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Focus-on-Teens, sexual risk-reduction intervention for high-school adolescents: impact on knowledge, change of risk-behaviours, and prevalence of sexually transmitted diseases

C A Gaydos, MPH DrPH[*], **Y-H Hsieh, MSc PhD**[*], **J S Galbraith, MA PhD**[†], **M Barnes, BS**[*], **G Waterfield, MS CPNP**[‡], and **B Stanton, MD**[§,**]

[*]Department of Medicine, Division of Infectious Diseases, Johns Hopkins University, Baltimore, MD 21205 [†]Department of Paediatrics, University of Maryland [‡]Baltimore City Health Department, School Based Health Clinics [§]Department of Pediatrics, Children's Hospital of Michigan, Wayne State University, Detroit, MI [**] University of Maryland, Baltimore, MD 21205, USA

Summary

A community-based intervention, Focus-on-Kids (FOK) has demonstrated risk-behaviour reduction of urban youth. We modified FOK to Focus-on-Teens (FOT) for high schools. High school adolescents ($n = 1190$) were enrolled over successive school semesters. The small-group sessions were presented during the school-lunch hours. Confidential surveys were conducted at baseline, immediate, six-, and 12-month postintervention for demographics, parental communication/monitoring, sexual risk behaviours and sexually transmitted diseases (STDs)/HIV/ condom-usage knowledge. Sexually active participants were encouraged to volunteer for urine-based STDs testing at the School-Based Health Centres. Many (47.4%) students reported having had sexual intercourse at baseline. Overall behaviours changed towards 'safer' sex behaviours (intent-to-use and using condoms, communicating with partner/parents about sex/condoms/STDs) with time ($P < 0.05$). Proportion of students with complete correct knowledge of STDs/HIV increased to 88% at time 4 from 80% at baseline after adjusting for age, gender and sexual activity ($P < 0.05$). High prevalence of STDs was detected in 875 participants who reported for urine testing at time 1: trichomonas, 11.8%; chlamydia, 10.1% and gonorrhoea, 4.1%. Prevalence decreased significantly for 310 participants who re-tested; chlamydia: 27.4% to 6.1% and gonorrhoea: 11.3% to 3.2%. FOT was successfully implemented as an STDs/HIV risk-reduction intervention. Sustained improvements of knowledge about STDs/HIV/condom usage, decreases in sexual risk behaviours supported the effectiveness of this intervention.

Keywords

adolescents; STDs; behavioural intervention; HIV; high schools

Correspondence to: Dr Charlotte A Gaydos, 1159 Ross Building, 720 Rutland Avenue, Baltimore, MD 21205, USA, cgaydos@jhmi.edu.

INTRODUCTION

In the USA, nearly half of high school students (46.8%) report ever-having had sexual intercourse, with rates being highest in Black males (74.6%) and lowest in White females (43.7%).[1] Surveys conducted in 2005 indicated that sexual intercourse among ninth graders was 34.3% and was 63.1% for twelfth graders. Of high and middle school students, 33.9% reported sexual activity in the previous three months, whereas 14.3% of students reported four or more partners during their lifetime.[1] Each year there are approximately 18 million new sexually transmitted diseases (STDs) that occur in the USA, of which half are among individuals 15–24 years old.[2] STDs are common and often asymptomatic among adolescents.[3–8] Evidence of re-infection is also very high among adolescents.[4,9–11] Because the ability of nucleic acid amplification tests to be used with non-invasive specimens, such as urine, screening adolescents in non-traditional venues like School-Based Health Centres (SBHCs) is feasible.[12,13] Since high chlamydial reinfection rates have been reported in high schools[4,8] and are often associated with adverse sequelae such as pelvic inflammatory disease and HIV acquisition, we introduced a behavioural modification programme monitored by screening for STDs, in order to educate about STDs/HIV and promote safer behaviour among students.

