

- 9 Dickersin K. The existence of publication bias and risk factors for its occurrence. *JAMA* 1990;263:1385-9.
- 10 Guyatt GH, DiCenso A, Farewell V, Willan A, Griffith L. Randomized trials versus observational studies in adolescent pregnancy prevention. *J Clin Epidemiol* 2000;53:167-74.
- 11 Jadad AR, Moore RA, Carroll D, Jenkinson C, Reynolds DJM, Gavaghan DJ, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials* 1996;17:1-12.
- 12 Handler AS. *An evaluation of a school-based adolescent pregnancy prevention program*. Chicago, IL: University of Illinois at Chicago, 1987 (PhD thesis).
- 13 Moberg DP, Piper DL. The healthy for life project: sexual risk behavior outcomes. *AIDS Educ Prev* 1998;10:128-48.
- 14 Aarons SJ, Jenkins RR, Raine TR, El-Khorazaty MN, Woodward KM, Williams RL, et al. Postponing sexual intercourse among urban junior high school students—a randomized controlled evaluation. *J Adolesc Health* 2000;27:236-47.
- 15 Allen JP, Philliber S, Herrling S, Kuperminc GP. Preventing teen pregnancy and academic failure: experimental evaluation of a developmentally based approach. *Child Dev* 1997;64:729-42.
- 16 Kirby D, Korpi M, Adivi C, Weissman J. An impact evaluation of project SNAPP: an AIDS and pregnancy prevention middle school program. *AIDS Educ Prev* 1997;9(suppl 1):44-61.
- 17 Zoritch B, Roberts I, Oakley A. Day care for preschool children. *Cochrane Database Sys Rev* 2000;(2):CD000564.
- 18 Ketting E, Visser AP. Contraception in the Netherlands: the low abortion rate explained. *Patient Educ Couns* 1994;23:161-71.
- 19 Alan Guttmacher Institute. *United States pregnancy rates for teens, 15-19*. www.teenpregnancy.org/resources/data/prates.asp (accessed 25 Mar 2002).
- 20 Office for National Statistics. *Population trends*. London: Stationery Office, 2000 www.statistics.gov.uk/themes/population/download/pt99book.pdf (accessed 24 Mar 2002).
- 21 Statistics Canada. *Canada pregnancy rates for teens, 15-19*. Ottawa: Statistics Canada, 1997.
- 22 Botvin GJ, Baker E, Dusenbury L, Botvin EM, Diaz T. Long-term follow-up results of a randomized drug abuse prevention trial in a white middle-class population. *JAMA* 1995;273:1106-12.
- 23 DiCenso A, Borthwick VW, Busca CA, Creatura C, Holmes JA, Kalagian WF, et al. Completing the picture: adolescents talk about what's missing in sexual health services. *Can J Public Health* 2001;92:35-8.

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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,<sup>1</sup> a rising incidence of sexually transmitted diseases, and unsatisfactory early heterosexual relationships.<sup>2,3</sup>

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.<sup>4-6</sup>

Sex education is more likely to influence behaviour if it is narrowly focused, has a clear behavioural message, and develops negotiation skills.<sup>7,8</sup> To date, school sex education has been delivered by teachers, outside experts, older pupils, or a combination of all three.<sup>9</sup> As most UK secondary schools have teachers designated to deliver sex education as part of the curriculum,<sup>10</sup> 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.<sup>11</sup>

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

programme combines active learning (for example, work in small groups and games), information leaflets on sexual health, and development of skills, primarily through the use of interactive video but also through role playing.<sup>11</sup> It has the 10 characteristics that Kirby identified as necessary for effective programmes.<sup>8</sup>

In the 12 control schools sex education for third and fourth years varied from seven to 12 lessons in total and was primarily devoted to provision of information and discussion. Only two schools routinely demonstrated how to handle condoms, none systematically developed negotiation skills for sexual encounters, and teachers' training in sex education was generally limited.

## Methods

### Recruitment and randomisation of schools

We invited all 47 non-Catholic state schools within 24 km of the main cities in Tayside and Lothian regions (excluding pilot schools) to participate. We recruited 25 schools and allocated them by balanced randomisation<sup>13</sup> to deliver the intervention programme or to continue with their existing sex education.

