CONTRACEPTIVE CHOICE AMONG AMERICAN TEENAGE WOMEN: A TEST OF TWO MODELS BASED ON THE DRYFOOS STRATEGY

DISSERTATION

Presented to the Graduate Council of the University of North Texas in Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Thomas Allen Crow, B.S.M.E., M.B.A.

Denton, Texas

May, 1997
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Teenage pregnancy rates in the U.S. are among the highest in the world for industrialized countries. The generally accepted reason is not that American teenagers are more sexually active but that they contracept less than do teenagers in other industrialized countries.

This dissertation reports on a study that was undertaken for two purposes. One purpose was to develop and test two models of contraceptive choice among American teenagers: a "likelihood-of-use" model to predict the likelihood of sexually active teenagers' using contraception, and a "medical-or-nonmedical" model to predict whether teenagers who use contraception are likely to use medical or nonmedical methods. The second purpose was to explore the level of support for the two models among black and white teenagers separately.

The theoretical underpinning of the models is value-expectancy theory. The models' exogenous variables are based on the prevailing strategy for preventing teenage
pregnancy among American teenagers, a strategy initially advocated by Joy G. Dryfoos. The strategy involves the use of access-to-contraception programs, educational programs, and life options programs.

The data used in the study were on 449 subjects drawn from the 1979 National Survey of Young Women, a probability-sample survey of women in the U.S. aged 15-19. The subjects were those survey respondents who were black or white, sexually active, never married, and never pregnant.

The statistical technique used in the study was logistic regression. Test results supported three of four hypotheses constituting the medical-or-nonmedical model and two of seven hypotheses constituting the likelihood-of-use model. The results for each model offered support for using two of the three programs constituting the prevailing pregnancy-prevention strategy: access-to-contraception programs and educational programs. Exploration of the level of support for each of the two models among black and white teenagers indicated that support for each model differed between the two groups of teenagers.
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I was very fortunate to have had as my supervisor in this project Dr. Vijayan K. Pillai, my major professor. Dr. Pillai is both a dedicated researcher and a dedicated teacher, which made the project the kind of experience I had hoped it would be.

I am also greatly indebted to Tom Skehan, head of the O'Hara Center for Youth Development, an affiliate of the Boys and Girls Clubs of America. Tom generously made available to me office space and use of the Center's computer resources--including the latest SPSS software--for the last several months work on the project. His doing so saved me countless hours in commuting the 70-mile round trip between my home and the University.
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CHAPTER I

INTRODUCTION

Background

Every year in the United States, about one out of every ten teen-aged women becomes pregnant (Hofferth and Hayes, 1987, Table 3.1; Henshaw, 1989; Henshaw, 1993). In 1988, such pregnancies numbered slightly more than a million (Henshaw, 1993). Based on percentage estimates from Trussell (1988), 800,000 of the 1988 pregnancies were to teenagers who were unmarried, and only 160,000 of the pregnancies were planned. About 390,000 of the pregnancies ended in abortion, 130,000 in miscarriages, and 480,000 in live births (Henshaw, 1993). With a total of 480,000 live births, and with 160,000 of the pregnancies planned, more than 320,000 of the births are estimated to have been the result of unplanned pregnancies.

Teenagers\(^1\) who become mothers as a result of unplanned pregnancies rarely give their newborns up for adoption (Dryfoos, 1990). Consequently, each year, as the 1988 data

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\(^1\) The theory used in this study is applicable to male as well as female teenagers. However, the data used in the study are limited to females. Consequently, the discussion here, and elsewhere, is limited to female teenagers, and subsequent reference to a "teenager" should be understood to mean a teenage woman.
suggest, hundreds of thousands of teenagers begin new lives as mothers of unplanned newborns. With many of the young mothers ill prepared for the role of parent, they and their children suffer hardships and disadvantages—and the public suffers certain costs—which post-teenage pregnancies might have avoided.

For the young mothers involved, teenage childbearing results in a greater likelihood that they will obtain less education (Card & Wise, 1978; Hofferth & Moore, 1979; Marini, 1984; Mott & Marsiglio, 1985), find employment in lower status jobs, with lower incomes (Card & Wise, 1978; Hofferth & Moore, 1979), experience less job satisfaction (Card & Wise, 1978), live in poverty (Hofferth & Moore, 1979), have more children (Card & Wise, 1978; Hofferth & Moore, 1979; Trussell & Menken, 1978), with shorter intervals between births (Mott, 1986; Trussell & Menken, 1978) and, if married, experience marital instability and divorce (Card & Wise, 1978; McCarthy & Menken, 1979).

Children born to teenage mothers are more likely than other children to suffer deficits in cognitive development (Baldwin & Cain, 1980; Moore & Snyder, 1991), perform poorly in school (Card, 1981; Furstenberg, Brooks-Gunn, & Morgan, 1987), experience problems in social and emotional development (Baldwin & Cain, 1980) and in school adjustment (Baldwin & Cain, 1980; Furstenberg et al., 1987), and become teenage parents themselves (Baldwin & Cain, 1980; Card,
The magnitude of the monetary costs which the American public incurs as a result of teenage childbearing—for AFDC, food stamps, medical assistance, and social services—are suggested by a study that was conducted by SRI International (Burt & Levy, 1987) of births to teenagers in 1979. It was estimated that, measured in 1979 dollars, the family begun by each birth would eventually cost taxpayers $18,710 and that the total cost to taxpayers for all families begun by first births would amount to at least $8.3 billion.

With teenage pregnancy capable of producing such negative consequences, how do teenage pregnancy rates for the United States compare with the rates for other countries that are comparably developed? Among industrialized countries, teenage pregnancy rates for the United States are among the highest in the world (Jones et al., 1985, 1986; Senderowitz & Paxman, 1985; Westoff, Calot, & Foster, 1983).

A study of 1979/1980 teenage fertility levels\(^2\) in 32 industrialized countries\(^3\) showed fertility among U.S.

\(^2\) Although the concern here is pregnancy rates, part of the discussion references birthrates as a proxy for pregnancy rates. In a 1981 study of pregnancy-related data in 13 countries, the finding of a high correlation between abortion rates and birthrates prompted the authors to conclude that, for purposes of analysis, it is "reasonable to assume that birthrates are an acceptable proxy for pregnancy rates" (Jones et al., 1985, p. 53).

\(^3\) See item 1 in Appendix A for a list of the 31 countries.
teenagers to be higher than that among teenagers in 27 of
the 31 other countries; among teenagers under 18, the U.S.
level was higher than that of any country except Hungary
(Westoff, Calot, and Foster, 1983).

The findings in a study of 1981 teenage birthrates in
37 industrialized countries\(^4\) included the following
statement:

Although it is one of the most highly developed
countries examined, the United States has a teenage
fertility rate much higher than the rates observed in
countries that are comparably modernized, and
considerably higher than the rates found in a number of
much less developed countries. The inconsonance applies
particularly to fertility among younger teenagers,
where the U.S. rate falls between that of Romania and
Hungary.... (Jones et al., 1986, p. 230).

Data on pregnancy rates were available on 13 of the
countries\(^5\) in the 37-country study. Among those 13, the U.S.
and Hungary tied for the highest pregnancy rate for
teenagers through age 19; for teenagers through age 17, the
U.S. rate exceeded the rates of all twelve other countries
(Jones et al., 1986).

\(^4\) See item 2 in Appendix A for a list of the 37 countries

\(^5\) See item 3 in Appendix A for a list of the 13 countries.
In a study of 1981 teenage pregnancy rates in Canada, England and Wales, France, Sweden, the Netherlands, and the United States, pregnancy rates among teenagers in each of the five other countries were compared to the rates for two categories of teenagers in the U.S.: for U.S. teenagers of all races and for white U.S. teenagers only. Pregnancy rates for both categories of U.S. teenagers exceeded by a considerable margin those of each of the five other countries at every age (Jones et al., 1985).

Why, then, are teenage pregnancy rates in the United States among the highest in the world for industrialized countries? Is it because a higher proportion of American teenagers are more sexually active, or because sexually active American teenagers contracept less, or do both conditions contribute to the higher rates? Data obtained in the study of the six Western European and North American countries indicate that American teenage pregnancy rates are not higher because American teenagers are more sexually active; the data show that the incidence of sexual activity among teenagers in other countries is comparable to that among U.S. teenagers (Jones et al., 1985; Trussell, 1988). It is generally recognized that pregnancy rates are higher among American teenagers because they contracept less than do teenagers in other industrialized countries (Miller and Moore, 1990; Brooks-Gunn & Furstenberg, 1989; Trussell, 1988).
In 1984, the Committee on Child Development Research and Public Policy within the National Research Council established a Panel on Adolescent Pregnancy and Childbearing. The purpose of the panel was to review research and program experiences and recommend approaches for policy formulation, program design, research, and evaluation. In its report (Hayes, 1987), the panel advocates an approach to teenage pregnancy prevention consistent with the conclusion drawn from the international studies. The report contains the following statement.

Because there is so little evidence of the effectiveness of the other strategies for prevention, the panel believes that the major strategy for reducing early unintended pregnancy must be the encouragement of diligent contraceptive use by all sexually active teenagers (p. 7).

The Dryfoos Strategy

The prevailing strategy for preventing unintended pregnancy among American teenagers consists of three types of programs: (a) those that impart knowledge and influence attitudes; (b) those that provide access to contraception; and (c) those that enhance life options (Hayes, 1987).

Prior to the latter 1980s, pregnancy prevention strategy had largely been limited to the first two of these types of programs: education programs and access-to-contraception programs. In the mid-1980s, Joy G. Dryfoos
(1984) successfully advocated "a new strategy," one that added to the two traditional types of programs a third type: life options programs, programs whose purpose is to elevate teenagers' expectations for the future. By elevating teenagers' expectations--largely their educational and occupational expectations--life options programs attempt to enable teenagers to see their futures as susceptible to being adversely affected by early pregnancy, thereby engendering a desire to avoid early pregnancy (Dryfoos, 1984; Hayes, 1987). The notion that the desire to avoid early pregnancy can flow from elevated expectations is contained in Dryfoos' (1984) following remarks:

The motivation to avoid motherhood stems from the adolescent's knowledge and understanding of the consequences of early childbearing. . . . Unless a young woman believes that childbearing during adolescence will limit her opportunities in life, and that foregoing maternity will result in enhanced life options, she is not likely to protect herself sufficiently against pregnancy even though she does not particularly want to become a parent. . . . A disadvantaged youngster with no hopes or aspirations cannot understand how having a baby will adversely affect her life. (p. 193)

In subsequent discussion, the three-program approach to pregnancy prevention which Dryfoos successfully advocated is
referred to as "the Dryfoos strategy."

**Purpose of the Study**

The study presented here was undertaken to test two theoretical models of teenage contraceptive choice that are based on the Dryfoos strategy. Each of the models attempts to explain an aspect of the effectiveness of the contraceptive alternative\(^6\) a sexually active teenager chooses. One model attempts to explain the likelihood of a teenager's using any method of contraception. The other attempts to explain whether a contraceptive-using teenager is likely to use a medical method or a nonmedical method.\(^7\)\(^8\)

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\(^6\) A "contraceptive alternative" is any of the options a sexually active teenager may choose in response to the threat of pregnancy: the use of any one of several contraceptive methods or the use of no contraception.

\(^7\) A medical method is a method whose use requires a prescription; use of a nonmedical method does not require a prescription. The least effective medical method is more effective than the most effective nonmedical method. Medical methods, as they are treated in this study, include the pill, the intrauterine device (IUD), and the diaphragm; nonmedical methods include the condom, chemical-barrier methods (foam, cream, jelly, and suppository), rhythm, withdrawal, and douching (see U.S. Food and Drug Administration, 1978).

\(^8\) An act of contraception is, of course, not limited to the use of a single method but may involve a combination of two or more methods. However, in the interest of simplifying the language, the singular term "method" will be used throughout the discussion, with the understanding that it is intended to mean "method or methods." In cases in which a combination of methods is used—for example, the pill and the condom—reference to the effectiveness of "the method used" is intended to go to the effectiveness of the most effective method in the combination.
The study also had a secondary objective: to explore the extent to which the effects of the selected theoretical variables in each model differ between black and white teenagers. This objective was undertaken on the assumption that the difference between the pregnancy rates of black and white teenagers\(^9\) may be due to dissimilar influences of the selected variables on the pregnancy rates.

**Importance of the Study**

No previous study has undertaken to specify and test a theoretical model that attempts to explain any aspect of a teenager's contraceptive choice in terms of the Dryfoos strategy (see Chilman, 1986, Miller and Moore, 1990, and Morrison, 1985, for reviews of research on contraceptive use by teenagers). The study, then, is important in two ways: (a) in making a contribution toward the specification of a theoretical basis for investigating how the Dryfoos strategy affects teenagers' contraceptive choices, and (b) in testing two models representative of that contribution, using data from a recognized survey whose sample was drawn at the national level. The data used were drawn from Zelnik and Kantner's (1985) 1979 National Survey of Young Women.

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\(^9\) According to the Alan Guttmacher Institute (1994), 19 percent of all black women aged 15-19 become pregnant each year, compared to 8 percent of whites.
CHAPTER II

A REVIEW OF THE LITERATURE

No previous studies have examined the effect of the Dryfoos strategy as a whole on any aspect of the effectiveness of a teenager's contraceptive choice. However, studies have been conducted that bear on the relationships between teenager characteristics addressed by each of the three types of programs that make up the Dryfoos strategy--access-to-contraception programs, education programs, and life options programs--and some aspects of the effectiveness of a teenager's contraceptive choice. The findings of such studies that were produced by a search of relevant literature are given below.

Studies Related to Access-to-Contraception Programs

The purpose of an access-to-contraception program is to increase a particular group of teenagers' access to a contraceptive method, or set of methods, whose effectiveness is greater than that of the most effective method to which they already have adequate access. The methods to which groups of teenagers already have adequate access may differ from one group to the next: One group may have access only to douching, withdrawal, and rhythm, the three least effective (and most accessible) of the recognized methods;
another group may, in addition, have access to condoms and chemical-barrier contraceptives, methods that are more effective than the three least effective methods but still less effective than medical methods (see U.S. Food and Drug Administration, 1978).

The concept of access to contraceptive methods may be seen to have several dimensions, such as the affordability, convenience, confidentiality, and availability of contraception-providing services (Moore & Burt, 1982, cited in Moore, Simms, & Betsey, 1986). Accordingly, a global concept of access—access defined in terms of any of its dimensions—was used in the review of studies related to teenagers' access to contraception.

Studies that were found indicated consistently that, among teenagers, greater access to more effective contraception is associated with greater use of more effective contraceptive alternatives. A study by Zabin & Clark (1981) found that perceived limitations in the confidentiality and affordability of the services provided by family planning clinics can prevent teenagers from using the methods available from such clinics.1 The subjects of the study were teenagers making their first visits to a

1 Services from family planning clinics include the provision of medical methods which, as a class, are the most effective methods.
family planning clinic. 29 percent of the subjects indicated that one of the reasons they decided to make the visit was that they had just learned that they could get birth control without their families being informed. Of those who delayed their visits for some time after becoming sexually active, 31 percent said that one of the reasons for their delay was that they were afraid their parents would find out; 18 percent included among their reasons that they thought it would cost too much.

Indirect evidence of a relation between greater access to more effective contraception and the use of more effective contraception is provided by studies that report reductions in fertility or pregnancy among members of a target population as a result of providing members of either or both sexes with greater access to more effective contraception. Edwards, Steinman, Arnold, & Hakanson (1980) found that over a 10-year period in which approximately 10 school-based clinics in St. Paul, Minnesota, provided family planning services to students, the fertility rate in schools with such clinics dropped from 79 births per 1,000 to 26 births per 1,000. Dryfoos (cited in Hayes, 1987) reported that fertility rates among black adolescent girls residing in a North Carolina community declined significantly following a year-long program in which condoms were made
available in pool halls, barber shops, a restaurant, and a
grocery store in the area. Moore and Caldwell (1977), using
data from the 1971 National Survey of Young Women, found
that black teenagers ages 16-18 living in areas with the
most subsidized contraceptive services were significantly
less likely to become pregnant than were their counterparts
in other areas.

Although a study by Zabin, Hirsch, Smith, Streett, &
Hardy (1986) confounds the effects of access to more
effective contraception with those of other factors such as
sex education, the study offers evidence consistent with the
results of other studies. Zabin and her colleagues
evaluated a pregnancy-prevention program targeted at the
students in a high school and a junior high school in
Baltimore. Through the installation of a free-services
family planning clinic in close proximity to the two
schools, the program gave the students a high level of
access to the most effective methods available. The study
indicated that, over a three-year demonstration period,
three types of increases occurred among sexually active
women students in the effectiveness of the contraceptive
alternatives they chose: (a) in the use of some method of
contraception instead of no contraception; (b) in the use of
methods requiring advance preparation, which are methods
more effective than douching, withdrawal, and rhythm, (U.S. Food and Drug Administration, 1978); and (c) in the use of the pill, the most effective method available (U.S. Food and Drug Administration, 1978).

Studies Related to Education Programs

Insofar as the Dryfoos strategy is directed at increasing the effectiveness of teenagers' contraceptive choices, the objective of the strategy's education programs is to increase the knowledge which teenagers' need in order to choose more effective contraceptive alternatives. Such knowledge is considered to include information on several topics (see Hayes, 1987, pp. 143-153; Morrison, 1985, pp. 539-550; Moore, Simms & Betsey, 1986, Chap. 3). Four topics were dealt with in the studies that were reviewed: (a) the risk of pregnancy with unprotected intercourse, (b) the disagreeableness of the side effects of contraceptive methods, (c) the effectiveness of contraceptive methods, and (d) how to obtain contraceptive methods.

Risk of pregnancy with unprotected intercourse. Two studies found that differences in teenagers' mean estimates of pregnancy risk with unprotected intercourse were not statistically significant between users and nonusers of contraception (Cvetkovich & Grote, 1981; Foreit & Foreit, 1981). In contrast, five other studies found that, among
teenagers or college-age women, estimates of pregnancy risk with unprotected intercourse were: (a) greater among users of contraception than among nonusers (Arnett, 1990; Kalmuss, 1986; Kantner & Zelnik, 1973); (b) greater among users of effective contraception than among nonusers and users of less effective contraception (Gerrard, McCann, & Fortini, 1983); and (c) greater among diligent users of contraception than among nondiligent users (Oskamp & Mindick, 1983).

Two differences between the two sets of studies may account for their disagreement. Both differences have to do with the ways in which subjects' perceptions of the probability of pregnancy were measured. First, both the Cvetkovich and Grote study and the Foreit and Foreit study asked subjects to express their perceptions of the risk of pregnancy as specific probabilities while the other studies asked their subjects to express their perceptions in conceptually less formidable terms; for example, in terms of categories on an ordinal scale. Second, neither the Cvetkovich and Grote study nor the Foreit and Foreit study asked subjects to estimate the probability of pregnancy as it applied to themselves; the Cvetkovich and Grote study asked subjects to estimate probabilities for women in general; the Foreit and Foreit study asked subjects to estimate probabilities in situations involving a
hypothetical 19-year-old woman and 20-year-old man. Of the five other studies, four asked subjects to estimate the risk of pregnancy as it applied to themselves; the fifth asked subjects to estimate pregnancy risk as it applied to "a girl about your age."

Thus, the methodology of the five studies in which subjects were asked to estimate the risk of pregnancy as it applied to themselves or to a figure they could easily identify with, and to do so in terms simpler than actual probabilities, would appear to be more reliable than the methodology of the two other studies. These differences in methodology, then, suggest why the findings of the two sets of studies differ. More important, however, they argue in favor of the conclusion that may be drawn from the five studies: that the greater a teenager's perceived pregnancy risk in unprotected intercourse, the greater the likelihood that she will use a more effective contraceptive alternative. Summaries of the seven studies follow.

Cvetkovich and Grote (1981) analyzed perceptions of pregnancy risk in unprotected intercourse among sexually active teenagers who used, most recently with first partner, either (a) no method, (b) condoms, or (c) pills. Measures of subjects' perceived probabilities of pregnancy were obtained by asking them to estimate "how many women out of
100 would become pregnant as a result of having one instance of unprotected intercourse" (p. 216). Results showed no difference in the estimates of pregnancy risk between no-method and condom and between no-method and pill. The Foreit and Foreit (1981) study included an analysis of perceptions of pregnancy risk in unprotected intercourse among a group of sexually active college women who were divided into two categories: those who usually used contraception with their most recent partner and those who did not. Subjects were asked to estimate the probability of pregnancy in five hypothetical situations involving a hypothetical 19-year-old woman and 20-year-old man. Results showed no difference in the estimates of pregnancy risk between contraceptors and non-contraceptors.

Arnett (1990) analyzed perceptions of pregnancy risk in unprotected intercourse among a group of female high school juniors and seniors who were divided between: (a) those who had had sex without contraception and (b) those who either had not had sex or had had sex only using contraception. Subjects' estimates of pregnancy risk were obtained by asking them to estimate the likelihood of pregnancy for "a girl about your age who [over a year's time] had sex about once a week, without any concern for using some kind of birth control." Possible responses were: (a) not at all
likely, (b) somewhat likely, (c) very likely, or (d) extremely likely. Results showed that the estimates of the subjects who had had sex without contraception were significantly lower than those of the other subjects.

The study by Gerrard, McCann, and Fortini (1983) found that, among college age women, ineffective contraceptors (those using no method or a less effective method) were significantly more likely than effective contraceptors to attribute their success at avoiding pregnancy to a low probability of contraception.

Oskamp and Mindick (1983) asked a number of new teenage contraception-clinic patients the extent of their agreement-disagreement with the statement, "I don't believe I can become pregnant easily," and followed up with them over a three-year period; a comparison between those who later had unwanted pregnancies (the pregnant group) and those who carried on their birth control program successfully (the birth planners) showed that the pregnant group had a significantly higher level of agreement with the statement than did the birth planners.

