

Peer-led and adult-led school health education: a critical review of available comparative research

A. R. Mellanby, J. B. Rees and J. H. Tripp

Abstract

Peer-led health education in school is widely used. Advocates suggest it is an effective method based on the belief that information, particularly sensitive information, is more easily shared between people of a similar age. Critics suggest that this is a method not based on sound theory or evidence of effectiveness. This review evaluates school-based health education programmes which have set out to compare the effects of peers or adults delivering the same material. The identified studies indicated that peer leaders were at least as, or more, effective than adults. Although this suggests that peer-led programmes can be effective, methodological difficulties and analytical problems indicate that this is not an easy area to investigate, and research so far has not provided a definitive answer.

Introduction

This paper reviews published studies which compare peer-led with adult-led delivery of the same school-based health education programme under experimental conditions.

Peer-led health education has been advocated as a potentially effective method of providing health education in schools [e.g. (Health Education Authority, 1993)]. The term 'peer educators' generally refers to students delivering an educa-

tional programme who are of similar, or slightly older, age than the students receiving the programme. A rationale for using peer-educators relates to the social influences theoretical model, based on the theories of social learning (Bandura, 1976, 1986), social inoculation (McGuire, 1964) and social norms (Baric, 1977). These theories relate to the observation that '...friends seek advice from friends and are also influenced by the expectations, attitudes and behaviours of the groups to which they belong' (Lindsey, 1997).

Underlying this is a concept that peer influence may be stronger than that of adults such as teachers or 'experts'.

As a technique in education it is not new, the 'monitorial system' was used in the 1800s as a cheap method of giving information to pupils in English and French elementary schools (Hopkins, 1979). Peer-led education has been used extensively to meet a variety of educational objectives, such as tutoring of reading (Devin-Sheehan *et al.*, 1976), and peers have been used in a wide variety of health-related initiatives (Vriend, 1969; Davis *et al.*, 1977; Baldwin, 1978; McCue and Afifi, 1996). Peers have used many and diverse methods including presenting lectures/lessons, drama productions, supporting resource centres, operating hot-lines and one-to-one counselling (Lindsey, 1997). Peer-led education is not confined to school-age students, and projects have involved nurse tutoring (Costello, 1989) and even geriatric services (Weinrich *et al.*, 1993).

Although peer-education may appear attractive it has 'often been embraced with uncritical enthusiasm, and the problems and difficulties overlooked' (Health Education Authority, 1993).

Department of Child Health, University of Exeter, Exeter
EX2 5SQ, UK

Currently there is a lack of good evaluation, particularly of outcomes (Milburn, 1995; Orme and Starkey, 1999), and peer education has been criticized as being dogma based on faith rather than sound principles (Frankham, 1998). Peer-led education may be exciting and novel, and requested by younger teenagers, but there needs to be evidence for effectiveness before this process can be recommended for standard health education: 'health educators must carefully assess how to use peer educators to enhance their health promotion and disease prevention efforts' (Lindsey, 1997).

The logistics of training and programme delivery are considerable. Schools may not have convenient time when peer-leaders and students can be put together. Changes in the timetable such as additional assemblies, work experience and even fire-drill or fire alarms going off 'inadvertently' all combine to prevent the full implementation of programmes since it may be impossible to rearrange sessions. Peer-leaders' exams, illness and occasional over-exuberant extracurricular activities add to the difficulties. Some peer-leaders may not attend the same school as the students and they may require transportation, this often means one of the adult support staff driving them between destinations.

In a school-based programme the content and style of peer-led sessions can be affected by factors outside their control. Peer-leaders may be selected and trained for specific tasks, but as with any individuals what happens in classroom sessions is less easily predicted (Frankham, 1998). Peer-leaders working in schools are working in a social environment with written and other ill-defined rules and regulations. If the peer-leaders are, or have recently been, students at the school this may complicate their roles further and teachers may find this difficult. Peer-leaders may assume a semi-expert position, having been trained in specific areas, while teachers may be more used to dealing with them as children. A peer-leader's history in the school and their own disciplinary past may affect how they are perceived (Phelps *et al.*, 1994). Teachers passing classrooms where events may

seem less controlled than normal lessons may intervene with unpredictable results.

This report has not reviewed 'peer helping', co-facilitation or peer counselling. We have taken the term 'peer-educators' to refer to students delivering an educational curriculum who are of similar, or slightly older, age than the students receiving the programme. Two previous reviews which examined the effect of substance abuse prevention interventions suggested that those led by peers had greater effects on attitudes and behaviour (Tobler, 1986; Bangert-Drowns, 1988). However, these reviews have included peer-led or adult-led interventions between studies conducted at different times, using different methods and with different ages of students. This study evaluates health education interventions which set out to compare effects of peer or adults delivering similar material within a single study during normal school time.

Methods

The electronic databases *Medline* (United States National Library of Medicine) from 1966 to 1999, *ERIC* (Educational Resources Information Centre) from 1981 to 1999, *BIDS* (Bath Information and Data Services) from 1981 to 1999 and *PsycLit* from 1967 to 1999 were searched. A systematic search was made of these databases including the terms 'peer(s) or 'same age' in combination with 'trial(s) or experiment(s)' or 'health (education)' and 'school or college'.

The abstract texts from these results were examined for publications of studies involving health education or promotion. Further references were obtained from publications. Additionally, workers in this country involved in peer education were approached for information about published material.

Studies were included if they were carried out in normal school time, and provided comparisons of adult and peer delivery of similar health education programmes.

Results

Thirteen studies detailing comparative trials of peer-led and adult-led education in schools were found, 10 carried out in North America, one in Finland, one in Australia and one an international collaboration. Details of the studies are given in Table I.

