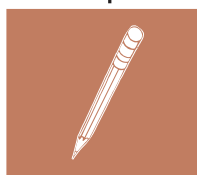


Sex and HIV Education Programs for Youth: Their Impact and Important Characteristics

Douglas Kirby, PhD • B.A. Laris, MPH • Lori Roller, MSW, MPH
ETR Associates

Development



Curriculum Content



Implementation



17 Characteristics of Effective Programs

Sex and HIV Education Programs for Youth: Their Impact and Important Characteristics

By

Douglas Kirby, PhD, B.A Laris, MPH, and Lori Roller, MSW, MPH
ETR Associates

Financial support for this research was provided by the United States Agency for International Development (USAID) through Family Health International (FHI)/YouthNet Project. The views reflected in this article do not necessarily reflect those of USAID, FHI or the organizations with whom the authors are affiliated.

May 13, 2006

Acknowledgments

Douglas Kirby, B.A. Laris, and Lori Roller work for ETR Associates, a research organization that has studied sex and HIV education in schools for over two decades.

The authors appreciate input and review comments from Karin Coyle of ETR Associates; Ralph DiClemente of the Rollins School of Public Health of Emory University; John Jemmott of the Annenberg School of Communication at the University of Pennsylvania; Angela Obassi of Liverpool School of Tropical Medicine; David Ross of the London School of Hygiene and Tropical Medicine, Shanti Conly of USAID and Bill Finger and Cindy Waszak Geary of Family Health International (FHI).

YouthNet is a five-year program funded by USAID to improve reproductive health and prevent HIV among young people. The YouthNet team is led by FHI and includes CARE USA and RTI International. This publication is funded through the USAID Cooperative Agreement with FHI for YouthNet, No. GPH-A-00-01-00013-00. The information contained in the publication does not necessarily reflect FHI, USAID or ETR policies.

© 2006 by Family Health International

Published by ETR Associates
4 Carbonero Way, Scotts Valley, CA 95066 USA
Tel: 831.438.4080 Web site: www.etr.org

Originally published as: *The Impact of Sex and HIV Education Programs in Schools and Communities on Sexual Behaviors among Young Adults.*

© 2006 by Family Health International, Research Triangle Park, NC

Table of Contents

Executive Summary	4
Results and discussion	4
Recommendations	7
Introduction.....	9
The Effects of Sex and HIV Education Programs	10
Methods for identifying and reviewing relevant literature	10
Findings: Characteristics of the studies reviewed.....	12
Findings: Impact of programs on sexual risk behaviors and pregnancy and STI rates	15
Findings: Impact on Mediating Factors	24
Characteristics of Effective Programs	27
Methods of identifying characteristics of effective programs	28
Findings: Common characteristics of effective programs	30
Conclusions and Implications for Policy	44
Impact on sexual risk behaviors.....	44
Characteristics of effective curricula	46
Program recommendations	47
Research recommendations	48
Conclusion	49
References	50
Tables and Figures	59
Table 1. Characteristics of Studies and Their Interventions	59
Table 2. Number of Studies Reporting Effects on Different Sexual Behaviors and Outcomes.....	63
Table 3. Number of Studies Reporting Effects of Abstinence-only Programs and Comprehensive Programs in the United States	65
Table 4. Number of Programs Having Effects on Mediating Factors that May Affect Sexual Behavior or Condom or Contraceptive Use	66
Table 5. Among Programs that Reduced Sexual Activity or Increased Condom or Contraceptive Use, the Number of Programs Having Effects on Mediating Factors that Affect Sexual Behavior	69
Figure 1. Characteristics of Effective Programs	72
Figure 2. An Example of Part of a Logic Model to Reduce Pregnancy That Addresses Individual Psychosocial Risk and Protective Factors of Sexual and Contraceptive Behaviors	73

Executive Summary

Introduction

Sex and HIV education programs that are based on a written curriculum and that are implemented among groups of youth in schools, clinics, or other community settings are a promising type of intervention to reduce adolescent sexual risk behaviors. This paper summarizes a review of 83 evaluations of such programs in developing and developed countries. The programs typically focused on pregnancy or HIV/STI prevention behaviors, not on broader issues of sexuality such as developmental stages, gender roles, or romantic relationships.

The review analyzed the impact these programs had on sexual risk-taking behaviors among young people. It addressed two primary research questions:

- 1) What are the effects, if any, of curriculum-based sex and HIV education programs on sexual risk behaviors, STI and pregnancy rates, and on mediating factors such as knowledge and attitudes that affect those behaviors?
- 2) What are the common characteristics of the curricula-based programs that were effective in changing sexual risk behaviors?

The methods used in this review included three primary activities: 1) comprehensively searching for and retrieving all studies meeting specified criteria, 2) coding all the results of those studies, and 3) conducting a content analysis of 19 curricula that were clearly effective at changing behavior.

Results and Discussion

The results are divided into four sections: characteristics of the studies reviewed, impact of programs on sexual risk behaviors and pregnancy and STI rates, impact of programs on mediating factors for sexual risk behaviors, and characteristics of the curricula-based programs that positively affected behaviors.

Characteristics of the Studies Reviewed. Of the 83 studies identified that matched the study criteria, 56 were conducted in the United States, 9 in other developed countries (Canada, Netherlands, Norway, Spain, and the United Kingdom), and the remaining 18 were conducted in developing countries (Belize, Brazil, Chile, Jamaica, Kenya, Mexico, Namibia, Nigeria, South Africa, Tanzania, Thailand, and Zambia). About half of the 83 focused only on preventing HIV/STIs; nearly one-third covered both HIV/STIs and pregnancy; and nearly one-fifth focused only on pregnancy. Virtually all the programs encouraged specific sexual risk reduction and protective behaviors. The vast majority encouraged abstinence but also discussed or promoted the use of condoms or contraception if young people chose to be sexually active.

More than 80 percent of the evaluations identified one or more theories that formed the basis for the program and often specified particular psychosocial mediating factors to be changed. Social learning theory and its sequel, social cognitive theory, formed the basis for more than half of the programs evaluated. About half of the studies employed an

experimental design with random assignment of individual youth, classrooms of youth, or entire schools or communities, while the remaining half used a quasi-experimental design. Only 23 studies measured impact on pregnancy or STI rates, and of these, only nine used laboratory tests to measure these health outcomes. More than half (59 percent) of the studies measured impact for a year or longer, while 22 percent measured impact for two years or longer. Many of these studies or their published articles had significant limitations such as limited explanations of the programs, problems with implementation, weak evaluation designs, measurement issues, and statistical shortcomings.

Impact of Programs on Sexual Risk Behaviors and Pregnancy and STI Rates. The 83 studies generally reported on one or more of six aspects of sexual behavior: initiation of sex, frequency of sex, number of sexual partners, condom use, contraceptive use in general, and composite measures of sexual risk-taking (e.g., frequency of sex without condoms). A few studies reported on pregnancy and STI rates.

Initiation of Sex. Of the 52 studies that measured impact on this behavior, 22 (42 percent) found that the programs significantly delayed the initiation of sex among one or more groups for at least six months, 29 (55 percent) found no significant impact, and one (in the United States) found the program hastened the initiation of sex.

Frequency of Sex. Of the 31 studies that measured impact on frequency, nine (29 percent) reduced the frequency, 19 (61 percent) found no significant change in frequency, and three (all in developed countries) found increased frequency among any major groups at any point in time.

Number of Sexual Partners. Of 34 studies measuring this factor, 12 (35 percent) found a decrease in the number of sexual partners, while 21 (62 percent) found no significant impact.

Condom Use. Of the 54 studies measuring program impact on condom use, almost half (48 percent) showed increased condom use; none found decreased condom use.

Contraceptive Use in General. Of the 15 studies measuring impact, six showed increased contraceptive use, eight showed no impact, and one (in the United States) showed decreased contraceptive use.

Sexual Risk Taking. Some studies (28) developed composite measures of sexual activity and condom use (e.g., frequency of sex without condoms). Half of them found significantly reduced sexual risk-taking. None of them found increased sexual risk-taking.

Pregnancy Rates. Of the 13 studies that measured pregnancy rates, three found significant positive effects, nine found insignificant effects, and one (in the United States) found significant negative effects.

STI Rates. Of the 10 studies that measured impact on STI rates, two found a positive impact, six found no significant impact, and two found a negative impact.

Overall, these results strongly indicate that these programs were far more likely to have a positive impact on behavior than a negative impact. Two-thirds (65 percent) of the studies found a significant positive impact on one or more of these sexual behaviors or

outcomes, while only seven percent found a significant negative impact. One-third (33 percent) of the programs had a positive impact on two or more behaviors or outcomes. Furthermore, some of these programs had positive impacts for two or three years or more. In general, the patterns of findings for all the studies were similar in both developed and developing countries. They were effective with both low- and middle-income youth, in both rural and urban areas, with girls and boys, with different age groups, and in school, clinic, and community settings.

A review of replication studies of four different curricula in the United States revealed that curricula did have similar positive behavioral effects when they were replicated, provided all activities were implemented as designed in the same type of setting and with similar populations of youth. When many activities were omitted or the setting was changed, the curricula were less likely to have a positive effect.

Impact of Programs on Mediating Factors for Sexual Risk Behaviors. The studies reported on various mediating factors that contribute to the behavior changes, such as knowledge, perceived risk, values and attitudes, perception of peer norms, self-efficacy and skills, and others. Most programs increased knowledge about HIV, STIs, and pregnancy (including methods of preventing STI/HIV and pregnancy). Half of the 16 studies that measured impact on perceived HIV risk were effective at increasing this perceived risk. More than 60 percent of the many studies measuring impact on values and attitudes regarding any sexual topic were effective in improving the measured values and attitudes. More than 40 percent of the 29 studies that measured impact on perceived peer sexual behavior and norms significantly improved these perceptions. More than half of those studies that measured impact on self-efficacy to refuse unwanted sex improved that self-efficacy, and more than two-thirds increased self-efficacy to use condoms. Regarding changing motivations, 10 of 16 programs increased motivation or intention to abstain from sex or restrict the number of sex partners, and 10 of 14 programs increased intention to use a condom. Eight of 11 programs increased communication with parents or other adults about sex, condoms, or contraception.

Thus, the evidence was strong that many programs had positive effects on relevant knowledge, awareness of risk, values and attitudes, self-efficacy, and intentions – the very factors specified by many psychosocial theories as being the determinants of behavior. Furthermore, all of these factors have been demonstrated empirically to be related to their respective sexual behaviors. Thus, it appears highly likely that changes in these factors contributed to the changes in sexual risk-taking behaviors.

Characteristics of the Curriculum-Based Programs that Had Impact. The analysis of these effective curricula led to the identification of 17 common characteristics of the curricula, including their development, content and implementation. The large majority of the effective programs incorporated most of the 17 characteristics of successful curriculum-based programs identified in this analysis. Also, programs that incorporated these characteristics were much more likely to change behavior positively than programs that did not incorporate many of these characteristics. Five of the 17 characteristics involve the development of the curriculum; eight involve the curriculum itself; and four describe the implementation of the curriculum.

Developing the Curricula. The development teams 1) involved multiple people with varied backgrounds, 2) assessed relevant needs and assets of the target groups, 3) used a logic model approach that specified health goals and other objectives and activities, 4) designed activities consistent with community values and available resources, and 5) pilot-tested the program.

Curricula Content. Effective curricula commonly 1) focused on clear goals of preventing HIV/STI and/or pregnancy, 2) focused on specific behaviors leading to these health goals (e.g., abstaining from sex or using condoms or contraception) and gave a clear message about those behaviors, 3) addressed psychosocial risk and protective factors affecting those sexual behaviors, 4) created a safe environment for youth, 5) included multiple activities to change the targeted risk and protective factors, 6) employed instructionally sound teaching methods that actively involved the participants and helped them personalize the information, 7) employed appropriate activities and messages (for participants' culture, age, sexual experience), and 8) covered topics in a logical sequence.

Implementation of the Curricula. When implementing curricula, effective programs commonly 1) secured at least minimal support from authorities, 2) selected educators with desired characteristics, trained them, and provided ongoing monitoring and support, 3) recruited youth if necessary and retained them, and 4) implemented virtually all activities as designed.

Recommendations

The results and discussion led to the programmatic and research recommendations that follow.

Programmatic

- Communities should implement curriculum-based sex and HIV education programs, preferably those proven to be effective with similar populations or those incorporating as many of the effective curriculum characteristics as possible.
- When organizations develop their own curricula or significantly adapt other existing curricula, they should follow the five characteristics for developing effective curricula and incorporate the eight content characteristics.
- When organizations implement programs, they should follow the four characteristics for implementing effective curricula.
- Programs may have their greatest impact in areas where issues of pregnancy and HIV/STIs are most salient. Thus, while programs should reach all youth, they should be especially certain to reach high-risk youth.
- Schools and other groups should provide adequate time and resources for these programs to be implemented.
- Organizations should encourage research to develop and evaluate programs that may be even more effective than current programs.

- Communities should not rely solely on these programs to address problems of HIV, other STIs, and pregnancy but should view them as an important component in a larger initiative that can reduce sexual risk-taking behavior to some degree.

Research

- More rigorous studies of promising programs should be conducted in developing countries and with groups at highest risk, because there are gaps in these areas in the existing literature.
- Evaluations can and should use randomized experimental designs.
- Sample sizes should be sufficiently large to have adequate statistical power for important statistical analyses, including those among sub-groups.
- Whenever possible, laboratory tests rather than self-reported data should be used for measuring pregnancy and STI rates.
- Statistical analyses should assess program effects on mediating factors and the impact of these factors on behaviors.
- Researchers should determine which mediating factors are most important across cultures and then measure these more consistently so that studies can be compared more easily.
- Published results of evaluations should provide more complete descriptions of their programs.

I. Introduction

Sex and HIV education programs that are based on a written curriculum and that are implemented among groups of youth in either schools or community settings are a promising type of intervention to reduce adolescent sexual risk behaviors that place youth at risk of HIV.

These programs are commonly implemented in schools for a variety of reasons. Schools are the one institution in most societies that are regularly attended by most young people. Of those youth who attend school, most do so before they initiate sex and some are enrolled in school when they do initiate sex. Obviously, these curriculum- and group-based sex and HIV education programs are well designed to be implemented in classrooms in schools which implement curriculum- and group-based instruction daily. In addition, schools are designed and structured to teach both knowledge and skills, and thus, with appropriate training, teachers can implement these programs. And finally, if programs are effective, ministries of education can facilitate their replication throughout their countries.

However, not all youth ever attend school and not all youth remain in school until they initiate sex. Thus, it is also important to reach youth who are out of school. Curriculum- and group-based sex and HIV education programs can also reach some youth out of school. Throughout the world, they have been implemented in youth-serving agencies, housing projects, faith communities, community centers, juvenile detention centers and elsewhere.

Notably, some of the sex and HIV education programs that have been found to reduce sexual risk-taking behavior have been implemented in both school and community settings with only minor modifications of the curricula (e.g., *Be Proud! Be Responsible!* and *Becoming a Responsible Teen* (Jemmott, Jemmott & McKaffree, 1994; St. Lawrence, 1998).

Consequently, public health authorities and policy makers may seriously consider these curriculum-based programs for both school and community settings as a major component of their strategies for achieving HIV, other STD and pregnancy prevention goals for youth[1].

Numerous, well-conducted studies have demonstrated that sex and HIV education programs can increase knowledge about how to avoid HIV and STD infection and unintended pregnancy. However, in order to actually reduce HIV, other STDs and unintended pregnancy, programs must actually change behavior and the evidence for the impact of these programs on actual behavior has been less clear.

There have been many previous reviews of sex and HIV education programs on behavior, but they typically have been limited by a focus on a particular geographical area such as the United States[2] or sub-Saharan Africa[3], or they are now somewhat dated[4, 5], or they do not analyze the curricula of either effective or ineffective programs in depth. Although potential key characteristics of effective programs have been previously suggested[6], those are now more than 10 years old and are limited to the United States. Similar analyses are urgently needed for the entire world, including developing countries

and need to be updated, if schools and communities are to fulfil their potential for combating HIV, other STDs and unintended pregnancy among youth.

Objectives of This Report

This current report seeks to address these issues by reviewing the existing literature on the effects of these curriculum- and group-based sex and HIV education programs on sexual risk behavior among young people in both developed and developing countries. It is not a formal statistical meta-analysis; rather it is a review. It includes many more studies than all previous meta-analyses or reviews. It addresses two primary questions: 1) What are the effects, if any, of these sex and HIV education programs on biological outcomes, sexual risk behaviors and mediating factors such as knowledge and attitudes that affect those behaviors, and 2) What are the common characteristics of the programs that are effective in changing sexual risk behaviors?

II. The Effects of Sex and HIV Education Programs

Methods for Identifying and Reviewing Relevant Literature

Identifying Studies

For this review, the authors sought to identify and retrieve studies meeting the following criteria:

- The program was a curriculum- and group-based sex and HIV education program (as opposed to an intervention involving only spontaneous discussion, only one-on-one interaction, or only broad school, community or media awareness activities).
- The program focused on adolescents or young adults ages 9 to 24.
- The research methods:
 - Included a reasonably strong experimental or quasi-experimental design with both intervention and comparison groups and both pretest and posttest data collection.
 - Had a sample size of at least 100.
 - Measured program impact upon one or more of the following sexual behaviors (initiation of sex, frequency of sex, and number of sexual partners); use of condoms or contraception more generally; composite measures of sexual risk (e.g., frequency of unprotected sex); pregnancy rates; birth rates and STD rates.
 - Measured impact on those behaviors that can change quickly (i.e., frequency of sex, number of sexual partners, use of condoms, use of contraception or sexual risk-taking) for at least three months or measured impact on those behaviors or outcomes that change less quickly (i.e., initiation of sex, pregnancy rates or STD rates) for at least six months.
- The study was completed or published after 1990.

In order to identify and retrieve as many of the studies throughout the entire world as possible, we completed many tasks, several of them on an ongoing basis. More specifically, we:

1. Reviewed the results of a previous ETR and University of Minnesota search for studies and identified those studies meeting the criteria specified above.
2. Reviewed the studies already summarized in previous reviews of these interventions.
3. Reviewed multiple computerized databases for studies meeting the criteria (i.e., PubMed, PsychInfo, Popline, Sociological Abstracts, Psychological Abstracts, Bireme, Dissertation Abstracts, ERIC, CHID, and Biologic Abstracts).
4. Contacted researchers in the process of completing known studies and obtained results (sometimes preliminary) whenever appropriate and possible. (We also requested any other studies they had completed that met our criteria.)
5. Attended professional meetings, scanned abstracts, spoke with authors, and obtained studies whenever possible.
6. Scanned each issue of 12 journals in which relevant studies might appear.
7. Reviewed reports of intervention development, training materials and process evaluation reports where possible or available.

Reviewing and Coding Studies

All studies were summarized in a template by one of this review's authors and then reviewed by a second author. The revised templates were then sent to the original study authors for verification. The authors of 73 out of 83 studies reviewed the summaries, and suggested minor changes that were incorporated. The remaining authors did not respond despite subsequent requests. (All 83 of these one-page summaries are available from the authors upon request.)

For this current review, all reported outcomes (e.g., effects on behavior or mediating factors) were considered significant if: (1) they were statistically significant at the .05 level, and (2) this significance was based on either the total population or a large sub-group that was roughly one-third of the population or more (e.g., either males or females, youth either below or above a certain age, sexually experienced or sexually inexperienced youth, or youth in the three largest racial/ethnic groups in the U.S.). Some studies did have significant effects for important subgroups, but not for the entire population.

