REVIEW ARTICLE

Behavioral Interventions to Reduce Incidence of HIV, STD, and Pregnancy Among Adolescents: A Decade in Review

LEAH ROBIN, Ph.D., PATRICIA DITTUS, Ph.D., DANIEL WHITAKER, Ph.D., RICHARD CROSBY, Ph.D., KATHLEEN ETHIER, Ph.D., JANE MEZOFF, CHES, Dr.P.H., KIM MILLER, Ph.D., AND KATINA PAPPAS-DELUCA, M.A.

Purpose: **To review adolescent sexual risk-reduction programs that were evaluated using quasi-experimental or experimental methods and published in the 1990s. We describe evaluated programs and identify program and evaluation issues for health educators and researchers.**

Methods: **We systematically searched seven electronic databases and hand-searched journals to identify evaluations of behavioral interventions to reduce sexual risk behaviors among adolescents. Articles were included if they were published in the 1990s, provided a theoretical basis for the program, information about the interventions, clear aims, and quasi-experimental or experimental evaluation methods. We identified 101 articles, and 24 met our criteria for inclusion.**

Results: **We reviewed these evaluations to assess their research and program characteristics. The majority of studies included randomized controlled designs and employed delayed follow-up measures. The most commonly measured outcomes were delay of initiation of sexual intercourse, condom use, contraceptive use, and frequency of sexual intercourse. Programs ranged from 1 to 80 sessions, most had adult facilitators, and commonly included skills-building activities about sexual communication, decision-making, and problem solving. The programs included a wide range of strategies for content delivery such as arts and crafts, school councils, and community service learning.**

Conclusions: **Analysis of these programs suggest four overall factors that may impact program effectiveness including the extent to which programs focus on specific skills for reducing sexual risk behaviors; program duration and intensity; what constitutes the content of a total evaluated program including researchers' assumptions of participants' exposure to prior and concurrent programs; and what kind of training is available for facilitators.**

KEY WORDS:
Adolescents
HIV
Program effectiveness
Sexual risk-reduction programs
Sexually transmitted infection

From the Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia (L.R., P.D.); the Division of HIV/AIDS Prevention, National Center for HIV, STD and TB Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia (D.W., K.M.); the Rollins School of Public Health, Emory University, Atlanta, Georgia (R.C.); the Division of STD Prevention, National Center for HIV, STD and TB Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia (K.E.); and the Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia (J.M., K.P-D.).

Address correspondence to: Leah Robin, Ph.D., Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway NE, MS K-33, Atlanta, GA 30341. E-mail: lrobin@cdc.gov

Manuscript accepted February 7, 2003.

The full text of this article is available via JAH Online at http://journals.elsevierhealth.com/periodicals/jah

In the 1990s, the prevalence of some sexual risk behaviors, such as initiation of sexual intercourse, decreased among adolescents, particularly among males, African-Americans, and Whites [1]. In addition, the number of adolescents using condoms at

Published by Elsevier Inc., 360 Park Avenue South, New York, NY 10010

1054-139X/04/$–see front matter
doi:10.1016/S1054-139X(03)00244-1

last intercourse increased. The abundance of sexual risk-reduction programs during this time may have contributed to improvements in these behavioral outcomes [2]. Despite these improvements, however, adolescents continue to be at risk for HIV infection, other sexually transmitted diseases (STD), and pregnancy. About 50% of new HIV infections occur among people younger than age 25 years, and 25% of new HIV infections occur among people younger than age 22 years [3]. One in every four cases of STD diagnosed annually in the United States occurs among teenagers [4]. In 1997, 840,000 pregnancies occurred among 15 to 19 year olds in the United States [5]. As many as four of every ten young women in the U.S. become pregnant before reaching age 20 years [6].

Several studies have reviewed the characteristics of effective programs focused on STD and HIV [7–12], teen pregnancy [13–15], and a combination of the three [16,17]. Evaluation criteria in most of these reviews included random assignment, behavioral outcomes demonstrating reductions in risky behavior, comparison data, a required minimum number of subjects, and limits on attrition. The characteristics of effective interventions identified by these reviews are numerous and varied. Among the most commonly cited are: cultural and community relevance, gender specificity, clear messages about the risks and how to reduce them, emphasis on both abstinence and protection from STD and pregnancy, and access to health and reproductive services in addition to sexual risk-reduction programs. Recent quantitative systematic literature reviews provide mixed findings about the overall effectiveness of sexual risk-reduction interventions in reducing risk behaviors. Mullen et al [18] found that HIV risk-reduction interventions reduced unprotected sexual intercourse and decreased overall sexual risk. Other systematic literature reviews of teen pregnancy prevention [19] and general sexuality education [20], however, find no overall impact of interventions in delaying sexual intercourse, use of condoms or contraceptives, or reducing pregnancy. All of the literature reviews assess interventions as independent studies; only one review mentions replications of interventions, and findings have not been analyzed across interventions and their variants [13]. Only three reviews include programs that simultaneously address HIV, STD, and pregnancy prevention.

In this review we examine common characteristics and features among sexual risk- reduction programs evaluated during the 1990s. We review individual studies and compare findings across programs and their variants. This analysis expands on previous work by examining interventions implemented at a time when sexual risk behaviors decreased among adolescents. Furthermore, we look across studies, particularly those that have been replicated, to clarify the characteristics of effective programs. These findings will help health educators and researchers identify important elements to be used in designing more effective programs.

Methods

Literature Searches

Literature searches were performed in six public research databases (Medline, Psychlit, Popline, ERIC, Sociofile, and CHID); in the Prevention Evaluation Research Registry for Youth (PERRY) at the Centers for Disease Control and Prevention (CDC); and through manual searches of journals. We searched during 1999 and 2000 for evaluations of interventions targeting youth and adolescents published in the 1990s.

Standards for Inclusion

Because we aimed to review programs with well-designed evaluations, we set minimum standards for inclusion by reviewing and synthesizing criteria used in other literature reviews of interventions to reduce sexual risk behaviors among youth and adolescents [8,10–12]. Our review criteria were intended to provide us with a set of studies that would be applicable to adolescents in the United States and would allow us to examine the advances made in behavioral interventions for adolescents in the 1990s. We did not include literature reviews or economic evaluations. We required that studies provide a theoretical basis for the programs, information about the interventions (content, duration, facilitators), and clear aims. Studies were included if they used random assignment, or matched control groups using a quasi-experimental design that matched units through stratification of risk behaviors and demographic variables. When analysis revealed inequalities among the conditions, studies were included if researchers controlled for the differences statistically. Studies were included if they had more than 16 participants per condition, followed participants at least four weeks after the end of the intervention or had immediate pre- and post-tests for interventions lasting four months or longer, and had attrition rates of less than 40% at follow-up four weeks after the

end of the intervention. Behavioral and biological outcomes included: abstinence, reduced sexual activity or number of sexual partners, less risky sexual behaviors, reduced numbers of pregnancies or repeat pregnancies, or reduced STD prevalence. Studies also were included if they measured sexual intentions for participants 13 years or younger. Positive changes in these outcomes were not required for inclusion.

