



Effects of a School-Based Intervention on Frequency and Quality of Adolescent-Parent/Caregiver Sexuality Communication: Results from a Randomized-Controlled Trial in Uganda

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Abstract

In a cluster-randomized trial conducted in 22 government secondary schools in Uganda, effects of a school-based intervention aimed at improving aspects of parent/caregiver-adolescent communication on sexuality were examined. The intervention comprised classroom-based education sessions, take home assignments for students to discuss with parents/caregivers and parenting workshops. Baseline and post intervention questionnaires were completed by students and by parents/caregivers. Effect estimates were significant for both students and parents/caregivers on sexuality communication frequency and quality, and for positive and negative attitudes towards sex-related communication, all in the desired direction with effect sizes ranging from 0.17 to 0.38. Effects on four sum scores related to general parenting proved significant only for parents'/caregivers' legitimacy with regard to rule setting (parents'/caregivers' reports only). These results suggest that in Uganda, using schools as gateways, parent/caregiver-adolescent communication can be improved through modification of existing school curricula, training teachers in learner-centred approaches and through mobilization and training of parents/caregivers.

Keywords Parents · Adolescents · Sexuality communication · Uganda · Africa

Resumen

En un ensayo aleatorizado por conglomerados, realizado en 22 escuelas gubernamentales de secundaria de Uganda, se examinaron los efectos de una intervención escolar, dirigida a mejorar los aspectos de la comunicación, sobre la sexualidad, entre padres/cuidadores y adolescentes. La intervención consistió en sesiones educativas en el aula, tareas para llevar a casa en las que los estudiantes discuten con sus padres/cuidadores y talleres de crianza. Los cuestionarios de línea base y post-intervención fueron completados tanto por los estudiantes como por los padres/cuidadores. Los efectos estimados, sobre la frecuencia y calidad de la comunicación sexual y las actitudes positivas y negativas hacia la comunicación relacionada con el sexo, fueron significativos tanto para los estudiantes como para los padres/cuidadores, todo en la dirección deseada, con tamaños del efecto de 0.17 a 0.38. Los efectos en cuatro puntajes totales, relacionados con la crianza general, demostraron ser significativos solo para la legitimidad de los padres/cuidadores con respecto al establecimiento de reglas (solo en los informes de padres/cuidadores). Estos resultados sugieren que, en Uganda, utilizando las escuelas como puertas de entrada, la comunicación entre padres/cuidadores y adolescentes puede mejorarse mediante la modificación de los planes de estudio existentes, capacitando a los docentes en enfoques centrados en el alumno y mediante la movilización y capacitación de padres/cuidadores.

Introduction

AIDS is the leading cause of death among adolescents (aged 10–19 years) in sub-Saharan Africa and the second leading cause of death among adolescents globally [1]. Contrary to the declines in prevalence noted elsewhere in Africa, in Uganda HIV prevalence rate remains relatively high ranging

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from 7.3% in 2011 to 6% in 2016 [2]. Among young people aged 15–24 HIV prevalence was estimated at 4.2% for females and 2.4% for males in 2013, with the majority of new HIV infections occurring among young women and adolescent girls [3]. The Uganda AIDS Commission and UNAIDS in February 2017, reported that among young people aged 15–24 years, girls in particular were disproportionately affected by HIV infection with a prevalence of 9.1% [4]. Additionally, Uganda's 2016 Demographic and Health Survey (DHS) found that, 25% of girls aged 15–19 years were either pregnant or had a child [5]. A previous DHS survey, in 2011 found that 60% of girls and 47% of boys had their first sexual experience before the age of 18, and 13% of girls and 12% of boys had sex before age 15. Yet only 38.9% of the young people in this same survey were able to correctly identify ways of preventing sexual transmission of HIV [6]. The early initiation of sexual activity combined with the lack of comprehensive sexuality education continues to put adolescents in Uganda at a high risk of HIV infection.

Comprehensive sexuality education has been shown to be effective in delaying sexual debut and increasing condom use among young people who are sexually active [7]. A review of the secondary school curriculum in Uganda identified several gaps in content and approach, including lessons and activities related to: relationships and power in relationships, sexuality and sexual behaviour, communication negotiation and decision making skills; STIs/HIV/AIDS prevention including condoms; pregnancy, contraception and abortion; critical thinking skills, personalizing content and using diverse methods [8]. Furthermore, the Africa UNGASS report of 2012, reported low coverage rates of 25% and lower of life-skills based HIV education in Ugandan schools [9].

This situation has not been helped by the recent contestations on the implementation of sexuality education in Ugandan schools. The Minister of Gender in October 2016 banned comprehensive sexuality education in schools and in non-school settings until a regulated government policy is formed. The Ministry of Education and Sports was tasked with spearheading the development of a "Sexuality Education Framework" meant to ensure that sexuality education is packaged in an acceptable, culturally sensitive and age appropriate way for young people in Uganda. This put a halt to the implementation of the new Life Education curriculum developed for secondary schools. In the absence of comprehensive sexuality education in schools, parent-adolescent communication on sexuality becomes even more critical in this context.

The role of parent-adolescent communication in promoting adolescent sexual health and development has been well documented [10]. Parent-adolescent communication has been shown to discourage adolescent behaviour that

could lead to pregnancy, STIs and HIV infection and evidence shows that programs for parents of adolescents can lead to greater parent-teen communication about sexual behaviour as well as actual changes in adolescent sexual behaviour especially if the adolescents are also involved in the programs [11]. A review of interventions involving parents designed to promote the sexual health of adolescents including parent-adolescent communication found that most of them were conducted in the USA [12]. A similar review conducted in sub-Saharan Africa found that while there was an increasing number of studies in the area of parent-adolescent sexuality communication, very few of them had focused explicitly on promoting and improving sexuality communication between parents and their adolescents and few of them were school based [13].

