

***A Systematic Review of the Effectiveness
of Adolescent Pregnancy
Primary Prevention Programs***

Family Health
Sexual Health

March 1999

A Systematic Review of the Effectiveness of Adolescent Pregnancy Primary Prevention Programs

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To determine the effectiveness of interventions included in the Mandatory Health Programs and Services Guidelines (MHPSG), the following systematic reviews were completed and funded by the Public Health Research, Education and Development (PHRED) Program of the Public Health Branch, Ontario Ministry of Health.

1998 - 1999

- **Health Hazard Investigation**
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 - Strategies to Enhance Public Awareness of Environmental Risks
- **Chronic Diseases and Injuries**
 - *Chronic Disease Prevention*
 - Community interventions to Enhance Fruit and Vegetable Consumption
 - Use of Coalitions in Heart Health, Tobacco Use Reduction and Injury Prevention
 - Community-Based Heart Health Programs
 - School-Based Adolescent Risk Behaviour Prevention Programs
- **Family Health**
 - *Sexual Health*
 - Adolescent Pregnancy Prevention Strategies
 - *Child Health*
 - Professionally Led Parenting Groups
 - Peer/Paraprofessional 1:1 Interventions in Improving Maternal/Child Health
 - Public Health Nurse Home Visiting
 - Curriculum Suicide Prevention Programs for Adolescents
- **Infectious Diseases**
 - Day Care Centre Infection Control Interventions
 - Adolescent STD Prevention Strategies

1999 – 2000

- **Chronic Diseases and Injuries**
 - *Chronic Disease Prevention*
 - Postpartum Smoking Relapse Prevention Strategies
 - Cervical Cancer Screening Interventions
 - *Injury Prevention*
 - Anticipatory Care Interventions with Community Dwelling Elderly
- **Family Health**
 - *Sexual Health*
 - Youth to Youth Peer Health Promotion
 - *Child Health*
 - Healthy Feeding in Infants Under One Year of Age
 - Injury Prevention in Children & Adolescents
- **Infectious Diseases**
 - Needle Exchange Programs
 - Online Computer Support Groups for Adults

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The conclusions of the reviews are based on the available evidence. They do not necessarily represent the views of the Public Health Branch, Ontario Ministry of Health. This report may be copied for circulation as appropriate. Please ensure that the PHRED Program, Public Health Branch, Ontario Ministry of Health is acknowledged.

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PREFACE

The Public Health Branch of the Ontario Ministry of Health released new Mandatory Health Programs and Services Guidelines (MHPSG) in December 1997. Although the MHPSG provide guidelines for a wide range of public health practices in Ontario, the strength of evidence for many of the guidelines has not been summarized in a systematic way.

In 1998-1999, the Public Health Branch provided funding for the Effective Public Health Practice Project. The mandate of the project was to complete 15 summary statements based upon systematic reviews of the effectiveness of specific requirements of the MHPSG. Each review was linked to one of the three general standards or three program standards. The reviews summarize the best available research evidence for public health practice in these areas. Research evidence is one piece of information needed to inform decision making in public health. Other factors, such as the local environment, local priorities, and available resources are also important.

The reviews were completed by review groups composed of members of the Ontario Public Health Research, Education and Development (PHRED) Program Health Units as well as representatives from other Health Units around the province. The PHRED Provincial Steering Committee has overseen the project.

Potential review topics were initially identified through a survey of public health practitioners and managers across Ontario. Each review group followed a systematic approach that included comprehensive search strategies and quality assessment of each primary research study selected for inclusion in the review.

One of the primary objectives in completing this work was to ensure that it is relevant to public health practitioners in the field. We contacted all Medical Officers of Health and asked for volunteer experts. The response was tremendous and more than 100 practitioners and managers from over 90% of health units across Ontario agreed to take on the role of peer reviewers for the draft reports.

This project already has had many benefits. Public Health professionals have developed skills in completing systematic reviews and have increased awareness of the importance and feasibility of evidence-based practice. Through this project, we have established new links with the Cochrane Collaboration. We hope that several reviews will be registered with the various Cochrane Review Groups, making them accessible to the international public health community. Finally, the process of completing this project has contributed to the development of a strong province-wide network of public health professionals.

Effective Public Health Practice Project Summary Statement for Practitioners/Managers

Primary Prevention of Adolescent Pregnancy

Public Health Mandate

Public Health Units are responsible for reducing the rate of adolescent pregnancy. One of the target groups is school-aged children in Grades 7 to 9 who should receive three hours annually of sexual health education.

Background

In 1994, the most recent year for which Statistics Canada figures are available, there were 48.8 pregnancies per 1000 Canadian females aged 15 to 19. This translates into 46,800 teen pregnancies, an increase of more than 20% since 1987. Pregnancy before age 20 is associated with a number of medical risks for both the mother and child, loss of educational and occupational opportunities, and diminished socioeconomic status.

Issue

A pregnancy during adolescence can have a serious impact on the adolescent parents, the child and society. Effective primary prevention strategies are needed to prevent pregnancies among this population.

Finding the Answers

A systematic review of both published and unpublished studies has been completed to determine whether primary prevention programs are effective in preventing pregnancies in adolescents aged ten to 18 years.

What's the Evidence?

- Twenty randomized controlled trials have been conducted to evaluate primary prevention interventions for adolescents.
- None of the studies are methodologically strong and only two scored more than two on the four-point rating scale.
- Although weaker in study quality, some programs have been effective in delaying initiation of intercourse, improving birth control use, and reducing pregnancies.

**Implications for
Practice and Research**

- Programs that focus on sexuality, including school, community and clinic-based interventions do not increase sexual activity.
 - No evidence was located to indicate that abstinence-only programs have delayed the onset of sexual intercourse or reduced pregnancies.
 - Programs that showed a positive impact were quite substantial in duration; focused on behaviours; were theory-based; actively involved participants; shared facts; focused on social pressures, modeling and skill rehearsal; and, included trained adult or peer leaders.
-
- It is possible to improve behaviours in adolescents that will protect against pregnancy.
 - Adolescent pregnancy prevention interventions do not lead to increases in the number of adolescents who choose to become sexually active.
 - Most evaluations included in their design a control group which continued to receive a conventional program and so, at the very least, this should continue until effective programs are identified.
 - There is a crucial need for the design and evaluation of school and community-based pregnancy prevention interventions for Ontario youth. The design of the intervention should be carefully considered with input from adolescents, community partners, and key informants.

More Sources of Information

DiCenso, A., Guyatt, G. H., Willan, A. (1999). A systematic review of the effectiveness of adolescent pregnancy primary prevention programs. Prepared by the Effective Public Health Practice Project for the Public Health Branch, Ontario Ministry of Health.

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Primary Prevention of Adolescent Pregnancy

Issue

The rate of teenage pregnancy in Canada is rising. Adolescent pregnancy is associated with physical, emotional and financial consequences.

Background

In 1994, the most recent year for which Statistics Canada figures are available, there were 48.8 pregnancies per 1000 Canadian females aged 15 to 19. This translates into 46,800 teen pregnancies, an increase of more than 20% since 1987. Pregnancy before age 20 is associated with a number of medical risks for both the mother and child, loss of educational and occupational opportunities, and diminished socioeconomic status.

Public Health Mandate

Public Health Units are responsible for reducing the rate of adolescent pregnancy. One of the target groups is school-aged children in Grades 7 to 9 who should receive three hours annually of sexual health education.

What's the Evidence

- Some adolescent pregnancy prevention programs have been effective in delaying initiation of intercourse, improving birth control use, and reducing pregnancies. However, the only studies available are of poorly designed evaluations.
- Programs that focus on sexuality, including school, community and clinic-based interventions do not increase sexual activity.
- No evidence was located to indicate that abstinence-only programs have delayed the onset of sexual intercourse or reduced pregnancies.
- Programs that showed a positive impact were quite substantial in duration; focused on behaviours; were theory-based; actively involved participants; shared facts; focused on social pressures, modeling and skill rehearsal; and, included trained adult or peer leaders.

Implications

- There is a crucial need for the careful design and evaluation of a multicomponent pregnancy prevention intervention for adolescents. The program should be designed with extensive input from adolescents, community partners, and key informants.

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ABSTRACT

Objective

To systematically review the literature to determine whether primary prevention programs are effective in preventing adolescent pregnancy.

Methods

Eleven electronic databases were searched from 1970 to November 1998. The Cochrane Library was searched. Hand searching of key journals dated January 1993 to September 1998 was done. Reference lists from retrieved articles were reviewed. Experts were contacted for unpublished studies. Each retrieved article was independently reviewed for relevance and validity by two reviewers. Two reviewers independently extracted the data from the studies.