### Surveys

We recruited two successive cohorts of third year secondary school pupils (aged 13-14 years) in 1996 and 1997 and followed them up at the start of their fifth year (at 15-16 years), about six months after completion of the programme. Parents were informed by letter of the research and the intervention programme and were given the opportunity to withdraw their children. Researchers explained the study to individual classes and answered questions. Pupils had the option to withdraw or to omit questions they did not wish to answer.

### Process evaluation

We investigated the general school context, the extent and quality of delivery of the intervention and control programmes, and pupils' responses to the programmes. We collected data through interviews, questionnaires, group discussions, and classroom observation.

### Statistical methods

In all but one case we used a restricted randomisation test for differences between arms of the trial.<sup>13</sup> This method is a robust procedure that allows confidence intervals to be calculated directly for the quantities of interest.<sup>14</sup>

For the outcome of unwanted pregnancy (data unavailable in one local authority) we based tests and confidence intervals on the random effects logistic regression.

## Results

### Participant flow and follow up

In total 7616 pupils provided information at baseline and 5854 at follow up. One school did not take part in the baseline survey. Other non-responders at baseline (6%) were mainly persistent absentees, with only 32 pupils and seven parents refusing to take part. The response rate to the questionnaire after the intervention was lower because some pupils had left school. The response rates were similar in each arm of the trial.

The characteristics of teachers, including sex, age, experience in sex education, main subject, or seniority, were similar in both groups. According to the 1991 census data the baseline sample was representative of all 14 year olds in Scotland in terms of social class and family structure, though of course Catholic young people were under-represented.

**Table 1** Comparison of arms of trial on sexual behaviour (restricted randomisation tests of school means, except for pregnancies). Figures are numbers\* (percentage) of young people

	Intervention	Control	Difference (95% CI)†	P value‡
<b>Experience of sexual intercourse after 1st year (inexperienced before 1st year programme)</b>				
Young men	263/1117 (23.6)	298/1246 (23.9)	-0.4 (-5.7 to 4.9)	0.89
Young women	423/1330 (31.8)	445/1350 (33.0)	-1.2 (-5.3 to 3.0)	0.59
<b>First intercourse without condom after 1st year (inexperienced before 1st year programme)</b>				
Young men	57/1099 (5.2)	70/1224 (5.7)	-0.5 (-2.5 to 1.5)	0.63
Young women	127/1309 (9.7)	120/1320 (9.1)	0.6 (-1.9 to 3.1)	0.66
<b>Any evidence of sex unprotected against STDs ever (whole follow up sample)‡</b>				
Young men	175/1252 (14.0)	191/1376 (13.9)	0.1 (-2.1 to 2.3)	0.93
Young women	364/1534 (23.7)	337/1520 (22.2)	1.6 (-2.4 to 2.9)	0.45
<b>Mean score for condom use (1=never, 5=always) (sexually experienced)</b>				
Young men	3.80 (n=421)	3.79 (n=451)	0.0 (-0.2 to 0.2)	0.93
Young women	3.51 (n=639)	3.58 (n=623)	-0.1 (-0.3 to 0.1)	0.55
<b>Most recent intercourse without condom (sexually experienced)</b>				
Young men	142/423 (33.6)	158/453 (34.9)	-1.3 (-5.9 to 3.3)	0.60
Young women	289/644 (44.9)	275/625 (44.0)	0.9 (-5.7 to 7.4)	0.81
<b>Most recent intercourse with oral contraception, with or without condom (sexually experienced)</b>				
Young men	79/423 (18.7)	96/453 (21.2)	-2.5 (-8.0 to 2.9)	0.38
Young women	196/644 (30.4)	175/625 (28.0)	2.4 (-4.1 to 8.9)	0.48
<b>Unwanted pregnancies (young women given unmodified questionnaire)§</b>				
Young women	48/1201 (4.0)	35/916 (3.8)	1.0 (0.6 to 1.8)	0.91

\*Denominators exclude participants with missing outcome data and "don't know" responses to questions about contraceptives.