The Focus-on-Kids (FOK) programme is an HIV prevention behavioural intervention based on a social cognitive model and the successful programme has been described extensively in the literature.[14–20] This programme has been previously evaluated and shown to be effective to reduce risk behaviours in youth in high HIV prevalent urban communities, as well as in developing countries.[14–16] FOK has been identified by a number of private organizations and federal agencies, including the community disease control, as an intervention with evidence of effectiveness and has been disseminated both nationally and internationally.[21–23]

Setting of intervention delivery is an important consideration when assessing feasibility. School HIV-prevention programmes have been found to be an efficient means of reaching young people. One strength in utilizing schools for implementing STDs/HIV prevention rests in the high potential 'reach' associated with the school setting. Every school day, 54.7 million young people attend nearly 119,000 schools across the USA.[24]

Parental support for STDs/HIV prevention in schools appears to be strong. A national survey conducted in adults in the USA reported that the majority believed schools should teach abstinence, contraception and about STDs (82%) and the correct way to use condoms (68.5%).[25,26]

In the present study, we modified the FOK, to develop focus-on-teens (FOT). Minor changes included: (1) delivery at urban high schools during lunch; (2) changed 8–90-minute sessions to 24–30-minute sessions; (3) more focus on STDs and (4) urine-based screening for prevalent STDs. The objectives were: (1) to determine whether high schools could provide an effective platform for implementation of the FOT programme, (2) to measure changes in reported risk-behaviour after the provision of FOT and (3) to use urine-based testing for STDs for students who volunteered for screening to monitor prevalent STDs.

METHODS

Intervention description and enrolment

FOK, originally developed by researchers at the University of Maryland, is an effective community-university-linked research and intervention programme originally presented in adolescent recreation centres in Baltimore, whose principal purpose was to reduce HIV risk behaviours among urban youth.[17,19,20] We modified the programme to be given to high school youth of the same ethnic and age groups as the original FOK and called our programme 'FOT'. As suggested by the lead FOK interventionist (BS), since this intervention had previously shown effectiveness in behaviour changes, it was judged to be unethical to not offer the programme to all students; thus the use of a non-intervention control group, was not deemed necessary. The control for behaviour change in our FOT study was the baseline survey. The study was approved by the Institutional Review Boards of the Johns Hopkins University, the Baltimore City Health Department and the University of Maryland.

Students were approached at parent–student 'back-to-school events' and flyers were posted in SBHCs for recruitment. All ninth or tenth graders (aged 14–16-year-old) in six high schools in Baltimore, Maryland were eligible. Students with parental and individual written consents were enrolled for FOT STDs/HIV prevention programme. This community-university-linked research and intervention programme was based on the philosophy of a social cognitive model. It used education to provide knowledge to youth through games and role playing, skills for communication and negotiation and informed decision-making, to prevent adolescents from becoming infected with HIV and other STDs.

FOT sessions were presented during the lunch, twice weekly, in small friendship groups of 6–8 students for 12 weeks (24–30-minute sessions) by trained adult interventionists from the same ethnic community, who received eight-hour-standardized educational training according to a written protocol by one of the lead interventionists (JSG). Lunch was provided to the students during the intervention sessions, which included games, discussions and role playing exercises, using the same curriculum as the original FOK. Incentives were offered to students for participation and attendance by entering names into drawings for prizes at the end of the interventions.

Five successive waves of students were enrolled consisting of approximately 200 students/ semester from six schools over five semesters from 2001 to 2003. Since adolescent participants were approximately 99% African-American, as reflected by the makeup of the urban schools; race/ethnicity was not asked.

Survey instrument

Participants completed an anonymous four-page survey questionnaire at four different time-points: pre- and immediate post-intervention, as well as at six- and 12-month follow-up times. The four-page survey instrument contained demographic information (age and gender), questions about perceived parental monitoring and communication, risk-taking information (smoking, alcohol consumption), relationships (boy/girlfriend) and sexual behaviours. In addition, STDs/HIV and condom-usage knowledge was assessed by a set of

16 questions and four questions, respectively. Forms were confidential without names, containing only study numbers. The programme evaluated knowledge, attitudes and risk behaviours about STDs/HIV before and after the implementation of the programme by serial survey results, with the first baseline survey serving as the reference control.

