Original Report

Impact of an intervention to improve treatment-seeking behavior and prevent sexually transmitted diseases among Nigerian youths

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Background: Interventions to treat STDs have been reported to reduce HIV incidence. Interventions to improve treatment-seeking for STDs may impact on the duration and prevalence of STDs. Nigeria has high rates of STDs and an increasing incidence of HIV.

Objective: To evaluate the impact of an intervention on STD treatment-seeking behavior and STD prevalence among Nigerian youth.

Methods: A randomized controlled trial in 12 schools in Edo State was conducted to evaluate an intervention to improve STD treatment-seeking and STD treatment provision. The intervention, based on formative research, consisted of community participation, peer education, public lectures, health clubs in the schools, and training of STD treatment providers, including those with no formal training. A questionnaire measured outcomes before and 10 months into the intervention. The effect of the intervention among four randomly selected intervention schools compared to eight randomly selected control schools was assessed using logistic regression with Huber's formula to account for school clusters.

Results: One thousand eight hundred and ninety-six and 1858 youths 14–20 years of age were enrolled in the pre- and post-intervention surveys. Youths in the intervention schools, compared to control schools, reported statistically significant improvements in knowledge of STDs, condom use, partner awareness that the youth had an STD, and STD treatment-seeking behavior. Treatment by private physicians increased (OR=2.1, 95% CI=1.1–4.0), and treatment by patent medicine dealers or pharmacists decreased (OR=0.44, 95% CI=0.22–0.88). The reported prevalence of STD symptoms in the past 6 months was significantly reduced in the intervention compared to control schools (OR=0.68, 95% CI=0.48–0.95).

Conclusion: Significant improvements in treatment-seeking for STD symptoms can be effected among Nigerian youths. The prevalence of reported STD symptoms can be decreased by improving treatment-seeking for and awareness of STDs.

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INTRODUCTION

There is now overwhelming evidence that in countries with high prevalences of both the human immunodeficiency virus (HIV) and the classic sexually transmitted diseases (STDs), the concomitant improved treatment of symptomatic STDs can reduce the incidence of HIV.[1,2] A community randomized trial in the Mwanza region of Tanzania showed that improved treatment of STDs substantially reduced the duration of infection with STDs[3] and reduced the incidence of HIV.[2] Nigeria, the most populous country in sub-Saharan Africa, currently has high rates of STDs[4,5] and a steadily increasing rate of HIV.[6] Thus, the control of STDs would be expected to be effective in curtailing the HIV epidemic in Nigeria. Indeed, the Nigerian HIV/STD control program has identified the control of STDs as an important strategy in its efforts to control HIV in the country.

Available evidence suggests that adolescents represent an important high-risk group for the acquisition of both STDs and HIV in Nigeria.[7,8] Data from the Nigerian National AIDS/STD Control Program indicate that about one-third of new HIV infections occur in adolescents aged between 15 and 25 years.[9] A survey of female adolescents in a rural Nigerian population revealed that 80% had vaginal discharge, 19.8% had candidiasis, 11% had trichomoniasis, and 10.5% had

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chlamydia infection.[10] These reported rates are consistent with rates reported from other countries in sub-Saharan Africa.

Despite the high rate of STDs and HIV in Nigerian adolescents, there is as yet no systematized and entrenched official strategy for targeting adolescents for STD/HIV prevention and treatment. The available public sector reproductive health services in the country are still largely adult-oriented and do not include clear guidelines for reaching adolescents. Some of the reasons for this state of affairs are the culturally sensitive nature of issues relating to adolescent reproductive health in Nigeria, and the lack of an adequate conceptual framework for understanding and addressing the reproductive health needs of adolescents. With this inadequate official orientation to the reproductive health of adolescents, we hypothesized that a purposefully innovative program of intervention would be needed to adequately confront the problem of STDs in Nigerian adolescents.

It was against this background that the Women's Health and Action Research Centre commenced a project in Benin City, mid-west Nigeria, seeking to improve the treatment of STDs as a strategy to reduce the incidence of HIV among Nigerian adolescents. In Nigeria, there is a considerable social stigma associated with the acquisition of STDs, especially in adolescents. Such a stigma has been shown to result in inappropriate health care-seeking behavior by adolescents for STDs, leading to delays in STD diagnosis and management. In particular, a major barrier to care-seeking for STDs by adolescents is the fear of parents, especially the perception that treatment-seeking could lead to parental notification and consequent reprisals. We hypothesize that the pattern of health care-seeking behavior would largely influence the quality of STD treatment accessible to adolescents, which, in turn, would determine the prevalence of STDs and subsequently the incidence of HIV.

In order to further explore and understand these propositions, we undertook a series of preliminary qualitative and quantitative studies that explored the pattern of health utilization by adolescents for various STDs. The results showed that adolescents either did not seek treatment when they had symptoms of STDs or received treatment from informal sector providers, such as patent medicine practitioners, pharmacists, laboratory technologists and traditional healers.[11–15] Among those receiving treatment in formal health establishments, many preferred doctors in private practice, since they were perceived as being more likely to maintain confidentiality and prevent parental notification and reprisals. Our preliminary assessment of the quality of STD treatment provided by the health providers showed that none of them used standard protocols for diagnosing and treating STDs in adolescents.[14]

Consequently, in early 1997, we organized a national workshop to discuss these results and to work with community leaders, adolescents and different health providers in planning a series of interventions to improve the health care-seeking behavior for STDs among adolescents. Thereafter, we undertook a community-based trial of the intervention in Edo State of Nigeria, comparing adolescents in intervention schools with those in control schools. The objectives of the study were to establish a program of health education on STDs among school-based adolescents and to measure the impact of the intervention on health care-seeking behavior for STDs and the prevalence of STD symptoms among the adolescents. In addition, we evaluated the effectiveness of the intervention on adolescents' condom use and notification of partner(s) of their STD symptoms. We believe that the results of the study would prove valuable for designing countrywide approaches for improving the treatment and prevention of STDs among adolescents in Nigeria.