Previous qualitative studies conducted in sub-Saharan Africa including Uganda on adolescent–parent sexuality communication have revealed that communication on sexuality is often negative, vague and authoritarian [14–17] and that young people's questions about sexuality are often met with silence [16, 18–21]. Yet, a study conducted in 2009 showed that more frequent parent-adolescent communication was associated with consistent condom use [17].

This article presents findings from a cluster randomized controlled trial conducted in Uganda as part of a European Union (EU) funded research project titled "Promoting Sexual and Reproductive Health among Adolescents in Southern and Eastern Africa" (PREPARE). The primary aim of this study was to evaluate the effects of a school delivered sexuality communication intervention designed to increase frequency and improve quality of parent/caregiver-adolescent sexuality communication among adolescents aged 12–15 years and their parents/caregivers.

Methods

Study Setting

The study was conducted in Kampala and Wakiso districts in Uganda between March and August 2012. Kampala is the capital city of Uganda and is entirely urban; Wakiso district is mostly rural with less than a tenth (8%) of the population living in urban settings. Kampala's population is estimated to be approximately 1.8 million (1,788,600) whilst that of Wakiso is estimated to be approximately 1.5 million (1,429,500) [22]. The introduction of universal primary and secondary education in Uganda resulted in increased enrolment of adolescents in school, creating an opportunity for reaching more adolescents through schools. In 2011, there were approximately 949 government-aided and 2200 private secondary schools in Uganda [23]. The abolition of tuition fees in government-aided schools in 2007 resulted

in increased enrolment of students in government-aided secondary schools, in particular students from lower socio-economic households with previously limited access to secondary education. In 2011, the secondary school enrolments for Kampala and Wakiso districts were 66,761 and 78,885 students respectively, up from less than 20,000 in the early 2000s [24].

Study Design and Data Collection

This study was designed as a cluster randomized controlled trial involving 22 government-aided senior secondary schools in Kampala and Wakiso districts. Eligible schools were restricted to government-aided day schools attended by both boys and girls. Government-aided schools were selected because they draw students from a wide range of socio-economic backgrounds. Only day schools were eligible because the intervention required students' frequent interaction and communication with parents/caregivers. Students in boarding schools were not eligible as they would not meet the inclusion criteria.

Intervention

The objective of the intervention was to evaluate the effects of a school-delivered intervention on the frequency and quality of adolescent-parent/caregiver sexuality communication. The intervention had three interrelated components comprised of classroom-based education sessions, take home assignments for students to discuss with their parents/caregivers and parenting workshops (Fig. 1).

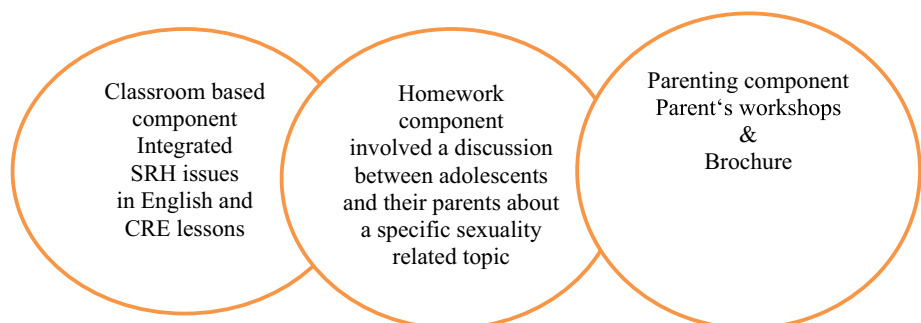
The classroom delivered component of the intervention consisted of fourteen 90-minute sessions that integrated sexual and reproductive health content into seven English and seven Christian Religious Education (CRE) lessons. Lesson delivery was modified introducing more learner-centred interactive pedagogical activities and content. English and CRE teachers in the intervention schools were trained in two 3-day workshops in preparation for delivery of the modified lesson plans. The aim was to increase students' knowledge, skills and motivation to delay sexual debut. The English

core curriculum for the first year of secondary education already had activities such as debates, role-plays and writing exercises incorporated within it, designed to build students confidence and interpersonal communication skills. The content of these activities however were left to the discretion of the teacher. In the intervention schools, topics on sexual and reproductive health were introduced as content for the English lessons. The debates, role-plays and writing exercises all had sexual and reproductive health topics as a focus. The CRE curriculum already covered topics such as changes in adolescence, values and choices but they were more narrowly focused. In the intervention schools the project enriched this content by infusing more specific content on sexual and reproductive health issues. In addition, students were offered condom education by a local NGO working with young people as a 2-hour extra-curricular activity. This session aimed to improve students' knowledge and attitudes towards condoms. The research team conducted teacher observations once a week in each of the intervention schools to monitor whether the teachers were following the lessons as planned. The students in the control schools followed the standard lesson plans in the existing national curriculum.

The second component of the intervention consisted of homework assignments. For each of the 14 lessons delivered in the classroom, there was a corresponding homework assignment that students took home to discuss and complete with their parents/caregiver and then returned to the school. Teachers were provided with homework checklists to track completion of the assignments given out to each of the students.

The third component of the intervention consisted of three workshops for parents/caregivers who were mobilized through the school's Parent Teachers Associations (PTAs). The 3 one-day workshops took place at each of the intervention schools and lasted approximately 4 h. Parents/caregivers were trained in communication and parenting skills. The workshops also prepared parents/caregivers for the homework assignments, equipping them with knowledge on sexually transmitted infections including HIV and prevention measures. The PREPARE project team attended all

Fig. 1 The three components of the intervention



the workshops and assisted the facilitators in responding to the parents/caregiver's questions. In each of the schools, a teacher and a parent/caregiver were trained by the project team to facilitate the three workshops.