Results

Twenty randomized controlled trials were identified for inclusion in the review. The trials were assessed for quality using a four point scale and only two studies scored higher than two. Neither study found any significant differences in outcomes between groups. The three behavioural outcomes of interest were: initiation of intercourse; birth control use; and pregnancy. In total, the 20 studies examined these outcomes 40 times. Of these, there were five significant findings. These need to be interpreted cautiously because, out of 40 outcomes, one would expect to find two statistically significant findings by chance ($p < 0.05$) and all these studies were rated as poor when assessed for quality. One study found a delay in initiation of intercourse in males in the intervention group. One study found that more participants in one of two interventions had ever had sex. However, this study is limited by the fact that they did not collect baseline data on this outcome and therefore, we cannot tell whether these rates differed prior to the beginning of the intervention. Two studies found improved birth control use in the intervention groups and one study found a significant reduction in pregnancy in the intervention group. Two studies evaluated abstinence-only programs and neither found a significant difference in initiation of intercourse or pregnancy. Only one of the 20 trials was conducted in Canada.

Conclusion

Pregnancy rates among adolescents in Canada are increasing. It is a serious problem with substantial physical, emotional and financial repercussions. There are no simple approaches that will markedly reduce adolescent pregnancy. The evidence demonstrates that programs that focus on sexuality, including school, community, and clinic-based interventions, do not increase sexual activity. There does not exist any evidence that abstinence-only programs have delayed the onset of intercourse or pregnancy. The quality of the studies that evaluated the programs that did make a difference in this review was not strong. These programs were substantial in duration and focused on behaviours; were theory-based; actively involved participants; shared facts; focused on social pressures, modeling and skill rehearsal; and, included trained adult or peer leaders. Rigorous research is needed in Ontario to evaluate a carefully designed multi-component pregnancy prevention program.

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BACKGROUND

Introduction

The rate of teenage pregnancy in Canada has risen by more than 20% since 1987. In 1994, the most recent year for which Statistics Canada figures are available, there were 48.8 pregnancies per 1,000 Canadian females aged 15 to 19. This translates into 46,800 teen pregnancies. In 1994, there were 39.6 pregnancies per 1,000 women aged 15-19 in the province of Ontario (Statistics Canada, 1998). In 1988, the most recent year for which comparable international figures are available, Canada's teenage pregnancy rate was 40 pregnancies per 1,000 women aged 15 to 19. This was higher than Sweden, Finland, Denmark, the Netherlands, and Japan but fell short of rates in the United States, Czechoslovakia, Hungary, New Zealand, England, Wales and Iceland (Statistics Canada, 1998). In 1997, Health Canada reported that approximately 50 percent of Canadian 17-year-olds had had sexual intercourse and that birth control use among these adolescents was poor.

Pregnancy before age 20 is associated with a number of medical risks for both the mother and child. Teenage mothers have a higher risk of having a preterm baby (Jacono et al. 1992), poor weight gain, pregnancy-induced hypertension, anemia, and cephalopelvic disproportion (Steven-Simon & White, 1991). Teenage motherhood may result in loss of educational and occupational opportunities, and increase the likelihood of diminished socioeconomic status (Wadhera & Strachan, 1991). Teenage mothers are more likely to be single and therefore, to be financially dependent on family support and social assistance (Goldenberg & Klerman, 1995). Bonham et al. (1987) estimated the 20-year-cost for providing support to new single parent families created by the first births to teenage mothers in the province of Alberta in 1985 to be \$443 million.

The Ontario Ministry of Health released revised Public Health Mandatory Programs and Services Guidelines in early 1998 (Ontario Ministry of Health, 1997). Primary prevention of adolescent pregnancy was one of the mandatory programs and services. The goal of the program is: "to decrease the rate of pregnancy in women 15-19 years of age to 40 per 1,000 population by the year 2005". (page 25). One of the related requirements stipulates:

"three hours of sexual health education annually to all students in Grades 7 to 9 by the person or organization that operates the school. The board of health shall assist in school curriculum development and implementation. In schools where this education is not provided, the board of health will report this to the Ministry of Health, and a program of equivalent activities targeted to school-aged children shall be delivered through other community settings". (page 25).

The programs will also include: provision of information for parents to help them in their role as primary sexuality educators of their children; annual workshops for those involved in education and counselling; and provision of clinic services including contraception, pregnancy tests, and post-abortion counselling.

Given the emphasis on evidence-based practice and on the efficient and effective use of health care dollars, the Ontario Ministry of Health has funded this systematic review to determine whether programs to prevent adolescent pregnancy have been evaluated and, if so, whether they are effective.

Review Question and Objectives

We have conducted a systematic review to address the question: "Are primary prevention interventions effective in delaying sexual intercourse, in improving responsible birth control use, and in reducing the incidence of pregnancy in the adolescent population?"

METHODS

Criteria for Study Selection

To address the study question, the following criteria for study selection were developed: the target population was adolescents whose mean age was 18 years or less; the intervention was any primary pregnancy prevention strategy (e.g., sex education classes, school-based clinics, community-based programs); the outcome measure was behavioural (e.g., initiation of sexual intercourse, birth control use, pregnancy); the study design was a randomized controlled trial; and the report was in English or a language for which a translator was available.

Search Strategy

The original search for this review was conducted in May 1993 back to 1970, and at that time, the following electronic databases were searched: CATLINE, CINAHL, Conference Papers Index, Dissertation Abstracts Online, Embase, ERIC, Medline, NTIS, POPLINE, PsycINFO, Sociological Abstracts, and the Cochrane Library. The keywords for each database search are outlined in Appendix 1. To update the review, these same databases were searched using the same keywords up to November 1998. Reference lists from retrieved articles were searched for relevant studies. Hand searching of key journals dated January 1993 to September 1998 was done. The key journals searched were: American Journal of Public Health, Canadian Journal of Public Health, Adolescence, Health Education and Behaviour, Family Planning Perspectives, Youth and Society (only the 1993 issues were available), Journal of Early Adolescence (only the 1993 issues were available), Journal of Adolescent Research (only the 1993 and 1994 issues were available), and Journal of Adolescent Health Care (1993 to 1996 issues were available). To minimize biases resulting from exclusion of unpublished studies, dissertations were identified and experts were asked for copies of unpublished studies.

Review Procedures

Two individuals independently reviewed each citation in every search and those identified by either reviewer as meeting the criteria for study selection were retrieved. Once retrieved, two individuals independently reviewed each paper to determine whether it should be included in the review. To be included, the paper had to meet the original criteria for study selection described above. Papers were excluded if the

intervention was directed at pregnant adolescents (secondary prevention) or at high risk populations (e.g., runaways, street youth), if the goal of the intervention was to prevent sexually transmitted diseases, including AIDS, or if the study was conducted in a developing country. For this stage of the review process, any disagreements between the raters were discussed until a consensus was reached.

Those studies that were rated as relevant to the review were also independently rated by the same reviewers for validity. The rating tool was adapted from that developed by Jadad et al. (1996). Using a multidisciplinary panel and additional raters, they developed a rating tool that would assess the three most important items related to internal validity: quality of randomization; double-blinding; and withdrawals/drop-outs. The validity assessment tool used in this review was revised to include four items rather than three for a number of reasons (Appendix 2). First, it is nearly impossible to have a double-blind evaluation of an adolescent pregnancy prevention intervention. Unlike a drug trial, those who have been allocated to the intervention usually know they are receiving a new intervention and those administering the intervention know they are doing so. Most important in these studies, is that the individuals responsible for data collection do not influence participant responses. Therefore, the criteria have been changed to reflect this. Second, not only is it important that the number of withdrawals be evenly distributed between the intervention and control groups, but also that the overall withdrawal rate is minimal. In studies of high risk behaviour in adolescents, those who withdraw are often those who are engaging in those behaviours (e.g., pregnant). The studies were eligible to receive a total of four points if they met all the validity criteria. A score of ≤ 2 was considered as reflecting poor quality.

Data about the method of randomization, study setting, participants, theoretical framework guiding the intervention, intervention, data collection methods, outcome variables, length of follow-up, number of withdrawals, and study findings at the last follow-up period by male and female sex (if possible) were extracted independently by two individuals, and any discrepancies were discussed to reach consensus.

A number of descriptors for adolescent pregnancy prevention interventions have been proposed by Kirby (1997c) and others. To facilitate comparison, each intervention was reviewed to determine if it addressed the following descriptors:

- Focus on specific behavioural goals such as delaying the initiation of intercourse or using birth control.
- Design of goals, teaching methods, and materials consistent with the age, sexual experience and culture of the students.
- Based on theoretical approaches effective in influencing other health-related risky behaviours.
- Lasting a sufficient length of time to adequately accomplish the objectives of the intervention program.
- Inclusion of booster sessions to reinforce the learning.

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- Use of a variety of teaching methods designed to involve the participants and have them personalize the information.
 - Inclusion of basic, accurate information about the risks of unprotected intercourse and methods of avoiding unprotected intercourse.
 - Inclusion of activities that address social pressures on sexual behaviours.
 - Provision of modeling and practice of communication, negotiation and refusal skills.
 - Selection and training of supportive teachers or peers.