Classifying Articles, Studies, and Programs

Out of 101 articles considered for inclusion in this review, 24 articles [21–44] met our inclusion criteria and 77 did not. Of those that did not meet our inclusion criteria, 60 were evaluations of programs, six were literature reviews or economic analyses, five focused on "lessons learned" from evaluation studies, four were evaluations that did not measure sexual risk behaviors or evaluated programs that were not behavioral in nature, and two reported results found in other articles.

To organize the results we created a classification system that distinguished between studies and programs. *Study* was defined as an evaluation of an intervention with a unique sample (which could result in multiple publications), and *program* was defined as a specific intervention or variant of an intervention (which may have been evaluated in multiple studies). In all, the 24 articles we included described 20 studies and 17 programs. Results were aggregated both at the study level, and across studies on the program level.

Each study was classified as having produced "positive," "null," or "negative" effects. A study had *positive effects* if the intervention(s) had a positive effect on at least one behavioral or biological outcome and no negative effects relative to the control group. A study had *null effects* if no differences were detected among groups for any of the behavioral or biological outcomes. A study had *negative effects* if the intervention had any negative impact on one or more of the behavioral or biological outcomes, regardless of any positive findings. For programs we added the category of *mixed effects* if one or more studies found positive effects and one or more studies found null effects.

Review Procedures

The eight authors worked in pairs to analyze each article to determine if it met the criteria for inclusion. All eight authors reviewed three articles before working in pairs to assure consistency in their analyses. If they differed in their judgments, all of the authors discussed the article and arrived at a consensus. If the authors could not arrive at a consensus, the article was analyzed by a third author and again discussed by all of the authors. Two authors then extracted key features of studies (i.e. population of interest, design, theory, attrition, outcome measures, results, limitations), and program characteristics (i.e. duration, facilitators, content, intervention strategies).

Results

Key Features of the Studies

Population of interest. Studies were conducted in schools (n = 9), in community-based venues (n = 2), clinics (n = 2), detention centers (n = 2), participants' homes (n = 1), or some combination of venues (n = 4), which generally included schools and clinics or community-based organizations. Some studies focused on broad age ranges during adolescence (such as *Focus on Kids* [23,24] which included youth aged 9–15 years, and *Teen Talk* [44] which included youth aged 13–19 years) and others focused on particular ages or school grades. Three studies included only males. As with age and gender, some studies were targeted toward a particular ethnic group. Five of the interventions included only African-American participants.

Design features. Overall sample sizes ranged from under one hundred participants to more than 10,000 participants; 13 studies had more than 500 participants (Table 1). Almost all studies used convenience sampling (18 of 20). Of the 20 studies, 12 employed a randomized, controlled trial design; the remaining studies had a quasi-experimental design. Of the quasi-experimental studies, almost all evaluated programs that were implemented in schools (n = 6), with only two quasi-experimental studies evaluating programs conducted in community settings. Sample sizes within conditions ranged from 43 to 933 participants, although five studies did not report sample sizes by condition. Nine studies conducted only pre- and post-test measurements; the shortest post-test period was 4 weeks, and the longest was 10 months. An additional nine studies conducted follow-up measurements at 12 months or later. The remaining two studies conducted delayed follow-up measurements at less than 1 year.

Table 1. Key Features of 20 Studies With Effects Classified as "Positive," "Null," or "Negative"

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Positive Effects							
Be Proud, Be Responsible [21]	Convenience sample from school, YMCA, and clinic. Mean age of participants was 14.6 yrs. Participants were: 100% male 100% African-American	N = 157. Randomized trial with one intervention group (I; n = 85) and one control group (C; n = 72) that received a career planning intervention similar in length and form to BPBR. Measurement was pre- and post-intervention (3 months).	None stated	3% at 3 months	Sexual intent Index of risky sexual behavior over last 3 months (included ever had sex, multiple partners, condom use, anal intercourse)	• Intent to engage in risky behavior: I < C • Risk sexual behavior index: I < C; effects were stronger when facilitator was female vs. male. • Frequency of sex, number of partners, occasions of sex without a condom, having had anal sex: I < C	None
Making Proud Choices: A safer-sex approach Making a Difference: An abstinence-based approach [22] (Be Proud, Be Responsible Variants)	Community based convenience sample. Participants were: in grades 6 and 7 (mean age = 11.8 yr, 47% male; 53% female; 100% African-American	N = 659. Randomized trial with 3 groups: Abstinence (A; n = 215), Safer sex (S; n = 218), and control (C; n = 214) that was a health-promotion intervention focused on cardiovascular health. Measurement was pre-intervention, 3-, 6-, and 12-month follow up.	Social Cognitive Theory of Planned Behavior	5%–7% at 12 months	Frequency of: intercourse, condom use, unprotected sex, and always used condoms during past 3 months.	• Frequency of intercourse: S < C (6, 12 months), A < S (6, 12 months) for sexually experienced at pre-test only • Unprotected sex: S < C (3, 6, 12) for sexually experienced only. A > S (3, 12 months) for sexually experienced. • Always used condom: S > C and A > S (3 months) • Frequency of condom use: S < C (3, 6, 12 months), A > C (12 months)	None

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Focus on Kids [23, 24]	Community based convenience sample. Participants were: 9–15 years old (mean age = 11.4 yr); 56% male; 44% female; 100% African-American	N = 383. Randomized trial with groups of friends assigned to intervention (I; n = 206) or control group (C; n = 177). Control group participants were offered weekly sessions, but not with their friendship group. Measurement was pre- and post-intervention at 6-, 12-, 18- and 24 months. 1996 paper reports on 6- & 12-month results only; 1997 paper reports cumulative results across all assessments.	Protection Motivation	22% at 6 months 27% at 12 months 31% at 18 months 31% at 18 months 36% at 24 months	Intentions, behavior (did vs. did not have sex), condom use	• Condom use and condom use intentions: I > C at 6 months but not 12 months [23] • Cumulative prevalence of unprotected sex: C > 1 at 24 months [24]	• Attenuation of effects for intent measures.
[25]	Convenience sample from detention facility (consecutive entry into detention center). Participants were: 16–19 years (median age = 17.8 yr); 100% male; 65% Black; 33% Hispanic; 2% White.	N = 157. Quasi-experimental with one intervention (I; n = 58) and one control group (C; n = 99) who received nothing. Measurement was pre and post-intervention 10 months after baseline.	Problem solving therapy	34% at 10 months	Multiple partners; risk partners, anal sex; condom use for vaginal, oral, and anal sex	• Condom use (for intercourse, oral sex/anal sex, and overall) and condom acceptability: I > C	• No random assignment • Recruitment from a single setting