Classroom observations revealed that most teachers followed the lesson plans as prescribed in the intervention with few deviations. For example, there were a few activities left out due to shortage of time. About two thirds of the students completed all the homework assignments in English and CRE. There were, however, a few cases of lost homework books and incomplete homework assignments due to students' absenteeism from school which is not uncommon in Ugandan schools. More than half (57%) of the parents/caregivers attended at least one of the parenting workshops. Parents'/caregivers' attendance at these workshops was relatively higher compared to their normal attendance of school activities and PTA meetings. All of the parenting workshops were highly interactive with parents/caregivers eager to learn and share their experiences.

Randomization of Schools

Information was obtained on all government-aided secondary schools located in the two districts (N = 39) from the Ministry of Education and Sports. Twenty-eight schools fulfilled the inclusion criteria. Twenty-four schools were paired based on geographic location (urban, peri-urban and rural) while four were excluded because they did not meet the set criteria. One pair out of the 24 was used for piloting the intervention leaving 22 schools (11 pairs) for the main study. The list of the matched pairs was forwarded to the PREPARE partners at the University of Oslo who allocated the schools within each pair to intervention and control arms of the study using GraphPad software for randomization.

Sampling

The study population was comprised of adolescents in their first year of secondary school in government-aided day schools in Kampala and Wakiso districts. The sample size was estimated using one of the primary trial outcomes, a sum score based on 13 items (four ordered response categories) measuring frequency of parent-adolescent sexuality-related communication. With a medium to weak effect size of (0.35), cluster size equal to 50 students, an intra-class correlation set to 0.06, significance level set to 5%, and power equal to 0.80, 11 clusters (schools) were identified as sufficient for each arm.

Recruitment of Students

A complete list of students in their first year of secondary school was obtained from each of the 22 schools with the

help of teachers from each of the schools. The inclusion criteria was that the student had to be in their first year of secondary school, their parents/caregivers had to have consented to participate in the study and for their adolescent to also participate in the study and the adolescent had to be living at home with a parent or caregiver at the time of the study. The sample for each school was set to be proportionate to the number of students eligible for inclusion in the study. Systematic sampling was used to determine which students were invited to participate in the study. This involved the selection of every *n*'th student from a list of all eligible students in each of the schools. A total of 1700 students and parents/caregivers were invited to participate in the study.

A flow diagram (Fig. 2) describes participation and attrition. After random allocation, the intervention group and the control group counted 849 and 851 students respectively. After the first data collection, number of students were 1502 (88.4%) and after follow-up, the number was 1381 (81.2%). After the second follow-up there was hardly any difference in attrition with 81.7% remaining study participants in the intervention condition and 80.7% in the control condition.

Study Instruments

A number of validated scales which measure parent child sexuality communication used in previous studies were reviewed [25–32]. During piloting of scales and discussion among researchers involved in the study, modifications were made in the wording of questions as well as response categories. This was done in order to adapt instruments to the specific purposes of our study. During analyses of data, further changes occurred, primarily based on analyses of dimensionality of scales and analyses of reliability.

Questionnaires were developed and piloted after forward and back-translations. Data collection was carried out by the research team before the administration of the intervention and then one and a half months after the implementation of the intervention. Process evaluation included observations of classroom sessions, interviews with teachers, focus group discussions (FGDs) with parents/caregivers, checklists for homework assignments returned and evaluations of training sessions. Questionnaires for parents/caregivers were placed in an envelope bearing an identical number to the student's unique identifying study number. The envelopes were given to each of the participating students to take home to their parent or caregiver to complete. Five days were given within which the completed parents/caregiver questionnaires were to be returned to the class teachers in each of the 22 schools. During the 5 day period, the class teachers reminded the students to return the completed parent's/caregiver's questionnaires. In cases where the students did not return the completed questionnaire within the 5 days, the study team contacted the parents or caregivers whose