Studies sometimes reported results for multiple measures of each behavior for different time periods, for different sub-populations or for various combinations of the above. Thus, some studies reported one or a very small number of positive effects on behavior as well as a large majority of results that were not significant. To avoid presenting only the positive results and to provide a more balanced overview of the results, the following rules for summarizing results were adopted:

- Regarding different measures of the same outcome behavior, all measures across all the studies were rank-ordered according to their probable impact on prevalence of STD or pregnancy. For example, use of condoms over twelve months was ranked

higher than condom use at first sex. Only the results from the highest ranked measure reported in each study were included in tables.

- Because very short term effects on behaviors would have had little impact on HIV prevalence, only those results for three months or longer were included in tables.
- As noted above, some behaviors can change quickly as a result of an intervention (i.e., frequency of sex, number of sexual partners, use of condoms, use of contraception or sexual risk-taking), but other behaviors or outcomes do not significantly change quickly (i.e., initiation of sex, pregnancy rates or STD rates). That is, relatively few youth initiate sex, become pregnant or contract STD in three months, and thus few studies have sufficient statistical power to measure a significant reduction in these already small numbers. Therefore, for initiation of sex, pregnancy rate and STD rate, only those results for six months or longer are included.

Even these rules for summarizing results may have provided a more positive picture than all the results from all studies. However, this probable positive bias was at least partly offset by a different negative bias – many results presented in the studies were based on samples with insufficient power. Thus, some programs produced programmatically meaningful results that were found to be not significant and were therefore coded as not significant. (Insufficient statistical power is further discussed in the section below.)

Findings: Characteristics of the Studies Reviewed

Location of Studies and Interventions

This search identified 83 studies conducted throughout the world meeting the selection criteria discussed above[6-112]. Some studies were summarized in more than one article or report. Characteristics of the studies included are described in Table 1.

A large majority of these (56) studies were conducted in the United States, but nine were conducted in other developed countries (Canada, Netherlands, Norway, Spain, and the United Kingdom) and 18 were conducted in developing countries (Belize, Brazil, Chile, Jamaica, Kenya, Mexico, Namibia, Nigeria, South Africa, Tanzania, Thailand and Zambia). Thus, studies from the United States are substantially overrepresented, but there are a good number of studies from diverse countries throughout the world.

About two-thirds of the studies were implemented in urban areas and slightly less than one-third in mixed urban and rural areas. Only two were implemented only in rural areas. Thus, programs in rural areas are greatly underrepresented.

Appropriately, two-thirds of the programs were implemented in communities at high risk of STD/HIV and most of the remaining programs were implemented in communities with medium or mixed risk. Only one intervention was implemented in a community at low risk. That one study was implemented for university students attending their university health center in the United States.

A total of 54 studies were conducted in schools, seven in health clinics, and 17 in community settings more generally. Two were implemented in both school and community settings and three were implemented both clinic and community settings. Of

the 54 implemented in schools, most (47) were implemented in secondary schools (which included 15 in middle schools, 22 in high schools and 10 unspecified); only one was implemented in elementary schools and seven were implemented in colleges or night schools.

Characteristics of Programs Evaluated

Despite the fact that these programs were implemented in schools and communities throughout the world, they had numerous characteristics in common and many of them incorporated many of the characteristics of programs previously found to be associated with effectiveness[6].

For example, 83 percent of the interventions focused on preventing STD/HIV. Of these, 52 percent focused only on STD/HIV, while 31 percent focused on both STD/HIV and pregnancy. Only 17 percent focused only on teen pregnancy. This greater emphasis on STD/HIV undoubtedly reflects the worldwide concern about young adults contracting HIV and the funds and other resources devoted to reducing STD/HIV transmission.

Virtually all the programs encouraged specific sexual and protective behaviors. The vast majority of the programs encouraged abstinence, but also discussed or promoted the use of condoms and/or other forms of contraception if young people chose to be sexually active. Only 7 percent of the programs recommended only abstinence. All of these were in the United States.¹ Only a few focused only on condoms. Typically these were designed for older youth who were already likely to be sexually active.

More than four-fifths of the programs (83 percent) identified one or more theories that formed the basis for their programs and often specified particular psychosocial mediating factors to be changed. Social learning theory and its sequel, social cognitive theory, formed the basis for more than half (54 percent) of the interventions. Related theories identifying some of the same mediating factors were mentioned by significant percentages of other studies: theory of reasoned action (19 percent), health belief model (12 percent), theory of planned behavior (10 percent) and the information, motivation and behavioral skills model (10 percent).

Nearly all (90 percent) of the interventions included at least two different interactive activities designed to involve youth and help them personalize the information (e.g., role playing, simulations or individual worksheets that applied lessons to their lives).

Finally, at least 90 percent of the programs trained their educators before the educators implemented curriculum activities. Some of the remaining 10 percent of programs may also have trained their educators, but their respective reports or articles did not mention the training.

It should be noted parenthetically that some of these commonalities reflected the criteria for inclusion in this review. Only studies that addressed STD/HIV or pregnancy and

¹ One study conducted in Chile reported that the program was “abstinence-centered” and it recommended abstinence as the best choice for young people. However, it taught fertility awareness registration methods and medically accurate information about contraception and therefore is not coded as an “abstinence-only” program in this report.

were both curriculum-based and group-based were included; broad youth development programs or sex education programs that did not address STD/HIV or pregnancy at all were not included.

The one area of great variation in these programs involved length. While the mean length was 12 hours, the actual lengths ranged from less than one hour to 48 hours. About two-thirds had between two and 15 sessions and lasted two to 15 hours. But 11 percent included only one session, and 4 percent lasted an hour or less. In sharp contrast, 22 percent had 16 or more sessions, with 26 percent lasting 16 or more hours.

Methodological Characteristics of the Studies

Half (51 percent) of these studies employed an experimental design with random assignment of individual youth, classrooms of youth or entire schools or communities, while the remaining half used a quasi-experimental design. To be included in this review, all the quasi-experimental designs had to have both intervention and comparison groups and both pretest and posttest data. About 88 percent of all the studies used a matched-cohort design in which they linked baseline and follow-up survey data, while the others (only 12 percent) used unmatched pre and post cross-sectional surveys.

To be included in this review, studies had to measure impact on behavior. All measures of sexual and contraceptive behavior relied on self-reports. Although some under- and over-reporting of these behaviors undoubtedly occurs, these data are generally believed to be reasonably reliable and valid in developed countries, and often, but not always, the biases may be similar in both the intervention and control groups, especially when the data are collected confidentially by data collectors months after the end of the intervention [113]. However, this may not be the case in some developing countries where youth are far less accustomed to talking about sexual behavior or completing questionnaires about personal behavior [114].

Measures of pregnancy and STD can be measured with laboratory tests and thereby overcome many of the problems of self-reported data. Of the 13 studies that measured impact on pregnancy, 31 percent used pregnancy tests; of the 10 studies that measured impact on STD, 50 percent used a laboratory test. The rest relied on self-reports.

To be included in this review, studies also had to measure behavior for at least three months (or initiation of sex for at least six months). Just over half (59 percent) of the studies measured impact for a year or longer, while 22 percent measured impact for two years or longer. The longest study measured impact over 57 months.

In sum, as the field is maturing, increasingly large percentages of studies have used experimental designs, have used cohort designs, and have measured long term impact on behavior. These changes and improvements in other areas (e.g., more rigorous and sophisticated statistical analyses) demonstrate that standards are becoming more rigorous.

On the other hand, of all 83 studies, about half lacked sufficient statistical power to detect programmatically meaningful effects on behavior. For example, if a program reduced the percentage of young people who initiated sex (or who had sex without a condom) from 30 percent to 20 percent, this reduction would be programmatically meaningful.

However, to have an 80 percent chance of finding a 10 percentage point change in a

dichotomous outcome to be statistically significant at the .05 level, a completed pretest-posttest sample size of close to 600 is needed, if individuals are randomly assigned. If random assignment is not used and groups are unmatched, the needed sample size becomes larger. Similarly, if clusters of youth (e.g., schools) are assigned, the needed number becomes still larger.

The smallest linked baseline- and first follow-up- sample was 102 and 47 percent of the studies had a sample size less than 600 for the baseline and first follow-up survey three or more months later and 49 percent of the studies also had a sample size of less than 600 for their baseline and last follow-up analyses. This suggests that at least half the studies lacked sufficient statistical power.

However, the problem of insufficient power was further aggravated by the fact that studies typically had to divide their samples into sexually inexperienced youth at baseline in order to measure initiation of sex and sexually experienced youth at follow-up to measure impact on condom and contraceptive use among those who did have sex. Some studies further divided their samples into males and females, because prior studies had found that results sometimes differ by gender. This division of the entire sample into sub-samples substantially increased the problem of statistical power.

Although many studies lacked sufficient statistical power to detect the minimum effects that could be programmatically important, they are included in the results summarized below, because some of them did produce statistically significant results. Nevertheless the inclusion of studies with insufficient power biases the results and may suggest that programs were less effective than they actually were. This may offset some of the positive biases discussed above.

In the summaries of behavioral results that follow, each study is counted only once for any given behavior. That is, if it significantly increased (or decreased) an outcome behavior for either the entire sample or an important sub-group, then that study for that behavior is counted as only increasing (or decreasing) that behavior. For example, if an intervention delayed sex among males but not among females, then it is coded only once as delaying sex.

Findings: Impact of Programs on Sexual Risk Behaviors and Pregnancy and STI Rates

Impact of Programs on Three Important Sexual Behaviors

These studies demonstrate very clearly that these sex and HIV education programs did not increase sexual behavior and a substantial percentage of programs significantly decreased one or more types of sexual behavior (Table 2).

Initiation of Sex. An important measure of sexual activity is timing of initiation of sex. The studies reviewed demonstrate that programs in general do not hasten the initiation of sex and some delay the initiation of sex. Of the 52 studies that measured impact on the initiation of sex throughout the world, 22 (or 42 percent) found that the programs significantly delayed the initiation of sex among one or more population sub-groups for at least six months, 29 (or 55 percent) found no significant impact, and only 1 (or 2

percent) found that the program hastened the initiation of sex. That one study was in the United States.

Results were remarkably similar for both developed and developing countries. In the U.S., 14 out of 30 programs delayed the initiation of sex; in other developed nations, two out of eight did so; and in developing countries, six out of 14 programs did so. Thus, all three groups of countries had programs that delayed the initiation of sex and the basic patterns of results are roughly similar across the three groups of countries.

Programs were effective in school, clinic and community settings. Programs were also effective with both males and females and with young people in all three age groups (9 to 13.9 years; 14 to 17.9 years; and 18-23 years).

Frequency of Sex. A second measure of sexual activity is the frequency of sex during a specified period of time (e.g. three or six months prior to the survey). This measure includes whether or not respondents had sex at all during that period of time. Sometimes people label this “being abstinent.” This measure is important for both pregnancy and STD prevention.

Results indicate that in general programs do not increase frequency of sex and some reduce the frequency. Of the 31 studies that measured impact on frequency, nine (or 29 percent) reduced the frequency, 19 (or 61 percent) did not significantly change frequency, and only three (or 10 percent) increased frequency among the entire sample or any major population sub-groups at any point in time. Both developed and developing nations had programs that significantly reduced the frequency of sex (Table 2). Of the programs that increased the frequency, two were in the United States and one was in Canada; none were in the developing world.

Programs in school, clinic and community settings were effective. In addition, programs were effective with both males and females and with all three age groups.

Sexual Partners. A third common measure of sexual activity is number of sexual partners during a specified period of time prior to the survey. This measure is especially important for STD transmission.

Once again, results indicated that, in general, programs did not increase the number of sexual partners and some decreased the number. A total of 34 studies measured this outcome. Worldwide, 12 out of 34 programs (or 35 percent) decreased the number of sexual partners, while 21 (or 62 percent) had no significant impact. The percentages of programs that had positive effects in the U.S. and in the developing world were virtually the same. Only one program significantly increased the number of partners. It was in the U.S.

Programs in both school and community settings were effective at reducing the number of sexual partners. Programs were roughly equally effective with both males and females, but tended to be more effective with younger youth.

Impact of Programs on Condom Use

Worldwide, 54 studies measured program impact on condom use and almost half (48 percent) of them increased condom use among the entire sample or one or more population sub-groups; none of them decreased condom use.

The proportion of effective programs in developing countries (7 out of 12) was similar to the proportion in the U.S. (18 out of 37). Programs were effective in school, clinic and community settings, were effective with both males (8 out of 17) and females (9 out of 17) and were effective with all three age groups.

Impact of Programs on Contraceptive Use

Far fewer studies measured impact on contraceptive use more generally (as opposed to condom use specifically). Of the 15 studies measuring impact, less than half (6 or 40 percent) increased contraceptive use; eight (or 53 percent) had no impact and only one decreased contraceptive use. That one study was in the U.S. Neither of the two studies in the developing world had a significant impact on this outcome.

Most of these studies were based on programs in school settings; there were too few studies from clinic- or community-based programs to reach any conclusions. Notably, programs were equally effective for both males and females and were effective for all three age groups.

Impact on Sexual Risk-Taking Behavior

Some studies, especially U.S. studies, recognized that STD/HIV transmission and pregnancy can be reduced either by reducing sexual activity or by increasing condom or contraceptive use and accordingly they developed composite measures of sexual activity and condom use, such as “frequency of unprotected sex” or “number of unprotected sexual partners.” These measures are strongly related to STD/HIV transmission and pregnancy.

There were 28 programs that measured behavior in this way; 25 were in the U.S. Exactly half (50 percent) significantly reduced sexual risk-taking. None of them increased sexual risk-taking.

They were also effective in school, clinic and community settings, with both males and females and with all three age groups.

Impact on Pregnancy and STD Rates

Thirteen studies measured program impact on pregnancy rates (Table 2). The results were typically mixed regardless of whether pregnancy was measured by self-report or laboratory tests and regardless of whether the studies were conducted in the U.S., other developed countries or developing countries. Across both methods of measuring pregnancy and all groups of countries, three studies had significant positive effects, nine had insignificant effects, and one found significant negative effects.

Ten studies measured impact on STD rates and again the results were typically mixed across the method of measuring STD and the three groups of countries, although the results based on laboratory tests provided the only significant positive results. Across both methods and all countries, two studies found a positive impact, six found no significant impact and two found a negative impact.

Thus, overall, these studies suggest that overall these programs might not have significantly affected pregnancy or STD rates in any particular direction. Although eight of 23 results were significant, five were in positive and three were in negative directions, suggesting they might have occurred by chance. Of course, a true meta-analysis is needed to properly assess their overall impact.

It should be emphasized that studies would have to have large sample sizes to have the power to detect as statistically significant even quite large programmatic effects on pregnancy or STD rates. This is because pregnancy and sexual transmitted disease are relatively uncommon events. Given that only five of the 13 studies measuring impact on pregnancy had sample sizes greater than 2,000 and given that only two of the 10 studies measuring impact on STD rates had sample sizes greater than 2,000, the failure of these results to provide many statistically significant results does not necessarily mean that the programs did not have a programmatically meaningful impact on pregnancy or STD rates.

Impact on Any of These Behaviors or Outcomes

Overall, these studies strongly indicate that these programs were far more likely to have a positive impact on behavior than a negative impact. Across all 83 studies, two-thirds (65 percent) had a significant positive impact on one or more of these sexual behaviors or outcomes, while only seven percent had a significant negative impact on one or more of these behaviors or outcomes. Given the large proportion of studies that found significant positive results and also given the large number of tests of significance across all of these studies, some, but not all, of these positive results may have occurred by chance. On the other hand, given that multiple coefficients were examined in each study, the percentage of negative coefficients that was found is roughly equal to or less than the number that is likely to have occurred by chance, suggesting that some or all of them may have occurred by chance.

Impact on Multiple Behaviors and Outcomes

Although this review has thus far examined program impact on each of six behaviors and two outcomes, exactly one-third (33 percent) of the programs had a positive impact on two or more behaviors or outcomes. For example, the *MEMA Kwa Vijana* intervention in Tanzania both reduced the number of sexual partners among boys and increased condom use among both boys and girls[79]. Similarly, the *Safer Choices* intervention in the U.S. delayed the initiation of sex among Hispanic youth, and increased both condom and contraceptive use among both boys and girls of all races/ethnicities[52]. Finally, the *BART (Becoming a Responsible Teen)* curriculum in the U.S. increased abstinence, reduced the number of sexual partners, increased condom use and reduced unprotected

sex[94]. These effects are particularly noteworthy, because all of these studies employed experimental designs and measured impact on behavior for at least one year.

Maximum Duration of Impact

While the positive effects of some curriculum-based programs lasted only a few months, the effects of other programs lasted for years. For example, the *MEMA Kwa Vijana*[79] intervention found positive behavioral effects over a 36-month period and *Safer Choices*[22] found positive behavioral effects over a 31-month period. Even though these periods included the periods during which the interventions were implemented, these were long periods of time, and the programs might have had even longer effects, but they were not measured.

Impact of Abstinence-Only Versus Comprehensive Sex and HIV Education Programs

For both religious and other reasons, some people believe that sex outside of marriage is morally wrong and that accordingly only abstinence should be encouraged in schools. They believe that teaching young unmarried people about using condoms and contraception to protect themselves from sexually transmitted disease or unintended pregnancy encourages immoral sexual behavior. Other people believe that teaching young people where to obtain condoms and contraception and how to use them will increase sexual behavior and thereby increase STD and pregnancy rates. Therefore they also oppose activities in classroom programs that encourage youth to use condoms and contraception if they do have sex.

Other people recognize that abstinence is the best protection against STD and pregnancy, but recognize that many young people do engage in sexual behavior that places them at risk of STD and pregnancy, and that therefore they should be encouraged both to abstain from sex and to use condoms and/or other contraceptives if they do have sex. These people therefore support “comprehensive” programs that encourage condom and contraceptive use as well as abstinence.

Because this debate is so controversial, both in the United States and increasingly in other parts of the world, this review provides results separately for abstinence-only and comprehensive programs. However, it should be recognized that programs actually fall along a continuum and do not fall neatly into abstinence-only programs and comprehensive programs. Thus, it is difficult to classify some of them. Also, it should be emphasized that both groups of programs are very diverse. For example, some abstinence-only programs strongly encourage abstinence, but nevertheless allow objective discussion of the effectiveness of condoms and contraceptives, while others very strongly oppose condoms and contraceptives and exaggerate their lack of effectiveness. Some encourage abstinence until youth are older, while others encourage abstinence until marriage. While most abstinence programs are secular, a few are very religious. Some are “character education” programs and emphasize more basic values that they then apply to sexual behavior, as well as to other behavior such as drug use or violence.

Because all of the abstinence-only programs that have been evaluated are in the United States, in Table 3 results for abstinence-only programs are presented along with results for comprehensive programs evaluated only in the United States.

Thus far, there are only six studies of abstinence-only programs meeting the selection criteria for this review. Regarding sexual behavior, of the three studies that measured impact on initiation of sex, none either delayed or hastened that initiation; all three had no significant impact. However, two of four programs reduced the frequency of sex among those who had previously had sex, and one of the four increased the frequency of sex. Finally, one of two programs reduced the number of sexual partners, while the other had no impact.

In regard to use of protection and sexual risk, one of three programs increased condom use, the only study to measure impact on contraceptive use found that it increased contraceptive use, and one of three programs reduced sexual risk.

Turning to the 50 comprehensive sex and HIV education programs in the United States, about half delayed the initiation of sex, but one hastened initiation; five out of 20 reduced frequency, but one increased frequency; and eight out of 24 reduced number of sexual partners, but one increased the number of sexual partners. Half increased condom use, four out of 10 increased contraceptive use, but one decreased it. Finally, 13 out of 22 (59 percent) reduced sexual risk through a combination of changes in multiple behaviors.