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Reach for Health [26]	School-based convenience sample. Participants were: in grades 7 and 8; 47.2% male; 52.8% female; 15.9% Hispanic; 79.2% Black; 4.9% "other"	N = 1061. Quasi-experimental with 3 groups: 35 classrooms at 1 school were randomized into two intervention groups - Reach for Health Curriculum only (RHC); Reach for Health Curriculum, plus the Community Youth Service (CYS) program. 32 classrooms at a 2nd school comprised the no intervention control (C). Group n's not given. Measurement was pre- and post-intervention at 6 month follow-up.	Health Belief Model Social Learning	8.3% at 6 months	Lifetime sexual experience; Frequency of sex in past 3 months; Recent condom use; Recent contraceptive use; Composite index of sexual risk.	• Frequency of recent sex; CYS > C at 6 months • Sex Behavior Index: CYS < C at 6 months	• Included only one intervention and one control school • Unit of randomization did not match unit of analysis
Reducing the Risk [27]	School-based convenience sample. Participants were: in grades 9–12 (mean age = 15.3 yr); 47% male; 53% female; 62% White; 20% Latino; 2% African-American; 16% "other"	N = 1033. Quasi-experimental with 2 groups: Reducing the Risk intervention (RTR; n = 586) & control group (C; n = 447) receiving a standard sexuality curriculum. Measurement was pre- and post-intervention at 6 and 18 months.	Social learning Social inoculation Social behavioral	27% at 18 months	Ever had sex; Frequency of sex in past month; Birth control use at first and most recent sex; Birth control use all or most of the time; Unprotected sex; Pregnant or caused pregnancy	• Sexual initiation: RTR < control (18 month only). Note that this was true when analyzing change scores, but ns when using log regression • Unprotected sex: RTR < control (18 month only) among youth who were sexually in-experienced at baseline (true for change score, but ns when using log regression) • In sub-analyses of lower risk youth and of females, contraceptive use RTR > C and for unprotected sex RTR < C (both at 18 m only)	• Potential for contamination within schools - same teachers taught some of the RTR and control curricula Interactions not tested to justify subgroup analyses, and the only positive intervention effects from the multivariate analyses were found among subgroups

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Safer Choices [28]	Recruited from classes in 20 schools. Participants were: in grades 9 and 10; 48% male; 53% female; 31% White; 27% Hispanic; 17% African-American; 18% Asian.	N = 3869. Randomized trial with 2 groups: Safer choices (SC; n not given) and comparison program (C; n not given) which was a standard HIV knowledge-based curriculum. Measurement was pre- and post-intervention at 7 months.	Social cognitive Social influence	5% at 7 months	Sexual initiation, frequency of unprotected intercourse, # sex partners, condom use (1st, last)	• Unprotected sex during past 3 months: SC < C • Condom use at last intercourse: SC > C • Effective birth control at last intercourse: SC > C	• None
Teen Incentives Program [29]	School-based convenience sample. Participants were: in 9th grade (mean age = 15.1 yr); 25.8% male; 74.2% female; 43.3% Black; 30.8% West Indian; 22.5% Hispanic; 3.3% "other"	N = 120. Randomized trial with one intervention group (I; n = 60) and one control group (C; n = 60) that received written materials about contraception and decision-making related to risk-taking behavior. Measurement was pre- and post-intervention at 6 months after baseline.	None stated	30% intervention, and 12% Control at 6 months	Frequency of sex; Frequency of contraceptive use	• Frequency of sex: I < C • Frequency of contraceptive use: I > C	• Sample recruited from only one school • Differential attrition rate

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Teen Outreach Project [30]	School-based convenience sample. Participants were: in grades 9–12 (mean age = 15.8 yr); 15% male; 85% female; 68.2% Black; 15.5% White; 11.2% Hispanic; 2.9% "other"	N = 695. Quasi-experimental with one Teen Outreach Project intervention group (TOP; n = 342) and one control group (C; n = 352) which received regular curricular offerings in health or social studies. Some sites had random assignment at student or classroom level. Measurement was at pre- and post-only (9 months after baseline)	None stated	5.3% TOP, 8.4% Ctrl at 9 months	Ever been pregnant or caused a pregnancy (or since baseline)	• Pregnancy rates: TOP < C for females only.	• Base line data collected 2–3 weeks into the program • Different units of random assignment across sites, so unit of analysis did not match unit of randomization at some sites.
[31]	Sampling from matched schools in which classrooms were randomly selected. Participants were: in grades 9 and 11 (mean age = 15.7 yr); 41.5% male; 58.5% female; 36.7% Black; 35.4% Hispanic; 27.9% "other"	N = 1316. Randomized with 4 schools randomized to one intervention group (I; n = 2 with 739 students) or one control (C; n = 2 with 577 students) that received no formal AIDS curriculum Measurement was pre- and post-intervention at 3 months	Health Belief Model Social cognitive Social influence	34% at 3 months	AIDS risk behaviors index included sexual involvement, condom use, high risk partner, STD diagnosis	• Risk behavior scores: I < C.	• Unit of analysis did not match unit of randomization • Low number of units randomized

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Youth AIDS Prevention Project (YAPP) [32, 33, 34]	School-based convenience sample. Participants were in 7th grade (mean age = 12.6 yr); 51% male; 49% female; 22% White; 61% African-American; 12% Hispanic; 5% "other"	N = 2392. Randomized trial with 15 schools assigned to 1 of 2 interventions groups (parent-interactive or PI, n = 770; non-parent interactive or NP, n = 689) and 1 control group (C, n = 933) that received basic AIDS education ordinarily provided by the school. Intervention groups were combined into one group for the 1995b analysis. Measurement was done pre- and post-intervention at 1 year and 2 years	Social cognitive Theory of Planned Behavior Social influence	As reported in [34]: At 1 year, C = 19.5% NP = 28.7 PI = 22.1% At 2 years, 55.8% overall. C= 50.9% NP= 60.2% PI= 54.9%	Behavioral intentions to use condoms, and to use condoms with foam Ever had sex, recent sex (30 days), age of debut, condom use at 1st and last intercourse (in 9th grade only), condom use with foam in past 12 months, in past 30 days	• Intentions to use condoms with foam PI and NP > C (at 1 year 1995a; among those who became sexually active between 7th & 8th grade, 1995b) • Intention to use condoms with foam: PI and NP > C, among sexually active and not sexually active students (at 2 years) • Condom use with foam, NP and PI>C (among those who became sexually active between 7th and 8th grade, 1 year, 1995b paper) • Condom use with foam, ever & at last intercourse, NP>PI among sexually active students (at 2 years)	• Parent-participation was very low • Very high attrition rate at 2 years, and used random effects regression, which replaces missing data so as to include all participants—those with and without data—in the analyses • Unit of analysis did not match unit of randomization