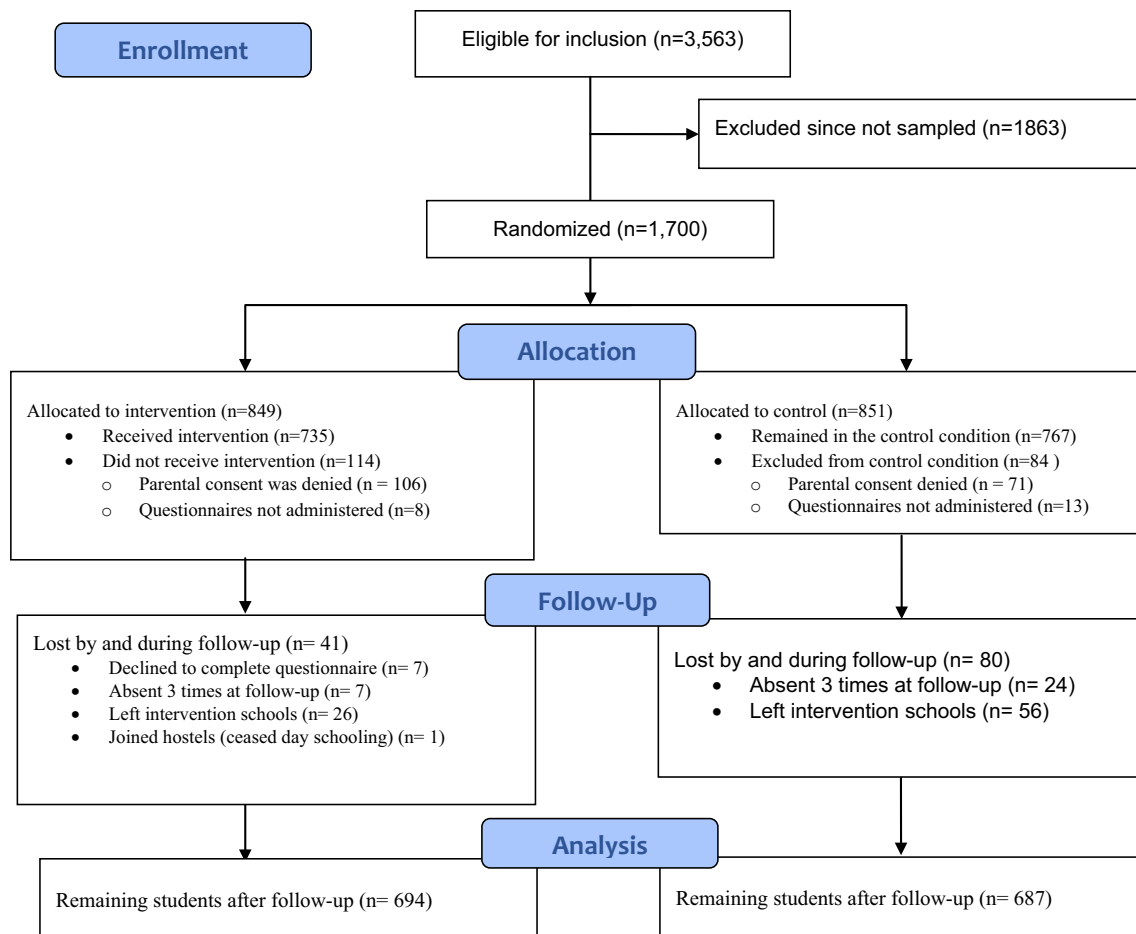


Fig. 2 Flow diagram for the study

cell phone numbers were available. The team also met the individual students who had not returned the questionnaires in order to find out the reasons why they had not returned the questionnaires.

Student's Questionnaire

The student's questionnaires were administered in schools on dates pre-arranged with the school administration. At baseline this was after the elapse of the 5-days set aside for the administration of the parents'/caregivers' questionnaire. The student questionnaires were administered to only those students whose parents/caregivers had completed and returned the parents'/caregivers' questionnaire. Each of the 22 schools was allocated trained interviewers under the supervision of a senior member of the research team. In schools with large numbers of students, more interviewers participated in the questionnaire administration. In each of the schools, the school administration provided a spacious room where students sat and completed

their individual questionnaires. Care was taken to prevent students from copying one another's responses. Research team members were available to respond to questions that individual students had during the completion of the questionnaire. No teachers were present in the classrooms during the administration of the questionnaires. Where sampled students were absent on the day of data collection, a member of the research team made two additional follow-up visits to the school in order to enrol these students. After the data collection was completed, the study team checked all the questionnaires manually for completeness prior to their computerization (data entry and re-entry).

Measures

The measures and scales included in the research instruments developed for both students and their parents/caregivers were based on a review of existing instruments and literature. These included the following:

Communication Frequency—Sex and HIV/AIDS Related Topics

This was assessed using 11 items. The recall period for the items was 3 months preceding data collection. Both parents/caregivers and adolescents were asked how frequently they had discussed 11 topics. All items were assessed on a 4-point scale with the rating of (1) never, (2) once or twice, (3) 3–5 times and (4) more than 5 times. The topics discussed were: (1) how women get pregnant and have babies, (2) what sex is, (3) postponing sex, (4) how to prevent pregnancy, (5) what a condom is, (6) how a condom is used, (7) sex in exchange for gifts, (8) sexually transmitted infections and how they can be prevented, (9) what HIV and AIDS is and how it can be prevented, (10) dating relationships and/or having a boy/girlfriend and (11) having only one boy/girlfriend at a time. The measure of frequency of communication assessed parents/caregivers' and adolescents' communication skills in conveying their values and expectations about sexual behaviour, as well as critical messages about HIV, sexually transmitted infections (STIs), and pregnancy prevention.

Quality of Sex-Related Communication—Openness, Parental Competence

To measure both parents/caregivers' and adolescents' perceptions of quality of sexuality-related communication, both parents/caregivers and adolescents responded to 11 questions. Responses were rated on a 5-point scale ranging from strongly disagree to strongly agree. The topics included: (1) confidence in ability to respond to a question about sex-related topics, (2) adequacy of information to discuss sex-related topics, (3) ability to respond to questions that were sex-related, (4) ability to satisfactorily answer questions about sex-related topics, (5) ability to give opportunity to ask questions and give opinions about sex-related topics, (6) satisfaction with communication about sex-related topics, (7) knowledge about how to talk about sex-related topics, (8) ability to avoid embarrassment when responding to sex-related questions, (9) comfort in asking questions about sex-related topics, (10) comfort in answering questions about sex-related topics and (11) feeling free to discuss sex-related topics with one another.

Positive Attitude Towards Sex-Related Communication

To assess the perceived value of sex-related communication, both parents/caregivers and adolescents responded to 4 questions which were also rated on a 5-point scale ranging from strongly disagree to strongly agree. The topics discussed included: (1) perceived duty of a parent/caregiver in ensuring that the adolescent knew about sex-related topics, (2)

the perception that the parent/caregiver was the best person for the adolescent to ask questions about sex-related topics, (3) the perception that the adolescent needed to learn about sex-related topics before starting to have sex, and (4) the perception by parents/caregiver that their adolescents were ready to learn about sex-related topics.

Negative Attitudes Towards Sex-Related Communication

In terms of perceived negative aspects associated with communication about sex both parents/caregivers and adolescents responded to 4 questions which were rated on a 5-point scale ranging from strongly disagree to strongly agree. The topics discussed included the perceptions that: (1) talking about sex-related topics would encourage engaging in sexual intercourse, (2) participating adolescents in the study were too young to learn about sex-related topics, (3) it would be safer if someone else talked to adolescents in the study about sex-related topics, and (4) a belief that if an adolescent in the study talked about sex-related topics, it would mean that he/she was already sexually active.