These results suggest several important conclusions about both abstinence-only and comprehensive sex and HIV education programs in the United States.

- First, given the great diversity of abstinence-only programs, there are far too few studies of abstinence-only programs to reach any definitive conclusions about their impact. This does not mean that these programs are not effective; it means that there is too little evidence to reach any strong conclusions about their effectiveness. That is, the jury is still out.
- Second, none of these abstinence-only programs have significantly delayed the initiation of sex for six months (the criterion used in this review). On the other hand, one program did reduce the frequency of sex and the number of sexual partners among those youth who did have sex[15] and a second program also reduced the frequency of sex. Thus, two programs appear to have some positive impact on some measure of sexual behavior, even though thus far none have demonstrated a delay in initiation of sex.
- Third, both abstinence-only programs and comprehensive programs had a very small percentage of significant negative effects. A more in-depth analysis of these studies, as well as the sheer number of tests of significance, suggest that these results were most probably caused by chance[55] and were not caused by the programs.
- Fourth, the results of the comprehensive programs closely mirror the results of all programs in the world combined and thus strongly demonstrate that in general they did not increase sexual behavior as some people have feared, but that a majority of them actually reduced sexual behavior, either by significantly delaying the initiation of sex, reducing the frequency of sex, or reducing the number of sexual partners.

- Fifth, a large majority of the comprehensive programs also increased condom or contraceptive use or reduced overall sexual risk.

Robustness of Effects of Programs in General

In regard to the methodological rigor of the studies, whereas 63 percent of the 41 studies with a quasi-experimental design had a significant positive impact on one or more behaviors, 66 percent of the 42 studies with an experimental design had a positive impact on one or more behaviors. This suggests that programs were likely to be effective regardless of type of design used, and in fact, were even slightly more effective if they were evaluated with experimental designs. Given that the studies with experimental designs tended to be more rigorous more generally (e.g., they used more rigorous statistical analyses), these findings suggest that the positive results were not the result of weak methodologies.

In regard to the programs themselves, they were effective in different countries and cultures throughout the world (e.g., Belize, Brazil, Chile, Mexico, Kenya, Namibia, Nigeria, South Africa, Tanzania, Thailand, the Netherlands, Canada, the United Kingdom and the United States). Furthermore, in general, the patterns of findings for all the studies were remarkably similar in both the United States and developing countries. They were also effective with both low and middle income youth in low and middle income communities in the developing countries (date not shown). Finally, they were effective in both rural and urban areas within these countries.

These sex and HIV education programs were effective in school, clinic and community settings. A few of the community programs that were effective were actually implemented on schools grounds on Saturdays. However, because they were not implemented during the school day, they may have been able to include condom related activities that might not have been allowed in school classes and these activities may have contributed to the success of these programs.

Programs were also roughly equally effective with both males and females (Table 2). A possible exception is that programs appeared to be more effective at reducing sexual risk-taking among females than males; six of seven programs reduced sexual risk-taking among females, while only four of eight did so among males. It is encouraging that programs can increase reported condom use, even among females who have less direct control over condom use.

Although more studies were conducted of programs that focused on adolescents aged 14 to 17.9 than on younger or older young people, programs were roughly equally effective with all three groups of young people (Table 2). One possible exception is that programs might have been less effective at reducing the number of sexual partners among people 18 and over than among younger people.

All of these findings indicate that these curriculum-based programs are quite robust; they can be effective in different countries, in different cultures, in different communities and with different types of young people. This does not mean that the same program can be effective with all these groups in all these countries; rather it means that different

curriculum- and group-based programs appropriately designed for each group of youth in each community can be effective.

This robustness should not be confused with magnitude of impact. In general, these programs did not dramatically reduce sexual risk-taking, or STD or pregnancy rates. Typically, the most effective programs tended to reduce the amount of sexual risk-taking by about a third or less. Thus, these programs are not a complete solution to the problems of HIV, other STDs or unintended pregnancy, but they can be an effective component in a larger effort.

Consistency of Results from Replications

A critically important question is whether or not a program, that has been found to be effective when designed, implemented and evaluated by a well-funded and highly skilled research team, will subsequently be effective when implemented by others in other communities.

Four interventions in the United States have now been replicated and evaluated and for three of the four interventions, the majority of the replications also produced positive behavior change. *Be Proud! Be Responsible!* has been evaluated the greatest number of times. It was originally evaluated in a randomized trial of all males and found to have a significant positive impact on condom use and other behaviors for three months (it was not evaluated for a longer period of time)[47]. It was then evaluated in different communities with both males and females and reduced unprotected sex for six months, as long as the evaluation lasted[49]. It was slightly modified and lengthened and evaluated and this time it had positive effects on condom use and other behaviors for a year[48]. Finally, it was then implemented in 86 community-based organizations and again had a statistically significant impact on condom use and frequency of unprotected sex over the one-year evaluation period[45]. This is the largest replication study in the field. *Be Proud! Be Responsible!* was then adapted for Hispanic youth and evaluated. This time it reduced sexual activity, reduced the number of sexual partners and increased condom use[104]. All of these studies were randomized trials.

Be Proud! Be Responsible! was designed to be implemented out of school, often on Saturdays. Another randomized trial evaluated the year-long impact of *Be Proud! Be Responsible!* when it was implemented in high school classrooms during the regular school day[14]. In this study, it did not have a significant impact on any sexual behavior. Several reasons have been hypothesized for lack of effects: 1) the study could not implement one activity that may have reduced negative attitudes about condoms affecting sexual pleasure; 2) it was implemented during the school day when youth might have become more tired and less attentive after taking other classes (than they might have been on Saturdays), where youth did not volunteer to participate (and may have been less open to change than those who volunteered in other studies), and where it was more difficult to implement activities in small groups; 3) it was implemented among youth who may have received prior instruction on this topic and may have been saturated; and 4) it was implemented among youth who were older than in the previous studies.

Reducing the Risk was originally evaluated in 13 communities in California and both delayed the initiation of sex and increased contraceptive use among some groups of youth[51]. This was not a randomized trial, but the comparison group very closely matched the intervention group. It was then independently evaluated in Arkansas. That evaluation design was not strong, but again it delayed initiation of sex and increased condom use among some groups of youth[44]. It was then evaluated twice by a third research group in Kentucky and both times it delayed the initiation of sex and one of the times it increased condom use[44, 111, 112]. Notably, in one of the two Kentucky studies, the curriculum was shortened from 16 sessions to 12 sessions and still had an impact.

Becoming a Responsible Teen was evaluated in three different randomized trials in different settings. First, it was implemented in a community setting and delayed the initiation of sex, reduced the frequency of sex among sexually active youth, increased condom use and reduced unprotected sex over a 14 month period[95]. Second, it was implemented in a drug rehabilitation center and increased abstinence, reduced number of sexual partners, increased condom use, and reduced unprotected sex over 13 months[94]. Third, it was shortened substantially, implemented in a state juvenile reformatory, and did not significantly change behavior[93]. These results suggest that the full version had positive impacts in two different settings, but that the short version was not effective in a third setting.

Focus on Kids was evaluated in two randomized trials. In the first study, it was implemented in an urban setting and increased condom use[98]. In the second study, it was adapted for a more conservative rural setting and some of the condom activities had to be removed in some or all of the evaluation sites[97]. The results of the replication study revealed that it failed to have a significant impact on condom use, suggesting that inclusion of the condom activities may have been critical.

Overall, the results of these replication studies are quite encouraging, providing greater evidence that curricula can often be effective when they are implemented with fidelity by others in different communities. It is less clear if effective programs will remain effective if 1) they are shortened considerably, 2) activities that focus on increasing condom use are omitted, or 3) they are designed for and evaluated in community settings, but are subsequently implemented in classroom settings.

Summary of Behavioral Effects

In sum, these studies present very strong evidence that, in general, these sex and HIV education programs did no harm and that many had positive effects on one or more of the sexual and protective behaviors measured. In general, these programs did not increase sexual behavior, either in developing or developed countries. In general, they did not hasten the onset of sexual intercourse or increase either the frequency of sex or the number of sexual partners after youth became sexually experienced. In contrast, these studies present very strong evidence that some, but not all, programs in both developing and developed countries reduced sexual activity, either by delaying the onset of sexual intercourse, reducing the frequency of sex or reducing the number of sexual partners. In addition, some, but not all, programs increased condom and contraceptive use and

reduced sexual risk-taking. These findings are quite robust across countries, cultures, communities, settings, and groups of young people.

Findings: Impact on Mediating Factors

Although the review above provides strong evidence that some programs had an impact on sexual risk behaviors, it does not describe how or why these programs had an impact. Those questions can be partially answered by examining programmatic impact on the mediating factors that programs attempted to change in order to change behavior.

The impact on mediating factors measured in all 83 studies is summarized in Table 4. That is, the results in Table 4 include results from both programs that successfully changed behavior and those that did not. In the section further below on the characteristics of effective programs there is an analysis of the impact on mediating factors of programs that actually changed behavior.

While researchers around the world have used many overlapping concepts and scales to measure mediating factors, they have also used many different variations and have reported results in differing amounts of detail. Thus, the mediating factors in Table 4 include all the common concepts, but sometimes some judgment had to be used to code each reported finding. Reported effects on factors not conceptually related to sexual risk behavior (e.g., impact on nutrition) were not included in the table.

Before reviewing the results in Table 4, several things should be recognized. First, the number of studies that simply measured each risk and protective factor provide an indication of the number of programs that focused on these factors. If a study measured a particular factor, then the program presumably was more likely to have addressed that factor. However, this should not be overstated, because some programs may not have adequately addressed a particular factor even though impact on that factor was measured. Not surprisingly, the mediating factors measured in these studies are consistent with the psychosocial theories on which the programs were based.

Second, this table summarizes the results of many studies, each of which measured programmatic impact on multiple factors. Thus, there were more than 400 tests of significance and one would expect that about five percent or roughly 20 to be significant at the $p < .05$ level by chance alone. However, it is quite unlikely that as many as three positive significant findings for any individual mediating factor would have occurred by chance. Thus, if three or more studies found that a particular factor was significantly improved, those findings would strongly suggest that at least one program had actually caused the improvement.

Third, if a majority of the studies that measured a particular factor actually significantly improved that factor, these results would indicate that either that factor is more amenable to change with the kinds of programs that have been implemented thus far or that the actual change is more easily measured.

Finally, these reported results may not be representative of the effects of all studies. As noted above, if a study measured a particular factor, then the intervention may have been more likely to focus on and change that factor than interventions which did not measure

it. The summaries that follow are obviously based only on those studies that measured each factor and therefore are not representative of all studies.

Knowledge. A total of 52 studies measured impact on knowledge and a large majority of these demonstrated that their respective sex and HIV education programs did increase knowledge about a wide variety of topics involving sexual risk behavior. The evidence is particularly strong that programs increased knowledge about HIV, STD and pregnancy (including methods of preventing STD/HIV and pregnancy). The evidence is also strong that programs increased overall knowledge about a variety of sexual topics, including those just mentioned, that were included in overall knowledge tests. Only small numbers of programs failed to increase knowledge about the topics that were measured. Logically, these few failures may have occurred because the programs did not in fact increase any relevant knowledge, because the knowledge tests did not measure the actual knowledge gained, or because statistical power was inadequate to detect programmatically meaningful effects.

Perceived Risk. Eighteen studies measured impact on perceived risk or susceptibility. Of these 16 measured impact on perceived risk of HIV specifically, and half of these were effective at increasing perceived risk. It should be noted parenthetically that while many programs strove to increase awareness of HIV risk, if programs actually reduced participants' sexual risk behavior, then these programs would logically reduce their perceived risk and thus possibly negate the positive effects of the programs creating greater awareness of HIV risk in their communities.

Only three studies measured impact on perceived risk of pregnancy, and they were not effective at changing this perception. It may be the case that young people were already aware that unprotected sex could lead to unintended pregnancy and they could visibly see the unintended pregnancies among their peers in a way that they could not see or know of HIV cases among their peers.

Perceived Severity. Eight studies measured perceived severity of the consequences of HIV, other STDs and pregnancy and more than half were effective. More specifically, three of four studies increased perceived severity of HIV/AIDS; only one measured impact on perceived severity of STDs and it was effective; and two of five programs were effective at increasing perceived severity of pregnancy.

Personal Values and Attitudes. A total of 48 studies measured impact on values and attitudes, especially values regarding abstinence and having sex and attitudes toward condoms, and a large majority of these programs were effective in improving these factors. Of all the studies measuring impact on values and attitudes regarding any sexual topic, more than 60 percent improved the measured values and attitudes. For example, they made attitudes more supportive of abstinence or condom use. These results clearly demonstrate that in general it is possible to improve values and attitudes. It should also be noted, however, that the magnitude of the measured change in these values and attitudes was frequently quite small and not always long lasting.

Of the studies that measured impact on these values and attitudes, at least half the studies (and a minimum of three studies) found that the programs improved values about sex and abstinence, attitudes about pressuring someone to have sex, attitudes towards condoms

(including perceived barriers to using condoms), attitudes toward risky sexual behavior and prevention of risk, and finally attitudes toward people living with HIV.

Perceived Peer Behavior and Norms. Twenty-nine studies measured impact on perceived peer sexual behavior and norms and more than 40 percent significantly improved these perceptions. For example, they helped teens realize that fewer of their peers had had sex, that their peers supported abstinence or that their peers used or supported condom use. At least three studies improved perceived norms about sex, condoms and avoiding risk, indicating that it is possible to change these perceptions. However, it is also true that less than half of the programs improved perceptions of peer behavior and norms about sex and condom use. This may reflect the fact that, in some cases, the perceptions of the young people were roughly correct.

Perceived Partner Values. Only three studies measured impact on perceived partner values and norms about condom use and none of them significantly improved those perceptions. These studies suggest that participants may already have reasonably accurate knowledge of their partners' reactions and thus, this factor may be more difficult to change.

Self-efficacy and Skills. Thirty-four studies measured impact on self-efficacy, especially self-efficacy to refuse sex, use condoms and avoid unprotected sex, and more than half improved self-efficacy. Of those studies that measured impact, more than half improved self-efficacy to refuse unwanted sex and more than two-thirds increased self-efficacy to use condoms. Almost half (seven out of 16) improved self-efficacy to avoid STD/HIV risk. These studies demonstrate that it is possible to improve self-efficacy for critical risk-avoidance behaviors.

Motivation and Intentions. Twenty-eight studies measured motivation or intentions to abstain from sex, restrict sexual partners, or use a condom, and two-thirds of these studies increased that motivation or intention. More specifically, 10 of 16 programs increased motivation or intention to abstain from sex or restrict sex partners, 10 of 14 programs increased intention to use a condom, three of six programs increased intention to avoid sex or unprotected sex (a factor that overlapped the previous two factors). All of these studies in combination clearly demonstrate that it is possible to improve motivation and intentions to reduce sexual behavior or to use protection.

Communication. Twenty-two studies measured impact on reported communication, especially, communication with parents or adults, and more than half were effective. Four of seven studies increased reported communication with their current partner about AIDS, STDs and/or past sexual partners. Similarly, eight of 11 programs increased communication with parents or other adults about sex, condoms or contraception. These studies demonstrate that it is also possible to improve communication with these important individuals.

Other Behaviors. Twenty-five studies also measured impact on a wide variety of other behaviors. A majority of programs (and a minimum of three programs) found a positive impact on avoiding places and situations that might lead to sex and on obtaining and/or carrying a condom.

On the other hand, of the 11 programs that measured alcohol or drug use, a large majority was not able to reduce use, and none of the three programs even reduced alcohol or drugs before sex. These discouraging results may reflect the fact that few (or none) of the programs placed much emphasis on reducing alcohol and drug use.

Relationship with Parents and Psychological States. Few studies measured the impact of programs on relationships with parents or on psychological states (e.g., self esteem or mental health) and the results were generally mixed. While the results for relationships with parents were typically positive, those for psychological states were typically not significant.

Summary. These studies present strong evidence that some of these programs have improved knowledge (especially knowledge about HIV, other STDs, pregnancy and methods of preventing them), awareness of risk of HIV, severity of HIV/AIDS, values and attitudes (especially about sex, condoms, risky sexual behavior and people living with HIV), self-efficacy to refuse sex and to use condoms, intention to abstain from sex (or restrict sex and numbers of partners), communication about AIDS or past partners with current partner, and finally communication with parents or other adults about a variety of sexual topics. Relevant knowledge, awareness of risk, values and attitudes, self-efficacy, and intentions – these are the very factors specified by many psychosocial theories as being the determinants of health behavior. Furthermore, all of these factors have empirically been demonstrated to be related to their respective sexual behaviors. Thus, it appears likely that changes in these factors contributed to the changes in the behaviors summarized above.

III. Characteristics of Effective Programs

Ideally it would be possible to identify a set of necessary and sufficient program characteristics that clearly distinguished programs that changed behavior from those that did not. However, at this point in time it does not appear possible to do that. There are several reasons why.

First, a few programs that incorporated many characteristics commonly believed to be desirable nevertheless failed to have an impact on sexual behavior for a variety of methodological reasons: their sample sizes were too small; they failed to follow study participants for sufficient lengths of time to observe delay in sex; their measurement of important outcome behaviors was poor; or their control groups received different but nevertheless potentially effective programs.

Second, a few programs may not have had a measured impact because they were not implemented with fidelity. For example, 12 of the studies described implementation problems of varying degrees of severity.

Third, a few curricula that did *not* appear to incorporate characteristics commonly believed to be important nevertheless had a positive impact possibly because the curricula were poorly written (e.g. were broad outlines) and did not well capture what really happened in the classroom.

Fourth, some seemingly weak programs (as well as strong programs) may have found significant positive effects simply by chance. Among the hundreds of tests of significance, certainly some occurred by chance.

Fifth, in some cases, it simply cannot be determined from the published study why programs did or did not have an impact, because the published report provided too little information about the intervention, the targeted population, or the evaluation methods.

Last, but *very important*, it is not possible to identify a group of necessary and sufficient characteristics of curriculum-based programs because important factors other than curriculum characteristics may dramatically affect their success. In general, at least three groups of factors may affect whether a curriculum-based program produced behavior change: 1) the characteristics of the curriculum and its implementation; 2) the needs, deficits (and assets) of the youth being served by the program (including their prior saturation with this topic); and 3) the characteristics of the youths' environment, especially the saliency of AIDS, other STDs or teen pregnancy.

For example, in the late 1980s in sub-Saharan Africa when youth (and many people more generally) saw other people around them dying a slow and terrible death and did not understand the cause of these deaths, programs that simply provided accurate information about HIV/AIDS, the modes of HIV transmission, and methods of preventing HIV transmission may have been sufficient to produce some behavior change, because people were already motivated to avoid illness and death and mostly needed accurate information about how to avoid HIV/AIDS. However, elsewhere or at different times, people did not see others dying around them and/or already knew the modes of transmission and the methods of preventing transmission, and in these circumstances, curricula that primarily provided accurate information about prevention were less likely to produce behavior change.

In some communities in the United States where few young people hear messages to delay sex until older and where HIV is a salient issue, programs that encourage young people to delay sex in order to avoid HIV may be effective, whereas they might not be effective in other communities where youth already hear those messages or where HIV is not a salient issue.

Although the impact of curricula is determined by more than the characteristics of those curricula, it is possible, nevertheless, to identify common characteristics of curriculum- and group-based sex and HIV education programs that did typically change behavior.

Methods of Identifying Characteristics of Effective Programs

To identify the characteristics of effective programs, we completed a three-step process. First, to generate a list of potentially important characteristics of effective programs, we:

- Reviewed several reviews of other kinds of health education programs or reviews of HIV education programs for adults and noted which characteristics they suggested might be important.
- Reviewed more than 20 previous reviews of sex and HIV education programs for young adults and noted which characteristics they suggested as being important.