Nine studies involved substance use prevention (mostly smoking), one alcohol education, one sexual health, one oral health and one testicular cancer. Two reports by Botvin *et al.* (Botvin *et al.*, 1984, 1990) were results from the same study published with data from immediate post-testing, and then with further intervention and data collection after 1 year. The reports by Murray *et al.* (Murray *et al.*, 1987) and Luepker *et al.* (Luepker *et al.*, 1982) represent the longer-term follow-up of earlier studies (Arkin *et al.*, 1981; Murray *et al.*, 1984). Shean *et al.* (Shean *et al.*, 1994) carried out a 5-year follow-up of 37% of the original sample described by Armstrong *et al.* (Armstrong *et al.*, 1990). All the trials included in the tables compared adult-led and peer-led interventions, some with additional controls receiving no intervention. Seven are described as randomized control trials.

No published trials or evaluations of effectiveness were found from studies carried out in British schools, although one publication gave preliminary details of a study in progress (Stephenson *et al.*, 1998). A study described by Lester *et al.* (Lester *et al.*, 1997) compared peer and adult instruction in resuscitation training, but has not been included in this review since this was not personal health education and peers provided instruction alongside adults who led the session. A further study by Kirby *et al.* (Kirby *et al.*, 1997) evaluated peer-led and adult-led sex education in separate arms of a randomized control study. This study found no effect from either intervention. However, no comparative analysis was made between the interventions and the study has not been included in this review.

Knowledge and attitudes

Seven studies reported evaluations of knowledge gains and attitudes, either anti-substance or atti-

tudes towards stopping use. There was only one study, relating to testicular cancer education, where the peer-led students gained less knowledge than the adult-led group. In the other studies peer-led students gained as much knowledge (Clarke *et al.*, 1986; Perry *et al.*, 1989) or more than the adult-led group (Jordheim, 1976; Botvin *et al.*, 1984, 1990; Laiho *et al.*, 1993). None of the studies reported that adults were more effective in altering attitudes, but three showed peers to be more effective (Botvin *et al.*, 1984, 1990; Laiho *et al.*, 1993).

Health-related behaviour

Table II summarizes the behavioural effects stratified by the level of evidence (Stevens *et al.*, 1995). Table II includes only those trials which have demonstrated some behavioural effect, either of one or both types of intervention, when compared to each other or a control group.

Eleven studies reported behavioural comparisons between adult-led and peer-led interventions with seven finding peer led more effective than adult led. One study found adult led more effective than peer led in males but the difference was not sustained at longer follow-up. Four studies found no significant difference between interventions. All 11 studies compared both peer-led and adult-led interventions with controls, finding peers more effective than controls in nine (one in females only) and adults more effective than controls in four. One adult-led group reported a negative effect on alcohol use compared to controls (Botvin *et al.*, 1990); no other studies reported negative results significant at the 5% level.

The majority of these studies compared same-age peer leaders with adults (whose ages were not given). In one study using a 'college' student, who was presumably older than the intervention students, a lower degree of knowledge gain was noted compared to the adult taught students. However, in two studies reporting behavioural effect (Botvin *et al.*, 1984, 1990; Clarke *et al.*, 1986) slightly older peers were as effective as the same-age peers in the remaining studies. Similarly there was no evidence of difference between studies

Table 1. Identified studies comparing peer-led and adult-led health education

Study	Study type	Target population	Intervention	Student numbers	Outcome measures and follow-up	Main results	Comments
Jordheim (1976)	Randomized trial of venereal disease education (VD).	Community College students New York.	Peer-led or adult-led curriculum on syphilis and gonorrhoea (ages of educators not given).	49 in peer-group, 48 in adult group.	Pre- and post-intervention questionnaires. Knowledge, attitude and behaviour (KAB) intention scores.	Peer-led compared to adult-led analysis of variance reported as showing greater improvement in knowledge ($P < 0.01$) and attitude to VD ($P < 0.01$) but no difference in attitude to prevention or behavioural intention.	Adult-led group mean knowledge scores decreased from pre- to post-test.
Luepker <i>et al.</i> (1985)	Controlled trial of smoking prevention.	Grade 7 students in three Minnesota schools.	Same age peer-led or adult teacher-led social influences programme and control programme.	1081 total at baseline (574 at 3 year assessment).	Questionnaires testing smoking behaviour, and saliva thiocyanate measurements at baseline and yearly over 3 years.	At 3 years. Smoking onset: control 23%, adult led 17%, peer led 22%, probability not given. Average cigarettes smoked per week: control 9; adult led 11; peer-led 5 ($P < 0.01$ between interventions). Mean thiocyanate levels reported different between interventions ($P < 0.01$).	Problems of school closure and school amalgamation. At baseline higher percentage of non-smokers in peer-led (57%), compared to adult-led (37%) or control (47%).
Botvin <i>et al.</i> (1984)	Randomized control trial of substance abuse prevention.	Grade 7 students in 10 New York suburban high schools.	Peer-led (Grade 10/11), adult teacher-led and control groups. Social influence programme. 20 sessions plus homework.	Pre-test, 1311, 1185 matched students pre- and post-test.	Pre- and 1 month post-intervention questionnaires. KAB plus saliva in bogus pipeline. Behaviour measures as daily, weekly, monthly use.	For peer-led programme. Less monthly smoking compared to adult ($P < 0.01$) and control ($P < 0.05$); weekly and daily measures not significant. Less monthly and weekly of marijuana use compared to teacher-led ($P < 0.01$) and control ($P < 0.002$). Less drinking reported compared to teacher-led ($P < 0.03$) and control ($P < 0.02$). Greater increases in knowledge and anti-substance attitudes compared to adult for all except smoking knowledge ($P < 0.0001$ to $P < 0.05$).	Poor overall effects of adult-led programme noted.
Clarke <i>et al.</i> (1986)	Randomized control study of smoking prevention.	Grade 7 students in 10 junior/senior high schools in Vermont.	Peer-led (Grade 9), teacher-led and expert health educator led 4 h of intervention based on social influences.	1321, two schools to each intervention and four to control.	Questionnaires at 6, 12 and 20 months. Saliva tests taken but described as not reliable.	At 20 months. Daily (i.e. yesterday) smoking change from baseline for females in teacher-led intervention lower than controls ($P = 0.05$) [approximately 6% decrease, compared to 5% increase in peer-led, 11% in control and 14% in expert-led]. Peer-led versus teacher-led significance not given. Other smoking estimates (weekly and monthly) and all male results not different by intervention at 5%. Attitude changes not different between interventions.	Differences in baseline daily smoking (teacher-led 8%, peer 13%, control 5% expert, 1%). Numeric data not provided in paper. Smoking onset not reported.