RESULTS

In the original review (DiCenso, 1995), 12 randomized controlled trials were identified. The review process also revealed a number of cohort studies that were excluded because observational studies tend to yield systematically greater estimates of treatment effects than randomized trials (Guyatt et al., 1999; Khan et al., 1996). These cohort studies are found in Appendix 3. The search and review process of studies conducted since May 1993 revealed an additional eight randomized controlled trials. This systematic review will report on the total of 20 randomized controlled trials that have been conducted to evaluate adolescent pregnancy primary prevention interventions.

Of the 20 trials, seven (35%) are unpublished. The remaining 13 are published in nine different journals or books with three in Family Planning Perspectives, two in Health Education and Behavior, and two in AIDS Education and Prevention. A description of the 20 studies is found in Table 1. Eighteen of the studies were conducted in the United States, one in Canada, and one in Norway. Three of the studies included only African Americans; nine included over 50% African Americans and/or Hispanics and the remaining eight included combinations of different races. Eleven of the studies evaluated school or community-based sex education, two evaluated abstinence programs, three evaluated multifaceted programs, and four evaluated education and counseling in family planning clinics. Length of follow-up ranged from two to 54 months and proportion followed to the last data collection point ranged from 56 to 94%. Fourteen of the studies evaluated initiation of intercourse, 14 evaluated birth control use, and 12 evaluated pregnancy.

Table 2 summarizes the features of the interventions. All but two of the study interventions focused on the behaviours that the investigators wanted to influence. All 20 were designed with the specific target population in mind. Just over 50% were theory-based and of sufficient length. Only three interventions included booster sessions. Most actively involved participants. Over 50% provided facts but less than 50% focused on social pressures. Half the interventions included modeling and skill rehearsal, and most provided training for adult or peer facilitators.

Validity Assessment of Studies

Studies did not score high on validity (Table 3). Only two studies (Grossman et al., 1992; Handler, 1987) scored over two points out of the possible four points. Seven of

the 20 studies reported using an appropriate method of randomization. In the remaining trials, authors did not specify how they randomized or they used a system that could lead to bias (e.g., alternate names on a list or coin toss between two participants). In eight of the studies, data were collected using a strategy that would minimize bias (e.g., using staff uninvolved in the delivery of the intervention, mailed questionnaires). In the remaining trials, authors did not specify how they handled this or they used data collectors who had also administered the intervention to one or more study groups.

In eight studies, the overall retention rate to the last follow-up period was over 80%. Only six of the 20 studies had similar retention rates in all study groups. In the remaining 14 studies, differences in retention between groups ranged from three to 19%. Grossman et al. (1992) randomized using computer generated numbers, hired an external agency to collect the data, followed 81% of the sample for 54 months, and had a difference of 1.6% in attrition rates between groups. Handler (1987) used data collectors who were blinded to the outcome for some outcomes, had a follow-up rate of 84% after 12 months, and had no difference in attrition rates between groups. Interestingly, neither study found any significant differences in outcomes between groups.

Effectiveness of Interventions

In total, the 20 studies examined 40 outcomes. Of these, there were five significant findings. These need to be interpreted cautiously for three reasons: first, out of 40 outcomes, one would expect to find two statistically significant findings by chance ($p < 0.05$); second, all these studies were rated as poor when assessed for quality; and third, they are being looked at individually rather than in the context of a meta-analysis which statistically combines the results, achieving a more precise measure of the treatment effect.

1) Initiation of Sexual Intercourse

Of the 14 studies that evaluated this outcome, two studies found significant findings. Eisen et al. (1990) evaluated a 12-15 hour intervention for inner city, low income, minority groups in Texas and California and found that 36% of the intervention group males initiated intercourse compared to 44% control group males ($p < 0.01$). There was no difference in this outcome for female participants. The intervention included all the components described in Table 2 except booster sessions and a focus on social pressures. The authors specify the method used to randomize study participants (coin flips) and they used data collectors that were not involved in the intervention, reducing the potential for bias. They followed 62% of the sample through to 18 months and had 4% more attrition in the control group. The study scored two out of four on the quality assessment scale.

Moberg and Piper (1998) evaluated two versions of a school-based intervention program offered to a predominantly white population that included all the components in Table 2. One intervention was offered for four weeks at a time over three years (Grades 6 to 8) and one was offered in a 12-week block during Grade 7 only. They found that significantly more adolescents in the first intervention group (36%) had ever had sex compared to the second intervention group (33%) and the control group (28%). However, this study is limited by the fact that they were not able to collect baseline data about this outcome and

therefore, we cannot determine whether these rates differed prior to assignment to the intervention. A better way to examine this outcome is initiation of sexual activity since the end of the intervention or since the last follow-up period. The study findings need to be interpreted with caution because the authors did not specify how they randomized, followed only 68% of the sample over five years, and had a significant difference in attrition between study groups ($p < 0.001$).

Two of the studies (Kirby et al., 1997a; Miller et al., 1993), both of which scored one out of four on the quality assessment, evaluated abstinence programs and did not find a significant difference in initiation of intercourse or pregnancy.

The remaining ten trials that evaluated the initiation of intercourse found no significant differences between groups. Three of these studies did not achieve any points on the quality assessment rating, one scored one point, five scored two points and one scored four points.

2) Birth Control Use

Of the 14 studies that evaluated birth control use, two studies found significant results in favour of the intervention. Coyle et al. (1999) recently completed a study in 20 high schools in the U.S. in which students in grades nine and ten in the intervention schools received a five component intervention: school support, curriculum and staff development, peer resources and school environment, parent education, and school-community linkages. They were able to follow 79% of approximately 3900 students (31% Caucasian) for 31 months and found that those in the intervention group were more likely to use effective birth control at last intercourse (odds ratio: 1.76; $p = 0.05$). This intervention includes all the components in Table 2. The authors do not state how they randomized participants, used trained data collectors uninvolved in delivering the intervention, had a 79% follow-up at 31 months, and had similar attrition in both study groups. The study scored two out of four in quality assessment.

The second study by Schinke et al. (1981), which may be the first randomized controlled trial conducted in adolescent pregnancy prevention, found that the intervention group reported more habitual contraception ($p < 0.05$), greater protection at last intercourse ($p < 0.005$), and less reliance on inadequate birth control ($p < 0.001$). The follow-up period was a short one at six months. The authors do not provide any details about method of randomization, who collected the data, how many were followed to the end of the study and degree of similarity in attrition between groups. As a result, this study scored no points in quality assessment. In terms of the intervention, it included many of the components in Table 2 except the booster sessions, a focus on social pressures, and provision of training for the group leader. Two concerns about this study are its small sample size (36) and its short follow-up period (six months).

The remaining 12 studies that included birth control use as an outcome did not find any significant differences between groups. These studies ranged in quality assessment from: zero ($n=2$), to one ($n=4$), to two ($n=5$), to four ($n=1$).

3) **Pregnancy**

Of the 12 studies that evaluated the impact of interventions on reduction of pregnancy, only one study reported a significant reduction (Allen et al., 1997). This study evaluated a unique intervention (Teen Outreach Program) available in many sites in the United States. This program consists of community volunteer experience and classroom-based discussions about future life options, but not many, if any, specific facts or information about pregnancy prevention. About 80% of the sample were from minority groups. This intervention includes very few of the components outlined in Table 2. It does not focus on sexual behaviours, is not theory-based, does not include boosters, does not present factual information related to sexual behaviours, and does not focus on social pressures, modeling, or skill rehearsal. The authors state that randomization occurred within 25 sites in the United States and some randomized using coin tosses or pulling names out of hats, but some relied on alternate names. They do not describe efforts to minimize bias in data collection, follow 93% of the sample to the nine month follow-up and have a relatively small difference in attrition rates between groups of 3%. The study scored 1.5 out of four in quality assessment.

The 11 other studies that included pregnancy as an outcome did not find any significant differences between groups. In terms of quality assessment, these studies scored: zero (n=1), one (n=4), two (n=5) and four (n=1).

DISCUSSION

After a comprehensive review of the literature, 20 studies that evaluated adolescent pregnancy primary prevention strategies were identified. All of these studies were conducted using the most rigorous study design (randomized controlled trial); yet only two scored higher than a poor score on the quality assessment. Less than 50% of the studies included a description of how randomization was done, collected data in a way that minimized bias, followed over 80% of the study participants to study completion, and had similar retention in the study groups. Collection of sensitive data related to sexual behaviour from adolescents is a challenge because the data can only be collected via self-report with few mechanisms for validating the information. Newcomer and Udry (1988) found that males tend to over report and females tend to underreport information related to sexual behaviour.