Kalmuss (1986) analyzed perceptions of pregnancy risk among sexually active Manhattan teenagers who were divided between those who used contraception at last intercourse and those who did not. Each "respondent's perceived probability
of pregnancy with unprotected intercourse" (p. 333) was measured with a 0-10 scale, with 10 indicating that pregnancy is very likely and 0 indicating that it is not at all likely. Results showed that nonusers perceived their probabilities of pregnancy to be significantly lower than did users.

Kantner & Zelnik (1973) found that, among the teenagers included in a survey who "strongly" held the belief that they could not get pregnant easily, 70 percent reported that they did not use contraception at last intercourse; in contrast, among those who strongly believed that they could become pregnant easily, 32 percent did not use contraception at last intercourse.

Disagreeableness of side effects. Studies reported that subjects' concern for the disagreeable side effects of contraceptive methods led to, or contributed to: (a) sexually active teenagers' failure to use contraception or failure to use it regularly (Abrams, 1985; Gerrard et al., 1983; Rogel, Zuehlke, Petersen, Tobin-Richards, & Shelton, 1980); and (b) a reduced likelihood of using the most effective contraceptive methods (Gerrard et al., 1983; Kantner & Zelnik, 1973; Silverman, Torres, and Forrest, 1987; Werner & Middlestadt, 1979; Zabin & Clark, 1981).
A study by Abrams (1985) of teenagers who had had an abortion included an analysis of the reasons they gave for not using contraception; a reason given by 37 percent of the group (the second most frequently cited reason) was a concern about the side effects of contraceptive methods. In a study by Gerrard et al. (1983), data collected but not analyzed statistically suggested that subjects who were "ineffective contraceptors" (i.e. either users of nonmedical methods or nonusers of contraception) possessed "more negative beliefs and fears" about the use of medical methods than did users of medical methods.

Kantner and Zelnik (1973) found that, among sexually active teenagers included in a national survey, the pill was used by 31 percent of those who believed that it was safe but by only seven percent of those who thought it was unsafe. In a study by Rogel, Zuehlke, Petersen, Tobin-Richards, and Shelton (1980), a group of sexually active teenage women who either never used or only sometimes used contraception were asked to select from 14 reasons those that explained why they did not use contraception; 61 percent selected as a reason "fear of safety or side effects."

In an analysis of the reasons women gave for choosing one method over another, Silverman, Torres, and Forrest (1987) found that the dominant reason given for selecting a method other than the pill or the IUD, the two most
effective medical methods, was fear of side effects. Werner and Middlestadt (1979) found that, among a group of sexually active women who were college students, those who used a method that was less effective than the pill were significantly more likely than were pill users to believe that the pill had not been proven fully safe and that its use increases the risk of blood clotting.

In a study of reasons for teenagers' delay in making first visits to family planning clinics, Zabin and Clark (1981) found that 27 percent of the patients gave as a contributing reason their fear of the side effects of birth control and that such fears appeared to be limited to medical methods.

Effectiveness of contraceptive methods. A search of the literature produced no studies that attempt a direct answer to the question as to whether a positive relationship exists between a teenager's knowledge of the effectiveness of contraceptive methods and the effectiveness of her contraceptive choice. However, indirect evidence of such a relationship was found in six studies that found a positive relationship between teenagers' exposure to sex education programs—in which, it is presumed, they were exposed to knowledge of the effectiveness of contraceptive methods—

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2 Zelnik and Kim (1982), using data from the 1979 National Survey of Young Women (Zelnik & Kantner, 1985), found that eight out of 10 teenagers who had sex education in school reported that they had received information about different types of contraception.
and the effectiveness of their contraceptive choices.

In a study of sex education programs, Eisen, Zellman, and McAlister, (1990) found that "programs of sexuality and contraceptive education as brief as 8-12 hours appear to help all participants increase their sexual and contraceptive knowledge [and] initiate and maintain relatively high levels of effective contraceptive use" (p. 269). Shipley (cited in Kirby, 1980) found that a four-week college course on sex roles, relationships, and contraception increased students' knowledge of contraception, and decreased by 57 percent the number of students using ineffective or no contraception. A study by Zelnik and Kim (1982) found that teenagers who had had sex education were more likely to have used contraception at first intercourse and more likely to have ever used a contraceptive method.

In some contrast, as cited in Hayes (1987), Kirby found that sex education programs increased teenagers' knowledge of contraception but, according to Hayes, the programs had "little impact on their behavior: whether they became sexually active and whether they use contraception."

However, in an article different from the one cited in Hayes (1987), Kirby (1980) made a distinction between "sexual behavior" and the use of contraception, and indicated that sex education programs increase teenagers' use of more effective contraceptive alternatives; he observed:
The studies [of sex education programs] fail to support sex education proponents who believe classes may reduce sexual behavior. They do indicate that units on contraception will increase the use of more effective contraceptives and decrease sexual activity with poor or no contraception (p. 561).

Zabin and her colleagues (Zabin et al., 1986) report that a three-year program providing sex education, counseling, and contraceptive services to the students of a high school and a junior high school in Baltimore produced the following among the students: a significant increase in knowledge of the efficacy of contraceptive methods as well as a significant increase among female students in the use at last intercourse of (a) the pill (i.e. the most effective medical method), (b) methods requiring advance preparation (i.e. methods more effective than the three least effective methods), and (c) some contraceptive method. The results of a study by Marsiglio & Mott (1986) suggest that teenagers who have previously taken a sex education course are more likely to use effective contraceptive methods (e.g. condom, diaphragm, IUD, pill) than are teenagers who have never taken a course. Zelnik and Kim (1982) found that black teenagers, but not white, who had had instruction about contraceptives were more likely ever to use a medical method.
How to obtain contraceptive methods. Two studies provide suggestive evidence that a positive relationship exists between a teenager's knowledge of how to obtain more effective contraceptive methods and the effectiveness of her contraceptive choice.

Abrams (1985) conducted a study of a group of teenagers who had had an abortion. The study included an analysis of one or more reasons each gave for not using contraception before her pregnancy. The fourth most frequently cited reason, given by 22 percent of the group, was "Didn't know where or how to get birth control" (p. 199).

Zabin and Clark (1981) conducted a study of more than 1,200 teenagers' first visits to a family planning clinic. The study included: (a) inquiring as to the reasons that contributed to each teenager's decision to make the visit, and (b) for each teenager who delayed the visit for some time after her sexual initiation, inquiring as to the reasons contributing to the delay. Of all the teenagers in the study, 22 percent indicated that their reasons for making the visit included "Just found out where to get birth control" (p. 213). Of the teenagers whose first visits occurred some time after their sexual initiations, 15 percent indicated that their reasons for delaying the visit included "Didn't know where to get birth control help" (p. 214).
Studies Related to Life Options Programs

The purpose of life options programs is to elevate teenagers' educational and occupational expectations. Related studies indicate that higher educational and/or occupational expectations are associated with the use of some form of contraception at first intercourse and, among sexually active teenagers, the more diligent use of contraception. No studies were found, however, that addressed the question of whether, among contraceptive-using teenagers, a teenager's level of educational and/or occupational expectations is likely to affect the effectiveness of the contraceptive method she uses.

A study by Herold and Sampson (1980) found that higher educational expectations were associated with the use of the pill at first intercourse. The study involved a survey of young women aged 13 to 20 who visited family planning clinics to initiate use of the pill. Two groups similar in

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Moore, Simms, and Betsey (1986) assert that a teenager's orientation toward her future education may be defined in two ways: (a) as an expectation, how much education she thinks she is likely to obtain, and (b) as an aspiration, how much education she would like to obtain, regardless of the likelihood of doing so. In two of the six studies referenced here, measurements of subjects' orientations toward future education were identified in such a way as to qualify them as aspirations (e.g. amount of education "desired") not expectations. However, these two studies are included on the notion that, absent an effort by researchers to distinguish expectations from aspirations in the minds of respondents, what respondents say they want may well be what they expect.
age and other demographic characteristics were selected from those interviewed; the members of one group had not yet had intercourse; the members of the other group were already sexually experienced. The two groups were found to differ in their educational expectations: The percentage of the sexually inexperienced group who planned to attend college was almost twice that of the sexually experienced group (42 percent to 22 percent).

In a similar study, Hogan, Antone, and Kitagawa (1985) found that higher-level career goals were associated with the use of contraception at first intercourse. In the study, measures were taken of career-goal levels among a group of sexually active teenagers. The level of each subject's career goals was categorized as "high," "above average," "below average," or "low." The percentages in each category who had used contraception at first intercourse were: high, 36 percent; above average, 25 percent; below average, 30 percent; and low, 19 percent. The difference in contraceptive use between subjects in the two higher categories and those in the two lower categories, however, was significant only at the .10 level.

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4 A "goal" is understood here to mean a level of attainment whose realization is perceived as likely enough to cause substantial action to be taken in its pursuit. Thus, because its realization is a reasonably likely prospect, a goal is seen to qualify as an expectation.
Shah, Zelnik, and Kantner (1975) found that, among a group of teenagers who were categorized by level of educational aspiration, the higher the level of aspiration, the greater the percentage who either always used contraception or always used contraception during their fertile periods. The subjects in the study, sexually active, never married teenagers, were divided into four categories according to their educational aspirations: less than high school graduation, high school graduation, some college, and college graduation. Those in each aspiration category were then divided into the following three groups: (a) those who always used contraception; (b) those who knew that the time of greatest risk occurs in the middle of the menstrual cycle and always used contraception during their fertile period; and (c) others. The percentage of cases falling into each of the three groups was calculated for each aspiration category. It was found that the percentage of cases who always used contraception and the percentage of cases who were protected during their periods each increased with the level of educational aspiration. The percentage of cases who either always used contraception or were always protected rose from 18 percent for the less-than-high-school level of aspiration to 57 percent for the college-graduation level of aspiration.

Jones and Philliber (1983) found that, among a group of sexually active, never-pregnant teenagers, the percentage of
those who gave future aspirations as a reason for not having 
had a baby was smaller among those who never used 
contraception than among those who used contraception at 
least sporadically. The subjects of the study, teenagers 
who had been sexually active for at least a year and had 
ever been pregnant, were divided into three categories: (a) 
those who never used contraception, (b) those who used 
contraception sporadically, and (c) those who used 
contraception consistently. Each subject was asked why she 
thought she had not yet had a baby. Those whose reason was 
a need to better oneself first, such as needing to finish 
school, get a good job, or get more money, included 44 
percent of the never-users, 55 percent of the sporadic 
users, and 58 percent of the consistent users. The 
differences, however, were not found to be statistically 
significant.

Two studies by Gispert and Falk (1976) and Goldsmith, 
Gabrielson, Gabrielson, Mathews, and & Potts (1972) compared 
the educational goals of pregnant teenagers with those of 
teensagers actively using contraception to avoid pregnancy. 
In each study, the pregnant teenagers were found to have 
lower educational goals than did those using contraception.
CHAPTER III

THEORY

The models to be tested are founded on two bases: the Dryfoos strategy and a theory that explains the making of choices. The theory is referred to as value-expectancy theory. Maiman and Becker (1974) identify value-expectancy theory as a by-product of an analysis conducted by Lewin and three colleagues (Lewin, Dembo, Festinger, & Sears, 1944); the subject of the analysis was goal-setting, a special-case application of Lewin's field theory (1935, 1951).

The theory that emerged from the analysis explains the selection by an individual of a goal-action--a course of action directed at accomplishing a particular goal--from among several alternative goal-actions. Two principles are stated in the analysis (Lewin et al., 1944) that together make up value-expectancy theory; one principle corresponds to the value side of the theory, the other to the expectancy side.

The Value Principle

The principle corresponding to the value side is based on three assumptions which comprise features of the goal setting process: (a) Each action has two possible outcomes, success or failure; (b) a success-outcome is attractive and
a failure-outcome is disagreeable; and (c) a goal setter assigns a value to each of the two possible outcomes of each action. Thus, the success-value of a goal-action is a measure of its attractiveness; the failure-value of a goal-action is a measure of its disagreeableness. The principle, then, specifies in general terms the process by which an individual selects a goal-action from among several alternative goal-actions: Each goal-action's disagreeableness (its failure-value) is subtracted from its attractiveness (its success-value) and the goal-action with the greatest result is the one selected.

The Expectancy Principle

The principle that corresponds to the expectancy side of the theory is prompted by the fact that, in goal-setting, the outcome of an action is not a certainty. Thus, each possible outcome of a contemplated action, its success and its failure, presents the goal setter with the problem of evaluating an event whose occurrence is only a probability. The principle specifies how the goal setter deals with the problem: by multiplying the value assigned to each possible outcome by the estimated probability that the outcome will occur.

This second principle modifies the definitions of attractiveness and disagreeableness used in the first principle: Instead of a goal-action's attractiveness being measured as its success-value, its attractiveness is
Value-Expectancy Theory as Applied to the Choice of a Goal-Action

Each goal-action's success-value

Each goal-action's probability of success

Each goal-action's failure-value

Each goal-action's probability of failure

Each goal-action's attractiveness

Each goal-action's net attractiveness: its attractiveness minus its disagreeableness

The goal-action likely to be chosen: the goal-action whose net attractiveness is the maximum

Each goal-action's disagreeableness

measured as the product of its success-value and the probability that the action will be successful; instead of a goal-action's disagreeableness being measured as its failure-value, its disagreeableness is measured as the product of its failure-value and the probability that the action will be unsuccessful.
Value-Expectancy Theory

These two principles in combination, then, produce value-expectancy theory as it is applied to the choice of a goal-action. The theory may be stated as follows.

In the choice of a goal-action, the goal-action likely to be chosen is the one whose net attractiveness is the maximum: the goal-action whose attractiveness (its success-value multiplied by the probability of its success) minus its disagreeableness (its failure-value multiplied by the probability of its failure) yields the highest value.

The theory is diagrammed in Figure 1.
CHAPTER IV
MODEL DEVELOPMENT

The two models that were tested attempt to explain (a) the likelihood of a sexually active teenager's using contraception and (b) whether a contraceptive-using teenager is likely to use a medical method or a nonmedical method.

Development of the models to be tested involved the following three steps. First, value-expectancy theory was adapted to explain the contraceptive alternative likely to be chosen by an individual, thus creating a "contraceptive-choice model." Second, the contraceptive-choice model was modified to explain the effectiveness of the contraceptive alternative likely to be chosen by a teenager, with elements of a conceptual framework implied by the Dryfoos strategy added as the model's exogenous variables; the result is referred to as the "effectiveness-of-contraception model." Third, each of the models to be tested was developed from the effectiveness-of-contraception model.

The Contraceptive Choice Model

The adaptation of value-expectancy theory to explain the choice of a contraceptive alternative may be summarized in terms of (a) the dependent variable specified for the adaptation, (b) the modification of value-expectancy theory
to explain the dependent variable, and (c) definitions of terms involved in the modification.\footnote{The adaptation of value-expectancy theory to produce the contraceptive-choice model was closely patterned after the way in which the theory was adapted to produce the Health Belief Model (HBM), a model which has been successfully used to investigate health-related phenomena (see Appendix B for details on the adaptation of value-expectancy theory that produced the HBM).}

The dependent variable to be explained by the adaptation is "the contraceptive alternative likely to be chosen," a nominal variable whose values consist of the contraceptive alternatives from which a choice is made.

The modification of value-expectancy theory to explain the dependent variable involved the following substitutions of concepts: "contraceptive alternative" for "goal-action," "perceived benefit" for "attractiveness," "perceived cost" for "disagreeableness," and "net utility" for "net attractiveness." The modification produced the following version of the theory.

In the choice of a contraceptive alternative, the alternative likely to be chosen is the one with the highest net utility (perceived benefit minus perceived cost).

The modification of the theory also involved the following definitions of terms:

a. The perceived benefit of a contraceptive alternative is the negation of the perceived
threat posed by the possibility of pregnancy, multiplied by the perceived effectiveness of the contraceptive alternative in reducing the perceived threat of pregnancy.

b. The perceived threat posed by the possibility of pregnancy is the perceived disagreeableness of the consequences of pregnancy (a negative value), multiplied by the perceived probability of pregnancy with unprotected intercourse.

c. The perceived effectiveness of a contraceptive alternative is the extent to which the alternative is perceived as able to reduce the threat posed by pregnancy, by reducing the probability of pregnancy below that associated with unprotected intercourse.

d. The perceived cost of a contraceptive alternative is the sum of whatever particular costs are perceived as associated with using the alternative.

These definitions specify explanatory variables in the contraceptive-choice model that are more remote from the dependent variable than the variables "each alternative's perceived benefit" and "each alternative's perceived cost." The contraceptive-choice model is diagrammed in Figure 2.
Figure 2

The Contraceptive-Choice Model: An Adaptation of Value-Expectancy Theory

Perceived disagreeableness of consequences of pregnancy → Perceived threat of pregnancy → Each alternative's perceived benefit → Each alternative's net utility: its perceived benefit minus its perceived cost → Each alternative's perceived cost → Contraceptive alternative likely to be chosen: the alternative whose net utility is the maximum

Note: The use of no contraception is a contraceptive alternative whose net utility is zero.

The Effectiveness-of-Contraception Model

Modification of the contraceptive-choice model to produce the effectiveness-of-contraception model involved, in part, the same steps that were used to develop the contraceptive-choice model: specifying the new model's dependent variable, modifying value-expectancy theory to
explain the dependent variable, and defining terms that were used in the modified theory. The new dependent variable was "the effectiveness of the contraceptive alternative likely to be chosen," an ordinal variable whose values consist of the efficacies of the contraceptive alternatives from which a choice is made.

The modification of value-expectancy theory to explain the new dependent variable is more precisely described as the modification of the contraceptive-choice version of value-expectancy theory. In the interest of brevity, however, the contraceptive-choice version of value-expectancy theory will be referred to as the contraceptive-choice theory, both here and in subsequent discussion. The modification of contraceptive-choice theory, then, to explain the new dependent variable produced the following version of the theory.

In the choice of a contraceptive alternative, the effectiveness of the alternative likely to be chosen is the effectiveness of the alternative with the highest net utility.

The terms that were defined for the contraceptive-choice model also apply to the effectiveness-of-contraception model, which means that the contraceptive-choice model's explanatory variables are incorporated unchanged in the effectiveness-of-contraception model.
Specification of the effectiveness-of-contraception model, however, involved more than specifying a new dependent variable, modifying contraceptive-choice theory, and incorporating the contraceptive-choice model's explanatory variables: It also involved adding, as exogenous variables, teenager characteristics addressed by the three types of programs that make up the Dryfoos strategy. The addition of the characteristics as exogenous variables gives the model the capability of explaining the effectiveness of the contraceptive alternative a teenager is likely to choose in terms relating to the Dryfoos strategy.

The specification of teenager characteristics as exogenous variables in the model was a two-part undertaking: The first part involved specifying a conceptual framework implied by the Dryfoos strategy in which teenager characteristics serve as explanatory variables; the second part involved specifying relationships that may plausibly be hypothesized to link those teenager characteristics to particular endogenous variables in the model.

Teenager Characteristics Addressed by the Dryfoos Strategy

The three types of programs that make up the Dryfoos strategy include life options programs, education programs, and access-to-contraception programs. Interest in the strategy is limited here to its use as a means of increasing the likelihood that teenagers will choose more effective contraceptive alternatives. Thus, for the purpose of the
proposed study, the strategy may be said to address four concerns, each of which comprises a set of teenager characteristics: its ultimate concern, the likelihood of a teenager's choosing a more effective contraceptive alternative, and three intermediate concerns, teenager characteristics addressed by the three types of programs that make up the strategy. Life options programs address characteristics which constitute a teenager's educational and occupational expectations; education programs address characteristics which constitute types of knowledge needed to choose a more effective contraceptive alternative which a teenager may possess; and access-to-contraception programs address characteristics which constitute a teenager's access to more effective contraception.

By implication, enhancement of each of the intermediate concerns is intended to enhance the strategy's ultimate concern; thus, it is implicitly hypothesized that a relationship exists between each of the strategy's intermediate concerns and its ultimate concern. Those relationships are specified in the following proposition:

The likelihood of a teenager's choosing a more effective contraceptive alternative is affected by (a) her educational and occupational expectations, (b) the extent to which she possesses the knowledge needed to choose a more effective contraceptive alternative, and (c) her access to more effective contraception.
The four sets of teenager characteristics specified in the proposition and the three relationships hypothesized to exist among them constitute a conceptual framework for explaining the likelihood of a teenager's choosing a more effective contraceptive alternative. A diagram of the conceptual framework is shown in Figure 3.

Figure 3

A Conceptual Framework Implied by the Dryfoos Strategy

In subsequent discussion involving the conceptual framework's explanatory variables, "educational and occupational expectations" will be referred to as the expectations variable, "knowledge needed to choose a more effective contraceptive alternative" will be referred to as the knowledge variable, and "access to more effective contraception" will be referred to as the access variable.
effective contraceptive alternative" will be referred to as the knowledge variable, and "access to more effective contraception" will be referred to as the access variable.

**Relationships Between Framework Variables and Other Variables**

The effectiveness-of-contraception model is diagrammed in Figure 4. Reference to Figure 4 may make the details of the discussion in the next several paragraphs easier to follow.

After the teenager characteristics that constitute the explanatory variables in the Dryfoos strategy's conceptual framework had been identified, it was determined that relationships between those variables and the other explanatory variables in the model could plausibly be hypothesized; thus, the teenager characteristics that make up the explanatory variables were found able to serve as the model's exogenous variables.