Table 1. Continued

Study	Study type	Target population	Intervention	Student numbers	Outcome measures and follow-up	Main results	Comments
Johnson <i>et al.</i> (1986)	Controlled trial of smoking prevention.	Nine high schools in Los Angeles.	Comparison of standard health messages and social influences programme, with and without same-age peer-led component and controls.	603 in peer-led arm, 635 in adult-led arm (2335 controls) (eight cells).	Questionnaires pre-intervention plus 1, 2 and 3 year post-testing. Attitudes and behaviour measures.	No main effects for any of the comparison analyses between peer-led and other interventions. At 1 year 37% peer-led and 46% adult-led students had smoked ($P = 0.12$). Attitude results not given.	Overall the study demonstrated some reduction in smoking onset in the social influences programme
Murray <i>et al.</i> (1987, 1998)	Two randomized control studies of smoking prevention.	Grade 7 students in 10 junior high schools in Minnesota.	Social influences programme delivered by adults or same-age peers with and without video; health consequences programme delivered by adults [control].	6974 students in two separate studies—one started in 1979 ($N = 3154$) the other in 1980 ($N = 3820$).	Questionnaire on smoking behaviour and saliva + CO for bogus pipeline. Pre-intervention plus 2, 3 and 5 year follow-up study I, and 2 and 4 year follow-up study II.	Study I: no significant differences in programme effect. Study II: reported lower onset smoking in both peer-led groups at 2 years (7% and 6%, difference) and weekly smoking in peer-led group without video at 4 years (3%) ($P < 0.05$).	Extensive analysis of attrition effects given. The comparison of peer and adult interventions in study II is described as 'posterior'. This report represents long-term follow up and greater detail of a previous study (Murray <i>et al.</i> , 1984).
Perry <i>et al.</i> (1989)	Controlled trial of alcohol education.	School students aged 11–18 international trial.	Same age Peer-led, adult-led and no intervention controls. Five 1 h sessions on decision making and social influences.	2536 students, 10 schools in peer-led, nine in adult, six control (Australia 828, Chile, 195, Norway 1306 and Swaziland 207).	pre- and 1 month post-intervention questionnaires KAB (alcohol use scale calculated including drinking recently and in last year, range 2.5–16.5).	No differences in knowledge or attitudes scores between peer-led and adult-led; both scores higher than control Students in peer-led programme had lower alcohol use scores ($P < 0.0003$ for baseline non-drinkers, $P < 0.04$ for baseline drinkers). Teacher-led results not significantly different from control on drinking.	One control school in Swaziland removed after they started teaching the programme. Same pattern of results at the country level.
Botvin <i>et al.</i> (1990) (see Botvin <i>et al.</i> , 1984 above)	Randomized control trial of substance abuse prevention.	Grade 8 students in New York suburban high schools.	Peer led ± booster, adult led ± booster (by older students grade 10–12) (four intervention groups) plus control. Social influences programme.	1185 matched students post-test and 998 at 1 year.	Pre-, 1 month post-intervention questionnaires, KAB plus saliva in bogus pipeline. Behaviour measures as daily, weekly, monthly use.	For peer-led programme. Less overall smoking compared to adult ($P < 0.0005$) and control ($P < 0.02$) groups. Less monthly and weekly use of marijuana use compared to teacher-led ($P < 0.03$); and monthly use compared to control ($P < 0.002$). Less drinking reported compared to teacher-led ($P < 0.002$) but not control. Greater increases in knowledge and anti-substance attitudes compared to adult for smoking alcohol and marijuana ($P < 0.002$).	See Botvin <i>et al.</i> (1984) above plus; negative effects of adult-led programme; documented poor adult-led programme implementation; attrition mentioned and assessed.

