.S. DHHS, *HIV/AIDS Surveillance Report,* various issues).[21]

Data on welfare generosity take two forms. First, I use the maximum welfare benefit for a family of two under the Aid to Families with Dependent Children (AFDC) or the Temporary Assistance for Needy Families (TANF) program, depending on which was in place in each year; these data were obtained from the *Green Book* (U.S. House of Representatives, various years). Second, I create an indicator variable that identifies whether a state has a "reformed" welfare system. These reforms could have come about either through waivers requested by states and granted by the federal government before national welfare reform in 1996 or through the state implementing a valid TANF plan after national welfare reform.[22] These data were obtained from the Council of Economic Advisers (1999).

The final set of variables is a series of three indicator variables that represent whether a particular type of abortion restriction was in place in a particular state and year. The three specific restrictions that I consider are Medicaid funding restrictions (which largely prohibit the use of public funds for abortions), parent consent/notification laws (which require a minor either to notify or to obtain consent from a parent before obtaining an abortion), and mandatory-waiting-period laws (which require a woman seeking an abortion to wait, typically, twenty-four or forty-eight hours after notifying a provider of her intent to abort before having the abortion performed). These data were obtained from NARAL Foundation, *Who Decides?* (various years).

Using these data, I estimate probit models with state and year fixed effects where the dependent variables are the sexual-activity/contraceptive-use measures described earlier and the explanatory variables include a vector of prices along with the limited personal characteristics available for each respondent. In such a model, price effects are identified by comparing changes between states over time. All reported results from the probit model represent the value of the derivatives estimated at the sample mean of the independent variables.

Although the YRBS is the data set best suited to estimate such a model because of its multiple survey years and available state identifiers, it does have some limitations. In particular, the survey is school based, and, al-

21. The definition of *AIDS* changed beginning in 1993, leading to a large increase in the number of cases counted. In the data used for this paper, I have adjusted the 1991 data by estimating a cubic trend in AIDS incidence rates and using the discrete jump between 1992 and 1993 as the scaling factor. The results presented are generally similar to (although less precise than) that obtained when I use only data from the period 1993–97.

22. The determination of whether a waiver was in place is based on the waiver's implementation date, not the date on which the waiver was requested. For those years in which a waiver or a TANF plan was implemented in the middle of the year, I use the fraction of the year in which the reform was in place.

though the sample is relatively large (between about eleven and sixteen thousand teens per year) and is chosen to be nationally representative, its school-based nature leads the respondents to be more concentrated geographically. In fact, in any given year only about half the states are represented. Of course, the larger states like California and New York are represented in each survey; some of the smaller states appear much less frequently, if at all. For instance, over the four survey years, only forty-one states (including the District of Columbia) are included at all, and thirteen states are represented only once. In a model with state fixed effects, this latter group of states offers no additional identification because no change can be observed within the state over time. In fact, only eleven states are represented in each survey year.[23]

Moreover, a model with state fixed effects is identified only on the basis of changes within states over time. For those policy variables that are discrete in nature, such as abortion restrictions, the power of the analysis may be limited because so few changes have taken place over the sample period within these states.[24] Although continuous price measures like the employment-to-population ratio and AIDS incidence provide greater variation, the power of an analysis of welfare generosity may also be limited in that very few states substantially changed the nominal value of their benefits over the sample period in the available states. This caveat should be kept in mind in interpreting the results reported subsequently.

The results of this analysis are reported in table 4.4. The first row of this table indicates the percentage of respondents who are engaging in each of the specified outcomes. Differences do emerge when comparing these estimates to those found from the AddHealth data. Some, but not all, of these differences can be attributed to the fact that the YRBS sample (high school students) is slightly older than the AddHealth sample (grades 7–12). After adjusting for age by focusing on the older AddHealth respondents, those in the YRBS appear less likely to report that they engaged in sexual activity in the last three months and that they failed to use contraception during last intercourse in the past three months and are at less risk of pregnancy. These differences may be due to differences in survey procedures.

The remainder of table 4.4 presents estimates of probit models where the outcomes represent indicator variables of sexual activity, birth-control

23. These states are California, Colorado, Florida, Georgia, Michigan, Mississippi, New York, Ohio, Pennsylvania, Texas, and Washington. To examine the effect on the findings of using an unbalanced sample, I have also estimated all reported models separately for just the eleven states that are represented in each survey year. Except where discussed below, all results from this subset of the data are qualitatively similar to those reported for the full sample.

24. In only three, seven, and six states are changes observed between the first and the last available survey years in Medicaid funding restrictions, parent consent/notification laws, and mandatory waiting periods, respectively.

Table 4.4 **The Relation between Geographic Factors and Teen Sexual Activity, Contraception, and Pregnancy, Probit Derivatives (standard errors in parentheses)**

	Sexual Intercourse Ever		Sexual Intercourse in Past Three Months		No Contraception Used during Last Intercourse in Past 3 Months		Pregnancy Risk	
Variable	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)	Girls (7)	Boys (for partners) (8)
Weighted % engaging in activity	49.6	53.0	37.6	35.2	16.5	14.7	6.2	5.2
Student's characteristics								
Age	.100	.105	.086	.081	.028	.006	.023	.013
	(.008)	(.009)	(.008)	(.008)	(.009)	(.009)	(.003)	(.003)
Black non-Hispanic	.213	.365	.138	.307	.075	.018	.053	.051
	(.018)	(.012)	(.016)	(.018)	(.012)	(.018)	(.007)	(.011)
Hispanic	.031	.153	.028	.103	.140	.106	.054	.058
	(.016)	(.019)	(.014)	(.021)	(.022)	(.027)	(.010)	(.013)
Other race	.002	.010	−.006	.011	.021	.023	.005	.009
	(.023)	(.029)	(.024)	(.026)	(.031)	(.027)	(.011)	(.011)
Grade in school	.020	−.008	.023	.008	−.042	−.022	−.013	−.007
	(.011)	(.008)	(.011)	(.009)	(.010)	(.008)	(.004)	(.003)

