
School-Based Programs to Reduce Sexual Risk Behaviors: A Review of Effectiveness

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Synopsis

This review was undertaken in recognition of the mounting public health and social problems associ-

ated with adolescent sexual behavior and the importance of basing school-affiliated programs designed to reduce sexual risk-taking behavior on sound research. The authors were commissioned by the Division of Adolescent and School Health within the Centers for Disease Control and Prevention, Public Health Service, to review carefully the research on these programs and to assess their impact on behavior.

The authors identified 23 studies of school-based programs that were published in professional journals and measured program impact on behavior. They then summarized the results of those studies, identifying the distinguishing characteristics of effective programs, and citing important research questions to be addressed in the future.

Not all sex and AIDS education programs had significant effects on adolescent sexual risk-taking behavior, but specific programs did delay the initiation of intercourse, reduce the frequency of intercourse, reduce the number of sexual partners, or increase the use of condoms or other contraceptives.

These effective programs have the potential to reduce exposure to unintended pregnancy and sexually transmitted disease, including HIV infection. These programs should be replicated widely in U.S. schools. Additional research is needed to improve the effectiveness of programs and to clarify the most important characteristics of effective programs.

WE ARE SEXUAL HUMAN BEINGS from birth, but during adolescence, sexual feelings change and intensify. Those sexual feelings can add a vital dimension to the lives of adolescents, a dimension that has many positive elements. There can be those wonderful and intense feelings of being attracted to someone else, there can be great caring and great pleasure, and there can be the opportunity for growth that comes from an intimate relationship with another person. These positive elements should not be forgotten or ignored.

Unfortunately, there can also be many negative consequences of adolescent sexual behavior. Some of

them, such as feelings of exploitation, dissatisfaction, and guilt are not easily quantified; other negative consequences are dramatized by the following statistics.

More than 40 percent of women in the United States become pregnant before they reach 20 years of age (1). More than a million American teenagers become pregnant each year, producing one of the highest teenage pregnancy rates of any western industrialized country ("United States and Cross-National Trends in Teenage Sexuality and Fertility Behavior," unpublished data of the Alan Guttmacher Institute, New York, 1986 and reference 2). In 1990,

the U.S. birth rate among 15- to 17-year-olds was 38 per 1,000 females; the birth rate for 18- to 19-year-olds was 89 per 1,000 females (3). Among white adolescents ages 15 to 19, the out-of-wedlock birth rate has risen steadily every year since 1970; among black adolescents, it is higher than among whites and has risen since 1981.

In addition, among all sexually active people, teenagers have the highest rates of sexually transmitted disease (STD) of any age group (4); in 1991, the rate of gonorrhea among 15- to 19-year-old females was 22 times higher (1,043 per 100,000) than the rate for women ages 30 or older (48 per 100,000) (5). Approximately one in four young people have been infected by any STD by age 21 (4). An increasing number of adolescents are becoming infected with the human immunodeficiency virus (HIV). Although relatively few of the reported acquired immunodeficiency syndrome (AIDS) cases have occurred among adolescents, about one-fifth have occurred among persons in their twenties (6). Because the average incubation period is about 10 years, many of these 20–29-year-olds were infected as teenagers.

These immediate consequences of adolescent sexual behavior, in turn, have long-term effects upon the lives of young people. Pregnancy among school-age youth can reduce their completed level of education, their employment opportunities, and their marital stability, and it can increase their welfare dependency (7). HIV and other STDs among youth can affect their physical health, their subsequent ability to bear children, and even their chances for a normal lifespan. AIDS has quickly become one of the three leading causes of death among women and men 25 to 44 years old in this country (6).

Because the incidence of pregnancy and STDs among teenagers is so great, these consequences affect not only the individuals involved and their families, but also overall welfare dependency, unemployment, and medical costs in the United States. For example, each year through just three programs alone—Aid to Families and Dependent Children (AFDC), food stamps, and Medicaid—the United States spends more than \$25 billion on families with children born in preceding years to teenagers (8).

Educational Programs

Faced with the magnitude of these problems, our nation through its educational institutions has responded during different eras with prevention programs. As long ago as the early 1900s there was concern that young people were having premarital sex and that the rates of “venereal disease” (VD) were

increasing. Believing that accurate information about VD would prevent youth from engaging in sex, some schools implemented VD education (9).

However, many more schools began developing programs to address adolescent sexuality during the 1970s when adolescent sexual behavior, unintended pregnancy, STDs, and their consequences were better measured and publicized. Schools responded far more dramatically when AIDS became a prominent problem in the latter part of the 1980s. The advent of AIDS affected the willingness of some schools to cover certain topics, as well as the overall design of some programs.

Currently, 46 States either strongly recommend or mandate the teaching of sexuality education, while all 50 States either recommend or mandate AIDS education programs (10,11). According to a national study by the Alan Guttmacher Institute in 1988, about 85 percent of all schools offer sexuality education. Of those schools offering sexuality education, between 85 and 100 percent included instruction on abstinence, contraception, pregnancy, STDs, and HIV–AIDS (12). The two messages most commonly emphasized were “the importance of abstinence and how to resist pressures to become sexually active” and “responsibility regarding sexual relationships and parenthood.” In 1991, 83 percent of the students in the national Youth Risk Behavior Survey reported that they had been taught about AIDS–HIV in school (13).

Several hundred schools also implemented school-based clinics providing reproductive health services. By 1993, more than 400 clinics had been opened in high schools and middle schools throughout the country (14). Although this number represents a very small proportion of all schools in the country, the number is continuing to grow. According to a 1991 study of these clinics, more than 60 percent provide counseling, referral, or followup for family planning methods, and about 28 percent write prescriptions for birth control pills, but fewer than 20 percent dispense contraceptives on site (15).

During the 1990s an increasing number of high schools began making condoms available to students as part of their HIV–AIDS prevention programs. Condoms are widely available in schools in some of our nation’s largest cities, such as New York City, Los Angeles, and Philadelphia; they also are available in many smaller cities such as Falmouth, MA, Commerce City, CO, and Santa Monica, CA. According to current unpublished research at ETR Associates, by the fall of 1993, condoms were available in more than 375 schools in 47 cities nationwide. This number represents a very small

proportion of all schools, but it, too, is rapidly increasing. Although making condoms available in schools remains very controversial, 65 percent of the American adult population supports condom availability in schools to prevent the transmission of HIV (16).

During most of this century, programs to reduce unprotected intercourse were not carefully evaluated; however, during the last two decades, numerous studies have provided evidence on the effectiveness of different programs.

Recognizing the magnitude of the problems associated with adolescent sexual behavior and the importance of basing programs upon sound research, the Division of Adolescent and School Health (DASH) within the Centers for Disease Control and Prevention (CDC) commissioned a careful review of the research on school-based programs designed to reduce sexual risk-taking behavior. The purposes of the review were (a) to synthesize qualitatively research on the effectiveness of these programs, (b) to identify the distinguishing characteristics of effective programs, and (c) to identify important research questions to be addressed in the future. This paper summarizes that review.

This paper is also the first product in a series of CDC efforts to translate rapidly and apply research to improve the impact of school efforts to reduce sexual risk-taking behaviors. CDC also has established (a) a research registry to catalogue studies about school programs to reduce sexual risk-taking behavior, (b) a meta-analysis of these studies, and (c) means to identify and rapidly disseminate programs that have demonstrated credible evidence of effectiveness in reducing such behaviors.

Methods

The review included a three-step process: (a) assembling a panel of experts in the field, (b) identifying research studies that met specified criteria, and (c) carefully reviewing those studies.

Panel review. The review panel helped identify important studies, assessed those studies during a 2-day working meeting, and subsequently reviewed this paper.

The panel included several nongovernment experts in the field: Marion Howard, PhD, Emory University and Grady Hospital; Douglas Kirby, PhD, ETR Associates; Brent Miller, PhD, Utah State University; Freya Sonenstein, PhD, Urban Institute; and Laurie S. Zabin, PhD, The Johns Hopkins School of Public Health. Also participating on the panel were eight

representatives from CDC: Stephen Banspach, PhD, Janet Collins, PhD, Susan Dietz, PhD, Yvonne Green, PhD, Lloyd Kolbe, PhD, Dan Peterson, PhD, Deborah Rugg, PhD, and Lynn Short, PhD, as well as representation from the National Institutes of Health: Susan Newcomer, PhD.

Criteria for selecting research studies. To limit the studies to be reviewed, we used three criteria. First, the interventions had to be implemented in schools. Schools are the one institution in our society regularly attended by most young people; nearly 95 percent of all school-age children and youths are in elementary or secondary schools (17). Moreover, virtually all youths attend school before they initiate sexual risk-taking behaviors, and a majority are enrolled in school when they initiate intercourse. Thus, many people perceive schools as one public institution with a broad opportunity and responsibility for addressing and reducing sexual risk-taking behaviors.

Second, the research must have been published, or accepted for publication, in a peer-reviewed journal. During the last decade there have been many reports published in newspapers or advocacy newsletters claiming that specific programs dramatically decreased (or increased) pregnancy or birth rates. When these reports were subsequently investigated, they often lacked valid empirical evidence. Thus, restricting this review to peer-reviewed articles helped provide a minimal level of research quality.

Third, the research must have measured reported sexual or contraceptive behaviors or their outcomes (that is, pregnancy rates, birth rates, or STD rates). Although knowledge about sexual topics may be a precursor to behavior change, it appears to be very weakly related to adolescent sexual behavior—one meta-correlation is about .17 (18). Although other educational outcomes such as changes in attitudes, norms, skills, and intentions may be precursors to behavior, even they are not adequate proxies for change in actual behavior.