- Reviewed numerous published studies of sex and HIV education programs for youth and noted which elements they mentioned as important.
- Reviewed the one-page summaries for all 83 studies and compared the common developmental, structural, and implementation characteristics of those programs that effectively changed one or more behaviors with those that did not.

Second, to identify the common characteristics of curriculum content (as opposed to curriculum development and implementation), we obtained and coded curricula that were either clearly effective or not effective.

More specifically, we identified those programs with stronger evidence supporting positive effects on one or more sexual behaviors (N=28) and those with reasonably strong evidence they did not have a significant impact (N=5). Many of the remaining 50 studies either 1) did not have significant positive results but had insufficient statistical power to conclude they had no programmatically meaningful impact or 2) they measured many effects on different behaviors or sub-populations and had scattered positive results that were individually significant but were not adjusted for multiple tests of significance and thus we were less certain of their impact.

Of the 33 curricula we requested, we received 21. We did not receive the remaining curricula because they were no longer available (N=2), the wrong curriculum was sent (N=1) or the authors never responded to our inquiries for unknown reasons (N=9).

To determine more precisely the common characteristics of the 19 effective curricula, we then:

- Rated the overall curriculum on each of the potentially important characteristics. Those characteristics that were incorporated into more than 90 percent of the effective curricula are described below.
- Coded most activities in the curricula according to the risk and protective factors they addressed and identified the specific activities employed to change each risk and protective factor. The activities from different curricula addressing the same risk and protective factor were then photocopied and placed in a binder for each factor. Two authors reviewed 12 varied curricula together and discussed their coding to assure inter-coder reliability. The remaining curricula were coded by the authors individually. The activities in each binder for each risk and protective factor were then scanned and summarized.

Third, to determine more accurately the characteristics of the process for developing the effective curricula and the implementation of these curricula, we reviewed the one-page summaries of the effective curricula, the original research articles and any other materials (e.g., the curricula themselves) that described how the curricula were developed and implemented. Because many studies provided inadequate information about development and implementation, the identification of the common development and implementation characteristics was necessarily less rigorous.

Overall, this three-step process enabled us to identify the common characteristics of 1) the process of developing the curricula, 2) the content of the curricula themselves, and 3) the implementation of the curricula.

Evidence for the Greater Impact of Programs Incorporating These Characteristics

On the one hand, it should be reemphasized that for the reasons given above, these characteristics should not be considered necessary or sufficient characteristics, because other factors involving the youth and their environments also affect programmatic success. On the other hand, there are multiple kinds of evidence indicating that programs incorporating these 17 characteristics are more likely to be successful than those that do not.

First, the process for generating these characteristics included an in-depth examination of programs that clearly did or did not have an impact and attempted to identify distinguishing characteristics.

Second, several studies involved a comparison of the impact of skill-based curricula that incorporate all (or nearly all) of these characteristics with the impact of knowledge-based curricula that did not incorporate many of these characteristics, and consistently, the skill-based programs were more effective at changing behavior than knowledge-based programs[22, 46, 51, 94, 95].

Third, to the extent feasible based on the original articles, we coded all the studies in the developing world according to these characteristics. Virtually all of the studies with most of the characteristics had either positive significant results (12 studies) or had large programmatically significant results that were not quite significant (2 studies). For example, in the first, the program reduced the percent of youth who initiated sex from 17 percent to seven percent[56] and in the second the odds ratio for contraceptive use was 2.25, but $p=.08$ [27]. In contrast, those programs having fewer of the characteristics did not have a significant impact (three studies).

Thus, throughout the world, for uncertain reasons, a few programs that appeared to have most of these characteristics did not have a significant impact on behavior and a few programs without all of these characteristics did have an impact on behavior. However, those programs with the large majority of these characteristics were much more likely to have an impact on behavior than those with fewer of these characteristics.

Findings – Common Characteristics of Effective Programs

A large majority of the effective programs shared most of the 17 characteristics described below and summarized in Figure 1. These 17 characteristics can logically be divided into three categories, namely those describing: 1) the development of the curriculum, 2) the overall design and teaching strategies of the curriculum itself, and 3) the implementation of the curriculum.

Category 1: Five characteristics describing the development of the curriculum

There are five common characteristics of effective curriculum development teams and their efforts to develop effective curricula. These teams:

1. Included multiple individuals (and sometimes groups) with expertise in different areas in the design of the curriculum. They often included people with different

backgrounds and expertise especially in the areas of theory of health behavior, research on adolescent sexual behavior and risk and protective factors affecting that behavior, theory of instructional design (how to change each risk and protective factor), elements of good curriculum design, specific activities used to teach youth about sexual topics, cultural knowledge, and evaluation. Sometimes the same person had expertise in more than one of these areas. Knowledge about evaluation may not have been a prerequisite for developing an effective curriculum, but may have been an artifact of the research component of all of these studies. Sometimes, but not always, the individuals included stakeholders from the communities or organizations involved.

2. Assessed the relevant needs and assets of the young people they were targeting. The curriculum developers typically reviewed quantitative data on HIV, other STD or pregnancy rates as well as any survey data on young adult sexual behavior. To the extent feasible, they reviewed these data for their targeted population. They sometimes conducted focus groups or interviews with youth and also interviews with adults working with youth on reproductive health concerns. During these focus groups and interviews they sometimes asked questions about why youth had sex – even if unwanted – and barriers to their using condoms or other forms of contraception.

3. Used a logic model approach to develop the curriculum. In public health, a logic model may specify how interventions can affect behavior and achieve a health goal. Curriculum developers may or may not have consciously developed a formal logic model. However, their discussion of the development of the curriculum, their use of theory, and their measurement of both sexual and contraceptive behaviors and the mediating factors affecting those behaviors all suggest that they completed the following four steps, although not necessarily in the following order and not necessarily so logically.

- The curriculum developers specified the health goal(s) they were trying to achieve. In these studies, they most often focused on preventing the sexual transmission of HIV, but many studies also included the prevention of STDs more generally and to a lesser extent also the prevention of unintended teen pregnancy.
- The curriculum developers identified the particularly important behaviors that lead to HIV/STD transmission or pregnancy or their prevention (e.g., abstaining from sex or using condoms or contraception).
- They used their knowledge of theory and research, focus groups and/or interviews with youth and professionals working with youth, and personal experience to identify some psychosocial sexual risk and protective factors affecting those behaviors. These included the factors that were measured and discussed above, e.g., knowledge about risk of sex and methods of protection, personal values and attitudes about sex and condoms, perception of peer norms about sex and condoms, self-efficacy to refuse sex, etc.
- Finally, they developed particular activities to address many or all of these risk and protective factors that they identified. Sometimes they used educational theory to develop these activities.

Figure 2 provides part of a logic model that incorporates elements from multiple logic models that people actually used to design effective programs.

4. *Designed activities consistent with community values and available resources (staff time, staff skills, facility space and supplies).* For example, in communities that greatly valued abstinence among young people, abstinence was emphasized as the safest or best approach for young people. In schools with teachers inexperienced in using role plays, less or no emphasis was placed on students practicing role plays. In communities that lacked video equipment, videos and films were not incorporated. In schools that lacked paper and pencils, individual worksheets were not used.

While this characteristic may seem obvious, there are numerous anecdotal (and even reported) stories of people who developed curricula that could not or were not fully implemented because they were not consistent with community values and resources, and consequently they were not effective. Thus, even though this characteristic may be obvious to some people, it remains important to recognize.

5. *Pilot-tested the program.* Many of the curriculum developers pilot-tested some or all of the activities and then made modifications in the activities before implementing the version that was actually evaluated. This allowed them to assess informally what did or did not work. Some curriculum developers also conducted formative evaluations during program implementation and made improvements in the curricula either during or after the research study.

Category 2: Eight characteristics describing the contents of the curriculum itself

The eight characteristics describe the curriculum goals and objectives, activities, and teaching methods. More specifically, effective curricula:

1. *Focused on at least one of three health goals: The prevention of HIV, other STDs and/or unintended pregnancy.* Effective curricula typically focused on young people's susceptibility to HIV, other STDs and/or pregnancy and the negative consequences of contracting HIV and other STDs or becoming pregnant. They gave a clear message about these health goals, namely that if young people have unprotected sex, they would be likely to contract HIV or another STD or to become pregnant (or cause a pregnancy) and that there were negative consequences associated with these outcomes. In the process of doing this, they strove to motivate young people to want to avoid STDs and unintended pregnancy.

2. *Focused narrowly on specific behaviors leading to these health goals, gave clear messages about these behaviors, and addressed situations that might lead to them and how to avoid them.* The curricula designed to prevent HIV and other STDs focused on abstinence and frequency of sex, number of sexual partners (less commonly), and condom use. Curricula designed to prevent pregnancy focused on abstinence, frequency of sex (less commonly) and contraceptive use.

Effective curricula focused on these behaviors in a variety of ways. First, they talked explicitly about sex, condom use and contraceptive use. For example, they identified specific situations that might lead to unwanted sex or unprotected sex and discussed how to avoid these situations and how to get out of them. They described how to use condoms

or contraceptives correctly and how to overcome barriers for obtaining and using condoms or other forms of contraception.

In contrast, many, but not all, of these effective curricula spent relatively little time talking about broader issues of sexuality, being in love, etc. A few, but only a few, talked about gender roles, and when they did so, they related gender roles to sexual or protective behaviors.

Second, effective curricula gave a clear and consistent behavioral message about these sexual and protective behaviors. Nearly all the effective programs repeated numerous times and in different ways a very clear and consistent message about these behaviors. In fact, most activities in the curricula were designed to change behaviors so that they would be more consistent with the message.

Given that the majority of the programs were designed to reduce HIV and other STDs and given that they were often designed for sexually experienced young people, the most common messages were that young people should use a condom every time they had sex with every partner. Programs concerned with pregnancy prevention logically emphasized that young people should use contraception every time they had sex. Several programs emphasized that abstinence was the safest choice, that unprotected sex was risky, and that using condoms was safer than unprotected sex.

Although most programs emphasized abstinence and/or condom/contraceptive use, a few programs recognized that condoms do not provide complete protection against STD transmission and thus encouraged youth to limit their sexual partners, especially older male partners. Programs in some developing countries, especially Africa, emphasized the dangers of “Sugar Daddies” – older men who offer gifts or treats, but later want sex in return.

Some programs identified important values in their communities and then appealed to those values. For example, they repeated “be proud,” “be responsible,” or “respect yourself.” Without exception, when the programs appealed to these values, they made very clear what sexual and protective behaviors were consistent with these values; these values were not vague admonitions.

The messages in these effective programs were appropriate to the age, sexual experience, gender and culture of the youth. For example, programs that were designed for younger youth who were less likely to be sexually experienced were more likely to place greater emphasis on abstinence than on condom use, while those programs designed for older more sexually experienced youth were more likely to place greater emphasis on condom use. As another example, a few programs for both males and females emphasized that youth should “identify their sexual limits ahead of time” and then “stick to their limits.” A couple of programs for only young women emphasized that they were capable, powerful and “could be in control.” “Being in control” was emphasized both generally and more specifically in regard to resisting unwanted or unprotected sex and insisting on condom use.

This particular characteristic of effective curricula – providing a clear message – appeared to be one of the most important. Some *ineffective* curricula provided information, discussed the pros and cons of different sexual choices and implicitly let the

youth decide what was right for them. In contrast, most of the activities in *effective* curricula were directed toward convincing the students that abstaining from sex, using condoms consistently, or using other forms of contraception consistently was the right choice, and that unprotected sex was clearly an undesirable choice. To the extent possible, they tried to use group activities to change values, attitudes and norms about what was the expected behavior (see next characteristic).

3. *Focused on specific sexual psychosocial factors that affect the specified behaviors, and changed some of those factors.* Programs designed to reduce sexual activity either by delaying the initiation of sex, reducing the frequency of sex (or increasing the return to abstinence), or reducing the number of sexual partners focused on one set of factors, while programs designed to increase condom or contraceptive use tended to focus on another different but overlapping set of factors.

Many studies did not clearly specify or did not measure all of the factors they addressed. Thus, it cannot be known with certainty which factors were most commonly targeted and improved by the programs. Nevertheless, some sexual psychosocial factors were frequently targeted and improved by the curricula.

Table 5 specifies the number of programs that had positive, not significant or negative effects on a wide array of potential mediating factors, by type of effective program. That is, whereas Table 4 included the results for all studies, in Table 5 the left hand set of results are the results for only those programs that reduced sexual behavior (through delay or reductions in frequency or number of partners) and the right hand set of results are the results for only those programs that increased condom or contraceptive use.

The results in this table support three conclusions:

1. Some programs significantly modified mediating factors hypothesized to be important and also then delayed or reduced sexual behavior or increased condom or contraceptive use. Other research studies have demonstrated that the mediating factors highlighted in Table 5 are significantly related to sexual behavior or condom or contraceptive use. Thus, it is likely that the effective programs changed sexual behavior and condom or contraceptive use in part by modifying these mediating factors that in turn affected behavior.
2. Some programs significantly changed sexual behavior without always significantly changing all the mediating factors considered important by some theorists. This does not mean that these mediating factors are not important, but it does suggest that there may be multiple pathways to changing sexual behavior. That is, programs can change one set of mediating factors that may be particularly important for one group and thereby change behavior and they may change another set of mediating factors that is more important for another group and thereby change that same behavior.
3. Some programs had a significant impact on potentially important mediating factors, but did not change behavior. Perhaps these mediating factors were not highly related to behavior for these particular study populations or perhaps the

significant impact on these mediating factors failed to have a *measurable* impact on sexual behavior for a variety of methodological reasons².

The lists below include factors that were frequently targeted and improved. To be included in the lists below, factors had to meet two criteria: 1) at least three programs that significantly reduced reported sexual behavior (or increased reported condom or contraceptive use) had to significantly improve each mediating factor, and 2) other research studies must have previously demonstrated that the factor reduced reported sexual activity (or increased condom or contraceptive use). It is also true that a large majority of these factors were significantly improved by a majority of the studies that measured them and changed the associated behavior and all of these factors were significantly improved by at least one-third of the studies that measured them and changed the associated behavior.

At least three programs that *reduced sexual activity* and at least three programs that *increased condom use* focused on and improved the following eight factors:

1. Knowledge, including knowledge of sexual issues, HIV, other STIs, and pregnancy (including methods of prevention)
2. Perception of HIV risk
3. Personal values about sex and abstinence
4. Attitudes toward condoms (including perceived barriers to their use)
5. Perception of peer norms and behavior about sex
6. Self-efficacy to refuse sex and to use condoms
7. Intention to abstain from sex or to restrict sex or partners
8. Communication with parents or other adults about sex, condoms, or contraception

In addition, at least three programs that *reduced sexual activity* focused on and improved an additional two factors:

9. Self-efficacy to avoid STI/HIV risk and risk behaviors

² There are at least three methodological reasons why some studies found a significant impact on mediating factors but not on behavior.

1. In this review, change in sexual behavior is not well measured. Only a few programs clearly did or did not change behavior; many had significance levels close to $p < .05$. Some of these were just barely significant and were coded in the category of programs with significant results while others were not quite significant and were coded in the category of programs without significant results.
2. In this review, change in many of the mediating factors also had significant levels close to $p < .05$, and again some were coded as significant and others were not, even though the effect sizes were the same or sometimes even larger in the non-significant group.
3. Some studies measured change in mediating factors at one point in time and change in behavior at another point in time. (Note: Those results for mediating factors that were measured only during immediate post tests were not included in these tables; mediating factors had to be measured for at least three months after baseline.) Thus, it was possible for programs to significantly change mediating factors, say at three months, but not affect behavior measured at 12 months.

10. Actual avoidance of places and situations that might lead to sex

Finally, at least three programs that *increased condom use* focused on and improved:

11. Intention to use a condom

It should be emphasized that just as some programs that reduced sexual activity also increased condom or contraceptive use, some programs that reduced sexual behavior also improved mediating factors for condom or contraceptive use, and vice versa. This provides greater evidence that it is possible to do both with the same programs.

4. Attempted to create a safe environment for youth to participate. Virtually all of the effective programs started by creating a set of ground rules for class involvement. Typically these included rules such as not expressing put-downs, not asking personal questions, respecting the right to refrain from answering questions, recognizing that all questions are legitimate questions, not interrupting others, respecting the opinions of others, and maintaining the confidentiality of views expressed. Consistent with this characteristic, to help make youth more comfortable talking about sexual topics, some curricula encouraged educators to give positive recognition and positive reinforcement.

In addition to establishing ground rules, some programs tried to create a safe environment by separating the class into same-sex groups for certain topics, or occasionally limiting the entire course to only one sex.

5. Included multiple instructionally sound activities designed to change each of the targeted risk and protective factors. In order to meet the needs of the targeted young people and to change the selected risk and protective factors, effective programs incorporated multiple activities to change these factors. Often individual activities were linked to specific factors; others times they addressed multiple factors.

The particular topics, teaching strategies and activities used to improve important groups of risk and protective factors follow:

5A. Basic information about risks of having sex and methods of avoiding sex or using protection. To increase knowledge, the curricula focusing on HIV/STD prevention most commonly covered the following topics: the most common modes of HIV and other STD transmission, symptoms of STDs, inability to assess the existence of STDs from a healthy appearance, susceptibility to STDs, consequences of STD/HIV (e.g., pain, sterility, ectopic pregnancy, possible death, and effects on newborn infants), methods of preventing STDs, common local myths about pregnancy and STDs, effectiveness of abstinence and condoms, correct use of condoms, and more generally, overall knowledge of HIV/STD. Some effective curricula covered testing and treatment of HIV and other STDs.

As noted above, relatively few effective curricula covered pregnancy prevention, but appropriately, of those that did, the majority covered the causes of pregnancy, chances of becoming pregnant if sexually active, consequences of pregnancy, methods of preventing pregnancy (abstinence and contraception), sources of contraception including community reproductive health resources, teens' legal rights to contraception, how different methods work, effectiveness of different contraceptive methods, and myths and facts about pregnancy and contraception.

Although a few curricula included a couple of errors or some information that was slightly outdated, nearly all curricula included medically accurate information about methods of avoiding pregnancy or sexually transmitted disease.

A variety of activities were used to convey and help personalize this information. The most common types of activities included short lectures, class discussions, competitive games in which teams win by correctly answering questions, simulations (discussed below), statistics on prevalence, skits, videos, flip charts or pamphlets with information about different STDs or contraceptives. Notably, many of these activities required that the students obtain and share their information rather than passively listen to the educators.

5B. Perceptions of risk (especially susceptibility). Virtually all of the effective curricula focused on both susceptibility and severity of HIV, other STDs or pregnancy respectively. To increase feelings of susceptibility, curricula commonly provided data on the incidence or prevalence of HIV, other STDs or pregnancy in their countries or in their communities, and when possible among youth roughly their age. They also used class discussions, videos with true stories of young people having HIV or stories of young people becoming pregnant, handouts with scenarios involving risk, etc.

Some of the curricula included one or more simulations. For example, a favorite simulation of the spread of STD is some version of the “STD handshake” in which youth shake hands with others, keep track of whom they shook hand, and subsequently learn that shaking hands represented having sex. They then see how STDs can rapidly spread.

Among the pregnancy prevention curricula, a popular simulation of pregnancy risk involves students choosing numbers from one to six (roughly representing the risk of pregnancy during each month of unprotected sex) and then having someone draw the numbers from a hat (which represents a pregnancy test). With each passing month (and draw from the hat), more and more youth become pregnant and must stand. This vividly shows how youth may not become pregnant the first month, but most youth do become pregnant within a few months of unprotected sex.