The expectations variable is hypothesized to affect "perceived disagreeableness of consequences of pregnancy": The more elevated a teenager's educational and occupational expectations, the more disagreeable are the perceived consequences of pregnancy. The basis for this hypothesis is Dryfoos' (1984) argument for instituting life options programs: Elevated educational and occupational expectations are believed to cause teenagers to see early pregnancy as a threat to the realization of their plans for
Figure 4

The Effectiveness-of-Contraception Model

<table>
<thead>
<tr>
<th>Variables from Framework</th>
<th>Variables from Contraceptive Choice Model</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational &amp; occupational expectations</td>
<td>Perceived disagreeableness of consequences of pregnancy</td>
<td>Perceived threat of pregnancy</td>
</tr>
<tr>
<td>Knowledge of probability of pregnancy with unprotected intercourse</td>
<td>Perceived probability of pregnancy with unprotected intercourse</td>
<td>Perceived benefit of each alternative</td>
</tr>
<tr>
<td>Knowledge of effectiveness of methods</td>
<td>Perceived effectiveness of each alternative</td>
<td>Net utility of each alternative: its perceived benefit minus its perceived cost</td>
</tr>
<tr>
<td>Knowledge needed to choose a more effective contraceptive alternative</td>
<td>Perceived probability of pregnancy with unprotected intercourse</td>
<td>Perceived cost of each alternative</td>
</tr>
<tr>
<td>Knowledge of how to obtain more effective methods</td>
<td>Perceived disagreeableness of side effects of more effective methods</td>
<td>Perceived disagreeableness of side effects of more effective methods</td>
</tr>
<tr>
<td>Access to more effective contraception</td>
<td>Effective-ness of alternative likely to be chosen: effectiveness of alternative whose net utility is the maximum</td>
<td></td>
</tr>
</tbody>
</table>
the future; such expectations are thus believed to motivate teenagers to take steps to avoid pregnancy.

Four relationships are hypothesized between the knowledge variable and three of the variables in the contraceptive-choice model. First, "knowledge of probability of pregnancy with unprotected intercourse" is hypothesized to affect "perceived probability of pregnancy with unprotected intercourse." Second, "knowledge of effectiveness of methods" is hypothesized to affect "perceived effectiveness of each alternative." Third, "knowledge of how to obtain more effective methods" is hypothesized to affect "perceived cost of each alternative" in the following way: The lack of such knowledge constitutes a barrier to the use of the methods; overcoming that barrier (by acquiring the knowledge) is seen to involve a cost; the provision of such knowledge, then, reduces or eliminates the cost otherwise involved in overcoming the lack-of-knowledge barrier. Fourth, "knowledge of disagreeableness of side effects of more effective methods" is hypothesized to affect "perceived disagreeableness of the side effects of more effective methods" and thus to affect "perceived cost of each alternative."

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2 Hypothesizing these relationships involved specifying additional variables that intervene between the knowledge variable and variables in the model; the intervening variables appear in Figure 4 as those not shown in boxes.
Finally, the access variable is hypothesized to affect "perceived cost of each alternative" by affecting the cost involved in gaining access to more effective contraception. The greater the access to more effective contraception, the lower the cost of using that contraception.

The effectiveness-of-contraception model includes all the variables shown in Figure 4, including the five variables specified as intervening between the knowledge variable and the other explanatory variables in the model.

The Likelihood-of-Use Model

One of the models to be tested attempts to explain the likelihood that a sexually active teenager will choose to use any one of several contraceptive methods instead of choosing to use no contraception. The dependent variable of the model, then, is "likelihood of using contraception," a ratio-level variable. The model is to be referred to in subsequent discussion as the likelihood-of-use model.

The likelihood-of-use model was developed from the effectiveness-of-contraception model by means of the following four steps: First, contraceptive-choice theory was modified to explain the likelihood-of-use model's dependent variable. Second, six explanatory variables in the effectiveness-of-contraception model were selected for representation as exogenous variables in the likelihood-of-use model, and how each was to be represented was specified. Third, the chain of relationships that link each of the
exogenous variables to the dependent variable was specified by duplicating the corresponding relationships in the effectiveness-of-contraception model. Fourth, the chain of relationships that link each exogenous variable to the model's dependent variable was analyzed to hypothesize the net effect of the exogenous variable on the dependent variable. The resultant set of hypotheses constitutes the likelihood-of-use model.

After the hypotheses that define the likelihood-of-use model were specified, a set of control variables was added to the model for purposes of statistical analysis.

**Modification of Contraceptive-Choice Theory**

The modification of contraceptive-choice theory to explain the likelihood of a teenager's using contraception occurred in two parts. The first part consisted of a straightforward application of contraceptive-choice theory to explain the choice of the contraceptive alternative whose likelihood of use determines the likelihood of a teenager's using a contraceptive method. The application produced the following version of the theory.

In a teenager's choice of a contraceptive alternative, the likelihood of her using contraception is that associated with the alternative whose net utility is the maximum.

The usefulness of this version of the theory is limited; it merely says that the likelihood sought is that associated
with the alternative whose net utility is the maximum; it does not specify what that association is—what likelihood-of-using-contraception goes with what maximum net utility. Thus, the second part of the theory-modification step consisted of postulating the following association between the likelihood of using contraception and a maximum net utility:

The likelihood of a teenager's using any one of a number of contraceptive methods varies with the extent to which the maximum net utility she assigns a contraceptive alternative exceeds zero.\(^3\)

Putting this postulate together with the version of the theory with limited usefulness produced the version of value-expectancy theory that was specified for the model:

In a teenager's choice of a contraceptive alternative, the likelihood of her using contraception is determined by the extent to which the maximum net utility she assigns to an alternative exceeds zero.

**Specification of Exogenous Variables**

Six explanatory variables in the effectiveness-of-contraception model were selected for representation as exogenous variables in the likelihood-of-use model; the variables included: "educational and occupational

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\(^3\) This postulate rests on the notion that, between two contraceptive methods, each of which is assigned a maximum net utility by a teenager (which means that each maximum net utility exceeds zero), the one with the higher net utility is more likely to be used.
expectations," "perceived probability of pregnancy with unprotected intercourse," "knowledge of effectiveness of methods," "perceived disagreeableness of side effects of more effective methods," "knowledge of how to obtain more effective methods," and "access to more effective contraception."

The variable "educational and occupational expectations" was represented by two variables: "educational expectations" and "thoughtfulness for the future." The former was specified on the basis that it is one of the two types of teenager characteristics that make up "educational and occupational expectations." The latter was specified on the basis that it may be seen as a necessary concomitant to any expectation for the future.

The variable "perceived probability of pregnancy with unprotected intercourse" was represented by "inclination to take chances." This substitution was based on (a) the tendency of teenagers to take chances because of their tendency to underestimate their risk of coming to harm (Arnett, 1990; Cvetkovich & Grote, 1981; Elkind, 1967), and (b) the extension of that chance-taking tendency to the to the risk of becoming pregnant by unprotected intercourse (Arnett, 1990; Chilman, 1979; Cobliner, 1974; Cvetkovich & Grote, 1981).

The variable "knowledge of the effectiveness of methods" was represented by "number of methods aware of."
Not to be aware of a method is not to know it has any effectiveness; to be aware of a method is to know at least that it is reputed to be effective to some degree in preventing pregnancy. In this sense, then, the greater the number of recognized methods a teenager is aware of, the better her knowledge of the efficacies of the methods.4

The three remaining variables were each represented as they appeared in the effectiveness-of-contraception model. The exogenous variables in the likelihood-of-use model, then, comprise the following: "educational expectations," "thoughtfulness for the future," "inclination to take chances," "number of methods aware of," "perceived disagreeableness of side effects of more effective methods," "knowledge of how to obtain more effective methods," and "access to more effective contraception."

**Specification of Relationships**

In a model in which one or more variables intervene between an exogenous variable and the model's dependent variable, the series of relationships between the exogenous variable and the dependent variable may be referred to as a

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4 The variable "knowledge of the effectiveness of methods" is seen to have two dimensions: (a) "number of methods aware of" and (b) "knowledge of the effectiveness of the methods of which aware." The latter dimension is seen to affect the likelihood of using contraception only by the extent to which the methods' perceived efficacies exceed zero. Such information was unavailable in the data, so the variable was represented in the model only by the former dimension.
"chain of relationships." The chain of relationships between each exogenous variable in the likelihood-of-use model and the model's dependent variable was specified as identical to the chain of relationships that linked the exogenous variable's predecessor in the effectiveness-of-contraception model to that model's dependent variable. The chains of relationships that were specified appear in Figure 5.

**Specification of Hypotheses**

The chains of relationships shown in Figure 5 were analyzed to specify the hypotheses that make up the likelihood-of-use model. The following discussion of the analyses that produced the hypotheses is organized in terms of the hypotheses' independent variables. In the discussion, the analysis that produced each hypothesis is referred to as the "rationale" for the hypothesis. Reference to Figure 5 may be helpful in following the details of each analysis. A summary of studies related to each hypothesis is given following the analysis that produced the hypothesis.

**Hypothesis for educational expectations.**

The more elevated a teenager's educational expectations, the more likely she is to use some method of contraception.

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5 This analytical process is referred to by Bohrnstedt and Knoke (1988) as "deduction" (p. 5).
Figure 5
Chains of Relationships Analyzed To Specify Hypotheses
Constituting the Likelihood-of-Use Model

<table>
<thead>
<tr>
<th>Exogenous Variables</th>
<th>Intervening Variables</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational expectations</td>
<td>Perceived disagreeableness of consequences of pregnancy</td>
<td>Likelihood of using contraception</td>
</tr>
<tr>
<td>Thoughtfulness for the future</td>
<td>Perceived threat of pregnancy</td>
<td></td>
</tr>
<tr>
<td>Inclination to take chances</td>
<td>Perceived benefit of each alternative</td>
<td></td>
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<tr>
<td>Number of methods aware of</td>
<td>Perceived effectiveness of each alternative</td>
<td></td>
</tr>
<tr>
<td>Perceived disagreeableness of side effects of more effective methods</td>
<td>Net utility of each alternative: its perceived benefit minus its perceived cost</td>
<td>Extent to which maximum net utility exceeds zero</td>
</tr>
<tr>
<td>Knowledge of how to obtain more effective methods</td>
<td>Perceived cost of each alternative.</td>
<td></td>
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<tr>
<td>Access to more effective contraception</td>
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</table>
The rationale for this hypothesis is that the more elevated a teenager's educational expectations, then (a) (because she is more likely to see early pregnancy as jeopardizing those expectations) the more disagreeable she perceives the consequences of pregnancy to be, (b) the greater the threat she perceives pregnancy to pose, (c) the greater the benefit she attaches to each contraceptive method, (d) the greater the maximum net utility she assigns to each contraceptive method, and (d) the more likely she is to use some method of contraception.

A study by Hogan et al. (1985) found that, among teenagers, higher career expectations, measured in part in terms of educational expectations, were associated with the use of contraception at first intercourse. Shah et al., (1975) found that, among sexually active teenagers, the higher the level of educational aspiration, the greater the percentage who either always used contraception or always used contraception during their fertile periods. Two studies by Gispert and Falk (1976) and by Goldsmith et al. (1972) compared the educational goals of pregnant teenagers with those of teenagers actively using contraception to avoid pregnancy and found that the pregnant teenagers had lower aspirations than did those using contraception. Devaney and Hubley (cited in Hayes, 1987) found that teenagers who have clear educational goals and are doing well in school appear more likely to use contraception.
Hypothesis for thoughtfulness for the future.
The greater a teenager's thoughtfulness for the future, the more likely she is to use some method of contraception.

The rationale for this hypothesis is that the more thought a teenager gives to her future, then (a) (because she is more likely to see early pregnancy as jeopardizing whatever plans she has) the more disagreeable she perceives the consequences of pregnancy to be, (b) the greater the threat she perceives pregnancy to pose, (c) the greater the benefit she attaches to each contraceptive method, (d) the greater the maximum net utility she assigns to each contraceptive method, and (d) the more likely she is to use some method of contraception.

Cobliner, Schulman, and Smith (1975) found that one of the characteristics of women making genuine but ineffective efforts to practice birth control was a low ability to tolerate present discomfort for future benefit. In a study of white, married women of lower socio-economic status who were users of contraception, Kar (1971) found that those who had used contraception before their first pregnancy scored significantly higher on a measure of future orientation than did those whose use of contraception was initiated after their first pregnancy. In a study by Clifford (1971), future orientation was one of the dimensions of modern-
tradition values found to be associated with contraceptive effectiveness among a sample of white, married women. Keller, Sims, Henry, and Crawford (1970) found that among a group of black, lower-income, married couples, contraception users were significantly more likely than nonusers to score high on a measure of tendency to plan ahead.

**Hypothesis for inclination to take chances.**

The more inclined a teenager is to take chances, the less likely she is to use some method of contraception.

The rationale for this hypothesis is that the more inclined a teenager is to take chances, then (a) the less threat she perceives pregnancy to pose, (b) the less benefit she attaches to each contraceptive method, (c) the lower the maximum net utility she assigns to each contraceptive method, and (d) the less likely she is to use some method of contraception.

In a study of teenagers who had terminated unwanted pregnancy, Cobliner (1974) found that 43 percent gave reasons for failing to avoid pregnancy that qualified them as "risk takers." When asked why they did not use contraception, they answered, "I did not think I would get pregnant" or "I took a chance" (p. 23). Based on other researchers' findings that sensation seeking is related to certain forms of risk taking, Arnett (1990) conducted a study of the relationship between sensation seeking among teenagers and their engaging in unprotected intercourse; the
study found significant relationships between sex without contraception and scores on a sensation seeking scale.

**Hypothesis for number of methods aware of.**

The greater the number of contraceptive methods a teenager is aware of, the more likely she is to use some method of contraception.

The rationale for this hypothesis is that the greater the number of methods a teenager is aware of, then (a) (because she is able to consider more methods) a method with a higher perceived effectiveness is likely to be included among the methods she considers, (b) a method with a higher perceived benefit is likely to be included among the methods she considers, (c) a method with a higher perceived net utility is likely to be included among the methods she considers, and (d) the more likely she is to use some method of contraception.

A search of the literature revealed no study that tested directly the hypothesis that a positive relationship exists between any measure of a teenager's knowledge of the efficacies of contraceptive methods and the likelihood of her using some method of contraception. However, studies were found that offer indirect support for the hypothesized relationship. That support consists of: (a) a finding by Zelnik and Kim (1982) that eight out of ten teenagers who had sex education in school reported that they had received information about different types of contraceptive methods;
and (b) findings by Eisen et al. (1990), Kirby (1980), and Zelnik and Kim (1982) that sex education courses tend to increase students' use of contraception.

**Hypothesis for disagreeableness of side effects.**

The more disagreeable a teenager perceives the side effects of the more effective contraceptive methods to be, the less likely she is to use some method of contraception.

The rationale for this hypothesis is that the more disagreeable a teenager perceives the side effects of the more effective methods to be, then (a) the greater the cost she assigns to using the more effective methods, (b) the lower the net utility she assigns to the more effective methods, (c) the more likely she is to assign a lower maximum net utility to a contraceptive method, and (d) the less likely she is to use some method of contraception.

A study by Abrams (1985) of teenagers who had had an abortion included an analysis of the reasons they gave for not using contraception; the second most frequently cited reason, given by 37 percent of the group, was a concern about the side effects of contraceptive methods. In a study by Rogel, Zuehlke, Petersen, Tobin-Richards, and Shelton (1980), a group of sexually active teenage women who either never used or only sometimes used contraception were asked to select from 14 reasons those that explained why they did not use contraception; the second most frequently selected
reason, chosen by 61 percent of the group, was "fear of safety or side effects."

**Hypothesis for knowledge of how to obtain methods.**
The better a teenager's knowledge of how to obtain the more effective contraceptive methods, the more likely she is to use some method of contraception.

The rationale for this hypothesis is that the better a teenager's knowledge of how to obtain the more effective contraceptive methods, then (a) the lower the cost she perceives as involved in acquiring the knowledge necessary to obtain the more effective methods, (b) the lower the cost she assigns to using the more effective methods, (c) the greater the net utility she assigns to the more effective methods, (d) the more likely she is to assign a higher maximum net utility to a contraceptive method, and (e) the more likely she is to use some method of contraception.

In the study by Abrams (1985) of teenagers who had had an abortion, 22 percent said that not knowing where or how to get birth control was a reason for their not using contraception. Studies by Shah et al. (1975) and by Zabin and Clark (1981) indicate that some teenagers fail to use medical methods because of not knowing where to obtain them.

**Hypothesis for access to more effective contraception.**
The greater a teenager's access to the more effective contraceptive methods, the more likely she is to use some method of contraception.
The rationale for this hypothesis is that the greater a teenager's access to the more effective methods, then (a) the lower the cost she perceives to be involved in gaining access to the more effective methods, (b) the lower the cost she assigns to using the more effective methods, (c) the greater the net utility she assigns to the more effective methods, (d) the more likely she is to assign a higher maximum net utility to a contraceptive method, and (e) the more likely she is to use some method of contraception.

Although a search of the literature revealed no study that tested this hypothesis directly, indirect support is available in an evaluation by Zabin et al. (1986) of a family planning program whose services were made available cost-free to the students in a high school and a junior high school in Baltimore. The services were dispensed by a clinic located across the street from one school and a few blocks away from the other school. Over a three-year demonstration period, the use of no contraception at last intercourse was reduced to "extremely low levels" among students exposed to the program.

The hypotheses that constitute the likelihood-of-use model are summarized in Table 1.

Control Variables

Findings of past research indicate that, in addition to the independent variables included in the likelihood-of-use
Table 1

Hypotheses Constituting the Likelihood-of-Use Model

1. The more elevated a teenager's educational expectations, the more likely she is to use some method of contraception.

2. The greater a teenager's thoughtfulness for the future, the more likely she is to use some method of contraception.

3. The more inclined a teenager is to take chances, the less likely she is to use some method of contraception.

4. The greater the number of contraceptive methods a teenager is aware of, the more likely she is to use some method of contraception.

5. The more disagreeable a teenager perceives the side effects of the more effective methods to be, the less likely she is to use some method of contraception.

6. The better a teenager's knowledge of how to obtain the more effective contraceptive methods, the more likely she is to use some method of contraception.

7. The greater a teenager's access to the more effective methods, the more likely she is to use some method of contraception.

Following are summaries of studies suggesting the existence of a relationship between each of the control variables and the dependent variable in the likelihood-of-use model.
**Age.** Studies by Zelnik and Shah (1983) and by Cvetkovich and Grote (1983) found that the older the teenager at first intercourse, the more likely she is to have used contraception at first intercourse. A study by Zelnik and Kantner (1977) found that, among sexually active, never-married teenagers, an increase in age was accompanied by a decrease in the percentage never using contraception and by an increase in the percentage reporting the use of contraception at last intercourse.

**Family income.** A study by Kantner and Zelnik (1973) found that, in a 1971 survey, teenagers with higher family incomes were more likely to have reported using contraception at last intercourse and more likely to have reported using contraception consistently.

**Education of female raiser.** Shah et al. (1975) found that the percentage of teenagers who always used contraception increased with the number of years of mother's education. Higher parental education has been found to be associated with a higher likelihood of contraceptive use at first intercourse (Zelnik et al., 1981), a higher likelihood of contraceptive use at last intercourse, and a lower likelihood of never using contraception (Kantner & Zelnik, 1973; Zelnik et al., 1981).

Herold and Samson (1980) studied a group of women aged 13 to 20 who visited a family planning clinic to obtain a prescription for the pill, dividing the group into those who
Figure 6

Likelihood-of-Use Model With Control Variables Added

- Educational expectations
- Thoughtfulness for the future
- Inclination to take chances
- Number of methods aware of
- Perceived disagreeableness of side effects of more effective methods
- Knowledge of how to obtain more effective methods
- Access to more effective contraception

Likelihood of using contraception

Control variables:
- Age
- Family income
- Education of female raiser
- Race of household
were sexually experienced and those who were sexually inexperienced. The mothers of 22 percent of the sexually inexperienced had attended college while the mothers of 12 percent of the sexually experienced had attended college.

**Race of household.** Zelnik and Kantner (1980) found that among never-married, never-pregnant teenagers who were respondents in a 1979 national survey, teenagers from white households were reported as more likely to use contraception than were teenagers from black households, as indicated by white-to-black percentages on four measures: (a) always used, 35.0 to 31.2; (b) used at first intercourse but not always, 16.1 to 9.7; (c) not at first intercourse but at sometime, 24.9 to 23.3; (d) never, 24.0 to 35.9. The statistical significance of differences was not reported.

The relationships which make up the likelihood-of-use model are diagrammed in Figure 6, along with those produced by the addition of the control variables.

**Medical-or-Nonmedical Model**

Each contraceptive method may be classified as either a medical method or a nonmedical method. The least effective medical method is more effective than the most effective nonmedical method (U.S. Food and Drug Administration, 1978). These observations led (a) to limiting the second of the two models to be tested to contraceptive-using teenagers, and (b) to specifying the model's dependent variable as "whether a medical method is likely to be used," a dichotomous
variable. The model is to be referred to as the medical-or-nonmedical model.

The medical-or-nonmedical model was developed from the effectiveness-of-contraception model by the same four-step process that was used to develop the likelihood-of-use model. After the medical-or-nonmedical model was specified, a set of control variables was added to the model for purposes of statistical analysis.

**Modification of Contraceptive-Choice Theory**

The modification of contraceptive-choice theory to explain whether a contraceptive-using teenager is likely to use a medical method consisted of a straightforward application of the theory. The following is the result.

In a contraceptive-using teenager's choice of a contraceptive method, whether she is likely to choose a medical method is determined by whether the method to which she assigns the highest net utility is a medical method.

**Specification of Exogenous Variables**

Four of the explanatory variables in the

---

Two of the six explanatory variables in the effectiveness-of-contraception model that were selected for developing the likelihood-of-use model were omitted from the development of the medical-or-nonmedical model. The two variables that were omitted were "educational and occupational expectations" and "perceived probability of pregnancy with unprotected intercourse." An analysis of the relationship between each of these variables and the medical-or-nonmedical model's dependent variable indicated that neither, by itself, had an effect on the dependent variable.
effectiveness-of-contraception model were selected for representation as exogenous variables in the medical-or-nonmedical model; the variables included: "knowledge of effectiveness of methods," "perceived disagreeableness of side effects of more effective methods," "knowledge of how to obtain more effective methods," and "access to more effective contraception."