Sexual and contraceptive behaviors reported on questionnaires or interviews are, of course, not perfect proxies for actual behavior; adolescent females may underreport sexual behavior, while males may exaggerate their sexual behavior. Nevertheless, in general, reports of sexual behavior from well-designed and administered questionnaires are consistent with reports of sexual behavior from in-person interviews; the changes over time in the sexual behaviors of youth are consistent with changes in their pregnancy rates; the reported age of onset of intercourse among seniors in high school is consistent

with the reported age among freshmen (19); and, in monogamous relationships, the reports of one sexual partner are consistent with those of the other sexual partner (20). Thus, reports of sexual behavior do provide useful indicators of actual sexual behavior.

To locate all the important studies meeting these criteria, we reviewed computer searches of appropriate data bases, reviewed all journals commonly publishing articles on this topic, and contacted other researchers in this field.

Results

As a result of these efforts, 23 studies meeting the specified criteria were found. Seven studies used national survey data to examine the relationship between reported exposure to sex and AIDS education programs and various reported behavioral outcomes. Sixteen experimental or quasi-experimental studies evaluated the impact of 32 specific programs upon such behavior. These studies are summarized in two boxes on pages 343–344 and 347–352.

Studies based upon national surveys. These studies (see box 1) are based upon large nationally representative surveys of adolescents. They included retrospective questions both about participation in sex or AIDS education programs and about personal sexual behavior. Thus, these analyses correlated respondents' reports about participation in programs with their reports about sexual behaviors, statistically controlling in a variety of ways for the effects of other characteristics of the respondents.

Because these studies sampled a cross-section of adolescents throughout the country, they also sampled participants in a cross-section of sex or AIDS education programs throughout the country. Thus, they measured the impact of the wide range of sex and AIDS education curriculums as they actually have been implemented by the wide range of teachers in our nation's schools. This representativeness is in contrast to the studies that evaluated model curriculums often taught by teachers who may have volunteered and who typically received specially developed training to teach their respective curriculums.

Studies based upon national surveys have several major limitations. First, they necessarily rely upon the respondents' recall of whether or not they received sex or AIDS education. Because this instruction is sometimes integrated into a variety of other topics and may vary greatly in length, content, and quality, respondents often had to use their own criteria to determine whether they had, in fact, received suf-

ficient instruction to say they had been exposed to a program. These problems undoubtedly added considerable measurement error and possibly bias to the seemingly simple question of whether or not they had been exposed to a sex or AIDS education program. For example, those youth who were most affected by an AIDS educational program may be more likely to remember that program and to report past participation in a program.

Second, most of the surveys failed to measure in any detail the characteristics of the sex or AIDS education instruction that the participants received. Typically the surveys asked three or fewer questions about the content of the students' instruction. Thus, these surveys provided little information about the quality of the programs. Consequently, relatively comprehensive and long-term programs are "averaged together" with brief superficial programs.

Third, with national survey data, controlling for all other explanatory variables that might produce spurious relationships between education and sexual behavior is impossible. For example, there is a belief among some professionals that during the 1970s and 1980s sex education was disproportionately likely to have been taught either in communities where such school instruction was more acceptable or in high-risk schools where there was greatest need. Because this selection bias could never be fully controlled statistically, it could have produced spurious relationships between receipt of sex education and sexual activity; alternatively, it could have obscured relationships indicating desirable effects.

Sexual activity. Five studies based on national surveys examined whether receipt of sex education was related to initiation of intercourse (21–25; Nos. 1, 4–7 in box 1). Their results are mixed.

The most recent study was conducted by Ku and colleagues and focused on 15- to 19-year-old males. They found that the association between sex education and subsequent initiation of intercourse varied with the topics covered (21; No. 1, box 1). Instruction on biological topics or contraception was significantly associated with earlier initiation of intercourse while instruction on AIDS or resistance skills (how to say no to sex) was significantly associated with later initiation of intercourse. When three or all four of these topics were covered, there was not a significant relationship with onset of intercourse, with one exception—instruction on biological topics, AIDS, and resistance skills, in combination, was significantly associated with later initiation of intercourse.

Marsiglio and Mott analyzed data for both sexes

1. Studies of Sex and HIV Education Programs Based on National Surveys of Youth

1. Ku, Sonenstein, and Pleck 1993 (Reference 21) Household survey: 1988 National Survey of Adolescent Males.

Sample characteristics. N=1,880 (74 percent response rate); cross section of U.S. males 15–19 years old; blacks = 15 percent, Hispanics = 9 percent, whites = 73 percent, others = 3 percent; varied income levels.

Survey questions about the program. Ever had a course with instruction on specified topics.

Analytic methods. Logistic regression controlling for background characteristics was used to estimate discrete-time event histories. (N=10,566 person-years).

*Results—changes in outcomes.*¹

Initiation of intercourse:

Biological topics –
Birth control –
AIDS education +
Resistance skills +

Use of condoms at first intercourse:

Biological topics 0
Birth control 0
AIDS education 0
Resistance skills 0

Use of any effective contraceptive method at first intercourse:

Biological topics 0
Birth control 0
AIDS education 0
Resistance skills 0

Additional comments. Data on the quality of instruction were not gathered. Analyses of all possible combinations of the four topics tended to conform to these reported results.

2. Ku, Sonenstein, and Pleck 1992 (Reference 30) Household survey: 1988 National Survey of Adolescent Males.

Sample characteristics. N = 1,880 (74 percent response rate); cross section of U.S. males 15–19 years old; blacks = 15 percent, Hispanics = 9 percent, whites = 73 percent, others = 3 percent; varied income levels.

Survey questions about the program. Ever had a course with instruction on AIDS, contraceptive use, or resistance skills (3 separate questions).

Analytic methods. Tobit multivariate analysis was used to statistically control for urban residence, ethnicity, age, religion, income, whether behind in school, whether mother gave birth as teenager, AIDS incidence for respondent's State.

*Results—changes in outcomes.*¹

Number of sexual partners during preceding year:

AIDS instruction 0
Contraceptive use 0
Resistance skills +

Frequency of intercourse during preceding year:

AIDS instruction 0
Contraceptive use 0
Resistance skills +

Condom use during preceding year:

AIDS instruction 0
Contraceptive use +
Resistance skills +

Additional comments. The data also indicated that increasingly large percentages of males used condoms as information about AIDS was disseminated to the public through schools and public awareness campaigns. Data on the quantity or quality of the instruction were not gathered. The relative order of instruction and the initiation of sex was not known.

3. Anderson, et al.: 1990 (Reference 29) School survey: 1989 Secondary School Student Health Risk Survey.

Sample characteristics. N = 8,098 (83 percent response rate); cross section of U.S. students in grades 9–12; males = 46 percent, females = 54 percent; blacks = 14 percent, Hispanics = 17 percent, whites = 63 percent, others = 6 percent; varied income levels.

Survey question about the program. Ever been taught about AIDS–HIV infection in school.

Analytic methods. Logistic regression was used to control for age, ethnicity, gender, and HIV–AIDS knowledge.

*Results—changes in outcomes.*¹

Number of sexual partners:

2 or more in lifetime 0
2 or more in last year 0
Consistent use of condoms 0

Additional comments. The relative order of instruction and the behaviors were not known. Data on the content, quantity, or quality of the instruction were not gathered.

4. Dawson 1986 (Reference 23) Household survey: 1982 National Survey of Family Growth.

Sample characteristics. N = 1,888; cross section of U.S. females 15–19 years old; blacks = 31 percent, whites and others = 69 percent; varied income levels.

Survey questions about the program. Ever had formal instruction about pregnancy and contraception (two separate questions).

Analytic methods. Logistic regression was used to control for mother's education, ethnicity, number of parents in home, income, whether behind in school, religion, region of country, urban residence. Analyses examined whether instruction prior to specified ages was associated with sexual behavior during the following year.

*Results—changes in outcomes.*¹

Initiation of intercourse:

Overall and most subgroups 0

continued on page 344

1. Studies of Sex and HIV Education Programs Based on National Surveys of Youth (Continued)

Students 14 years old in 1 of 2 classification systems –
Students 14 years old in second of 2 classification systems 0
Students 15–19 years old 0
Contraceptive use at first intercourse +
Contraceptive use ever +
Current use of contraception 0
Pregnancy:
Sexually experienced 0
Additional comments. Data on the content, quantity, or quality of the instruction were not gathered.

5. Marsiglio and Mott 1986 (Reference 22) Household survey: 1984 National Longitudinal Survey of Work.

Sample characteristics. N = 12,069; cross section of U.S. adults 19–27 years old; males = 50 percent, females = 50 percent; blacks = 25 percent, Hispanics = 16 percent, whites = 59 percent; varied income levels.

Survey questions about the program. Ever had a course with instruction on the menstrual cycle, contraception, and STD (3 separate questions).

Analytic methods. Logistic regression was used to control statistically for ethnicity, economically disadvantaged, residence in the South, rural residence, religion, parents' education. Analyses examined whether instruction prior to specified ages was associated with sexual behavior during the following year.

*Results—changes in outcomes.*¹

Initiation of intercourse:

15–16-year-olds –

17–19-year-olds 0

Contraceptive use:

Female 17–18-year-olds +

Pregnancy:

Females 0

Additional comments. Data on the content, quantity, or quality of the instruction were not gathered. If instruction and initiation of sex occurred within the same age, the order was not known, but analyses assumed that instruction occurred first.

6. Furstenberg, Moore, and Peterson 1985 (Reference 24) Household survey: 1981 National Survey of Children.

Sample characteristics. N = 469 (80 percent response rate); cross section of U.S. youth 15 and 16 years old; males = 50 percent, females = 50 percent; blacks = 15 percent, whites

= 85 percent; varied income levels.