Testing for STDs

During the intervention sessions, students were encouraged to voluntarily attend SBHCs if they were sexually active for urine testing for *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (GC) and *Trichomonas vaginalis*. Symptoms of STDs were not collected during the voluntarily urine testing. SBHCs also offer testing for other STDs such as HIV at the time of visit. However, we did not collect this information because of the IRB constraints. Beyond the question on the confidential assessment surveys, students were not specifically asked about sexual activity by the group leaders during the intervention, in order to maintain confidentiality. Students were only presented with the option: 'If you are sexually active, you can report on your own time early in the intervention programme to the SBHC for free confidential urine-based screening for STDs'. Not all students reported for confidential STD testing and we were specifically restricted by the IRB from requiring students to be tested for STDs. Near the end of the intervention, students were reminded to attend SBHCs for re-screening for STDs, if sexually active. The test for genital chlamydial and gonococcal infection was performed by ligase chain reaction (Abbott Diagnostics, Abbott Park, IL, USA) with a sensitivity >91% and a specificity >99% for both in urine specimens[27,28] and trichomonas infection was detected by a research-based polymerase chain reaction (PCR).[29,30] The results were entered into a separate laboratory-based database for purposes of reporting clinical test results to clinicians at the SBHCs, so that treatment could be provided for infected students. This database was later stripped of student identifiers and merged by study number to the survey database, in order to maintain the anonymity of the students tested. The nurse practitioners at SBHCs treated all infected students except those who dropped out of school. The nurse practitioners turned infected students' names to disease intervention specialists in the Baltimore City Health Department to contact for treatment, if the infected students had dropped out of school. Partner notification was conducted by SBHCs as follows. The infected students were asked to name their sexual partners if they were in school so the nurse practitioners could get them treated. If their sexual partners were not in school, they were asked to refer them to the STD clinics for treatment. Again, we did not collect the information of partner notification because of the IRB constraints.

Booster intervention session

As part of a substudy, an additional survey assessing STDs knowledge and an FOT booster session were conducted after the administration of survey 3 (six months follow-up). Booster interventions have been reported previously by this group of interventionists as being important in sustaining intervention impact.[31] After survey 3, an STDs quiz, consisting of 23 true–false questions, was administered to assess STDs knowledge for 638 students. Scores were determined on a scale of 0–100%. After administration of the survey, a one-hour 'FOT booster session' was provided to the adolescents by the interventionists, in order to reinforce the risk reduction messages that were taught throughout the original intervention, with

special emphasis on STDs. The booster consisted of a standardized script dialogue. At the 12 month-postintervention session, when survey 4 was administered, the STDs 'booster' survey was administered again for 629 (98.6%) of the 638 students who were enrolled in the booster session.

Statistical analysis

Factors associated with change of behaviours over time were identified by multivariate logistic regression modelling using generalized estimating equation (GEE) approach by adjusting for potential confounders (age and gender).[32] By means of a similar GEE approach, average increased STDs/HIV and condom-use knowledge measured in number of correct answers by each survey were also determined by multivariate linear regression modelling after adjusting for age, gender and sexual activity. Time was handled as a discrete variable, i.e. survey 1–4. The GEE approach was performed using SAS GENMOD procedure that can estimate the working correlation from data containing missing values using the all available pairs method (SAS version 9.1, SAS Institute Inc., Cary, NC, USA).

McNemar's test was performed to determine if there was a significant change in genital infection rates between baseline and at the second time-point for students who tested twice. Logistic regression using GEE approach was conducted to determine the factors associated with infection at the second time-point for students, who participated in at least two surveys and were tested for chlamydia and gonorrhoea twice.

RESULTS

Over multiple semesters, five different waves (Wave I–V) of the FOT intervention programme were conducted in six inner-city high schools. Approximately 200 students (range 197–298) were enrolled in each successive wave. At baseline (survey 1), 1222 students were enrolled and 1190 students with utilizable data participated in the FOT intervention programme during the lunch hours. Participants were predominantly females (845/1190, 71.0%) with mean age of 14.9 ± 1.0 years (Table 1). Eighty-eight percent (1047) of students participated in immediate postintervention follow-up (survey 2); 77.8% (850) at six-month follow-up (survey 3) and 47.3% (563) at the 12-month follow-up (survey 4). Not all of the later surveys (several survey 3s and additional survey 4s) were able to be offered to all students in the later enrolled waves (Waves IV and V) during the last years of the study, due to termination of the study. Survey 4 was not offered to 494 participants. However, the follow-up rate for survey 4 was 563/696 (80.9%) of students who were approached for survey 4. There were no statistical differences in age, gender and ever-having sexual intercourse at baseline between those who were followed up and those who were not in survey 4.