The variable "knowledge of the effectiveness of methods" was represented by "number of medical methods in methods perceived as three most effective." The basis for the representation was the following: (a) The medical methods, which include the diaphragm, the IUD, and the pill, are the three most effective nonsurgical contraceptive methods (U.S. Food and Drug Administration, 1978); (b) to the extent to which a teenager fails to perceive that the three most effective contraceptive methods are the three medical methods, her knowledge of the effectiveness of methods is deficient, and that deficiency affects the likelihood of her choosing to use a medical method. Each of the three other variables that were selected for representation was modified by changing the term "more effective methods" or "more effective contraception" to the term "medical methods." "Perceived disagreeableness of side effects of more effective methods" was modified to "perceived disagreeableness of side effects of medical methods"; "knowledge of how to obtain more effective
methods" was modified to "knowledge of how to obtain medical methods"; and "access to more effective contraception" was modified to "access to medical methods."

In summary, the variables specified as the exogenous variables in the medical-or-nonmedical model include: "number of medical methods in methods perceived as three most effective," "perceived disagreeableness of side effects of medical methods," "knowledge of how to obtain medical methods," and "access to medical methods."

**Specification of Relationships**

The chain of relationships between each exogenous variable in the medical-or-nonmedical model and the model's dependent variable was specified as identical to the chain of relationships that linked the exogenous variable's predecessor in the effectiveness-of-contraception model to that model's dependent variable. The chains of relationships that were specified appear in Figure 7.

**Specification of Hypotheses**

The chains of relationships shown in Figure 7 were analyzed to specify the hypotheses that make up the medical-or-nonmedical model. The discussion of the analyses that produced the hypotheses is organized in terms of the hypotheses' independent variables. A summary of studies related to each hypothesis is given following the analysis that produced the hypothesis.
**Figure 7**

**Chains of Relationships Analyzed To Specify Hypotheses**

**Constituting the Medical-or-Nonmedical Model**

<table>
<thead>
<tr>
<th>Exogenous Variables</th>
<th>Intervening Variables</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of medical methods in methods perceived as three most effective</td>
<td>Perceived effectiveness of each alternative</td>
<td>Perceived benefit of each alternative</td>
</tr>
<tr>
<td>Perceived disagreeableness of side effects of medical methods</td>
<td>Net utility of each alternative: its perceived benefit minus its perceived cost</td>
<td></td>
</tr>
<tr>
<td>Knowledge of how to obtain medical methods</td>
<td></td>
<td>Perceived cost of each alternative</td>
</tr>
<tr>
<td>Access to medical methods</td>
<td></td>
<td></td>
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</table>

**Hypothesis for number of medical methods.**

The greater the number of medical methods a contraceptive-using teenager includes among the methods which she perceives to be the three most effective, the more likely she is to use a medical method.
This hypothesis is based on the rationale that the greater the number of medical methods a contraceptive-using teenager includes among the methods she perceives as being the three most effective, then (a) the greater the number of medical methods she includes among the methods she perceives as being the three most beneficial, (b) the more likely the method to which she assigns the maximum net utility is a medical method, and (c) the more likely she is to use a medical method.

A search of the literature revealed no study that tested directly the hypothesis that a positive relationship exists between any measure of a teenager's knowledge of the efficacies of contraceptive methods and the effectiveness of the method she uses. However, the results of studies by Marsiglio & Mott (1986), Zabin et al. (1986), and Zelnik and Kim (1982) provide indirect support for such an hypothesis: The results suggest that teenagers' exposure to a sex education course in which they receive information about contraceptive methods is related to an increase in their use of more effective contraceptive methods.

**Hypothesis for disagreeableness of side effects.**

The more disagreeable a contraceptive-using teenager perceives the side effects of medical methods to be, the less likely she is to use a medical method.

This hypothesis is based on the rationale that the more disagreeable a teenager perceives the side effects of
medical methods to be, then (a) the cost she perceives to be involved in using each medical method is greater than it would be otherwise, (b) the net utility she assigns to each medical method is less than it would be otherwise, and (c) the less likely she is to use a medical method.

A study by Gerrard et al. (1983) suggested that users of nonmedical methods possessed more negative beliefs about the use of the pill and the IUD than did users of medical methods. Kantner and Zelnik (1973) found that, among sexually active teenagers included in a national survey, the pill was used by 31 percent of those who believed that it was safe but by only seven percent of those who thought it was unsafe. In a study of reasons for teenagers' delay in making first visits to family planning clinics, Zabin and Clark (1981) found that 27 percent of the patients gave as a contributing reason their fear of the side effects of birth control and that such fears appeared to be limited to medical methods. In an analysis of the reasons women gave for choosing one method over another, Silverman, Torres, and Forrest (1987) found that the dominant reason given for selecting a method other than the pill or the IUD was fear of side effects. Werner and Middlestadt (1979) found that, among a group of sexually active women who were college students, those who did not use oral contraceptives, compared to those who did, were significantly more likely to believe that oral contraceptives had not been proven fully
safe and that their use increases the risk of blood clotting.

Hypothesis for knowledge of how to obtain methods.
The better a contraceptive-using teenager's knowledge of how to obtain medical methods, the more likely she is to use a medical method.

This hypothesis is based on the rationale that the better a teenager's knowledge of how to obtain medical methods, then (a) the cost she perceives to be involved in acquiring the knowledge necessary to obtain medical methods is lower than it would be otherwise, (b) the cost she perceives to be involved in using each medical method is lower than it would be otherwise, (c) the net utility she assigns to each medical method is greater than it would be otherwise, and (d) the more likely she is to use a medical method.

Studies by Shah et al. (1975) and by Zabin and Clark (1981) indicate that not knowing where to obtain medical methods denies some teenagers the opportunity to use them.

Hypothesis for access to medical methods.
The greater a contraceptive-using teenager's access to medical methods, the more likely she is to use a medical method.

This hypothesis is based on the rationale that the greater a teenager's access to medical methods, then (a) the cost she perceives to be involved in gaining access to
medical methods is lower than it would be otherwise, (b) the cost she perceives to be involved in using each medical method is lower than it would be otherwise, (c) the net utility she assigns to each medical method is greater than it would be otherwise, and (d) the more likely she is to use a medical method.

Zabin and her colleagues (Zabin et al., 1986) evaluated a family planning program targeted at the students in a high school and a junior high school in Baltimore; the program involved in part the establishment of a free-services clinic in close proximity to the schools. The evaluation found that, over a three-year demonstration period, significant increases in the use of the pill occurred among sexually active female students.

The hypotheses that constitute the medical-or-nonmedical model are summarized in Table 2.

**Control Variables**

Findings of past research indicate that, in addition to the independent variables included in the medical-or-nonmedical model, the variables of age, attitude toward unwed childbirth, religiosity, and race of household may also affect whether a contraceptive-using teenager chooses to use a medical or a nonmedical method. These variables were added, as control variables, to the medical-or-nonmedical model.
Table 2

Hypotheses Constituting the Medical-or-Nonmedical Model

1. The greater the number of medical methods a contraceptive-using teenager includes among the methods which she perceives to be the three most effective, the more likely she is to use a medical method.

2. The more disagreeable a contraceptive-using teenager perceives the side effects of medical methods to be, the less likely she is to use a medical method.

3. The better a contraceptive-using teenager's knowledge of how to obtain medical methods, the more likely she is to use a medical method.

4. The greater a contraceptive-using teenager's access to medical methods, the more likely she is to use a medical method.

Following are summaries of studies indicating the existence of a relationship between each of the control variables and the medical-or-nonmedical model's dependent variable.

Age. Zelnik and Shah (1983) found that the older the teenager at first intercourse, the more likely she is to have used a medical method of contraception at first intercourse. Zelnik and Kantner (1977) found that, among ever-contracepting, never-married teenagers included in a 1976 survey, the percentage of older teenagers (aged 18-19) who ever used a medical method (pill, IUD, or diaphragm) was greater than the percentage of younger teenagers (aged 15-17) who did so.

Religiosity. Zelnik et al. (1981) found, among contraceptive-using white teenagers, significant negative
associations (a) between religiosity\textsuperscript{7} and use of a medical method at last intercourse and (b) between religiosity and ever use of a medical method. Similarly, Studer and Thornton (1987) found that sexually active, never-married white teenagers who regularly attended religious services were less likely to have used a medical method than were those who rarely attended services.

**Race of household.** Zelnik and Shah (1983) found that, among respondents in a 1979 national survey, black teenagers who used contraception at first intercourse were more likely than white teenagers to have used a medical method. Zelnik and Kantner (1980) found in national surveys conducted in 1976 and 1979 that, among never-married, never-pregnant teenagers who ever used contraception, the percentage of blacks who used medical methods was larger than the percentage of whites for method first used and for most recent method used.

The relationships which make up the medical-or-nonmedical model are diagrammed in Figure 8, along with those produced by the addition of the control variables.

\textsuperscript{7} Zelnik et al. (1981) measured the concept of a teenager's religiosity as an index composed of three measures: (a) how important religion was to her, (b) how important it was in the life of her family while she was growing up, and (c) how frequently she attended religious services.
CHAPTER V

METHODOLOGY

Data

The data used for the study were obtained from the 1979
U.S. National Survey of Young Women (NSYW) (Zelnik &
Kantner, 1985), with the exception of data for one variable
which were taken from a study prepared by the Alan
Guttmacher Institute (1982). The data for the NSYW were
obtained by a national-level, probability-sample survey of
15-to-19-year-old, ever-married and never-married women
living in households in Standard Metropolitan Statistical
Areas (SMSAs) in the coterminous United States. The NSYW
included 1,717 respondents. The survey respondents used as
subjects in the study were limited to those who were
sexually active¹, never married, never pregnant, and whose
households were classified by race as either white
(Caucasian, Mexican-American or Chicano, or Puerto Rican) or
black (African-American). Such respondents totaled 449.
Data from a study prepared by the Alan Guttmacher Institute
(1982) were used in measurements of the access-to-
contraception variable.

¹ Respondents whose sexual experience was limited to a
single act of intercourse were not considered to have
been sexually active.
Measurements of Variables

**Likelihood-of-Use Model**

Three of the seven independent variables in the likelihood-of-use model make reference to "more effective" contraceptive methods: "perceived disagreeableness of side effects of more effective methods," "knowledge of how to obtain more effective methods," and "access to more effective contraception." For the study, the concept of more effective contraceptive methods was operationalized as "medical methods."

**The Dependent Variable**

The likelihood that a sexually active teenager has used contraception in any single act of intercourse may be measured as the frequency with which she has used contraception, that is, as the proportion of the times she has used a contraceptive method when she engaged in intercourse. Thus, in the study, the variable "likelihood of using contraception" was measured as the frequency with which each subject had used contraception.

The frequency with which a subject used contraception was measured in terms of her answers to questions in the NSYW that permitted the frequency with which she had used contraception to be classified in one of three ways: (a) never, (b) sometimes, or (c) always. A "never" answer was coded 1, a "sometimes" answer 2, and an "always" answer 3.
The Independent Variables

Educational expectations. Measurements of subjects' educational expectations were obtained from answers to four questions asked in the NSYW: (a) "What is the highest grade of school you have completed?" (b) "At the present time are you: 1-going to school during the day, 2-going to school at night, or 3-not going to school?" (c) for respondents not currently going to school, "Do you think you will or will not return to school in the future?" and (d) for respondents attending or planning to return to school, "What is the highest grade of school or year of college you think you will eventually complete?"

The measurements were arrived at as follows. For those who indicated they were currently not going to school and did not think they would be returning to school, their educational expectations were taken as their answers to the question, "What is the highest grade of school you have completed?" For those who indicated they were either attending or planning to return to school, their educational expectations were taken as their answers to the question, "What is the highest grade of school or year of college you think you will eventually complete?" Subjects' educational expectations were coded as follows: 1-below high school graduation; 2-high school graduation; 3-beyond high school but less than graduation from college; 4-graduation from college; and 5-beyond graduation from college.
Thoughtfulness for the future. The NSYW data used for measuring "thoughtfulness for the future" were subjects' answers to the question, "How much have you thought about what you will be doing when you are 25?" Answers were categorized as: "a lot," "some," "very little," and "not at all." "Not at all" was coded 1, "very little" 2, "some" 3, and "a lot" 4.

Inclination to take chances. Measurements for the variable "inclination to take chances" were obtained from subjects' answers to the question, "Are you a person who takes chances?" Answers were recorded as "yes," "no," and "don't know." An answer of "no" or "don't know" answer was coded 0; a "yes" answer was coded 1.

Number of methods aware of. The number of methods of which each subject was aware was measured as the number of methods she had "heard of." In the NSYW, the number of methods a respondent had heard of was obtained by the following procedure: The interviewer showed the respondent a card on which were listed, in random order, the names by which eight methods referenced in the survey were commonly identified; the interviewer then read aloud the name or names of each of the methods and, each time a method was identified, asked the respondent whether she had heard of it.

For the study, subjects' responses were coded as follows: The responses of those who had heard of five or
fewer methods were coded 1; the responses of those who had heard of six or seven methods were coded 2; the responses of those who had heard of all eight methods were coded 3.

Perceived disagreeableness of side effects of more effective methods. The extent to which each subject perceived more effective methods as possessing disagreeable side effects was measured by her agree-or-disagree response to the statement, "The use of a diaphragm has very few harmful effects." Each response indicating agreement with the statement (and thus a belief that use of a diaphragm is relatively harmless) was coded 1; each response indicating disagreement with the statement (and thus a belief that use of a diaphragm entails exposure to something other than "very few harmful effects") was coded 3; each "don't know" response was coded 2 to indicate that the respondent was undecided as to the truth of the statement.

An attempt was made to operationalize this variable as an index constructed from subjects' agree-or-disagree responses to three statements about possible harmful effects of, respectively, the use of birth control pills, the use of an IUD, and the use of a diaphragm. However, an analysis of the reliability of the index indicated that it was inadvisable to use it to measure the variable. As a result, the variable was measured in terms of subjects' responses only to the statement about the use of a diaphragm. This statement was selected because, unlike each of the other two statements, a belief that use of the indicated method results in the indicated harmful effects is clearly an untrue belief.
Knowledge of how to obtain more effective methods.\(^3\)

Whether each subject possessed the knowledge required to obtain more effective methods was measured by her agree-or-disagree response to the statement, "Birth control pills can be purchased at a drug store without a prescription." Each incorrect response ("agree") and each "don't know" response -- both responses indicating a lack of the knowledge in question -- were coded 1; each correct response ("disagree") was coded 2.

Access to more effective contraception. With more effective and less effective contraceptive methods defined as medical and nonmedical methods, a subject's access to more effective contraception was conceptualized as the availability to teenagers of services from family planning clinics in the census region in which she resided. Such availability was measured in terms of a three-category (low-medium-high) variable. The variable was constructed by a two-step process. First, an index number was calculated for each region by dividing the number of family planning clinics in the region by the estimated number of teenagers

\[^3\] An attempt was made to operationalize this variable as an index constructed from subjects' agree-or-disagree responses to three statements about how birth control pills, an IUD, and a diaphragm, respectively, may be obtained. However, an analysis of the reliability of the index indicated that it was inadvisable to use it to measure the variable. As a result, the variable is measured in terms of subjects' responses only to the statement about obtaining pills. This statement was selected because pills were the method most frequently used among subjects using a medical method.
at risk of unintended pregnancy in the region, and then multiplying the result by a thousand. Second, each region was placed in one of the three categories on the basis of its index number. Regions with index numbers less than .81 were coded 1; regions with index numbers greater than 1.19 were coded 3; remaining regions were coded 2.

Subjects' regions of residence were included in the NSYW data; the number of family planning clinics and the number of teenagers at risk of pregnancy in each region were developed from state-level 1980 data included in a study prepared by the Alan Guttmacher Institute [AGI] (1982, Tables 11 & 33). Although the AGI data are for 1980, they were assumed to be sufficiently representative of 1979 data to be able to serve as proxies.

The AGI data on the clinics and number of teenagers at risk of pregnancy were provided for each of the states and the District of Colombia. Each region's number of family planning clinics and estimated number of teenagers at risk of pregnancy were computed by aggregating such data for the states in the region.4

Control Variables

**Age.** A subject's age was obtained directly from NSYW data. In the NSYW, a respondent's age was measured by

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4 Because the NSYW was limited to the coterminous 48 states, data for Alaska and Hawaii were excluded from the data for the Pacific region, the region to which Alaska and Hawaii belong.
asking her the date of her birthday and assigning her age according to the location of her birthday in a schedule of five 12-month periods. A subject's birthday that fell in the 12-month period preceding the end of February, 1964, placed her in the category of 15-year-olds; computations using corresponding 12-month periods ending in 1963, 1962, 1961, and 1960 placed other subjects in the categories of 16-, 17-, 18-, and 19-year-olds.

**Family income.** Each subject's family income was measured as falling into one of three categories: 1-less than $10,000, 2-from $10,000 to $20,000 dollars, or 3-more than $20,000. The data on subjects' household incomes that were provided by the NSYW, the point of departure for the measurement, were organized as follows. The NSYW (a) defined 16 sequential dollar ranges, (b) assigned sequential whole-number values to the dollar ranges, with the lowest range assigned a value of 1 and the highest range assigned a value of 16, and (c) placed each case on which household income data had been obtained into its corresponding dollar range.\(^5\)

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\(^5\) The placement was determined in the NSYW by the interviewer’s asking one of the members of the subject’s household to: (a) look at a card on which were listed the 16 dollar ranges representing household incomes, with each range given an identifying number, and then (b) identify the number corresponding to the income of the household. The request contained a detailed definition of the kinds of income to be included. See Appendix C for the exact wording of the request and the income ranges listed on the card.
Two steps, then, were involved in translating the NSYW data into the three-category measurements. The first step was to (a) calculate the weighted average of the whole-number values assigned to cases on the basis of their placements in the dollar ranges, (b) identify the dollar range which corresponds to the whole-number value nearest to that average, and (c) assign cases with missing values to that dollar range. The second step was to locate each subject's household income in one of the three abovementioned categories on the basis of its placement in the 16 dollar ranges. The categories were coded as numbered.

Education of female raiser. The education of each subject's female raiser was measured as falling into one of four categories: 1-below high school graduation; 2-high school graduation; 3-beyond high school but less than graduation from college; 4-graduation from college and beyond. The NSYW reported the number of years of education which subjects' female raisers had obtained, with each amount less than 17 years coded by the same whole number as the years of education it represented; 17 or more years were coded as 17. If a raiser was the subject's grandmother, the NSYW adjusted her education by the difference (approximately 3 years) between the mean education of parents and grandparents for her racial (black-nonblack) category, as such differences were determined by a separate study. Two
steps, then, were involved in transforming the NSYW data into the four-category measurements. The first step was to
(a) calculate the weighted average of the whole-number codes representing the education which raisers had obtained and
(b) assign cases with missing values to the number-of-years-of-education category whose code was the nearest whole
number. The second step was to locate the education of each subject's female raiser in one of the four abovementioned
categories on the basis of the years of education she had obtained. The categories were coded as numbered.

Race of household. The race of a subject's household (black or white) was obtained directly from NSYW data. The
racial category of each survey respondent's household was determined by interviewer observation. The race of a
subject's household was coded 1 if it was classified as "white" and 2 if it was classified as "black."

A Summary of the Variables

Table 3 lists the variables included in the likelihood-of-use model. The table also presents each variable's
abbreviated name--eight or less capitalized characters--and the coding that was used for the variable.

Medical-or-Nonmedical Model

The subjects whose behavior was analyzed by the medical-or-nonmedical model were limited to those who reported ever using contraception.
Table 3

Variables in the Likelihood-of-Use Model

<table>
<thead>
<tr>
<th>Abbreviated Name</th>
<th>Description</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIKE2USE</td>
<td>Likelihood of using contraception.</td>
<td>1 = Never 2 = Sometimes 3 = Always</td>
</tr>
<tr>
<td>EDEXPECT</td>
<td>Educational expectations.</td>
<td>1 = less than HS 2 = High school 3 = Some college 4 = College 5 = Post grad</td>
</tr>
<tr>
<td>THCT4FUT</td>
<td>Thoughtfulness for the future.</td>
<td>1 = None 2 = Very little 3 = Some 4 = A lot</td>
</tr>
<tr>
<td>TKCHANCE</td>
<td>Inclination to take chances.</td>
<td>0 = Not inclined 1 = Inclined</td>
</tr>
<tr>
<td>NUMMETHD</td>
<td>Number of methods aware of.</td>
<td>1 = Five or less 2 = Six or seven 3 = Eight</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>Perceived disagreeableness of side effects of more effective methods.</td>
<td>1 = Agreeable 2 = Uncertain 3 = Disagreeable</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>Knowledge of how to obtain more effective methods.</td>
<td>0 = Doesn't know 1 = Knows</td>
</tr>
<tr>
<td>ACCESS</td>
<td>Access to more effective contraception.</td>
<td>1 = Low 2 = Moderate 3 = High</td>
</tr>
</tbody>
</table>

(table continues)
Abbreviated Name | Description | Coding
---|---|---
AGE | Age. | (Age in years)
FAMINCOM | Family income. | 1 = Low  
| | 2 = Moderate  
| | 3 = High  
EDFMRASR | Education of female raiser. | 1 = Less than HS  
| | 2 = High school  
| | 3 = Some college  
| | 4 = College or post grad  
RACE | Race of household. | 0 = White  
| | 1 = Black

The Dependent Variable

Measurements of whether subjects were likely to use a medical or a nonmedical method were obtained from the answers given by NSYW respondents when they were asked to identify the contraceptive methods they had used most recently. An answer that was a nonmedical method was coded 0; an answer that was a medical method was coded 1.