†Confidence interval and P value from restricted randomisation test of school means except for unwanted pregnancies for which they are from random effects logistic regression adjusted for baseline characteristics.

‡Any report of sex without condoms for three specific events of intercourse or report of own pregnancy or that of girlfriend or answering less than "always" or "most of the time" to "How often did you ever use a condom?"

§Pregnancy deemed unwanted if young woman reported she did not want it or pregnancy had ended in termination; excludes nine schools where question could not be asked: tested by random effects regression.

**Table 2** Results for quality of sexual relationships by arm of trial. Figures are numbers\* (percentage) of participants

	Intervention	Control	Difference (95% CI)†	P value‡
<b>Regret of first sexual intercourse (first experience after 1st year of programme)</b>				
Young men	211 (18.0)	249 (18.1)	-0.1 (-5.9 to 5.7)	0.98
Young women	361 (34.6)	381 (33.1)	1.6 (-6.1 to 9.2)	0.69
<b>Regret of first sexual intercourse with most recent partner (experienced &gt;1 partner)</b>				
Young men	157 (9.6)	170 (19.4)	-9.9 (-18.7 to -1.0)	0.02
Young women	304 (26.0)	285 (33.7)	-7.7 (-16.6 to 1.2)	0.09
<b>Pressure at first sexual intercourse (first experience after 1st year of programme)</b>				
Young men	242 (13.6)	274 (15.7)	-2.1 (-8.1 to 4.0)	0.52
Young women	402 (19.2)	415 (21.5)	-2.3 (-8.5 to 3.9)	0.49
<b>Pressure with most recent partner (experienced &gt;1 partner)</b>				
Young men	184 (14.1)	195 (20.5)	-6.4 (-13.7 to 0.9)	0.09
Young women	326 (13.5)	318 (14.8)	-1.3 (-5.8 to 3.2)	0.60
<b>Mean enjoyment of last sexual intercourse (5=strongly agree, 1=strongly disagree) (&gt;1 experience of sexual intercourse)</b>				
Young men	4.57 (n=284)	4.54 (n=292)	0.0 (-0.1 to 0.1)	0.57
Young women	4.29 (n=502)	4.27 (n=484)	0.0 (-0.1 to 0.2)	0.83

\*Denominators exclude participants with missing outcome data and "don't know" responses to questions about regret.

†Confidence interval and P value from restricted randomisation test of school means.

### Delivery of intervention

Initially 80 teachers were trained to deliver the intervention programme. In 10 of the 13 intervention schools almost all pupils received over 15 sessions, including those on sexual negotiation and use of condoms. In three schools timetabling and the low priority attached to sex education meant that most of the pupils did not receive this minimum package.<sup>15</sup> In six schools timetabling constraints and teacher mobility led to non-trained teachers delivering the programme to a small minority of classes.

### Sexual behaviour

Overall 41% of young women (1278/3090) and 33% of young men (890/2692) reported having had sexual intercourse by the two year follow up. There were no differences between the groups in any of the main behavioural measures (table 1).

The most important baseline factors influencing sexual experience at age 16 (as at 14<sup>16</sup>) were family composition, spending money, and parental monitoring.

### Quality of sexual relationships

There were no differences between groups in regret about or pressure at first intercourse for those experiencing this after the first year of the programme (table 2). For those with more than one partner there was evidence that those in the intervention group reported less regret at the timing of their first intercourse with their most recent partner, and fewer young men in the intervention arm reported pressure at this event. Overall there were high levels of reported enjoyment of most recent sexual intercourse, with no difference between arms of the trial.

### Pupils' knowledge and evaluation of sex education

We calculated a mean score from eight questions on practical knowledge about sexual health. Pupils in the intervention arm were more knowledgeable than those in the control arm (table 3), with young men being less informed than young women in each arm. Pupils in the intervention arm had higher scores about how well sex education about five practical issues had been covered in school (table 3).