METHODS

Study population

The study was conducted in the ancient city of Benin, the capital of Edo State, one of the 36 States of the Nigerian Federation. Benin City is situated midway between Lagos and Abuja, the new Nigerian capital, and has a population of approximately one million people. Adolescents aged between 10 and 20 years constitute about 20% of the population. Over 80% of adolescents are enrolled in the many primary, secondary and tertiary educational institutions that abound in the area. There are two specialist public hospitals and several private hospitals in the city. In addition, numerous private laboratories, pharmacies and patent medicine stores exist, which provide treatment for STDs, although they are not permitted by law to do so. A major feature of Edo State is the high number of traditional and spiritual healing homes that exist for the treatment of STDs. Recently, the use of traditional medicines has become popular in the area, due to the fact that traditional medical practitioners have been given official recognition by the government. An annual festival of traditional medicines has taken place in the city since the 1990s, and traditional medicine practitioners frequently advertise their services on television, and with strategically displayed billboards throughout the city, claiming to have effective cures for various STDs. By contrast, orthodox medical practitioners are not permitted by their professional regulatory bodies to advertise their services.

Intervention program

The intervention was targeted at in-school adolescents in four secondary schools in Benin City and consisted of three components. First, we established a reproductive health club in each school to provide a forum for

interaction between the adolescents on reproductive health matters. The clubs mounted a series of health awareness campaigns in the schools, during which health professionals provided information on STD prevention and treatment to the youths. The activities of the clubs also included the distribution of educational and informational materials on STDs, and the organization of debates, drama, essay writing, symposia and film shows on STD prevention and treatment.

Second, some members of the clubs who were identified by their colleagues were chosen and trained as peer educators. Ten peer educators were trained in each of the four schools (total=40) over a period of 4 weeks. The 40 students were trained simultaneously and incrementally around school hours over a block of 4 weeks in the schools. They were trained on various aspects of STD prevention and treatment, including symptom recognition, the benefits of early treatment, the need for professional treatment, sources of professional treatment for STDs in the city, the prevention of STDs, the need for partner notification, and the need to defer sexual intercourse until treatment is complete. Various standardized educational modules on STD prevention and treatment were used in training the peer educators. Upon completion of the training, the peer educators provided counseling to other in-school adolescents, either on a one-to-one basis, or in groups at breaktimes or after school hours. They also distributed information, education and communication (IEC) materials on STDs to the adolescents, and referred adolescents who experienced STD symptoms to trained health providers.

A third component of the intervention was the training of health providers. Adolescents were asked to identify the health institutions they knew in the neighborhood that are frequently used by youths for STD treatment. The medical practitioners, patent medicine dealers and pharmacists who were identified by the adolescents were thereafter trained in the diagnosis and treatment of STDs. The training provided was based on the WHO syndromic management, using different treatment algorithms and with emphasis placed on condom promotion and partner tracing and treatment. Different algorithms were used for different health providers. For pharmacists and patent medicine dealers, simple algorithms that emphasized simple treatments, condom promotion and referral of adolescents to trained private practitioners were used. By contrast, the private doctors were trained to use standard WHO protocols and algorithms and to refer difficult cases to tertiary hospitals.

The different categories of health practitioners were trained separately. Each group was given an aggregate of 30 h of lectures, demonstrations and practicals in STD diagnosis and management. In addition, they were trained to provide health information to adolescents with STDs, to offer free condoms for use during the current STD episode, and to seek partners' notification and treatment.

Participant involvement

The intervention schools consisted of six classes (junior classes 1–3, and senior classes 4–6). The intervention was targeted at adolescents in senior classes 4 and 5, with age ranging between 14 and 18 years. The major reason for targeting these classes was that adolescents in this age group were most likely to be sexually active, and they would be expected to still be in school for the post-intervention evaluation to be undertaken 1 year later. Adolescents in senior class 6 would have left school by the end of the intervention and would therefore not be available for the post-intervention evaluation. Thus, the essential elements of the intervention focused primarily on adolescents in senior classes 4 and 5. The peer educators were mainly drawn from these two classes, and the specific health promotional events related to the intervention involved adolescents in the senior classes. At the onset, individual informed consent was obtained from the adolescents. However, all of them agreed to participate in the intervention. In particular, all participating adolescents showed a high level of enthusiasm for the project, and the majority participated in all the intervention activities. Additionally, all randomly selected adolescents agreed to complete the pre-intervention and post-intervention survey questionnaires.

For the health providers' intervention, 40 private practitioners, 36 pharmacists and 50 patent medicine dealers in the neighborhood were identified for training. However, only 28 private practitioners, 29 pharmacists and 45 patent medicine dealers actually participated and completed the training. At the end of the training, these practitioners were given certificates of participation. In addition, the names of trained private clinics were compiled and listed as adolescent-friendly clinics. This list was presented to the peer educators to guide them in their counseling of adolescents with symptoms of STD. The health providers were trained before the peer educators were trained in the intervention schools. Indeed, the health providers were trained several weeks before the commencement of the school-based interventions.

Study design

The objectives of the study design were to evaluate the impact of the intervention program on the following outcomes among youths: (1) knowledge of STD symptoms; (2) condom use; (3) treatment-seeking behavior among youths who experience symptoms of STD; (4) the proportion of youths who had experienced symptoms of an STD in the 6 months prior to interview; and (5) notification of partner(s) by adolescents who had STDs. Specifically, the intervention was designed to decrease adolescents' use of 'informal' sector providers who lacked formal training in STD treatment and increase their utilization of trained doctors. Considerable barriers to the use of public hospitals or clinics by

youths were identified in the formative research, including high costs of treatment and the lack of confidentiality at public health institutions. At the time of the study, Nigeria was under 'transitional' rule by a military regime, which had shown little interest in public health concerns. Thus, it would have been difficult to intervene at the level of public medical establishments. Consequently, the intervention focused on increasing utilization of physicians in private practice.