Table 1. *Continued*

Study	Study type	Target population	Intervention	Student numbers	Outcome measures and follow-up	Main results	Comments
Armstrong <i>et al.</i> (1990) ^a	Randomized controlled trial of smoking prevention.	Grade 7 (12 years) students in Australia.	Same age peer-led, adult-led and no intervention controls. Social influences programme of five sessions.	2366 students overall entered in study; 1505 followed for 2 year assessment.	Smoking behaviour and saliva tests for bogus pipeline. Pre-intervention, 1 and 2 year follow-up.	New smoking at 2 years. Girls: control (49.7%), teacher led (37.8%), peer-led (37.8%) [$P = 0.03$ for both interventions compared to control]. Boys: control (33.5%), teacher led (25.9%), peer-led (41.9%) [$P = 0.009$ teacher led compared to the other two groups].	Differences between intervention types not significant at 5% when adjusted for other smoking related factors (e.g. family smoking). Reported poor matching of intervention and control(2) school. Main results presented for 441 non-smokers at baseline. The number of new smokers reported is small.
Telch <i>et al.</i> (1990)	Randomized control trial of smoking prevention (interventions and some controls within same schools).	Grade 7 students in two California junior high schools (enrolled in social studies).	Video-taped social influences programme led by teachers or same-age peers, control with no intervention. Five 90 min sessions.	572 students, 121 in peer-led, 116 in adult-led, 200 and 135 in two control groups.	Pre- and post-intervention questionnaires on attitudes and behaviour. CO in expired air, and saliva (bogus pipeline). Follow-up within 1 year.	New smoking at post-test: peer-led 2.5%; adult-led 9.5%; control(1) 11.0%; control(2) 11.1%. Fewer transitions to experimental smoking in peer-led group compared to other three ($P < 0.05$); overall smoking onset significance not given.	
Laaho <i>et al.</i> (1993)	Controlled trial of oral health education.	13-year-old students in three secondary schools Finland.	Group I: expert-led lecture. Group II: peer-led lecture (14/15 year olds). Group III: self searching for information (control). 146 students in groups I and III, 166 in group II.	Questionnaire on knowledge and attitudes about 2 weeks after for Group II, and 2 months post-intervention for Groups I and II.	Peer to adult comparisons: Knowledge of gingivitis males $P = 0.03$, females not significant. Positive attitudes to oral hygiene females and males $P < 0.002$.	48% did not answer questionnaire in Group III, 12% in Group II and 8% in Group I.	
Prince (1995)	Controlled trial of smoking prevention.	Grade 1 and 12 students.	Six session smoking resistance programme delivered by same age peers or adult (non-teacher); 32 control; 31 adult-led; 30 peer-led.	Pre- and immediate and 1 month post-intervention questionnaire on smoking and attitudes.	At 1 month post-test smoking reduction reported in all groups with difference between both interventions and control given as $P < 0.0001$. No difference reported between interventions.	17% dropout. Recruitment details not given (all smoked).	

Table 1. Continued

Study	Study type	Target population	Intervention	Student numbers	Outcome measures and follow-up	Main results	Comments
Best <i>et al.</i> (1996)	Randomized control trial of testicular cancer education.	Grade 10 students in eight North Carolina high schools.	One 50 min instructional programme led by adult physician or male peer (college student); or no intervention control.	897 in intervention groups, 433 in control.	Knowledge and attitude questionnaires at 6 months (all groups) and 18 months post-intervention (adult intervention (adult versus peer only).	At 6 months. Significant increases in knowledge and positive attitudes for all intervention versus control ($P < 0.05$). Peer less knowledgeable on one of six knowledge questions at both 6 and 18 months (different questions). No attitude differences.	Attrition at 18 months 42%, not given at 6 months.

North American school grades are given for some interventions. Grade 7 is equivalent to the National Curriculum Year 8 (12/13 years of age), and Grade 8 = Year 9 (13/14 years) and Grade 10 = Year 11 (age 15/16). The main outcomes relate to the longest period of follow-up given within studies. Where proportions of students engaging in behaviours were cited these have been reported, otherwise probability values are given.

^aShean *et al.* (Shean *et al.*, 1994) carried out a follow-up study on 872 (37% of the sample described by Armstrong *et al.* (Armstrong *et al.*, 1990). The trends were similar to the previous follow-up with fewer boys smoking who had received the teacher-led intervention and fewer girls smoking who had either intervention smoking but no differences between the intervention types were significant at the 5% level. However, the smoking levels amongst those who were followed were markedly lower than among those tested at 2 years.

Table II. Summary of trial results where behavioural change was reported

Type of trial/publication	Targeted behaviours (summarized)	Peer versus adult	Peer versus control	Adult versus control
Randomized control trials				
Botvin <i>et al.</i> (1984) ^d	reducing smoking, alcohol and marijuana use	peer > adult	peer > control	NSD
Clarke <i>et al.</i> (1986) ^d	smoking prevalence, daily, weekly and monthly ^c	NSD	NSD	F: adult > control M: NSD
Murray <i>et al.</i> (1987): I	reducing smoking onset ^b	NSD	NSD	NSD
Murray <i>et al.</i> (1987): III	reducing smoking onset ^b	peer > adult.	peer > control	NSD
Botvin <i>et al.</i> (1990) ^d	reducing smoking, alcohol and marijuana use	peer > adult	peer > control	NSD
Telch <i>et al.</i> (1990)	smoking reduction.	peer > adult	peer > control	NSD
Armstrong <i>et al.</i> (1990)	in reducing smoking onset ^a	M: adult > peers F: NSD	M: NSD peer > control	adult > control
Non-randomized trials				
Luepker <i>et al.</i> (1983) ^e	smoking reduction.	peer > adult	peer > control	NSD
Johnson <i>et al.</i> (1986)	smoking onset ^b	NSD	peer > control	adult > control
Perry <i>et al.</i> (1989)	alcohol use	peer > adult	peer > control	NSD
Prince (1995) ^e	smoking cessation	NSD	peer > control	adult > control

NSD, No differences significant at 5%; >, $P < 0.05$ for difference; M, Males; F, Females.

^aDifference between intervention not significant when adjusted for other smoking-related factors and no significant difference found at 7 year follow-up (Shean *et al.*, 1994).

^bIntervention groups had social learning models while controls had other intervention (in remaining studies control groups: no intervention).

^cMajor difference in baseline smoking rates between groups.

^dStudies which used slightly older peers, the remainder same-age.

^eStudies which used external trained adults, the remainder schools' teachers.

using external adults or normal schools' teachers (see Table II).