Survey question about the program. Ever had a course on sex education at school.

Analytic methods. Analyses compared outcome percentages between groups. There were multivariate analyses with statistical controls for background factors: family income, mother's education, mother's age at first birth, family structure, and community size. Separate analyses were conducted by sex and ethnic group.

*Results—changes in outcomes.*¹

Initiation of intercourse +

Additional comments. The relative order of sex education and initiation of sex was not known. Data on the content, quantity, or quality of the instruction were not gathered.

7. Zelnik and Kim 1982 (Reference 25) Household surveys: 1976 National Survey of Young Women, 1979 National Survey of Young Women, 1979 National Survey of Young Men.

Sample characteristics. N = unspecified; young people in a cross section of SMSAs; females 15-19 years old and males 17-21 years old; varied income levels.

Survey question about the program. Ever had a course with instruction on contraception.

Analytic methods. Separate Mantel-Haentzel chi-square tests by sex, race, and age were used to assess relationships between sex education instruction and sexual activity, contraceptive use, and pregnancy rates.

*Results—changes in outcomes.*¹

Sexual activity 0

Contraceptive use at first intercourse:

1976 0

1979 +

Contraceptive use ever:

White females 0

Black females +

Pregnancy rates:

5 of 9 subgroups +

4 of 9 subgroups 0

Additional comments. Data on the quantity or quality of the instruction were not gathered. The relative order of instruction and the behaviors were not known.

¹Significant desirable change at .05 level = +; significant undesirable change at .05 level = –; no significant change = 0.

(22; No. 5, box 1). They found that for older teens ages 17 and 18 years, previous participation in sex education was not associated with subsequently initiating intercourse, but for younger teens ages 15 or 16 years, previous participation in sex education was positively associated with subsequent initiation of intercourse. This association held both for those

teens who reported they had ever had a sex education course and also for those who had ever had a course that specifically included contraception.

A third study by Dawson found less clear results (23; No. 4, box 1). Among females ages 15 to 19 years, there were no significant relationships between subsequent initiation of sex and instruction on

pregnancy only or pregnancy and contraception combined, except possibly among those who received instruction and initiated intercourse when they were 14 years old. Among 14-year-olds, the results varied depending upon the assumption made about the temporal order of instruction and initiation of sex when they took place during the same year.

Two additional studies were based upon national surveys that did not measure the timing of instruction and initiation of intercourse. Thus, the researchers were not able to use more sophisticated and powerful statistical methods (for example, survival, hazard, or event-history models) and were less capable of measuring the impact of instruction. Furstenberg and colleagues found that 15- and 16-year-old students who had participated in a sex education class were significantly less likely to have initiated intercourse than students of similar ages who had not received sex education (24; No. 6, box 1). Finally, Zelnik and Kim concluded that there was not a significant relationship between sex education and sexual experience among 15- to 19-year-old females and 17- to 21-year-old men (25; No. 7, box 1). However, the data presented in their tables reveal that among females ages 15 to 17 years, sex education was significantly associated with a greater probability of having initiated intercourse, while among females ages 18 to 19 years, it was associated with a lower probability of having initiated intercourse. Among males 17 to 18 years old, there was not a significant relationship.

Notably, all of these studies, except that by Ku and colleagues, were based on data collected either during the late 1970s or early 1980s, when abstinence, postponing sexual involvement, and AIDS were not given as much emphasis as they received during the later 1980s and 1990s. Data from the study by Ku and colleagues were collected in 1988 (21).

The two remaining studies based upon national surveys examined different measures of sexual activity, namely number of acts of intercourse during a specified period and number of sexual partners. These measures are directly related to exposure to pregnancy and STD (26–28).

Anderson and colleagues found that AIDS instruction was not significantly related to having had two or more sexual partners ever or during the preceding year (29; No. 3 in box 1). In contrast, Ku and colleagues found that males who had received AIDS instruction with resistance skills engaged in fewer acts of intercourse and had fewer sexual partners than did students who had not previously received such instruction (30; No. 2, box 1). However, instruction about biology topics, AIDS without resistance skills,

and birth control were not significantly related to either the number of partners or the number of acts of intercourse.

In sum, the studies based upon national surveys and measuring the relationship between sex education topics and initiation of intercourse produced some seemingly inconsistent results and suggest that the impact of instruction might vary with the topics covered and with the age of the students. A plausible interpretation is that instruction on resistance skills may delay the initiation of intercourse and possibly reduce both the number of partners and the number of acts of intercourse and that instruction about contraception alone may hasten the onset of intercourse among younger teens, but not among older teens. Notably, the one study that examined the relationship between instruction and frequency of intercourse once it was initiated found that particular topics may reduce the frequency of intercourse (30).

Use of contraception. Six of the studies based upon national survey data examined the impact of sex education on the use of contraception (Nos. 1–5, 7, box 1). Dawson found that instruction about pregnancy and contraception was positively related to use of contraceptives during first intercourse and to use of contraceptives ever, but not to use at the time of the interview (23; No. 4, box 1). Zelnik and Kim found statistically significant relationships between sex education instruction and use of contraception both during first intercourse and during any sexual experience, but only for blacks and not for whites (25). Marsiglio and Mott found a positive relationship between sex education and contraceptive use during the month preceding the interview (23). Ku and colleagues analyzed data on males only and failed to find a significant relationship between instruction on biological topics, birth control, AIDS, or resistance skills, and use of contraception at first intercourse (30).

In addition to these studies of general contraceptive use, three of the cross-sectional studies specifically examined the impact of AIDS education upon the use of condoms. Anderson and his colleagues failed to find a significant direct relationship between AIDS instruction and condom use, but there appeared to be an indirect relationship through knowledge (29). In contrast, Ku and colleagues found that among adolescent males, instruction on AIDS, contraception, and resistance skills was not significantly related to use of condoms at first intercourse but they were significantly and independently associated with greater condom use during the year preceding the interview (30; No. 2, box 1). The data also indicated

that during the 1980s, when information about AIDS was disseminated to the public through schools and public awareness campaigns, increasingly large percentages of males used condoms.

In sum, these results varied both with the particular study and with the time interval of the contraceptive measure (for example, first intercourse versus intercourse during a period preceding data collection). However, four of the five survey data sets did produce some positive significant relationships between participation in a sex or AIDS education program and either contraceptive use or specifically condom use, while the fifth data set revealed a possible indirect effect through greater knowledge.

Evaluations of specific programs. Sixteen studies evaluated specific programs. Although these studies overcome some of the limitations of the studies based upon survey research (for example, assessing whether specific youth participated in some type of sex or HIV education program), they nevertheless measure only the additional effect of the intervention and not the cumulative effect of that intervention plus whatever sexuality and HIV education the youths had previously or subsequently received. In addition, field experiments may increase response bias among the participants—students who participate in a program designed to reduce unprotected intercourse may be less likely to report risk-taking behaviors than students who did not participate.

The 16 evaluations of specific programs are summarized in the box on pages 347–352. The studies varied considerably: they focused upon different goals, included different components, were implemented in different parts of the country, and targeted different populations of youth.

All of the programs that included only educational components (and not additional reproductive health services) were evaluated with experimental or quasi-experimental designs. All of these designs assigned students to program and comparison groups. All used some method of making the program and comparison groups similar before program implementation; some designs included the random assignment of individual students, classrooms of students, or entire schools to treatment or control groups. In all the studies, individual students were followed over time and their pretest and posttest data were linked.

There was a variety of possible criteria for grouping the 16 studies of particular programs (for example, primary program focus, topics covered, and characteristics of additional components). In the box we used a combination of these three criteria that reflects the additive nature of the components in these

programs. The first group of programs includes those that focus upon abstinence and do not discuss contraception; the second group includes sexuality or AIDS education programs that include both abstinence plus contraception (or at least condoms); the third group includes these more comprehensive educational components plus reproductive health services, either at the school or nearby. The additive nature of these programs does not mean that the latter groups include components that are as well developed as they are in the former groups. For example, programs that provide sexuality education only may have a stronger educational component than programs that provide sexuality education plus reproductive health services.

Abstinence programs. Abstinence programs focus upon the importance of abstinence from sexual intercourse, typically abstinence until marriage. Either these programs do not discuss contraception or they briefly discuss failure of contraceptives to provide complete protection against pregnancy and STD.

To date, only three studies of school-based abstinence programs have been published in the professional literature. Postponing Sexual Involvement is sometimes considered an abstinence program, because it does not discuss contraception. However, its evaluation actually measured the impact of two components in combination, Postponing Sexual Involvement and a human sexuality unit that included contraception and was taught a few weeks earlier than Postponing Sexual Involvement. Thus, Postponing Sexual Involvement is included in the second group described subsequently.

Jorgensen and colleagues evaluated the impact of a program called Project Taking Charge (33; No. 1 in box 2). Its 6-month followup did not find a statistically significant impact (at the .05 level) on the initiation of intercourse. The generalizability of this study was limited by its small sample—91 students at two sites.

Christopher and Roosa (31; No. 2, box 2) and Roosa and Christopher (32; No. 3, box 2) examined different implementations of the same abstinence program called Success Express. These two evaluations analyzed posttest data collected only 6 weeks after the pretest data. Because only a small percentage of youth initiate sexual intercourse during any 6-week period, there was not a reasonable chance that Success Express could significantly reduce the initiation of sex among the program's group members below that of the comparison group members during the short period of the studies.

text continued on page 352

2. Experimental and Quasi-Experimental Studies of Sex Education and HIV Education Programs

ABSTINENCE PROGRAMS

1. Jorgensen, Potts, and Camp 1993 (Reference 33) Project taking charge.

Sample characteristics. Students in Wilmington, DE, and West Point, MS; N = 91; mean age = 14.4; 7th graders only; males = 47 percent, females = 53 percent; blacks = 43 percent, Hispanics = 7 percent, whites = 45 percent, others = 5 percent; low income.