The intervention began in early September 1997, while the post-intervention survey was conducted in late July 1998. Thus, the intervention was carried out over 11 months. In order to evaluate the impact of the intervention on the outcome variables, a randomized controlled design was employed, using three-study groups—one intervention group, and two control groups. Four secondary schools in Benin City were randomly selected to participate in the intervention program. Another four secondary schools in Benin City were randomly selected as control schools that received no intervention. Since it is impossible to restrict the influence of a community-based intervention to the specific schools chosen as intervention sites without having some effect on nearby control schools, a second control group of four secondary schools was randomly selected from the secondary schools in a nearby town, Ekpoma. The socio-demographic profile of Ekpoma was known to be different from that of Benin City, but nevertheless provided a control group which would not be influenced by a community-based intervention in Benin City.

In order to have equal representation of boys and girls in the intervention, we sampled single-sex schools and co-educational schools separately. Thus, at the onset, we divided Benin City into two sections: a western section to receive the intervention, and an eastern section to act as the part where the control schools would be selected. The training of health providers was also carried out in the western part of Benin City, in order to create an opportunity for synchronizing this part of the intervention with the school-based interventions. In both intervention and control areas, three types of school were identified—boys-only schools, girls-only schools, and co-educational schools. To obtain a statistically valid analysis and sufficient power at the 95% confidence interval, it was determined that four schools would be required in the intervention as well as the two control sites. These schools were selected by first listing the number of schools under the three categories of school that agreed to participate in the study in the three study sites, and then randomly selecting four schools from each list using simple balloting.

At each of the selected schools, we determined that there were about 320 students in senior classes 4 and 5. Thus, in each school in the intervention and control sites, we randomly selected 160 subjects to participate in the pre- and post-intervention interviews. Since the questionnaires were completed in the schools, it was important to ensure confidentiality in order to obtain accurate and valid responses. In particular, we ensured that the questionnaires were self-completed by the adolescents, with the questions being explained by a trained interviewer at the onset. In the trade-off between valid responses and analytical power to observe within-individual changes, we chose to avoid having any personal identifiers on the questionnaires. Hence, all changes from pre- to post-intervention were assessed on a school level rather than an individual level. The same classes that were interviewed in the pre-intervention survey were resurveyed after the intervention, although the subjects in the classes were resampled using a random selection process.

Outcome evaluation

Based on qualitative[14,15] and quantitative formative research[12,13], an intervention survey questionnaire was developed to assess changes in key outcomes from pre- to post-intervention. An iterative process was undertaken to ensure that youths understood the questions and to pilot test the questionnaire, requiring four focus group discussions and several in-depth interviews with youths.

Knowledge of STDs was assessed by asking youths to name the different symptoms of STDs that they were aware of. The total number of STDs listed by an individual was used as that individual's knowledge of STDs. Condom use was assessed by questions on how often the study subject had used condoms during sex in the past 6 months. This question was simplified into a dichotomous outcome by dividing the condom use variable into some versus none.

Asking the youths whether, in the last 6 months, they had had any of the seven symptoms listed in the questionnaire was used to assess the youths' experience of symptoms of STD within the 6 months prior to interviews. The listed symptoms were: painful urination; discharge from genitals; open sores on, in or around genitals; blisters on, in or around genitals; itching around genitals; and pain and swelling around genitals. The treatment provider whom the youth used was determined by asking the youth where they had gone for treatment in the past 6 months if they had experienced symptoms of STDs. Notification of partner(s) by adolescents who perceived STD symptoms was determined by a question on this.

Statistical analysis

Since randomization was applied at the school level, statistical inference needed to take into account the dependencies among individuals within the same cluster.[16] Fisher's exact, chi-square and Student's t-tests were used for univariate analyses. For multivariate analyses, logistic regression was used, with robust standard errors based on Huber's formula for individual-

level data. Consistent standard errors are estimated with this method, even if there is clustered sampling and heteroscedasticity.[17] The general effect of this correction on the design effect was to increase the variance of odds ratios, thereby widening confidence intervals and decreasing P-values, relative to ordinary logistic regression.

The effect of the intervention on outcome measures was determined by the interaction term between the variable designating intervention schools (compared to Benin control schools, Ekpoma control schools, or both) and the variable designating time (pre-intervention). The odds ratio for the intervention-by-time interaction was calculated using logistic regression with robust standard errors based on Hubert's formula. For univariate analyses, no covariates were added to the model. For multivariate analyses, the following covariates were adjusted for: age, gender, religion, ethnicity, socio-economic status indicated by a score of ownership of items by the household (television, radio, car, motorcycle, refrigerator, electric stove, flush toilet), ever had sexual intercourse, and living situation (with family, non-relatives, or no answer given). The P-values associated with whether adjusted odds ratios for the intervention-by-time interaction differed significantly from 1.0 were calculated using likelihood ratio tests. The latter are more robust than Wald tests when variances of regression models may be inflated through interrelations between variables in the model. Likelihood ratio tests were calculated by assessing the chi-square value of –2 times the change in the log likelihood value from the saturated model to the model without the intervention-by-time interaction term.

The study was designed to have 90% power to detect a 50% reduction in the proportion of subjects reporting having had an STD in the past 6 months from 1% in the pre-intervention survey to 0.5% in the post-intervention survey.

RESULTS

Enrollment and demographic characteristics

In total, 1896 and 1885 youths were enrolled in the pre-intervention and post-intervention surveys, respectively. The subjects were approximately equally distributed among the three study groups (at baseline: 643 in the intervention group in Benin City, 649 in the control group in Benin City, and 604 in the control group in Ekpoma), with four schools in each study group. The socio-demographic characteristics of adolescents in the intervention and control schools in Benin City and Ekpoma are shown in Table 1. At baseline, there were significant differences in demographic characteristics between the Ekpoma control group and the Benin City intervention and control groups. The two Benin City groups were similar in demographic characteristics.