Studies differed substantially in length of time participants were followed from as short a period as two months to as long as 54 months. The longer the follow up, the higher the risk of losing study participants due to reasons such as moving out of the area or dropping out of school. Yet it is noteworthy that in the study by Grossman et al. (1992), one of the few studies rated higher than two points in terms of validity, over 81% of the study sample was followed for 54 months. We are particularly interested in the long-term impact of these interventions. However, the longer the study continues, the more difficult it becomes to keep track of all those who began the study. It is often those lost to follow-up who are at the highest risk of experiencing a negative outcome such as pregnancy.

Evaluations of pregnancy prevention strategies do not often include a no-intervention control group. Instead the new intervention is compared to the conventional or existing program. Of the 20 randomized trials, 13 included a control group that continued to receive the conventional program while seven control groups did not receive any related intervention. As long as control groups continue to receive some form of intervention, the conclusion of no difference results should not be interpreted to mean the experimental intervention had no impact but that it did not have an impact over and above the control group intervention.

All five studies that had significant findings were conducted in the United States. Two studies (Moberg & Piper, 1998; Schinke et al., 1981) included a high proportion of Caucasian participants which may increase generalizability to an Ontario population. The majority of the study population in the study by Eisen et al. (1990) were low-income African Americans and Hispanics. The other two studies had mixed racial groups with approximately 70-80% non-Caucasians.

While one should only very cautiously generalize the findings of these studies to Ontario youth, there may be some lessons to be learned from the interventions. All four studies that found significant positive effects evaluated interventions that are potent in duration. Eisen et al. (1990) offered an intervention that was 12-15 hours in length. Coyle et al. (1990) offered a multicomponent school-based intervention that provided ten sessions in grade nine and ten sessions in grade ten, as well as school, parent and community links. The intervention conducted by Schinke et al. (1981) consisted of 14, 50-minute sessions. Finally, the Teen Outreach Program evaluated by Allen et al. (1997) included a minimum of 20 hours per year of community volunteer work and one hour per week throughout the academic year of classroom-based discussions.

Only one of the studies was conducted in Canada and it found no significant differences in outcomes. However, the school-based intervention was reduced from 14 to ten sessions by Board of Education officials who insisted on the removal of any birth control information (Mitchell-DiCenso et al., 1997). There is clearly a serious need for methodologically rigorous evaluations of carefully designed school, community, and clinic-based pregnancy prevention interventions for adolescents in Ontario. Rather than evaluating these interventions separately, a comprehensive program that includes the school, community, parents, and clinics should be considered. These evaluations should include random assignment, a large sample size, unbiased data collection, long-term follow-up, measurement of behaviour, and proper statistical analysis (i.e., unit of analysis corresponds to unit of randomization). In the meantime, those involved in offering these interventions to teens should attempt to include as many of the components in Table 2 as possible. The research does indicate that it is possible to influence adolescent behaviours in a positive direction to prevent adolescent pregnancies and this is encouraging.

Pregnancy rates are substantially lower in The Netherlands where the rate is 8.1 per 1,000 females aged 15 to 19 years (Ketting & Visser, 1994). We should be encouraged by their experience and we should learn from them. This country uses a multi-faceted community approach including positive messages about responsible sexual behaviour in the media, sex education, and confidential, accessible, affordable birth control services.

Consideration should be given to programs that could be offered very early in life for individuals at high risk of adolescent pregnancy. For example, in the Perry Preschool

Project, non-parental daycare for disadvantaged populations resulted in a decrease in the number of births outside marriage at age 27 (Zoritch & Roberts, 1997).

In a recent qualitative study conducted in Niagara and Haldimand-Norfolk regions, 83 male and female adolescents in Grades nine and 11 participated in focus groups to share their concerns about current sexual health services and to offer their opinions about strategies that would improve service delivery (DiCenso et al., 1999). They recommended that sex education be more sex positive with less emphasis on the anatomy and scare tactics; address assertiveness training, relationships, negotiation skills in sexual relationships, and communication; expand to include issues such as homophobia, heterosexism, gay/lesbian relationships, and sexuality for the physically disabled; include varied learning approaches (e.g., interactive classroom discussion, use of humour, dynamic speakers) and be taught by public health nurses because they are perceived by students as comfortable with the material, knowledgeable, open, and separate from teachers with whom the students feel reluctant to discuss embarrassing, sensitive issues.

With respect to sexual health services, they recommended: birth control clinics should advertise services in areas that teens frequent (e.g., school washrooms, shopping malls); cost of birth control methods, location and hours of clinic be assessed to ensure that the needs of the teens are being met; students be offered tours to local birth control centres; and finally, method of booking appointments with the school nurse and location of the school nurse should ensure privacy and confidentiality.

Strengths of the Review

This systematic review applied rigorous methods to identify intervention studies through an extensive search of 12 electronic databases, handsearching of key journals, review of reference lists of retrieved articles, and contact with key experts for published and unpublished research. Two raters were used for all steps of the review process: study identification from the searches, relevance and validity rating of retrieved articles, and data extraction.

Studies were limited to randomized controlled trials. The review focused specifically on impact of interventions on sexual behaviour rather than knowledge, attitudes, and intentions which are often used as proxy measures for behaviour. Repeatedly, in research, we have learned that improvements in knowledge and attitudes (e.g., learning the short and long-term health effects of smoking) do not necessarily translate into a behaviour change (e.g., smoking cessation).

Limitations of the Review

This review is limited by the methodologic limitations of the primary studies. Over half the studies failed to meet the four quality assessment criteria. It is also limited in the extent to which its findings can be generalized to Ontario adolescents because of differences in study populations.

CONCLUSIONS

Implications for Practice

Pregnancy rates among adolescents in Canada have been increasing since the 1980s. This is a serious problem with substantial physical, emotional and financial repercussions. As there are no simple approaches that will markedly reduce adolescent pregnancy, interventions will likely need to have multiple components involving schools, the community, and parents. While universal prevention programs for all young people are important, there may be a need to 'target' individuals at higher risk of early sexual behaviour and offer them a more intense program earlier. Many studies have examined the determinants or predictors of early sexual initiation, poor birth control use, and adolescent pregnancy (DiCenso, 1995). These data could be very helpful in identifying the high risk adolescent.

The evidence demonstrates that programs that focus on sexuality, including school, community and clinic-based interventions, do not increase sexual activity. There is no evidence that abstinence-only programs have delayed the onset of sexual intercourse or reduced any other measure of sexual activity.

The programs that did make a difference in this review were methodologically not strong and therefore, it is unclear how much we should allow them to influence our program planning. However, it is worth noting that each of the four studies that found significant positive results were robust in their duration and addressed many of the components outlined in Table 2. At least three of the four studies focused on sexual behaviours, were designed specifically for the adolescent population, were theory-based, lasted a minimum of 12 to 15 hours (although some were substantially longer), actively involved participants, presented facts, provided opportunity for skill-building exercises, and used trained adult or peer facilitators. Practitioners should try to incorporate as many of these components as possible. Only one of the four studies included boosters and therefore, more research is needed to determine whether these contribute to the effectiveness of a program. Those charged with providing pregnancy prevention interventions should not feel the need to abandon current interventions. Most evaluations have included in their design a control group which continues to receive the conventional program and so, at the very least, this should continue until effective programs are identified.

Implications for Research

There is a need for rigorous evaluation of a multicomponent pregnancy prevention program in Ontario. The design of the intervention should be carefully considered with input from adolescents, community partners and key informants.

Key Messages

- Adolescent pregnancies in Canada are increasing and pose a significant problem for the adolescent parents, the child and society.
- Research demonstrates that programs that focus on sexuality, including school, community and clinic-based interventions, do not increase sexual activity.

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- There is no evidence that abstinence-only programs have delayed the onset of sexual intercourse or reduced any other measure of sexual activity.
 - Programs that have shown a positive impact are quite substantial in duration and focus on behaviours; are theory-based; actively involve participants; share facts; focus on social pressures, modeling and skill rehearsal; and, include trained adult or peer leaders.
 - Rigorous research is needed in Ontario to evaluate a carefully designed multi-component pregnancy prevention intervention.

