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Interventions to reduce unintended pregnancies among adolescents: systematic review of randomised controlled trials

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Abstract

Objective To review the effectiveness of primary prevention strategies aimed at delaying sexual intercourse, improving use of birth control, and reducing incidence of unintended pregnancy in adolescents.

Data sources 12 electronic bibliographic databases, 10 key journals, citations of relevant articles, and contact with authors.

Study selection 26 trials described in 22 published and unpublished reports that randomised adolescents to an intervention or a control group (alternate intervention or nothing).

Data extraction Two independent reviewers assessed methodological quality and abstracted data.

Data synthesis The interventions did not delay initiation of sexual intercourse in young women (pooled odds ratio 1.12; 95% confidence interval 0.96 to 1.30) or young men (0.99; 0.84 to 1.16); did not improve use of birth control by young women at every intercourse (0.95; 0.69 to 1.30) or at last intercourse (1.05; 0.50 to 2.19) or by young men at every intercourse (0.90; 0.70 to 1.16) or at last intercourse (1.25; 0.99 to 1.59); and did not reduce pregnancy rates in young women (1.04; 0.78 to 1.40). Four abstinence programmes and one school based sex education programme were associated with an increase in number of pregnancies among partners of young male participants (1.54; 1.03 to 2.29). There were significantly fewer pregnancies in young women who received a multifaceted programme (0.41; 0.20 to 0.83), though baseline differences in this study favoured the intervention.

Conclusions Primary prevention strategies evaluated to date do not delay the initiation of sexual intercourse, improve use of birth control among young men and women, or reduce the number of pregnancies in young women.

Introduction

The period between childhood and adulthood is a time of profound biological, social, and psychological changes accompanied by increased interest in sex. This interest places young people at risk of unintended pregnancy, with consequences that present difficulties

for the individual, family, and community.¹ There are negative associations between early childbearing and numerous economic, social, and health outcomes.²⁻⁵ For society, unintended early childbearing has tremendous social and financial costs.^{6,7} In response, communities have implemented various pregnancy prevention strategies for adolescents, several of which have been evaluated. Discrepant results of these evaluations have left the effectiveness of such strategies in doubt.

We undertook a systematic review that included non-published studies to avoid publication bias,^{8,9} excluded non-randomised studies that tend to inflate treatment effects,¹⁰ and provided a summary measure to facilitate interpretation.

Methods

Eligibility criteria

We included published and unpublished randomised controlled trials of adolescents (aged 11 to 18 years) that evaluated pregnancy prevention programmes including sex education classes, school based clinics, family planning clinics, and community based programmes. We included studies that evaluated delay in initiation of sexual intercourse, consistent use of birth control, or avoidance of unintended pregnancy. All studies took place in North America, Australia, New Zealand, or Europe (excluding Eastern Europe) and were published in any language.

Search for primary studies

Our literature search extended from 1970 to December 2000. We searched 12 electronic bibliographic databases, 10 key journals, citations of relevant articles, and contacted authors. Twenty six randomised controlled trials described in 22 reports met our inclusion criteria (references for these 22 reports can be found in the long version of this paper on bmj.com; selected references are cited here).

Quality assessment of studies

We assessed the methodological quality of the studies using a modified version of the rating tool developed by Jadad et al.¹¹ We rated the studies according to appropriateness of randomisation, extent of bias in data collection, proportion of study participants followed to the last point of follow up (adequate follow

up included data on $\geq 80\%$ of the study participants at the last point of follow up), and similarity of attrition rates in the comparison groups (acceptable rates were within 2% of each other). We assigned 1 point for each (maximum of 4 points) and considered studies to be of poor quality if they scored ≤ 2 . Two people assessed the studies with discrepancies resolved by joint review and consensus. We reviewed assessment of methodological quality with 16 of the authors, who provided additional information when necessary.