The Ekpoma control group consisted of slightly more females and was older by a mean of 1 year compared to the Benin City groups. The predominant religious affiliation in Benin City was the Pentecostal Church, compared to the Catholic Church in Ekpoma. The predominant ethnicities in Benin City were Bini, Ishan, and Ibo, while in Ekpoma the majority of study subjects were Ishan. The Ekpoma subjects had a lower socio-economic status than Benin subjects, as indicated by fewer household possessions and less paternal education of fathers. Very few of the subjects were married.

Baseline STD risk

The baseline STD risks of the adolescents in the intervention and control schools are presented in Table 2. Significantly more adolescents in Ekpoma reported experience of sexual intercourse experience than in the Benin groups. Condom use was low in all three groups and did not differ between groups. More of the Ekpoma youths reported having experienced at least one symptom of an STD in the 6 months prior to the interview. The treatment providers used for STD symptoms did not differ between the three study groups. At baseline, the Benin intervention group scored significantly better than the two control groups with respect to their ability to name STDs.

Knowledge of STDs

Youths' knowledge of STDs was indirectly assessed using a scale constructed from the number of STDs that youths were able to name. As shown in Table 3, a minimum of 0 and a maximum of 6 STDs were named. The mean number of STDs that youths were able to name increased by 0.47 in the intervention group and by 0.01 and –0.16 in the Benin control and Ekpoma control groups, respectively, from pre-to post-intervention. The relative increase in mean number of STDs named increased during the intervention period by 0.35 (95% CI=0.11–0.60) and 0.63 (95% CI=39–0.86) in the intervention group compared to the Benin control and Ekpoma control groups respectively. While this effect of the intervention was statistically significant in both genders, it appeared that females were more responsive to the impact of the intervention on gain in knowledge of STDs than were males. The mean increase in number of STDs listed in the intervention group compared to the control groups increased by 0.57 (95% CI=0.28–0.87) in females and 0.34 in males (95% CI=0.05–0.63).

Condom use

Condom use by youths was assessed for those youths who reported that they were sexually active. The results are presented in Table 4. From pre- to post-intervention, reported condom use in the intervention

Table 1. Demographic baseline characteristics by intervention group.

Characteristic	*Intervention (n=643)* %	*Benin Control (n=649)* %	*Ekpoma Control (n=604)* %	*P-value versus controls* Benin	Ekpoma
Gender					
Female	52.5	50.7	56.6	0.507	0.002
Male	47.6	49.3	41.6		
Missing	0.2	0.0	1.8		
Age (Years)	17.4	18.2	18.5	0.417	0.739
Mean Age					
12–15	17.6	18.3	11.1	0.217	<0.001
16–18	53.3	48.8	48.2		
18–25	28.3	31.1	39.1		
No answer	0.8	1.7	1.7		
Religion					
Traditional	11.8	9.2	5.5	0.289	<0.001
Catholic	23.5	24.0	39.7		
Anglican	6.7	8.3	18.4		
Pentecostal	47.4	47.5	27.8		
Muslim	3.0	1.4	1.2		
Others	3.0	4.5	2.5		
No answer	4.5	5.1	5.0		
Ethnicity					
Ishan	12.6	13.7	71.2		
Bini	48.7	49.6	9.3		
Yoruba	7.9	4.8	2.0		
Ibo	11.8	14.8	4.8		
Others	15.6	11.7	2.6		
No answer	3.4	5.4	10.1		
Fathers education					
None	4.5	2.5	9.3	0.016	<0.001
Primary	18.5	16.6	19.0		
Secondary	26.1	27.9	26.7		
College	16.0	16.3	10.4		
University	31.4	33.1	29.1		
Other	2.0	0.5	0.3		
Missing	1.4	3.1	5.1		
Married					
Yes	1.4	0.5	3.0	0.080	0.079
Household items owned					
Mean of 6 listed items	3.91	3.95	3.33	0.644	<0.001

group increased significantly among males (30.8% to 40.5%) and females (30.2% to 36.5%). In the two control groups combined, reported condom use increased significantly among males (29.4% to 35.5%) but not among females (30.3% to 27.9%). The odds ratio for increased condom use pre- to post-intervention within study groups between both sexes was OR=1.48 (95% CI=1.22–1.79) in the intervention group and OR=1.11 (95% CI=0.86–1.42) in the two control groups combined (Table 4).

The relative increase in condom use in the intervention group compared to the two control groups was OR=1.41 (95% CI=1.12–1.77). However, this statistically significant effect of the intervention was due to the reported increase among females (OR=1.80, 95%= 1.11–2.92) rather than among males (OR=1.13, 95% CI=0.84–1.51) when comparing the intervention to control groups.

Treatment-seeking behavior

Changes in reported treatment-seeking behavior for symptoms of STD were analyzed to evaluate the impact of the intervention in encouraging youths to seek treatment for symptoms of STD from medical doctors rather than to self-treat or obtain treatment from untrained providers such as pharmacists or patent medicine dealers. The results are presented in Table 5.

In the intervention group, the proportion of youths who sought treatment from private practitioners for symptoms of STD in the 6 months prior to the interview increased from 17.5% to 40.7% (OR=3.24, 95% CI= 1.84–5.74). Among the Benin control schools, there was also a significant increase in seeking treatment from private physicians (19.0% to 29.1%), but this effect was smaller than that observed in the intervention group (OR=1.75, 95% CI=1.51–2.03). Among the Ekpoma control group, there was a slight increase in the use of private physicians (24.0% to 30.4%), but this was not statistically significant.

The impact of the intervention on the use of private doctors to treat STD symptoms as compared to control groups was significant compared to both the Benin control study group (OR=1.85, 95% CI=1.06–3.22) and the Ekpoma control study group (OR=2.31, 95% CI= 1.03–5.2) after adjusting for covariates.