Geographic variables								
Teen employment-to-population ratio (× 10)	−.112 (.031)	−.081 (.029)	−.106 (.024)	−.068 (.024)	−.011 (.024)	.016 (.027)	−.022 (.010)	−.002 (.009)
Log maximum AFDC/TANF benefit for a family of 2	.282 (.098)	−.021 (.133)	.073 (.090)	.296 (.118)	.301 (.086)	.081 (.108)	.121 (.039)	.072 (.039)
Reformed welfare system	.104 (.028)	.059 (.024)	.078 (.021)	.037 (.019)	.013 (.020)	−.048 (.021)	.017 (.008)	−.012 (.076)
AIDS rate per 100,000 population (× 100)	−.259 (.103)	−.052 (.091)	−.072 (.087)	−.064 (.070)	−.007 (.080)	−.061 (.083)	−.025 (.031)	−.024 (.031)
Medicaid funding restrictions	−.013 (.101)	.023 (.044)	−.011 (.084)	−.008 (.017)	−.066 (.055)	.015 (.026)	−.017 (.026)	.006 (.009)
Parent consent/notification required for abortion	−.023 (.047)	.065 (.031)	−.004 (.032)	.027 (.030)	.043 (.023)	−.016 (.035)	.015 (.011)	−.001 (.014)
Mandatory waiting period for abortion	.014 (.054)	−.062 (.051)	.019 (.040)	−.027 (.042)	−.021 (.032)	−.021 (.029)	−.005 (.014)	−.011 (.010)
Sample size	27,137	25,623	27,137	25,623	10,610	10,508	27,137	25,623

Source: Author's calculations from the 1991, 1993, 1995, and 1997 YRBS.

use, and pregnancy risk. Estimated coefficients for the demographic variables are generally consistent with those obtained in the analysis of Add-Health data. For girls, for the geographic variables representing differences in prices, estimated effects of differences in the employment-to-population ratio provide support for the hypothesis that prices matter. A 1 percentage point rise in this ratio (which represents an increase in the cost of a pregnancy) is predicted to reduce the likelihood of sexual activity ever or in the past three months by about 1 percentage point (cols. 1 and 3). The likelihood of failing to use contraception is estimated to fall by 1.1 percentage points (col. 5). Combining these two effects, the risk of pregnancy is estimated to fall by 0.2 percentage point (col. 7). To put these numbers in perspective, the teen employment-to-population ratio rose from an annual average of 41.9 to 43.5 from 1991 to 1996 and would be predicted to have reduced the risk of pregnancy by 0.3 percentage point, or 5 percent using the average risk of pregnancy of 6.2 percent as a base. In comparison, pregnancies are estimated to have fallen by 16 percent from 1991 to 1996, as reported earlier.

For boys, a stronger labor market is estimated to lead to less frequent sexual activity but not failure to use contraception during the last intercourse in the past three months. Point estimates indicate that the effect on sexual activity is smaller for boys than it is for girls, which is consistent with the notion that some, but not complete, spillover might be expected in the behavior of high school boys and girls.

Some support for a price effect is also found in the estimates of the effect of AIDS incidence. Here, results indicate that AIDS is negatively and significantly related to a girl's likelihood of ever having sexual intercourse (i.e., positively related to abstinence). Abstinence is the strongest response one could have to the fear of contracting AIDS. For those who are sexually experienced, I find estimated effects on sexual activity in the past three months and contraceptive use that are not statistically significant. One might suspect these effects to be weaker than that regarding abstinence since, having once decided to engage in sexual activity in the presence of AIDS, one may be less likely substantially to reduce that activity. Moreover, those using contraception may have been more likely to switch to condoms, but this does not represent an increase in the use of contraception and would not be captured by this model. In terms of pregnancy risk, estimates in table 4.4 suggest that greater AIDS incidence in a girl's state reduces her risk, but not significantly.[25]

25. On the other hand, when the sample is restricted to the eleven states for which data are available for all four survey years, estimates indicate that a ten case per 100,000 increase in AIDS incidence reduces the probability of pregnancy risk for girls by 0.9 percentage point, which is significantly different from 0 (results available on request). Since this analysis is based on eleven of the largest states, this sample may be more representative of the locations where AIDS is a greater threat.

Regarding welfare generosity, results provide mixed support for the role of prices. Welfare benefits do appear to be positively related to the likelihood of sexual activity and the failure to use birth control for both boys and girls. A 10 percent increase in welfare generosity is estimated to raise the risk of pregnancy by 1.2 percent for girls and 0.7 percent for boys. On the other hand, some of the results regarding the effect of welfare reform are counterintuitive. For instance, teens residing in states that reformed their welfare system were *more* likely to engage in sexual activity than girls in other states. Almost universally, welfare reform in a state meant that women faced increased difficulty collecting benefits, which would have been predicted to reduce sexual activity. Taking into account birth-control use, the results indicate that the effect of welfare reform is positive and marginally statistically significant for girls. One potential explanation for these findings is that the reform initiatives may have been endogenous in that the states that were experiencing the biggest increases in teen sexuality were the ones most concerned about the potential caseload growth in the future and, therefore, were more likely to crack down sooner on welfare receipt.