The severity of HIV and other STDs were emphasized in short lectures, by presenting factual information on deaths due to AIDS and the consequences of other STDs, by having HIV positive speakers describe the impact of HIV on their own lives, and with videos of people who had contracted AIDS and died, or had contracted other STDs. To the extent possible, curricula appeared to use videos, speakers, skits, etc involving people similar as possible to the students.

Some curricula included activities that further personalized the severity of STDs and pregnancy by asking students to write a paragraph about how they would feel if they just learned they had contracted HIV or another STD, or were pregnant (got someone pregnant), and what they would have to do during the following few days. These activities emphasized short term effects. Other activities emphasized longer term effects by asking students to write down many things they would like to do during the following years and to then cross out those activities that they could not do if they developed AIDS or became a parent and to draw a single line through those activities they could do, but only with greater difficulty.

5C. Personal values about having sex or premarital sex and perception of peer norms about having sex. Programs for younger youth were more likely to address values about sex than were programs for older youth. Many programs, especially those for younger youth, promoted abstinence values by repeatedly emphasizing that abstaining from sex was the safest method of avoiding HIV, other STDs and pregnancy. Several programs included group discussions in which students discussed the advantages and disadvantages of engaging in sex, and the educators both emphasized that abstinence was the only 100 percent effective method of avoiding pregnancy, STDs, and other negative outcomes and guided the discussion so that avoiding sex was viewed as the best choice by youth. A few curricula discussed methods of showing you care about someone without engaging in sex. A few included “values voting” activities in which youth had to take a position about having sex and then defend it. Several programs provided survey data from broader representative surveys or from anonymous class surveys showing that many youth their age were not having sex and that many peers their age believed their best option was to avoid having sex at that time. A few programs talked about “lines” that people use to get someone to have sex when they may not want to, and then discussed responses to those lines. Many programs included role-playing activities in which all students practiced saying “no” to sex. Other programs identified common situations that might lead to sex and students then brainstormed methods of avoiding those situations or getting out of them. In the process of discussing and practicing refusal lines and discussing methods of avoiding situations that might lead to sex, students implicitly conveyed less permissive values and norms about having sex.

5D. Individual attitudes and peer norms toward condoms and contraception. Effective curricula gave a clear message about using condoms and contraception if sexually active. Typically they discussed the effectiveness of condoms and contraception, often stating that they did not provide complete protection against STD or pregnancy, but were much safer than unprotected sex and that condoms provided the only significant protection against STD during sexual activity. Some effective curricula included survey data either from large samples of youth or from the students in each classroom showing that students believed that young people should use condoms or contraception if they do have sex.

Effective curricula addressed a variety of attitudes towards condoms and contraception and perceived barriers to using condoms, e.g., perceived effectiveness in preventing STD and pregnancy, difficulties obtaining and carrying condoms, embarrassment asking one’s partner to use a condom, the hassle of using a condom, and the loss of sensation while using a condom. These were addressed by lectures and class discussions that talked about condoms and described their effectiveness if used properly, by discussions about where to obtain condoms with little embarrassment, by visits to drug stores to assess the characteristics of the condoms sold there, by fact sheets about condoms, and by practicing role plays in which each partner insisted on using condoms. A few programs included class discussions of how using condoms could increase sexual enjoyment rather than decrease it by using lubricated or different kinds of condoms or by having the female partner put on the condom as part of sexual foreplay.

5E. Both skills and self-efficacy to use those skills. Curricula typically focused on three different skills: 1) ability to refuse unwanted, unintended or unprotected sex, 2)

ability to insist on using condoms or contraception, and 3) ability to use condoms correctly. The first two of these skills inherently involved communication with partner. Because more of these curricula focused on HIV and other STD prevention than on pregnancy prevention, more of the curricula appropriately focused on condoms rather than contraception more generally. In addition to these skills, a few effective curricula strove to improve general assertiveness skills, ability to obtain condoms or contraception, and ability to obtain STD testing and treatment.

By far the most common method for increasing skill to refuse unwanted sex or skill to insist on using condoms or contraception was role-playing. Many of the curricula first described the components of the skills verbally, then modeled them in role plays, and then provided individual practice through role plays in groups of two to four in which everyone practiced avoiding unwanted sex or insisting on using condoms. Often the role plays started with a plausible scenario for the youth and then followed with a fully scripted role play in which both actors (the person pressuring to have sex and the person resisting having sex) simply read scripts. During the role plays in the small groups, the observers in the small group used a check list to see if the important components of effective skills were employed.

Many, but not all, curricula included multiple role plays reflecting a variety of different situations. Some curricula started with easier situations and moved to increasingly difficult situations; others moved from scripts with lines for both people in the role play to scripts in which the person pressuring to have sex read his/her lines, while the person resisting had to create his/her own responses.

Although the specific skills taught did vary from curriculum to curriculum and from culture to culture, the following skills were commonly taught: say “no,” repeat the refusal, explain why, use direct words, use appropriate body language, use a clear confident voice, be assertive, look the other person directly in the eyes, use delaying tactics, change the topic, suggest an alternative, show the partner you care, build the relationship, and walk away if necessary.

This role playing practice may have both improved the skills and increased the participants’ confidence in their skills. Although the role plays were probably designed primarily to increase skills, when youth saw other youth like themselves continually successfully refusing unwanted sex or insisting on using condoms, this activity may have also improved their perceptions of peer norms about resisting unwanted sex or using condoms.

To increase condom use skills, two activities were most commonly implemented. As part of the first activity, each of the steps for using condoms correctly was put on a separate sheet of paper and students, holding these sheets of paper, had to stand in the correct chronological order (e.g., “the air should be squeezed out of the reservoir tip” before “putting the condom on”). The first team to arrange themselves in the proper order won the contest.

As part of the second activity, teachers first demonstrated how to use a condom properly by checking the date, taking the condom out of the wrapper, and properly putting it over either their own fingers or an object representing an erect penis, squeezing the excess air out, etc, and then students were given condoms and practiced the same behaviors.

To increase skill and comfort obtaining either condoms or contraception, a few curricula included 1) discussions of places where condoms or contraception could most easily and comfortably be obtained and 2) actual visits with fellow students either to drug stores to locate and price condoms or to clinics to obtain information about obtaining reproductive health services.

5F. Communication with parents or other adults. To increase parent/child communication, some programs provided homework assignments to discuss selected topics with their parents or other adults. Sometimes these assignments started with easier topics and moved toward more sensitive topics. Sometimes the programs provided the parents with information about HIV, other STDs and pregnancy, information about adolescent sexual behavior, and various skills to talk more comfortably with their own children about sex. A few programs described a variety of values widely held in the communities that parents might wish to emphasize to their children. Because parents knew that their children were going to have these homework assignments, they could be better prepared and also could understand why their children were asking questions about sex.

6. Employed instructionally sound teaching methods that actively involved the participants, that helped participants personalize the information, and that were designed to change each group of risk and protective factors

The following teaching methods were most commonly implemented: short lectures, class discussions, small group work, video presentations, stories, live skits, role plays, simulations of risk, competitive games, forced choice activities, surveys of attitudes and intentions with anonymous presentation of results, problem solving activities, worksheets, homework assignments (including assignments to talk with parents or other adults), drug store visits, clinic visits, question boxes, hotlines, condom demonstrations, quizzes, and a variety of other interactive activities.

Nearly all of these instructional methods were interactive and engaged youth; some directly encouraged youth to apply the concepts to their own lives. The interactive quality of many of these teaching methods helped them change some of the risk and protective factors above that include much more than knowledge.

In addition, the instructional methods were designed to change their respective risk and protective factors. For example, to increase knowledge, competing teams of students had to answer selected questions. To increase perceived risk of contracting STD, students participated in simulations showing how rapidly STD can spread among youth. To change values and peer norms, peers expressed the advantages of abstaining or using condoms and expressed lines to refuse sex or insist on condom use. To overcome various barriers to using condoms or contraceptives, students brainstormed solutions. And to learn various refusal skills, students practiced role playing. Thus, consistent with educational theory, each of these teaching strategies was appropriate for changing their respective risk and protective factors.

7. Employed activities, instructional methods and behavioral messages that were appropriate to the youths' culture, developmental age, and sexual experience. Some curricula were designed for specific racial or ethnic groups and emphasized the high rates of HIV, other STDs or pregnancy among those groups and the need for young people to

be responsible not only to themselves, but also to their communities, by avoiding unprotected sex. Other curricula were designed specifically for young women and emphasized that young women can be powerful and can be in control in sexual situations.

Most curricula were consistent with the developmental age and sexual experience of the students. Activities for younger youth sometimes included more basic information, less advanced cognitive tasks, and less difficult activities, while those for older youth did the reverse. For example, role playing without scripts was more commonly implemented among older youth than among younger youth. As described above, for younger less sexually experienced youth, programs focused more on abstinence, while for older more sexually experienced youth, programs focused more on condoms.

8. Covered topics in a logical sequence. In many, but not all, of the curricula, the risk and protective factors and the activities addressing them were presented in an internally logical sequence. Often the curricula first enhanced the motivation to avoid HIV, other STDs and pregnancy by emphasizing susceptibility and severity of these events and then addressed the knowledge, attitudes and skills needed to avoid them. For example, their sequence of activities included:

1. Basic information about HIV, other STDs or pregnancy, including susceptibility and severity of HIV, other STDs and pregnancy
2. Discussion of behaviors to reduce vulnerability
3. Knowledge, values, attitudes and barriers related to these behaviors
4. Skills needed to perform these behaviors.

Category 3: Four characteristics describing the implementation of the curriculum

When implementing curricula, effective programs:

1. Secured at least minimal support from appropriate authorities. Virtually all of the effective programs obtained approval from authorities such as ministries of health or education, school principals, clinic directors or directors of local youth-based organizations. This approval may have provided needed support or sanction for educators who were covering topics that were controversial in some cultures.

It should be noted, incidentally, that all of the programs, both effective and ineffective received some approval, because these were visible research studies that required approval, often from multiple organizations.

2. Selected educators with desired characteristics (whenever possible), trained them, and provided monitoring, supervision and support. While some programs were implemented by classroom teachers in whatever classes were appropriate, other programs hired their own educators and had more control over whom they hired. Commonly they hired people whom they believed could relate to youth and who had a background in health education and especially sex or HIV education.

Notably, most studies did not examine the impact of the characteristics of the educators on behavior change. However, one study did randomly assign youth to different types of educators and found that matching the youths' race/ethnicity or gender with that of the educators did not have a significant impact on behavior change[48]. Similarly, two

studies randomly assigned youth to receive either adult-taught or peer-taught sex and HIV education and found that the age of the educators did not affect program effectiveness[49, 53]. Qualitative evaluations of multiple programs have found that what is most important to young people is whether the educator can relate to youth, not the age of the educator[54].

Virtually all of the programs trained their educators in the implementation of the curriculum. This training varied considerably in length and approach. Some of the trainings were skill-based and provided practice teaching some of the activities, while others did not.

While all of the programs trained their educators, one study randomly assigned the educators to receive minimal training plus the well scripted curriculum, a three-day training plus the curriculum, or a three-day training plus video-taping of sessions and feedback on those video-tapes[115]. Notably, the level of training did not significantly affect the impact of the curriculum on subsequent behavior change.

Most studies also provided at least minimal monitoring, supervision and support for the educators. Sometimes, the educators met periodically to discuss their experiences and solve common problems.

3. *Implemented needed activities to recruit and retain youth.* If needed, effective programs implemented activities necessary to recruit and retain youth and avoided or overcame obstacles to their attendance. For example, if appropriate, they obtained parental notification, provided transportation, implemented activities at convenient times, and assured safety.

Although this characteristic may be obvious, there are many reported examples in the field in which too few youth chose to participate in voluntary sex or HIV education programs and thus the programs were not effective.

Some programs implemented programs for parents to attend. Often few parents attended these programs. Typically, programs were more effective at reaching parents through homework assignments discussed above.

4. *Implemented curricula with reasonable fidelity.* Most of the effective programs implemented all or nearly all the activities in the curriculum as designed. Once again, this was in part because typically these programs were more controlled research projects.

Because some studies provided relatively little information about implementation and also because other studies provided different types of process information (e.g., percentage of activities implemented or distributions of numbers of sessions received by intervention participants), it is not possible to make a more definitive statement about implementation across all the studies.

On the other hand, the results of the replication studies do provide some information about the importance of fidelity for those few curricula that were evaluated multiple times. As note above, those studies suggested that intervention may be less likely to be effective if 1) they are shortened considerably, 2) activities that focus on increasing condom use are omitted, or 3) they are designed for and evaluated in community settings, but are subsequently implemented in classroom settings.

Additional Characteristics of Effective Short Programs

Most of the effective programs incorporated most of the 17 characteristics described above. However, additional characteristics described two different groups of programs.

A few programs were effective even though they were remarkably short, e.g., one to five hours. However, these short programs shared several characteristics that may have contributed to their success:

- 1. The programs were implemented after school, on weekends or in non-school settings.*** This meant that when youth participated, they had not just completed several hours of classroom instruction and were fresher and more ready to learn and to be involved.
- 2. Youth volunteered to participate in them.*** Thus, they may have been more open to the information provided and may not have resented being there. They may have been more open to change. There also may have been a self-selection bias – those who agreed to participate in the study may have been different from those who did not. This self-selection would not have affected internal validity of the study, because study participants were randomly assigned after arriving at the program site, but the self-selection might limit generalizability of the findings.
- 3. The programs focused primarily on one behavior, typically condom use.*** This enabled the programs to be more focused, to cover fewer topics, and to give a simpler message.
- 4. The programs were implemented in small groups of about six or so youth.*** This also enabled them to be more efficient. Educators could spend less time managing the classroom and more time addressing the specific questions and concerns of the individual youth. It also meant that interactive small group activities could be more easily and more quickly implemented. Finally, it meant that each group participant could speak up and be involved in discussion a larger percentage of the time.

Additional Characteristics of Effective Programs Having a Long Term Impact

Some programs had a positive impact for more than two years. They shared several qualities:

- 1. These programs were likely to be implemented in schools.*** Eight of the 10 programs that measured and found behavioral effects for two years or more were school-based programs. However, a few of them also had weak to strong community components.
- 2. These programs included 12 or more sessions.*** Nearly all of these programs included 12 or more sessions. This may have enabled them to address more risk and protective factors more intensely.
- 3. These programs included sequential sessions over multiple years.*** Nine of the 10 programs that measured and found behavioral effects for two or more years were either multi-year programs with sequential sessions offered over two or three years or were programs with most of the sessions offered during one year and then booster sessions

offered many months or even years later. This enabled the programs to implement more sessions than they might have been able to in one year, and it enabled them to reinforce important concepts over successive years. A few of these programs also implemented school- or community-wide activities over subsequent years. Thus, students could be exposed to curriculum instruction in the classroom for two or three years and then their knowledge, attitudes and values could continue to be reinforced as long as they remained in their schools or communities.

In essence, programs that reached the same youth for a longer period of time over multiple years sometimes had a longer term impact on behavior. Because it was often (but not always) easier to reach the same youth over multiple years in school, most of these programs having a long term impact were implemented in schools.

IV: Conclusions and Implications for Policy

This review of 83 studies from developed and developing countries provided important findings regarding impact on sexual risk behaviors, changes in mediating factors, and common characteristics of curriculum-based programs that were effective in changing sexual risk behaviors.

Many of these studies or their published articles had significant limitations. For example, few described their respective programs adequately; none studied programs for youth engaging in same-sex behavior; some had problems with implementation; a few had relatively weak quasi-experimental designs; an unknown number had measurement problems; many were statistically underpowered; most did not adjust for multiple tests of significance; few measured impact on either STD or pregnancies rates; and still fewer measured impact on STD or pregnancy rates with biomarkers. And, of course, there are inherent publication biases that affect the publication of studies – researchers are more likely to try to publish articles if positive results support their theories and programs and journals are more likely to accept articles for publication if results are positive. Fortunately, some of these biases counteract each other.

Despite these limitations, the evidence for the positive impact on behavior of curriculum- and group-based sex and HIV education programs for adolescents and young adults is quite strong and encouraging and effective programs had common characteristics.

Impact on Sexual Risk Behaviors and Mediating Factors

Two-thirds of the programs had a significant positive impact on behavior. More specifically, across all 83 studies, 65 percent had a statistically significant impact on one or more sexual behaviors affecting risk of HIV, other STDs or pregnancy among either the entire study sample or important study sub-samples (e.g., males or females). Of the 42 studies that employed an experimental design and in general were more rigorous, 66 percent found one or more positive significant behavioral effects in comparison with 63 percent of the studies employing quasi-experimental designs. This suggests that the positive results were not the result of weak research methods.

The sex and HIV education programs evaluated by these studies did not increase sexual behavior, as some people have feared. Of the 52 studies that measured impact on initiation of sex, only one significantly hastened the initiation of sex. Given the large number of studies and tests of significance for that outcome, that could have occurred by chance. The other scattered negative findings among both abstinence-only and comprehensive sex and HIV education programs may also have occurred by chance.

Even more important, many programs actually delayed or reduced sexual activity either among the entire sample or important sub-groups within the sample. More specifically, 42 percent of the studies that measured impact on sexual initiation found that the programs significantly delayed initiation of sex, and 45 percent of the studies that measured impact on sexual initiation, frequency of sex or number of sexual partners found that the programs either delayed sex or reduced the frequency of sex or number of sexual partners.

Close to half the programs significantly increased condom or contraceptive use. More specifically, of those studies that measured impact on condom use, 48 percent found a positive impact, while among the larger number that measured impact on either condom or contraceptive use, 47 percent found that the programs had a positive impact.

One-third of the studies (22 of 66) that measured impact on two or more behaviors found a positive impact on two or more behaviors (e.g., the programs both delayed sex and increased condom use).

At least ten interventions had long term effects lasting two or more years; some lasted for close to three or more years – as long as the effects were measured. These interventions were typically implemented in schools and had sequential curriculum activities that were implemented for at least two years and had either additional school curriculum activities or school-wide activities that extended into subsequent years. These studies suggest that having sequential curriculum activities over multiple years may enhance long term impact.

When three programs were replicated with fidelity in different locations throughout the United States, but in the same type of setting, the original positive effects were confirmed. This is very encouraging and suggests that effective programs can remain effective when they are implemented by other people in other communities. However, when curricula were shortened, when important activities were removed or when a program originally implemented among volunteer youth in a community setting was then implemented among students in the classroom, the positive changes in behavior were not always replicated. These findings reinforce the importance of implementing effective programs with as designed – both in terms of setting and curriculum content.

Many studies found positive effects on both sexual behaviors and the mediating factors known to be related to those behaviors. These studies provide stronger evidence, both for the impact of the programs and for our understanding of how and why these programs changed behavior, especially when the programs were based on theory empirically supported by studies in other health areas.

The effects of these programs were quite robust. They were just as likely, if not more likely, to be effective in developing countries as they were to be effective in the U.S. or

other developed countries. They were effective in both urban and rural areas, in both low and middle income communities, in both school and community settings, with both advantaged and disadvantaged youth, with both males and females, with different racial and ethnic groups, with both younger and older youth, and with both sexually experienced and inexperienced youth. There is some indication that they were especially effective with youth who were most likely to engage in unprotected sex with multiple partners and thus were at highest risk of HIV, other STDs and pregnancy. Of course, the exact same program was not implemented with all of these groups; rather programs were appropriately designed or tailored for some of these groups.

While both adult-led and peer-led programs have been found to be effective, the evidence is stronger that adult-led programs are effective, in part because there have been more studies of these programs. Some effective programs were taught by adults, but used peer educators to help with various classroom and school-wide activities.

Even a few very short programs were effective, provided that 1) they were implemented after school or on weekends when participants were fresher, 2) they were implemented in small groups, and 3) youth volunteered to participate (and may have been more open to change).