Program description. The program was implemented in home economics classes. The classroom component included 30 sessions which covered self-development, anatomy and physiology, pregnancy, STD, importance of abstinence prior to marriage, vocational goal setting, family values, and family communication. The evening component included 3 sessions for parents, their adolescent children, and the teachers. It included communication exercises, values exploration, adolescent sexuality, pregnancy, and STD.

Evaluation design. An experimental design was used. Two home economics classes in each of 2 schools were randomly assigned to intervention and comparison groups. The comparison group did not receive any sex education program. Matched questionnaire data were collected at baseline and 6 weeks later. Chi-square tests between intervention and comparison groups at posttest were used. There were separate analyses for students sexually inexperienced at pretest.

*Results—changes in outcomes.*¹

Initiation of intercourse 0

Additional comments. The small number of classrooms randomly assigned, the small number of students, and the inexplicably large proportion of comparison group students who initiated intercourse during the 6-month pretest-posttest period (50 percent) all limit the internal and external validity of this study.

2. Christopher and Roosa 1990 (Reference 31) Success Express.

Sample characteristics. Students in unspecified locations; N = 320; mean age = 12.8; 6th and 7th graders; males = 39 percent, females = 61 percent; blacks = 21 percent, Hispanics = 69 percent, whites = 8 percent, others = 2 percent; low income.

Program description. The program was implemented in health education classes in 5 schools. Its 6 sessions covered abstinence attitudes, skills, behaviors, self-esteem, family values, peer and media pressure, consequences of sex, how to say no, life goals, and goal-setting skills.

Evaluation design. A quasi-experimental design was used. Both intervention and comparison groups were health education classes at each school. The comparison group received no program. Matched questionnaire data were collected at baseline and 6 weeks later. Analyses included

repeated measures ANCOVA, controlling for sex and grade. There were analyses for the entire sample and separate analyses for sexually inexperienced.

*Results—changes in outcomes.*¹

Initiation of intercourse 0

Additional comments. The posttest at 6 weeks did not allow sufficient time for a measurable delay in the initiation of intercourse.

3. Roosa and Christopher 1990 (Reference 32) Success Express.

Sample characteristics. Students in unspecified locations; N = 528; mean age = 13; 6th graders = 21 percent, 7th graders = 16 percent, 8th graders = 53 percent; males = 43 percent, females = 57 percent; blacks = 15 percent, Hispanics = 64 percent, whites = 12 percent, others = 5 percent; low income.

Program description. The program was implemented in health education classes in 5 schools and in communities. Its 6 sessions covered abstinence attitudes, skills, behaviors, self-esteem, family values, peer and media pressure, consequences of sex, how to say no, life goals, and goal-setting skills.

Evaluation design. A quasi-experimental design was used. Both intervention and comparison groups were health education classes at each school. The comparison group received no program. Matched questionnaire data were collected at baseline and 6 weeks later. Analyses included repeated measures ANCOVA, controlling for sex and grade. There were analyses for the entire sample and separate analyses for sexually inexperienced students.

*Results—changes in outcomes.*¹

Initiation of intercourse 0

Additional comments. The posttest at 6 weeks did not allow sufficient time for a measurable delay in initiation of intercourse.

SEXUALITY AND HIV EDUCATION PROGRAMS

4. Walter and Vaughan 1993 (Reference 51) AIDS Prevention for Adolescents in School.

Sample characteristics. Students in New York City; N = 867; 9th and 11th graders; males = 42 percent, females = 58 percent; Asian = 11 percent, blacks = 37 percent, Hispanics = 35 percent, whites = 13 percent, others = 4 percent; low income.

Program description. The program was implemented in general health education classes in 4 schools. It included 6 sessions and was based upon the health belief model, social cognitive theory, and social influence theory. It focused upon correcting facts about AIDS, teaching cognitive skills to appraise risks of transmission, increasing knowledge of AIDS-prevention resources, changing perceptions of frequency of peer risk-taking behaviors, clarifying personal

continued next page

2. Experimental and Quasi-Experimental Studies of Sex Education and HIV Education Programs (Continued)

values, understanding external influences, and teaching skills to delay intercourse or to consistently use condoms, or both.

Evaluation design. An experimental design was used. Four high schools were divided into 2 matched pairs. Within each pair of schools, one school provided 9th grade program classes and 11th grade control classes, while the other school provided 9th grade control classes and 11th grade program classes. The control classes received no AIDS prevention program. Matched questionnaire data were collected at baseline and 3 months later. Analyses included *t* tests between intervention and control groups using change scores. Multiple regression was used to control for background characteristics and baseline scores.

*Results—changes in outcomes.*¹

Abstinence 0

Intercourse with high-risk partner +

Monogamous relationships +

Consistent condom use +

Additional comments. The 3-month posttest did not allow measurement of long-term effects.

5. Thomas, et al. 1992 (Reference 41) McMaster Teen Program.

Sample characteristics. Students in Ontario, Canada; N = 3,290; 7th and 8th graders; males = 48 percent, females = 52 percent; English as primary language = 75 percent; low unemployment area.

Program description. The program was implemented in health classes in junior high schools. Students were divided into small groups with 6–8 students each. The curriculum included 10 sessions which covered adolescent development, peer pressure, gender roles, responsibility in relationships, stages of intimacy, adolescent pregnancy and childbearing, and decision-making. Tutors used group discussions, question and answer periods, films, and role plays.

Evaluation design. An experimental design was used. Twenty-one schools were randomly assigned to treatment and control groups. The control schools received the conventional sex education curriculum. Matched questionnaire data were collected at baseline, 3 months later, and then once a year for 4 years. Logistic regression was used to control for school, school size, sex, and any other variables related to the outcome variables. Treatment group was added last to test its effect.

*Results—changes in outcomes.*¹

Initiation of intercourse:

At 3 months 0

At 1 year 0

At 4 years 0

Consistent contraceptive use:

At 3 months 0

At 1 year 0

At 4 years 0

Pregnancy rates:

At 3 months 0

At 1 year 0

At 4 years 0

Additional comments. The content of the treatment intervention did not appear much stronger than that of the control intervention. The evaluation was very rigorous; it had random assignment, large sample sizes, high consent rates, short- and long-term followup, low dropout rates, and appropriate statistical analyses.

6. Walker and Vilella-Velez 1992 (Reference 48) Summer Training and Education Program (STEP).

Sample characteristics. Students in 5 U.S. cities; N=4,800; 14 years old = 57 percent; 15 years old = 43 percent; males = 48 percent, females = 53 percent; Asians = 19 percent, blacks = 49 percent, Hispanics = 18 percent, whites and others = 14 percent; low income; academically behind.

Program description. The program included 36 sessions divided equally between 2 summers. They covered life skills education in such areas as sexual behavior, drug use, careers, and community involvement. In sexuality, they focused upon decision-making and the importance of responsible behavior. The intervention also included 90 hours of work (half time) at minimum wage, 90 hours of academic remediation, and 5 to 15 hours of support during the school years.

Evaluation design. An experimental design was used. Youth were randomly assigned to the STEP program or to a guaranteed job during the summer. Matched questionnaire data were collected annually for 5 years.

*Results—changes in outcomes.*¹

Sexual activity 0

Use of contraceptives 0

Births 0

Additional comments. The evaluation was very rigorous; it had random assignment, large sample sizes, and long-term followup.

7. Kirby, et al. 1991 (Reference 40) Reducing the Risk.

Sample characteristics. Students in urban and rural areas throughout California; N = 758; 9th graders = 27 percent, 10th graders = 56 percent, 11th graders = 9 percent, 12th graders = 6 percent; males = 47 percent, females = 53 percent; blacks = 2 percent, Hispanics = 20 percent, whites = 62 percent; varied income levels.

Program description. The program was implemented in health education classes and included 15 sessions. It was based upon social learning theory, cognitive behavioral theory, and social inoculation theory. It placed a strong emphasis on avoiding unprotected sex either by avoiding sex or using protection. Activities were often experiential; there were many role-playing activities to build skills and self-efficacy.

continued next page

Evaluation design. A quasi-experimental design was used. Classrooms of health education students were assigned to program and comparison groups, sometimes randomly. The comparison group received the existing sex education program of equal length taught in that school. Matched questionnaire data were collected at baseline, 6 months later, and 18 months later. Analyses included chi-square tests and *t* tests of change scores over time between intervention and comparison groups at 6 and 18 months. The initial equivalence of the intervention and comparison groups was established with *t* tests or chi-square tests.

*Results—changes in outcomes.*¹

Initiation of intercourse:

At 6 months 0

At 18 months +

Frequency of intercourse among sexually experienced 0

Contraceptive use among sexually experienced:

At 6 months 0

At 18 months 0

Contraceptive use at 18 months:

Among females +

Among males 0

Among lower-risk youth +

Among high-risk youth 0

Unprotected intercourse among all students:

At 6 months 0

At 18 months 0

Unprotected intercourse among students sexually inexperienced at pretest:

At 6 months 0

At 18 months +

Pregnancy rates 0

Additional comments. Sample sizes for some subgroups were too small for reasonable power.

8. Eisen, Zellman, and McAlister 1990 (Reference 34) Teen Talk.

Sample characteristics. Students in Texas and California; N=1,288; 13–14 years old = 22 percent, 15–17 years old = 65 percent, 18–19 years old = 3 percent; males = 46 percent, females = 54 percent; blacks = 22 percent, Hispanics = 51 percent, whites = 17 percent, others = 10 percent.