Quality of evidence

The published studies found in this review concentrated on the measurement of the outcomes of knowledge, attitudes and behaviour. Although a description of programme content is given (Table II), details are lacking about the comparability of the extent of training, style of programme delivery and adherence to planned structure for the sessions. It is therefore not possible from these publications to assess the effects in relation to the quality of the programmes themselves.

In common with many school health education programmes (Kirby, 1984), several of the interventions described difficulty in adhering to the original experimental design. In one study, one of the schools was permanently closed during the follow-

up (Luepker *et al.*, 1983), one of the control schools in the international alcohol education programme started teaching the active intervention and another school was closed by floods (Perry *et al.*, 1989); in another study, Laiho states that one group of teachers forgot to administer some of the questionnaires (Laiho *et al.*, 1993).

Data collection and outcome measures

All studies used questionnaires to evaluate outcomes. In three studies the questionnaires were administered by the research team or other outsiders (Johnson *et al.*, 1986; Perry *et al.*, 1989; Best *et al.*, 1996), in one by teachers (Laiho *et al.*, 1993) and in the remainder the data collection methods were not stated. In addition to questionnaires, in seven smoking prevention studies saliva samples were collected. In two experiments these were used to measure thiocyanate levels which

may indicate recent smoking (Luepker *et al.*, 1983; Clarke *et al.*, 1986), although the results were given in only one (Luepker *et al.*, 1983). In five experiments they were used as a 'bogus pipeline' (Botvin *et al.*, 1984; Johnson *et al.*, 1986; Murray *et al.*, 1987; Armstrong *et al.*, 1990; Telch *et al.*, 1990)—the aim of this method is to encourage accurate self-reporting by suggesting that analysis of saliva samples can be done to corroborate answers without actually performing the analysis (Askers *et al.*, 1983).

Six of the studies gave numbers in each intervention type (Jordheim, 1976; Murray *et al.*, 1987; Armstrong *et al.*, 1990; Telch *et al.*, 1990; Laiho *et al.*, 1993; Prince, 1995), two gave numbers in groups of interventions (Clarke, 1986; Perry, 1989) and five gave only overall numbers in the study (Luepker *et al.*, 1983; Botvin *et al.*, 1984, 1990; Johnson *et al.*, 1986; Best *et al.*, 1996).

Analysis

All the studies presented results and analysis based on individual student's response to the intervention and were based on students present at times of evaluation (rather than an 'intention to treat' analysis). The reported studies described several different methodologies for considering pre-test and post-test data. In one study on dental hygiene, knowledge and attitude pre-test values were not measured (Laiho *et al.*, 1993) and in two where no difference in pre-test was found these scores were not included in outcome analysis (Jordheim, 1976; Best *et al.*, 1996). In six studies, results at post-test were given for groups of students dependent on their pre-test scores on the target behaviour, e.g. non-smokers at pre-test (Luepker *et al.*, 1983; Clarke *et al.*, 1986; Armstrong *et al.*, 1990; Johnson *et al.*, 1990; Telch *et al.*, 1990; Prince, 1995). In some of the studies pre-test results were markedly different across the groups. Clarke reported that pre-intervention smoking prevalence was 2% in the adult-led group and 13% in the peer-led group, and post-test results were presented for comparative reduction in smoking prevalence (Clarke *et al.*, 1986). In three studies pre-intervention values were used as covariates in

an analysis of variance, although it was not entirely clear whether the intervention pre-test values, and therefore matched schools, were different (Botvin *et al.*, 1984, 1990; Perry *et al.*, 1989). In the largest smoking prevention study (Murray *et al.*, 1987) pre-intervention details were given and included in the analysis.

Attrition

In any study measuring pre- and post-intervention variables, missing individuals present problems, particularly when the follow-up time extends over several years. Johnson *et al.* (Johnson *et al.*, 1986) noted an attrition of 65% at the end of the intervention, Luepker *et al.* (Luepker *et al.*, 1983) around 50%, Best *et al.* (Best *et al.*, 1996) 42%, Armstrong *et al.* (Armstrong *et al.*, 1990) 36%, Telch *et al.* (Telch *et al.*, 1990) 19%, and Botvin *et al.* (Botvin *et al.*, 1990) noted 24% missing at the final assessment and greater attrition amongst certain groups, such as alcohol users, and Prince (Prince, 1995) reported that 17% did not complete the study. Three studies gave comparative numbers missing between interventions: Laiho *et al.* (Laiho *et al.*, 1993) where due to non-collection of questionnaires 50% were missing in the control group; Murray *et al.* (Murray *et al.*, 1987) where attrition was stated (ranging from 13.2 to 30.8%) and accounted for in the analysis; and Armstrong *et al.* (Armstrong *et al.*, 1990) where attrition was very similar in all groups. The remaining studies did not mention attrition (Botvin *et al.*, 1984; Clarke *et al.*, 1986; Perry *et al.*, 1989).

In addition, students are not always in school either for the intervention or the questionnaires, but only two studies mentioned non-attendance [Luepker *et al.* (Luepker *et al.*, 1983) around 8% and Clarke *et al.* (Clarke *et al.*, 1986) 1–5%], although Murray *et al.* (Murray *et al.*, 1987) noted that 93% of students on roll completed the pre-intervention questionnaire.

Theoretical basis

Three of the studies were based on traditional information teaching methods (Jordheim, 1976; Laiho *et al.*, 1993; Best *et al.*, 1996). The

remainder of the studies stated that the health education programmes were related to a social influences model. This applies to all the studies which measured health behaviour outcomes. These studies describe dealing with social pressures and developing counteractive techniques to combat pressure. Although details are given for some of the content, insufficient information was given to allow an assessment of the outcome in relation to the application of specific theoretical components.