ARCHIVED

TABLES

Table 1: Included Studies

Table 2: Components of Interventions

Table 3: Quality Assessment of Randomized Controlled Trials

ARCHIVED

TABLE 1: Included Studies

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Coyle et al. (1999) (unpublished) Setting: 20 urban high schools in Texas & California, U.S.	3,869 grade nine students; 53% females; 31% caucasian; 18% Asian or Pacific Islander; 11% African- American	<ul style="list-style-type: none"> • Social cognitive theory • Social influence theory • Models of school change 	<p>Intervention group: Safer Choices Five components:</p> <ul style="list-style-type: none"> • school council formed to support intervention • 9th and 10th grade curriculum focused on knowledge and skills and led by trained peers and teachers • peer resource team to reinforce key messages through school activities • parent activities such as newsletters, involvement in homework, meetings; activities to increase awareness • access to community resources <p>Control group:</p> <ul style="list-style-type: none"> • standard, knowledge-based prevention curriculum 	<ul style="list-style-type: none"> • initiation of intercourse • birth control use 	<ul style="list-style-type: none"> • no difference in initiation of intercourse • intervention group more likely to use effective birth control method at last intercourse (Odds ratio = 1.76; p = 0.05) • (79% of sample at 31 month follow-up)

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Eisen et al. (1990) (published) Setting: 6 family planning service agencies & 1 school district in Texas & California, U.S.	1,444 13-19 year-olds (67% 15-17 years); 52% females; 53% Hispanic; 24% African-American; majority low-income, inner-city youth	<ul style="list-style-type: none"> Health belief model Social learning theory 	Intervention group: Teen Talk <ul style="list-style-type: none"> 12-15 hours: discussion re: factual information, values, feelings, emotions, decision-making & responsibility for sexual behaviour Control group: <ul style="list-style-type: none"> usual sex education programs which varied among sites 	<ul style="list-style-type: none"> initiation of intercourse birth control use pregnancy 	<ul style="list-style-type: none"> 36% of intervention group males initiated intercourse compared to 44% control group males ($p < 0.01$) no difference in initiation of intercourse in females, birth control use, or pregnancy (62% of sample at 12 month follow-up)
Ferguson (1996) (dissertation) Setting: 4 local public housing developments or subsidized neighbourhoods in Virginia, U.S.	63 African-American female 12-16 year olds (mean age 13 years); in 5 th -10 th grades; low income	<ul style="list-style-type: none"> Social learning theory 	Intervention group: <ul style="list-style-type: none"> 8-week program focusing on sex education, reproduction, birth control methods, life management skills, family relations, and education and career options led by trained peer counselor Control group: <ul style="list-style-type: none"> same program led by usual adult staff 	<ul style="list-style-type: none"> initiation of intercourse birth control use pregnancy 	<ul style="list-style-type: none"> no difference in sexual or contraceptive behaviours (83% of sample at 3 month follow-up)

Table 1: Included Studies 22

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Handler (1987) (dissertation) Setting: 2 public schools in Chicago, Illinois, U.S.	63 7 th Grade African- American females; mean age of 13.3 years; majority in female-headed households and over half on public assistance	<ul style="list-style-type: none"> knowledge, access, empowerment 	Intervention group: Peer Power Project <ul style="list-style-type: none"> one-hour per week during school year to increase knowledge, enhance decision- making skills, improve self-concept, set goals, increase interpersonal communication skills, link with a supportive adult, visit clinics, establish career goals, and participate in enrichment activities Control group: <ul style="list-style-type: none"> no intervention 	<ul style="list-style-type: none"> initiation of intercourse birth control use pregnancy 	<ul style="list-style-type: none"> no difference in initiation of intercourse, birth control use, or pregnancy (84% of sample at 12 month follow-up)

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Kirby et al. (1997a) (published) Setting: 6 schools with grade 7 in Los Angeles, California, U.S.	~2100 Grade seven students with a mean age of 12.3 years; 54% were female; 64% Hispanic; 13% Asian; 9% African- Americans; low SES	<ul style="list-style-type: none"> • Health belief model • Social learning theory 	Intervention group: Project SNAPP <ul style="list-style-type: none"> • 8 sessions over 2 weeks focusing on risks and consequences of teen sex; social influences, assertive communication and resistance skills • increasing participants' perceived susceptibility to pregnancy; identification of barriers to remaining abstinent and to using protection • contraceptive methods; medical and psychosocial resources in community • sessions led by trained peer educators Control group: <ul style="list-style-type: none"> • standard curriculum 	<ul style="list-style-type: none"> • initiation of intercourse • birth control use • pregnancy 	<ul style="list-style-type: none"> • no difference in sexual or contraceptive behaviours or pregnancy • (77% of sample at 17-month follow-up)

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Kvalem et al. (1996) (published) Setting: all upper secondary schools in one county of Norway	2411 students; 50% females	<ul style="list-style-type: none"> • Cognitive social learning theory • Social influence theory 	Intervention group: <ul style="list-style-type: none"> • focus on risk awareness, contraceptives, barriers to safe sexual behaviour, behaviour alternatives, associated consequences and decision-making in peer educators by asking them to develop a 10-14 hour intervention for younger peers Control group: <ul style="list-style-type: none"> • not specified 	<ul style="list-style-type: none"> • initiation of intercourse 	<ul style="list-style-type: none"> • no difference in initiation of intercourse • (59% of sample at 12-month follow-up)
Mitchell-DiCenso et al. (1997) (published) Setting: 21 schools with grades 7 & 8 in Hamilton, Ontario, Canada	3,289 grade 7 & 8 students with a mean age of 12.6 years; 52% females; majority caucasian; range of income levels	<ul style="list-style-type: none"> • Cognitive-behavioural theory 	Intervention group: McMaster Teen Program <ul style="list-style-type: none"> • 10 sessions focusing on problem-solving, decision-making, puberty, male/female roles, media & peer pressure, responsibility in relationships, intimacy, teenage pregnancy, and parenting Control group: <ul style="list-style-type: none"> • standard curriculum 	<ul style="list-style-type: none"> • initiation of intercourse • birth control use • pregnancy 	<ul style="list-style-type: none"> • no difference in initiation of intercourse, birth control use, pregnancy • (56% of sample at 4 year follow-up)

Table 1: Included Studies 25

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
<p>Moberg & Piper (1998) (published)</p> <p>Setting: 21 schools in Wisconsin, U.S.</p>	<p>2483 6th Grade students; 52% female; 96% caucasian</p>	<ul style="list-style-type: none"> Social influence model 	<p>Intervention group 1: Age-Appropriate Program</p> <ul style="list-style-type: none"> 4 weeks of age- relevant segments each year over 3 years. Focus on social situations, refusal skills, parental values, media, communicating, body image, responsibility, risks, birth control and sexuality. <p>Intervention group 2: Intensive Program</p> <ul style="list-style-type: none"> same program provided as a 12 week block during 7th grade <p>Control group:</p> <ul style="list-style-type: none"> usual program 	<ul style="list-style-type: none"> initiation of intercourse 	<ul style="list-style-type: none"> Age-appropriate program students had significantly higher proportion who ever had sex (36%) than intensive program (33%) or control group (28%) (68% of sample at 4 year follow-up)
<p>Schinke et al. (1981) (published)</p> <p>Setting: large public high school in Seattle, Washington, U.S.</p>	<p>36 sophomores with a mean age of 15.9 years; 53% female</p>	<ul style="list-style-type: none"> Cognitive- behavioural theory 	<p>Intervention group:</p> <ul style="list-style-type: none"> 14 50-minute small group sessions with 8- 12 participants focusing on contraceptive information, problem- solving, practicing communication decisions about sexual behaviour through role playing <p>Control group:</p> <ul style="list-style-type: none"> No program 	<ul style="list-style-type: none"> birth control use 	<ul style="list-style-type: none"> intervention group reported more habitual contraception ($p < 0.05$), greater protection at last intercourse ($p < .005$), and less reliance on inadequate birth control (p < 0.001) (94% of sample at 6 month follow-up)

Table 1: Included Studies 26

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Slade (1989) (dissertation) Setting: high school in Washington, D.C., U.S.	201 Grades 10 to 12 females 15-19 years of age; all African- Americans; most in female-headed households	<ul style="list-style-type: none"> not specified 	<p>Intervention group 1: Life-Outcome Perceptions</p> <ul style="list-style-type: none"> 1-hour session focusing on negative impact of early childbearing on vocational goals, desired lifestyle & on unplanned child <p>Intervention group 2: Contraceptive Education</p> <ul style="list-style-type: none"> 1-hour session focusing on types of birth control <p>Intervention group 3: Life-Outcomes and Contraceptive Education</p> <ul style="list-style-type: none"> 1-hour session combining negative impact of early childbearing and birth control methods <p>Control group:</p> <ul style="list-style-type: none"> 1-hour session about current events 	<ul style="list-style-type: none"> initiation of intercourse birth control use 	<ul style="list-style-type: none"> no difference in initiation of sexual intercourse, or birth control use (90% of sample at 2 month follow-up)

<u>School/Agency-Based Sex Education</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Smith (1994) (published) Setting: inner city high school in Queens, New York City, New York, U.S.	120 freshmen; mean age 15.1 years; 74% females; 43% African American; 31% West Indian; 23% Hispanic	<ul style="list-style-type: none"> Operant theory 	Intervention group: Teen Incentive Program <ul style="list-style-type: none"> 6-month 3-phase program: 8 weekly sessions focusing on self-esteem, assertiveness, communication skills, social interaction skills, decision-making skills, academic performance, career planning, parent/teen relationships, substance abuse/peer and community influences, teen sexuality, pregnancy, STD and male/female sexual responsibility; condoms were distributed free of charge 6-week career mentorship component to permit teens to spend time with a professional in a chosen area of health care 6-week life skills application session Control group: <ul style="list-style-type: none"> no programme 	<ul style="list-style-type: none"> initiation of intercourse birth control use 	<ul style="list-style-type: none"> no difference in initiation of sexual intercourse, or birth control use (79% of sample at 6 month follow-up)