Results

Trial characteristics

Details of the 22 reports of 26 randomised controlled trials that met our eligibility criteria are available on bmj.com. Of the 22 reports, 17 were published, four were unpublished dissertations, and one was an unpublished report. Twelve reports were dated before 1995 and 10 after 1995. Twenty one of the studies were conducted in the United States and one in Canada. Three of the studies included only African-Americans, 10 included over 50% African-Americans or Hispanics, or both, and the nine remaining included combinations of different races. Ten studies evaluated school or community based sex education; three evaluated abstinence programmes; four evaluated multifaceted programmes; and five evaluated education and counselling in family planning clinics.

Quality assessment of studies

Only eight studies scored over 2 points of the possible 4 (details of quality assessment of studies are available on bmj.com). Only two studies scored the maximum 4 points.^{12, 13} Fourteen studies used an appropriate method of randomisation. In the remaining studies methods were not specified or could have led to bias. In 12 studies investigators collected data using a strategy that would minimise bias. In the remaining studies authors did not specify or used data collectors who had also administered the intervention to one or more study groups. In 11 studies over 80% of participants completed follow up. In only eight studies were retention rates in the comparison groups within 2% of each other. In the 14 remaining studies differences between groups ranged from 3% to 19%.

Initiation of sexual intercourse

Figure 1 shows the results of the meta-analysis on studies that looked at initiation of sexual intercourse. Thirteen studies in 9642 young women showed no delay in initiation of sexual intercourse (pooled odds ratio 1.12; 95% confidence interval 0.96 to 1.30). Results were consistent across studies (heterogeneity $P=0.99$). Results of 11 studies also showed no delay in initiation of sexual intercourse in 7418 young men (0.99; 0.84 to 1.16). There was no significant heterogeneity among the studies ($P=0.28$).

Use of birth control

Figure 2 shows the results for use of birth control at every intercourse. In 1967 eight studies of young women showed no improvement in use of birth control at every intercourse (0.95; 0.69 to 1.30). However, there was significant heterogeneity among studies ($P=0.08$) that was not explained by any of our 10 a priori hypotheses (details of these hypotheses are

available on bmj.com). Three studies of school based sex education in 1505 young men looked at whether they always used birth control. Results were remarkably consistent across studies (heterogeneity $P=0.97$) with a pooled estimate of 0.90 (0.70 to 1.16), indicating that the programmes did not improve use of birth control at every intercourse.

Figure 3 shows results for use of birth control at last intercourse. Five studies of school based sex education programmes in 799 young women showed no improvement (1.05; 0.50 to 2.19), with significant heterogeneity ($P=0.007$) that was not explained by any of our 10 a priori hypotheses. Aarons et al found a large treatment effect in favour of the intervention (4.47; 1.60 to 12.51).¹⁴ However, there were substantial baseline differences in this study that favoured the treatment group.