These studies also present strong evidence that some of these programs improved knowledge, awareness of risk of HIV, severity of HIV/AIDS, values and attitudes (especially about sex, condoms, risky sexual behavior and people living with HIV), self-efficacy to refuse sex and to use condoms, intention to abstain from sex (or restrict sex and numbers of partners), communication about AIDS or past partners with current partner, and finally communication with parents or other adults about a variety of sexual topics. Given that these factors have empirically been demonstrated to be related to their respective sexual behaviors, the programs' impact on these mediating factors provide a better understanding of how these programs change behavior.

Given that many programs reduced sexual behavior and/or also increased condom or contraceptive use, they logically would reduce both sexually transmitted disease and pregnancy. The results of the few studies that measured impact on STD or pregnancy, however, did not produce many significant positive effects. The lack of consistent positive effects may have been caused, in part, by sample sizes that were too small, by other methodological limitations, by significant changes in behavior that were too small or too short term to produce marked changes in STD or pregnancy, or possible failure to change those behaviors that have the strongest impact on STD or pregnancy rates.

Thus, while these programs alone cannot solve the problems of STD, HIV and unintended pregnancy, many of them can change sexual and protective behaviors in desired directions and they can be an important component in larger more comprehensive initiatives.

Characteristics of Effective Curricula

At a minimum, characteristics of the development of the curricula, characteristics of the contents of the curricula, and characteristics of the implementation, as well as the needs and assets of participating youth, and the saliency of HIV, other STDs and unintended

teen pregnancy all affect whether or not the programs significantly affect sexual behavior. This complexity of reality, in combination with inadequate published descriptions of programs and numerous methodological limitations of the studies, make it difficult to identify the most important characteristics of effective programs.

Nevertheless, the large majority of the effective programs incorporated most of the 17 characteristics described above, and programs that incorporated these characteristics were much more likely to positively change behavior than programs that did not incorporate many of these characteristics. *It should be fully recognized that some of the studies compared the impact of curricula with these characteristics not against no curricula, but against curricula without many of these characteristics.* That is, in some studies, the control groups did not receive nothing; rather they received curricula without many of these characteristics and the study results revealed that the curricula with the characteristics had a greater impact.

These 17 characteristics describe the development of the curriculum, the content of the curriculum itself, and the implementation of the curriculum. They also provide a better understanding of how these programs worked, that is, what kinds of activities affected which mediating factors which in turn contributed to change in one or more sexual behaviors.

Program Recommendations

These conclusions naturally lead to several programmatic recommendations:

- First and foremost, communities should implement curriculum- and group-based sex and HIV education programs in their schools and youth-serving agencies. To the extent possible, organizations should either 1) implement with fidelity specific curricula that have already been demonstrated to be effective with populations and in cultures similar to their own, or 2) implement programs that incorporate as many of the characteristics of effective curricula as possible.
- If organizations wish to implement effective curricula, they should select curricula that focus on health goals, focus on behaviors affecting those goals, address the sexual psychosocial factors affecting those behaviors, create a safe social environment, include multiple activities to improve the psychosocial factors, employ instructionally sound teaching methods, incorporate culturally and developmentally appropriate activities, and cover topics in a logical sequence.
- If organizations develop their own curricula or significantly adapt others, then they should strive to create curricula that incorporate as many of the eight curriculum content characteristics as possible and during their process of developing their own curricula, they should include multiple individuals with expertise in different areas in the design of the curriculum; assess the needs and assets of the young people they were targeting; develop a logic model for the curriculum; design activities consistent with community values and resources available, and pilot-test and revise the activities.

- When organizations implement programs, they should secure any needed support from appropriate authorities; select educators with desired characteristics, train them, and supervise them; assure adequate recruitment and retention of youth, and implement the curricula with reasonable fidelity.
- Programs should focus on the highest risk youth in the highest risk areas. By definition, that is where the need is greatest. Also, that may be where the issue is most salient; that may be where the programs can have their greatest impact; and, in some countries, that may be where potentially controversial activities can be implemented most easily.
- Schools and youth-serving organizations should provide adequate time in the classroom or in their organizations for these programs. Organizations should also provide both training and support so that educators can implement effective programs with fidelity.
- Organizations should encourage and facilitate research to develop and evaluate programs that may be even more effective.
- Communities should not rely solely on these programs to address problems of HIV, other STD and pregnancy, but should view these programs as a component that can reduce sexual risk-taking behavior to some degree and contribute to long-term success in efforts to reduce HIV, other STDs and unintended pregnancy among young people.

Research Recommendations

Rigorous program evaluation is critical to the improvement of pregnancy and HIV prevention programs for youth. Findings from this review have several implications for how program evaluations can produce the most meaningful results.

- More evaluations of curriculum-based programs should be conducted in developing countries and rural areas, and with youth at highest risk because there are gaps in these areas in the existing literature.
- Evaluations should be conducted using randomized designs. One of the largest and most rigorous studies in the entire world was conducted in Mwanza, Tanzania. Other studies have implemented rigorous evaluation designs in developing countries. It is not always easy, but it can be done.
- Studies should involve much larger samples and should have sufficient statistical power to conduct needed analyses among important subgroups (e.g., those who have had sex and those who have not). They should also address the problem of multiple tests of significance and always publish results for primary hypotheses regardless of whether they are positive or not. To the extent possible, they should follow the CONSORT guidelines for randomized trials[116].
- If studies have sufficient statistical power, they should measure impact on pregnancy and STD rates and if possible, they should use laboratory tests, as opposed to self reports, to measure these rates.

- To the extent possible, researchers should determine how overlapping concepts – especially psychosocial concepts – relate to one another and then use agreed upon measures more consistently across studies so that the effects of different programs can be more easily compared.
- Statistical analyses should include mediational analyses to better determine which risk and protective factors are affected by effective programs and in turn change behavior.
- In their published or available materials, studies should provide much more complete descriptions of their programs, as well as more informative process evaluations, so that reviewers can better ascertain why some programs were effective and others were not. If these descriptions are too long for professional journals, they should be readily available upon request by interested parties.

Conclusion

In sum, enormous progress has been made in the development of effective sex and HIV education programs. Twenty to twenty-five years ago none of the programs demonstrated significant changes in behavior; currently about two-thirds do so, and a few even have a positive impact for three years or more. Today one important challenge is to develop programs that not only reduce sexual risk-taking behavior, but also significantly reduce HIV and STD transmission and unintended pregnancy. Five programs have measured and accomplished that goal; more need to follow, and they undoubtedly will. And a second important challenge is to implement far more broadly those programs that with strong evidence of behavioral change, or, at the very least, to implement programs incorporating the 17 characteristics of programs demonstrated to change behavior. This is beginning to happen, but much more effort should be devoted to it.

References

1. Ross, D., B. Dick, and J. Ferguson, *Preventing HIV/AIDS in Young People: A systematic review of the evidence from developing countries*, in *WHO Technical Report Series No. 938*. 2006, WHO: Geneva.
2. Mullen, P., et al., *Meta-analysis of the effects of behavioral HIV prevention interventions on the sexual risk behavior of sexually experienced adolescents in controlled studies in the United States*. *Journal of Acquired Immune Deficiency Syndrome*, 2002. **30**: p. S94-105.
3. Gallant, M. and E. Maticka-Tyndale, *School-based HIV prevention programmes for African youth*. *Social Science & Medicine*, 2004. **58**(1337-1351).
4. FOCUS on Young Adults, *Advancing Young Adult Reproductive Health: Actions for the Next Decade*. 2001, Pathfinder: Washington D.C.
5. Kirby, D., *Emerging Answers: Research Findings on Programs to Reduce Teen Pregnancy*. 2001, National Campaign to Prevent Teen Pregnancy: Washington, D.C.
6. Kirby, D., *No Easy Answers: Research Findings on Programs to Reduce Teen Pregnancy*. 1994, National Campaign to Prevent Teen Pregnancy: Washington, D.C.
7. Aarons, S., et al., *Postponing sexual intercourse among urban junior high school students-a randomized controlled evaluation*. *Journal of Adolescent Health*, 2000. **27**(236-247).
8. Agha, S. and R. Van Rossem, *Impact of a school-based peer sexual health intervention on normative beliefs, risk perceptions, and sexual behavior of Zambian adolescents*. *Journal of Adolescent Health*, 2004. **34**(5): p. 441-52.
9. Antunes, M., et al., *Evaluating an AIDS sexual risk reduction program for young adults in public night schools in São Paulo, Brazil*. *AIDS*, 1997. **11**(Supplement 1): p. S121-S127.
10. Aten, M., et al., *Keeping middle school students abstinent: Outcomes of a primary prevention intervention*. *Journal of Adolescent Health*, 2002. **31**(1): p. 70-78.
11. Baker, S., et al., *Evaluation of an HIV/AIDS program for college students in Thailand*. 2003. Washington, D.C.: Population Council.
12. Baldwin, J., S. Whiteley, and J. Baldwin, *Changing AIDS- and fertility- related behavior: The effectiveness of sexual education*. *The Journal of Sex Research*, 1990. **27**(2): p. 245-262.
13. Blake, S., et al., *Overall and differential impact of an HIV/STD prevention curriculum for adolescents*. Washington, DC: Academy for Educational Development.

14. Borawski, E., E. Trapl, and M. Goodwin. *Teaching HIV Prevention in Schools: Taking Be Proud! Be Responsible! To The Suburbs*. in *Psychosocial Workshop of the Population Association of America*. 2005. Philadelphia.
15. Borawski, E., et al., *Effectiveness of abstinence-only intervention in middle school teens*. *American Journal of Health Behavior*, 2005. **29**(5): p. 423-434.
16. Boyer, C., et al., *Prevention of sexually transmitted diseases and HIV in young military men: Evaluation of a cognitive-behavioral skills-building intervention*. *Sexually Transmitted Diseases*, 2001. **28**(6): p. 349-355.
17. Boyer, C., et al., *Evaluation of a cognitive-behavioral, group, randomized controlled intervention trial to prevent sexually transmitted infections and unintended pregnancies in young women*. *Preventive Medicine*, 2005. **40**(420-431).
18. Boyer, C., M. Shafer, and J. Tschann, *Evaluation of a knowledge- and cognitive-behavioral skills-building intervention to prevent STDs and HIV infection in high school students*. *Adolescence*, 1997. **32**(125): p. 25-42.
19. Bryan, A., L. Aiken, and S. West, *Increasing condom use: Evaluation of a theory-based intervention to prevent sexually transmitted diseases in young women*. *Health Psychology*, 1996. **15**(5): p. 371-382.
20. Cabezon, C., et al., *Adolescent pregnancy prevention: An abstinence-centered randomized controlled intervention in a Chilean public high school*. *Journal of Adolescent Health*, 2005. **36**(1): p. 64-69.
21. Caron, F., et al., *Evaluation of a theoretically based AIDS/STD peer education program on postponing sexual intercourse and on condom use among adolescents attending high school*. *Health Education Research*, 2004. **19**(2): p. 185-197.
22. Coyle, K., et al., *Safer Choices: Reducing Teen Pregnancy, HIV and STDs*. *Public Health Reports*, 2001. **116**(Supplement 1): p. 82-93.
23. Coyle, K., et al., *Short-term impact of Safer Choices: A multi-component school-based HIV, other STD and pregnancy prevention program*. *Journal of School Health*, 1999. **69**(5): p. 181-188.
24. Coyle, K., et al., *Draw the Line/Respect the Line: A randomized trial of a middle school intervention to reduce sexual risk behaviors*. *American Journal of Public Health*, 2004. **94**(5): p. 843-851.
25. DiClemente, R., et al., *Efficacy of an HIV prevention intervention for African-American adolescent girls*. *Journal of the American Medical Association*, 2004. **292**(2): p. 171-179.
26. Diez, E., et al., *Effects on attitudes, knowledge, intentions and behaviour of an AIDS prevention programme targeting secondary school adolescents*. *Promotion & Education*, 2000. **7**(3): p. 17-22.
27. Eggleston, E., et al., *Evaluation of a sexuality education program for young adolescents in Jamaica*. *Revista Panamericana de Salud Pública/Pan American Journal of Public Health*, 2000. **7**(2).

28. Eisen, M., G. Zellman, and A. McAlister, *Evaluating the impact of a theory-based sexuality and contraceptive education program*. Family Planning Perspectives, 1990. **22**(6): p. 261-271.
29. Ekstrand, M., et al., *Peer-led AIDS prevention delays onset of sexual activity and changes peer norms among urban junior high school students*. in *XI International Conference on AIDS*. 1996. Vancouver, Canada.
30. Erulkar, A., et al., *Behavior change evaluation of a culturally consistent reproductive health program for young Kenyans*. International Family Planning Perspectives, 2004. **30**(2): p. 58-67.
31. Fawole, I., et al., *A school-based AIDS education programme for secondary school students in Nigeria: A review of effectiveness*. Health Education Research, 1999. **14**(5): p. 675-683.
32. Fisher, J., et al., *Information-motivation-behavioral skills model-based HIV risk behavior change intervention for inner-city high school youth*. Health Psychology, 2002. **21**(2): p. 177-186.
33. Fitzgerald, A., et al., *Use of western-based HIV risk-reduction interventions targeting adolescents in an African setting*. Journal of Adolescent Health, 1999. **23**(1): p. 52-61.
34. Gillmore, M., et al., *Effects of a skill-based intervention to encourage condom use among high risk heterosexually active adolescents*. AIDS Education and Prevention, 1997. **9**(Supplement A): p. 22-43.
35. Girls Incorporated, *Truth, trust and technology: New research on preventing adolescent pregnancy*. 1991. Indianapolis: Girls Incorporated.
36. Girls Incorporated, *Girls Incorporated Preventing Adolescent Pregnancy: A program development and research project. Volume 2: Narrative description of the Preventing Adolescent Pregnancy Project*. 1991.
37. Goertzel, T. and M. Bluenond-Langner, *What is the impact of a campus AIDS education course?* College Health, 1991. **40**(2): p. 87-92.
38. Gottsegen, E. and W. Philliber, *Impact of a male sexuality responsibility program on young males*. Adolescence, 2001. **36**(427-433).
39. Harrington, N., et al., *Evaluation of the All Stars character education and problem behavior prevention program: Effects on mediator and outcome variables for middle school students*. Health Education and Behavior, 2001. **28**(5): p. 533-546.
40. Harvey, B., J. Stuart, and T. Swan, *Evaluation of a drama-in-education programme to increase AIDS awareness in South African high schools: a randomized community intervention trial*. Journal of STD & AIDS, 2000. **11**(2 (February)): p. 105-11.
41. Harvey, B., J. Stuart, and T. Swan, *Statistical methods and the evaluation of school-based AIDS education in Africa (reply)*. International Journal of STD AIDS, 2000. **11**(August): p. 553-554.

42. Howard, M., *Delaying the start of intercourse among adolescents*. Adolescent Medicine, 1992. **3**(2): p. 181-193.
43. Howard, M. and J. McCabe, *Helping teenagers postpone sexual involvement*. Planning Perspectives, 1990. **22**(1): p. 21-26.
44. Hubbard, B.M., G. M.L., and J. Rainey, *A replication of Reducing the Risk, a theory-based sexuality curriculum for adolescents*. Journal of School Health, 1998. **68**(6): p. 243-247.
45. Jemmott III, J., *Effectiveness of an HIV/STD risk- reduction intervention implemented by nongovernmental organizations: A randomized controlled trial among adolescents*. American Psychological Association Annual Conference, 2005.
46. Jemmott III, J., et al., *HIV/STD risk reduction interventions for African American and Latino adolescent girls at an adolescent medicine clinic*. Archives of Pediatric Adolescent Medicine, 2005. **159**: p. 440-449.
47. Jemmott III, J., L. Jemmott, and G. Fong, *Reductions in HIV risk-associated sexual behaviors among black male adolescents: Effects of an AIDS prevention intervention*. American Journal of Public Health, 1992. **82**(3): p. 372-377.
48. Jemmott III, J., L. Jemmott, and G. Fong, *Abstinence and safer sex: HIV risk-reduction interventions for African American adolescents: A randomized controlled trial*. Journal of the American Medical Association, 1998. **279**(19): p. 1529-1536.
49. Jemmott III, J., et al., *Reducing HIV risk-associated sexual behaviors among African American adolescents: Testing the generality of intervention effects*. American Journal of Community Psychology, 1999. **27**(2): p. 161-187.
50. Kinsler, J., et al., *Evaluation of a school-based intervention for HIV/AIDS prevention among Belizean adolescents*. Health Education Research, 2004. **19**(6): p. 730-738.
51. Kirby, D., et al., *Reducing the Risk: Impact of a new curriculum on sexual risk-taking*. Family Planning Perspectives, 1991. **23**(6): p. 253-263.
52. Kirby, D., et al., *The "Safer Choices" intervention: It's impact on the sexual behaviors of different subgroups of high school students*. Journal of Adolescent Health, 2004. **35**(6): p. 442-452.
53. Kirby, D., et al., *An impact evaluation of Project SNAPP: An AIDS and pregnancy prevention middle school program*. AIDS Education and Prevention, 1997. **9**(Supplement A): p. 44-61.
54. Kirby, D., et al., *Evaluation of Education Now and Babies Later (ENABL): Final Report*. 1995. Berkeley, CA: Family Welfare Research Group.
55. Kirby, D., et al., *The impact of the Postponing Sexual Involvement curriculum among youths in California*. Family Planning Perspectives, 1997. **29**(3): p. 100-108.

56. Klepp, K., et al., *AIDS education in Tanzania: Promoting risk reduction among primary school children*. Journal of Public Health, 1997. **87**(12): p. 1931-1936.
57. Klepp, K., et al., *AIDS education for primary school children in Tanzania: An evaluation study*. AIDS, 1994. **8**(8): p. 1157-1162.
58. Kvaalem, I., et al., *The effect of sex education on adolescents' use of condoms: Applying the Solomon four-group design*. Health Education Quarterly, 1996. **23**(1): p. 34-47.
59. LaChausse, R., *Evaluation of the positive prevention HIV/STD curriculum for students grades 9-12*. Journal of School Health, 2006. **37**(4):203-209.
60. Levy, S.R., et al., *Impact of a school-based AIDS prevention program on risk and protective behavior for newly sexually active students*. Journal of School Health, 1995. **65**(4): p. 145-151.
61. Li, X., et al., *Unprotected sex among African American adolescents: A three year study*. Journal of the National Medical Association, 2002. **94**(9): p. 789-796.
62. Lieberman, L.D., et al., *Long-term outcomes of an abstinence-based, small-group pregnancy prevention program in New York City schools*. Family Planning Perspectives, 2000. **32**(5): p. 237-245.
63. Little, C.B. and A. Rankin, *An evaluation of the Postponing Sexual Involvement curriculum among upstate New York eighth graders*. Cortland, NY: State University of New York at Cortland; Unpublished.
64. Magura, S., S. Kang, and J.L. Shapiro, *Outcomes of intensive AIDS education for male adolescent drug users in jail*. Journal of Adolescent Health, 1994. **15**(6): p. 457-463.
65. Main, D.S., et al., *Preventing HIV infection among adolescents: Evaluation of a school-based education program*. Preventive Medicine, 1994. **23**(4): p. 409-417.
66. Martinez-Donate, A., et al., *Evaluation of two school-based HIV prevention interventions in the border city of Tijuana, Mexico*. The Journal of Sex Research, 2004. **41**(3): p. 267-278.
67. Maticka-Tyndale, E., et al., *Primary School Action for Better Health: 12-18 Month Evaluation - Final Report on PSABH Evaluation in Nyanza and Rift Valley*. 2004. Windsor, Canada: University of Windsor.
68. McCauley, A., S. Pick, and M. Givaudan, *Programming for HIV prevention in Mexican schools*, in *Horizons Research Summary*. 2004, Population Council: Washington, D.C.
69. Mellanby, A., et al., *School sex education: An experimental programme with educational and medical benefit*. British Medical Journal, 1995. **311**: p. 414-417.
70. Mitchel-DiCenso, A., et al., *Evaluation of an educational program to prevent adolescent pregnancy*. Health Education & Behavior, 1997. **24**(3): p. 300-312.