Table 1: Included Studies 28

Abstinence Programmes

Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Kirby et al. (1997b) (published) Setting: 56 schools and 17 community- based agencies in California, U.S.	10,600 Grade seven and eight students with a mean age of 12.8 years; 42-45% males; 39% Hispanic; 30% caucasian, 9% African-American; and 10% Asian	<ul style="list-style-type: none">not specified	Intervention group: Postponing Sexual Involvement <ul style="list-style-type: none">5 sessions, each 45-60 minutes delivered in classroom or small group settings focusing on risks of early sexual involvement, resistance to social and peer pressures, assertiveness skills, and nonsexual ways to express feelings Control group: <ul style="list-style-type: none">standard curriculum	<ul style="list-style-type: none">initiation of intercoursepregnancy	<ul style="list-style-type: none">no difference in initiation of intercourse or pregnancy(75% of sample at 17- month follow-up)

<u>Abstinence Programmes</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Miller et al. (1993) (published) Setting: Northern Utah, U.S.	548 families Grade seven and eight adolescents; upper middle SES; 95% caucasian; 86% Mormon	<ul style="list-style-type: none"> not specified 	Intervention group 1: Facts and Feelings <ul style="list-style-type: none"> six 15-20 minute videotapes focusing on puberty, sexual values, sexual anatomy, reproduction, prenatal development, birth, sexuality within relationships, advantages of postponing sexual intercourse, influence of media, consequences of sexual activity, decision-making, assertiveness and refusal skills Intervention group 2: <ul style="list-style-type: none"> same videotapes plus mailed newsletters Control group: <ul style="list-style-type: none"> no videotapes or newsletters 	<ul style="list-style-type: none"> initiation of intercourse 	<ul style="list-style-type: none"> no difference in initiation of intercourse (92% of sample at 12-month follow-up)

<i>Multifaceted Programmes</i>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Allen et al. (1997) (published) Setting: 25 sites in U.S.	695 Grade nine to 12 students 85% females; mean age 15.8 years; 67% African-American, 19% caucasian, 11% Hispanic	<ul style="list-style-type: none"> not specified 	Intervention group: Teen Outreach Program <ul style="list-style-type: none"> minimum of 20 hours per year of community volunteer experience; classroom-based discussions about service experiences, future life options, and about developmental tasks of adolescence for 1 hour per week throughout academic year led by trained facilitators Control group: <ul style="list-style-type: none"> regular curricular offerings 	<ul style="list-style-type: none"> pregnancy 	<ul style="list-style-type: none"> pregnancy in intervention group was reduced by 59% ($p < 0.05$) (93% of sample at 9- month follow-up)

<u>Multifaceted Programmes</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Grossman & Sipe (1992) (unpublished) Setting: 5 U.S. cities: Boston, Massachusetts; Fresno, California; Portland, Oregon; San Diego, California; Seattle, Washington	3,226 14-15 year-olds economically & educationally disadvantaged youths; 51% female; 45% African- American; 18% Hispanic	<ul style="list-style-type: none"> not specified 	Intervention group: Summer Training & Education Program (STEP) <ul style="list-style-type: none"> mix of work experience, basic skills remediation, and life skills and opportunities instruction during 2 summers sexuality component focused on decision- making & importance of responsible behaviour 90 hours of work (half- time) at minimum wage; 90 hours of academic work; 5-15 hours of support during school years Control group: <ul style="list-style-type: none"> summer jobs 	<ul style="list-style-type: none"> initiation of intercourse birth control use pregnancy 	<ul style="list-style-type: none"> no difference in initiation of intercourse, birth control use, or pregnancy rates (81% of sample at 54- month follow-up)

<u>Multifaceted Programmes</u>					
Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Last Follow-up (% in study at last follow-up)
Philliber & Allen (1992) (published) Setting: 5 sites in U.S.	168 11-21 year olds; 70% females; 40% African-American, 13% Hispanic, 40% caucasian	<ul style="list-style-type: none"> not specified 	Intervention group: Teen Outreach Program <ul style="list-style-type: none"> school-based small group discussions and involvement in volunteer service in the community; met once per week through school year to discuss values, communication skills, growth and development, parenting, family relationships and community resources Control group: <ul style="list-style-type: none"> usual sex education 	<ul style="list-style-type: none"> pregnancy 	<ul style="list-style-type: none"> no difference in pregnancy rates (90% of sample at 9-month follow-up)

Education and Counselling in Family Planning Clinics

Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Follow-up (% in study at last follow-up)
Baker (1990) (dissertation) Setting: family planning clinic, Northeast New Jersey, U.S.	62 never-married sexually active 15-18 year old female first- time clinic attenders from minority racial groups living in female-headed households	<ul style="list-style-type: none"> Cognitive-behavioural theory 	Intervention group: Self-efficacy training <ul style="list-style-type: none"> one 5.5 hour session: 1 hour: factual information 1 hour: problem-solving skills 1 hour: modeling of verbal and nonverbal behaviour 2+ hours: role playing of problem-solving and communication Control group: <ul style="list-style-type: none"> usual care 	<ul style="list-style-type: none"> initiation of intercourse compliance with oral contraceptives pregnancy 	<ul style="list-style-type: none"> no difference in initiation of sexual intercourse or compliance with oral contraceptives or pregnancy rates (77% of sample at 6-month follow-up)
Hanna 1990 (dissertation) Setting: 2 family planning clinics in a rural state in upper Midwest U.S.	51 16-18-year-old never-married females seeking oral contraceptives for first time; 98% caucasian	<ul style="list-style-type: none"> King's theory of nursing 	Intervention group: <ul style="list-style-type: none"> nurse-client transactional intervention to identify anticipated perceived contraceptive benefits and barriers, and to develop a contraceptive adherence regimen to manage anticipated, perceived contraceptive barriers Control group: <ul style="list-style-type: none"> information on birth control using written and video information 	<ul style="list-style-type: none"> oral contraceptive compliance 	<ul style="list-style-type: none"> no difference in oral contraceptive compliance (77% of sample at 3-month follow-up)

Education and Counselling in Family Planning Clinics

Author, year (publication type)	Participants	Theoretical Framework	Intervention	Outcome Variables	Results of Follow-up (% in study at last follow-up)
<p>Herceg-Baron et al. (1986) (published)</p> <p>Setting: 9 family planning clinics in Philadelphia, Pennsylvania, U.S.</p>	<p>417 females <16-17 year olds; 53% African-American</p>	<ul style="list-style-type: none"> not specified 	<p>Intervention group 1:</p> <ul style="list-style-type: none"> promotion of greater family involvement through 6 weekly 50-minute counseling sessions <p>Intervention group 2:</p> <ul style="list-style-type: none"> increased staff support through 2-6 telephone calls <p>Control group:</p> <ul style="list-style-type: none"> no intervention 	<ul style="list-style-type: none"> birth control compliance pregnancy 	<ul style="list-style-type: none"> no difference in regularity of contraceptive use or pregnancy rates (86% of sample at 15-month follow-up)
<p>Jay et al. (1984) (published)</p> <p>Setting: adolescent gynecology clinic in Augusta, Georgia, U.S.</p>	<p>57 females aged 14-19 from lower SES on oral contraceptives; 96.5% African-American</p>	<ul style="list-style-type: none"> not specified 	<p>Intervention group:</p> <ul style="list-style-type: none"> peer counseling on compliance with oral contraceptives <p>Control group:</p> <ul style="list-style-type: none"> nurse counseling on compliance with oral contraceptives 	<ul style="list-style-type: none"> compliance with oral contraceptives pregnancy 	<ul style="list-style-type: none"> no difference in compliance with oral contraceptives or pregnancy rates (67% of sample at 4-month follow-up)