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Becoming a Responsible Teen [35]	Health Center–based convenience sample. Participants were: 14–18 years (mean age = 15.3 yr); 28% male; 72% female; 100% African-American	N = 246. Randomized trial with 2 groups: one-time Education Program (EC) similar to standard AIDS education program, 8-wk Education plus Behavioral Skills Training (BST). Group *n*'s not reported. Measurement was at pre- and post-intervention, 6- and 12-month follow up.	Information, Motivation, Behavior Model	8.5% at 12 months	Frequency of unprotected vaginal, oral, and anal sex; Frequency of condom use; Number of sex partners	• Frequency of condom protected vaginal intercourse: EC < BST (post, 6m) • Frequency of condom protected oral intercourse: EC < BST (6, 12 m) • Composite condom use: BST > EC (post, 6m, 12m) with both groups decreasing condom use at 1 year • Rate of sexual activity: BST < EC at 1 year • Initiation of sexual activity: EC > BST at 1 year among non-sexually active youth	• Some effects attenuated at one year
Null Effects							
Working on the Right Direction [36] (Becoming a Responsible Teen Variant)	State Reformatory–based convenience sample. Mean age of participants was 15.8 years. Participants were 100% male; 69.9% African-American; 28% White; 1.9% Hispanic Participants were 100% male; 69.9% African-American; 28% White; 1.9% Hispanic	N = 361. Randomized trial with 2 groups: 6 hr intervention based on 12-hour BART intervention (ST; n = 180), control condition based on PACT (Anger Management intervention; AM, n = 181). Measurement was at pre- and post-intervention, and 6-month follow up.	Information, Motivation, Behavior Model	14% at 6 months	Frequency of unprotected vaginal, oral, and anal sex; Percentage of intercourse occasions protected by condoms; Number of sex partners—all in past 3 months	• No differences on any behavioral outcomes	• Only 1 institution included in study so there is potential contamination
[37]	School-based convenience sample (Phys. Ed. classes from 4 schools). Participants were: in 9th grade (mean age = 14.4 yr); 41% male; 59% female; 10% White; 16% African-American; 20% Latino; 42% Asian; 12% "other"	N = 695. Quasi-experimental with two schools assigned to intervention (I; n = 210) and two assigned to control (C; n = 303) which received a standard educational program lasting 1 class period. Measurement was pre- and post-intervention at 4 weeks.	Social cognitive, Heath Belief Model	26% at 4 weeks	Average condom use, sexual risk in past month, condom use in past month	• No differences on any behavioral outcomes	• No random assignment • Very short follow up period and high attrition given that short period.

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral outcomes[2,3]	Limitations
Facts & Feelings [38]	Home-based convenience sample. Participants were: in grades 7 and 8 (mean age = 13.9 yr); gender not reported; 97% White.	N = 548. Randomized trial with three groups: video + newsletter (VN; n = 126), video only (VO; n = 132), or control (C, n = 290) which received nothing. Measurement was pre- and post-intervention, and 9-month follow up.	None stated	8% overall at 9 months. VN = 4.7%, VO = 7.5%, C = 10%	Teen sexual behavior, intentions	• No differences on any behavioral outcomes	• Solicited over 6000 families and only 548 volunteered • Homogenous and low risk sample
[39]	Clinic-based sample (consecutive enrollment of adolescents with at least 1 STD). Mean age was 17.6 years. Participants were: 8% male; 92% female; 81% Black; 4% White; 8% Hispanic; 7% "other"	N = 90. Randomized trial with one intervention group (I; n = 43) and one control group (C; n = 47) which received standard care at clinic. Measurement was pre- and post-intervention at 2-months.	None stated	8% at 2 months	Ever had sex, condom use, number of partners	• No differences on any behavioral outcomes	• Small N • Recruited from single clinic.
SNAPP [40]	School-based convenience sample.	N = 1616. Randomized trial with classrooms randomized to one intervention group (1) or one control group (C) that received didactic instruction about prevention of HIV, STD, and pregnancy. Group n's not given	Social learning, Health Belief Model	23% at 17 months	Delay of sexual onset, frequency of intercourse, condom use, birth control use. STD and pregnancy rate	• No differences on any behavioral outcomes	• Randomization unit was classroom not school

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
	Participants were: in 7th grade (mean age = 12.3 yr); 46% male; 54% female; 64% Latino; 13% Asian; 9% African-American; 5% White.	Measurement was pre- and post-intervention at 5 and 17 months.					
Negative Effects							
Postponing Sexual Involvement [41, 42]	School/Clinic sponsored convenience sample. Participants were: in 8th grade; male and female; 99% Black.	N = 536. Quasi-experimental with 2 groups, assigned by school: one intervention group (PSI; N = 395 in 24 schools) and one control group (C; N = 141 in 29 schools) which received nothing. Measurement was at beginning, middle, & end of 8th grade and at beginning and end of 9th grade, and end of 12th grade [44].	Social Influence	15–19% at 1 year; 44–57% at 5 years	Whether or not had sex; Frequency of intercourse; Contraceptive use; Occurrence of pregnancy (females only)	• Sexual initiation: C > PSI (end of 8th, 9th, for both males and females • Contraceptive use: PSI > C (end of 9th; only among those who had not engaged in sex at baseline) • Frequency of sex: C > PSI (end of 9th only among those who had not engaged in sex at baseline) • Occurrence of pregnancy: C > PSI (end of 9th end of 12th • *Not engaged in sex in past month: C > PSI (males only, end of 9th grade)*	• No random assignment • No effects for youth sexually experienced at baseline • No analysis of school level differences • Significant differences at baseline not controlled for • Attenuation of most effects by 12th grade.