Table 2. Baseline STD risk behavior by intervention group

Characteristic	Intervention (n=643) %	Benin Control (n=649) %	Ekpoma Control (n=604) %	P-value versus controls Benin	Ekpoma
Ever had sex	38.0	34.4	53.0	0.517	<0.001
Condom use					
None	88.5	88.9	85.3	0.814	0.091
Some	11.5	11.1	14.7		
Mostly/all the time	8.6	6.8	7.3	0.231	0.407
Percentage using condoms at last sexual intercourse					
Yes	8.6	9.4	10.3	0.595	0.300
Had symptoms of STDs in past 6 months					
Painful urination	12.8	11.2	19.5	0.405	<0.001
Discharge	15.6	12.9	19.4	0.180	0.075
Open sore	6.7	3.4	6.0	0.007	0.598
Blisters	5.6	2.5	6.6	0.004	0.450
Itching	12.6	11.9	20.5	0.688	<0.001
Pain or swelling	7.0	4.9	10.9	0.116	0.015
Any of the above	33.1	31.3	42.1	0.477	0.001
Place of STD treatment					
Private doctor	17.5	19.0	24.0	0.889	
Hospital/clinic	26.2	21.5	5.8		
Patient medicine dealer	2.2	2.1	2.2		
Pharmacist	13.1	12.3	16.0		
Traditional healer	1.6	1.5	2.2		
Friend/relative	3.3	2.1	1.8		
Self	36.1	41.5	28.0		
Second place of STD treatment					
Private doctor	29.9	30.1	27.4	0.944	0.210
Hospital/clinic	29.9	37.0	26.4		
Patent medicine dealer	6.2	6.8	2.8		
Pharmacist	20.6	15.1	19.8		
Traditional healer	1.0	1.4	9.4		
Friend/relative	2.1	1.4	2.8		
Self	10.3	8.2	11.3		

Self-treatment was the most common source of treatment for STD among youths who had experienced symptoms of STD. At baseline, 36.1% of subjects in the intervention group, 41.5% of subjects in the Benin control group, and 28.0% of subjects in the Ekpoma control group, reported self-treatment as their first choice for treating symptoms of STD. All three study groups reported less self-treatment in the post-intervention than in the pre-intervention survey (see Table 5). Odds ratios for pre- to post-intervention changes within groups ranged from 0.60 in the intervention group to 0.71 in the Ekpoma control group. Since all the study groups demonstrated large decreases in self-medication over the study period, there was no apparent significant impact of the intervention on this outcome.

Within the intervention study group, the proportion of youths who reported using pharmacists or patent medicine dealers to treat STD symptoms decreased from 15.3% to 4.4% (OR=2.26, 95% CI=0.21–0.32). A similar decrease from 18.2% to 7.7% was observed in the Ekpoma control group, but no large decrease was observed in the Benin control group (14.4% to 12.2%).

The effect of the intervention relative to both control groups on the use of pharmacists or patent medicine dealers was statistically significant (OR=0.44, 95% CI=0.22–0.88) after adjusting for covariates. There was an apparent increase in the reported use of traditional healers from pre- to post-intervention in the intervention group (1.6% to 5.2%) and in the Benin control group (1.5% to 6.4%), but not in the Ekpoma control group (2.2% to 2.8%). There were no significant differences between the intervention and control groups in the proportion of youths seeking treatment for STD symptoms from traditional healers.

STD symptoms

The proportion of study subjects who reported having had a symptom of an STD in the 6 months prior to interview decreased from the pre-intervention survey to the post-intervention survey in all three study groups (Table 6). The proportion of study subjects who reported STD symptoms decreased from 33.1% to 22.0% in the intervention schools, from 31.1% to 28.5% in the Benin control schools, and from 42.1% to 35.3% in the Ekpoma control schools.

The adjusted odds ratio for the change in STD symptom prevalence indicated a statistically significant reduction in the intervention group compared to the Benin control group (OR=0.63, 95% CI=0.43–0.91), the Ekpoma control group (OR=0.69, 95% CI=0.48–0.98), and both control groups combined (OR=0.68, 95%

Table 3. Change (pre- to post-intervention) in the number of STD symptoms that youths were able to name[a]

Group and school	Mean no. of STDs listed (0–6) Intervention stage		Change pre- to post-intervention	Change relative to control groups				
	Pre	Post		Crude change	Crude 95% CI	Adjusted[b] change	Adjusted 95% CI	Adjusted P-value
Intervention								
Uselu	2.42	2.87	0.45[c]					
Adolo Boys	2.97	3.01	0.04					
Evbareke	2.61	3.77	1.16[d]					
Iyoba Girls	2.96	2.99	0.03					
Total	2.74	3.16	0.41[d]	Reference[e]	–	–	Reference	–
Control Benin								
Anglican Girls	2.92	2.84	−0.08					
Niger	2.96	2.73	−0.23					
Western Boys	1.97	2.27	0.30					
Baptist	2.39	2.43	0.04					
Total	2.56	2.57	0.01	0.41	0.16–0.66	0.35	0.11–0.60	0.004
Control Ekpoma								
Irrua Girls	1.69	2.15	0.45					
Eguare	2.95	2.25	−0.70[d]					
Ujoelen	1.90	2.14	0.24					
Emuado	2.39	1.72	−0.67[d]					
Total	2.23	2.07	−0.16	0.57	0.33–0.81	0.63	0.39–0.86	<0.001
Intervention versus both controls both genders				0.48	0.27–0.69	0.47	0.26–0.68	<0.001
Intervention versus both controls females only				0.62	0.33–0.92	0.57	0.28–0.87	<0.001
Intervention versus both controls males only				0.33	0.03–0.63	0.34	0.05–0.63	0.021

[a]Scores ranged from 0 to as many STDs as were listed. A maximum of 6 was listed by 67 youths.
[b]Adjusted for age, gender, religion, ethnicity, condom use, ever had sex, household items ownership score, and living situation.
[c]$P<0.05$.
[d]$P<0.001$.
[e]Indicates that the change (both crude and adjusted) is relative to the intervention group.