TABLE 2: Components of the Adolescent Pregnancy Prevention Interventions

Study (First Author, Year)	Focus on Behaviours	Appropriate for Population	Theory- Based	Sufficient Length	Boosters	Participant Involvement	Facts	Focus on Social Pressures	Modeling & Skill Rehearsal	Trained Leaders
Allen, 1997	No	✓	No	✓	No	✓	No	No	No	✓ (adult)
Baker, 1990	✓	✓	✓	No	No	✓	✓	No	✓	✓ (adult)
Coyle, 1996	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ (adult/ peers)
Eisen, 1990	✓	✓	✓	✓	No	✓	✓	No	✓	✓ (adult)
Ferguson, 1996	✓	✓	✓	✓	No	✓	No	No	No	✓ (peers)
Grossman, 1992	✓	✓	No	✓	✓	✓	✓	No	✓	No
Handler, 1987	✓	✓	✓	✓	No	✓	✓	No	No	No
Hanna, 1990	✓	✓	✓	No	No	✓	✓	No	No	✓ (adult)
Herceg-Baron, 1986	✓	✓	No	✓	NA*	No	No	No	No	✓ (adult)
Jay, 1984	✓	✓	No	✓	NA	No	✓	No	No	✓ (adult/ peers)
Kirby, 1997a	✓	✓	✓	No	No	✓	✓	✓	✓	✓ (peers)
Kirby, 1997b	✓	✓	No	No	No	✓	No	✓	✓	✓ (adult/ peers)
Kvalem, 1996	✓	✓	✓	✓	No	No	✓	No	No	✓ (adult/ peers)
Miller, 1993	✓	✓	No	No	No	No	✓	✓	No	N/A
Mitchell- DiCenso, 1997	✓	✓	✓	No	No	✓	No	✓	✓	✓ (adult)

Study (First Author, Year)	Focus on Behaviours	Appropriate for Population	Theory- Based	Sufficient Length	Boosters	Participant Involvement	Facts	Focus on Social Pressures	Modeling & Skill Rehearsal	Trained Leaders
Moberg, 1998	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓ (adult/ peers)
Philliber, 1992	No	✓	No	✓	No	✓	No	No	No	✓ (adult)
Schinke, 1981	✓	✓	✓	✓	No	✓	✓	No	✓	No (adults)
Slade, 1989	✓	✓	No	No	No	✓	✓	No	No	No
Smith, 1994	✓	✓	✓	✓	No	✓	✓	✓	✓	✓ (adult)

*NA – not applicable (clinic interventions)

TABLE 3: Quality Assessment of Randomized Controlled Trials*

Study (First author, year)	Randomization Appropriate	Data Collection Unbiased	Last Follow-up >80% participants	Attrition similar in study groups (within 2% difference)	Final Score (out of 4)
Allen, 1997	✓ (0.5)	NS**	✓	3%***	1.5
Baker, 1990	No	No	No	9%	0
Coyle, 1996	NS	✓	No	✓	2
Eisen, 1990	✓	✓	No	4%	2
Ferguson, 1996	✓	No	✓	18%	2
Grossman, 1992	✓	✓	✓	✓	4
Handler, 1987	No	✓ (0.5)	✓	✓	2.5
Hanna, 1990	No	No	No	15%	0
Herceg-Baron, 1986	No	NS	✓	5%	1
Jay, 1984	✓	NS	No	19%	1
Kirby, 1997a	NS	NS	No	✓	1
Kirby, 1997b	NS	NS	No	✓	1
Kvalem, 1996	NS	✓	No	6%	1
Miller, 1993	NS	No	✓	5%	1
Mitchell-DiCenso, 1997	✓	✓	No	9%	2
Moberg, 1998	NS	✓	No	7%	1
Philliber, 1992	NS	No	✓	✓	2
Schinke, 1981	NS	NS	NS	NS	0
Slade, 1989	No	✓	✓	NS	2
Smith, 1994	✓	No	No	18%	1

*Scoring range: 0-4; study is rated as poor quality if it scores ≤2

** NS – not stated

***Difference in retention between groups if > 2%

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APPENDICES

Appendix 1: Terms Used for Searching Databases

Appendix 2: Quality Assessment Tool for Randomized Controlled Trials

Appendix 3: Table of Excluded Studies

ARCHIVED

Appendix 1: Terms Used for Searching Databases

Listed below are the terms (i.e., keywords, text words, descriptors, major headings, etc.) used for searching each database. These terms were used in various combinations to identify citations relevant to the areas of evaluation of adolescent pregnancy prevention interventions, predictors of sexual behaviour, and reviews of each topic. Where possible, the search strategy used truncated versions of the term to ensure identification of variations in the forms of the terms (e.g., pregnancy and pregnant). These are not specified below.

CATLINE

Pregnancy in adolescence, family planning, contraception, sex education, sex counselling, prevent, primary prevention, preventive health services

CINAHL

Adolescence, adolescent behaviour, pregnancy in adolescence, school health education, school health services, clinic, prevent, ambulatory care facilities, primary health care, family practice, evaluation, review

Conference Papers Index

Adolescent, teen, pregnancy, birth control, contraception, family planning, sex education, clinic, prevent, public health, community health, primary care, physician, family practice/medicine, general practice/medicine

Dissertation Abstracts Online

Adolescent, teen, pregnancy, birth control, contraception, family planning, sex education, clinic, prevent, public health, community health, primary care, physician, family practice/medicine, general practice/medicine

EMBASE

Adolescence, 'teenager and adolescent', adolescent pregnancy, birth control, family planning, contraception, sexual education, clinic, school clinic, prevent, primary prevention, preventive medicine, primary medical care, primary health care, family medicine, general medicine, family physician/practice, general physician/practice, review

ERIC

Adolescents, teen, pregnancy, teenage pregnancy, adolescent pregnancy, pregnant students, birth control, contraception, family planning, sex education, clinic, prevent, preventive medicine, primary care, primary health care, family practice, general practice, family medicine, family physician, review

MEDLINE

Adolescence, teen, pregnancy, pregnancy in adolescence, contraception, family planning, education, sex education, sex counselling, 'knowledge, attitudes and perceptions' school health services, clinic, prevent, primary prevention, primary health care, ambulatory care facilities, family physicians, family practice, evaluation studies, review literature, review
Exclusionary Terms: not secondary, tertiary, AIDS, HIV, infection, prenatal, nutrition, surgical, alcohol, ectopic, premature

NTIS

Adolescent, teen, pregnancy, birth control, contraception, family planning, sex education, clinic, prevent, primary care, public health, community health, physician, family practice/medicine, general practice/medicine, review

POPLINE

Adolescence, pregnancy in adolescence, contraception, contraception behaviour, family planning, 'knowledge, attitudes and perceptions', prevent, preventive medicine, primary prevention, predict, risk factors, review

PsycINFO

Adolescent, teen, adolescent pregnancy, teenage pregnancy, birth control, family planning, family planning attitudes, sex education, school, clinic, prevent, preventive medicine, primary health care, family physicians, general practitioners, review

Sociological Abstracts

Adolescents, teen, pregnancy, birth control, family planning, contraception, sex education, clinic, prevention, primary health care, public health, physicians, family practice/medicine family physician, general practice/medicine, review, literature reviews

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Appendix 2: Quality Assessment Tool for Randomized Controlled Trials

Give a score of 1 point for each 'yes' or 0 points for each 'no' to the following four questions:

1. **Was the method of randomization appropriate?** A method to generate the sequence of randomization will be regarded as appropriate if it allowed each study participant to have the same chance of receiving each intervention and the investigators could not predict which treatment was next. Examples of appropriate methods are: coin toss; drawing names from a hat; table of random numbers; and computer-generated numbers. Examples of inappropriate methods are alternation and date of birth.
2. **Was data collection unbiased?** Data collection will be considered unbiased if it was collected by someone who was blind to the study allocation or by someone who had no involvement in the delivery of the intervention. Other unbiased methods of data collection include the use of computers or questionnaires that are completed alone and mailed in. The potential for bias exists when data are collected by persons perceived by the study participants as having been involved in the delivery of the intervention.
3. **Were there over 80% of the study participants still in the study at the last point of follow-up?** In studies of pregnancy in adolescents, it may be those who have experienced a pregnancy who drop-out of the study and from whom outcome data cannot be collected. For this reason, it is particularly important that at least 80% of the study participants are followed to the conclusion of the study.
4. **Were the attrition rates in the comparison groups similar (i.e., within 2% of one another)?** It is important that imbalances in the proportion who drop-out of each comparison group are identified. There may be something about the intervention or control group assignments that cause different rates of attrition.

Scoring Range: 0 to 4

Poor Quality: ≤ 2

Adapted from: Jadad, A.R., Moore, R.A., Carroll, D., Jenkinson, C., Reynolds, D.J.M., Gavaghan, D.J., & McQuay, H.J. (1996). Assessing the quality of reports of randomized clinical trials: Is blinding necessary? Controlled Clinical Trials, 17, 1-12.