The results regarding abortion restrictions find little evidence that the imposition of a restriction has any effect on teens' sexual activity, use of birth control, or pregnancy risk. A potential explanation for this finding is the lack of power inherent in the statistical methodology, as described earlier. This problem can be attributed to the limited sample of states and the pattern of changes of abortion restrictions across states. Of the three types of restrictions considered, relatively few changes were made over the sample period, and those changes were more likely to occur in smaller states that were not in the sample each possible year. Therefore, the ability to obtain precise before-and-after differences to compare to other states is limited and may have contributed to the general weakness in the findings along this dimension.

I have also estimated a model analogous to the probit models described above that includes interaction terms between each price variable and the race/ethnicity of each respondent. Since trends in sexual activity and contraceptive use differed so dramatically by race/ethnicity (and particularly for black non-Hispanics), one might expect these price effects to have differential effects as well. Table 4.5 reports the results of this analysis when all observations are used in the analysis separately for boys and girls. Identification in these models is weakened by the fact that sample sizes within states/years by race/ethnicity begin to get small, so imprecision plagues many of the results.

Nevertheless, some important differences emerge. In particular, the effect of labor market conditions is found to be greater for black non-Hispanics than for white non-Hispanics. For girls, an improvement in the employment-to-population ratio is found to have a significantly stronger

Table 4.5 **The Relation between Geographic Factors and Teen Sexual Activity, Contraception, and Pregnancy by Race and Ethnicity, Probit Derivatives (standard errors in parentheses)**

	Sexual Intercourse Ever		Sexual Intercourse in Past Three Months		No Contraception Used during Last Intercourse in Past 3 Months		Pregnancy Risk	
Geographic Variables	Girls (1)	Boys (2)	Girls (3)	Boys (4)	Girls (5)	Boys (6)	Girls (7)	Boys (8)
Employment-to-population ratio (× 10)	−.123	−.088	−.114	−.082	.006	.049	−.015	.005
	(.033)	(.029)	(.026)	(.025)	(.027)	(.029)	(.011)	(.010)
Black non-Hispanic	.035	.022	.021	.026	−.049	−.099	−.015	−.029
	(.038)	(.035)	(.033)	(.028)	(.020)	(.027)	(.009)	(.009)
Hispanic	−.004	.031	.018	.004	−.057	−.086	−.020	−.020
	(.028)	(.047)	(.026)	(.036)	(.038)	(.040)	(.013)	(.013)
Log maximum AFDC/TANF benefit for a family of 2	.281	−.016	.068	.312	.317	.078	.121	.068
	(.106)	(.137)	(.094)	(.119)	(.090)	(.104)	(.037)	(.038)
Black non-Hispanic	.049	−.040	−.010	.019	.057	.080	.024	.033
	(.058)	(.063)	(.047)	(.054)	(.028)	(.047)	(.013)	(.018)
Hispanic	.053	−.008	.019	−.019	.038	.032	.015	.012
	(.056)	(.074)	(.048)	(.053)	(.051)	(.077)	(.020)	(.026)
Reformed welfare system	.102	.059	.079	.033	.005	−.070	.014	−.019
	(.030)	(.027)	(.024)	(.022)	(.021)	(.027)	(.009)	(.009)
Black non-Hispanic	−.019	−.003	−.032	.041	.038	.035	.010	.016
	(.030)	(.043)	(.030)	(.036)	(.025)	(.036)	(.011)	(.013)
Hispanic	.012	−.045	.009	−.077	−.007	.035	.013	.002
	(.028)	(.052)	(.027)	(.038)	(.035)	(.048)	(.012)	(.017)

AIDS rate per 100,000 population (× 100)	−.224	−.044	−.049	−.056	.015	−.026	−.006	−.017
	(.106)	(.093)	(.087)	(.081)	(.083)	(.093)	(.031)	(.035)
Black non-Hispanic (× 100)	−.061	.097	.003	.006	.015	−.108	.012	−.036
	(.086)	(.101)	(.087)	(.085)	(.083)	(.067)	(.024)	(.028)
Hispanic (× 100)	−.012	−.008	.000	−.057	−.257	−.033	−.083	−.011
	(.091)	(.101)	(.086)	(.075)	(.070)	(.094)	(.028)	(.033)
Medicaid funding restrictions	−.013	.026	.007	−.007	−.109	−.026	−.029	−.007
	(.104)	(.046)	(.084)	(.020)	(.062)	(.028)	(.030)	(.010)
Black non-Hispanic	.014	.020	−.052	−.003	.158	.159	.055	.062
	(.061)	(.066)	(.046)	(.056)	(.048)	(.070)	(.024)	(.032)
Hispanic	−.008	−.115	−.035	−.078	−.015	.082	−.009	.012
	(.059)	(.078)	(.047)	(.050)	(.054)	(.102)	(.019)	(.028)
Parent consent/notification required for abortion	−.031	.061	−.011	.020	.048	−.007	.016	.002
	(.049)	(.031)	(.036)	(.031)	(.025)	(.038)	(.013)	(.014)
Black non-Hispanic	.038	.031	.028	.023	−.008	−.001	.001	−.003
	(.044)	(.048)	(.042)	(.041)	(.024)	(.036)	(.011)	(.014)
Hispanic	−.027	−.023	−.004	−.002	−.070	.110	−.024	.024
	(.044)	(.083)	(.041)	(.062)	(.044)	(.095)	(.015)	(.032)
Mandatory waiting period for abortion	.049	−.075	.029	−.036	−.006	−.023	.002	−.014
	(.059)	(.052)	(.046)	(.043)	(.037)	(.039)	(.019)	(.010)
Black non-Hispanic	−.091	−.004	−.050	−.016	−.064	−.046	−.026	−.014
	(.050)	(.073)	(.039)	(.056)	(.020)	(.052)	(.009)	(.015)
Hispanic	−.063	.271	−.054	.269	.231	.173	.062	.132
	(.052)	(.110)	(.066)	(.148)	(.180)	(.161)	(.075)	(.119)