Baseline risk-taking behaviours and STDs/HIV, condom-usage knowledge

A substantial number of consenting students reported high-risk behaviours at baseline. More than one-third of students (*n* = 446, 37.5%) reported ever-smoking and 192 (16.1%) said that they currently smoked (Table 1). The majority (*n* = 726, 61.0%) reported ever-drinking alcohol and 456 (38.3%) reported that they were current alcohol drinkers. Almost half (*n* =

564) of students reported having had sexual intercourse at baseline and the percent reporting sexual activity increased over the length of the follow-up period. Reported sexual activity increased from 47.4% at survey time one, to 50.8% at time 2, to 51.5% at time 3 and to 54.5% at survey period 4 (P = 0.004, Cochran-Armitage trend test). Among those students who answered on their confidential questionnaires that they were sexually active (n = 564), a significant number of high-risk sexual behaviours were noted: 55% had more than one sexual partner since they initiated sex, 25% had sex more than five times with the same or a different partner in the past six months, 21.8% did not use condom at last sex, 8.5% reported having-ever been pregnant or made someone pregnant and 5.3% had been diagnosed with an STD in the past six months (Table 1). The average percentage of participants who answered all 16 STDs/HIV knowledge questions correctly at baseline was 80% (95% confidence interval [CI]: 79%, 81%) while the percentage of correctly answering all four condom knowledge questions was 77% (95% CI: 76%, 78%). The average number of correct answers for the 16 STDs/HIV questions by participants was 12.8 ± 2.9 questions, whereas the average correct answers for the four condom-use knowledge questions was 3.1 ± 1.0.

Change of behaviours with time

After the implementation of FOT programme, many participants reported changed behaviours at follow-up towards 'safer' sex behaviours over time (e.g. intent-to-use condoms, using condoms, communicating with partner and parents about sex, condoms and STDs). Condom-usage increased as measured by the survey question, 'Use condoms as birth control measure when having sex last time (P = 0.0145) (Table 2). However, having more than one lifetime partner reported increased statistically (P < 0.0001). After adjusting for age and gender, several of these behaviours were significantly changed (Table 2). Age and gender were also significantly associated with the change of some behaviours. Gender had differential impact on the change of behaviours. Males were more likely to have sex more than five times with the same or a different partner in the past six months, intended to always use condom when having sex in the next six months, to have used a condom as birth control at last sex. Female participants were more likely to have been diagnosed with an STD in the past six months, were more likely to state that they had talked with boyfriends about not having sex in the last six months, and more likely had asked their most recent sexual partner about the number of his sexual partners. Older age was associated with all behaviours listed in the Table 2 except for 'intend to always use condom when having sex in the next six months' and 'used withdrawal/pulling out as birth control measure when having last sex'.

Change of STDs/HIV, condom-usage knowledge with time

Knowledge about STDs/HIV infection and condom-usage increased with time in participants (Table 3). Percentage of students who correctly answered all 16 STDs/HIV questions increased significantly from 80% at baseline to 88% at time 3 and was sustained at 88% at survey time 4, while the proportion of participants who correctly answered all questions about condom-use knowledge increased significantly from 77% to 88% at time 3 and was sustained at 88% survey time 4 (Table 3). The average number of correct answers also increased with time (STDs/HIV knowledge: baseline: 12.8 ± 2.9; time 2: 13.2 ± 2.9; time 3: 14.0 ± 2.5; time 4: 14.0 ± 2.5 (P < 0.001); condom-use knowledge: baseline: 3.1 ±

1.0; time 2: 3.3 ± 1.0; time 3: 3.5 ± 0.8; time 4: 3.5 ± 0.8) ($P < 0.001$) (Table 3). An average increase of 0.43 ($P < 0.0001$) and 0.15 ($P < 0.0001$) in the number of corrected answers per survey in STDs/HIV and condom-use knowledge was noted, respectively, after adjusting for age, gender and sexual activity (Table 3). Older age and female gender were also associated with higher STDs/HIV and condom-use knowledge (Table 3).

Prevalence of genital chlamydial, gonococcal and trichomonas infection

Overall, 875 participants reported to SBHCs and were tested for genital chlamydial and gonococcal infection testing and 508 female participants were tested for trichomonas infection at baseline. Trichomonas infection was the most common genital infection in participants among these three STDs with an infection prevalence of 11.8% (60/508) (females), followed by chlamydial infection, 10.1% (88/875) and gonococcal infection, 4.1% (36/875). Both genders had the same gonoccocal infection rate (male: 4.2% (10/239); female: 4.1% [26/636]), however, male participants had a slightly higher chlamydial infection rate than females (male: 12.6% [30/239] versus female: 9.0% [57/636], $P = 0.114$).