The Independent Variables

Number of medical methods among the three methods perceived as most effective. NSYW respondents were asked to rank the methods they had heard of on the basis of their effectiveness. The number of medical methods a subject included among the methods she perceived as the three most effective was obtained by counting the number of medical methods she included among the methods which she ranked as
the three most effective.\textsuperscript{6} The number in each case was 0, 1, 2, or 3.

In the NSYW, the rank each respondent assigned to the methods she had heard of was obtained by the following procedure: As indicated earlier, the interviewer showed the respondent a card on which were listed, in random order, the names by which the eight methods referenced in the survey were commonly identified; the interviewer then read aloud the name or names of each of the methods and, each time a method was named, asked the respondent whether she had heard of it; then, continuing to show the respondent the list of methods, the interviewer asked her to rank the methods she had heard of by identifying, first, the most effective method, then the next most effective method, then the next most effective, and so forth, until the respondent had ranked all the methods she had heard of.

\textbf{Perceived disagreeableness of side effects of medical methods.} A subject's "perceived disagreeableness of side effects of medical methods" was measured in the same way as her "perceived disagreeableness of side effects of more effective methods" was measured (see page 77).

\textbf{Knowledge of how to obtain medical methods.} A subject's knowledge of how to obtain medical methods was

\textsuperscript{6} In cases in which the respondent had heard of less than three methods, the number of medical methods she included among those she had heard of was taken as the number of medical methods she included among those she perceived as being the three most effective.
measured in the same way as her "knowledge of how to obtain more effective methods" was measured (see page 78).

**Access to medical methods.** A subject's access to medical methods was measured as the same way as her "access to more effective contraception" was measured (see page 78).

**Control Variables**

**Age.** Each subject's age was measured in the same way as indicated for the likelihood-of-use model (see page 79).

**Attitude toward unwed childbearing.** A subject's attitude toward unwed childbearing was inferred from the answers she gave to two questions asked NSYW respondents: "What do you think is the ideal age for a woman to have her first baby?" and "What do you think is the ideal age for a woman to get married?" If the age a subject indicated as ideal for a first birth was greater than that for marriage, it was inferred that her attitude toward unwed childbearing was unfavorable; if the age she indicated as ideal for a first birth was less than that for marriage, it was inferred that her attitude toward unwed childbearing was favorable; if the age she indicated as ideal for first birth was the same as that for marriage, it was inferred that her attitude toward unwed childbearing was undecided. If a subject's inferred attitude was unfavorable, it was coded 1; if it was undecided, it was coded 2; if it was favorable, it was coded 3.
Religiosity. A subject's religiosity was measured by a three-category variable. The variable was constructed by recoding a seven-category index of religiosity that was obtained directly from the NSYW. The recoding was accomplished as follows: The lowest three categories were assigned a code of 1; the middle category was coded 2; the highest three categories were assigned a code of 3.

The seven-category index was arrived at by summing three constituent index-numbers; each of the constituent indexes had values ranging from 0 to 2, which gave the values of the religiosity index a range of 0 to 6. The constituent indexes were measures of: (a) the importance a respondent attached to religion, (b) the importance the respondent's family attached to religion, and (c) the respondent's frequency of attendance at religious services.

The index-score representing the importance a respondent attached to religion was developed by a two-step procedure. The first step was to obtain the respondent's answer to the question, "How important would you say religion is to you? Is it: very important, fairly important, fairly unimportant, or not important at all"? The second step was to code the respondent's answer as follows: If the answer was "fairly unimportant" or "not important at all," it was coded 0; if the answer was "fairly important," it was coded 1; if the answer was "very important," it was coded 2.
The index-score representing the importance a respondent's family attached to religion was developed by a similar two-step procedure. The first step was to obtain the respondent's answer to the question, "How important would you say religion was in the life of your family while you were growing up? Was it: very important, fairly important, fairly unimportant, or not important at all"? The second step was to code the respondent's answer as follows: If the answer was "fairly unimportant" or "not important at all," it was coded 0; if the answer was "fairly important," it was coded 1; if the answer was "very important," it was coded 2.

The index-score representing each respondent's frequency of attendance at religious services was developed by a six-step procedure. The first step was to obtain each respondent's answer to the question, "What is your religion, if any"? The second step was to use each respondent's answer to place her in one of the following religious-affiliation categories: "fundamentalist," "Baptist," "other Protestant/Christian," "Catholic," "Jewish," "Mormon," "other," and "none." The third step was to obtain each respondent's answer to the question, "How many times did you attend a religious service in the last four weeks"? The fourth step was to use the answers of the respondents who belonged to each religious-affiliation category to specify
three categories of attendance (low', medium, and high) for the affiliation category; this was accomplished by splitting the frequency distribution of the attendance figures for the affiliation category as nearly as possible into thirds. The fifth step was to code each of the three attendance categories specified for each affiliation category as follows: Low attendance was coded as 0; medium attendance was coded as 1; high attendance was coded as 2. The sixth step was to assign an index-score to each respondent's answer to the attendance question, based on the affiliation category to which she belonged and the attendance categories specified for that affiliation category.

Race of household. The race of a subject's household was measured in the same way as indicated for the likelihood-of-use model (see page 82).

A Summary of the Variables

Table 4 lists the variables included in the medical-or-nonmedical model. The table also presents each variable's abbreviated name and the coding that was used for the variable.

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7 In every affiliation category, the frequency of attendance represented by the "low attendance" category was zero times.
Table 4

**Variables in the Medical-or-Nonmedical Model**

<table>
<thead>
<tr>
<th>Abbreviated Name</th>
<th>Description</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDORNON</td>
<td>Whether a medical method is likely to be used.</td>
<td>0 = Nonmedical 1 = Medical</td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDNTO3</td>
<td>Number of medical methods among three methods perceived as most effective.</td>
<td>(Number: 0-3)</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>Perceived disagreeableness of side effects of medical methods.</td>
<td>1 = Agreeable 2 = Uncertain 3 = Disagreeable</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>Knowledge of how to obtain medical methods.</td>
<td>0 = Doesn't know 1 = Knows</td>
</tr>
<tr>
<td>ACCESS</td>
<td>Access to medical methods.</td>
<td>1 = Low 2 = Moderate 3 = High</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>Age.</td>
<td>(Age in years)</td>
</tr>
<tr>
<td>UNWEDBIR</td>
<td>Attitude toward unwed childbearing.</td>
<td>1 = Unfavorable 2 = Undecided 3 = Favorable</td>
</tr>
<tr>
<td>RELOSITY</td>
<td>Index of religiosity.</td>
<td>1 = Low 2 = Moderate 3 = High</td>
</tr>
<tr>
<td>RACE</td>
<td>Race of household.</td>
<td>0 = White 1 = Black</td>
</tr>
</tbody>
</table>
Analyses of Data

The analyses that were performed were of three types: (a) those performed to obtain a frequency distribution of cases for each of the variables used in the study; (b) those performed to test the likelihood-of-use model and the medical-or-nonmedical model; and (c) those performed to explore the extent to which the effects of the models' selected theoretical variables—Independent variables—differ for black and white teenagers. In each analysis, the cases in the sample that was used were weighted by a variable provided for that purpose in the data from the NSYW. The analyses were carried out using SPSS software.

Preliminary Analyses

The frequency distributions of variables were obtained for two purposes: (a) to ensure that no variable, because of the distribution of cases across its categories, presented a problem in the performance of the other analyses; and (b) to provide descriptive information on the subjects in the study. The descriptive information was intended for possible use in interpreting the results of the other analyses. Frequency distributions were obtained for the total sample of teenagers, a subsample of black teenagers, and a subsample of white teenagers.
Tests of the Models

The test of each model had two parts. The first part was a test of the model as a whole to determine (a) whether the effects of the independent variables on the dependent variable, taken together, were statistically significant and (b) its goodness-of-fit. The second part was a test of each of the hypotheses constituting the model to determine whether the hypothesis was supported by the data. Whether an hypothesis was supported was determined by whether the effect of the related independent variable was (a) statistically significant, (b) substantial in magnitude, and (c) consistent in direction with the hypothesis. Each model was tested using the total sample of teenagers.

The Statistical Technique Used: Logistic Regression

The dependent variable in the likelihood-of-use model was an ordered trichotomy: the frequency of a subject's use of contraception, measured as "never," "sometimes," or "always." The dependent variable in the medical-or-nonmedical model was a dichotomy: whether a contraceptive-using subject used a medical method or a nonmedical method.

Because each dependent variable was operationalized as a categorical variable, the statistical technique used in testing the models was logistic regression. The application of logistic regression to the medical-of-nonmedical model was relatively straightforward because the dependent
variable was a dichotomy. The likelihood-of-use model's dependent variable was a multinomial variable. The multinomial dependent variable was transformed into a set of dichotomous dependent variables (Agresti, 1996; Clogg & Shihadeh, 1994), creating thereby a set of "submodels" of the likelihood-of-use model. Each of the submodels was tested by using logistic regression; the results from the tests of the submodels were used to infer corresponding characteristics for the likelihood-of-use model: (a) whether, for the model as a whole, the effects of the independent variables were statistically significant; (b) the magnitude of the goodness-of-fit; and (c) the level of support for the hypotheses constituting the model.

The Submodels of the Likelihood-of-Use Model

A set of dichotomous variables was developed, then, to represent the operationalized version of the dependent variable. The development of the dichotomous dependent variables was guided by the general form of the hypotheses implicitly constituting the operationalized model and by the categories that made up the model's dependent variable.

Each of the hypotheses constituting the original likelihood-of-use model had the following general form: "The greater the value of [a characteristic possessed by a teenager], the more likely she is to use contraception." When the concept of likelihood of use was operationalized as frequency of use, with categories of never, sometimes, and
always, each hypothesis in the likelihood-of-use model implicitly took the following form: "The greater the value of [a characteristic possessed by a teenager], the greater the frequency with which she uses contraception."

With each hypothesis in the operationalized version of the likelihood-of-use model given this general form, and with the trichotomous frequency-of-use variable (never-sometimes-always) serving as the dependent variable, two dichotomous variables were specified to represent the dependent variable.

For one of the dichotomous variables, the categories that were specified were (a) never and (b) a combination of sometimes and always; the never category was coded 0 and named the "nonuse" category; the combination-of-sometimes-and-always category was coded 1 and named the "use" category; the variable, then, was named the "nonuse-or-use" variable. For the other dichotomous variable, the categories that were specified were (a) sometimes and (b) always; the sometimes category was coded 0; the always category was coded 1; the variable was named the "sometimes-or-always" variable. The rationale for specifying these variables was that never, sometimes, and always follow an ordered continuum in the process of contraceptive use; that continuum presents two transitional stages: (a) never to sometimes or always and (b) sometimes to always.
The two submodels that were created along with the nonuse-or-use variable and the sometimes-or-always variable are referred to as the nonuse-or-use submodel and the sometimes-or-always submodel.

Features of Logistic Regression

In order for the discussion of the tests of the models to proceed further, it will be helpful, first, to define two key concepts in logistic regression, to describe the general form of logistic regression equations, and to indicate how ordinal independent variables were treated in the logistic regression analyses.

Definitions. Two key concepts--odds and log odds--must be defined. When logistic regression analysis is applied to a model with a dichotomous dependent variable, one category of the dependent variable represents the occurrence of an event; the other category represents the nonoccurrence of that event. For example, in the nonuse-or-use submodel, the use of contraception was taken as the event whose occurrence was in question. In the submodel's dependent variable, then, the use category was the occurrence category; the nonuse category was the nonoccurrence category.

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8 The logistic-regression software used in the study, SPSS software, treats the higher-coded category in a model's dependent variable as the occurrence category.

9 Alternatively, of course, the nonuse category could be treated as the occurrence category, with the use category treated as the nonoccurrence category.
When a model with an occurrence-or-nonoccurrence dependent variable is applied to a sample of cases, the odds that the event in question occurs among the cases is the ratio between the number of cases in the occurrence category and the number of cases in the nonoccurrence category. For example, when the nonuse-or-use submodel was applied to the sample of teenagers used in the study, the odds that a teenager in the study used contraception was the ratio between the number of teenagers in the use category of the nonuse-or-use variable and the number of teenagers in the nonuse category.

When a model (or submodel) with an occurrence-or-nonoccurrence dependent variable is expressed as a logistic-regression equation, the equation's dependent variable is the natural logarithm of the odds of the event in question. The natural logarithm of an odds is referred to as the log odds of the event in question.

The logistic regression equation. If an occurrence-or-nonoccurrence dependent variable in a model is symbolized as $Y$, then the odds of the event in question may be symbolized as $\text{Odds}(Y)$. In a logistic regression equation corresponding to the model, the equation's dependent variable, the natural

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10 The odds of an event is not the same thing as the probability that the event will occur. This is indicated by the fact that the odds of an event is equal to the ratio between the probability of the occurrence of the event and the probability of the nonoccurrence of the event.
logarithm of Odds(\(Y\)), may be symbolized as \(\ln[\text{Odds}(Y)]\). (It is spoken of as the "log odds of \(Y\).") The general form of the logistic-regression equation for the model, then, may be expressed as

\[
\ln[\text{Odds}(Y)] = a + b_1X_1 + b_2X_2 + \ldots + b_kX_k.
\]

This equation has the same general form as that of linear regression equations: The \(a\) is the intercept on the dependent-variable axis, the \(Xs\) are the independent variables, and the \(bs\) are the regression coefficients.

**The Treatment of Ordinal Independent Variables.** Each of the independent variables in the models that were tested was operationalized as either a dichotomy, an ordinal-level variable, or an interval-level variable. With logistic regression equations having the same general form as linear regression equations, the relationship between each independent variable and the dependent variable in a logistic regression analysis is a linear relationship. Thus, in the tests of the models, ordinal-level independent variables were treated as interval-level variables.

As the similarity in the general forms of the linear regression and logistic regression equations suggests, logistic regression analysis closely parallels linear regression analysis in certain respects. This similarity is used in subsequent discussion in which features of logistic regression are explained in terms of analogous features of linear regression.
The Test of a Model as a Whole

The test of a model as a whole consists of determining two characteristics of the model: (a) whether the effects of the independent variables on the dependent variable, taken together, are statistically significant, and (b) the goodness-of-fit.

Statistical significance. In linear regression analysis, the multivariate $F$ test is used to determine whether the effects of a model's independent variables on its dependent variable, taken together, are statistically significant. The test indicates the probability of obtaining regression coefficients as large as those observed in the sample if, in the population, all of the coefficients of the independent variables are zero.

In logistic regression, the statistical significance of the effects of a model's independent variables in combination is evaluated as the level of significance of the "model chi-square." The model chi-square is the difference between the chi-square for the intercept-only version of the model (the model without the independent variables) and the chi-square for the full model. The level of significance associated with the model chi-square may be interpreted as follows: It is the probability of finding the model chi-square that was found in the sample if, in the population, the full model (which incorporates all the independent
variables) brings about no reduction in the chi-square statistic for the intercept-only model.

**Goodness-of-fit.** In linear regression analysis, the goodness-of-fit of a model is symbolized by $R^2$; it is interpreted as the proportion by which use of the model reduces the error that would occur if the mean of the dependent variable were used to predict the values of all cases. In logistic regression, a model's goodness-of-fit is symbolized by $R_L^2$. A model's $R_L^2$ indicates how much the fit of the model improves when the intercept-only version of the model is replaced by the full model. It is a proportion calculated by dividing the model chi-square by the chi-square for the intercept-only version of the model.

**The Test of an Hypothesis**

Whether the data in an analysis support an hypothesis is determined by whether the effect of the independent variable in the hypothesis is (a) statistically significant, (b) substantial in magnitude, and (c) consistent in direction with the hypothesis.

**Statistical significance.** In the application of linear regression analysis to a model, the statistical significance of each independent variable's effect on the dependent variable is evaluated by means of an $F$ or $t$ test. The test produces a probability of finding in the sample the effect that was found if, in the population, the independent variable has no effect on the dependent variable.
In logistic regression analysis, the statistical significance of each independent variable's effect on the model's dependent variable is evaluated as the level of significance associated with the difference between the chi-square for the full model and the chi-square for the model without the independent variable. The difference between the two chi-squares—a "chi-square differential"—has a chi-square distribution whose degrees of freedom are equal to the degrees of freedom in the full model minus the degrees of freedom in the model without the variable in question.

Some statistical software packages, including SPSS, use a less computationally intensive alternative to the chi-square differential, the Wald statistic, to evaluate the statistical significance of the effects of individual independent variables. However, for large regression coefficients, the Wald statistic produces estimated standard errors that are inflated; this sometimes results in a Type II error, a failure to reject the null hypothesis when it should be rejected (Menard, 1995). Consequently, to avoid this shortcoming of the Wald statistic, the following steps were taken to determine whether the effect of each independent variable in a model was statistically significant. First, the SPSS logistic regression procedure was applied to the model to obtain a Wald-statistic level of significance for each independent variable; second, independent variables whose Wald-statistic levels of
significance were greater than or equal to .10 were distinguished from those whose Wald-statistic levels of significance were less than .10; third, the variables whose Wald-statistic levels of significance were greater than or equal to .10 were recognized as having nonsignificant effects; fourth, the level of significance for each variable whose Wald-statistic level of significance was less than .10 was re-computed by (a) obtaining the chi-square differential between the full model and the model without the independent variables and (b) consulting a chi-square table to determine the level of significance for the chi-square differential. Those variables whose re-computed levels of significance were beyond the .05 level were recognized as having significant effects.

Magnitude and direction. In logistic regression, as in linear regression, the magnitude of an independent variable's effect on the dependent variable is indicated by the independent variables's regression coefficient. Interpretation of a logistic regression coefficient involves exponentiating (taking the antilog of) the coefficient, thereby transforming it into an "odds ratio." An odds ratio is the number by which being in the next higher-coded category of the independent variable multiplies the odds of being in the occurrence category of the dependent variable. An odds ratio greater than one indicates that the odds of being in the occurrence category increase with being in the
next higher-coded category of the independent variable; an odds ratio of less than one indicates that the odds of being in the occurrence category decrease with being in the next higher-coded category of the independent variable. The odds-ratio interpretation of an independent variable's effect, then, indicates the direction of that effect: An odds ratio greater than one indicates a positive effect; an odds ratio less than one indicates a negative effect.

The magnitude of an independent variable's effect is indicated by the extent to which the odds-ratio interpretation of the effect changes the odds of being in the occurrence category of the dependent variable. For example, an odds ratio of two indicates that each one-unit increase in the independent variable doubles the odds of being in the occurrence category, a 100 percent increase in the odds; an odds ratio of one third indicates that each one-unit increase in the independent variable reduces the odds of being in the occurrence category to one third of what they would be without the one-unit increase in the independent variable, a two-thirds reduction in the odds.

**Exploratory Analyses**

The exploratory analyses were performed to investigate the extent to which the effects of the independent variables in the likelihood-of-use and medical-or-nonmedical models differed between the black and white subsamples.
Two steps were involved in the investigation of the medical-or-nonmedical model. The first step consisted of applying the model separately to the black subsample and the white subsample and using logistic regression to determine, for each subsample, (a) whether the effect of each independent variable in the model was statistically significant and, if so, (b) whether the effect was substantial in magnitude and, if so, (c) whether its direction was positive or negative. The second step consisted of comparing the finding made for each independent variable in one subsample with the finding made for that independent variable in the other subsample to determine whether the findings were the same.

The investigation of the likelihood-of-use model was accomplished by performing for the nonuse-or-use submodel and the sometimes-or-always submodel the same two steps that are outlined above for the medical-or-nonmedical model.
CHAPTER VI

RESULTS

The results of the preliminary analyses, model-testing, and exploratory analyses that were outlined in the last chapter are presented in this chapter.

Preliminary Analyses

The preliminary analyses consisted of determining the frequency distributions for the dependent variables, the independent variables, and the control variables in the likelihood-of-use and medical-or-nonmedical models. The dependent variables included frequency of contraceptive use (LIKE2USE) and use of medical or nonmedical method (MEDORNON). The independent variables included educational expectations (EDEXPECT), thoughtfulness for the future (THOT4FUT), number of medical methods aware of (NUMMETHD), number of medical methods among methods perceived as three most effective (MEDNTOP3), disagreeableness of side effects of more effective/medical methods (SIDEFFEC), knowledge of how to obtain more effective/medical methods (KNOWHOW), access to more effective/medical methods (ACCESS), and inclination to take chances (TKCHANCE). The control variables included age (AGE), family income (FAMINCOM), education of female raiser (EDFMRA), index of
religiosity (RELOSITY), attitude toward unwed childbearing (UNWEDBIR), and race (RACE).

The distributions were of subjects in the total sample of teenagers and in the black and white subsamples. The sample and subsamples were weighted by a variable provided for that purpose by the NSYW.

Table 5 displays the frequency distributions. The most salient features of the distributions had to do with differences between the black and white subsamples on the control variables. Those features indicated that, compared to teenagers in the white subsample, teenagers in the black subsample tended (a) to come from households with substantially lower incomes, (b) to have been raised by women with somewhat less formal education, (c) to be more religious, and (d) to be more favorable in their attitudes toward unwed childbearing.