Source: Author's calculations from the 1991, 1993, 1995, and 1997 YRBS.

Note: All specifications include the same additional control variables as those reported in table 4.4.

effect on the likelihood of using contraception. The magnitude of the effect of labor market conditions on pregnancy risk is twice as great for blacks as it is for whites; the difference is significant at the 10 percent level. Racial differences for boys are even more dramatic; pregnancy risk is found to be roughly unaffected by labor market conditions for white, non-Hispanic boys, but a strong negative effect is observed for black, non-Hispanic boys. Some evidence also supports the position that the generosity of welfare benefits has a larger effect on black non-Hispanics than on white non-Hispanics. Again, the effect on failure to use contraception and pregnancy risk is significantly greater for blacks than it is for whites.

What can these results tell us about the potential determinants of recent trends in teens' sexual activity and contraceptive use? Recall that these trends are most clearly evident for black non-Hispanics. For these teens, the pregnancy risk fell by nearly half, from 14.7 to 8.4 percent between 1991 and 1997 (on the basis of YRBS data). The main potential predictor of a decline in that level given the results presented above would be labor market conditions. Between 1991 and 1997, the teen employment-to-population ratio rose from 41.9 to 43.4. The results presented in table 4.5 indicate that, for this demographic group, a 1.5 percentage point increase in the teen employment-to-population ratio would be predicted to lower the risk of becoming pregnant by 0.5 percentage points, a relatively small share of the decline.[26]

Other price-related factors offer little additional help in explaining the decline in pregnancy risk for black teen girls. Even if the estimated effect of AIDS was stronger, AIDS cases grew only through 1993 and have fallen back since then, with the result that the 1997 level is not much higher than that in 1991. Welfare-benefit generosity is found to be related to greater pregnancy risk, and more so for blacks, and real benefit levels have fallen by about 19 percent over the period 1991–97.[27] On the basis of the estimates given in table 4.4, this decline is predicted to reduce teen pregnancy risk by 2.8 percentage points, or about 44 percent of the overall decline. One should be cautious about providing such an interpretation of these results, however, given the counterintuitive estimates regarding the effect of welfare reform. Taking the welfare-reform estimates at face value, and given the fact that the entire country experienced welfare reform between 1991 and 1997, one would predict black teen pregnancy risk to rise by 2.4 percentage points on the basis of these estimates. This effect would almost

26. This calculation is based on the increase in the teen employment-to-population ratio for all races, not just black non-Hispanics, because the overall rates were used at the state level in the probit models. But the black, non-Hispanic employment-to-population ratio rose by even more between 1991 and 1997, increasing 3.6 points, from 22.6 to 26.2. Even if this larger increase were used, however, it would still explain a very small share of the decline in pregnancy risk over the period.

27. This decline represents a national average across states using the population weights in the YRBS data.

completely offset the effect of falling benefit generosity. It would also be difficult to attribute any causal effect of changes in abortion rules given the weakness of the evidence provided earlier regarding these policies. Taken as a whole, it would appear that a great deal of the decline in pregnancy risk among black non-Hispanics, which may have contributed to the dramatic decline in teen fertility among this group, cannot be explained by these factors.

4.4 Teen Motherhood and Subsequent Outcomes

The previous analysis considered the factors related to the risk of becoming pregnant, but the risk itself has not yet been defined. In particular, if a teen becomes pregnant and goes on to have a child, what cost does that impose on her during the remainder of her life? This section will evaluate the literature examining the effect of becoming a teen mother on the women's labor market outcomes and receipt of public assistance.

Earlier research on this topic is well summarized by Hofferth (1987). Results from this work identify some important life-cycle patterns in the labor market activity of teen mothers. Soon after giving birth, teen mothers face significant disadvantages compared to women who have delayed childbirth but are similar in some other dimensions. Teen mothers have significantly lower rates of labor force participation in the years immediately following teen childbirth. This difference is eliminated or even reversed by the time the women are in their late twenties, when those women who delayed childbearing are more likely to be caring for very young children. Little research has compared teen mothers with those who delayed childbearing until even later in life, and, while the available evidence suggests that teen mothers are somewhat less likely to work after their childbearing years, that difference is small.

Regardless of the point that they have reached in the life cycle, teen mothers earn less and have lower incomes than women who delay childbirth, even after controlling for several background characteristics. The fact that teen mothers also acquire significantly less education is strongly related to their lower earnings. Lower earnings also contribute to the higher rate of welfare receipt through the childbearing years, although some evidence indicates that the greater relative rate of welfare receipt diminishes over time as well.