Discussion

This review identified 13 experimental study comparisons of peer-led and adult-led health education programmes in schools. The results in Table II indicate that in the majority of trials that reported any behavioural effects of the intervention, peer-led interventions were at least as, or more, effective than adult-led interventions. In the one randomized trial that reported fewer boys starting smoking in the adult-led group, these results were not sustained in multivariable analysis adjusting for factors such as family smoking levels (Armstrong *et al.*, 1990) and not sustained in longer-term follow-up (Shean *et al.*, 1994).

It is likely that trial publications are markedly biased towards studies with positive and significant outcomes (Dickersin, 1990). One additional study (Guthrie *et al.*, 1996) has published methodology but results appear not to have been published. There were many (more than 50) educational interventions which have used peer-led components; however, only comparative studies were investigated for evidence of effectiveness. There have been other comparative investigations using peers and experts in, for example, clinic settings (Quirk *et al.*, 1993). The absence of UK research publications may reflect a difference in approach to health education evaluation and the nature of the results collected. The emphasis is less on the need to evaluate the behavioural effects than to assess important educational aspects of health education in Britain (Rivers and Aggleton, 1993; Tones, 1996). The identification of two studies in

progress, one our own, may indicate a change in attitudes toward school health education evaluation.

A fundamental question in assessing these reports is whether the studies are comparing equivalent procedures. Peer-led education was probably not the norm in any school, even in health education. Although these studies have evaluated new programmes in schools, the peer-led component is likely to be regarded as more 'novel' and there may be more effort given to the accuracy of implementation. It is also not clear exactly how the programmes described relate to the theories included in a social influences model. The poor implementation of the adult-led comparative programme was raised (Botvin *et al.*, 1984, 1990). The findings in some of the studies that students receiving the adult-led component were actually worse informed at post-intervention than pre-intervention (Jordheim, 1976) or had negative behavioural outcomes compared to controls with no intervention (Botvin *et al.*, 1990) questions the style and methods used by the adults. In the second study by Botvin *et al.* (Botvin *et al.*, 1990), a 'restricted sample' analysis of groups which had received a 'high fidelity' adult-led intervention did have lower substance use than controls, and, although not analysed in the paper, there appears not to have been significant differences between this group and the peer-led group. It is possible that some adult-led health education relies too heavily on didactic teaching methods previously shown to have poor effects (Kirby, 1984; Rundall and Bruvold, 1988). Thus it may sometimes be the methodology rather than the deliverer of the programme which is being tested. It has been suggested that peer-leaders are easier to train than adult teachers because they 'possess fewer preconceived notions' (Perry, 1989) and since they change from year to year their novelty is less likely to wear off. However, none of these programmes have evaluated either adult-led or peer-led interventions delivered over several years or as part of a service rather than research programme. Thus even if it is accepted that peer-educators are probably more effective than adults in achieving positive

results, it is still unclear whether the results can be sustained.

Unit of analysis

The results presented in the reviewed publications are based on the individual results of students in schools. It has been argued that since the school and not the student is the unit of allocation in such interventions (Murray and Hannan, 1990), the school should be the unit of analysis. The reasoning is that 'intact social groups such as schools often display measurable intraclass correlation across a variety of measures' (Rooney and Murray, 1996). Thus using the individual misleadingly increases the power of a study and increases the likelihood of type I error. Within the reviewed studies, four made reference to the unit of analysis: Murray *et al.* (Murray *et al.*, 1987) commenting on the results suggested 'they are not as valuable perhaps [as using the school as the unit of analysis] but they can provide additional evidence in support of particular interventions'. Perry *et al.* (Perry *et al.*, 1989) found that using the school as the unit of analysis reduced the significance of all of the findings to above the 5% level. Botvin *et al.* (Botvin *et al.*, 1990) suggested 'there is no easy solution to this problem'. Armstrong *et al.* (Armstrong *et al.*, 1990) discussed using the class as the unit of analysis, but decided against this considering that the mixing of classes over time would reduce the intra-class correlation, that using the individual would make the results more easily interpreted and that since the school identifier had been removed inadvertently from the data, this prevented such analysis.

To deal with the problem of the unit of analysis, various methods have been used to compensate for intra-class correlation. These methods are used to correct (inflate) the variance of the measured effects and reduce the overestimate of the population effect. Using this method in a meta-analysis of smoking prevention, Rooney and Murray (Rooney and Murray, 1996) found that the overall effects may be insufficient to suggest that these interventions have much health benefit and this has been confirmed in a prospective study of smoking prevention (Nutbeam *et al.*, 1993).

Effect size

Although several of the studies reviewed have produced highly significant results in terms of probability values, it is not possible to determine from these data what would be the expected benefit in health gain from introducing a peer-led or adult-led health intervention into a specific population. Further studies or further examination of the data would be required before health gain could be quantified or an assessment of cost-effectiveness be determined.

Conclusions

The evidence from the studies reviewed suggests that peer-led education may be more effective, resulting in greater positive changes in health behaviour, than adult-led interventions, although the analytical and methodological problems of these studies indicate that the case is not entirely proven. The complexity of school-based studies and the requirement for very large sample sizes to address the problems of the unit of allocation make it difficult to implement or obtain funding to answer this specific question.