Table 4. Change (pre- to post-intervention) in the proportion of sexually active youths who reported some condom use

Group and school	Some condom use (%)		Change pre- to post intervention		Change relative to control groups			
	Pre	Post	Crude odds ratio	Crude 95% CI	Crude odds ratio	Crude 95% CI	Adjusted change[a]	Adjusted 95% CI
Intervention								
Females	30.2	36.5	1.3	1.03–1.72	Reference[b]	– –	Reference	– –
Males	30.8	40.5	1.5	1.38–1.69	Reference	– –	Reference	– –
All	30.3	39.1	1.5	1.22–1.79	Reference	– –	Reference	– –
Control Benin								
Females	32.6	31.8	0.9	0.78–1.19	2.11	1.27–3.51	1.82	1.28–2.60
Males	32.1	36.1	1.2	1.07–1.33	1.26	0.91–1.76	1.32	0.97–1.79
All	32.3	34.5	1.1	1.00–1.22	1.57	1.19–2.06	1.39	1.13–1.70
Control Ekpoma								
Females	29.2	25.4	0.8	0.44–1.54	2.03	0.94–4.41	1.96	0.94–4.10
Males	26.6	34.3	1.4	0.90–2.32	1.04	0.75–1.43	1.08	0.60–1.46
All	27.8	29.1	1.1	0.64–1.76	1.52	0.99–2.33	1.48	0.98–2.24
Both controls								
Females	30.3	27.9	0.9	0.61–1.30	2.03	1.17–3.52	1.80	1.11–2.92
Males	29.4	35.5	1.3	1.04–1.66	1.15	0.85–1.55	1.13	0.84–1.51
All	29.7	31.9	1.1	0.06–1.42	1.51	1.16–1.96	1.41	1.12–1.77

[a]Adjusted for age, gender, religion, Ishan ethnicity, use of traditional healers, knowledge of STDs, and whether last STD was cured.
[b]Indicates that the change (both crude and adjusted) is relative to the intervention group.

Table 5. Change during the intervention in treatment-seeking behavior over the past 6 months among subjects who had experienced symptoms of an STD

	Proportion using provider (%)		*Change pre- to post intervention*		*Change relative to control groups*		
	Pre	*Post*	*Crude odds ratio*	*Crude 95% CI*	*Crude odds ratio*	*Adjusted[a] change*	*Adjusted 95% CI*
Private Doctor							
Intervention	17.5	40.7	3.24	1.84–5.73	Reference[b]	Reference	– –
Control Benin	19.0	29.1	1.75	1.51–2.03	1.85	1.85	1.06–3.22
Control Ekpoma	24.0	30.4	1.38	0.75–2.56	2.35	2.31	1.03–5.17
Both controls	21.7	29.8	1.53	1.07–2.19	2.11	2.10	1.10–3.99
Self-Treat							
Intervention	36.1	25.2	0.60	0.27–1.32	Reference	Reference	– –
Control Benin	41.5	30.8	0.63	0.38–1.03	0.95	0.95	0.42–2.17
Control Ekpoma	28.0	21.6	0.71	0.45–1.11	0.84	0.83	0.37–1.89
Both controls	34.3	26.1	0.66	0.48–0.96	0.88	0.87	0.41–1.86
Hospital/Clinic							
Intervention	26.2	23.7	0.87	0.44–1.73	Reference	Reference	– –
Control Benin	21.5	20.4	0.93	0.43–2.00	0.78	1.04	0.39–2.78
Control Ekpoma	25.8	36.5	1.65	0.90–3.05	0.52	0.55	0.22–1.39
Both controls	23.8	28.6	1.28	0.74–2.21	0.62	0.73	0.31–1.71
Pharmacist/PMD							
Intervention	15.3	4.4	0.26	0.21–0.32	Reference	Reference	– –
Control Benin	14.4	12.2	0.83	0.33–2.12	0.31	0.30	0.12–0.74
Control Ekpoma	18.2	7.7	0.38	0.21–0.69	0.68	0.67	0.35–1.28
Both controls	16.4	9.8	0.56	0.29–1.08	0.46	0.44	0.22–0.88
Traditional healer							
Intervention	1.6	5.2	3.28	1.06–10.18	Reference	Reference	– –
Control Benin	1.5	6.4	4.37	2.28–8.38	0.62	0.48	0.07–3.31
Control Ekpoma	2.2	2.8	1.25	0.61–2.58	2.20	1.82	0.27–12.40
Both controls	1.9	4.5	2.45	1.14–5.26	1.12	0.92	0.14–6.06

[a]Logistic regression with Huber standard errors corrected for intra-school correlations were used to calculate 95% confidence intervals.
[b]Indicates that the change (both crude and adjusted) is relative to the intervention group.

Table 6. Change (pre- and post-intervention) in the proportion of study subjects who reported having had symptoms of an STD in the past 6 months