The focus of more recent research has been to introduce alternative methodologies intended to compare teen mothers with other women who are identical on all relevant characteristics. For instance, even women who grew up in low-income, inner-city households may have been raised in very different family circumstances. One woman may have had parents who placed a heavy emphasis on education; another woman may have grown up in a household in which domestic violence occurred often. Eth-

nographic studies that track the lives of a relatively small number of women might be able to identify such differences. But this research can seldom be generalized to larger groups of women. Statistical analysis that relies on large samples of individuals cannot hope to control for these "unobservable" characteristics. More recent research in this area has applied innovative methods of identifying comparison groups across which even these differences are more likely to be held constant.

Geronimus and Korenman (1992) provide one example of this type of research. They compared the outcomes (including income, employment, and welfare receipt) of sisters, one who gave birth as a teen and one who did not. Of course, sisters differ in many ways, and Geronimus and Korenman control for differences between them in many of the same types of characteristics considered in first-generation studies. Since sisters generally share a common family background, however, differences in outcomes between them probably cannot be attributed to these characteristics, which would otherwise be unobservable in this type of study. The results of this study provide little evidence of a substantial detrimental effect of teen motherhood once these other factors are controlled for. Although the authors acknowledge that small sample sizes lead to imprecision in their estimates and limit the power of their analysis, they conclude that their results should lead one to be more cautious in finding a causal relation between teen motherhood and subsequent outcomes.

This research has led to a healthy exchange of papers, including replication exercises and alternative interpretations of the findings (Hoffman, Foster, and Furstenberg 1993a; Geronimus and Korenman 1993; and Hoffman, Foster, and Furstenberg 1993b), and the controversy has led to subsequent analysis by others. For instance, Hotz, McElroy, and Sanders (1996) provide another attempt to identify a sample of women who differ only by their status as teen mothers. These authors compare women who gave birth as teenagers to teens who became pregnant but miscarried. They report that roughly 10 percent of first teen pregnancies result in a miscarriage and that those who miscarry postpone subsequent childbearing three to four years, on average. If a miscarriage can be thought of as occurring "by chance," then it acts as a means of random assignment that separates pregnant teenagers into pseudo–control and −treatment groups, which can be compared using techniques similar to those of a controlled experiment.[28] Within their quasi-experimental framework, these authors find few negative labor market consequences or greater welfare receipt brought about by a teen birth.

Angrist and Evans (1996) introduce another quasi-experimental technique, using the legislative history of abortion liberalization to identify

28. Hotz, McElroy, and Sanders (1996) recognize that this assumption is not perfectly accurate and control for observable differences between the two groups in their analysis.

groups of women who are similar except for their status as teen mothers. They use the fact that the timing of abortion legalization in the early 1970s differed across states. In those states where abortion was legalized earlier, women—and teens in particular—may have responded by having relatively fewer children than women in states where abortion was not legalized until the 1973 *Roe v. Wade* Supreme Court decision. If a teen birth leads to differences in subsequent outcomes, the teenage women in those states that legalized abortion early should have had different outcomes within this window compared to teenage women living in states that did not liberalize their abortion laws until 1973. Angrist and Evans show few effects, if any, from differences in abortion laws. They identify a reduction in the probability of work among adult black but not white women who gave birth as teens. Moreover, even for blacks, the estimated effect is very imprecise, so it is difficult conclusively to determine whether the effect is large or small.

One last paper, by Grogger and Bronars (1993), uses a quasi-experimental design to identify relevant comparison groups. In this paper, women who have a first birth as teens are differentiated by whether they gave birth to twins or to a single child. Viewing the occurrence of twins as a "chance" event, having twins acts as a means of random assignment where women in a pseudo–control group have one child and women in a pseudo–treatment group have two. Comparing these groups can identify the independent effect of having an additional teen birth on the subsequent outcomes of these women.[29] Results indicate that having an additional child out of wedlock has no significant negative effect on employment but a small positive effect on welfare receipt for white women. For black women, the effect is larger.

It is clear that differences in outcomes between teen mothers and women who delay childbearing cannot be entirely attributed to the birth of the child. Given the evidence provided by recent research, it may even be an open question whether any economic disadvantage is "caused" by teen motherhood (except, perhaps, for blacks). Given the narrow categories of women on which the estimates from this research are based and the general imprecision in estimated effects, however, it would be premature definitively to draw such a conclusion.

4.5 Discussion

The prevalence of teen sexual activity without the use of contraception is clearly a concern of the American public (despite the fact that empirical

29. It is important to recognize that this exercise is not completely analogous to that conducted in the previous papers discussed, which attempted to estimate the effect of becoming a teen mother (with, most likely, one child) compared to delaying childbirth.

research has been unable to provide convincing evidence that the cost of a teen birth is large). This paper has documented that the level of such behavior is high by international standards and that little evidence indicates that it is declining rapidly (except, perhaps, among blacks). I have provided a discussion of alternative frameworks for thinking about this problem, with an emphasis on the contribution of economic analysis. The results of the empirical evidence provided in this paper provide some support for the conclusion that economic factors do affect individuals' decisions regarding sexuality and contraceptive use, although these factors cannot explain much of the recent trends.

The analysis presented in this paper can potentially provide a mechanism to help evaluate possible policy responses. The policies most commonly advocated to reduce the level of unprotected sexual activity by teens generally differ by political persuasion. From the Right, the advocacy of abstinence ("just say no") is the proposed response. From the Left, the expansion of sex education and increased funding for family planning are typically proposed. Within the framework of the analysis provided here, neither approach is likely to be particularly effective.