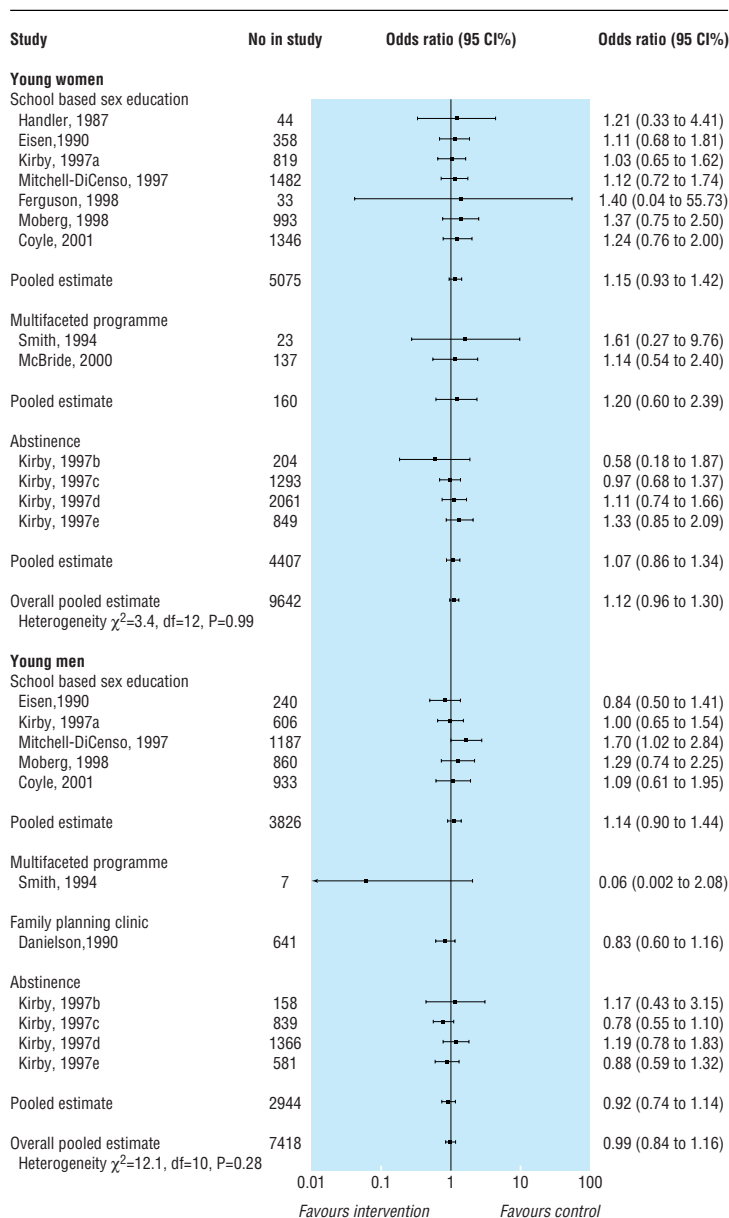


Fig 1 Effect of interventions on whether adolescents started to have sexual intercourse