### Discussion

In comparison with conventional sex education, a programme specially developed to incorporate current theories on behavioural change had a limited beneficial effect on the quality of relationships but no effect on use of condoms for the third of pupils who have had sexual intercourse by the age of 16 years. These results could be interpreted as evidence of the failure of the programme, the delivery, or the evaluation.

### Programme

There are several reasons why this intervention programme might not affect sexual behaviour compared with conventional programmes. Firstly, more of the young people in our study used condoms than we had expected from data from the early 1990s.<sup>17, 18</sup> This corresponds with other recent findings<sup>19</sup> and makes the further reduction of unsafe sex by a new programme much more challenging.

Secondly, the impact of a 20 period school sex education programme might be unimportant compared with long term and pervasive influences<sup>8</sup> from, for instance, family, local culture, and the mass media. Skills based exercises in 40-80 minute lessons might be too short to develop sexual interaction skills and too distant to be remembered when needed.

A third possibility is that skills based lessons might require higher motivation to be successful, implying that participants should opt into an intervention. Psychological models of the antecedents of action emphasise motivation, yet in UK secondary schools personal and social education is perceived by pupils to require little attention or effort because there are no exams. If active volunteering is critical to the success of behavioural interventions, however, it would be difficult to recruit young men without innovative approaches.<sup>20</sup>

**Table 3** Pupils' knowledge about sexual health and evaluation of sex education by arm of trial. Figures are mean scores (number of participants\*)

	Intervention	Control	Difference (95% CI)†	P value‡
<b>Score for knowledge about sexual health (all)‡</b>				
Young men	4.35 (n=1200)	3.66 (n=1343)	0.7 (0.2 to 1.2)	0.003
Young women	5.11 (n=1489)	4.66 (n=1469)	0.5 (0.1 to 0.9)	0.008
<b>Score for evaluation of sex education (all)§</b>				
Young men	5.08 (n=1233)	4.74 (n=1378)	0.3 (0.1 to 0.6)	0.0003
Young women	5.04 (n=1510)	4.48 (n=1485)	0.6 (0.2 to 0.9)	0.0006

\*Denominators exclude participants with missing data.

†Confidence interval and P value from restricted randomisation test of school means.

‡Range of scores from -8 (poor) to 8 (good).

§1=can't remember any items, 6=all items very well covered.

## Delivery

Possibly the intervention programme may be effective but was not delivered as intended. However, when we analysed our data taking into account the extent and quality of delivery of sex education we got the same results as the intention to treat analysis, suggesting that the lack of effectiveness cannot be attributed to differential quality of delivery.

The intervention might not have been delivered as well as an established programme that had been developed over years to suit teachers' needs. However, the intervention programme was not perceived to have been imposed against teachers' will<sup>15</sup>; most had been consulted about participating in the trial and the training gave them a sense of ownership of the programme.

## Evaluation

At follow up only about one third of the respondents reported having had sexual intercourse and they are likely to be those who are least responsive to interventions delivered by teachers. The programme may have influenced the behaviour of the remaining two thirds of the sample, but this will be detected only in the planned future follow ups. Furthermore, our analysis did not distinguish between those who had received only the first year of the programme and those who had received the full two years before having sex.

Although the groups were well balanced, the design of the study could have been inadequate to detect real effects. Comparison with sex education in control schools might have obscured any effect if some control programmes also influenced behaviour. Furthermore, use of self assessments of sexual relationships as an outcome is problematic because the intervention may have changed perceptions or reporting, or both. However, the good internal consistency of our follow up data does not support this interpretation.

Finally, the intervention programme might have been effective with certain, as yet unidentified, subgroups, but the effects are obscured within the whole sample.

## Conclusion

The results imply that the potential for teacher delivered, whole class sex education to influence sexual behaviour in adolescents might have already been reached by conventional provision. If behavioural change among this age group is a central objective of school sex education then it should be further refined and other means of delivery should be rigorously evaluated. The intervention programme was rated more positively by pupils than comparison programmes, led to greater practical knowledge about sexual health, and did not encourage earlier sexual activity. We are following up these young people to the age of 20 to assess any effect on the cumulative rate of abortion, an outcome measure uninfluenced by reporting bias or attrition.