Approximately, one-third of participants reported for testing again for chlamydial and gonococcal infection in at least three weeks or more after the initial visit. The repeat visits were self-initiated, although students were reminded of the importance of testing and re-testing during the intervention. The median time of re-test was 109 days (inter-quartile range: 57, 165 days). The chlamydial and gonococcal infection prevalences were 6.1% (19/310) and 3.2% (10/310), respectively. A marked decrease in infection prevalence was observed in those same students who tested twice (CT: from 27.4% [85/310] at time 1 versus 6.1% at time 2, $P < 0.001$; GC: from 11.3% [35/310] versus 3.2%, $P < 0.001$, [McNemar test]). Only a small percentage of participants repeatedly tested positive (Table 4). Repeated positivity was observed in four (1.3%) students for CT infection and five (1.6%) for GC infection. A significant trend that more CT/GC-positive students at baseline became negative and less negative students turned to positive at second time-point was observed. Eighty-one (26.1%) participants had changed their CT infection status from positive to negative while 15 (4.8%) became infected at second time-point. All 15 students who turned positive for CT at the second time-point received the re-test at least 30 days after the first test. Four were re-tested between one and two months, four were between two and three months and seven were between three and ten months later. Similarly, 9.7% ($n = 30$) students were not infected with GC at the second test time and 1.6% ($n = 5$) became infected after an initial negative test. A similar but non-significant trend was also observed in 116 students who tested for trichomonas infection again; the infection prevalence decreased to 6.9% (8/116) from 12.9% (15/116) ($P = 0.126$).

Factors associated with chlamydial or gonococcal infection at second-time point

In order to identify factors on CT/GC infection status during the study period, further analysis was performed for the 310 participants who participated in at least two surveys and provided specimens for CT/GC testing twice at least three weeks apart. Students who talked with parents or other adults about STDs and/or HIV infection were 45% less likely to have chlamydial infection after adjusting for gender ($P = 0.05$) (Table 5). Students who used the 'withdrawal' method as contraceptive method and who had ever stayed out all night without

telling their parents were 5.5 ($P < 0.05$) and 3.3 (approaching significance at $0.05 < P < 0.1$) times more likely to have gonococcal infection (Table 5).

Knowledge retention at the six-month booster session results

From the true–false questions at the booster session, the average score for correct answers was 88.3%. This quiz was given at survey 3 (six-months postintervention). At survey 4 (12 month-postintervention), the average score was 91.0%, indicating sustainability of knowledge.

DISCUSSION

Results of this quasi-experimental study indicated that this STDs/HIV risk prevention intervention programme conducted among urban minority high school students increased and sustained STDs/HIV and condom-usage knowledge, changed sexual behaviours towards a 'safer-sex' direction and monitoring indicated reduced STD prevalence. Significant changes for intention to always use condoms were observed, as well as an increase in communications sessions with parents/adults about STDs/HIV and the use of condoms. Reports about having asked sex partners about whether they use condoms also increased significantly. Reported frequency of sex in the previous six months also significantly decreased. Importantly, condom usage appeared to have increased as measured by the survey. We believe our study provides further evidence that behavioural interventions can change high-risk behaviours in adolescents.

The measures of increased knowledge reported in successive surveys demonstrated that STDs/HIV knowledge showed a significant gain over the period of the study, increasing from 80% of students answering all questions correctly at baseline to 88% at both periods 3 and 4. Additionally, the average of correct answers significantly increased from 12.8 to 14. Similarly, questions about condom-use knowledge significantly increased from 77% to 88%. Booster STDs knowledge questions and follow-up quizzes also indicated maintenance of this high level of knowledge.

Similar to the original FOK intervention, our modified FOT programme provided evidence that this behavioural intervention could be effective in demonstrating gain in knowledge about STDs/HIV, as well as demonstrated evidence that behaviour intention could be modified towards 'safer' sexual risk behaviour. Additionally, our programme indicated that the intervention could be modified to be given in high schools as short sessions over a longer time period (one semester of school), rather than the eight original 90-minute sessions.