Peer-led education is not easy to establish and sustain. Providing teenagers with sufficient factual information to become experts in health-related problems is probably impractical and would take up too much of their own educational time. It may be more appropriate for the majority of this factual information to be delivered by adults, with peer-leaders concentrating more on the social factors related to health. It is not known how peer-led and more usual adult/teacher-led programmes can be used together effectively in school health education. This review has focussed only on peer-led and adult-led experimental comparisons using similar interventions. There are issues around the suitability of the material for use by both groups, e.g. ethical considerations about the use of material suitable for youth to youth that would be inappropriate for adult to youth. Although there are research problems, there is a need to determine the strengths and weaknesses of the approaches and

the specific areas where peer-led health education is most effective and therefore should be targeted. Further information is also required on the application of specific health education theories and their effectiveness in deriving either peer-led or adult-led programmes. To determine relative effectiveness between peer and adult educators requires isolating the 'educator' from the programme. Any new comparative research in this area should take into account the necessity of describing how peer-led and adult-led sessions differ in content and style, how programmes are introduced into schools, and the training given to those delivering the programme. There is also a need to determine whether an effective peer-led educational programme can be sustained outside of research programmes within the normal school curriculum structure. When these questions have been answered we will be able to assess whether the theoretical advantages of the use of peers in rendering health education more effective can be carried out in practice.

References

- Arkin, R. M., Roemhild, H. F., Johnson, C. A., Luepker, R. V. and Murray, D. M. (1981) The Minnesota smoking prevention program. *Journal of School Health*, **51**, 611–616.
- Armstrong, B. K., de Klerk, N. H., Shean, R. E., Dunn, D. A. and Dolin, P. J. (1990) Influence of education and advertising on the uptake of smoking by children. *Medical Journal of Australia*, **152**, 117–124.
- Askers, R. L., Massey, J., Clarke, W. and Lauer, R. M. (1983) Are self-reports of adolescent deviance valid? Biochemical measures, randomized responses, and the bogus pipeline in smoking behavior. *Social Forces*, **62**, 234–251.
- Baldwin, B. A. (1978) Moving from drugs to sex: new directions for youth-oriented peer counselling. *Journal of American College Health Association*, **27**, 75–78.
- Bandura, A. (1976) *Social Learning Theory*. Prentice-Hall, Englewood Cliffs, NJ.
- Bandura, A. (1986) *Social Foundations of Thought and Action*. Prentice-Hall, Englewood Cliffs, NJ.
- Bangert-Drowns, R. L. (1988) The effects of school-based substance abuse education—a meta analysis. *Journal of Drug Education*, **18**, 243–265.
- Baric, L. (1977) Harrison A. Social pressure and health education. *Journal of The Institute of Health Education*, **15**, 12–18.
- Best, D. L., Davis, S. W., Vaz, R. M. and Kaiser, M. (1996) Testicular cancer education: a comparison of teaching methods. *American Journal of Health Behavior*, **20**, 229–241.
- Botvin, G. J., Baker, E., Filazzola, A. D. and Botvin, E. M. (1990) A cognitive-behavioral approach to substance abuse prevention: one-year follow-up. *Addictive Behaviors*, **15**, 47–63.
- Botvin, G. J., Baker, E., Renick, N. L., Filazzola, A. D. and Botvin, E. M. (1984) A cognitive-behavioral approach to substance abuse prevention. *Addictive Behaviors*, **9**, 137–147.
- Clarke, J. H., MacPherson, B., Holmes, D. R. and Jones, R. (1986) Reducing adolescent smoking: a comparison of peer-led, teacher-led, and expert interventions. *Journal of School Health*, **56**, 102–106.
- Costello, J. (1989) Learning from each other: peer teaching and learning in student nurse training. *Nurse Education Today*, **9**, 203–206.
- Davis, A. K., Weener, J. M. and Shute, R. E. (1977) Positive peer influence: school-based prevention. *Health Education*, **8**, 20–22.
- Devin-Sheehan, L., Feldman, R. S. and Allen, V. L. (1976) Research on children tutoring children: a critical review. *Review of Educational Research*, **46**, 355–385.
- Dickersin, K. (1990) The existence of publication bias and risk factors for its occurrence. *Journal of the American Medical Association*, **263**, 1385–1389.
- Frankham, J. (1998) Peer education: the unauthorised version. *British Educational Research Journal*, **24**, 179–192.
- Guthrie, B. J., Wallace, J., Doerr, K., Janz, N., Schottenfield, D. and Selig, S. (1996) Girl talk: development of an intervention for prevention of HIV/AIDS and other sexually transmitted diseases in adolescent females. *Public Health Nursing*, **13**, 318–330.
- Health Education Authority (1993) *Peers in Partnership*. Health Education Authority, London.
- Hopkins, E. (1979) *A Social History of the English Working Classes 1815–1945*. Edward Arnold, London.
- Johnson, C. A., Hansen, W. B., Collins, L. M. and Graham, J. W. (1986) High-school smoking prevention: results of a three-year longitudinal study. *Journal of Behavioural Medicine*, **9**, 439–452.
- Jordheim, A. (1976) A comparison study of peer teaching and traditional instruction in venereal disease education. *Journal of the American College Health Association*, **24**, 286–289.
- Kirby, D., Korpi, M., Barth, R. P. and Cagampang, H. H. (1997) The impact of the Postponing Sexual Involvement curriculum among youths in California. *Family Planning Perspectives*, **29**, 100–108.
- Kirby, D. (1984) *Sexuality Education: An Evaluation of Programs and their Effects*. Network Publications, Santa Cruz, CA.
- Laiho, M., Honkala, E., Nyssönen, V. and Milen, A. (1993) Three methods of oral health education in secondary schools. *Scandinavian Journal of Dental Research*, **101**, 422–427.
- Lester, C., Donnelly, P. and Weston, C. (1997) Is peer tutoring beneficial in the context of school resuscitation training? *Health Education Research*, **12**, 347–354.
- Lindsey, B. J. (1997) Peer education: a view point and critique. *Journal of the American College of Health*, **45**, 187–189.
- Luepker, R. V., Johnson, C. A., Murray, D. M. and Pechacek, T. F. (1983) Prevention of cigarette smoking: three-year follow-up of an education program for youth. *Journal of Behavioural Medicine*, **6**, 53–62.
- McCue, M. and Afifi, L. A. (1996) Using peer helpers for tuberculosis prevention. *Journal of the American College of Health*, **44**, 173–176.