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## What is already known on this topic

Despite the widespread assumption that sex education delivered by teachers can reduce sexual risk taking in young people, there have been few randomised trials large enough to show this and none in the United Kingdom

Several quasi-experimental studies have concluded that sex education is effective, but most randomised trials suggest it is not

## What this study adds

Improvements in teacher delivered whole class sex education have some beneficial effect on the quality of young people's sexual relationships but do not influence sexual behaviour

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A longer version of this report can be found at [www.msoc-mrc.gla.ac.uk/Reports/Pages/share\\_MAIN.html](http://www.msoc-mrc.gla.ac.uk/Reports/Pages/share_MAIN.html)

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- 1 Social Exclusion Unit. *Teenage pregnancy*. London: Stationery Office, 1999.
- 2 Holland J, Ramazanoglu C, Sharpe S, Thomson R. *The male in the head: young people, heterosexuality and power*. London: Tufnell Press, 1998.
- 3 Wight D, Henderson M, Raab G, Abraham C, Buston K, Scott S, et al. Extent of regretted sexual intercourse among young teenagers in Scotland: a cross-sectional survey. *BMJ* 2000;320:1243-4.
- 4 NHS Centre for Reviews and Dissemination. Preventing and reducing the adverse effects of unintended teenage pregnancies. *Effective Health Care* 1997;3:1-12.
- 5 Franklin C, Grant D, Corcoran J, Miller PO, Bultman L. Effectiveness of prevention programs for adolescent pregnancy: a meta-analysis. *J Marriage Family* 1997;59:551-67.
- 6 Aggleton PA, Baldo M, Grunseit A, Kippax S, Slutkin G. Sexuality education and young people's sexual behaviour: a review of studies. *J Adolesc Res* 1997;12:421-53.
- 7 Kirby D, Short L, Collins J, Rugg D, Kolbe L, Howard M, et al. School-based programs to reduce sexual risk behaviors: a review of effectiveness. *Public Health Rep* 1994;109:339-60.
- 8 Kirby D. Sexuality and sex education at home and school. *Adolesc Med* 1999;10:195-209.
- 9 Mellanby AR, Phelps FA, Crichton NJ, Tripp JH. School sex education: an experimental programme with educational and medical benefit. *BMJ* 1995;311:414-7.
- 10 Buston K, Wight D, Scott S. Difficulty and diversity: the context and practice of sex education. *Br J Sociol Educ* 2001;22:353-68.
- 11 Wight D, Abraham C. From psycho-social theory to sustainable classroom practice: developing a research-based teacher-delivered sex education programme. *Health Educ Res* 2000;15:25-38.
- 12 Wight D, Abraham C, Scott S. Towards a psycho-social theoretical framework for sexual health promotion. *Health Educ Res* 1998;13:317-30.
- 13 Raab GM, Butcher I. Balance in cluster randomized trials. *Stat Med* 2001;20:351-65.
- 14 Tukey JW. Tightening the clinical trial. *Control Clin trial* 1993;14:266-85.
- 15 Buston K, Wight D, Hart G, Scott S. Implementation of a teacher-delivered sex education programme: obstacles and facilitating factors. *Health Educ Res* 2002;17:59-72.
- 16 Henderson M, Wight D, Raab GM, Abraham C, Buston K, Hart G, Scott S. Heterosexual risk behaviour among young teenagers in Scotland. *J Adolescence* (in press).
- 17 Johnson AM, Wadsworth J, Wellings K, Field J. *Sexual attitudes and lifestyles*. London: Blackwell Scientific, 1994.
- 18 West P, Wight D, Macintyre S. Heterosexual behaviour of 18-year-olds in the Glasgow area. *J Adolescence* 1993;16:367-96.
- 19 Wellings K, Nanchahal K, Macdowall W, McManus S, Erens B, Mercer CH, et al. Sexual behaviour in Britain: early heterosexual experience. *Lancet* 2001;358:1843-50.
- 20 Abraham C, Wight D. Developing HIV-preventive behavioural interventions for young people in Scotland. *Int J STD AIDS* 1996;7(suppl 2):39-42.

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