In the distributions by family income (in 1978 dollars), almost half of the black subsample lived in households with incomes under $10,000, compared to less than a quarter of the white subsample; a tenth of the black subsample lived in households with incomes over $20,000, compared to almost half of the white subsample. Almost 40 percent of the black subsample had female raisers who had less than a high school education, compared to slightly more than 20 percent of the white subsample; eight percent of the black subsample had female raisers who were college
Table 5

Frequency Distributions of Subjects by Categories of Variables in Models

Dependent Variables

Distributions by Frequency of Contraceptive Use

<table>
<thead>
<tr>
<th>Frequency of Use</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
</tr>
<tr>
<td>Never</td>
<td>43</td>
<td>9.6%</td>
<td>26</td>
</tr>
<tr>
<td>Sometimes</td>
<td>152</td>
<td>33.9%</td>
<td>54</td>
</tr>
<tr>
<td>Always</td>
<td>254</td>
<td>56.6%</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
<td>199</td>
</tr>
</tbody>
</table>

Distributions by Use of Medical or Nonmedical Method

<table>
<thead>
<tr>
<th>Medical or Nonmedical</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
</tr>
<tr>
<td>Nonmedical</td>
<td>215</td>
<td>52.7%</td>
<td>69</td>
</tr>
<tr>
<td>Medical</td>
<td>193</td>
<td>47.3%</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>408</td>
<td>100.0%</td>
<td>173</td>
</tr>
</tbody>
</table>

Independent Variables

Distributions by Educational Expectations

<table>
<thead>
<tr>
<th>Level of Expectation</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
</tr>
<tr>
<td>&lt; HS</td>
<td>12</td>
<td>2.7%</td>
<td>5</td>
</tr>
<tr>
<td>HS Grad</td>
<td>155</td>
<td>34.6%</td>
<td>63</td>
</tr>
<tr>
<td>Some Coll</td>
<td>105</td>
<td>23.4%</td>
<td>34</td>
</tr>
<tr>
<td>Coll Grad</td>
<td>124</td>
<td>27.7%</td>
<td>67</td>
</tr>
<tr>
<td>Post Grad</td>
<td>52</td>
<td>11.7%</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
<td>199</td>
</tr>
</tbody>
</table>

(table continues)
### Distributions by Thoughtfulness for the Future

<table>
<thead>
<tr>
<th>Thought</th>
<th>Total Sample</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>None</td>
<td>20</td>
<td>4.5%</td>
<td>20</td>
<td>10.0%</td>
</tr>
<tr>
<td>A little</td>
<td>48</td>
<td>10.7%</td>
<td>26</td>
<td>13.2%</td>
</tr>
<tr>
<td>Some</td>
<td>144</td>
<td>32.0%</td>
<td>41</td>
<td>20.7%</td>
</tr>
<tr>
<td>A lot</td>
<td>237</td>
<td>52.8%</td>
<td>112</td>
<td>56.1%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
<td>199</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Distributions by Number of Methods Aware of

<table>
<thead>
<tr>
<th>Methods</th>
<th>Total Sample</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>5 or less</td>
<td>42</td>
<td>9.4%</td>
<td>34</td>
<td>17.1%</td>
</tr>
<tr>
<td>6 or 7</td>
<td>117</td>
<td>26.1%</td>
<td>59</td>
<td>29.7%</td>
</tr>
<tr>
<td>8</td>
<td>290</td>
<td>64.6%</td>
<td>106</td>
<td>53.2%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
<td>199</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Distributions by Number of Medical Methods Among Methods Perceived as Three Most Effective

<table>
<thead>
<tr>
<th>Methods</th>
<th>Total Sample</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>0 or 1</td>
<td>86</td>
<td>19.1%</td>
<td>55</td>
<td>27.5%</td>
</tr>
<tr>
<td>2</td>
<td>177</td>
<td>39.4%</td>
<td>88</td>
<td>44.2%</td>
</tr>
<tr>
<td>3</td>
<td>186</td>
<td>41.5%</td>
<td>56</td>
<td>28.3%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
<td>199</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Distributions by Disagreeableness of Side Effects of More Effective/Medical Methods

<table>
<thead>
<tr>
<th>How Disagreeable</th>
<th>Total Sample</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>Harmless</td>
<td>242</td>
<td>53.8%</td>
<td>100</td>
<td>50.1%</td>
</tr>
<tr>
<td>Undecided</td>
<td>104</td>
<td>23.2%</td>
<td>49</td>
<td>24.5%</td>
</tr>
<tr>
<td>Harmful</td>
<td>103</td>
<td>23.0%</td>
<td>51</td>
<td>25.5%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
<td>199</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

(table continues)
### Distributions by Knowledge of How to Obtain More Effective/Medical Methods

<table>
<thead>
<tr>
<th>Whether Knows</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>51</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Yes</td>
<td>398</td>
<td>164</td>
<td>225</td>
</tr>
</tbody>
</table>

### Distributions by Access to More Effective/Medical Methods

<table>
<thead>
<tr>
<th>Amount of Access</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>167</td>
<td>81</td>
<td>91</td>
</tr>
<tr>
<td>Medium</td>
<td>166</td>
<td>54</td>
<td>98</td>
</tr>
<tr>
<td>High</td>
<td>116</td>
<td>63</td>
<td>61</td>
</tr>
</tbody>
</table>

### Distributions by Inclination to Take Chances

<table>
<thead>
<tr>
<th>Amount of Inclination</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>182</td>
<td>74</td>
<td>103</td>
</tr>
<tr>
<td>High</td>
<td>265</td>
<td>125</td>
<td>145</td>
</tr>
</tbody>
</table>

### Control Variables

### Distributions by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Total Sample</th>
<th>Black Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>45</td>
<td>37</td>
<td>20</td>
</tr>
<tr>
<td>16</td>
<td>97</td>
<td>35</td>
<td>56</td>
</tr>
<tr>
<td>17</td>
<td>98</td>
<td>39</td>
<td>56</td>
</tr>
<tr>
<td>18</td>
<td>104</td>
<td>54</td>
<td>56</td>
</tr>
<tr>
<td>19</td>
<td>105</td>
<td>34</td>
<td>62</td>
</tr>
</tbody>
</table>

*(table continues)*
### Distributions by Family Income

<table>
<thead>
<tr>
<th>Income</th>
<th>Total Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>&lt;$10K</td>
<td>127</td>
<td>28.2%</td>
</tr>
<tr>
<td>$10K-20K</td>
<td>139</td>
<td>31.0%</td>
</tr>
<tr>
<td>&gt;$20K</td>
<td>183</td>
<td>40.8%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Distributions by Education of Female Raiser

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Total Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>&lt;HS</td>
<td>110</td>
<td>24.5%</td>
</tr>
<tr>
<td>HS Grad</td>
<td>224</td>
<td>49.9%</td>
</tr>
<tr>
<td>Some Coll</td>
<td>68</td>
<td>15.2%</td>
</tr>
<tr>
<td>Coll Grad+</td>
<td>47</td>
<td>10.4%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Distributions by Index of Religiosity

<table>
<thead>
<tr>
<th>Index</th>
<th>Total Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>Low</td>
<td>189</td>
<td>42.1%</td>
</tr>
<tr>
<td>Medium</td>
<td>104</td>
<td>23.1%</td>
</tr>
<tr>
<td>High</td>
<td>155</td>
<td>34.5%</td>
</tr>
<tr>
<td></td>
<td>448</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

### Distributions by Attitude Toward Unwed Childbearing

<table>
<thead>
<tr>
<th>Attitude</th>
<th>Total Sample</th>
<th>White Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percent</td>
</tr>
<tr>
<td>Unfavorable</td>
<td>237</td>
<td>52.9%</td>
</tr>
<tr>
<td>Uncertain</td>
<td>154</td>
<td>34.2%</td>
</tr>
<tr>
<td>Favorable</td>
<td>58</td>
<td>12.9%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

(table continues)
Distribution by Race

<table>
<thead>
<tr>
<th>Race</th>
<th>No.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>366</td>
<td>81.6%</td>
</tr>
<tr>
<td>Black</td>
<td>83</td>
<td>18.4%</td>
</tr>
<tr>
<td></td>
<td>449</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Notes. (a) Weightings of the total sample and of the subsamples were adjusted to maintain original total counts. (b) Category-level figures for black and white subsamples do not sum to the corresponding figure for the total sample because of the weightings. (c) Some columns do not sum to indicated totals because of rounding in the weightings or in percentage calculations.

graduates or postgraduates, compared to 11 percent of the white subsample. Slightly more than 20 percent of the black subsample had an unfavorable attitude toward unwed childbearing, compared to sixty percent of the white subsample; almost 35 percent of the black subsample had a favorable attitude, compared to eight percent of the white subsample. In the distribution of the total sample by race, 82 percent of the sample was made up of whites while blacks made up 18 percent.

Model Testing

The tests of the models were performed by using logistic regression analysis and applying each model to data on the total sample of teenagers.

The test of each model addressed two sets of issues:
(a) for the model as a whole, whether the effects of the
independent variables, taken together, were statistically significant, and whether the model's goodness-of-fit was substantial in magnitude; (b) for each of the hypotheses constituting the model, whether the data offered support for the hypothesis.

The Likelihood-of-Use Model

The test of the likelihood-of-use model was accomplished in four steps: First, the model was transformed into the nonuse-or-use submodel and the sometimes-or-always submodel; second, each submodel was tested by using logistic regression; third, the test results that dealt with each submodel as a whole were used to infer corresponding characteristics for the model as a whole; fourth, the test results for the hypotheses constituting the submodels were used to infer a level of support for each hypothesis constituting the model.

The Test of the Model as a Whole

The test results for each submodel as a whole are given in Table 6 under the heading "Statistics on Each Submodel as a Whole." The results for each submodel include (a) its overall statistical significance and (b) its goodness-of-fit ($R_L^2$). The statistical significance of the nonuse-or-use submodel fell beyond the .05 level, with a $p$ of .0383; the submodel's $R_L^2$ was .075. The statistical significance of
the sometimes-or-always submodel also fell beyond the .05 level, with a \( p \) of .0000; the submodel's \( R^2_L \) was .082. From these results, then, it was inferred that the model as a whole was statistically significant and its \( R^2_L \) fell in a range between .075 and .082.

**The Test of Each Hypothesis**

Each hypothesis in each submodel was tested by using logistic regression to determine whether the effect of the independent variable in the hypothesis was (a) statistically significant, (b) substantial in magnitude, and (c) consistent in direction with the hypothesis. If so, the hypothesis was found to be supported.

Table 6 displays the results of the test of each hypothesis in each submodel under the heading "For Independent Variables: Levels of Significance and Odds Ratio Interpretations of Regression Coefficients." Each submodel was made up of seven hypotheses; each hypothesis corresponded to one of the hypotheses constituting the likelihood-of-use model. The abbreviated names of the independent variables in the hypotheses are listed in Table 6 under the heading "Independent Variables."

The rules that governed the inferences drawn from the tests of the submodels' hypotheses included the following: (a) If test results supported both of the hypotheses in the
Table 6

For the Total Sample: Results of Logistic Regression Applied to the Submodels—Nonuse-or-Use and Sometimes-or-Always

Statistics on Each Submodel as a Whole

<table>
<thead>
<tr>
<th></th>
<th>Nonuse-or-Use</th>
<th>Sometimes-or-Always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sig.</td>
<td>$R^2$</td>
</tr>
<tr>
<td></td>
<td>.0383</td>
<td>.075</td>
</tr>
</tbody>
</table>

For Independent Variables: Levels of Significance and Odds Ratio Interpretations of Regression Coefficients

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Nonuse-or-Use</th>
<th>Sometimes-or-Always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Sig.</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>RDEEXPECT</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>THOT4FUT</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>TKCHANCE</td>
<td>&lt;.025</td>
<td>.36</td>
</tr>
<tr>
<td>NUMMETHD</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>ACCESS</td>
<td>NS</td>
<td>--</td>
</tr>
</tbody>
</table>

Control Variables

<table>
<thead>
<tr>
<th></th>
<th>Nonuse-or-Use</th>
<th>Sometimes-or-Always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Sig.</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>AGE</td>
<td>&lt;.050</td>
<td>1.27</td>
</tr>
<tr>
<td>FAMINCOM</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>EDFMRASR</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>RACE</td>
<td>NS</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: NS = Not significant.
submodels that corresponded to an hypothesis in the model, then it was inferred that the tests offered full support for the hypothesis in the model; (b) if test results supported only one of the hypotheses in the submodels that corresponded to an hypothesis in the model, then it was inferred that the tests offered partial support for the hypothesis in the model; (c) if test results supported neither of the hypotheses in the submodels that corresponded to an hypothesis in the model, then it was inferred that the tests offered no support for the hypothesis in the model.

Test results supported the hypothesis in each submodel whose independent variable was TKCHANCE. Consequently, it was inferred that test results fully supported the hypothesis in the model whose independent variable was TKCHANCE:

- The more inclined a teenager is to take chances, the less likely she is to use some method of contraception.

In the nonuse-or-use submodel, the effect of TKCHANCE was statistically significant (with a level of significance of <.025), substantial in magnitude (with an odds-ratio of .36), and consistent in direction with the hypothesized negative effect of TKCHANCE on the submodel's dependent variable (with an odds ratio of less than one). The interpretation given these results was that, for a teenager
inclined to take chances, the odds of ever using contraception tend to be .36 times the odds for a teenager not inclined to take chances.

In the sometimes-or-always submodel, the effect of TKCHANCE was statistically significant (with a level of significance of <.050), substantial in magnitude (with an odds-ratio of .63), and consistent in direction with the hypothesized negative effect of TKCHANCE on the submodel's dependent variable (with an odds ratio of less than one). The interpretation given these results was that, among contraceptive-using teenagers, a teenager inclined to take chances has odds of always using contraception that tend to be .63 times the odds of a teenager not inclined to take chances.

For the sometimes-or-always submodel, but not for the nonuse-or-use submodel, test results supported the hypothesis whose independent variable was ACCESS. Consequently, it was inferred that test results offered partial support for the hypothesis in the model whose independent variable was ACCESS:

- The greater a teenager's access to the more effective methods, the more likely she is to use some method of contraception.

In the sometimes-or-always submodel, the effect of ACCESS was statistically significant (with a level of significance of <.005), substantial in magnitude (with an
odds-ratio of 1.89), and consistent in direction with the hypothesized positive effect of ACCESS on the submodel’s dependent variable (with an odds ratio greater than one). The interpretation given these results was that, among contraceptive-using teenagers in adjacent categories of the access-to-more-effective-contraception variable, a teenager in the higher category has odds of always using contraception that tend to be 1.89 times the odds of a teenager in the lower category.

For both submodels, test results failed to support the hypotheses whose independent variables were EDEXPECT, THOT4FUT, NUMMETHOD, SIDEFFEC, and KNOWHOW. Consequently, it was inferred that test results offered no support for the corresponding hypotheses in the model:

- The more elevated a teenager's educational expectations, the more likely she is to use some method of contraception.
- The greater a teenager's thoughtfulness for the future, the more likely she is to use some method of contraception.
- The greater the number of contraceptive methods a teenager is aware of, the more likely she is to use some method of contraception.
• The more disagreeable a teenager perceives the side effects of the more effective methods to be, the less likely she is to use some method of contraception.

• The better a teenager's knowledge of how to obtain the more effective contraceptive methods, the more likely she is to use some method of contraception.

The results of the tests of the hypotheses in the likelihood-of-use model are summarized in Table 7.

Table 7

Results of the Tests of the Hypotheses Constituting the Likelihood-of-Use Model

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Direction of Effect</th>
<th>Result of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEXPECT</td>
<td>Positive</td>
<td>Unsupported</td>
</tr>
<tr>
<td>THOT4FUT</td>
<td>Positive</td>
<td>Unsupported</td>
</tr>
<tr>
<td>TKCHANCE</td>
<td>Negative</td>
<td>Fully supported</td>
</tr>
<tr>
<td>NUMMETHD</td>
<td>Positive</td>
<td>Unsupported</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>Negative</td>
<td>Unsupported</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>Positive</td>
<td>Unsupported</td>
</tr>
<tr>
<td>ACCESS</td>
<td>Positive</td>
<td>Partially supported</td>
</tr>
</tbody>
</table>
The Medical-or-Nonmedical Model

The test of the medical-or-nonmedical model was accomplished by using logistic regression (a) to test the model as a whole and (b) to test each of the hypotheses constituting the medical-or-nonmedical model.

The Test of the Model as a Whole

The results of the test of the medical-or-nonmedical model as a whole are given in Table 8 under the heading "Statistics on the Model as a Whole." The statistical significance of the model as a whole fell beyond the .05 level, with a $p$ of .0000. The model's $R^2$ was .113.

The Test of Each Hypothesis

Each hypothesis in the medical-or-nonmedical model was tested by using logistic regression to determine whether the effect of the independent variable in the hypothesis was (a) statistically significant, (b) substantial in magnitude, and (c) consistent in direction with the hypothesis. If so, the hypothesis was found to be supported.

Table 8 displays the results of the test of each hypothesis under the heading "For Independent Variables: Levels of Significance and Odds Ratio Interpretations of Regression Coefficients." The model was composed of four hypotheses. The abbreviated names of the independent variables in the hypotheses are listed in Table 7 under the heading "Independent Variables."
Table 8
For the Total Sample: Results of Logistic Regression
Applied to the Medical-or-Nonmedical Model

Statistics on the Model as a Whole

<table>
<thead>
<tr>
<th>Sig.</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0000</td>
<td>0.113</td>
</tr>
</tbody>
</table>

For Independent Variables: Levels of Significance and Odds Ratio Interpretations of Regression Coefficients

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Level of Sig.</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDNTOP3</td>
<td>&lt;.005</td>
<td>2.31</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>&lt;.025</td>
<td>2.56</td>
</tr>
<tr>
<td>ACCESS</td>
<td>&lt;.025</td>
<td>1.47</td>
</tr>
</tbody>
</table>

Control Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sig.</th>
<th>Odds</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>UNWEDBIR</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>RELOSITY</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>RACE</td>
<td>&lt;.025</td>
<td>2.14</td>
</tr>
</tbody>
</table>

Note: NS = Not significant.

Test results supported the hypothesis whose independent variable was MEDNTOP3:

• The better a contraceptive-using teenager's knowledge of the effectiveness of medical methods, the more likely she is to use a medical method.
The effect of MEDNTOP3 was statistically significant (with a level of significance of <.005), substantial in magnitude (with an odds-ratio of 2.31), and consistent in direction with the hypothesized positive effect of MEDNTOP3 on the model's dependent variable (with an odds ratio greater than one). The interpretation given these results was that, among contraceptive-using teenagers in adjacent categories on the variable measuring the number of medical methods among the methods perceived as the three most effective, a teenager in the higher category has odds of using a medical method that tend to be 2.31 times the odds of a teenager in the lower category.

Test results supported the hypothesis whose independent variable was KNOWHOW:

- The better a contraceptive-using teenager's knowledge of how to obtain medical methods, the more likely she is to use a medical method.

The effect of KNOWHOW was statistically significant (with a level of significance of <.025), substantial in magnitude (with an odds-ratio interpretation of 2.56), and consistent in direction with the hypothesized positive effect of KNOWHOW on the model's dependent variable (with an odds ratio greater than one). The interpretation given these results was that, among contraceptive-using teenagers,
a teenager who knows how to obtain medical methods has odds of using a medical method that tend to be 2.56 times the odds of a teenager who does not know how to do so.

Test results supported the hypothesis whose independent variable was ACCESS:

- The greater a contraceptive-using teenager's access to medical methods, the more likely she is to use a medical method.

The effect of ACCESS was statistically significant (with a level of significance of <.025), substantial in magnitude (with an odds-ratio of 1.47), and consistent in direction with the hypothesized positive effect of ACCESS on the model's dependent variable (with an odds ratio greater than one). The interpretation given these results was that, among contraceptive-using teenagers in adjacent categories on the access-to-medical-methods variable, a teenager in the higher category has odds of using a medical method that tend to be 1.47 times the odds of a teenager in the lower category.

Test results failed to support the hypothesis whose independent variable was SIDEFFEC:

- The more disagreeable a contraceptive-using teenager perceives the side effects of medical methods to be, the less likely she is to use a medical method.
Table 9

Results of the Tests of the Hypotheses Constituting the Medical-or-Nonmedical Model

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent Variable</th>
<th>Direction of Effect</th>
<th>Result of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEDNTOP3</td>
<td>Positive</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>SIDEFFEC</td>
<td>Negative</td>
<td>Unsupported</td>
</tr>
<tr>
<td></td>
<td>KNOWHOW</td>
<td>Positive</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>ACCESS</td>
<td>Positive</td>
<td>Supported</td>
</tr>
</tbody>
</table>

The results of the tests of the hypotheses in the medical-or-nonmedical model are summarized in Table 9.

Exploratory Analyses

Two steps were involved in conducting the exploratory analyses for the medical-or-nonmedical model. The first step consisted of applying the model separately to the black and white subsamples and using logistic regression to determine, for each subsample, (a) whether the effect of each independent variable in the model was statistically significant and substantial in magnitude and (b) if so, whether the direction was positive or negative. The second step consisted of comparing the finding made for each independent variable in one subsample with the finding made for that variable in the other subsample to determine whether the findings were the same.
The exploratory analyses for the likelihood-of-use model were accomplished by performing these same two steps for each of the two submodels that were developed to test the likelihood-of-use model, the nonuse-or-use submodel and the sometimes-or-always submodel.

The Likelihood-of-Use Model

The results of the logistic regression analyses for the nonuse-or-use submodel and for the sometimes-or-always submodel, as each was applied to the black and white subsamples, are given in Tables 10 and 11, respectively. In each table, the abbreviated names of the submodel's independent variables are given under the heading "Independent Variables." Whether the effect of each independent variable in each subsample was statistically significant is indicated under the headings of "Black Subsample" and "White Subsample"; if an effect was significant, its level of significance and the odds ratio interpretation of its magnitude are shown under the headings "Level of Sig." and "Odds Ratio."