	STD symptoms (%) intervention stage		*Change pre- to post intervention*		*Change relative to control groups*			
Group and school	*Pre*	*Post*	*Mantel–Haenzel odds ratio*	*Crude 95% CI*	*Crude odds ratio*	*Crude 95% CI*	*Adjusted[a] change*	*Adjusted 95% CI*
Intervention								
Uselu	40.9	21.9	0.40	0.25–0.66				
Adolo Boys	19.5	15.5	0.76	0.43–1.35				
Evbareke	28.2	13.8	0.41	0.23–0.72				
Iyoba Girls	43.6	36.1	0.73	0.47–1.14				
Total	33.1	22.0	0.56	0.43–0.72	Reference[b]	– –	Reference	– –
Control Benin								
Anglican Girls	40.4	33.8	0.75	0.48–1.18				
Niger	29.1	37.7	1.47	0.93–2.33				
Western Boys	24.8	24.1	0.96	0.58–1.59				
Baptist	30.9	18.2	0.50	0.30–0.84				
Total	31.3	28.5	0.87	0.69–1.11	0.65	0.40–1.05	0.63	0.43–0.91
Control Ekpoma								
Irrua Girls	56.4	37.2	0.46	0.30–0.71				
Eguare	43.1	44.1	1.04	0.67–1.62				
Ujoelen	35.3	36.4	1.05	0.62–1.78				
Emuado	29.4	21.9	0.67	0.39–1.16				
Total	42.1	35.3	0.75	0.59–0.95	0.76	0.47–1.22	0.69	0.48–0.98
Intervention versus both controls both genders					0.70	0.47–1.05	0.68	0.48–0.95
Intervention versus both controls females only					0.76	0.44–1.32	0.70	0.50–0.98
Intervention versus both controls males only					0.61	0.39–0.95	0.58	0.36–0.94

[a]Adjusted for age, gender, religion, ethnicity, condom use, ever had sex, self-treated for STDs, household items ownership score.
[b]Indicates that the change (both crude and adjusted) is relative to the intervention group.

CI=0.48–0.95). This effect of the intervention appeared stronger in males (OR=0.58, 95% CI=0.36–0.94) than in females (OR=0.70, 95% CI=0.50–0.98), when the intervention schools were compared to all control schools.

Notification of partners by adolescents with STD symptoms

In formative research conducted among youths in Benin City, it was apparent that a large proportion of youths was unaware that having sexual intercourse while experiencing symptoms of an STD could exacerbate transmission of STDs to sexual partners.[12,13] The intervention design consequently included a focus on increasing disclosure by youths to their sexual partners if they experienced symptoms of STDs. The pre- and post-intervention surveys included the same question on whether the youths informed their partners if they experienced symptoms of an STD. The effect of the intervention on this outcome was assessed in the subset of the study population who reported being sexually active. The results are shown in Table 7.

The proportion of sexually active youths who informed their partners that they had an STD increased from 6.6% to 13.3% in the intervention group, while in the Benin control group, the proportion changed from 9.0% to 8.6%, and in the Ekpoma control group, the proportion changed from 16.3% to 11.2%. Among the intervention group, the increase in partner awareness that the subject had an STD was driven primarily by the change among females (4.8% to 17.7%, OR=4.3, 95% CI=1.5–12.6). There was little change in the proportion of male subjects in the intervention group who informed their sexual partners if they had an STD (8.6% to 9.9%).

There was a significant impact on informing partners in the intervention group compared to both control groups among females but not among males. The adjusted odds ratios for the change from pre- to post-intervention in the proportion of youths who informed their partners if they had an STD were 7.1 (95% CI=2.4–21.3) among females and 1.3 (95% CI=0.49–3.4) among males when comparing the intervention group to both control groups combined.

DISCUSSION

The results of the evaluation of this intervention indicate that an intervention among Nigerian youths that was designed to educate youth about STDs, to increase condom use, to modify treatment-seeking behavior with regard to STD symptoms away from self-medication or untrained treatment providers towards specially trained private physicians, and to improve notification of STD infection to partners, did have substantial effects. These effects were associated with a statistically significant reduction in the proportion of youths reporting symptoms of STD in the intervention group compared to the two control groups. However, there was very little effect of the intervention on the level of condom use by the adolescents.

In Nigeria, information relating to STDs and other aspects of reproductive health are still not provided in the school system through a formal sex education curriculum, and there have been very few interventions that evaluate the impact of informal educational methods of the kind that are described in this paper. The low levels of knowledge about STD symptoms among adolescents at baseline may partially explain the success of the intervention despite the short period of its implementation. To empirically test the effect of the intervention, we segmented Benin City into parts—an eastern part and a western part—separated by a large central

Table 7. Change (pre- to post-intervention) in the proportion of subjects who informed their partners about an STD

	Partner aware of subjects STD (%)		*Change pre- to post intervention*		*Change relative to control groups*			
Group and school	*Pre*	*Post*	*Crude odds ratio*	*Crude 95% CI*	*Crude odds ratio*	*Crude 95% CI*	*Adjusted[a] change*	*Adjusted 95% CI*
Intervention								
Females	4.76	17.71	4.30	1.47–12.63	Reference[b]	–	Reference	–
Males	8.55	9.92	1.18	0.56–2.46	Reference	–	Reference	–
All	6.56	13.33	2.19	0.91–5.30	Reference	–	Reference	–
Control Benin								
Females	8.14	5.68	0.68	0.30–1.56	6.33	1.63–24.65	6.07	1.93–4.88
Males	9.49	10.24	1.09	0.47–2.53	1.08	0.35–3.32	0.92	0.29–2.91
All	8.97	8.63	0.96	0.43–2.16	2.29	0.69–7.59	2.10	0.62–7.12
Control Ekpoma								
Females	18.38	13.04	0.67	0.32–1.40	6.46	1.74–23.94	6.79	2.03–22.70
Males	13.28	9.09	0.65	0.31–1.39	1.80	0.63–5.20	1.69	0.57–4.52
All	16.25	11.20	0.65	0.35–1.20	3.37	1.15–9.90	3.17	1.08–9.33
Both controls								
Females	15.13	10.18	0.62	0.31–1.24	6.77	1.92–23.92	7.12	2.38–21.30
Males	11.32	9.81	0.85	0.45–1.63	1.38	0.52–3.69	1.28	0.49–3.36
All	13.26	9.88	0.72	0.43–1.19	3.06	1.10–8.47	3.35	1.32–8.48

[a] Adjusted for age, gender, religion, ethnicity, condom use, number of items owned, living situation, use of traditional healers, knowledge of STDs.
[b] Indicates that the change (both crude and adjusted is relative to the intervention group.

part. In order to reduce the possibility of diffusion of knowledge and information between the adolescents in the intervention and control schools, the intervention schools were chosen from the western part, while the control schools were chosen from the eastern part. However, since there was the possibility that adolescents would exchange information during social activities after school hours, and also to eliminate the effects of the several health-promotional events that were taking place in Benin City during the period, we decided to use a second set of control schools in Ekpoma. Although Ekpoma and Benin City differed significantly in baseline socio-demographic characteristics, the pattern of health-seeking behavior and the use of available services by adolescents are similar in both communities. Thus, our use of a second set of adolescent controls in Ekpoma eliminated any potential 'contamination' effects.