Positive Parenting

Both parents/caregivers and adolescents responded to 7 questions which were rated on a 5-point scale ranging from strongly disagree to strongly agree. Two items, whose scales had been reversed in the student questionnaire, were omitted from the analysis. The topics included were: (1) ability to listen to what the adolescent would say, (2) perceived happiness with how the adolescent and the parent/caregiver were getting along, (3) confidence that the adolescent and the parent/caregiver understood one another, (4) perception by either the parent/caregiver or the adolescent that each liked to talk to the other and (5) the feeling that the adolescent and the parent/caregiver were important to one another.

Parental Monitoring

In terms of parental monitoring, both parents/caregivers and adolescents responded to 5 questions which were rated on a 3-point scale ranging from never to always. The topics included: (1) knowledge of parent/caregiver about where the adolescent was when not at home, (2) knowledge of parent/caregiver about what the adolescent was doing when not at home, (3) knowledge of parent/caregiver about who the adolescent was with when not at home, (4) knowledge of parent/caregiver about what time the adolescent was home when away from home, and (5) knowledge of parent/caregiver about whom how the adolescent got money or gifts from.

Parents'/Caregivers' Legitimacy

Both parents/caregivers and adolescents were asked about two situations in which parents/caregivers may set boundaries for their adolescents. Response categories for parents/caregivers were 'never', 'sometimes', and 'always'. Response categories for adolescents were 'yes' and 'no'. The situations were described as follows; "in your opinion, is it your job as a parent/caregiver to set rules for your adolescent about..." (and for adolescents, "*in your opinion, is it okay for your parent/caregiver to set rules for you about...*"): (1) whether or not to have a boyfriend/girlfriend, and (2) drinking alcohol.

Both parents/caregivers and adolescents were asked about another five situations in which parents/caregivers may set boundaries for their adolescents. Response categories for parents/caregivers were 'never', 'sometimes', and 'always'. Response categories for adolescents were 'yes' and 'no'. The situations were described as follows; "in your opinion, is it your job as a parent/caregiver to set rules for your adolescent about..." (and for adolescents, "*in your opinion, is it okay for your parent/caregiver to set rules for you about...*"): (1) what to watch on TV or videos, (2) who the friends are, (3) where the adolescent goes with friends, (4) where the adolescent goes after school, (5) what the adolescent does in their leisure time.

The questionnaires were pre-tested in four schools including 407 students and their parents/caregivers. A test re-test to assess reliability was conducted 14 days apart. The final questionnaires were translated into Luganda and then back translated into English by professional translators. To ensure that all the students and parent/caregivers understood the questions, the final questionnaires were printed in both English and Luganda.

Data Collection and Data Management

The baseline survey was conducted in March 2012 prior to the implementation of the intervention, and the post-intervention survey was conducted in the final week of July and the first week of August 2012. At baseline, administration of the parents'/caregivers' questionnaire at home preceded the administration of the student's questionnaire at school. During the post intervention survey, the questionnaire administration for parents/caregivers and students was done simultaneously.

Statistical Analyses

Data were analysed using The International Business Machines Corporation—Statistical Package for the Social Sciences (IBM-SPSS) Statistics versions 20, 22, and 23. The initial descriptive analyses included percentage distributions,

means, and standard deviations. In order to examine dimensionality of scales and internal consistency, principal components analysis with oblique rotation was used. Reliability of scales was estimated with Cronbach's Alpha. For each scale, sum-scores were constructed by adding scores on all valid items and dividing by the number of items. If more than half of the items within a scale were missing, the sum score was coded as missing. For the analysis of intervention effects, mixed models analysis with school as a random effects variable (in order to adjust for cluster effects) and adjustment for demographic factors measured at baseline was used [33]. In the mixed model analysis, missing data were handled with the direct likelihood method [34]. Effect sizes were estimated by dividing effect estimates by standard deviations at baseline.

Ethical Considerations

The PREPARE study was approved by the Western Norway Regional Committee for Medical and Health Research Ethics. The study protocol was also approved by Makerere University School of Medicine Research and Ethics Review Committee and granted ethical clearance by the Uganda National Council for Science and Technology. The objectives and the procedures of the study were explained to the Ministry of Education Officials responsible for secondary education, head teachers, directors of studies, teachers of senior one, students and parents/caregivers in all the participating schools. Active consent and assent was sought from all the participating parents/caregivers and students in the study. The parents/caregivers were given an information sheet that in detail described the purpose of the study, the different components of the intervention and duration of the study. They were also sent a consent form, which they had to sign after reading the information sheet. They were also asked to sign a separate consent form for their children's participation in the study. Only those adolescents whose parents/caregivers returned signed consent forms, were approached individually to participate in the study. The details of the study were explained to them individually before they were asked to assent.

The trial is registered under ClinicalTrials.gov number NCT01772628.

Results

Demographic Characteristics

As shown in Table 1, there were slightly more female than male students in both the intervention and control groups (52% females). The majority of students were within the age range targeted by the intervention of 12–15 years, with a mean age of

Table 1 Demographic characteristics at baseline for parents/caregivers and children

	Parents						Children							
	Intervention group			Control group			Intervention group			Control group				
	% or Mean	n	p	% or Mean	n	Significance ^a	% or Mean	n	p	% or Mean	n	Significance ^a		
Gender: Females (%)	65.1	724	57.1	756	9.954	1;21	0.005	51.7	731	51.6	765	0.003	1;21	0.955
Age (mean; range)	40.6	600	40.1	611	0.607	1;21	0.444	13.7	726	14.3	753	6.660	1;21	0.017
Religion														
Christian (%)	79.8		79.0		0.121	1.66; 34.93	0.851	79.6		80.2		0.163	1.79; 37.50	0.826
Muslim (%)	15.2	732	16.4	761				17.0	735	17.1	766			
Socioeconomic status														
Completed college or university education (%)	34.3	722	21.5	749	4.362	1;21	0.049	36.3	595	20.9	652	4.699	1;21	0.042
Mother with college or university education (%)								52.4	559	29.7	627	8.451	1;21	0.008
Father with college or university education (%)								4.15	739	3.40	767	4.018	1;21	0.058
Possessions at home (mean)	4.55	736	3.87	762	2.887	1;21	0.104							