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Postponing Sexual Involvement [43] (Replication of Postponing Sexual Involvement)	Convenience sample from schools, health departments, CBOs. Participants were: in 8th grade (mean age = 12.8 yr); 43% male; 57% female; 30% White; 9% Black; 39% Hispanic; 22% "other".	N = 10,600. Quasi-experimental with 3 different designs. One design used random assignment by classroom, with 3 groups: PSI adult-led intervention group (PSI-A), PSI peer-led intervention group (PSI-P), and no program control (C). Second design used random assignment by school, with 2 groups: PSI intervention which was adult-led (PSI-A) plus school-wide activities in support of the ENABL initiative, and a no program control (C). Third design randomly assigned individuals from community-based agencies to adult-led PSI intervention (PSI-A) or a no program control (C). Measurement was at pre-intervention, 3-(1st design only) & 17-month follow up.	None stated	9% at 3 months first design only, 31% at 17 months	Initiation of sex; Frequency of sex; Number of sexual partners; Use of contraceptives; Pregnancy rates; Rates of reported sexually transmitted diseases.	• *Pregnancy rates: PSI-P > control (major difference among males; relationship holds when examining sexually active at baseline only).* • *STD rates: PSI-A > control.*	• Unit of randomization did not match unit of analysis

Table 1. continued

Program & Citation	Population of Interest	Design	Theory	Attrition[1]	Outcome Measures	Results for Behavioral Outcomes[2,3]	Limitations
Teen Talk [44]	Convenience sample from family planning agencies and schools. Participants were: 13–19 years; 52% male; 48% female; 15% White; 24% Black; 53% Hispanic.	N = 1444. Quasi-experimental with one Teen Talk intervention (TT: N = 722) and one control group (C; N = 722) which received the standard curriculum that was in place at each site (8 different programs total). Some sites had random assignment at student or classroom level. Measurement was at pre- and post-intervention, and one year follow-up.	Health Belief Model, Social Learning Theory	8% at post; 38% at one year	Ever had sex; Contraceptive use at first and most recent sex; Consistency of contraceptive use; Index of contraceptive efficiency; Occurrence of pregnancy	• Sexual initiation: TT < Control at 1 year (males only) • *Contraceptive use at most recent sex: Control > TT at 1 year (females only, sexually inexperienced at baseline)* • *Contraceptive efficiency: Control > TT at 1 year (females only, both for sexually experienced and inexperienced at baseline)* • Contraceptive efficiency: TT > Control at 1 year (males only, sexually experienced at baseline)	• Different units of random assignment across sites, so unit of analysis did not match unit of randomization at some sites.

[1]Attrition rates are provided for the longest available follow-up period for which information was available. A single attrition rate indicates that intervention and control group rates did not differ from one another.

[2]Group abbreviations are defined in the Outcome Measures column. Any effects in which the intervention has a negative impact on adolescents relative to the control group are in italics.

[3]Results are significant at the $p \leq .05$ level unless otherwise indicated.

Theory. Many interventions were based on a combination of theories. Social cognitive theories, the Health Belief Model, social learning theories, and social influence theories were applied most often. No clear patterns emerged in study methods, year of publication, intervention content, or duration with respect to the theory guiding interventions.

Attrition. Attrition was difficult to assess because of differences in follow-up periods and reporting. The average attrition rate was 14.7% among studies in which any follow-up measurement was conducted before 6 months, 13.1% among follow-ups conducted between 6 and 12 months, 23% among follow-ups conducted between 1 and 2 years, and 50.5% among follow-ups conducted between 2 and 5 years.

Outcome measures. Behavioral measures most frequently used were: delay of initiation of sexual intercourse, condom use, contraceptive use, and frequency of sexual intercourse. Less frequently measured were cases of teen pregnancy or of STD or sexual risk behaviors such as number of sexual partners, anal or oral sex, or the perceived riskiness of sexual partners. The time frame for behavioral measures varied and included: lifetime, 12 months, 3 months, 1 month, most recent sexual intercourse, and first intercourse. Many studies used multiple time frames to measure behavioral outcomes. Of the studies, 50% created a composite index of behavioral measures, some of which used multiple time frames. Some studies did not report any time frame for their measures.

Results. Among frequently measured behaviors, condom use (8 studies of 12) was affected most consistently, and delayed initiation of sexual intercourse (4 studies of 11) was affected least consistently. Among measures less commonly used, the most consistent impact was observed for whether participants became pregnant or impregnated their sexual partners. Three studies reported negative findings: (a) increased likelihood of males in the intervention group engaging in sex within the last month relative to the control group [41]; (b) increased reports of pregnancy and STD [43]; (c) less contraceptive use at most recent sex among females who were sexually inexperienced at baseline [44]; or (d) less contraceptive efficiency (i.e. an index measure combining the consistency of contraceptive use and effectiveness of the selected method of contraception) among females in the intervention group [44]. It is worth noting that most studies did not test the treatment by subgroup interaction before conducting subgroup analyses.

Limitations. Common limitations concerning recruitment and retention included recruiting all participants from a single setting (because the potential for contamination is higher), differential attrition among groups, and a high attrition rate in a short follow-up period. Common limitations concerning group assignment included non-random assignment to condition and having too few units to randomize. Analytic limitations included differences among groups that were reported but not controlled in the analyses, and the unit of randomization not matching the unit of analysis. Finally, the attenuation of effect sizes at subsequent follow-up periods constituted a practical limitation. Some study-specific limitations also are listed in Table 1. It is important to note that a lack of limitations for any given study may result from a lack of information provided in the paper.

Program Characteristics

Duration and intensity. Programs were of variable durations (Table 2). The shortest program was one session (less than an hour) and the longest was 80 sessions (over 15 hours). A greater proportion of programs that were 15 or more hours long were evaluated using randomized designs than were programs of shorter duration. About half of programs between 2 and 7 hours long were evaluated using a quasi-experimental design (n = 7). Of these, five evaluated programs were implemented in a school setting. Further, the program of the shortest duration was evaluated before 1995, and none evaluated in that time period were longer than 15 hours. In contrast, almost half of the studies published after 1995 were more than 15 hours long, and none were less than 7 hours long. In some cases, determining program duration was difficult because other sexual risk-reduction programs were offered at the same time as the program of interest and affected the dosage of sexual risk-reduction messages and skills provided to youth. Another reason for this difficulty was the failure of some studies to report the total number of hours or the length and number of sessions. Programs also varied in their intensity. For example, *Be Proud! Be Responsible!* [21] was conducted in one 5 hour session, and three programs (*Reach for Health* [26], *Safer Choices* [28], and *Youth AIDS Prevention Project* [32–34]) conducted sessions over a two year span.

Facilitators. Among the 17 programs, 13 were facilitated by adults and four by peer leaders. One program was facilitated by only African-American adults, and one was facilitated by only males. Adult facilitators had varied backgrounds and included parents, counselors, teachers, nursing school students, university faculty, administrators, community adults, Masters-level health educators, and medical professionals. Peer leaders also had varied backgrounds and characteristics. Some of the peer leaders in *SNAPP* [40] (e.g., were teen mothers and persons infected with HIV).