A further source of potential bias was that resulting from possible loss to follow-up. Our preliminary investigations indicated that the mean age of first sexual experience among youths in the city was 14.6 years for boys and 16.1 years for girls.[12,13] Thus, we decided to focus the intervention on older adolescents aged 14–20 years who would be more likely to engage in sexual intercourse and experience STDs. The study was designed to minimize loss to follow-up by conducting the pre- and post-intervention surveys among adolescents in senior classes 4 and 5, to ensure their availability 12 months after baseline.

Thus, our findings provide strong substantive evidence that an informal peer educational program that offers education and counseling on STDs to in-school adolescents can substantially improve the care-seeking behavior with regard to STDs among youths. A major strategy to prevent the occurrence of STDs among sexually active adolescents is the promotion of regular condom use during every act of sexual intercourse. However, the intervention had only a modest positive impact on condom use among female adolescents, while no significant effect was found among male adolescents. The fact that the intervention showed a significant reduction in STD symptoms despite the continued low use of condoms among the adolescents suggests that other components of the intervention, such as behavior change modification, especially the reduction in number of sexual encounters and sexual partners, may have been more effective. Unfortunately, there are no empirical data to confirm or refute this proposition.

One barrier to condom use was the negative attitude of the school system towards condom promotion in schools. At the beginning of the intervention, we were required by the school authorities not to openly promote condom use in the intervention schools. Thus, we relied on indirect promotional methods such as the information provided by peer educators. During the intervention, we were prevented from distributing condoms in schools, but we did distribute condoms to private physicians who received the intervention training. Thus, only adolescents who sought treatment from trained private practitioners had access to free condoms offered by the intervention program. As Nigeria faces a real threat of an escalating HIV/AIDS epidemic and increasing incidence of STDs among adolescents, there is a need for a more pragmatic and liberal official attitude towards condom promotion in adolescents.

The results show that the intervention was successful in influencing adolescents to seek treatment for STDs from private physicians rather than from pharmacists and patent medicine dealers. The proportion of adolescents reporting self-treatment in the intervention schools decreased from 36.1% to 25.2%. By contrast, the use of traditional healers increased in the intervention schools and the two groups of control schools during the study period. Focus group discussions and in-depth interviews with adolescents prior to the intervention had indicated that many of them harbored strong views about the use of traditional treatment for STDs. Many of them believed that traditional treatment was more effective than orthodox STD treatment.[12,13,15] In addition, traditional STD treatment continued to be widely advertised throughout Edo State during the period of the intervention. Unfortunately, there is evidence that STD treatments offered by traditional practitioners in the city do not meet the minimum standards of STD care.[14] Thus, there is a need for a specific program to investigate the nature of STD treatments provided by traditional healers, and to design a strategy for integrating such treatments into formal systems of care.

It may be argued that a potential shortcoming of the use of private practitioners for STD treatment by adolescents is the high cost of services offered by this category of providers. However, there is currently no evidence to support this contention. Indeed, the results of our qualitative assessment of services offered by health providers in the city[12] revealed no appreciable differences in the costs of STD services between various categories of formal sector providers. However, we believe that cost of services should not be the only consideration, as treatment effectiveness and efficacy are equally important. As compared to informal sector providers, who may be more likely to charge lower fees for STD treatment, the results of our qualitative study suggest that private providers may be more able to provide qualitative and cost-effective STD treatment.[12] Additionally, our training of private providers in the intervention sites included the identification and delineation of strategies to reduce costs of services while maintaining treatment effectiveness and efficacy.

A possible limitation of this study is the fact that the intervention did not specifically educate youths about asymptomatic STDs. However, by providing information on prevention, early treatment and partner notification of symptomatic STDs, it was hoped that asymptomatic STDs would be targeted as well. Another potential limitation was the short follow-up period,

limiting the duration of potential effects of the intervention. Clearly, our research design was limited by major logistic considerations. Logistic considerations also prevented our use of biomarkers to document the presence or absence of STDs in the adolescents in order to specifically guide the intervention. However, we felt that it would be more appropriate to use symptom recognition by adolescents, since this is the most important clinical entry point that frequently brings adolescents to health services in real-life situations. Without symptoms, adolescents are unlikely to see the need to seek treatment for almost all types of STD. In addition, for a country like Nigeria, which is rapidly transiting from a low to a high incidence of HIV, especially among adolescents, there was a need to obtain rapid preliminary results to guide the design of STD and HIV prevention programs among adolescents. Clearly, future trials will need to pay careful attention to these details and overcome these difficulties.

We believe that these results are generalizable to the rest of Nigeria. Currently, most Nigerian adolescents are enrolled in school, with a school enrollment rate ranging between 60% in northeast Nigeria to a high of 80% in southwest Nigeria. Consequently, targeting reproductive health programs at in-school adolescents can be expected to be effective in reaching a high proportion of adolescents. In addition, in-school adolescents represent a convenient sample that can be investigated easily to test the effectiveness of innovative interventions in reproductive health. The published data on adolescent reproductive health from other parts of Nigeria[15,18] indicate that the social circumstances of in-school adolescents are similar throughout the country. Thus, at very minimal costs, this intervention would probably yield similar beneficial results in other parts of the country. The basic principles of the intervention can easily be implemented in every school, without the need to establish substantial infrastructure.

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