The uniqueness of this modified programme was additionally to provide an objective measure of 'biomarkers' of STDs behaviour change, by the offering urine testing for STDs for sexually active students in the SBHCs in the same schools where the intervention was given. While we did not specifically ask who was sexually active during the intervention sessions, sexual behaviour was assessed in the confidential survey. We could not mandate or coerce students due to IRB constraints to report for urine screening, but we did encourage students throughout the intervention sessions to attend the SBHCs later for screening if they

were sexually active or had had a previous infection. We did this by advertising that free screening services were available in their own school. A significant limitation of our STDs measures of infection was that we did not know whether all sexually active students reported for screening. We knew that 47.4% (547) of participants reported having had sex at the baseline survey and that 881 students reported at some time-point for STD urine-based screening and reported to the clinician they were in the FOT programme. It is possible that some students may not have reported ever-having sex at the baseline survey. It is also possible that some non-sexually active students reported for screening. We would not have included their test results, unless their lab requisition had an FOT study number, however. More students also appeared to become sexually active during the intervention and follow-up period, as reported on successive surveys with increases from 47.4% at baseline to 54.5% at survey period 4. However, since not all students participated in all follow-up surveys, it is not possible to know whether these percentage increases in reported sexual activity on the anonymous survey form were meaningful.

Infections at time-points after the initial baseline test for STDs decreased, were monitored two different ways: (1) overall prevalence decreased for students at baseline to prevalence in students tested during the follow-up period (may not have been the same students tested at both time periods) and (2) for 310 paired samples, prevalence decreased significantly. A limitation is that it is not possible to ascertain whether the decrease in STDs prevalence in this programme was due to the behavioural intervention of FOT or whether the 'intervention of testing and treating' for STDs may have also impacted subsequent STDs prevalence, since there was no comparison group, who were not given the FOT intervention and for whom STDs prevalence was measured. However, historically, the SBHC chlamydia and gonorrhoea prevalence data for the same years for all of the schools as a whole in Baltimore did not decrease during this time (personal communication, Billie Jo Wood).

Analysis of survey results for participants who participated in at least two surveys and provided specimens for chlamydia and gonorrhea testing twice at least three weeks apart indicated that parental and adult communications were associated with less risk of being infected a second time with chlamydia or gonorrhoea. 'Staying out all night without telling my parent' was statistically associated with gonococcal infection. Others have demonstrated the importance of parental communication in reducing sexual risk-taking.[33–35] Booster quiz results at follow-up after the booster intervention in the substudy were encouraging, perhaps lending more evidence that booster interventions help maintain and sustain intervention impact.[31]

In conclusion, the FOT intervention was successfully given in high school venues, demonstrated evidence of changes towards 'safer-sex' risk behaviour, gain and retention of knowledge about STDs/HIV compared with baseline survey. Monitoring urine-based screening for STDs provided some evidence of decreasing the prevalence of STDs for those students who availed themselves of STD testing services. Institution of similar combination programmes in high schools, which merge behavioural interventions with screening and treatment for STDs, may have the potential to decrease STDs and the risk of acquisition of HIV in adolescents.

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Table 1

Characteristics of 1190 'Focus-on-Teens' participants at baseline

Characteristics	Categories	No.	(%)
Age	Year	14.9 ± 1.0	
Sex	Female	845	(71.0%)
Smoking cigarette	Currently	192	(16.1%)
	Ever	446	(37.5%)
Alcohol drinking	Currently	456	(38.3%)
	Ever	726	(61.0%)
Having had sexual intercourse	Yes	564	(47.4%)
Having >1 sexual partner since having had sex	Yes	310	(55.0%)[*]
Having being pregnant or made someone pregnant	Yes	48	(8.5%)[*]
Having used condom as contraceptive method when having had sex last time	Yes	441	(78.2%)[*]
Having been diagnosed with an STD in the past six months	Yes	31	(2.6%)[*]

[*] Of 564 participants who stated that they have had sex as denominator

Table 2

Change of behaviours with follow-up survey in urban high school 'Focus-on-Teens' participants