71. Moberg, D.P. and D.L. Piper, *An outcome evaluation of Project Model Health: A middle school health promotion program*. Health Education Quarterly, 1990. **17**(1): p. 37-51.
72. Moberg, D.P. and D.L. Piper, *The Healthy for Life Project: Sexual risk behavior outcomes*. AIDS Education and Prevention, 1998. **10**(2): p. 128-148.
73. Murray, N., et al., *An evaluation of an integrated adolescent development program for urban teenagers in Santiago, Chile*. 2000, Futures Group: Washington, D.C.
74. Nicholson, H.J. and L.T. Postrado, *Health BridgeSM: A collaborative model for delivering health services to young women ages 12-18: A component of the Preventing Adolescent Pregnancy Program of Girls Incorporated*. In: National Organization on Adolescent Pregnancy and Parenting Annual Conference. Atlanta, GA; 1990.
75. Nicholson, H. and L. Postrado, *A comprehensive age-phased approach: Girls Incorporated*. In: Miller B, Card JJ, Paikoff RL, Peterson JL, editors. Preventing Adolescent Pregnancy. Newbury Park: Sage Publications; 1992.
76. Nicholson, H.J. and L.T. Postrado, *Girls Incorporated preventing adolescent pregnancy: A program development and research project*. 1991.
77. Postrado, L.T. and H.J. Nicholson, *Effectiveness in delaying the initiation of sexual intercourse of girls aged 12-14: Two components of the Girls Incorporated Preventing Adolescent Pregnancy Program*. Youth & Society, 1992. **21**(3): p. 356-379.
78. Piper, D., D. Moberg, and M. King, *The Healthy for Life Project: Behavioral outcomes*. The Journal of Primary Prevention, 2000. **21**(1): p. 47-73.
79. Ross, D., *MEMA Kwa Vijana: Randomized controlled trial of an adolescent sexual health programme in rural Mwanza, Tanzania*. 2003, London School of Hygiene and Tropical Medicine: London.
80. Reddy, P., S. James, and A. McCauley, *Programming for HIV Prevention in South African Schools: A report on Program Implementation*. Washington, D.C.: Population Council; 2003.
81. Reddy, P., S. James, and A. McCauley, *Programming for HIV Prevention in South African Schools.*, in *Horizons Research Summary*. 2003, Population Council: Washington, D.C.
82. Rotheram-Borus, M., et al., *Timing of HIV interventions on reductions in sexual risk among adolescents*. American Journal of Community Psychology, 1998. **26**(1): p. 73-96.
83. Rotheram-Borus, M., et al., *Efficacy of a prevention intervention for youths living with HIV*. American Journal of Public Health, 2001. **91**(3): p. 400-405.
84. Rotheram-Borus, M., et al., *A brief HIV intervention for adolescents and young adults*. American Journal of Orthopsychiatry, 1998. **68**(4): p. 553-564.

85. Rotheram-Borus, M., et al., *Reductions in HIV risk among runaway youth*. Prevention Science, 2003. **4**(3): p. 173-187.
86. Rotheram-Borus, M.J., et al., *Reducing HIV sexual risk behaviors among runaway adolescents*. Journal of the American Medical Association, 1991. **266**(9): p. 1237-1241.
87. Schaalma, H., et al., *Planned development and evaluation of AIDS/STD education for secondary school students in the Netherlands: Short-term effects*. Health Education Quarterly, 1996. **23**(4): p. 469-487.
88. Seidman, M., Vigil, P, Klaus, H, Weed, S, and Cachan, J, *Fertility awareness education in the schools: A pilot program in Santiago Chile*. In: American Public Health Association Annual Meeting. San Diego, California; 1995.
89. Siegel, D., M. Aten, and M. Enaharo, *Long-term effects of a middle school- and high school- based human immunodeficiency virus sexual risk prevention intervention*. Archives of Pediatric Adolescent Medicine, 2001. **155**(October): p. 1117-1126.
90. Siegel, D., et al., *Change in junior high school students' AIDS-related knowledge, misconceptions, attitudes, and HIV-prevention behaviors: Effects of a school-based intervention*. AIDS Education and Prevention, 1995. **7**(6): p. 534-543.
91. Slonim-Nevo, V., et al., *The long-term impact of AIDS-preventive interventions for delinquent and abused adolescents*. Adolescence, 1996. **31**(122): p. 409-421.
92. Smith, P., M. Weinman, and J. Parrilli, *The role of condom motivation education in the reduction of new and reinfection rates of sexually transmitted diseases among inner-city female adolescents*. Patient Education and Counseling, 1997. **31**: p. 77-81.
93. St. Lawrence, J., et al., *Sexual risk reduction and anger management interventions for incarcerated male adolescents: A randomized controlled trial of two interventions*. Journal of Sex Education and Therapy, 1999. **24**: p. 9-17.
94. St. Lawrence, J., et al., *Reducing STD and HIV risk behavior of substance-dependent adolescents: A randomized controlled trial*. Journal of Consulting and Clinical Psychology, 2002. **70**(4): p. 1010-1021.
95. St. Lawrence, J.S., et al., *Cognitive-behavioral intervention to reduce African American adolescents' risk for HIV infection*. Journal of Consulting and Clinical Psychology, 1995. **63**(2): p. 221-237.
96. St. Pierre, T.L., et al., *A 27-month evaluation of a sexual activity prevention program in Boys & Girls Clubs across the nation*. Family Relations, 1995. **44**: p. 69-77.
97. Stanton, B., L. Cottrell, and X. Li, *The complex business of adapting effective interventions to new populations: An urban to rural transfer*. Journal of Adolescent Health 2005;37(163.e):17-26.

98. Stanton, B., et al., *Sexually transmitted diseases, human immunodeficiency virus and pregnancy prevention*. Archives of Pediatric Adolescent Medicine, 1996. **150**: p. 17-24.
99. Stanton, B., et al., *Increased protected sex and abstinence among Namibian youth following a HIV risk-reduction intervention: A randomized, longitudinal study*. AIDS, 1998. **12**: p. 2473-2480.
100. Stanton, B., et al., *A randomized, controlled effectiveness trial of an AIDS prevention program for low-income African-American youths*. Archives of Pediatric Adolescent Medicine, 1996. **150**: p. 363-372.
101. Stephenson, J., et al., *Pupil-led sex education in England (RIPPLE study): Cluster-randomised intervention trial*. The Lancet, 2004. **364**(338-346).
102. Thomas, B., et al., *Small group sex education at school: The McMaster Teen Program*, in *Preventing adolescent pregnancy*, B.C. Miller, et al., Editors. 1992. p. 28-52.
103. Turner, J., et al., *Reduction in sexual risk behaviors among college students following a comprehensive health education intervention*. College Health, 1993. **41**: p. 187-193.
104. Villarruel A, Jemmott III J, Jemmott L. A randomized controlled trial testing an HIV prevention intervention for Latino youth. Archives of Pediatrics & Adolescent Medicine 2006. 160(8):772-777.
105. Walter, H.J. and R.D. Vaughn, *AIDS risk reduction among a multiethnic sample of urban high school students*. Journal of the American Medical Association, 1993. **270**(6): p. 725-730.
106. Warren, W.K. and A.J.C. King, *Development and evaluation of an AIDS/STD/sexuality program for grade 9 students*. 1994. Kingston, Ontario: Social Program Evaluation Group.
107. Weed, S.E., et al., *Predicting and changing teen sexual activity rates: A comparison of three Title XX programs*. Washington, DC: Office of Adolescent Pregnancy Programs; 1992 December.
108. Weeks, K., et al., *Does parental involvement make a difference? The impact of parent interactive activities on students in a school-based AIDS prevention program*. AIDS Education and Prevention, 1997. **9**(Supplement A): p. 90-106.
109. Wenger, N., et al., *Effect of HIV antibody testing and AIDS education on communication about HIV risk and sexual behavior: A randomized, controlled trial in college students*. Annals of Internal Medicine, 1992. **117**(11): p. 905-911.
110. Wight, D., et al., *The limits of teacher-delivered sex education: Interim behavioral outcomes from a randomised trial*. British Medical Journal, 2002. **324**: p. 1430-33.
111. Zimmerman, R., et al., *The effects of a school-based HIV and pregnancy prevention program in rural Kentucky*. Perspectives on Sexual and Reproductive Health 2008. 40(1):41-51.

112. Zimmerman, R., et al., *Effects of a school-based, theory driven HIV and pregnancy prevention curriculum*. Unpublished.
113. Sonenstein, F., *Measuring sexual risk behaviors*. Washington, DC: American Enterprise Institute; 1996.
114. Plummer, M., et al., "*A bit more truthful*": the validity of adolescent sexual behaviour data collected in rural northern Tanzania using five methods. *Sexually Transmitted Infections*, 2004. **80**(Supplement 2): p. ii49-56.
115. Jemmott III, J. 1995. Personal communication.
116. Moher, D., K. Schulz, and D. Altman, *The CONSORT statement: Revised recommendations for improving the quality of reports of parallel-group randomized trials*. *Journal of the American Medical Association*, 2001. **285**(15): p. 1987-1991, 2001.

Table 1:
Characteristics of Studies and Their Interventions³

	Percent⁴
Location of Studies and Interventions	
Region (N=83)	
United States	68%
Other developed nations	11
Developing nations	22
Rural versus urban (N=79)	
Rural	3%
Urban	67
Both	30
Reported STD/HIV risk in communities (N=53)	
Low	2%
Medium or mixed	30
High	68
Location of intervention (N=83)	
School only	65%
Community only	21
School and community	2
Health clinic only	8
Health clinic and other	4
Type of school (N=54)	
Elementary	2%
Secondary	88
Middle school	28
High school	41
Unknown	19
College or night school	9
Mixed	2

³ The sample sizes change among the study characteristics, because not all studies reported every characteristic.

⁴ The sum of the percentages may not always equal 100% because of rounding.

Characteristics of Interventions

Goals of the intervention (N=83)	
Reduce HIV and other STDs	52%
Reduce unintended teen pregnancy	17
Reduce both	31
Behavioral Focus (N=83)	
Abstinence only (or abstinence until marriage)	7%
Abstinence plus condoms or contraception	93
Identified theoretical basis (N=83)	
Yes	83%
No	17
Included two or more interactive methods (N=79)	
Yes	90%
No	10
Number of sessions (N=72)	
1	11%
2 to 5	26
6 to 10	24
11 to 15	17
16 to 20	11
21 to 64	11
Number of hours (N=74)	
1 hour or less	4%
2 to 5 hours	23
6 to 10 hours	22
11 to 15 hours	26
16 to 20 hours	14
21 to 30 hours	7
31 to 48 hours	5
Trained educators (N=83)	
Training described in article	90%
Training not described, but may have occurred	10
Type of educator (N=74)	
Classroom teacher or regular staff	32%
Outside educator	32
Peer educator	10
Classroom teacher and peer educator	7
Classroom teacher and outside educator	5
Outside educator and peer educator	11
Classroom teacher, outside educator and peer educator	3

Methodological Characteristics of Studies

Type of design (N=83)	
Experimental	51%
Quasi-experimental	49
Survey design (N=83)	
Matched cohort	88%
Unmatched cross-sectional	12
Behaviors measured (N=83)	
Sexual behavior only (e.g., delay in sex, number of partners, frequency of sex)	8%
Condom or contraceptive use only	4
Both sexual behavior and condom or contraceptive use	88
Method of measuring pregnancy (N=13)	
Self reports	69%
Laboratory tests	31
Method of measuring STD (N=10)	
Self reports	50%
Laboratory tests	50
Number of months from baseline to last follow-up (N=83)	
3 months	11%
4 to 6 months	26
8 to 10 months	6
12 months	16
14 to 18 months	16
20-24 months	13
27-32 months	4
36 to 57 months	9
Sample size for first follow-up at 3 or more months (N=83)	
100 to 199	13%
200 to 499	30
500 to 999	21
1,000 to 1,999	16
2,000 to 4,999	16
5,000 or more	5

Characteristics of Samples

Sex (N=77)

All male	7%
Mixed male and female	84
All female	9

Average Age⁵ (N=83)

11.0 to 13.9	22%
14.0 to 17.9	57
18.0 to 23.0	22

⁵ Studies used means, median, and ranges to describe age. In this table, the mean was used if available, the median was used if the mean was not available, and the midpoint of the range was used if neither the mean nor median were available.

Table 2: Number of Studies Reporting Effects on Different Sexual Behaviors and Outcomes⁶

		Delay sex			Reduce Frequency of Sex			Reduce # of Partners			Increase Condom Use			Increase Contraceptive Use			Reduce Sexual Risk-Taking		
	Studies	Neg	NS	Pos	Neg	NS	Pos	Neg	NS	Pos	Neg	NS	Pos	Neg	NS	Pos	Neg	NS	Pos
Region																			
US	56	1	15	14	2	15	7	1	16	9	0	19	18	1	5	5	0	11	14
Other developed	9	0	6	2	1	1	0	0	0	0	0	4	1	0	1	1	0	1	0
Developing	18	0	8	6	0	3	2	0	5	3	0	5	7	0	2	0	0	2	0
TOTAL	83	1	29	22	3	19	9	1	21	12	0	28	26	1	8	6	0	14	14
Setting																			
School	56	1	25	18	3	14	6	0	13	6	0	21	15	1	5	6	0	8	2
Community	19	0	3	1	0	4	2	1	5	3	0	5	7	0	1	0	0	5	8
Clinic	10	0	1	3	0	1	1	0	3	3	0	2	4	0	2	0	0	1	4
TOTAL	83	1	29	22	3	19	9	1	21	12	0	28	26	1	8	6	0	14	14
Behavioral Focus																			
Abstinence only	6	0	3	0	1	1	2	0	1	1	0	2	1	0	0	1	0	2	1
Comprehensive	77	1	26	22	2	18	7	1	20	11	0	26	25	1	8	5	0	12	13
TOTAL	83	1	29	22	3	19	9	1	21	12	0	28	26	1	8	6	0	14	14
Sex																			
Males	28	0	15	6	1	3	3	0	6	3	0	9	8	0	4	3	0	4	4
Females	30	0	15	6	0	5	1	1	5	3	0	8	9	0	6	1	0	1	6
TOTAL	58	0	30	12	1	8	4	1	11	6	0	17	17	0	10	4	0	5	10
Average Age																			
9 – 13.9	18	0	9	3	2	4	3	0	2	2	0	5	3	0	2	4	0	2	3
14 – 17.9	47	1	16	16	1	11	5	1	11	9	0	17	16	1	3	1	0	8	6
18 – 23	18	0	4	3	0	4	1	0	8	1	0	6	7	0	3	1	0	4	5
TOTAL	83	1	29	22	3	19	9	1	21	12	0	28	26	1	8	6	0	14	14

⁶ Pos = Positive (desirable) effect on factor; NS=Not significant; Neg = Negative (undesirable) effect on factor.

Table 2: Continued⁷

	Reduce Pregnancy: Self-Report			Reduce Pregnancy: Laboratory Test			Reduce STDs: Self-Report			Reduce STDs: Laboratory Test		
	Neg	NS	Pos	Neg	NS	Pos	Neg	NS	Pos	Neg	NS	Pos
Region												
US	1	3	2	0	2	0	1	2	0	0	2	2
Other developed	0	3	0	0	0	0	0	0	0	0	0	0
Developing	0	0	0	0	1	1	0	2	0	1	0	0
TOTAL	1	6	2	0	3	1	1	4	0	1	2	2
Setting												
School	1	6	0	0	1	1	1	4	0	0	0	0
Community	0	0	1	0	1	0	0	0	0	0	1	0
Clinic	0	0	1	0	1	0	0	0	0	1	1	2
TOTAL	1	6	2	0	3	1	1	4	0	1	2	2
Behavioral Focus												
Abstinence only	1	0	0	0	0	0	1	0	0	0	0	0
Comprehensive	0	6	2	0	3	1	0	4	0	1	2	2
TOTAL	1	6	2	0	3	1	1	4	0	1	2	2
Sex												
Males	0	2	0	0	0	0	0	0	0	0	1	0
Females	0	4	2	0	2	1	0	0	0	1	2	2
TOTAL	0	6	2	0	2	1	0	0	0	1	3	2
Average Age												
9 – 13.9	1	3	0	0	0	0	1	0	0	0	0	0
14 – 17.9	0	3	2	0	3	1	0	4	0	1	2	2
18 – 23	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	6	2	0	3	1	1	4	0	1	2	2

⁷ Pos = Positive (desirable) effect on factor; NS=Not significant; Neg = Negative (undesirable) effect on factor.

Table 3:
Number of Studies Reporting Effects of Abstinence-only Programs and Comprehensive Programs in the United States

	Abstinence-Only Programs N=6	Comprehensive Sex & HIV Education Programs N=50
Initiation of Sex		
‣ Delayed initiation of sex	0	14
‣ Had no significant impact	3	12
‣ Hastened initiation of sex	0	1
Frequency of Sex		
‣ Reduced frequency of sex	2	5
‣ Had no significant impact	1	14
‣ Increased frequency of sex	1	1
# of Sexual Partners		
‣ Reduced # of sex partners	1	8
‣ Had no significant impact	1	15
‣ Increased # of sex partners	0	1
Condom Use		
‣ Increased condom use	1	17
‣ Had no significant impact	2	17
‣ Decreased condom use	0	0
Contraceptive Use		
‣ Increased contraceptive use	1	4
‣ Had no significant impact	0	5
‣ Decreased condom use	0	1
Sexual Risk		
‣ Reduced risk	1	13
‣ Had no significant impact	2	9
‣ Increased risk	0	0

Table 4:
Number of Programs Having Effects on Mediating Factors that May Affect Sexual Behavior or Condom or Contraceptive Use

	Pos ⁸	NS	Neg
Knowledge			
Overall knowledge of sexual issues ⁹	7	2	0
Knowledge of pregnancy	5	0	0
Knowledge of STD	8	3	0
Knowledge of HIV	28	3	0
Knowledge of abstinence	2	0	0
Knowledge of methods of contraception	4	2	0
Knowledge of condoms	5	3	0
Knowledge of methods to prevent STD/HIV	6	1	0
Knowledge of community or reproductive health services	1	1	0
Knowledge of one's own sexual limits	1	2	0
Perceived Risk			
Perception of pregnancy risk	0	3	0
Perception of STD risk	1	1	0
Perception of HIV risk	8	8	0
Perceived Severity of Consequences			
Perception of severity of pregnancy and childbearing (including attitude toward childbearing)	2	3	0
Perception of severity of STDs	1	0	0
Perception of severity of HIV/AIDS	3	1	0
Personal Values and Attitudes			
Values about sex/abstinence	14	10	0
Regret about initiating sex	1	0	0
Attitude about pressuring someone to have sex (including right to say no to sex)	3	2	0
Attitudes toward condoms	14	8	0
Belief that condoms are a hassle and reduce pleasure	2	3	0
Perceived barriers to using condoms	4	3	0
Attitude toward risky sexual behavior and AIDS prevention	5	2	0
Self-approval to use condoms	1	1	0
Attitudes toward HIV+ people (including interacting with them)	6	0	0
Homophobia	1	0	0

⁸ Pos = Positive (desirable) effect on factor; NS=Not significant; Neg = Negative (undesirable) effect on factor.