^aF_{adjusted} for categorical variables. Wald F for metric dependent variables

13.7 among the intervention group and 14.3 in the control group (Wald $F = 6.660$; $d.f. = 1;21$; $p = 0.017$). Approximately 80% in both groups reported that they were Christians and 17% were Muslims. The difference in religious affiliation (as reported by the students) across groups was not significant ($F_{adjusted} = 0.163$; $d.f. = 1.79$; 37.50 ; $p = 0.826$). A higher proportion of students in the intervention group than in the control group reported that their mother had college or university education (36.3% vs 20.9%) ($F_{adjusted} = 4.699$; $d.f. = 1;21$; $p = 0.042$), and a similar difference between the groups was reported for their fathers (52.4% vs 29.7%) ($F_{adjusted} = 8.451$; $d.f. = 1;21$; $p = 0.008$).

Most parents/caregivers who participated in the study were female. The proportion of female caregivers in the intervention group was higher (65.1%) compared to those in the control group (57.1%) ($F_{adjusted} = 9.954$; $d.f. = 1; 21$; $p = 0.005$). The mean age of parents/caregivers in both groups was approximately 40 years, and almost 80% of them were Christians. More parents/caregivers in the intervention group (34.3%) had completed higher education compared to parents/caregivers in the control group (21.5%) ($F_{adjusted} = 4.362$; $d.f. = 1;21$; $p = 0.049$). There was no significant difference, however, between the groups with regard to mean number of possessions at home as reported by parents/caregivers.

Communication Sum scores at Baseline

Descriptive statistics and Cronbach's alpha for all scales are presented in Table 2. The number of items range from 2 to 11. Alpha values for parents/caregivers vary from 0.59 to 0.90, and for the students from 0.64 to 0.91.

Analyses of differences in communication sum scores between intervention and control group of students and parents/caregivers at baseline (table not shown) revealed four significant differences. Students in the intervention group had a higher mean score (4.30) on 'positive parenting' than students in the control group (4.15) (Wald $F = 12.898$; $d.f. = 1;21$; $p = 0.002$). Parents/caregivers in the intervention group had a higher mean score on 'Knowledge of their children's whereabouts' (2.28 versus 2.18) (Wald $F = 6.895$; $d.f. = 1;21$; $p = 0.016$) and on 'Parents/caregivers setting rules with regard to having boy/girlfriend or using alcohol' (1.67 versus 1.55) (Wald $F = 4.343$; $d.f. = 1;21$; $p = 0.050$). Among students, there was also a significant difference on this sum score, but in the opposite direction (1.28 in the intervention group and 1.35 in the control group) (Wald $F = 6.636$; $d.f. = 1;21$; $p = 0.018$).

Estimation of Intervention Effects

Frequency of Sex-Related Communication

Table 3 shows differences in changes from baseline to follow-up by group (intervention versus control) with control

Table 2 Scale properties at baseline for included outcome measures for both parents/caregivers and children

	No. of items	Parents/caregivers					Children				
		Range	Mean	SD	n	Alpha	Range	Mean	SD	n	Alpha
Communication frequency—sex and HIV/AIDS related topics	11	1–4	1.88	0.77	1479	0.90	1–4	1.74	0.71	1498	0.89
Quality of sex-related communication—openness, parental competence	11	1–5	3.79	0.79	1484	0.89	1–5	3.44	0.91	1501	0.91
Positive attitudes towards sex-related communication	4	1–5	3.87	0.85	1495	0.72	1–5	3.76	0.89	1502	0.65
Negative attitudes towards sex-related communication	4	1–5	2.44	0.88	1491	0.67	1–5	2.40	0.91	1502	0.68
Positive parenting	5	1–5	4.49	0.46	1497	0.75	1–5	4.22	0.81	1496	0.84
Parental knowledge of child's whereabouts	5	1–3	2.23	0.52	1487	0.80	1–3	2.36	0.51	1496	0.79
Parents/guardians setting rules with regard to having boy-/girlfriend or using alcohol	2	1–3	1.61	0.72	1498	0.59	1–2	1.32	0.40	1496	0.66
Parents/guardians setting rules with regard to leisure time activities	5	1–3	2.25	0.46	1493	0.71	1–2	1.28	0.28	1497	0.64

for demographic factors (mixed models analyses). There was a significant stronger increase in 'Frequency of communication about sexuality and HIV/AIDS related topics' reported by both students and their parents/caregivers in the intervention group compared to that in the control group. The effect sizes were 0.27 ($t = 3.566$; $p < 0.001$) for parents/caregivers and 0.38 ($t = 4.915$; $p < 0.001$) for students.

Quality of Sex-Related Communication—Openness and Parental Competence

Table 3 also shows that there were significant "effects" on 'Quality of sex-related communication—openness and parental competence' among parents/caregivers as well as among the students. The effect sizes were 0.36 ($t = 5.162$; $p < 0.001$) (parents/caregivers) and 0.26 ($t = 5.279$; $p < 0.001$) (students).

Attitudes Towards Sex Related Communication

Differences between the two groups on 'Positive attitudes towards sex-related communication' were also significant with effect sizes equal to 0.31 ($t = 4.424$; $p < 0.001$) and 0.20 ($t = 2.772$; $p = 0.006$) for parents/caregivers and for the students respectively. The reduction in 'negative attitudes towards sex related communication' was significantly stronger in the intervention group than in the control group with effect sizes equal to -0.17 ($t = 2.349$; $p = 0.019$) (parents/caregivers) and -0.19 ($t = 2.662$; $p = 0.008$) (students).

Positive Parenting

There were no significant "effects" on 'Positive parenting' between the intervention and control groups, although for parents/caregivers, the difference was close to borderline significant (effect size = 0.13; $t = 1.649$; $p = 0.099$).