Intervention content. Program content was diverse. For example, the *Teen Outreach Program* [30] included volunteer work; the *Teen Incentives Program* [29] included career planning; *Reducing the Risk* [27] included activities conducted with parents; and *Focus on Kids* [23,24] included condom-use skills. Knowledge-based content was present in all of the programs and included information on HIV, STDs, pregnancy, violence prevention, alcohol and other drug-use prevention, and general youth sexuality information. Skills-building activities were also frequently addressed, including communication skills (n = 12), problem-solving (n = 8) changing peer norms (n = 8), and decision-making (n = 6). Intervention content varied by duration. Programs that were more than 15 hours long addressed a greater variety of knowledge topics (including violence prevention and drug and alcohol use) than did those of shorter duration. In addition, more programs that were more than 15 hours long included more general life skills (such as community service learning, career planning, and general problem solving) than programs of shorter duration, and included a greater variety of general life skills. In contrast, programs between 7 and 15 hours were more likely than longer or shorter programs to teach abstinence and condom-use skills, and to teach a greater variety of each.

Intervention strategies. Researchers used a variety of program strategies. For example, *Focus on Kids* [23,24] included arts and crafts; *Reach for Health* [26] included community service learning; *Safer Choices* [28] used a school health promotion council composed of teachers, students, administrators, and parents; and the *Teen Incentives Program* [29] included family planning services. The most common strategies for content delivery were small group discussion, role-playing and interactive and experiential exercises, use of media and interactive media, use of structured games, and lecture.

Study Effects

We found that 12 studies had positive effects, five had null effects, and three had negative effects. Two studies classified as having negative effects [41,42] also had positive effects. When we aggregated studies into the 17 programs and their variants, we found that 10 programs had positive effects, one had mixed effects, four had null effects, and two had negative effects. *Becoming a Responsible Teen* [35] was categorized as "mixed" because the original curriculum had positive results, but its variant curriculum, *Working on the Right Direction* [36], had null results (Table 2). We found very few clear differences among studies and programs on the basis of their effects.

The majority of studies showing positive effects were published in 1995 or later, targeted African-American youth, included both males and females, and took place in schools. Three studies with positive effects included only African-American participants. Two studies included only male participants. Most studies with positive effects employed a randomized, controlled design.

Programs that produced positive effects used trained adult facilitators. Two programs demonstrating positive effects, both variants of *Be Proud! Be Responsible!* [22] and *Safer Choices*, also used trained peer facilitators [28]. *Safer Choices* also included parents and school staff in school-based activities. Programs demonstrating positive effects included content that was specific to reducing sexual risk behavior such as refusal of unwanted sex and condom-use skills. Programs with positive effects most commonly employed interactive and participatory educational strategies. Although we have found that effective programs emphasize skills that reduce specific behaviors, interventions more generally targeted toward increasing youth resiliency and competencies are emerging as promising approaches to reducing sexual risk behavior [13].

An example of a promising youth resiliency program is the *Seattle Social Development Project*. In this program, elementary school children received social competence training, and training and support programs were provided for their teachers and parents [45]. This program focused on school bonding, academic success, and the prevention of many health risk behaviors. Children receiving the intervention in first through sixth grades were less likely to report being sexually experienced or having multiple sex partners by aged 18 years than those in the control group. This program is innovative in its broad, resiliency-based approach and its implementation

Table 2. Characteristics of 17 Programs With Effects Classified as "Positive", "Mixed", "Null", and "Negative"

Program	Duration/Intensity	Facilitators	Content	Intervention Strategies
Positive Effects				
Be Proud Be Responsible![a] [21]	5 hour session held on one Saturday	Trained male and female adult facilitators; all were African-American	Knowledge about HIV/AIDS, education about AIDS-risk activities, condom use skills, negotiation skills for safer sex activities	Videos, games, interactive exercises, and role-plays.
Making a Difference: Safer-sex program [22] (Be Proud Be Responsible Variant)[a]	8 1-hour sessions held on 2 consecutive Saturdays.	Trained male and female adult and peer facilitators; adults were all African-American.	Value of condoms, knowledge about HIV/STD, enhance beliefs that condom use does not adversely affect sexual enjoyment, increase skills and self-efficacy for condom-use, and negotiating condom-use	Small group discussions, videos, games, brainstorming, experiential exercises, skills-building activities, role-plays.
Making a Difference; Abstinence-focused program [22] (Be Proud Be Responsible Variant)[a]	8 1-hour sessions held on 2 consecutive Saturdays.	Trained male and female adult and peer facilitators; adults were all African-American	HIV/STD knowledge; strengthen beliefs supporting abstinence, increase self-efficacy and skills to resist pressure to have sexual intercourse and to negotiate abstinence.	Small group discussions, videos, games, brainstorming, experimental exercises, skills-building activities, role-plays.
Focus on Kids [23, 24]	7 1.5-hour sessions of 7 weeks, and one 1-day retreat	Trained adult male and female facilitators matched to gender of group; most were African-American.	Knowledge about STD/AIDS, contraception, communication and negotiation skills, values clarification, goal setting, prevalence of peer risk behaviors and condom-use behaviors, condom-use skills.	Small group discussions, lectures, videos, games, role-plays, acting, storytelling, arts, crafts, developing community projects, "family tree" depicting relationships and situations, "graduation" ceremony.
[25]	4 1-hour sessions, twice weekly	Adult male counselors	Knowledge about HIV drug abuse and its consequences, AIDS risk reduction, seeking AIDS-related services in the community.	Small group discussions, role-plays, skills practice, brainstorming.
Reach for Health [26] O'Donnell et al, 1999	80 sessions over 7th and 8th grade	Teachers, nursing school students, university faculty members	2 community service job assignments, instruction in preventing drug/alcohol use, violence, and risky sexual behaviors.	A variety of tasks in child daycare centers, nursing homes, and senior centers, including assisting doctors and dentists, clerical work, reading, arts and crafts, exercise; debriefing sessions in classrooms.
Reducing the Risk [27]	15 class periods	Teachers who volunteered to implement the program	Sexual decision-making, communication skills, emphasis on norms to avoid risky sex through abstinence or condom-use, parent-adolescent communication	Skills practice, small group discussion, role-plays, parent-child discussion.