Program description. The program was implemented by 6 family planning service agencies and 1 school district. The curriculum lasted 8 to 12 hours. It was based upon the health belief model and social learning theory. Factual material, values, feelings, decision-making, and skill-building were covered. Lectures with discussion, role playing, and films were used.

Evaluation design. An experimental design was used. Classes of students were randomly assigned to treatment and control conditions. Control classes received various programs lasting an equal number of sessions. Matched questionnaire data were collected at baseline, immediately after the intervention, and 1 year later. Logistic regression controlling for background characteristics was conducted. There were separate analyses for males and females and for

sexually experienced and inexperienced. Sample sizes lacked much power in these subgroups.

*Results—changes in outcomes.*¹

Initiation of intercourse:

Overall 0

Males +

Females 0

Contraceptive use among those inexperienced at pretest but initiating sex by followup:

Males:

First intercourse 0

Last intercourse 0

Consistent use 0

Females:

First intercourse –

Last intercourse 0

Consistent use –

Contraceptive use among those sexually experienced at pretest:

Males:

Last intercourse 0

Consistent use +

Females:

Last intercourse 0

Consistent use 0

Additional comments. The combination of varied sex education programs among the comparison groups, small sample sizes for many analyses, and inconsistent results make it difficult to draw conclusions from these results.

9. Howard and McCabe 1990 (Reference 36) Postponing Sexual Involvement (PSI) and Human Sexuality.

Sample characteristics. Students in Atlanta, GA, whose parents attended a public hospital; N=536; 8th graders; 13–14 years old; blacks = 99 percent; low income.

Program description. The program was implemented in regular classrooms and included two components, a 5-hour unit called Postponing Sexual Involvement and a 5-hour unit on human sexuality. The Postponing Sexual Involvement unit emphasized postponing sexual involvement and was designed both to help youth understand social and peer pressures to have sex and to develop and apply resistance skills. It was based on social influence theory and was taught by peers (11th and 12th graders). The human sexuality unit included sessions on human sexuality, decision-making, and contraceptives.

Evaluation design. A quasi-experimental design was used. The intervention group included students from 1 school district which received the program, while the comparison group included students from 3 smaller adjacent school districts which received existing programs. Telephone interviews were conducted in the 8th, 9th, and 12th grades. Matched questionnaire data were collected at baseline and post-intervention. *T* tests between intervention and comparison groups at pretest and posttest were used. The initial equivalence of intervention and comparison groups was established with *t* tests.

continued next page

2. Experimental and Quasi-Experimental Studies of Sex Education and HIV Education Programs (Continued)

Results—changes in outcomes.¹

Initiation of intercourse:

- End 8th grade +
- End 9th grade +
- End 12th grade 0

Frequency of intercourse among those who were sexually inexperienced at pretest but initiated sex by followup:

- End 9th grade +
- End 12th grade 0

Frequency of intercourse among those who were sexually experienced at pretest:

- End 9th grade 0
- End 12th grade 0

Contraceptive use among those who were sexually inexperienced at pretest but initiated sex by followup:

- End 9th grade +
- End 12th grade 0

Contraceptive use among those who were sexually experienced at pretest:

- End 9th grade 0
- End 12th grade 0

Additional comments. A limitation of the study was the fact that intervention and comparison groups lived in different geographic areas. Some background characteristics were controlled through sampling procedures to reduce the impact of this difference. Other events or activities that might have affected either the intervention group or comparison group differently were not controlled.

10. Kirby 1985 (Reference 39) Eleven Untitled Sexuality Education Programs in the U.S.

Sample characteristics. Students in schools dispersed throughout the U.S.; total N=2,589, N's for individual programs ranged from 53 to 556; 9th-12th graders; varied gender proportions; all major ethnic groups represented; varied income levels.

Program descriptions. All of the programs were implemented in health or sex education classes. They ranged in length from 5 hours to a full semester. Their contents also varied. Some were mostly knowledge based; a few used role playing to teach communication skills.

Evaluation design. Quasi-experimental designs were used. Comparison groups included other health classes in the same schools. They received either no programs or weaker sex education programs. Matched questionnaire data were collected at baseline, after the program, and in some sites, 3 to 5 months after the program. Analyses included *t* tests between intervention and comparison groups using change scores.

Results—changes in outcomes.¹

Initiation of intercourse 0

Frequency of sex previous month 0

Use of contraceptives:

- None or less effective method used:
 - 10 programs 0
 - 1 program -

Effective contraception used:

- 2 programs +
- 9 programs 0

Pregnancy (measured in 3 sites) 0

Additional comments. This was a study of 15 different sexuality education programs in the U.S. Behavior data, collected from 11, are summarized here. Sample sizes for individual programs were often too small for reasonable power; longer term effects were not measured for the five most comprehensive programs.

11. Schinke, Blythe, and Gilchrest 1981 (Reference 50) Untitled Curriculum.

Sample characteristics. Students in Seattle, WA; N = 36; mean age = 15.9; 10th graders; males = 47 percent, females = 53 percent; ethnicity not specified.

Program design. The program was implemented in small groups in special high school classes. The 14 sessions were based on cognitive-behavioral theory. The curriculum included contraceptive information, problem solving steps, activities to apply information to themselves, the modeling of skills, and practice in communicating decisions about sexual behavior.

Evaluation design. A Solomon 4-group experimental design with random assignment of individual students was used. Matched questionnaire data were collected at baseline, after the intervention, and 6 months following the intervention. Analyses included *t* tests between intervention and comparison groups at baseline, post intervention, and 6-month follow-up. The initial equivalence of intervention and comparison groups was established with *t* tests.

Results—changes in outcomes.¹

Contraceptive use at 6 months:

- Consistent use +
- Use at last intercourse +
- Use of inadequate method +

Additional comments. Sample sizes were too small for reasonable power. Nonsignificant results may not have been reported.

EDUCATION AND SERVICES

12. Kirby et al. 1993 (Reference 59) St. Paul School-based Clinics.

Sample characteristics. Students in St. Paul, MN; N = 1,838 to 2,988, depending upon year; 9th-12th graders; females = 100 percent; ethnicity not specified; income not specified.

Program description. The health clinics located in high schools provided comprehensive health services, including reproductive health care. Contraceptives were picked up at a special hospital clinic. The clinics also provided day care for infants.

Evaluation design. A quasi-experimental design was used. In 4 schools, birth rates for 5 years before and 6 years after

continued next page

clinics opened were compared; in 1 school birth rates 2 years before and 3 years after the clinic opened were compared. Birth rates were estimated by matching school enrollment records and county birth certificates. Several methods were used to compare pre-clinic and post-clinic birth rates. Tests of significance were conducted.

*Results—changes in outcomes.*¹

Birth rates 0

Additional comments. Large year-to-year fluctuations in birth rates may have obscured a small clinic impact. St. Paul students had access to relatively good health care and had relatively low birth rates before the clinics opened. Only school-wide effects were measured, even though not all students used the clinics for contraception.

13. Vincent et al. 1987 (Reference 60) School and Community Program for Sexual Risk Reduction Among Teens.

Sample characteristics. Students in a rural county in South Carolina; N = 710; 14–17-year-olds; females = 100 percent; blacks = 58 percent, whites = 42 percent; low income.

Program design. The program was implemented in both the community and K-12 classrooms. In the classrooms, material was integrated into other instruction. About two-thirds of the school staff were given sex education training. Classroom instruction was designed to increase knowledge, decision making skills, communication skills, and self esteem and to align values with those of the community. The focus was not always on sexuality but upon problem solving, risk assessment, and assuming personal responsibility. Peer education was included. The school nurse provided consultation, condoms, and transportation to a family planning clinic. Community groups and churches implemented classes and special events. There were also articles and announcements in papers and on the radio.

Evaluation design. A quasi-experimental design was used. Annual pregnancy rates for 14–17-year-old females were estimated for the years 1977–88, for (a) the western part of the county surrounding the program community, (b) the eastern part of the county serving as a comparison group, and (c) 3 similar counties serving as comparison groups. The Z statistic for proportional differences in pregnancy rates were used to compare intervention and comparison groups.

*Results—changes in outcomes.*¹

Pregnancy rates +

Additional comments. The small number of 14–17-year-old females, the initial low pregnancy rates of the comparison counties, and difficulty in estimating significance limit the internal validity of these findings. The very small population and the geographic isolation of the county limit the study's external validity.

14. Kirby, Waszak, and Ziegler 1991 (Reference 55) Multiple titles for multiple clinic programs.

Sample characteristics. Students in high schools in Gary, IN; San Francisco, CA; Muskegon, MI; Jackson, MS; Quincy, FL; and Dallas, TX; N ranged from 824 to 1,360;

9th–12th graders; males = 46 percent, females = 54 percent; blacks = 95 percent; low income.

Program design. The clinics, located in high schools, all provided comprehensive health services. Two referred for contraception, 1 prescribed contraception, and 3 dispensed contraception.

Evaluation design. Quasi-experimental designs were used. In 4 sites, school-wide data from schools with clinics were compared with data from similar comparison schools. Schools were matched to the extent feasible. In the remaining 2 sites, school-wide data were collected before and 2 years after the clinics opened. Data were collected through school-wide surveys. Separate analyses were conducted for each sex and race. Multiple regression was used to control for 6 student background characteristics.