Parental Monitoring

There were no significant differences between intervention group and control group with regard to change in 'parental knowledge of child's whereabouts' as shown in Table 3.

Parents'/Caregivers' Legitimacy

There was a significant difference between intervention and control groups on the two-item sum score on 'parents/caregivers setting rules with regard to having boy-/girlfriend or using alcohol' (effect size 0.31; $t = 4.122$; $p < 0.001$) as shown in Table 3, but only for parents/caregivers. There was no significant difference between intervention group and control group on 'parents/caregivers setting rules with regard to leisure time activities' (Table 3).

Table 3 Differences in change from baseline to follow-up by group (intervention/control)

	Parents				Students				
	N	Effect estimate	t	P	N	Effect estimate	t	P	Effect size
Communication frequency—sex and HIV/AIDS related topics	2832	0.210	3.566	0.000	2861	0.269	4.915	0.000	0.38
Quality of sex-related communication—openness, parental competence	2842	0.287	5.162	0.000	2866	0.235	5.279	0.000	0.26
Positive attitudes towards sex-related communication	2856	0.266	4.424	0.000	2866	0.180	2.772	0.006	0.20
Negative attitudes towards sex-related communication	2852	-0.147	2.349	0.019	2867	0.172	2.662	0.008	-0.19
Positive parenting	2861	0.059	1.649	0.099	2860	0.036	0.597	0.551	0.04
Parental knowledge of child's whereabouts	2850	0.055	1.502	0.133	2859	0.058	1.596	0.111	0.11
Parents/guardians setting rules with regard to having boy/girlfriend or using alcohol	2871	0.224	4.122	0.000	2861	0.024	0.833	0.405	0.06
Parents/guardians setting rules with regard to leisure time activities	2864	0.028	0.823	0.411	2862	0.002	0.079	0.937	0.01

Adjustment for demographic factors (see Table 1) measured at baseline. Mixed models analyses with 22 clusters (schools)

N indicates the number of observations at baseline plus the number of observations at follow-up. Cases with valid observations on both occasions are counted twice

Tables presenting unadjusted scores (means) at baseline and follow up for both groups of informants as well as effect and effect size estimates can be obtained from the lead author of this paper. Unadjusted effect estimates were almost identical to the adjusted effect estimates presented in Table 3.

In order to examine differences in intervention effects across students' and parents'/caregivers' gender and parents'/caregivers' education, a series of additional mixed models analyses were conducted. Positive intervention effects on 'positive parenting' as reported by parents/caregivers were significantly stronger when at least one of the parents/caregivers had completed higher education (coefficient = 0.161; $t = 1.981$; $p = 0.048$).

The Kampala PREPARE intervention programme included three workshops for parents. Separate analyses were carried out on data from the intervention group in order to examine the relationship between workshop attendance and change in each of the eight outcome variables from baseline to follow-up. When using an outcome variable in which a distinction was made between zero, one, two and three attendances, no differences obtained statistical significance at the $p < 0.05$ level. When combining all groups who attended at least one workshop into one category, change in 'Quality of sex-related communication' as reported by parents was significantly stronger in the group of parents who attended at least one workshop (coefficient = 0.150; $t = 1.981$; $p = 0.048$). There were no other significant differences in change between those who attended at least one workshop and those who did not.

Discussion

The main objective of this study was to develop and evaluate a school-based intervention aimed at increasing the frequency and improving quality of parent-adolescent communication related to sexuality and sexually transmitted infections (primarily HIV/AIDS). Another set of outcomes were scales related to parenting styles with no specific reference to sexuality or STIs. Significant, positive "effects" (differences in change between intervention group and control group) were shown for parents/caregivers as well as adolescents on all four outcomes related to communication on sexuality or STIs. Among the four parenting outcomes, only one significant change was observed, namely on parents/caregivers reporting about 'setting rules with regard to having boy/girlfriend or using alcohol'.

The findings suggest that positive effects in frequency and quality of parent/caregiver-adolescent communication on sexuality can potentially be achieved through integrating additional information on adolescent sexuality into the existing curricula and training teachers in the delivery of

this information using more learner-centered approaches that promote learner participation in the classroom. Furthermore, the findings suggest that adolescent–parent/caregiver communication and engagement can also be potentially improved through homework assignments that require parental engagement. Future interventions could also look at the students' overall academic performance and learning outcomes as a possible outcome of this kind of intervention.

Given the dearth of evidence in sub-Saharan Africa on the effects of interventions designed to improve parent/caregiver–adolescent communication [13], this study is an important contribution to the growing body of literature in this area and its importance for adolescent health [17, 19, 35, 36]. The findings from this study also underscore the potential role of schools in mobilizing and training parents to be more engaged in their adolescents' homework and in communicating with them about sexuality issues. Previous studies in sub-Saharan Africa have revealed that parent–adolescent communication on sex-related matters is uncommon and is often surrounded by discomfort [10, 37, 38] due to cultural inhibitions. Furthermore, parents are often not involved in discussions with adolescents about sex-related matters [11, 39]. In a previous study conducted in Uganda, adolescents reported low levels of communication between themselves and their parent/caregiver about sexual matters [37].

This study also demonstrates that adolescent–parent/caregiver communication about sexuality can be triggered by more positive non-threatening communication in the context of other activities such as homework. Previous studies in sub-Saharan Africa have reported that most adolescent–parent communication about sexuality is often triggered by parent's perceptions of potentially negative outcomes of adolescent behaviour such as a death attributable to HIV or pregnancy of an unmarried young person [19, 20]. As a result the communication takes the form of warnings, threats and physical discipline [14–16, 18, 20, 40]. The findings that both adolescents and parents/caregivers in the intervention group changed more than those in the control group towards being comfortable with sex-related communication, finding it more valuable and perceiving it as less negative compared to the control group, underscore this.