Table 2. continued

Program	Duration/Intensity	Facilitators	Content	Intervention Strategies
Safer Choices [28]	Classroom curriculum including 20 sessions over 9th and 10th grade; a school health promotion council, a Safer Choices peer team or club; parental activities; school-community linkages.	Teachers, students, parents, administrators, and community representatives	A knowledge and skills-based curriculum plus peer resources, parent education, school-community linkages to health services, and other planned safer-sex promotion activities	School health promotion council that plans and conducts program activities including teachers, students, parents, administrators, and community representatives; classroom intervention includes small group discussion and role-plays; a peer team or club hosts school-wide activities; parents receive newsletters and participate in student-parent homework assignments; students gather information about local resources and services and the classroom activities include an HIV+ speaker.
Teen Incentives Program [29]	8 weekly sessions, a six week career program, further small group work (duration not stated).	Not stated	Knowledge about pregnancy, HIV/STD prevention, communication skills, self-efficacy, career planning, parent relationships, peer influences, drug abuse, teen sexuality.	Provides family planning services, small group discussions, role-plays, writing, and videotaped skits, a healthcare career mentoring component.
Teen Outreach Program [30]	Classroom discussions 1–3 times a week for an academic school year, at least 20 hours of volunteer experience a year	Teachers or guidance personnel, and trained staff and adult volunteers in community service sites.	Service learning discussions including plans for and skills needed in service learning sites, sharing of, and reflection on experiences while volunteering. Class curriculum topics varied, and included values, life skills, family stress, human growth and development, issues related to transitions from adolescence to adulthood. Less than 15% of the classroom curriculum covered sexuality topics.	Structured discussions, group exercises, role-plays, guest speakers, informational presentations.
[31]	6 classroom sessions on consecutive days	Teachers	Knowledge about AIDS, risk appraisal, finding AIDS prevention resources, prevalence of peer risk behavior, clarifying values, negotiating delay of sexual intercourse and negotiating condom use, obtaining and using condoms.	Lectures, small group discussions, role-plays.
Youth AIDS Prevention Project [32, 33, 34]	Classroom curriculum had 10 sessions in two consecutive weeks the first year and 5 booster sessions in one week in the second year.	Master's level health educators	Knowledge about HIV/AIDS, pregnancy, drug-use and abuse; decision-making and resistance skills, use of condoms with foam.	Skills-building, modeled skills, class discussions, small group discussion, role-plays, games, and anonymous question box, homework including parents.

Table 2. continued

Program	Duration/Intensity	Facilitators	Content	Intervention Strategies
	A second condition received the curriculum and two extra assignments with parents in the first year, and one extra assignment with parents the second year		Parent intervention component included interactive homework assignments, attend parent meetings, participate in organizing parent networks and participate in AIDS prevention activities in the schools.	
Mixed Effects				
Becoming a Responsible Teen [35][a]	90–120 minute sessions over 8 weeks.	Paired male and female adult facilitators	Knowledge about STD/AIDS, condom use, skills, sexual assertiveness, refusal skills, information provision to peers, self-management, and risk recognition.	Small group discussion, videos, modeled skills, skills practice, role-plays, HIV+ speakers.
Working on the Right Direction [36][a] *(Becoming a Responsible Teen Variant)*[a]	6 one-hour sessions over 3 weeks	Paired male and female adult facilitators	Knowledge about STD/AIDs, condom-use skills refusal skills, information provision to peers, self-management, and condom negotiation.	Small group discussion, modeled skills, skills practice, videos, role-plays.
Null Effects				
[37]	3 class periods over 3 consecutive days.	Not described	Knowledge about HIV/STD, sexual decision-making skills, problem-solving and communication skills.	Interactive slides presentations, videos, classroom and small group discussion, games, role-plays.
Facts & Feelings [38]	Six 15–20 minute videos, supplementary printed materials and newsletters; intensity was not regulated, families had 3 months to view the tapes.	Self-administered by parents and teens.	Social, emotional, and physical changes from puberty, sexual values, knowledge of anatomy, reproduction, prenatal development and birth, sexuality within relationships and advantages of postponing intercourse, media influences, consequences of sexual involvement, and refusal skills.	Videos, printed materials providing supplementary information and additional suggestions for discussions and activities.
[39]	30 minute discussion with adolescent	Physicians	HIV risk assessment, condom-use counseling, susceptibility to HIV, HIV prevention, condom efficacy, drug and needle use, free condoms.	Individualized risk assessment for HIV, counseling on condom use, and HIV pamphlet, an offer of free condoms, and a 20-minute counseling session with a physician to discuss a variety of HIV prevention issues.
SNAPP [40]	8 sessions over 2 weeks	Male and female peer educators, including teen mothers and HIV+ individuals	Identify social influences, gain resistance skills, knowledge about pregnancy and HIV, learn about risks of unprotected sex, learn decision-making skills and communication skills.	Games, role-plays, large- and small-group activities, discussion, and question and answer sessions, modeling of skills and skills practice.

Table 2. continued

Program	Duration/Intensity	Facilitators	Content	Intervention Strategies
Negative Effects				
Postponing Sexual Involvement [41, 42][a]	4 45–60 minute sessions in one week or 4 consecutive weeks, a fifth session 1–3 months later. Preceded by a 5 session sexuality course	Male and female older 11th and 12th grade students.	Knowledge about decision-making, human sexuality, family planning, and STD/HIV; assertiveness skills, resisting social and peer pressure to have sex, practice in refusal skills.	5 classroom periods of basic human sexuality information, including family planning, videos, slide presentations, class discussions.
Sexual Involvement [43] (Replication of Postponing Sexual Involvement)[a]	4 45–60 minute sessions in one week or 4 consecutive week, a fifth session 1–3 months later. Preceded by a reproductive health education course for 85% of the students. Also combined with school-wide ENABL project activities in a classroom condition	Adult health educators and peers.	Knowledge about decision-making, human sexuality, family planning, and STD/HIV; assertiveness skills, resisting social and peer pressure to have sex, practice in refusal skills	Class discussions, group activities, videos, slide presentations, and role plays.
Teen Talk [44]	Variable implementation ranging from 4 two hour sessions to a total of 12 hours.	Adult clinic and school staff	Increase feelings of vulnerability to pregnancy, negative consequences of teen parenthood, benefits of delayed sexual initiation and using contraception, skills to reduce barriers to abstinence and contraceptive use.	Lectures, simulations, leader-guided discussions, role-plays, games, and videos.

[a] Aggregated programs and their variants.

throughout elementary school. Another youth resiliency approach is the *Teen Outreach Program* [30], which focuses on academic success, including service-learning activities. Little of the *Teen Outreach Program* deals specifically with sexual risk-reduction, but the number of pregnancies was reduced among female students participating in the program relative to the control group.