Behaviours	Categories	Adjusted* odds ratios (95% CI)	*P* value
Having >1 lifetime sex partner	Increasing each survey	1.82 (1.63-2.02)	<0.0001
Having sex >5 times with the same or a different partner in the past six months	Increasing each survey	0.90 (0.80-1.00)	0.0420
Have talked with girlfriend/boyfriend about not having sex in the last six months	Increasing each survey	1.29 (1.16-1.44)	<0.0001
Having asked most recent sexual partner about the number of his/her sexual partners	Increasing each survey	1.07 (0.86-1.34)	0.5425
Having asked most recent sexual partner if he/she uses condom	Increasing each survey	1.30 (1.01-1.68)	0.0421
Have talked with parents/adults about condom use in the past six months	Increasing each survey	1.24 (1.13-1.36)	<0.0001
Have talked with parents/adults about STDs/HIV infection in the past six months	Increasing each survey	1.16 (1.05-1.27)	0.0035
Use 'withdrawal/pulling out' as birth control measure when having sex last time	Increasing each survey	0.89 (0.79-1.00)	0.0640
Use condom as birth control measure when having sex last time	Increasing each survey	1.14 (1.03-1.26)	0.0145
Intend to always use condom when having sex in the next six months	Increasing each survey	1.15 (1.04-1.28)	0.0049
Having been pregnant or made someone pregnant	Increasing each survey	0.97 (0.82-1.15)	0.7376
Having been diagnosed with an STD in the past six months	Increasing each survey	0.96 (0.79-1.16)	0.6765

CI = confidence interval

*
Generalized estimating equations adjusted for age and gender

Table 3

Factors associated with STDs/HIV knowledge and condom knowledge in urban high school 'Focus-on-Teens' participants

Variables	Number of correct questions answered (95% CI)[*]	P value
STDs/HIV knowledge (out of 16 questions)		
Intercept	10.05 (8.42, 11.69)	<0.0001
Age (years)	0.16 (0.05, 0.27)	0.0058
Gender (female versus male)	0.55 (0.30, 0.80)	<0.0001
Sexually active (yes versus no)	0.43 (0.23, 0.64)	<0.0001
Sexually active (unknown versus no)	−1.61 (−2.23, −0.99)	<0.0001
Survey (survey 4 versus 3 versus 2 versus 1)	0.43 (0.35, 0.51)	<0.0001
Condom knowledge (out of 4 questions)		
Intercept	2.39 (1.86, 2.93)	<0.0001
Age (years)	0.04 (0, 0.08)	0.0334
Gender (female versus male)	0.15 (0.07, 0.23)	0.0005
Sexually active (yes versus no)	0.08 (0.02, 0.15)	0.0001
Sexually active (unknown versus no)	−0.42 (−0.63, −0.20)	0.0131
Survey (survey 4 versus 3 versus 2 versus 1)	0.15 (0.12, 0.18)	<0.0001

CI = confidence interval

[*] Generalized estimating equations

Table 4

Change of genital chlamydial and gonococcal infection status of 310 'Focus-on-Teens' participants who tested twice

Chlamydia/gonorrhoea first time-point	Chlamydia/gonorrhoea second time-point	$n = 310$	
		No.	(%)
Chlamydia			
Negative	Negative	210	(67.7)
Negative	Positive	15	(4.8)
Positive	Negative	81	(26.1)
Positive	Positive	4	(1.3)
Gonorrhoea			
Negative	Negative	270	(87.1)
Negative	Positive	5	(1.6)
Positive	Negative	30	(9.7)
Positive	Positive	5	(1.6)

Table 5

Factors associated with genital chlamydial and gonococcal infection after testing at baseline of 310 'Focus-on-Teens' participants who tested twice

Variables	Categories	Infection at 2nd time-point	Crude OR	Adjusted OR (95% CI)[*]
Chlamydial infection				
Talk with parents or other adults about STDs and/or HIV infection[†]	Yes	11/230 (4.8%)	0.40[‡]	0.55 (0.15-1.01)[‡]
	No	8/71 (11.3%)	1.00	1.00
Gonococcal infection				
Use withdrawal as contraceptive method[§]	Yes	4/38 (10.5%)	5.10[**]	5.50 (1.42-21.32)[**]
	No	6/266 (2.3%)	1.00	1.00
Have stayed out all night without telling parents[††]	Yes	6/101 (5.9%)	3.06[††]	3.32 (0.84-13.17)[††]
	No	4/198 (2.0%)	1.00	1.00

[*]
Generalized estimating equations adjusted for gender

[†]Information was not available in 9 subjects

[‡]$0.05 \leq P < 0.1$

[§]Information was not available in six subjects

[**]$P < 0.05$

[††]Information was not available in 11 subjects