*Results—changes in outcomes.*¹

Initiation of intercourse

Males:

5 sites 0

1 site +

Females:

4 sites 0

1 site +

1 site -

Frequency of sexual activity

Males:

6 sites 0

Females:

6 sites 0

Use of contraceptives

Condoms:

4 sites 0

2 sites +

Pill (females only):

5 sites 0

1 site +

Pregnancy:

6 sites 0

Additional comments. The evaluation designs were weak. School and community differences may have affected the comparison between clinic schools and comparison schools in unknown ways. Other community-wide activities and changes may have affected the pre- post comparisons. Only school-wide effects were measured, even though not all students used the clinics for contraceptives.

15. Zabin et al. 1986 (Reference 56) Self Center.

Sample characteristics. Students in Baltimore, MD; N = 6,596; 7th–12th graders; males = 45 percent, females = 55 percent; blacks = 99 percent; low income.

Program description. Clinic staff made presentations to each homeroom at least once per year, provided individual consultation in the school health suites during the school day, and provided a full range of reproductive health services (group discussions, individual counseling, contraceptive services, pregnancy testing, referrals) at the clinic located across the street from the high school and a few

continued next page

2. Experimental and Quasi-Experimental Studies of Sex Education and HIV Education Programs (Continued)

blocks from the junior high school. Most student contacts were through the small-group discussions.

Evaluation design. A quasi-experimental design was used. One junior and one senior high school were selected for the program group; another junior and senior high school were selected for the comparison group. Questionnaire data were collected from students schoolwide in the fall before the program was implemented and the three following springs. Pregnancy rates were analyzed for only 28 months. Life table analysis was used to adjust for age related differences in some tables. Many analyses were based upon years of exposure to the program. Multiple tests of significance were used to compare intervention and comparison groups.

*Results—changes in outcomes.*¹

Initiation of intercourse:

Females +

Males not provided

Contraceptive use:

Time from first intercourse to clinic attendance +

Use of contraception at last intercourse:

Females +

Males +

Pregnancy among high school females +

Additional comments. Some higher risk students dropped out between the first fall survey and 3 subsequent spring school surveys. The program schools (one of which was, in part, a magnet school) may have differed in unknown ways from the comparison schools. An additional middle school opened nearby. Some sample sizes were small.

16. Edwards et al. 1980 (Reference 58) St. Paul School-Based Clinics.

Sample characteristics. Students in St. Paul, MN; N = approximately 1,000; 9th–12th graders; females = 100 percent; ethnicity not specified; low and middle income.

Program design. The clinics were located in 1 junior-senior high school and 2 high schools. They provided comprehensive health services, including reproductive health care. Contraceptives were picked up at a special hospital clinic. The clinics also provided day care for infants.

Evaluation design. A quasi-experimental design was used. Pregnancy and birth rates for the first year each clinic was open were compared with the rates for subsequent years. Both pregnancy and birth rates were estimated by clinic staff from their personal knowledge of students' pregnancies and births. No tests of significance were conducted.

*Results—changes in outcomes.*¹

Birth rates +

Additional comments. The internal validity of these results were limited by the small number of baseline years, incomplete knowledge of pregnancies and births, and lack of tests of significance.

¹Significant desirable change at .05 level = +; significant undesirable change at .05 level = -; no significant change = 0.

In sum, given the studies published to date, there is not sufficient evidence to determine if school-based programs that focus only upon abstinence delay the onset of intercourse or affect other sexual or contraceptive behaviors.

Sexuality and AIDS-STD education programs.

These programs differ from the abstinence programs in that they discuss both abstinence and contraception; the sex education programs typically include discussions of different methods of contraception while the AIDS education programs typically include discussions of condoms. (The McMaster Teen Program did not include methods of contraception as a specific topic, but it did allow questions on contraception and it did cover other sexuality topics, for example, stages of intimacy, adolescent pregnancy, and parenting.)

Initiation of intercourse. Of the eight evaluations of individual sexuality or AIDS education programs, five measured the impact of the programs upon the

initiation of intercourse (34–41; Nos. 5, 7–10, box 2). None of these five programs significantly hastened the onset of intercourse. This finding is particularly important, given that two of these programs focused upon middle school youth, all of them included youth in grade 10 or lower, and all included youth 16 years old or younger. These data strongly support the conclusion that sexuality and AIDS education curriculums that include discussions of contraception in combination with other topics—such as resistance skills—do not hasten the onset of intercourse.

Furthermore, the two curriculums that specified delaying the onset of intercourse as a clear goal—Postponing Sexual Involvement (42) and Reducing the Risk (43)—successfully reduced the proportion of sexually inexperienced students who initiated sex during the following 12 to 18 months (36,40; Nos. 9 and 7 in box 2). Notably, both groups also received instruction on contraception. Thus, these findings should reduce concerns that such instruction may encourage youth to have intercourse. They also demonstrate that some, but not all, programs can

delay the initiation of sex.

Frequency of sexual activity. Of the eight studies of sex and AIDS education programs, four measured the impact of the programs upon the frequency of sexual activity among those who had initiated intercourse (Postponing Sexual Involvement, Reducing the Risk, STEP, and Kirby untitled curriculums) (36,37,39,40,45; Nos. 9, 7, 6, 10 in box 2). None of the programs significantly increased or decreased the frequency of intercourse among those who were sexually experienced prior to the curriculum. However, Postponing Sexual Involvement, but not Reducing the Risk, significantly reduced the frequency of intercourse among the relatively small proportion of students who initiated intercourse after the curriculum was implemented. That is, for this sample of students who initiated intercourse, the program group had a smaller mean frequency of intercourse than did the comparison group. (The other two studies did not report similar information for students who initiated intercourse after the program.) These results should somewhat reduce concerns that instruction about contraception increases frequency of intercourse.

Use of contraception. All eight evaluations measured program impact upon contraceptive use. The McMaster Teen Program (41) and STEP (47,48) had no significant impact upon contraceptive use. Teen Talk (49) and the Kirby untitled curriculums found inconsistent or mixed results (34,39). Postponing Sexual Involvement, in combination with instruction on human sexuality and contraception, increased use of contraception among those who initiated intercourse after the program, but not among those who were sexually experienced at pretest (36,37). Reducing the Risk increased contraceptive use among sexually experienced females and lower risk youths, but not among males or higher risk youths (40). The Schinke-Blythe-Gilchrest untitled curriculum increased use of contraception among all sexually experienced students (50). And AIDS Prevention for Adolescents in School, a curriculum developed by Heather Walter and her colleagues at Columbia University, increased condom use among all sexually experienced youths (51).

In addition, the primary goal of Reducing the Risk was to reduce unprotected intercourse, in part through delaying the onset of intercourse and in part through increasing the use of contraception. Accordingly its evaluation examined the impact upon a composite measure involving both abstinence and use of contraception. Results indicated that the curriculum significantly reduced unprotected intercourse among

students sexually inexperienced at pretest (40).

In sum, the data from all eight studies indicate that some, but not all, of these programs increased contraceptive use. Only two of the eight programs significantly increased contraceptive use among all sexually experienced youths, but two additional curriculums increased contraceptive use among specific groups of students.

Characteristics of effective education programs.

The varying effects of different programs lead to the question: what are the distinguishing characteristics of effective programs? Because of the relatively few studies and the variation among their target populations, methodological rigor, and statistical power, any observations of commonalities among effective programs must necessarily be preliminary and tentative.

Four programs clearly had a positive impact upon behavior: the Schinke-Blythe-Gilchrest curriculum, Postponing Sexual Involvement, Reducing the Risk, and AIDS Prevention for Adolescents in School. A review of these curriculums indicates that they share the following characteristics, which may be linked to their success.

Effective programs included a narrow focus on reducing sexual risk-taking behaviors that may lead to HIV-STD infection or unintended pregnancy. All four effective programs focused upon a few specific behavioral goals, such as delaying the initiation of intercourse or using protection; relatively little time was spent addressing other sexuality issues, such as gender roles, dating, and parenthood.

Effective programs used social learning theories as a foundation for program development. In general, the effective programs were based upon theoretical approaches that have been demonstrated to be effective in influencing other health-risk behaviors; for example, social cognitive theory (52), social influence theory (53), social inoculation theory (54), and cognitive behavioral theory (50,52). When applied to sexual behavior, social learning theories posit that behavior such as delaying the initiation of intercourse or using protection will be affected by an understanding of what must be done to avoid sex or to use protection (knowledge), a belief in the anticipated benefit of delaying sex or using protection (motivation), the belief that particular skills or methods of protection will be effective (outcome expectancy), and the belief that one can effectively use these skills or methods of protection (self-efficacy).

Social learning theories give considerable recognition to the fact that youths gain these understandings and beliefs directly through education and indirectly

by observing the behavior of others. In addition, social influence theories address the societal pressures on youths and the importance of helping youths understand and resist those pressures. Thus, these programs go far beyond the cognitive level; they focus on recognizing social influences, changing individual values, changing group norms, and building social skills.

Effective programs provided basic, accurate information about the risks of unprotected intercourse and methods of avoiding unprotected intercourse through experiential activities designed to personalize this information. Although increasing knowledge was not the primary goal of these programs, all four provided basic information that students needed to assess risks and avoid unprotected sex. Typically, this information was not unnecessarily detailed or comprehensive. For example, the curriculums rarely provided detailed information about all methods of contraception or different types of STD. Instead, they emphasized the basic facts needed to make behaviorally relevant decisions.

This information was provided through active learning methods of instruction, not through didactic instruction. Students were involved in numerous experiential activities: small group discussions, games or simulations, brainstorming, role-playing, covert rehearsal, written rehearsal, verbal feedback and coaching, locating contraceptives in local drugstores, visiting or telephoning family planning clinics, and interviewing parents.