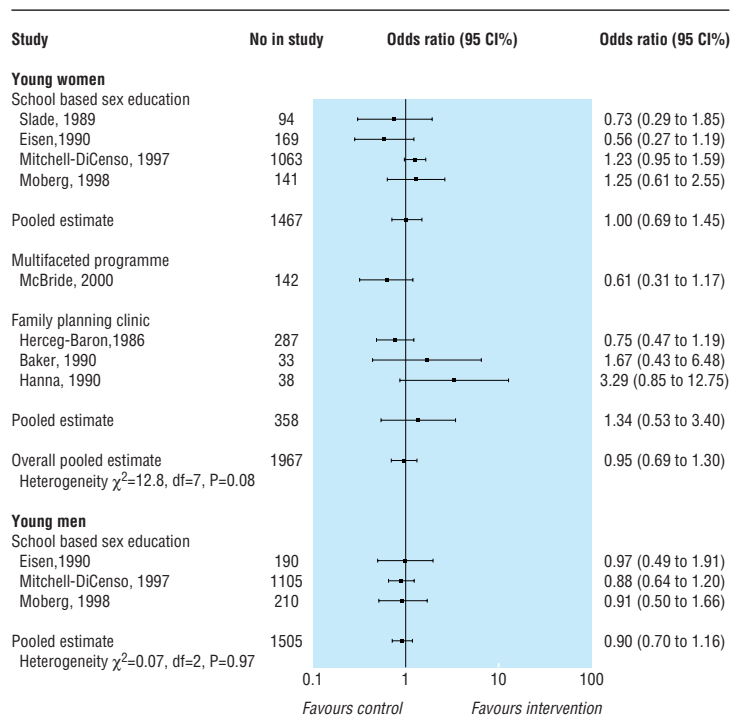


Fig 2 Effect of interventions on whether adolescents always used birth control

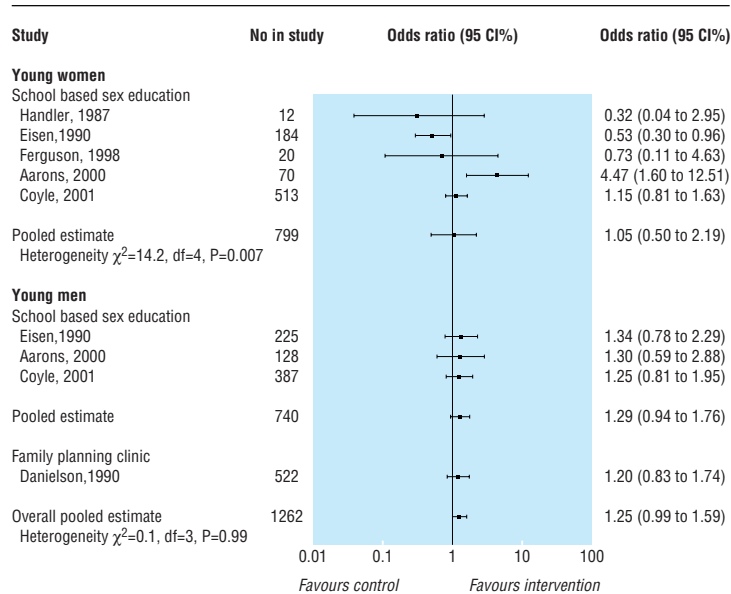


Fig 3 Effect of interventions on whether adolescents used birth control the last time they had sexual intercourse

For use of birth control at last intercourse four studies in 1262 young men had consistent results across studies (heterogeneity $P=0.99$), with a pooled estimate of 1.25 (0.99 to 1.59). The programmes therefore did not improve use of birth control by young men at last intercourse.

Pregnancy

Twelve studies in 8019 young women showed that the interventions did not reduce pregnancy rates (1.04; 0.78 to 1.40), and there was no significant heterogeneity among studies ($P=0.23$, fig 4). One study that

evaluated a multifaceted programme did find a reduction (0.41; 0.20 to 0.83).¹⁵ At baseline, however, the control group had higher levels of previous course failure ($P<0.04$), school suspension ($P<0.03$), and teenage pregnancy ($P<0.01$). The authors excluded three of 25 sites where baseline differences were most problematic (these data were also excluded in our odds ratio calculation), adjusted for any remaining demographic differences, and still found a significant odds ratio of 0.41.

Figure 5 shows the effects of interventions on reducing pregnancies among the partners of 3759 young men. The pooled estimate of 1.54 (1.03 to 2.29) suggests that these interventions increased reported pregnancies. There was no significant heterogeneity among studies ($P=0.58$). Because Kirby et al did not report pregnancy data separately for young men and women we could not include their data in the meta-analyses. For the sexes combined they found no significant treatment effect (0.83, 0.34 to 2.01).¹⁶

Discussion

The results of our systematic review show that primary prevention strategies do not delay the initiation of sexual intercourse or improve use of birth control among young men and women. Meta-analyses showed no reduction in pregnancies among young women, but data from five studies, four of which evaluated abstinence programmes and one of which evaluated a school based sex education programme, show that interventions may increase pregnancies in partners of male participants.

Most of the participants in over half of the studies in our systematic review were African-American or Hispanic, thus over-representing lower socioeconomic groups. The interventions may be more successful in other populations. In all but five studies, participants in the control group received a conventional intervention rather than no intervention. It is possible that the control interventions had some effect on the outcomes and the tested interventions were not potent enough to exceed this effect. Finally, only eight of the 22 studies scored over 2 points out of the possible 4 points in the quality assessment. However, as poor methodological quality is more often associated with overestimates than underestimates of treatment effects it is unlikely that methodological weaknesses can explain the failure of the interventions to influence the outcomes measured.

This review shows that we do not yet have a clear solution to the problem of high pregnancy rates among adolescents in countries such as the United States, the United Kingdom, and Canada.