First, consider the calls for greater use of sex education and additional funding for family planning. If teen sexual activity is dictated by the developmental process and specific acts occur spontaneously, then the benefit of providing more information about contraception and the availability of low-cost family-planning services may be quite small. As teens age and reach a developmental level at which they are able to respond on the basis of perceived risks or an economic model in which costs are always weighed against benefits, greater information and lower costs are potentially useful tools. Their usefulness depends on the extent of misinformation and the extent to which these costs are altered by policy. On this basis, their effectiveness may be limited.

Evidence from a recent survey of high school students conducted by the Kaiser Family Foundation (1999) may be brought to bear on this question. The survey indicates that 95 percent of teenage girls know that they can become pregnant during first intercourse, 80 percent know that they can buy condoms in drugstores without their parents' permission, and 80 percent know that they qualify for free or low-cost contraception at family-planning clinics. Although relatively high percentages report wanting even more information, the vast majority seem to know the minimum required to avoid getting pregnant.[30] Although increased information may certainly

30. For instance, survey results indicate that 61 percent of girls mistakenly believe that they need their parents' permission to get birth-control pills and that 51 percent would like to have more information about birth control. These results suggest that increased sex education and family planning would still provide benefits for teens through greater choices and a more thorough understanding of their decisions. Nevertheless, most appear to have sufficient knowledge to make decisions that would prevent them from getting pregnant should they so desire.

result in some gains, it seems unlikely to provide a substantial reduction in teen pregnancy. Moreover, if the cost of teen pregnancy is as high as is often claimed, small changes in the price of birth control (such as providing free condoms) also seem unlikely significantly to shift the balance and cause people to use contraception who otherwise would not.

Promoting abstinence has similar problems. If younger teens have not developed sufficiently to make rational decisions, then they will be unable to respond to such calls. If they are making rational decisions on the basis of the relative costs and benefits of the activity, then just-say-no policies will be ineffective without any reference to either part of this comparison.

If none of the conventional proposals seem likely to have a significant effect on the sexual behavior of teens, what sorts of policies are likely to be effective? From a rational decision-making framework, only one set of alternatives is really possible. Since it would be difficult to alter the perceived benefits of sexual activity, one would have to focus on the costs. To yield a significant reduction, the perceived cost would have to be elevated considerably. This could take many forms. For instance, perhaps sex education should amend its focus away from health-related issues and add to the curriculum the economic risks that teen pregnancy poses. A thorough understanding of the potentially lifelong implications of one's decision as a teen to accept the risk of becoming pregnant could shift the balance. However, this would require teens to place sufficient weight on future costs compared to present benefits; models of such activity by behavioral economists in which tremendous weight may be placed on activity today would work against a large effect. Moreover, in the light of the recent empirical evidence reviewed above, it is unclear whether a teen birth does impose a large cost.

Other policies that actually do change the cost (as opposed to the perceived cost) of giving birth may also be effective. Given the evidence provided earlier, strengthening labor market opportunities for teens may increase the opportunity cost of childbearing and reduce its incidence. Improving those opportunities over the long term (rather than relying strictly on cyclic fluctuations), however, is a difficult task. The analysis provided earlier also suggests that AIDS incidence played some role in reducing risky sexual behavior, but, given its enormous cost to teens and others, no one could conceivably propose limiting the fight against AIDS solely for this purpose. More stringent welfare policies, such as those embedded in welfare reform, could also provide such costs through a greatly diminished value of benefits, provisions that limit benefit increases resulting from additional births, forcing teen mothers to live with their parents, and the like.[31] Yet the evidence presented earlier regarding the effect of welfare policies on sexual activity is mixed. Beyond options such as

31. Welfare-reform legislation also provided incentives to states to reduce the level of teen births, but it allows states to introduce their own specific policies.

these, it becomes clear that lowering the level of risky sexual practices among teens, and therefore lowering birthrates, is a very difficult exercise. In fact, if one takes the perspective that sexual activity is largely spontaneous and irrational, it would be virtually impossible for any intervention to have much of an effect.

One additional avenue that should be considered, one that has been given less attention in the literature and ignored here, is the behavior of men. Although the empirical analysis reported above estimated analogous models for school-age boys and girls, the costs considered were largely associated with the behavior of girls. The risk for teenage men associated with unprotected sexual activity is quite low and may be limited to the risk of contracting a sexually transmitted disease.[32] If men are rational decision makers, then the positive benefit combined with very little cost means that they should be willing to undertake such behavior regardless of its potential outcome. In fact, Akerlof, Yellen, and Katz (1996) argue that the changes in the availability of contraception and the legalization of abortion in the late 1960s and early 1970s are responsible for the current trend toward increasing out-of-wedlock births because the cost to men of engaging in sexual activity became so low. To the extent that policies could be designed that hold teenage men more accountable for their actions in this regard, they might be effective in helping reduce the rate of risky sexual behavior.

References

Abma, Joyce, and Freya L. Sonenstein. 1998. Teenage sexual behavior and contraceptive use: An update. Hyattsville, Md.: National Center for Health Statistics, Centers for Disease Control, 28 April.

Ahituv, Avner, V. Joseph Hotz, and Tomas Philipson. 1996. The responsiveness of the demand for condoms to the local prevalence of AIDS. *Journal of Human Resources* 31, no. 4 (fall): 869–97.

Akerlof, George A., Janet L. Yellen, and Michael L. Katz. 1996. An analysis of out-of-wedlock childbearing in the United States. *Quarterly Journal of Economics* 111, no. 2 (May): 277–318.