In addition to these experiential activities, several curriculums used peer educators or videos with characters (either real or actors) who resembled the students and with whom the students could identify. All of these activities helped the students personalize the information.

Effective programs included activities that address social or media influences on sexual behaviors. The effective programs discussed social pressures to have sex. They took several forms. Postponing Sexual Involvement, the Schinke-Blythe-Gilchrest untitled curriculum, and AIDS Prevention for Adolescents in School addressed media influences (for example, how sex is used to sell products and how television shows often suggest that characters have unprotected intercourse but don't experience the consequences). At least one program, Reducing the Risk, discussed situations that might lead to sex. All of the curriculums discussed "lines" that are typically used to get someone to have sex and both AIDS Prevention for Adolescents in School and Reducing the Risk discussed social barriers to using protection (for example, embarrassment about buying condoms).

Effective programs reinforced clear and appropriate values to strengthen individual values and group norms against unprotected sex. The effective programs focused upon and continually reinforced specific values or norms (that is, postponing sex, avoiding unprotected intercourse, using condoms, and avoiding high-risk partners).

Critically, the values and norms expressed in these programs were tailored to the age and experience of the target population. As an example, Postponing Sexual Involvement was developed for middle school youths and focused upon delaying intercourse; given that the majority of middle school youths in the targeted areas had not yet initiated intercourse, the message was appropriate for most students. The Schinke-Blythe-Gilchrest curriculum and Reducing the Risk, on the other hand, were designed for high school students and explicitly emphasized that students should avoid unprotected intercourse, either by not having sex or by using contraception if they did have sex. Finally, AIDS Prevention for Adolescents in School targeted higher risk youths, many of whom were already sexually active, and emphasized the importance of using condoms and avoiding high-risk situations.

The importance of promoting values and norms that are age- and experience-appropriate is demonstrated by the fact that Postponing Sexual Involvement, which emphasized delay in initiating intercourse, did not reduce the frequency of intercourse nor increase the use of contraceptives among those students who had already had sex. Thus, it was an ineffective curriculum for sexually experienced youths. Similarly, AIDS Prevention for Adolescents in School, which emphasized condom use, did not affect abstinence. Thus, it was less effective for sexually inexperienced youths. In other words, the norms emphasized in the curriculum needed to match the experience of the students.

The effective programs used a variety of instructional strategies to reinforce specific values and norms. For example, instruction that emphasized the negative consequences of engaging in sex or unprotected sex provided the proper knowledge base for these norms; the discussion of lines used to get someone to have sex and the effective responses strengthened norms against such lines; the role-playing activities that ended successfully in the avoidance of unprotected intercourse reinforced the norms against unprotected sex; small group discussions which appraised possible risk-taking scenarios and reached consensus about their excessive risk further reinforced peer norms against risk-taking behavior. In addition, a few programs provided

accurate information on the rates of certain behaviors or the acceptability of those behaviors to emphasize that "not everyone is doing it," as is often assumed by teens.

Finally, some of the curriculums used either peer leaders or testimonials from respected peers to contribute to the development of conservative group norms. Collectively, these types of activities helped establish or clarify standards of group behavior, and they may have given students the support or "permission" they needed to feel comfortable choosing to avoid sexual activity or to insist on the use of a condom or other methods of contraception.

Effective programs provided modeling and practice in communication and negotiation skills. All of the effective programs devoted some time to development of skills in communication, negotiation, and refusal. Typically, the programs provided information about the skills, modeled their effective use, and then provided some type of skill rehearsal and practice (for example, verbal role-playing or written practice). There were, however, significant variations in the quality of time devoted to skills practice.

Despite these six common characteristics, there is very little evidence regarding which factors or combinations of factors contribute most to the overall success of the programs. For example, knowledge alone is known to be insufficient to change behavior (18,39). However, assuming that the positive behavioral effects resulted from just the skills practice or the instruction on social influences would be premature. To understand which characteristics were necessary for behavior change, we compared the characteristics of effective programs with those of programs that had no measurable impact on students' risk behaviors.

Differences between effective and ineffective programs. Because only three studies reported no significant behavioral impact (that is, STEP, the McMaster Teen Program, and the Kirby untitled programs), generalizations about the differences between the effective and ineffective programs must be made cautiously. However, there do appear to be several distinguishing differences. First, the ineffective curriculums tended to be less focused and more comprehensive. That is, they covered a broader array of topics and discussed many values and skills, but they failed to emphasize those particular facts, values, norms, and skills necessary to avoid sex or unprotected sex.

Second, the less effective curriculums tended to use a decision-making model in which the decision-making steps were taught; the model was applied to

important decisions; and students were implicitly instructed to make their own decisions. This approach is in contrast to the methods used in the effective curriculums, which presented a clear stand and emphasized clear behavioral values and norms. For example, an ineffective curriculum, the McMaster Teen Program, asked students to identify reasons for and against having sex, but it did not process the discussion beyond the generation of ideas. In contrast, Postponing Sexual Involvement, an effective program, asked students to identify reasons why teens have sex, to identify reasons students should wait to have sex, and then to assess the reasons to have sex and to postpone having sex in terms of likely consequences. Given this structure, the student groups usually concluded that the reasons to wait were more compelling. Because all four of the effective programs clearly focused upon specific behavioral values and norms and none of the ineffective programs did so, this focus may be a particularly important characteristic of effective programs.

There were also program characteristics that professionals in the field have previously believed might be important, but they did not appear to discriminate between effective and ineffective curriculums. One example is length. Although Reducing the Risk was one of the longest (15 sessions) and most effective programs, other long programs were not effective (McMasters Teen Program—10 sessions; STEP—18 sessions; Kirby untitled programs—up to 45 sessions). Furthermore, some shorter programs were effective (Postponing Sexual Involvement in combination with Human Sexuality—10 sessions, AIDS Prevention for Adolescents in School—6 sessions). Thus, length may not be as critical as previously believed.

Skill practice is another example of a curriculum component that did not distinguish well between effective and ineffective programs. Although it is difficult to quantify the amount of practice in each curriculum, it is nevertheless clear that STEP, the McMaster Teen Program, and some of the Kirby untitled curriculums did not significantly change behavior, but they included more skills practice than did Postponing Sexual Involvement or AIDS Prevention for Adolescents in School, two programs that did significantly change behavior. Perhaps skills practice is effective only when clear values or norms are emphasized, or when the skills focus upon avoiding unprotected intercourse instead of covering more general communication skills.

Education plus reproductive health services. Five studies examined the impact of programs that

combined both education and reproductive health services (55–60; Nos. 12–16, box 2). Four of these studies examined programs in two to six schools. Both the educational and reproductive health services varied considerably among these programs. Some programs offered students services on campus; others offered them across the street or nearby. Some referred students for contraceptives; others provided prescriptions for contraceptives; others dispensed contraceptives. The outcomes measured and the quasi-experimental designs also varied among the studies. Consequently, inferences should be drawn cautiously from these studies.

Only two studies measured the impact of school-based clinics and school-linked clinics upon sexual and contraceptive behaviors (55,56). In Baltimore, an adolescent reproductive health clinic, called the Self Center, provided educational, counseling, and reproductive health services in that clinic and educational and counseling services in two schools, a junior high school that was four blocks away and a high school that was across the street. In both schools, the staff implemented a peer education program and after-school group discussions, while in the clinic the staff provided individual counseling, group counseling, and contraceptive services (56,57). According to the survey data collected from the program schools and the matched comparison schools, there was a delay in the onset of sexual intercourse among those youths who had not yet initiated sex.

The study by Kirby and colleagues evaluated the impact of six school-based clinics located on six school campuses in different parts of the country (55). They were comprehensive health clinics, not family planning clinics, and they provided a wide range of primary health care services appropriate for adolescents. Two of them referred students for contraceptives; one wrote prescriptions that could be filled at a nearby Planned Parenthood clinic; and three dispensed contraceptives in the school clinics. The quality of their education programs varied from site to site.

An analysis of survey data collected from the clinic schools and comparison schools (or survey data collected before and after the clinic opened) revealed that in general, clinic presence was not significantly associated with initiation of intercourse or frequency of intercourse. Among males in five of the sites, there were no significant differences in the percent who had initiated intercourse nor in the age of first intercourse. In the sixth site (which dispensed contraceptives), the males in the clinic school were less likely than males in the comparison school to have initiated intercourse. Among females, there were

no significant differences in four of the sites. In one site (which only referred students for contraception) clinic school females were more likely to have initiated intercourse. In the sixth site (which prescribed contraceptives), clinic school females were less likely to have initiated intercourse than comparison school females. Among neither sex in any of the schools was clinic presence significantly associated with frequency of intercourse.

The data from the study by Kirby and his colleagues in combination with the data from the study by Zabin and her colleagues indicate that providing reproductive health services either on campus or nearby neither hastens the onset of intercourse or increases the frequency (55,56).

The Zabin study also indicated that the Self Center increased the use of contraception among those who had initiated sex (56). The results of the Kirby study were more mixed (55). At one site where the clinic focused upon high-risk youths, emphasized pregnancy prevention, and dispensed oral contraceptives, there was a significantly greater use of oral contraceptives among females than among females in the comparison school. However, there was no difference in condom use. At two other sites which dispensed both condoms and oral contraceptives but did not have strong educational components, no significant differences were found in use of condoms by male students or use of oral contraceptives by female students between the clinic and comparison schools. At the site which prescribed contraceptives and had a strong educational component, male students reported higher rates of condom use and female students reported higher rates of contraceptive use than did their counterparts in the comparison school. At the fifth site, which had a strong educational component and referred students for services, clinic presence was associated with greater use of condoms. Finally, at the last site which had weak educational and clinic components, there were no significant differences in condom or contraceptive use.