⁹ Lightly shaded factors meet two criteria and therefore have stronger evidence that programs can modify them: 1) at least three programs significantly improved them and 2) at least half of the studies that measured them found significant improvements.

Perceived Peer Values & Behavior			
Perception of peer norms/behavior re sex	9	13	1
Perception of peer norms/behavior re condoms	4	6	0
Perception of peer norms/behavior re avoiding risk	3	2	0
Influences of peers	0	1	0
Perceived Partner Values			
Perceived partner norms and reaction to condom use	0	3	0
Self-efficacy and Skills			
Self-efficacy to show love and affection without sex	1	3	0
Self-efficacy to discuss sex, condoms or contraception with partner	0	3	0
Self-efficacy to refuse sex	8	4	2
Self-efficacy to obtain condoms	1	3	0
Self-efficacy to use condoms	12	4	1
Condom use skills	1	0	0
Self-efficacy to avoid STD/HIV risk and risk behaviors (e.g., to abstain or use condoms)	7	9	0
General sexual negotiation skills	2	1	0
Social competency/locus of control	2	0	1
Self esteem	0	1	0
Self-efficacy to provide information to peers	0	1	0
Motivation/Intentions			
Intention to discuss AIDS, STDs, and past partners with new partner	1	0	0
Intention to discuss condoms with partner	2	1	0
Intention to abstain from sex, or restrict sex or partners	10	6	0
Intention to use a condom	10	4	0
Intention to avoid unprotected sex (including perceived likelihood of having sex)	3	2	0
Communication			
Communication with partner re AIDS, STDs and past partners	4	3	0
Communication with boy/girlfriend or partner re abstinence or condom use	1	4	0
Communication with parents or other adult about sex, condoms or contraception	8	2	1
Comfort talking with parents about sex, condoms or contraception	1	0	0

Other Possible Mediating Behaviors			
Using alcohol or drugs	3	7	1
Using alcohol or drugs before sex	0	3	0
Having a boyfriend or girlfriend	0	2	0
Engaging in coercive behavior	0	1	0
Experiencing violence in relationship	0	2	0
Avoiding places and situations that could lead to sex (including pre-coital sexual activities)	4	2	0
Attending reproductive health clinic	0	1	0
Obtaining and carrying a condom	3	2	0
Putting a condom on partner (females only)	1	0	0
Being tested for STD	0	1	0
Being tested for HIV	0	1	0
Relationship with Parents			
Relationship with parents	1	0	0
Parental respect	2	0	0
Relevance of parents' concern about sex	1	0	0
Perceived parent concern or values about having sex and using condoms	1	1	0
Psychological States			
Self-esteem	0	1	0
Depression and mental health	0	1	0
Concern about health	0	1	0
Future orientation	1	0	0
Enjoyment of sex	0	1	0

Table 5:
Among Programs that Reduced Sexual Activity or Increased Condom or Contraceptive Use, the Number of Programs Having Effects on Mediating Factors that Affect Sexual Behavior

	Among Programs that Significantly Delayed Sex or Reduced Frequency or Number of Sexual Partners N=34				Among Programs that Significantly Increased Condom or Contraceptive Use N=30		
	Pos ¹⁰	NS	Neg		Pos	NS	Neg
Knowledge							
Overall knowledge of sexual issues ¹¹	3	1	0		2	0	0
Knowledge of pregnancy	3	0	0		0	0	0
Knowledge of STD	5	1	0		3	0	0
Knowledge of HIV	13	1	0		10	0	0
Knowledge of methods of contraception	4	1	0		3	0	0
Knowledge of condoms	2	0	0		0	0	0
Knowledge of methods to prevent STD/HIV	4	0	0		2	0	0
Knowledge of community or reproductive health services	1	1	0		1	0	0
Knowledge one's own sexual limits	1	0	0		0	1	0
					0	0	0
Perceived Risk					0	0	0
Perception of pregnancy risk	0	1	0		0	2	0
Perception of STD risk	1	0	0		1	1	0
Perception of HIV risk	4	2	0		4	1	0
Perceived Severity							
Perception of severity of pregnancy and childbearing (including attitude toward childbearing)	1	0	0		1	1	0
Perception of severity of STDs	0	0	0		1	0	0
Perception of severity of HIV/AIDS	1	0	0		0	0	0

¹⁰ Pos = Positive (desirable) effect on factor; NS=Not significant; Neg = Negative (undesirable) effect on factor.

¹¹ Lightly shaded factors meet two criteria and therefore have stronger evidence that programs can modify them: 1) at least three programs significantly improved them and 2) at least half of the studies that measured them found significant improvements.

Personal Values and Attitudes							
Values about sex/abstinence	6	7	0		4	2	0
Attitude about pressuring someone to have sex (including right to say not to sex)	2	1	0		1	0	0
Attitudes toward condoms	5	3	0		8	1	0
Belief condoms are a hassle and reduce pleasure	1	1	0		1	0	0
Perceived barriers to using condoms	3	1	0		2	1	0
Attitude toward risky sexual behavior and AIDS prevention	2	1	0		3	1	0
Self-approval to use condoms	1	0	0		0	0	0
Attitude towards HIV+ people (including interacting with them)					1		
Perceived Peer Values & Behavior							
Perception of peer norms/behavior re sex	4	6	0		3	5	0
Perception of peer norms/behavior re condoms	2	1	0		1	2	0
Perception of peer norms/behavior re avoiding risk	2	1	0		1	0	0
Perceived Partner Values							
Perceived partner norms and reaction to condom use	0	1	0		1	1	0
Self-efficacy and Skills							
Self-efficacy to show love and affection without sex	1	0	0		0	1	0
Self-efficacy to discuss sex, condoms or contraception with partner	0	3	0		0	1	0
Self-efficacy to refuse sex	3	3	2		4	1	0
Self-efficacy to obtain condoms	0	1	0		0	1	0
Self-efficacy to use condoms	6	2	0		4	1	0
Condom use skills	1	0	0		1	0	0
Self-efficacy to avoid STD/HIV risk and risk behaviors (e.g., to abstain or use condoms)	4	6	0		1	4	0
General sexual negotiation skills	2	0	0		0	0	0
Social competency/locus of control	1	0	0		1	0	1
Response Efficacy							
Perceived effectiveness of condoms to prevent pregnancy	0	1	0		0	1	0
Perceived effectiveness of condoms to prevent STD/HIV	0	0	0		0	1	0

Motivation/Intentions							
Intention to discuss condoms with partner	0	1	0		0	1	0
Intention to abstain from sex, or restrict sex or partners	4	3	0		3	1	0
Intention to use a condom	2	1	0		5	1	0
Intention to avoid unprotected sex (including perceived likelihood of having sex)	1	1	0		1	1	0
Communication Behavior							
Communication with partner re AIDS, STDs and past partners	1	0	0		0	2	0
Communication with boy/girlfriend or partner re abstinence or condom use	1	1	0		1	2	0
Communication with parents or other adult about sex, condoms or contraception	4	1	1		5	2	1
Other Possible Mediating Behaviors							
Using alcohol or drugs	1	3	0		0	3	0
Using alcohol or drugs before sex	0	2	0		0	2	0
Having a boyfriend or girlfriend	0	1	0		0	0	0
Engaging in coercive behavior	0	1	0		0	0	0
Experiencing violence in relationship	0	1	0		0	0	0
Avoiding places and situations that could lead to sex (including pre-coital sexual activities)	3	2	0		1	0	0
Having unwanted sexual advances or forced to have sex	0	0	0		1	0	0
Attended reproductive health clinic	0	1	0		0	1	0
Obtaining and carrying a condom	2	0	0		1	1	0
Putting a condom on partner (females only)	1	0	0		1	0	0
Being tested for STD	0	1	0		0	1	0
Being tested for HIV	0	1	0		0	1	0

Figure 1: Characteristics of Effective Curriculum-Based Programs

The Process of Developing the Curriculum	The Contents of the Curriculum Itself	The Implementation of the Curriculum
<ol style="list-style-type: none"> 1. Involved multiple people with different backgrounds in theory, research and sex/HIV education to develop the curriculum 2. Assessed relevant needs and assets of target group 3. Used a logic model approach to develop the curriculum that specified the health goals, the behaviors affecting those health goals, the risk and protective factors affecting those behaviors, and the activities addressing those risk and protective factors 4. Designed activities consistent with community values and available resources (e.g., staff time, staff skills, facility space, and supplies) 5. Pilot-tested the program 	<p><i>Curriculum Goals and Objectives</i></p> <ol style="list-style-type: none"> 1. Focused on clear health goals – the prevention of STD/HIV and/or pregnancy 2. Focused narrowly on specific behaviors leading to these health goals (e.g., abstaining from sex or using condoms or other contraceptives), gave clear messages about these behaviors, and addressed situations that might lead to them and how to avoid them 3. Addressed multiple sexual psychosocial risk and protective factors affecting sexual behaviors (e.g., knowledge, perceived risks, values, attitudes, perceived norms, and self-efficacy) <p><i>Activities and Teaching Methodologies</i></p> <ol style="list-style-type: none"> 4. Created a safe social environment for youth to participate 5. Included multiple activities to change each of the targeted risk and protective factors 6. Employed instructionally sound teaching methods that actively involved the participants, that helped participants personalize the information, and that were designed to change each group of risk and protective factors 7. Employed activities, instructional methods and behavioral messages that were appropriate to the youths' culture, developmental age, and sexual experience 8. Covered topics in a logical sequence 	<ol style="list-style-type: none"> 1. Secured at least minimal support from appropriate authorities such as ministries of health, school districts or community organizations 2. Selected educators with desired characteristics (whenever possible), trained them and provided monitoring, supervision and support 3. If needed, implemented activities to recruit and retain youth and overcome barriers to their involvement, e.g., publicized the program, offered food, or obtained consent 4. Implemented virtually all activities with reasonable fidelity

Figure 2:
An Example of Part of a Logic Model to Reduce Pregnancy That Addresses Individual Psychosocial Risk and Protective Factors of Sexual and Contraceptive Behaviors

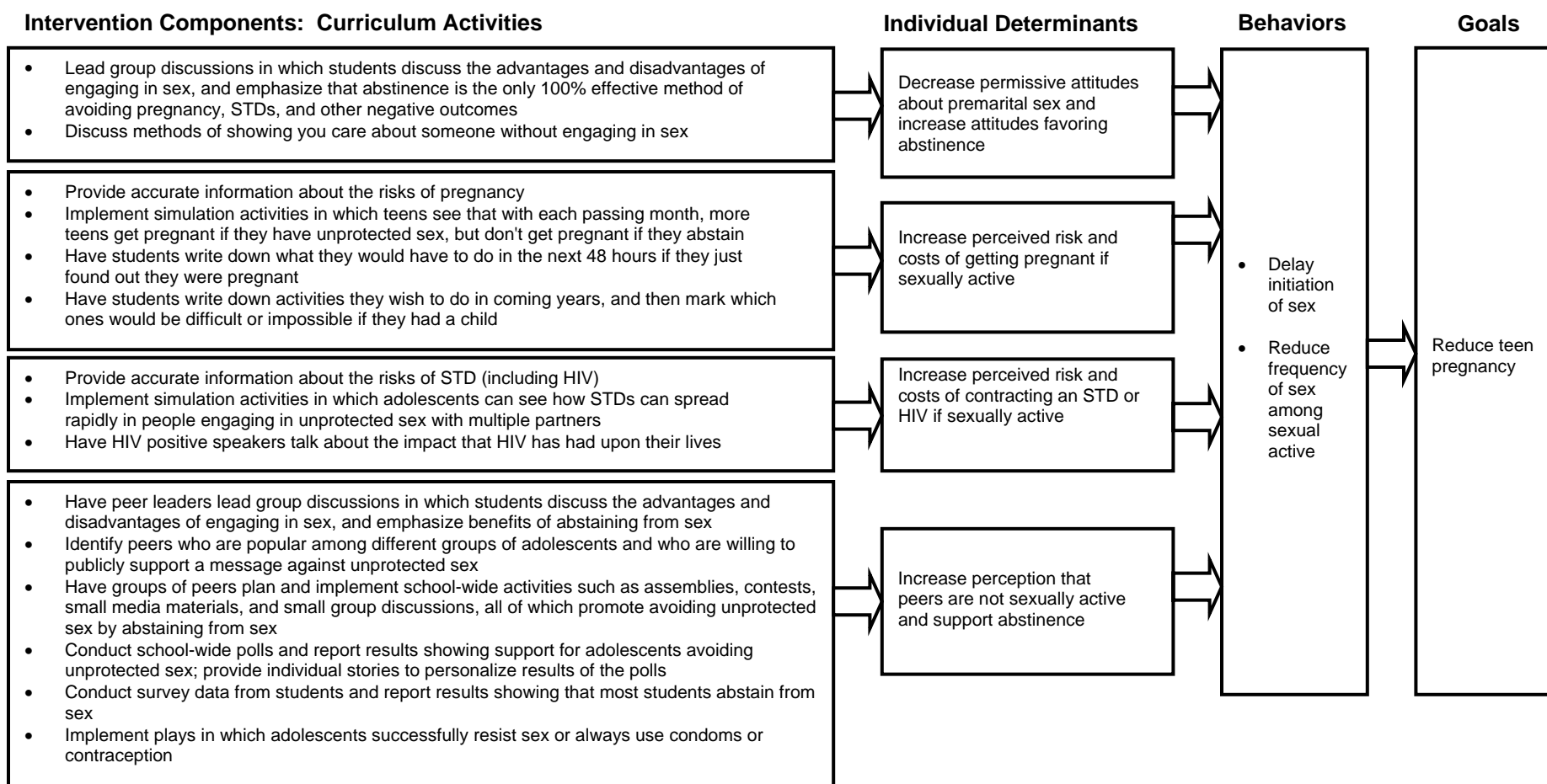


Figure 2: Continued

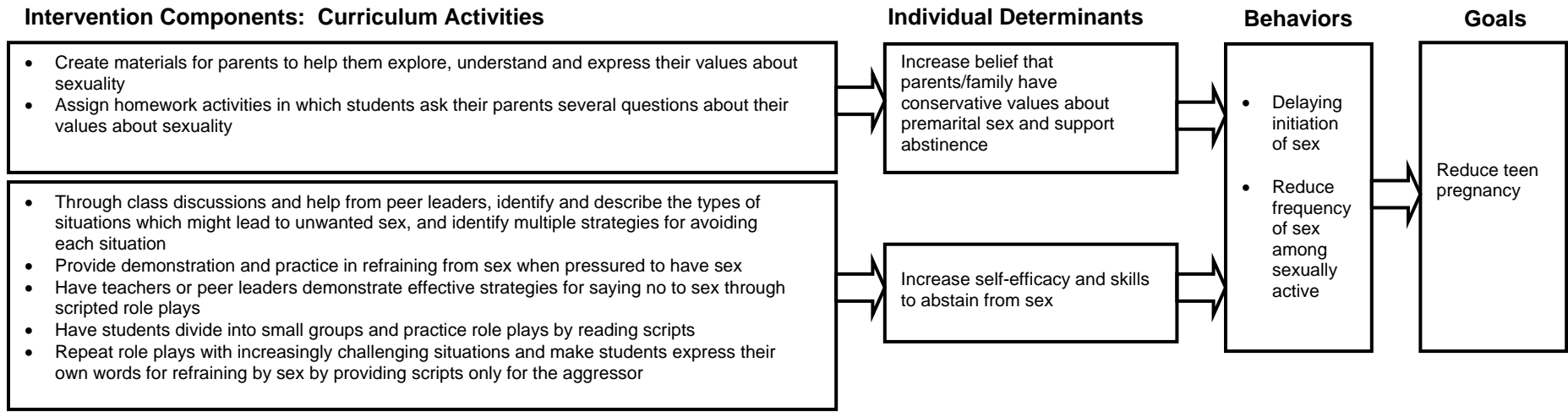


Figure 2: Continued

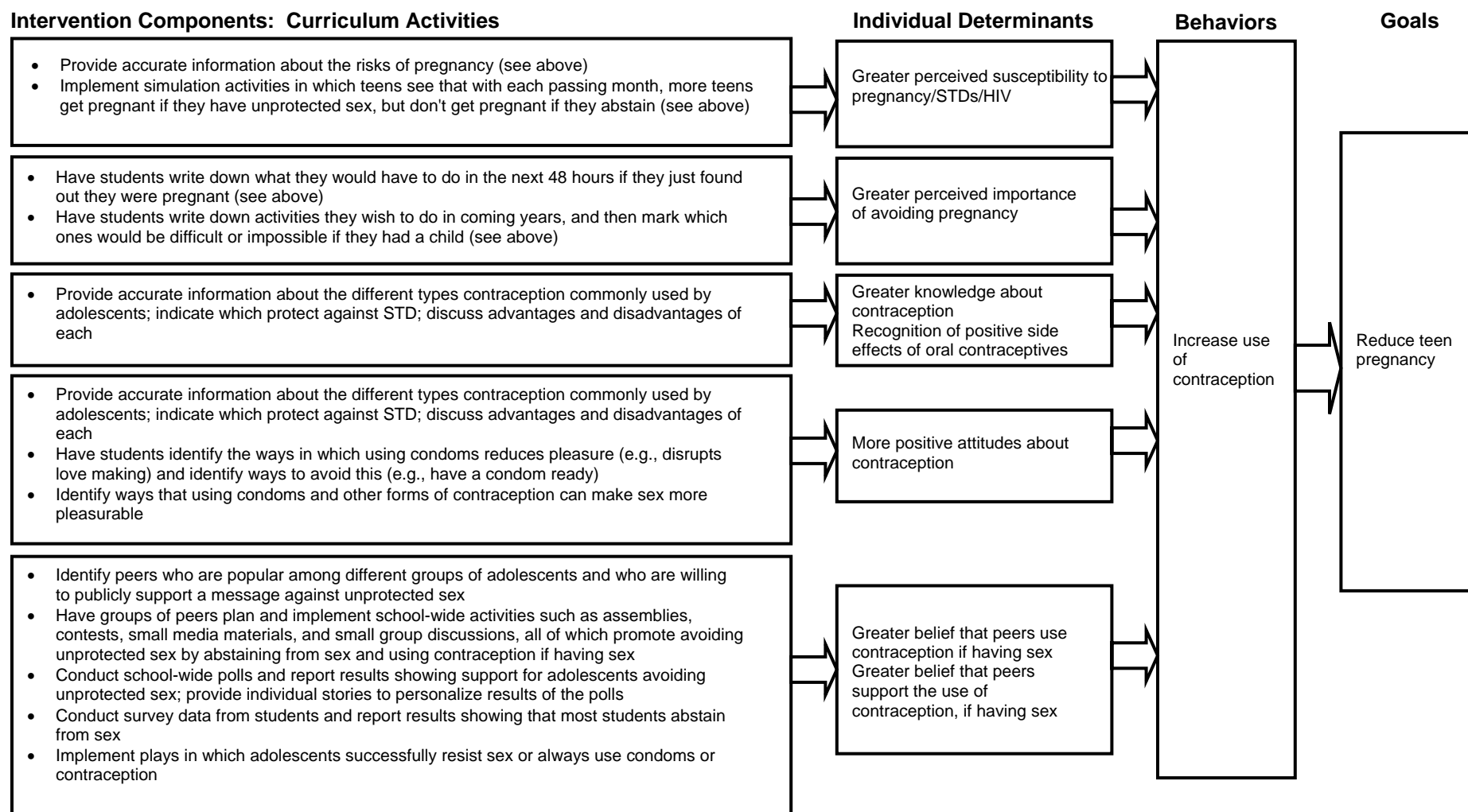


Figure 2: Continued