Alan Guttmacher Institute. 1998. *Facts in brief: Teen sex and pregnancy, 1998.* New York.

Angrist, Joshua D., and William N. Evans. 1996. Schooling and labor market consequences of the 1970 state abortion reforms. Working Paper no. 5406. Cambridge, Mass.: National Bureau of Economic Research, January.

32. One could argue that an additional cost for a teenage man is the probability that a woman gets pregnant and successfully identifies him as the father, potentially leaving him liable for child-support payments. Given the low earnings capacity at that stage of life, however, even this cost is likely to be quite small. This also works against the effectiveness of a policy strengthening the enforcement of child-support awards.

Argys, Laura, Susan Averett, and Daniel Rees. In press. Welfare generosity, pregnancies, and abortions among unmarried AFDC recipients. *Journal of Population Economics.*

Blank, Rebecca, Christine George, and Rebecca London. 1996. State abortion rates: The impact of policies, providers, politics, demographics, and economic environment. *Journal of Health Economics* 15, no. 5 (October): 513–53.

Brooks-Gunn, Jeanne, and Frank F. Furstenberg Jr. 1989. Adolescent sexual behavior. *American Psychologist* 44, no. 2 (February): 249–57.

Brooks-Gunn, Jeanne, and Roberta Paikoff. 1997. Sexuality and developmental transitions during adolescence. In *Health risks and developmental transitions during adolescence,* ed. John Schulenberg, Jennifer L. Maggs, and Klaus Hurrelmann. Cambridge: Cambridge University Press.

Butz, William P., and Michael P. Ward. 1979. The emergence of countercyclical U.S. fertility. *American Economic Review* 69, no. 3 (June): 318–28.

Camasso, Michael, Carol Harvey, Mark Killingsworth, and Radha Jagannathan. 1999. New Jersey's family cap and family size decisions: Some findings from a 5-year evaluation. Rutgers University, 8 April. Typescript.

Centers for Disease Control (CDC) Press Office. 1998. New CDC report cites drop in sexual risk behaviors among teens. Atlanta, 17 September. Press release.

Council of Economic Advisers. 1999. The effects of welfare policy and the economic expansion on welfare caseloads: An update. Washington, D.C., 3 August.

Darroch, Jacqueline E., David J. Landry, and Selene Oslak. 1999. Age differences between sexual partners in the United States. *Family Planning Perspectives* 31, no. 4 (July/August): 160–67.

Dee, Thomas S. 1999. The effects of alcohol use and availability on teen childbearing. Swarthmore College, February. Typescript.

Fairlie, Robert W., and Rebecca A. London. 1997. The effect of incremental benefit levels on births to AFDC recipients. *Journal of Policy Analysis and Management* 16, no. 4:575–97.

Gallup Organization. 1999. Gallup social and economic indicators—most important problem. 3 September 1999. *www.gallup.com/poll/indicators/indmip.asp.*

Geronimus, Arline T., and Sanders Korenman. 1992. The socioeconomic consequences of teen childbearing reconsidered. *Quarterly Journal of Economics* 107, no. 4 (November): 1187–1214.

———. 1993. The socioeconomic costs of teenage childbearing: Evidence and interpretation. *Demography* 30, no. 2 (May): 281–90.

Grogger, Jeff, and Stepen Bronars. 1993. The socioeconomic consequences of teenage childbearing: Findings from a natural experiment. *Family Planning Perspectives* 25, no. 3 (July/August): 156–62.

Haas-Wilson, Deborah. 1996. The impact of state abortion restrictions on minors' demand for abortions. *Journal of Human Resources* 31, no. 1 (winter): 140–58.

Hardy, Janet B., and Laurie Schwab Zabin. 1991. *Adolescent pregnancy in an urban environment.* Washington, D.C.: Urban Institute Press.

Henshaw, Stanley K. 1999. *Special report: U.S. teenage pregnancy statistics, with comparative statistics for women aged 20–24.* New York: Alan Guttmacher Institute, 1 June.

Hofferth, Sandra L. 1987. Social and economic consequences of teenage childbearing. In *Risking the future: Adolescent sexuality, pregnancy, and childbearing,* ed. Cheryl D. Hayes. Washington, D.C.: National Academy Press.

Hoffman, Saul D., E. Michael Foster, and Frank F. Furstenberg Jr. 1993a. Reevaluating the costs of teenage childbearing. *Demography* 30, no. 1 (February): 1–13.

———. 1993b. Reevaluating the costs of teenage childbearing: Response to Geronimus and Korenman. *Demography* 30, no. 2 (May): 291–96.

Horvath, Ann, and H. Elizabeth Peters. 1999. Welfare waivers and non-marital childbearing. Working Paper no. 109. Chicago: Joint Center for Poverty Research, September.

Hotz, V. Joseph, Susan Williams McElroy, and Seth G. Sanders. 1996. The impacts of teenage childbearing on the mothers and the consequences of those impacts for government. In *Kids having kids: Economic costs and social consequences of teen pregnancy,* ed. Rebecca A. Maynard. Washington, D.C.: Urban Institute Press.

Kaiser Family Foundation. 1997. *Is the secret getting out? 1997 national surveys of Americans and health care providers on emergency contraception.* Menlo Park, Calif.

———. 1999. *1999 national survey of 9th–12th grade public school students about sexual health issues and services.* Menlo Park, Calif.