Discussion

Among frequently targeted behaviors, the least consistent impact was found for delayed initiation of sexual intercourse and the most consistent for condom use. Both the original evaluation of *Postponing Sexual Involvement* [41,42] and the study replicating the evaluation [43] focused on delayed initiation of sexual intercourse and produced negative findings (although the original evaluation produced some positive findings as well). Only one program focusing primarily on delayed initiation of sexual intercourse reported positive effects without also reporting negative effects [22]. These findings underscore the need to develop and rigorously evaluate programs that can consistently delay the initiation of intercourse. The more consistent impact of programs on condom use also was reported in a prior literature review of HIV prevention programs targeting heterosexual adolescents [7].

Virtually no key study features or program characteristics clearly distinguish studies with positive, null, and negative effects from each other. However, when we aggregate the studies, four implications for effective programs become apparent: (a) they have focused on skills that reduce specific sexual risk behaviors; (b) the duration and intensity of a program may play a role in its effectiveness; (c) the need for researchers and health educators to carefully determine what constitutes an entire program; and (d) program facilitators' training may be more important than whether facilitators' and participants' demographic characteristics match.

The importance of emphasizing skills focusing on reducing specific sexual risk behaviors is underscored by the fact that, although most of the programs contained skills-building activities (e.g., sexual communication, decision-making, problem-solving), programs reporting null and negative effects (with the exception of *Teen Talk* [44]) appeared to emphasize skills that were less specific. We also found that many of these programs were likely to have evaluations published in 1995 or before, and to be between 7 and 15 hours in duration. These findings are consistent with prior literature reviews [9,11,12,13]. Programs for which evaluations were published after 1995 were of longer duration, and longer programs also contained more general types of skills and knowledge. This may reflect a shift toward multi-component interventions that target a variety of youth competencies.

Such broad-based programs may be appealing because community objections to them are less likely than objections to programs focused specifically on sexuality and sexual risk-reduction behaviors. However, more narrowly focused programs have been more extensively evaluated and their effects are better understood. Consequently, health educators should exercise caution in depending solely on broad-based programs to reduce sexual risk behaviors among youth.

The second implication of our findings is that the duration of programs may play a role in their effectiveness. The three shortest programs (at less than 1 hour, 2 hours, and 3 hours) all produced null effects. *Becoming a Responsible Teen* [35] exhibited mixed effects. The program was originally effective in reducing sexual risk behavior when it was implemented in 90–120 minute sessions during 8 weeks. A variant of the program that produced null effects, *Working On the Right Direction* [36], was implemented in six 1-hour sessions during 3 weeks. Although other aspects of the program were changed, this reduction in duration may have contributed to its null findings.

Similarly, changes in intensity of interventions may affect the effectiveness of programs. Rotheram-Borus et al [46] tested two versions of an intervention that had the same overall duration (10.5 hours) but were delivered in three or seven sessions to participants. Only the seven session intervention was associated with reductions in sexual risk behaviors among participants. Thus, when the content of an intervention is not changed, a reduction in the number of sessions may reduce the efficacy of an intervention even though the overall duration is the same. These findings are supported by previous literature reviews [9,11,13]. The effect of duration and intensity on interventions results in a particular challenge for school-based educators because they may have limited time to implement programs within a school year. Community-based organizations also need sufficient resources to implement programs in multiple sessions. Rotheram-Borus et al suggest that shorter sessions spread over time may better allow adolescents to learn and practice sexual risk-reduction

skills [46]. Researchers also should be aware of these implications for program intensity in designing programs and should carefully collect dosage data. The study by Rotheram-Borus et al should be replicated to test the implications of intensity and duration controlling for content. The issue of program content is an especially important one, as we found that programs including a greater variety of knowledge skills and general life skills were longer than programs focused more specifically on abstinence and condom skills. Researchers performing quantitative systematic literature reviews should design studies to untangle the effect of differences in program content and program duration, and researchers reporting evaluation results should carefully report program content and strategies as well as duration.

A third implication of these findings is that health educators should be careful when implementing evaluated programs to determine what actually constitutes a given program, and how other programs and resources in schools and communities may affect program outcomes. The program content of *Postponing Sexual Involvement* [41,42] and its variant evaluated by Kirby et al [43] is difficult to define. The original program included both the *Postponing Sexual Involvement* curriculum and a five-session sexuality program that preceded it. In an effort to replicate *Postponing Sexual Involvement*, Kirby et al implemented the program along with a reproductive health education course and some components of the *Education Now and Babies Later* program. As a result, whether the positive and negative outcomes result from the program itself or from the additional curriculum elements is not clear. Researchers should therefore give careful consideration to what constitutes a particular program. This can be challenging when performing an applied evaluation that assesses programs already offered in a school or community context.

A fourth implication of these findings is that training facilitators may be more important than matching the demographic characteristics of facilitators and participants. Little research has assessed the effectiveness of peer-led interventions as compared with those led by adults. In the only randomized controlled trial to directly compare the effects of adult versus peer-led interventions, Jemmott et al [22] found no difference in intervention effects. In another study, Jemmott et al [47] found that the facilitators' race and gender, relative to participants, did not affect the outcomes of the interventions. These findings suggest that the content of the program and thorough training of facilitators may be more important than their demographic characteristics in producing effective interventions. Educators in school and community settings who received thorough training could effectively implement programs for youth who are demographically different from them [47]. Kirby also stressed the importance of training both adult and peer facilitators [13]. Health educators may therefore have more options in the number of settings in which they can offer effective programs. Researchers should replicate previous findings that test the effects of facilitators' demographic characteristics on the behavioral outcomes of sexual risk-reduction programs.

Limitations

Our review has several important limitations. We only searched through English-language reports published in the United States to identify eligible evaluation studies. Further, we conducted searches in seven electronic databases and hand-searched journals and may have missed studies in our literature review. Additionally, publication bias may have resulted in the inclusion of more studies with positive results than with null or negative results [48]. Published reports may not represent fully all aspects of any given evaluation study or program, resulting in incomplete information. Finally, our analysis may have omitted important research or program design issues. Other research and program issues may arise as researchers continue to evaluate increasingly sophisticated interventions.

Conclusions

Health educators are faced with challenges in putting researched programs into practice. Our findings reveal that focusing on appropriate skills, adapting programs for length, being clear about what constitutes a given program, and deciding who should facilitate them should all be considered. Additionally, resiliency-based programs should be further explored to determine their efficacy in reducing sexual risk behaviors among adolescents. Researchers should also design studies that will clearly reveal which program characteristics drive positive effects in sexual risk-reduction. Research in this decade will build on the advances in sexual risk-reduction evaluations and programs of the 1990's.

We gratefully acknowledge the contributions of Dr. Janet Collins and Dr. Janet St. Lawrence, both of whose early guidance brought the authors together and shaped this project.

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