Results for the Nonuse-or-Use Submodel

Table 10 shows that, in the submodel's application to the black subsample, the effect of EDEXPECT was found to be statistically significant (with a level of significance that was <.010), substantial in magnitude, and positive in direction (with an odds ratio of 1.87). The interpretation
Table 10

For the Black and White Subsamples: Results of Logistic Regression Applied to the Nonuse-or-Use Submodel

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Black Subsample</th>
<th>White Subsample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Odds</td>
<td>Level of Odds</td>
</tr>
<tr>
<td></td>
<td>Sig. Ratio</td>
<td>Sig. Ratio</td>
</tr>
<tr>
<td>EDEXPECT</td>
<td>&lt;.010</td>
<td>NS</td>
</tr>
<tr>
<td>THOT4FUT</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>TKCHANCE</td>
<td>&lt;.050</td>
<td>NS</td>
</tr>
<tr>
<td>NUMMETHD</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>&lt;.025</td>
<td>NS</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>ACCESS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Control Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>NS</td>
<td>&lt;.050</td>
</tr>
<tr>
<td>FAMINCOM</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>EDFMRASR</td>
<td>NS</td>
<td>NS</td>
</tr>
</tbody>
</table>

Note: NS = Not significant.

given these results was that, among black teenagers in adjacent categories on the educational-expectations variable, a teenager in the higher category has odds of using contraception that tend to be 1.87 times the odds of a
teenager in the lower category. In the white subsample, the effect of EDEXPECT was found to be statistically nonsignificant.

In the black subsample, the effect of TKCHANCE was found to be statistically significant (with a level of significance that was <.050), substantial in magnitude, and negative in direction (with an odds ratio of .30). The interpretation given these results was that, for a black teenager inclined to take chances, the odds of ever using contraception tend to be .30 times the odds for a black teenager not inclined to take chances. In the white subsample, the effect of TKCHANCE was found to be statistically nonsignificant.

In the black subsample, the effect of SIDEFFEC was found to be statistically significant (with a level of significance that was <.025), substantial in magnitude, and negative in direction (with an odds ratio of .47). The interpretation given these results was that, among black teenagers in adjacent categories on the disagreeableness-of-side-effects-of-more-effective methods variable, a teenager in the higher category has odds of using contraception that tend to be .47 times the odds of a teenager in the lower category. In the white subsample, the effect of SIDEFFEC was found to be statistically nonsignificant.
The effects of THOT4FUT, NUMMETHD, KNOWHOW, and ACCESS were each found to be statistically nonsignificant in both the black and white subsamples.

The results of the exploratory analyses for the nonuse-or-use submodel, then, are summarized as follows: (a) The effect of EDEXPECT was significant, substantial, and positive in the black subsample but nonsignificant in the white subsample; (b) the effects of TKCHANCE and SIDEFFEC were each significant, substantial, and negative in the black subsample but nonsignificant in the white subsample; (c) the effects of THOT4FUT, NUMMETHD, KNOWHOW, and ACCESS were each nonsignificant in both subsamples. Thus, among the seven independent variables in the submodel, the effects of three, EDEXPECT, TKCHANCE, and SIDEFFEC, were each found to differ between the black and white subsamples while the effects of four, THOT4FUT, NUMMETHD, KNOWHOW, and ACCESS, were each found to be the same in both subsamples.

Results for the Sometimes-or-Always Submodel

Table 11 shows that, in the submodel's application to the black subsample, the effect of TKCHANCE was found to be statistically significant (with a level of significance that was <.050), substantial in magnitude, and negative in direction (with an odds ratio of .31). The interpretation given these results was that, among black
Table 11

For the Black and White Subsamples: Results of Logistic Regression Applied to the Sometimes-or-Always Submodel

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Black Subsample</th>
<th>White Subsample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Sig.</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>EDEXPECT</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>THOT4FUT</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>TKCHANCE</td>
<td>&lt;.050</td>
<td>.31</td>
</tr>
<tr>
<td>NUMMETHD</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>SIDEFPEC</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>ACCESS</td>
<td>NS</td>
<td>--</td>
</tr>
</tbody>
</table>

Control Variables

<table>
<thead>
<tr>
<th></th>
<th>Black Subsample</th>
<th>White Subsample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Sig.</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>AGE</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>FAMINCOM</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>EDFMRASR</td>
<td>NS</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: NS = Not significant.

contraceptive-using teenagers, a teenager inclined to take chances has odds of always using contraception that tend to be .31 times the odds for a teenager not inclined to take chances. In the white subsample, the effect of TKCHANCE was found to be statistically nonsignificant.
In the white subsample, the effect of ACCESS was found to be statistically significant (with a level of significance that was <.005), substantial in magnitude, and positive in direction (with an odds ratio of 2.05). The interpretation given these results was that, among white teenagers in adjacent categories of the access-to-more-effective-contraception variable, a teenager in the higher category has odds of always using contraception that tend to be 2.05 times the odds for a teenager in the lower category. In the black subsample, the effect of ACCESS was found to be statistically nonsignificant.

The effects of EDEXPECT, THOT4FUT, NUMMETHD, SIDEFFEC, and KNOWHOW were each found to be statistically nonsignificant in both the black and white subsamples.

The results of the exploratory analyses for the sometimes-or-always submodel, then, are summarized as follows: (a) The effect of TKCHANCE was significant, substantial, and negative in the black subsample but nonsignificant in the white subsample; (b) the effect of ACCESS was significant, substantial, and positive in the white subsample but nonsignificant in the black subsample; (c) the effects of EDEXPECT, THOT4FUT, NUMMETHD, SIDEFFEC, and KNOWHOW were each nonsignificant in both subsamples. Thus, among the seven independent variables in the submodel,
the effects of two, TKCHANCE and ACCESS, were each found to differ between the black and white subsamples while the effects of five, EDEXPET, TH0T4FUT, NUMMETHD, SIDEFPEC, and KNOWHOW, were each found to be the same in both subsamples.

The Medical-or-Nonmedical Model.

Table 12 displays the results of the logistic regression analyses of the medical-or-nonmedical model, with the model applied to the black and white subsamples. The table is organized in the same way as Tables 10 and 11.

In the black subsample, the effect of ACCESS was found to be statistically significant (with a level of significance that was <.005), substantial in magnitude, and positive in direction (with an odds ratio of 1.89). The interpretation given these results was that, among black contraceptive-using teenagers in adjacent categories of the access-to-medical-methods variable, a teenager in the higher category has odds of always using contraception that tend to be 1.89 times the odds for a teenager in the lower category.

In the white subsample, the effect of ACCESS was found to be statistically nonsignificant.

The effect of MEDNTO}P3 was found to have (a) a statistical significance of <.005 in both subsamples, (b) an odds ratio of 2.48 in the black subsample, and (c) an odds ratio of 2.34 in the white subsample. The interpretation
Table 12

For the Black and White Subsamples: Results of Logistic Regression Applied to the Medical-or-Nonmedical Model

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Black Subsample</th>
<th>White Subsample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level of Sig.</td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>MEDNTOP3</td>
<td>&lt;.005</td>
<td>2.48</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>NS</td>
<td>--</td>
</tr>
<tr>
<td>ACCESS</td>
<td>&lt;.005</td>
<td>1.89</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
</tr>
<tr>
<td>UNWEDBIR</td>
</tr>
<tr>
<td>RELOSITY</td>
</tr>
</tbody>
</table>

Note: NS = Not significant

given these results was the following: Among contraceptive-using teenagers in adjacent categories of the variable that measures the number of medical methods a subject included in the methods she perceived as the three most effective, (a) a black teenager in the higher category has odds of always using contraception that tend to be 2.48 times the odds for a black teenager in the lower category, and (b) a white teenager in the higher category has odds of always using
contraception that tend to be 2.34 times the odds for a white teenager in the lower category.

The effects of SIDEFFEC and KNOWHOW are nonsignificant in both subsamples.

The results of the exploratory analyses for the medical-or-nonmedical model, then, are summarized as follows: (a) The effect of ACCESS was significant, substantial, and positive in the black subsample but nonsignificant in the white subsample; (b) the effect of MEDNTOP3 was significant, substantial, and positive in both subsamples; (c) the effects of SIDEFFEC and KNOWHOW were each nonsignificant in both subsamples. Thus, among the four independent variables in the model, the effects of ACCESS were found to differ between the black and white subsamples, and the effects of the variables MEDNTOP3, SIDEFFEC, and KNOWHOW were each found to be the same in both subsamples.
CHAPTER VII

DISCUSSION AND CONCLUSIONS

The primary purpose of this study was to test two models of teenage contraceptive choice that were based on a pregnancy-prevention strategy advocated by Joy G. Dryfoos (1984), the likelihood-of-use model and the medical-or-nonmedical model. A secondary purpose was to explore the extent to which the effects of the independent variables in each of the models differ for black and white teenagers.

This chapter presents the following: (a) implications drawn from the tests of the models; (b) implications drawn from the exploratory analyses; (c) limitations in the data used in the study and their possible consequences; and (d) an assessment of the study in relation to ongoing research on contraceptive choice among American teenage women.

Implications of Tests of the Models

The tests produced two types of findings for each model: The first type consisted of the findings from the test of the model as a whole, including (a) whether the effects of the independent variables, taken together, were statistically significant and (b) the model's goodness of
fit; the second type consisted of the findings from the tests of the individual hypotheses constituting the model.

In the test of each model as a whole, the effects of the model's independent variables, in combination, were found to be statistically significant; the goodness of fit of the likelihood-of-use model was estimated to fall in a range between .075 and .082; the goodness of fit of the medical-or-nonmedical model was estimated to be .113. These findings imply that each of the models does explain some of the variation in the contraceptive-choice behavior it attempts to explain, but the amount it explains is small.

Two types of implications were drawn from the tests of the individual hypotheses constituting each model: (a) implications for the theory underlying each model and (b) implications for implementation of the Dryfoos strategy.

**The Likelihood-of-Use Model**

In the tests of the seven hypotheses constituting the likelihood-of-use model, the hypothesis whose independent variable was TKCHANCE (inclination to take chances) was found to be fully supported. The hypothesis whose independent variable was ACCESS (access to more effective contraception) was found to be partially supported. The other five hypotheses were each found to be unsupported; their independent variables were EDEXPECT (educational expectations), THOT4FUT (thoughtfulness for the future), NUMMETHOD (number of methods aware of), SIDEFFEC (perceived
disagreeableness of side effects of the more effective methods), and KNOWHOW (knowledge of how to obtain the more effective methods).

Implications for the Underlying Theory

The theory underlying the likelihood-of-use model is shown in Figure 5 (page 50). Figure 5 presents the chains of relationships whose analyses produced the hypotheses that constitute the model.

Figure 9 (a modification of Figure 5) illustrates the extent to which the test of the likelihood-of-use model supported the theory underlying the model. In Figure 9, the variables in relationships which were supported by test results are shown in boxes. Relationships which were fully supported are represented by double-line arrows. Relationships which were partially supported by test results are represented by single-line arrows. The variables in relationships which test results did not support are shown without boxes and those relationships are represented by dash-line arrows.

The support found for the hypothesis whose independent variable was TKCHANCE constituted support for the chain of relationships shown in Figure 9 between TKCHANCE and the dependent variable, likelihood of using contraception: from TKCHANCE to the perceived threat of pregnancy, to the perceived benefit of each alternative, to the net utility of
Figure 9

Implications of Test Results for the Theory Underlying the Likelihood-of-Use Model

<table>
<thead>
<tr>
<th>Exogenous Variables</th>
<th>Intervening Variables</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEXPECT</td>
<td>Perceived disagreeableness of consequences of pregnancy</td>
<td>Perceived threat of pregnancy</td>
</tr>
<tr>
<td>THOT4FUT</td>
<td></td>
<td>Perceived benefit of each alternative</td>
</tr>
<tr>
<td>TKCHANCE</td>
<td></td>
<td>Net utility of each alternative: its perceived benefit minus its perceived cost</td>
</tr>
<tr>
<td>NUMMETHD</td>
<td>Perceived effectiveness of each alternative</td>
<td>Extent to which maximum net utility exceeds zero</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td></td>
<td>Perceived cost of each alternative</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCESS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend
a. → = relationship fully supported by test results.
b. → = relationship not supported by test results.
c. → = relationship partially supported (supported only in the sometimes-or always submodel).
each alternative, to the extent to which maximum net utility exceeds zero, to the likelihood of using contraception.

The partial support found for the hypothesis whose independent variable was ACCESS constituted partial support for the relationships shown in Figure 9 between ACCESS and the likelihood-of-using-contraception variable: from ACCESS to the perceived cost of each alternative, to the net utility of each alternative, to the extent to which maximum net utility exceeds zero, to the likelihood of using contraception.\(^1\)

With no support found for the hypotheses whose independent variables were EDEXPECT, THOT4FUT, NUMMETHD, SIDEFFEC, and KNOWHOW, test results failed to support the remaining links in the original chains of relationships: the links from EDEXPECT and THOT4FUT to perceived disagreeableness of consequence of pregnancy, to perceived threat of pregnancy; from NUMMETHD to perceived effectiveness of each alternative, to perceived benefit of each alternative; and from SIDEFFEC and KNOWHOW to perceived cost of each alternative.

In summary, then, test results supported a very limited portion of the theory underlying the likelihood-of-use model.

\(^1\) The last two links in this chain of relationships are shown in Figure 9 as fully supported because of the finding of full support for the hypothesis whose independent variable was TKCHANCE.
Implications for the Dryfoos Strategy

The Dryfoos strategy consists of three types of programs: life options programs, education programs, and access-to-contraception programs (Dryfoos, 1984). The variable TKCHANCE (inclination to take chances) is able to be addressed by education programs, and ACCESS (access to the more effective methods) is able to be addressed by access-to-contraception programs. The findings of the test of the likelihood-of-use model, then, support implementation of the following features of the Dryfoos strategy in efforts to increase among sexually active teenagers the likelihood of using contraception: (a) the use of educational programs to reduce the inclination among teenagers to take chances, and (b) the use of access-to-contraception programs to increase teenagers' access to the more effective contraceptive methods.

Medical-or-Nonmedical Model

In the test of the four hypotheses constituting the medical-or-nonmedical model, three of the hypotheses were found to be fully supported: those whose independent variables were MEDNTOP3 (number of medical methods among three methods perceived as most effective), KNOWHOW (knowledge of how to obtain medical methods), and ACCESS (access to medical methods). The fourth, whose independent variable was SIDEFFEC (perceived disagreeableness of side effects of medical methods), was found to be unsupported.
Implications for the Underlying Theory

The theory underlying the medical-or-nonmedical model is shown in Figure 7 (page 65). Figure 7 presents the chains of relationships whose analyses produced the hypotheses that constitute the medical-or-nonmedical model.

Figure 10 (a modification of Figure 7) illustrates the extent to which the test of the medical-or-nonmedical model supported the theory underlying the model. In Figure 10, the variables in relationships which the test supported are shown in boxes, and the supported relationships are represented by solid-line arrows. One relationship in the model was not supported by test results; the independent variable in that relationship, SIDEFPEC, is shown without a box, and the relationship is represented by a dash-line arrow.

The support found for the hypothesis whose independent variable was MEDNTOP3 supported the relationships shown in Figure 10 between MEDNTOP3 and the dependent variable, whether medical method is likely to be used: from MEDNTOP3 to perceived effectiveness of each alternative, to perceived benefit of each alternative, to net utility of each alternative, to whether method with maximum net utility is a medical method, to whether medical method is likely to be used. The support found for the hypotheses whose independent variables were KNOWHOW and ACCESS supported the relationships between these independent variables and the
Figure 10

Implications of Test Results for the Theory Underlying the Medical-or-Medical-or-Nonmedical Model

<table>
<thead>
<tr>
<th>Exogenous Variables</th>
<th>Intervening Variables</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDNTOP3</td>
<td>Perceived effectiveness of each alternative</td>
<td>Whether medical method is likely to be used</td>
</tr>
<tr>
<td>SIDEFFEC</td>
<td>Perceived benefit of each alternative</td>
<td>Net utility of each alternative: its perceived benefit minus its perceived cost</td>
</tr>
<tr>
<td>KNOWHOW</td>
<td>Perceived cost of each alternative</td>
<td>Whether method with maximum net utility is a medical method</td>
</tr>
<tr>
<td>ACCESS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend

a. = relationship supported by test results.
b. = relationship not supported by test results.

dependent variable: from KNOWHOW and ACCESS to perceived cost of each alternative, to net utility of each alternative, to whether method with maximum net utility is a medical method, to whether medical method is likely to be
used. The failure of test results to support the hypothesis whose independent variable was SIDEFFEC indicated that no support was available for the relationship between SIDEFFEC and perceived cost of each alternative.

Test results, then, supported all elements of the theory underlying the medical-or-nonmedical model except the relationship between SIDEFFEC and the perceived-cost-of-each-alternative variable.

Although a social-psychological approach was taken in examining the two aspects of teenage contraceptive choice on which the study focused, several other perspectives also lend themselves to explanations of the contraceptive choices teenagers make. For example, from a social structural perspective, one may suggest that the variable TKCHANCE constitutes a dimension of risk-taking among adolescents. Further, it may be argued that the extent to which contraception is acceptable, accessible, and available to teenagers may be influenced by social and economic factors. This perspective was applied to a limited degree in the study's exploration of the extent to which the effects of the independent variables in the likelihood-of-use model and the medical-or-nonmedical model differ between black and white teenagers.

Implications for the Dryfoos Strategy

The variable MEDNTOP3 (number of medical methods among the three methods perceived as most effective) was used as a
measure of the extent to which subjects possessed knowledge of the effectiveness of contraceptive methods. Thus, MEDNTOP3 and KNOWHOW (knowledge of how to obtain medical methods) are able to be addressed by educational programs in the Dryfoos strategy. ACCESS (access to medical methods) is able to be addressed by access-to-contraception programs. The findings of the test of the medical-or-nonmedical model, then, support implementation of the following features of the Dryfoos strategy in efforts to increase the use of medical methods among contraceptive-using teenagers: (a) the use of education programs to increase teenagers' knowledge of the effectiveness of contraceptive methods and knowledge of how to obtain medical methods of contraception, and (b) the use of access-to-contraception programs to increase teenagers' access to medical methods.

Implications of Exploratory Analyses

The exploratory analyses were performed to investigate the extent to which the effects of the independent variables in the likelihood-of-use model and in the medical-or-nonmedical model differ between black and white teenagers. The investigation was carried out for the medical-or-nonmedical model by using logistic regression to determine whether the findings on the effect of each independent variable were the same when the model was applied to the black subsample as when the model was applied to the white subsample. The investigation of the likelihood-of-use model
was accomplished by conducting the same kind of investigation that was carried out for the medical-or-nonmedical model for each of the model's submodels, the nonuse-or-use submodel and the sometimes-or-always submodel.

The Nonuse-or-Use Submodel

The investigation of the seven independent variables in the nonuse-or-use submodel produced the following findings: (a) The effects of the independent variables EDEXPECT, TKCHANCE, and SIDEFFEC were each significant in the submodel's application to the black subsample but nonsignificant in its application to the white subsample; (b) the effects of the four remaining independent variables, THOT4FUT, NUMMETHD, KNOWHOW, and ACCESS, were each nonsignificant in both subsamples. These findings suggest that, in future studies concerned with the extent to which Dryfoos-strategy factors may cause teenage nonusers of contraception to become users, it may be useful (a) to investigate the effects of those factors among black teenagers separately from the effects of the factors among white teenagers and (b) in particular, to test the observed difference in the responsiveness of black and white teenagers to the independent variables of EDEXPECT, TKCHANCE, and SIDEFFEC.

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2 The results of the exploratory analyses referenced in this section appear in Table 8 on page 119.
The Sometimes-or-Always Submodel

The investigation of the seven independent variables in the sometimes-or-always submodel produced the following findings: (a) The effect of the independent variable TKCHANCE was significant in the submodel's application to the black subsample but nonsignificant in its application to the white subsample; (b) the effect of the independent variable ACCESS was significant in the submodel's application to the white subsample but nonsignificant in its application to the black subsample; (c) the effects of the five remaining independent variables, EDEXPACT, THOT4FUT, NUMMETHD, SIDEFFEC, and KNOWHOW, were each nonsignificant in both subsamples. These findings suggest that, in future studies concerned with the extent to which Dryfoos-strategy factors may cause teenagers who are sometimes users of contraception to become always users, it may be useful (a) to investigate the effects of those factors among black teenagers separately from the effects of the factors among white teenagers and (b) in particular, to test the observed difference in the responsiveness of black and white teenagers to the independent variables of TKCHANCE and ACCESS.

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The results of the exploratory analyses referenced in this section appear in Table 9 on page 122.
The Medical-or-Nonmedical Model

The investigation of the four independent variables in the medical-or-nonmedical model produced the following findings: (a) The effect of the independent variable MEDNTOP3 was significant in the submodel's application to both the black subsample and the white subsample; (b) the effect of the independent variable ACCESS was significant in the submodel's application to the black subsample but nonsignificant in its application to the white subsample; and (c) the effects of the independent variables SIDEFFEC and KNOWHOW were nonsignificant in both subsamples. These findings suggest that, in future studies concerned with the extent to which Dryfoos-strategy factors may cause teenagers who are users of nonmedical methods of contraception to become users of medical methods, it may be useful (a) to investigate the effects of those factors among black teenagers separately from the effects of the factors among white teenagers and (b) in particular, to test the observed difference in the responsiveness of black and white teenagers to the independent variable ACCESS.

Application of the Models to Black Teenagers

Each of the exploratory analyses, then, suggest that it may be advisable to investigate the models' applications to black and white teenagers separately. Investigation of the

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4 The results of the exploratory analysis referenced in this section appear in Table 10 on page 124.
models' applications to black teenagers may be guided in part by considering three characteristics of black teenagers, each of which is either not possessed by white teenagers or possessed to a lesser degree.

One characteristic, recognized as markedly less prevalent among whites than blacks, is a tendency to live in poverty (see the item headed "Distributions by Family Income" in Table 5, page 109.) A second characteristic of black teenagers, one not possessed by whites, is racism's exacerbation of the depressing effects of poverty on educational and occupational expectations, and thus on contraceptive choice. Chilman (1983) says in this regard:

> Research reveals that poverty status often breeds attitudes of fatalism, powerlessness, alienation, and a sense of personal incompetence and hopelessness in respect to striving for high educational and occupational goals. This is especially apt to be true when racism combined with poverty reduces one's life chances . . . . [T]hese attitudes are also associated with failure to use effective contraceptives (p. 110).