Kane, Thomas J., and Douglas Staiger. 1996. Teen motherhood and abortion access. *Quarterly Journal of Economics* 111, no. 2 (May): 467–506.

Leibowitz, Arleen, Marvin Eisen, and Winston K. Chow. 1986. An economic model of teenage pregnancy decision-making. *Demography* 23, no. 1 (February): 67–77.

Levine, Phillip B., Amy B. Trainor, and David J. Zimmerman. 1996. The effects of Medicaid abortion funding restrictions on abortions, pregnancies, and births. *Journal of Health Economics* 15:555–78.

Lowenstein, George, and Frank Furstenberg. 1991. Is teenage sexual behavior rational? *Journal of Applied Social Psychology* 21, no. 12 (1991): 957–86.

Lundberg, Shelly, and Robert D. Plotnick. 1995. Adolescent premarital childbearing: Do economic incentives matter? *Journal of Labor Economics* 13, no. 2 (April): 177–200.

Mancunovich, Diane J. 1995. The Butz-Ward fertility model in the light of more recent data. *Journal of Human Resources* 30, no. 2 (spring): 229–55.

Matthews, Stephen, David Ribar, and Mark Wilhelm. 1997. The effects of economic conditions and access to reproductive health services on state abortion and birthrates. *Family Planning Perspectives* 29, no. 2 (March/April): 52–60.

Miller, Wayne J., Sirinder Wadhera, and Stanley K. Henshaw. 1997. Repeat abortions in Canada, 1975–1993. *Family Planning Perspectives* 29, no. 1 (January/February): 20–24.

Moffitt, Robert. 1998. The effect of welfare on marriage and the family. In *Welfare, the family, and reproductive behavior,* ed. Robert A. Moffitt. Washington, D.C.: National Academy Press.

Moore, Kristin A., Brent C. Miller, Dana Glei, and Donna Ruane Morrison. 1995. *Adolescent sex, contraception, and childbearing: A review of recent research.* Washington, D.C.: Child Trends, June.

National Abortion and Reproductive Rights Action League (NARAL) Foundation. Various years. *Who decides? A state-by-state review of abortion and reproductive rights.* Washington, D.C.

National Center for Health Statistics (NCHS) Press Office. 1997. Teen sex down, new study shows. Hyattsville, Md., 1 May. Press release.

O'Donoghue, Ted, and Matthew Rabin. 1999. Doing it now or later. *American Economic Review* 89, no. 1 (March): 103–24.

Oettinger, Gerald S. 1999. The effects of sex education on teen sexual activity and teen pregnancy. *Journal of Political Economy* 107, no. 3 (June): 606–44.

O'Neill, June. 1994. Report concerning New Jersey's Family Development Program. Baruch College. Typescript.

Philipson, Tomas J., and Richard A. Posner. 1993. *The AIDS epidemic in an economic perspective.* Cambridge, Mass.: Harvard University Press.

Terry, Elizabeth, and Jennifer Manlove. 1999. Trends in sexual activity and contraceptive use among teens. Paper presented at the Child Trends conference "Messengers and Methods for the New Millennium: A Round Table on Adolescents and Contraception," Washington, D.C., February.

UN Department of Economic and Social Affairs. Statistical Office. Various years. *Demographic yearbook.* New York.

———. Centers for Disease Control. National Center for Health Statistics. 1999a. *Healthy people 2000 review, 1998–99.* Hyattsville, Md., June.

———. Office of Disease Prevention and Health Promotion. 1999b. *Healthy people 2010—draft.* 20 August. *http://web.health.gov/healthypeople/default.htm.*

———. Office of the Assistant Secretary for Planning and Evaluation. 1998. *Trends in the well-being of America's children and youth: 1998.* Washington, D.C.: U.S. Government Printing Office.

———. Public Health Service. Centers for Disease Control. National Center for Health Statistics. 1995. *Report to Congress on out-of-wedlock childbearing.* Hyattsville, Md., September.

———. Public Health Service. Centers for Disease Control. National Center for Infectious Diseases. Division of HIV/AIDS. Various issues. *HIV/AIDS surveillance report.* Atlanta.

U.S. House of Representatives. Various years. *The green book.* Washington, D.C.

Ventura, Stephanie J., Joyce A. Martin, Sally C. Curtin, and T. J. Matthews. 1997. Report of final natality statistics, 1995. *Monthly Vital Statistics Report,* vol. 45, no. 11, suppl. (10 June).

———. 1998. Report of final natality statistics, 1996. *Monthly Vital Statistics,* vol. 46, no. 11, suppl. (30 June).

———. 1999. Births: Final data for 1997. *Monthly Vital Statistics Report,* vol. 27, no. 18 (29 April).

Ventura, Stephanie J., Joyce A. Martin, T. J. Mathews, and Sally C. Clarke. 1996. Advance report of final natality statistics, 1994. *Monthly Vital Statistics Report,* 44, no. 11, suppl. (24 June).

Ventura, Stephanie J., T. J. Matthews, and Sally C. Curtin. 1999. Declines in teenage birth rates, 1991–1998: Update of national and state trends. *National Vital Statistics Reports,* vol. 47, no. 26 (25 October).

Ventura, Stephanie J., Selma M. Taffel, William D. Mosher, Jacqueline B. Wilson, and Stanley Henshaw. 1995. Trends in pregnancies and pregnancy rates: Estimates for the United States, 1980–92. *Monthly Vital Statistics Report,* vol. 43, no. 11(S) (25 May).