Direction of future research

There is some evidence that prevention programmes may need to begin much earlier than they do. In a recent systematic review of eight trials of day care for disadvantaged children under 5 years of age, long term follow up showed lower pregnancy rates among adolescents.¹⁷ We need to investigate the social determinants of unintended pregnancy in adolescents through large longitudinal studies beginning early in life and use the results of the multivariate analyses to guide the design of prevention interventions. We

What is already known on this topic

Unintended pregnancies among adolescents pose a considerable problem for the young parents, the child, and society

What this study adds

Primary prevention strategies evaluated to date do not delay the initiation of sexual intercourse or improve use of birth control among adolescents

Primary prevention strategies have not reduced the rate of pregnancies in adolescent women

Meta-analysis of five studies, four of which evaluated abstinence programmes, has shown an increase in pregnancies in partners of male participants

should carefully examine countries with low pregnancy rates among adolescents. For example, the Netherlands has one of the lowest rates in the world (8.1 per 1000 young women aged 15 to 19 years), and Ketting and Visser have published an analysis of associated factors.¹⁸ In contrast, the rates are 93 per 1000 in the United States,¹⁹ 62.6 per 1000 in England and Wales,²⁰ and 42.7 per 1000 in Canada.²¹ We should examine effective programmes designed to prevent other high risk behaviours in adolescents. For example, Botvin et al found that school based programmes to prevent drug abuse during junior high school (ages 12-14 years) resulted in important and durable reductions in use of tobacco, alcohol, and marijuana if they taught a combination of social resistance skills and general life skills, were properly implemented, and included at least two years of booster sessions.²²

Few sexual health interventions are designed with input from adolescents. Adolescents have suggested that sex education should be more positive with less emphasis on anatomy and scare tactics; it should focus on negotiation skills in sexual relationships and communication; and details of sexual health clinics should be advertised in areas that adolescents frequent (for example, school toilets, shopping centres).²³ None of the interventions in this review focused on strategies for improving the quality of sexual relationships. Sexual exploitation, lack of mutual respect, and discomfort in voicing sexual needs and desires are common problems in adulthood. Interventions to help adolescents learn about healthy sexual relationships need to be designed and evaluations of these interventions that follow the adolescents into adulthood should be done.

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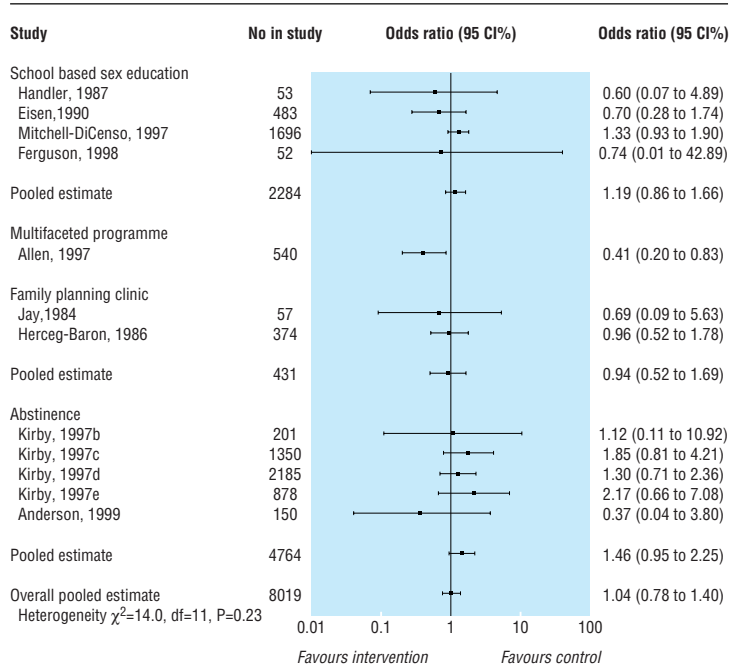