Given these inconsistent results, we cannot determine conclusively the impact of school-based or school-linked reproductive health services. However, it is clear that there is a substitution effect—some of the students who obtained reproductive health services from the school clinic or school-linked clinic would have obtained them elsewhere if the clinics had not been there. Given that the largest behavioral effects were observed in those sites that had the strongest educational components, we found that these data are also consistent with the hypothesis that the presence of a strong educational component is more critical than provision of reproductive health services.

All five studies examined the impact of their programs upon either pregnancy or birth rates. The Zabin study found that after the Self Center opened, there was a continued small increase and then a large decrease in pregnancy rates for 2 years (56) in contrast to a large increase in pregnancy rates in the comparison schools that continued throughout the 28-month observation period. Furthermore, students who were in the program schools longer (and thus exposed to the program longer) demonstrated greater decreases in pregnancy rates than students who were in the program schools a shorter period. However, the validity of these findings on pregnancy rates is limited by the few years of pregnancy data collected.

Kirby and colleagues found that clinic presence was not significantly related to the pregnancy rate in any of the six school-based clinic sites, after background characteristics of the students were statistically controlled (55).

Edwards and her colleagues gave a great impetus to school-based clinics with a report that birth rates declined in three different schools after clinics providing reproductive health care (including prescriptions for contraception) were opened (58). However, these conclusions were based upon only 1 baseline year for each school and upon the staffs' knowledge of births among students. Subsequently, Kirby and colleagues overcame these limitations by generating birth rates from school and public records for 5 baseline years and multiple post-clinic years (59). That study found large year-to-year variations in school-wide birth rates, but no evidence indicating that the clinics significantly reduced birth rates.

Finally, in a small rural South Carolina community, a comprehensive school and community campaign was implemented (an unpublished paper by H. P. Koo and colleagues entitled "Reducing Adolescent Pregnancy Through School and Community-based Education: Denmark, South Carolina Revisited" and reference 60). Teachers, administrators, and community leaders were given training in sexuality education; sex education was integrated into all grades in the schools; peer counselors were trained; the school nurse counseled students, provided male students with condoms, and took female students to a nearby family planning clinic; and finally, local media, churches, and other community organizations highlighted special events and reinforced the messages of avoiding unintended pregnancy. After the program was implemented, the pregnancy rate for 14- to 17-year-olds declined significantly for several years (60). After parts of the program ended (for example, the school nurse resigned, linkages to contraceptive sources were terminated, and some teachers left the school), pregnancy rates returned to prepro-

gram levels (Unpublished paper "Reducing Adolescent Pregnancy Through School and Community-based Education: Denmark, South Carolina Revisited").

In sum, it remains unclear whether school-based or school-linked reproductive health services, either by themselves or in addition to education programs, significantly decrease pregnancy or birth rates.

Future Directions for Research

This review provides some guidance to educators, but it leaves many important questions unanswered. Additional research is needed to address these questions more definitively. Methodologically sound studies are needed:

- to determine more definitively the relationships among particular topics of instruction, the students' ages, and sexual and contraceptive behavior;
- to investigate further which additional characteristics of curriculums are particularly important in reducing risk-taking behaviors;
- to determine whether curriculums emphasizing abstinence until marriage effectively delay the onset of intercourse and, if so, whether they are more or less effective than curriculums that include clear messages about both abstinence and contraception;
- to assess more definitively and accurately the impact of different approaches to improving access to reproductive health services;
- to assess more accurately the impact of all of these educational and reproductive health service approaches on pregnancy, birth, STD, and HIV rates;
- to assess the durability of measured effects, and to determine whether reinforcement, for example, booster sessions, is necessary and effective in sustaining desired effects.

In addition to these questions that arise directly from this review, other questions also need to be answered: What is the impact of additional program components, such as parent programs, peer programs, after-school discussion sessions, and individual counseling? Are programs more or less effective when they are taught by teachers, the students' peers, or outside experts? Are there appropriate and acceptable ways to target students so that they receive instruction more relevant to their personal experience? What is the impact of program location (school-based or school-linked) and the location of its sponsor (school, clinic, or other community agency)? How can school-based programs be reinforced by community-wide efforts and vice versa?

What is the impact of programs designed to improve the students' life options (for example, the "I-Have-A-Dream" programs)? What is the impact of programs that legitimize condoms and contraceptives (for example, school condom availability programs)? Conversely, do school-based clinics that refrain from providing contraceptives delegitimize contraceptives? If effective programs are integrated into more comprehensive skill-based health education programs, will they be more or less effective? Are there generic skills, norms, and values that can be taught that will reinforce effective programs? What should be the characteristics and instructional content of programs for elementary school youths? How is program effectiveness affected by teaching both students and their potential sexual partners? How can effective programs be maintained and replicated with fidelity? How effective are programs when they are modified slightly to meet local needs? What are the processes needed to institutionalize effective programs in schools?

Our ability to reach definitive conclusions was limited by the few rigorous studies of individual programs, by methodological limitations of individual studies, and by inconsistent results among some of the findings. Additional research needs to employ more valid and statistically powerful methods. Recent studies and studies in progress have demonstrated both the importance and the feasibility of (a) randomly assigning individual students, classrooms of students, or entire schools to program and control conditions, (b) including sufficiently large samples to assure adequate statistical power, (c) tracking youths over sufficient time to measure longer term impact upon initiation of intercourse and contraceptive use, and (d) measuring sexual and contraceptive behaviors. If these research methods are used to address some of the questions posed earlier, then in the future we will have far more definitive answers to some of these questions, and practitioners can have greater confidence in the programs they implement.

Summary and Conclusions

Nearly a century has passed since the first programs to reduce unprotected intercourse were implemented in schools. Subsequently, many approaches have been tried. There has been considerable disappointment, partly because programs have not been nearly as effective as many people had hoped, and partly because program evaluations have been incapable of measuring small effects. However, there is room for some optimism; both programs and evaluation methods have improved considerably

during the past several years, and there is now evidence that a few programs can reduce unprotected intercourse, either by delaying the initiation of intercourse or by increasing the use of condoms and other contraceptives.

There are serious limitations in the research on pregnancy prevention programs, and little is known with much certainty. Nevertheless, our review does support several conclusions about the impact of these programs.

The vast majority of sex and AIDS education programs in the United States include the following topics: abstinence, contraception, pregnancy, STD, and HIV-AIDS. The studies that we have reviewed indicate that these programs do not increase sexual activity. Studies based on national surveys provide consistent evidence that the programs covering these topics did not hasten intercourse when they were implemented among older students; they provide less consistent evidence about their impact among younger students. The studies of specific programs that included instruction on contraception consistently indicated that none of these programs hastened the onset of intercourse. Indeed, all of them either delayed the onset of intercourse or had no effect upon the initiation of intercourse. Furthermore, of the four studies that examined program impact upon frequency of intercourse, none found significant increases in frequency of intercourse, and one found a significant decrease among the relatively small proportion of youths who initiated intercourse after program implementation.

Our review indicates that some programs can increase the use of condoms or other contraceptives. The weight of the evidence from the national surveys indicates that sex education programs do increase the use of contraceptives and AIDS education programs do increase the use of condoms somewhat. However, the data are not always consistent. Studies of specific programs indicate that some, but not all, programs can increase contraceptive or condom use among sexually experienced youths.

The curriculums that effectively delayed the onset of intercourse, increased the use of condoms or other forms of contraception, or reduced sexual risk behaviors in other ways had six common characteristics: (a) theoretical grounding in social learning or social influence theories, (b) a narrow focus on reducing specific sexual risk-taking behaviors, (c) experiential activities to convey the information on the risks of unprotected sex and how to avoid those risks and to personalize that information, (d) instruction on social influences and pressures, (e) reinforcement of individual values and group norms against unprotected sex

that are age and experience appropriate, and (f) activities to increase relevant skills and confidence in those skills. The importance of these characteristics are reinforced by the national surveys indicating the importance of teaching resistance skills.

To date, the published literature does not provide any good evidence indicating whether programs focusing only upon abstinence either do or do not delay the onset of intercourse or reduce the frequency of intercourse.

Because some programs can effectively delay the onset of intercourse and increase the use of contraception, and also because no existing program can prevent most youths from having intercourse during the high school years, programs should both encourage youths to delay or refrain from intercourse and also encourage them to use contraceptives if they initiate intercourse. Programs should be both age- and experience-appropriate. That is, programs for younger adolescents should focus more upon delaying intercourse, while those for older youths should focus more upon condoms and other contraceptives.

Two studies consistently indicate that the provision of reproductive health services either on campus or nearby does not hasten the onset of intercourse nor increase the frequency of intercourse. However, at this time, there is insufficient evidence to determine their impact upon contraceptive use.

There is also insufficient direct evidence to determine whether any of these educational or clinic programs actually decreased pregnancy, birth, STD, or HIV rates. However, there is evidence from at least two studies that some programs delay the onset of intercourse, reduce the number of sexual partners, and reduce the frequency of intercourse or increase the use of protection. If programs have these outcomes, then logically they should also reduce pregnancy, birth, STD, and HIV rates.

In conclusion, research demonstrates that not all school-based sex and AIDS education programs are effective, but that some programs are effective. If these effective programs are implemented in our schools, they can have an important impact upon reducing sexual risk-taking behavior. Clearly, they do not represent a total solution to the problems of unprotected intercourse—families, community-based organizations, churches, and the media all must be involved—but they can provide an effective component in a larger overall strategy to reduce pregnancy, STD, and HIV. The most important characteristics and components of effective programs need to be further delineated, and then programs with these characteristics need to be implemented widely in our nation's schools.

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