Appendix 3: Table of Excluded Studies

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Christopher & Roosa (1990) (published)	3 community sites & 5 schools, Arizona, U.S.	cohort	320 low-income, minority 6th-7th graders, 69% Hispanic, 21% African American; mean age 12.8 yrs	Success Express Program <ul style="list-style-type: none"> 5-session program about abstinence no theoretical framework specified 	<ul style="list-style-type: none"> 6 weeks 63.4% followed 	<ul style="list-style-type: none"> coitus:0
Frappier (1978) (MSc thesis)	2 high schools in Quebec, Canada	cohort	1,100 13-17-year-olds; 53% females; range of SES levels	<ul style="list-style-type: none"> 40 minute classes every week throughout school year (10 mos) no theoretical framework specified 	<ul style="list-style-type: none"> 10 months 100% followed 	<ul style="list-style-type: none"> coitus:0
Gibson (1987) (dissertation)	7 high schools in New York, U.S.	cohort	588 African American and Hispanic 12-19 year-olds; 79% females	Teen Choice Program <ul style="list-style-type: none"> 1-2 semesters of small group activities no theoretical framework specified 	<ul style="list-style-type: none"> 3 months 68.0% followed 	<ul style="list-style-type: none"> coitus:0 birth control use:0
Howard & McCabe (1990) (published)	53 schools in Georgia, U.S.	cohort	536 male & female 8th grade 13-14 year olds from low-income families; 99% African-Americans	Postponing Sexual Involvement <ul style="list-style-type: none"> peer-led 10-session groups based on social influence theory 	<ul style="list-style-type: none"> 12-18 mos 100% followed 	<ul style="list-style-type: none"> coitus:0 for females; + for males pregnancy:0

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Hubbard et al. (1998) (published)	10 school districts in Arkansas, U.S.	cohort	532 9th-12th graders	Reducing the Risk <ul style="list-style-type: none"> 16-lesson curriculum for Grades 9-12 based on social learning and social influence theories 	<ul style="list-style-type: none"> 18 months 40% followed 	<ul style="list-style-type: none"> coitus:+ birth control use:+
Jorgensen et al. (1993) (published)	schools in 3 cities in U.S.	cohort	91 7th graders; mean age 14.4 years; 53% female; 45% Caucasian, 43% African- American; >50% low income	Project Taking Charge <ul style="list-style-type: none"> 6-week abstinence curriculum for 7th grade home economics classes and 3 parent-youth evening sessions no theoretical framework specified 	<ul style="list-style-type: none"> 6 months 100% followed 	<ul style="list-style-type: none"> coitus:+
Kirby et al. (1991a) (published)	23 classes in 13 high schools in California, U.S.	cohort	1,033 grades 9-12 students; 53% females; 62% Caucasian; 20% Hispanic	Reducing the Risk <ul style="list-style-type: none"> 15 sessions, strategies to resist pressures to have sex based on social influence, social learning, cognitive- behavioural theories 	<ul style="list-style-type: none"> 18 months 73.4% followed 	<ul style="list-style-type: none"> coitus:0 birth control use: 0 for females; - for males pregnancy:0

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Kirby et al. (1991b) (published)	6 schools in: Indiana, California, Michigan, Mississippi, Florida, Texas, U.S.	cohort 4 sites before/ after, 2 sites	9th-12th graders; 54% female; 95% African- American; low income	<ul style="list-style-type: none"> school-based primary health care clinics that provided comprehensive health services no theoretical framework specified 	<ul style="list-style-type: none"> 24 months % followed not applicable 	<ul style="list-style-type: none"> coitus: - for females; + for males birth control use:+ pregnancy:0
Klaus et al. (1987) (published)	7 U.S. areas	cohort	231 15-17 year-old females; 35% African- American; range of income levels	Fertility Awareness <ul style="list-style-type: none"> taught rhythm and discussions re: self-concept, relationships with peers no theoretical framework specified 	<ul style="list-style-type: none"> 12 months 78% followed 	<ul style="list-style-type: none"> coitus:+ pregnancy:+
Mellanby et al. (1995) (published)	Devon, U.K.	cohort	6573 9th-11th graders; 49% female	<ul style="list-style-type: none"> 25-30 one-hour lessons delivered by a doctor, teachers and peers on puberty, reproduction, contraception, negotiation no theoretical framework specified 	<ul style="list-style-type: none"> 9 months % followed not given 	<ul style="list-style-type: none"> coitus:+

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Moberg & Piper (1990) (published)	2 schools in Wisconsin, U.S.	cohort	265 8th grade 12- 14 year-olds; 55% female; no minority groups	Project Model Health <ul style="list-style-type: none"> • 32-hour program on nutrition, sexuality, drug use • based on social influence theory 	<ul style="list-style-type: none"> • 20 months • 74.3% followed 	<ul style="list-style-type: none"> • coitus: + for females; 0 for males

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Nicholson & Postrado (1992) (published) Note: 4 studies	Texas, Tennessee, Nebraska, Delaware, U.S.	cohort	343 females aged 12-15 years; >80% African-American	Growing Together <ul style="list-style-type: none"> 5 2-hour sessions for parent-daughter pairs to improve communication Will Power/Won't Power <ul style="list-style-type: none"> 6 2-hour sessions focusing on assertiveness skills, and peer pressure Taking Care of Business <ul style="list-style-type: none"> 9 2-hour sessions to encourage abstaining or using birth control Health Bridge <ul style="list-style-type: none"> linking with comprehensive health clinics no theoretical framework specified 	<ul style="list-style-type: none"> 24 months % followed not given 	<ul style="list-style-type: none"> coitus:0 birth control use:0 pregnancy:0

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Philliber & Allen (1992) (published) Note: 2 studies	65 sites in U.S.	RCT cohort	985 11-21 year- olds; 70% female; 40% African- American, 13% Hispanic, 40% Caucasian	Teen Outreach Program <ul style="list-style-type: none"> School-based small group discussions and involvement in volunteer service in the community; met once per week through school year no theoretical framework specified 	<ul style="list-style-type: none"> 9 months 89.9% followed 	<ul style="list-style-type: none"> pregnancy: + for females; 0 for males
Ralph & Edgington (1983) (published)	youth clinic in Texas, U.S.	cohort	comparison of teen birth rates among low income, minority female teens	Youth Clinic <ul style="list-style-type: none"> provided teen health care during school hours no theoretical framework specified 	<ul style="list-style-type: none"> 12 months % followed not applicable 	<ul style="list-style-type: none"> pregnancy (live births):0
Roosa & Christopher (1990) (published)	20 schools, community sites and Indian reservations in Arizona, U.S.	cohort	528 6th-8th graders; 57% female; 64% Hispanic, 15% African- American; mean age 13 years	Success Express Program <ul style="list-style-type: none"> 5-session program about abstinence no theoretical framework specified 	<ul style="list-style-type: none"> 6 weeks 71% followed 	<ul style="list-style-type: none"> coitus:0

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
St. Pierre et al. (1995) (published)	14 Boys & Girls Clubs across U.S.	cohort	359 males and female; mean age 13.6; 45% Caucasian, 42% African- American; low income	Stay SMART <ul style="list-style-type: none"> 12-session abstinence program plus 5 booster sessions at 2 years based on social influence theory 	<ul style="list-style-type: none"> 27 months 42% followed 	<ul style="list-style-type: none"> coitus: + for non-virgins; 0 for virgins
Vincent et al. (1987) (published)	western portion of a county in South Carolina, U.S.	cohort	14-17 year old female; 58% African- American; low income	<ul style="list-style-type: none"> saturation of a community with pregnancy prevention messages based on social learning and diffusion theories 	<ul style="list-style-type: none"> 12 months % followed not applicable 	<ul style="list-style-type: none"> pregnancy:0
Williams et al. (1985) (unpublished)	East Tennessee, U.S.	cohort	comparison of teen birth rates among females ages 11-18	Appalachian Adolescent Health & Education Project <ul style="list-style-type: none"> at least 1 50-minute lecture/discussion session no theoretical framework specified 	<ul style="list-style-type: none"> 12 months % followed not applicable 	<ul style="list-style-type: none"> pregnancy (live births):+

Author, year (publication)	Setting	Design	Participants	Intervention	Length & success of follow-up	Outcomes/ Results**
Winter & Breckenmaker (1991) (published)	6 non- metropolitan family planning clinics in Pennsylvania, U.S.	cohort	1,261 females <18 yrs of age making an initial or annual clinic visit; majority Caucasian	<ul style="list-style-type: none"> counseling, one-to-one education, reassurance & social support no theoretical framework specified 	<ul style="list-style-type: none"> 12 months 38% followed 	<ul style="list-style-type: none"> birth control use:0 pregnancy:0
Young et al. (1992) (published)	5 junior high schools in Arkansas, U.S.	cohort	Grade 7 & 8 students (no description of sample provided). State that data were collected from 209 students but do not specify number who took program.	Living Smart <ul style="list-style-type: none"> abstinence program taught over 24 classes by trained health teachers no theoretical framework specified 	<ul style="list-style-type: none"> 1 month % followed unclear 	<ul style="list-style-type: none"> coitus:+

* The search for studies for the original systematic review ended May 1993. For the update of the review, searches were limited to randomized controlled trials and therefore, this table may not include all cohort studies published after May 1993.

** '0' signifies no difference in outcome between the intervention and control groups; '+' signifies a significant difference in favour of the intervention group; '-' signifies a significant difference in favour of the control group.