Fig 4 Effect of interventions on rates of pregnancy in adolescent women

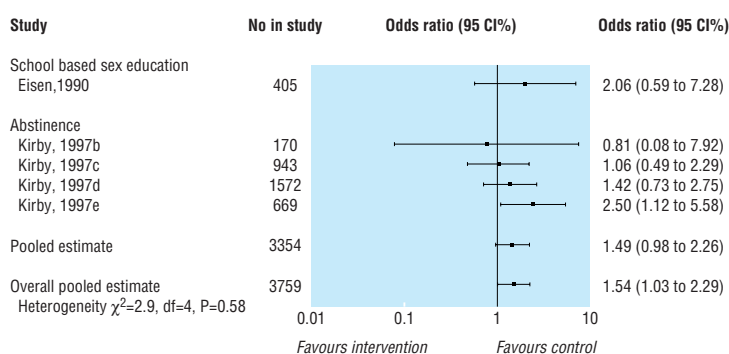


Fig 5 Effect of interventions on rates of pregnancy in partners of young men

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Limits of teacher delivered sex education: interim behavioural outcomes from randomised trial

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Abstract

Objective To determine whether a theoretically based sex education programme for adolescents (SHARE) delivered by teachers reduced unsafe sexual intercourse compared with current practice.

Design Cluster randomised trial with follow up two years after baseline (six months after intervention). A process evaluation investigated the delivery of sex education and broader features of each school.

Setting Twenty five secondary schools in east Scotland.

Participants 8430 pupils aged 13-15 years; 7616 completed the baseline questionnaire and 5854 completed the two year follow up questionnaire.

Intervention SHARE programme (intervention group) versus existing sex education (control programme).

Main outcome measures Self reported exposure to sexually transmitted disease, use of condoms and contraceptives at first and most recent sexual intercourse, and unwanted pregnancies.

Results When the intervention group was compared with the conventional sex education group in an intention to treat analysis there were no differences in sexual activity or sexual risk taking by the age of 16 years. However, those in the intervention group reported less regret of first sexual intercourse with most recent partner (young men 9.9% difference, 95% confidence interval -18.7 to -1.0; young women 7.7% difference, -16.6 to 1.2). Pupils evaluated the intervention programme more positively, and their knowledge of sexual health improved. Lack of behavioural effect could not be linked to differential quality of delivery of intervention.

Conclusions Compared with conventional sex education this specially designed intervention did not reduce sexual risk taking in adolescents.

Introduction

In Britain problems associated with young people's sexual health include high rates of teenage pregnancy,¹ a rising incidence of sexually transmitted diseases, and unsatisfactory early heterosexual relationships.^{2,3}

Several overviews of sexual health programmes for adolescents have concluded that sex education can beneficially affect behaviour, although the evidence comes almost entirely from quasi-experimental studies rather than randomised trials.⁴⁻⁶

Sex education is more likely to influence behaviour if it is narrowly focused, has a clear behavioural message, and develops negotiation skills.^{7,8} To date, school sex education has been delivered by teachers, outside experts, older pupils, or a combination of all three.⁹ As most UK secondary schools have teachers designated to deliver sex education as part of the curriculum,¹⁰ this is the most sustainable mode of delivery.

Between 1993 and 1996 a sex education programme delivered by teachers was developed for 13-15 year olds in Scotland. We used a randomised trial to evaluate the programme between 1996 and 1999.

SHARE programme

The SHARE intervention entails five days' teacher training and a programme of 10 sessions in the third year of secondary school (at 13-14 years) and 10 in the fourth year (at 14-15 years). The programme aims to reduce unsafe sexual behaviours, reduce unwanted pregnancies, and improve the quality of sexual relationships. It was developed and piloted in Scotland over two years in consultation with teachers, sex education specialists, and education and health promotion departments.¹¹

The psychosocial and sociological theoretical basis of the programme has been set out previously.¹² The