- McGuire, W. J. (1964) Inducing resistance to persuasion: some contemporary approaches. *Advances in Experimental Social Psychology*, **1**, 191.
- Mellanby, A. R. (1997) Peer-led sex education. *MPH Dissertation*, University of Wales.
- Milburn, K. (1995) A critical review of peer education with young people with special reference to sexual health. *Health Education Research*, **10**, 407–420.
- Murray, D. M. and Hannan, P. J. (1990) Planning for the appropriate analysis in school-based drug-use prevention studies. *Journal of Consulting and Clinical Psychology*, **58**, 458–468.
- Murray, D. M., Luepker, R. V., Johnson, C. A. and Mittelmark, M. B. (1984) The prevention of cigarette smoking in children: a comparison of four strategies. *Journal of Applied and Social Psychology*, **14**, 274–288.
- Murray, D. M., Richards, P. S., Luepker, R. V. and Johnson, C. A. (1987) The prevention of cigarette smoking in children: two- and three-year follow-up comparisons of four prevention strategies. *Journal of Behavioral Medicine*, **10**, 595–611.
- Murray, D. M., Davis-Hearn, M., Goldman, A. I., Pirie, P. and Luepker, R. V. (1988) Four- and five-year follow-up results from four seventh-grade smoking prevention strategies. *Journal of Behavioral Medicine*, **11**, 395–405.
- Nutbeam, D., Macaskill, P., Smith, C., Simpson, J. M. and Catford, J. (1993) Evaluation of two school smoking education programmes under normal classroom conditions. *British Medical Journal*, **306**, 102–107.
- Orme, J. and Starkey, F. (1999) Peer drug education: the way forward? *Health Education*, **1**, 8–16.
- Perry, C. (1989) Prevention of alcohol use and abuse in adolescence: teacher vs peer led intervention. *Crisis*, **10**, 52–61.
- Perry, C. L., Grant, M., Ernberg, G., Florenxano, R. U., Langdon, M. C., Myeni, A. D., Waahlberg, R., Berg S., Andersson, K., Fisher, K. J., Blaze-Temple, D., Cross, D., Saunders, B., Jacobs, D. R. and Schmid, T. (1989) WHO collaborative study on alcohol education and young people: outcomes of a four-country pilot study. *International Journal of the Addictions*, **24**, 1145–1171.
- Phelps, F. A., Mellanby, A. R., Crichton, N. J. and Tripp, J. H. (1994) Sex education: the effect of a peer programme on pupils (aged 13–14 years) and their peer leaders. *Health Education Journal*, **53**, 127–139.
- Prince, F. (1995) The relative effectiveness of a peer-led and adult-led smoking intervention program. *Adolescence*, **30**, 187–194.
- Quirk, M. E., Godkin, M. A. and Schwenzfeir, E. (1993) Evaluation of two AIDS prevention interventions for inner-city adolescent and young adult women. *American Journal of Preventive Medicine*, **91**, 21–26.
- Rivers, K. and Aggleton, P. (1993) Participation and information—why young people need more than the ‘facts’ in HIV and AIDS education. *Hygie*, **12**(2), 22–5.
- Rooney, B. L. and Murray, D. M. (1996) A meta-analysis of smoking prevention programs after adjustment for errors in the unit of analysis. *Health Education Quarterly*, **23**, 48–64.
- Rundall, T. G. and Bruvold, W. H. (1988) A meta-analysis of school-based smoking and alcohol use prevention programs. *Health Education Quarterly*, **15**, 317–334.
- Shean, R. E., de Klerk, N. H., Armstrong, B. K. and Walker, N. R. (1994) Seven year follow-up of a smoking-prevention program for children. *Australian Journal of Public Health*, **18**, 205–208.
- Stephenson, J. M., Oakley, A., Charleston, S., Brodala, A., Fenton, K., Petruckevitch, A. and Johnson, A. M. (1998) Behavioural intervention trials for HIV/STD prevention in schools: are the feasible? *Sexually Transmitted Infections*, **74**, 405–408.
- Stevens, A., Colin-Jones, D. and Gabbay, J. (1995) ‘Quick and clean’: authoritative health technology assessment for local health care contracting. *Health Trends*, **27**, 37–42.
- Telch, M. J., Miller, L. M., Killen, J. D., Cooke, S. and Maccoby, N. (1990) Social influences approach to smoking prevention: the effects of videotape delivery with and without same-age peer leader participation. *Addictive Behaviors*, **15**, 21–28.
- Tobler, N. S. (1986) Meta-analysis of 143 adolescent drug prevention programs: quantitative outcome results of program participants compared to control or comparison group. *Journal of Drug Issues*, **16**, 537–567.
- Tones, K. (1996) The health promoting school: some reflections on evaluation. *Health Education Research*, **11**, 1.
- Vriend, T. J. (1969) High-performing inner-city adolescents assist low-performing peers in counselling groups. *Personnel Guidance Journal*, **48**, 897–904.
- Weinrich, S. P., Weinrich, M. C., Stromborg, M. F., Boyd, M. D. and Weiss, H. L. (1993) Using elderly educators to increase colorectal-cancer screening. *Gerontologist*, **33**, 491–496.

Received on August 5, 1999; accepted on January 25, 2000