A third characteristic, as expressed by Hogan in Wilson (1987), is that, among black teenagers, "single motherhood is not sufficiently 'unwanted'". Consistent with Hogan's observation, Moore, Simms, and Betsey (1986) note that
blacks tend to hold more tolerant attitudes toward early and out-of-wedlock childbearing; they cite as evidence that (a) a substantial proportion of blacks express a preferred age for childbearing that precedes a preferred age for marriage and (b) black teenagers are less likely to perceive strong condemnation for unwed childbearing in their own neighborhood than are white teenagers. Dash (1990) suggests that acceptance of unwed childbearing among low-income American blacks may be a cultural legacy from the time when most American blacks were poor Southern sharecroppers; at that time, the family was an economic unit, children were looked on as economic assets, and an unmarried young woman's demonstrated fertility elevated her marriageability in the community.

In investigating the models' applications to black teenagers, then, it would seem advisable to consider poverty, perceptions of racism, and culturally conditioned attitudes toward unwed childbearing as factors that may influence their contraceptive choices. Taking such factors into account may indicate ways in which pregnancy prevention programs should be tailored to the pregnancy-prevention needs of black teenagers.

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See "Distributions by Attitude Toward Unwed Childbearing" in Table 5 (page 109) for a related finding.
Limitations in the Data

The data used in the study were limited in two ways: (a) by the extent to which the variables used in the study were deficient in their measurements, and (b) by the extent to which the data did not make available variables which, had they been included in the models, would have allowed the models to represent more elaborate versions of their theories.

Measurements of Variables

The measurements of four variables that were used as independent variables in the models were each deficient in some respect: The measurement of ACCESS was lacking in precision; the measurement of NUMMETHD was lacking in face validity; and the measurements of SIDEFFEC and KNOWHOW were each lacking in content validity.6

A subject's ACCESS to medical methods was conceptualized as the extent to which family planning services were available to teenagers in a geographical area in which the subject lived. It was measured as the number of family planning clinics in the area per thousand teenagers estimated to be at risk of unintended pregnancy. However, the only area of residence given for each respondent in the NSYW survey was her census region. Thus, the area used in each measurement of ACCESS was one of nine

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6 See Babbie, 1986, pp. 107-114, on criteria for measurement quality.
census regions into which the 48 contiguous states were divided (see page 78). With a region including as many as eight states, the measurement of a subject's ACCESS was very imprecise; a more precise measure would have been one in which the area of residence was a single state or, better yet, an SMSA.

The variable NUMMETHD arose from a concern for measuring a subject's knowledge of the effectiveness of contraceptive methods. Such knowledge was seen as measurable along two dimensions: (a) the number of methods of which aware and (b) knowledge of the effectiveness of the methods of which aware. The NSYW data lacked the means for measuring the second dimension; this limited measurement to the concept represented by NUMMETHD: the number of methods of which a subject was aware. NUMMETHD, then, is lacking in face validity because it is not a strict measurement of a subject's knowledge of the effectiveness of contraceptive methods.

Each of the variables SIDEFFEC and KNOWHOW was originally conceptualized as a teenager characteristic related to the three medical methods collectively: the diaphragm, the IUD, and the pill. SIDEFFEC resulted from a concern for the extent to which subjects perceived that the three methods produce disagreeable side effects; KNOWHOW was prompted by a concern for the extent to which subjects possessed knowledge as to how the three methods are
obtained. Limitations in the data, however, required that each of the variables be operationalized with data pertaining to only one of the three methods (see footnotes on pages 77 and 78). SIDEFPEC is a measure of the extent to which a subject agrees with a statement about the harmful effects of using a diaphragm. KNOWHOW is a measure of whether a subject knows how birth control pills are obtained. Thus, as a measure of a teenager characteristic related to the three medical methods collectively, SIDEFPEC and KNOWHOW each lack content validity.

Omissions of Variables.

The NSYW data did not include five variables which could have served as independent variables in the models; four of the variables could have been added to the medical-or-nonmedical model; all five could have been added to the likelihood-of-use model. The variables represent teenager characteristics suitable to be addressed by the three types of programs that make up the Dryfoos strategy: life options programs, educational programs, and access-to-contraception programs.

The purpose of life options programs is to elevate teenagers' expectations for the future. The variable EDEXPECT was specified as a teenager characteristic which such programs are designed to target. Another future-defining characteristic which could have been an independent
variable in the likelihood-of-use model, but for which the NSYW survey failed to provide data, was occupational expectations (Dryfoos, 1984).

The purpose of educational programs is to provide knowledge and engender attitudes which teenagers need to prevent pregnancy. The variables of TKCHANCE, NUMMETHOD, MEDINTOP3, SIDEFFEC, and KNOWHOW each represent a teenager characteristic thought to be susceptible to alteration by an educational experience and to affect the contraceptive choices of sexually active teenagers. Knowledge of the risk of pregnancy with unprotected intercourse is another such characteristic (Arnett, 1990; Kalmuss, 1986; Kantner & Zelnik, 1973; Gerrard, McCann, & Fortini, 1983), but data for it were not included in the NSYW.

Teenagers' access to contraception has been conceptualized as having four dimensions: availability (the ratio of contraceptive-service units to potential clients), affordability, convenience, and confidentiality (Moore & Burt, 1982, cited in Moore et al., 1986). The data that were used in the study were able to represent only availability. Thus, three of the four dimensions of access to contraception were omitted from the study.
Possible Consequences

Inadequate measurements and omissions of variables may have had two kinds of consequences in the study: (a) Inadequate measurements may have caused the effects of individual independent variables which otherwise would have been statistically significant to be found nonsignificant; (b) inadequate measurements and the omission of variables may have caused each model's goodness of fit (its $R^2_i$) to be less than it would have been otherwise.

Kerlinger (1979) observes that, if the relationship between two variables is statistically significant, and if the measurement of one of the variables is deficient, an analysis is likely to understate the statistical significance of the relationship. Thus, the effects of some of the independent variables which were found to be statistically nonsignificant might have been significant if they had been measured more adequately.

A model's goodness of fit is a measure of the model's ability to reduce prediction error. Because deficient measurements among the models' independent variables may have diminished each model's ability to make predictions, the deficient measurements may have diminished the goodness of fit of each model.

Each independent variable added to a model increases its goodness of fit (Lewis-Beck, 1990); conversely, then,
the omission of each independent variable theoretically qualified for inclusion in a model produces a goodness of fit for the model that is less than it would be otherwise. Thus, the omission of the previously mentioned variables from the models may have diminished each model's goodness of fit.

A Question on the Age of the Data

The data used in the study were obtained from a survey conducted in 1979 (Zelnik & Kantner, 1985). As a result, a question may arise as to whether the data are too old to be used in the study.

If the question is prompted by descriptive changes thought to have occurred in the data--changes in the distributions of cases on individual variables--the question may be answered by an observation made by Hakim (1982). The observation is that satisfactory performance of a descriptive analysis may require the use of data collected at a relatively recent time, while an explanatory analysis--the kind conducted in the study reported here--may satisfactorily be performed using much older data. Hakim's remarks include the following.

Research that is primarily theoretical, concerned with elucidating causal relationships and explanation of social phenomena, is not time-specific in the same way as research geared to descriptive accounts of how society is functioning 'today'. Thus theoretical
research, and some types of policy research, do not necessarily have to be based on very recent data; they can well be based on secondary analysis of older data . . . . Secondary analysts who have confronted the question of time as a variable in social research with some sophistication have found that a lot of the data in archives are entirely appropriate to their needs, even if such data tend to be regarded by scholars who have done primary analysis as historic in their antiquity (pp. 10-11).

It is reasonable to expect that, if a survey comparable to the 1979 survey were made today, the data produced by the survey would differ in certain respects from those produced by the 1979 survey: For many of the variables, the cases in today's survey would very likely be distributed in patterns that differ substantially from the corresponding patterns found in the 1979 survey. Such patterns constitute what Hakim refers to as "descriptive accounts of how society is functioning" at the time their respective data are collected.

However, the study reported here was not descriptive in character; its purpose was to determine the extent to which the data offered support for the hypothesized relationships that constituted each model. If a relationship exists between two variables, a change can occur in the distribution of cases on each variable without causing any
substantial change in the relationship between the variables. Consider, for example, a community in which, at one point in time, most teenagers have low access to contraceptive services and a positive relationship exists between the teenagers' access to contraceptive services and their use of contraception. If, then, at a later point in time, most teenagers in the community are observed to have high access to contraceptive services, a substantial descriptive change may be said to have occurred. At that later time, however, a positive relationship of roughly the same magnitude may still exist between the teenagers' access to contraception and their use of contraceptive services.

One may acknowledge the distinction Hakim makes between descriptive and explanatory analyses, however, and still ask whether the 1979 data are too old to be used in the explanatory analyses that were part of the study reported here. That question may be answered by determining whether pertinent relationships that were supported in the literature in 1979 are still supported in the literature of the 1990s. If so, it would indicate that the data are not too old to be used in the study.

Evidence that pertinent relationships supported in 1979 are still supported in the 1990s is presented in Table 13. The table lists the seven hypotheses constituting the
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Support in 1979 or Before</th>
<th>Support in 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The more elevated a teenager's educational expectations, the more likely she is to use contraception.</td>
<td>Chilman, 1979.</td>
<td>Miller and Moore, 1990.</td>
</tr>
<tr>
<td>2. The greater a teenager's thoughtfulness for the future, the more likely she is to use contraception.</td>
<td>Cobliner et al., 1975; Kar, 1971; Clifford, 1971.</td>
<td>(Reference not found)</td>
</tr>
<tr>
<td>3. The more inclined a teenager is to take chances, the less likely she is to use contraception.</td>
<td>Chilman, 1979.</td>
<td>Arnett, 1990.</td>
</tr>
<tr>
<td>4. The greater the number of contraceptive methods a teenager is aware of, the more likely she is to use contraception.</td>
<td>Shipley, 1974 (cited in Kirby, 1980). (indirect support)</td>
<td>Eisen et al., 1990.</td>
</tr>
<tr>
<td>5. The more disagreeable a teenager perceives the side effects of the more effective methods to be, the less likely she is to use contraception.</td>
<td>Chilman, 1979.</td>
<td>Miller and Moore, 1990.</td>
</tr>
<tr>
<td>6. The better a teenager's knowledge of how to obtain the more effective contraceptive methods, the more likely she is to use contraception.</td>
<td>Chilman, 1979.</td>
<td>Miller and Moore, 1990.</td>
</tr>
<tr>
<td>7. The greater a teenager's access to the more effective methods, the more likely she is to use contraception.</td>
<td>Chilman, 1979.</td>
<td>Miller and Moore, 1990.</td>
</tr>
</tbody>
</table>
likelihood-of-use model and, with one exception, gives the following for each: (a) a supportive reference either to a 1979 review by Chilman of research on teenage pregnancy or to one or more studies reported before 1979, and (b) a supportive reference either to a 1990 review by Miller and Moore of research on teenage contraceptive use or to a study reported in 1990. The single exception is that no supportive reference dated around 1990 was found for the second hypothesis in the table, that a teenager's thoughtfulness for the future affects the likelihood of her using contraception.

An Assessment of the Study

Miller and Moore (1990) in a review of 1980s research on adolescent sexual behavior, pregnancy, and parenting, conclude a section on contraception and pregnancy with the following observation: "There is great need for studies of how, where, and when which types of education or services will encourage teenagers . . . to initiate contraception simultaneously with sexual intercourse and to use contraception consistently and correctly thereafter." The study reported here is seen as responsive to the need specified by Miller and Moore in four ways.

First, a recognized theoretical perspective, value-expectancy theory, was combined with the conceptual framework underlying the prevailing teenage pregnancy
prevention strategy, the Dryfoos strategy, to produce a theoretical model of the effectiveness of the contraceptive alternative a teenager is likely to choose. This model is referred to as the effectiveness-of-contraception model (see Figure 4, page 42). Development of the effectiveness-of-contraception model constitutes a contribution toward the specification of a theoretical basis for investigating how the Dryfoos strategy affects teenagers' contraceptive choices. It may also serve as a point of departure for specifying other models useful in such investigations.

Second, from the effectiveness-of-contraception model, two other models were developed, the likelihood-of-use model (see Figure 6, page 60) and the medical-or-nonmedical model (see Figure 8, page 71); these models correspond, respectively, to the two major dimensions of contraceptive effectiveness: consistency of use and effectiveness of method.\(^7\) The likelihood-of-use model and the medical-or-nonmedical model may be used in future research to replicate the tests of the models that were conducted in this study. Also, each of these models may be modified to investigate a revised version of its underlying theory, as the foregoing discussion of the NSYW data's failure to include potentially useful variables suggests.

\(^7\) See page 97 of Voydanoff and Donnelly (1990) for remarks that suggest these two dimensions.
Third, the likelihood-of-use and medical-or-nonmedical models were each tested using a national-level, probability-sample survey, the 1979 NSYW. The test of each model as a whole indicated that it does explain some of the variation it attempts to explain, but the amount it explains is small. Tests of the hypotheses in the likelihood-of-use model indicated that, of the seven hypotheses constituting the model, one was fully supported and one was partially supported. Tests of the hypotheses in the medical-or-nonmedical model indicated that, of the four hypotheses constituting the model, three were fully supported.

Fourth, the extent to which the effects of the independent variables in each of these two models differed between black and white teenagers was explored. The results indicated that there were substantial differences between black and white teenagers in the effects of the Dryfoos-strategy factors; thus, in future research, it may be useful to investigate the effects of the factors among black and white teenagers separately.
APPENDIX A

COUNTRIES INCLUDED IN INTERNATIONAL STUDIES OF TEENAGE PREGNANCY
Countries Included in International Studies of Teenage Pregnancy

1. **Countries Included in 31-Country Study**

   Australia, Austria, Belgium, Canada, Czechoslovakia, Denmark, East Germany, England, Finland, France, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, the United States, Yugoslavia, West Germany.

2. **Countries Included in 37-Country Study**

   Australia, Austria, Belgium, Canada, Chile, Cuba, Czechoslovakia, Denmark, the Federal Republic of Germany, Finland, France, the German Democratic Republic, England and Wales, Greece, Hong Kong, Hungary, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, Poland, Portugal, Puerto Rico, Romania, Scotland, Singapore, Spain, Sweden, Switzerland, Taiwan, the USSR, the United States, Yugoslavia.

3. **Countries Included in the 13-Country Study**

   Canada, Czechoslovakia, Denmark, England and Wales, Finland, France, Hungary, the Netherlands, New Zealand, Norway, Scotland, Sweden, the United States.
APPENDIX B

THE HEALTH BELIEF MODEL AS AN ADAPTATION

OF VALUE-EXPECTANCY THEORY
The Health Belief Model as an Adaptation of Value-Expectancy Theory

In its original formulation, the Health Belief Model (HBM) was intended to explain decisions by individuals to take or not take a particular preventive health action in response to the threat posed by the possibility of contracting a particular disease (Rosenstock, 1966, 1974a, 1974b).

According to Irwin R. Rosenstock (1966, 1974a, 1974b), one of the group of Public Health Service investigators whose work produced the HBM (Rosenstock, 1974b), the theory on which the HBM is based grew out of the social psychology of Kurt Lewin (1935, 1951). As mentioned, Maiman and Becker (1974) identify the theory as value-expectancy theory.

The following discussion of the HBM as an adaptation of value-expectancy theory begins with a brief outline of the HBM's major features and then specifies particulars involved in the adaptation.

A Description of the HBM

A diagram of the HBM is shown in Figure 11. The HBM's dependent variable is the likelihood of an individual's taking a preventive health action prescribed in response to the threat of a particular disease (Becker et al., 1974; Rosenstock, 1974b); that likelihood is determined by the perceived benefit of the action in question minus the action's perceived cost (Becker et al., 1974; Rosenstock,
The perceived benefit of a preventive health action is the reduction it is able to effect in the threat posed by the disease in question (Becker, 1979; Maiman & Becker, 1974). Thus, the perceived benefit of a health action has
two dimensions: (a) the extent to which the disease in question is perceived to pose a threat and (b) the perceived efficacy of the action in question in reducing that threat. The greater the threat, the greater the benefit; the greater the efficacy of the action, the greater the benefit. The threat posed by a disease also has two dimensions: (a) the perceived seriousness of the consequences of the disease and (b) the perceived probability of the individual's contracting the disease (Becker, 1979; Maiman & Becker, 1974). A health action, then, may reduce the threat posed by a disease in either or both of two ways: by reducing the seriousness of the consequences of the disease and/or by reducing the probability of the individual's contracting the disease (Maiman & Becker, 1974). Accordingly, the perceived benefit of a health action is evaluated by multiplying the threat posed by the disease in question by two factors: (a) by the perceived effectiveness of the action in reducing the seriousness of the consequences of the disease and (b) by the perceived effectiveness of the action in reducing the probability of the individual's contracting the disease.

The perceived cost of a health action is the sum of whatever costs are perceived to be incurred in taking the action. The nature of such costs can vary widely: Rosenstock (1966) observes that the negative aspects of a health action may be "inconvenient, expensive, unpleasant, painful, or upsetting" (p. 100); Becker (1979) categorizes
costs as "physical, psychological, financial, and other types" (p. 255); Maiman & Becker (1974) say that costs may also include "the 'work' involved in taking action" (p. 349).

The HBM as An Adaptation of Value-Expectancy Theory

When value-expectancy theory (as outlined in Chapter III) is viewed in relation to the HBM, it may be postulated that the HBM was produced by making the following modifications to the theory:

1. Instead of an individual's making a choice from among several alternative goal-actions, the individual makes a choice between only two options: taking or not taking a preventive health action.

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1 Some versions of the HBM have also included a factor labeled a "cue to action," an experience that causes an individual to become consciously aware that a disease poses a threat, and thus prompts the individual to consider action to counter the threat (see Maiman and Becker, 1974). Other versions of the HBM have included a set of "modifying" factors which do not themselves define the determinants of health behavior--perceived cost and perceived benefit--but do operate to influence those determinants (see Katatsky, 1977; Nathanson & Becker, 1983). Still other versions have included both the cue-to-action factor and the set of modifying factors (see Becker, 1979; Becker et al., 1974; Rosenstock, 1974b). The cue-to-action factor and the set of modifying factors are not included in the HBM as described here because, while they may affect the cost and benefit factors in the HBM, they do not serve as defining dimensions of those factors.
2. The assumption that a goal-action has a possible successful outcome to which the individual assigns a perceived value (its success-value) is replaced by the assumption that a preventive health action has a possible successful outcome which the individual evaluates as the negation of the threat posed by the disease in question; the threat posed by the disease is conceptualized as the value assigned the perceived seriousness of the consequences of the disease, multiplied by the perceived probability of contracting the disease.

3. The assumption that the attractiveness of a goal-action is measured by the value assigned its possible successful outcome, multiplied by the perceived probability of the action's success, is replaced by the assumption that the perceived benefit of a preventive health action is measured by the negation of the value assigned the threat posed by the disease in question, multiplied by the perceived effectiveness of the action in reducing the threat.

4. The assumption that a goal-action has a single possible disagreeable outcome (its failure), to which the individual assigns a perceived value (its failure-value), is replaced by the assumption
that a preventive health action may have one or more perceived costs.

5. The assumption that the disagreeableness of a goal-action is measured by the perceived value of its possible failure, multiplied by the perceived probability of the action's failure, is replaced by the assumption that the perceived cost of taking a preventive health action is the sum of a number of perceived costs associated with the action.

6. The conclusion that that goal-action is chosen whose attractiveness minus its disagreeableness is the maximum is replaced by the conclusion that the likelihood of the action's being taken varies with the extent to which its perceived benefit exceeds its perceived cost.

The adaptation of value-expectancy theory consisting of these modifications, and thus represented by the HBM, is summarized as follows in terms of the question it addresses, the definitions of the concepts involved in its construction, and the resultant theory it expresses.

a. The question the HBM addresses. In response to the perceived threat posed by the possibility of contracting a particular disease, an individual considers a choice between taking or not taking a particular preventive health action. What is the
likelihood of the individual's taking the health action?

b. **Definitions used in constructing the HBM.**

1. The perceived threat posed by the disease is the perceived seriousness of the consequences of the disease, expressed as a negative value, multiplied by the perceived probability of contracting the disease.

2. The perceived effectiveness of the health action is the perceived ability of the action to reduce the threat posed by the disease, by reducing the seriousness of the consequences of the disease and/or the probability of contracting the disease.

3. The perceived benefit of the health action is the negation of the perceived threat posed by the disease, multiplied by the perceived effectiveness of the action in reducing the threat.

4. The perceived overall cost of taking the action is the sum of the perceived particular costs of taking the action.

c. **The theory the HBM expresses.** In an individual's making a choice between taking or not taking a preventive health action, the likelihood of the individual's taking the action varies with the
extent to which the perceived benefit of the action exceeds its perceived cost.
APPENDIX C

QUESTIONS ASKED TO OBTAIN EACH SUBJECT'S FAMILY INCOME
Question Asked to Obtain Each Subject's Family Income

Please look at this card and tell me the number corresponding to the total combined income of this household during 1978 before taxes. Include wages & salaries, net business income, pensions, dividends, interest, rent, welfare assistance, and other income received by all persons in this household who are related to you.

01 - none
02 - $1 to $499
03 - $500 to $999
04 - $1,000 to $1,999
05 - $2,000 to $2,999
06 - $3,000 to $3,999
07 - $4,000 to $4,999
08 - $5,000 to $5,999
09 - $6,000 to $6,999
10 - $7,000 to $9,999
11 - $10,000 to $11,999
12 - $12,000 to $14,999
13 - $15,000 to $19,999
14 - $20,000 to $24,999
15 - $25,000 to $49,999
16 - $50,000 and over
REFERENCES