The lack of consistent and significant differences in change between the intervention and control groups with regard to parental legitimacy and monitoring ('rule setting' and 'knowledge of child's whereabouts') is not unexpected. Significance was obtained for 'setting rules with regard to having a boy/girlfriend or using alcohol' only, and only based on parents'/caregivers' reports. No such effect was observed in the analyses based on adolescents' reports. In a previous study, Ugandan adolescents reported moderate to high levels of parental monitoring [37] suggesting that parental monitoring may be a common practice. This is especially true for parental monitoring that is interpreted as a "top-down" parenting skill reflected

in parents/caregivers' knowledge of adolescents' peers and activities outside of the home [12]. More recent theory indicates that parents' monitoring knowledge is closely tied to adolescent's willingness to divulge information than parental efforts at investigation and control [21].

The lack of significant effects on perceived parental warmth for both adolescents and parents/caregivers may be explained by the very high levels of parental warmth reported at baseline, scores of 4.49 (parents/caregivers) and 4.22 (students). These high scores on scales ranging from 1 to 5 did not leave much room for improvement (ceiling effect), but more importantly, they suggest that parents and their offspring do share a good relationship that can be harnessed as a foundation for improving communication on sexuality issues.

When interactions between intervention (intervention group versus control group) and gender of parent/caregiver and gender of student as well as parents'/caregivers' highest level of completed education were tested, only one significant interaction (out of 32 tested) was found, and only at the $p < 0.05$ significance level. It is quite likely that this significant effect occurred by chance due to the high number of tests performed. The chances that this finding is reproducible are slim. This is not surprising, since the study was not powered to examine variations in intervention effects across subgroups.

In the present study, we have presented estimates of intervention effects in terms of effect sizes as proposed by Cohen [41]. By standards established within clinical research, effect sizes ranging from slightly lower than 0.20 to almost 0.40 would be characterized as small or medium to small. As demonstrated by research elsewhere, even small effect sizes can be of great importance if they stem from evaluations of universal public health interventions [42]. Small effect sizes from interventions targeting large groups are often more important than large effect sizes from interventions targeting fragments of populations. It is also important to keep in mind that progress in public health is not primarily obtained by single interventions producing very strong effects among a few, but rather from well-orchestrated combinations of interventions, each of them with less strong effects, but targeting populations or large population segments.

In one review of studies, eleven programmes aimed at increasing communication with parents or other adults about sex, and condoms were identified [43]. In that review, significant effects were found in eight of these programmes. The conclusion was that it is possible to improve reported communication between youth and important adults in their lives. In a more recent review, it was found that positive effects can be obtained on frequency as well as quality of communication between adolescents and their parents or adult caregivers [13]. However, no effect size estimates were reported in these two reviews. In a recent meta-analysis of

eleven randomized controlled trials from the United States [44] the mean effect size on level of communication was found to be 0.50, while the mean effect on parental comfort with communication was 0.70. These effect sizes are considerably higher than those found in the present study. One could also argue that even weaker effect sizes would have been found in the present study, if there was a longer time-span from end of intervention to start of data collection.

Strong intervention effects may be more difficult to obtain in sub-Saharan African settings in a context of low-resource schools, less affluent families and perhaps also teachers less well trained in modern educational approaches. Nevertheless, the encouraging findings from American studies may also give grounds for optimism. Stronger effects may also be obtained in interventions elsewhere, including Uganda.

When analyzing change in outcome variables in the intervention group from baseline to follow up against workshop attendance, only one association turned out to be significant ($p < 0.05$). This was on the 'Quality of sex related communication' reported by parents outcome variable. Most likely this significance occurred by chance. This could mean that the workshops did not contribute much to the impact of the intervention programme. If this is the case, such interventions could be carried out with considerably less effort and costs by removing the parent workshop component. This is, however, only a tentative suggestion given that the study was not sufficiently powered for subgroup analyses.

Study Limitations

Among the limitations of this study was the lack of information on students who lived with biological parents compared to those living with caregivers. Without this information we were unable to examine intervention effects for the two groups separately and test for relevant interaction effects. Furthermore, due to resource constraints, the intervention though very intense had a short follow-up interval and did not include a long-term post intervention follow-up study. We recommend for future studies to test and trial this same approach for a longer period and to conduct a post intervention follow-up study.

Another limitation relates to the detection of a few significant differences between intervention group students and control group students at baseline. A reliable randomization procedure was applied, with the randomization carried out by a separate research institute (located at the University of Oslo, Norway). In principle, only differences occurring at random should show up, but a few p -values lower than 0.01 indicated that some systematic differences actually did exist at baseline. Since the Mixed Models analyses of intervention effects were carried out with control for all relevant demographic baseline variables, it is unlikely that the

intervention effects found in this study should stem from differences between intervention group students and control group students at baseline.

In sub-Saharan Africa, adolescents' intimate relationships are marked by a high incidence of violence; and sexual violence and intimate partner violence (IPV) increase the risk of STIs including HIV among women [45]. This implies that to be effective, HIV prevention interventions should include a focus on preventing sexual violence and IPV. The purpose of the present study was, however, not to examine effects of our intervention on sexual practices, but only to study effects on student-parent/caregiver communication on issues related to sexuality. Inter-generational communication on gender-based violence is probably as challenging as inter-generational communication on sexuality issues. This perhaps should have been given greater emphasis in the intervention.

Another topic, which might have been covered by the PREPARE intervention in Kampala is skills in negotiating condom use. Although these are skills relevant in communication with partners and not with parents/caregivers, covering this topic in communication with parents/caregivers could have been a positive element with possible spillover to intimate partner communication. The policy of the Uganda Ministry of Education is, however, that schools are not an arena for promoting use of condoms. In our intervention program, students learned negotiation skills in terms of saying no to sex, but they did not learn to negotiate the use of condoms. Although evidence from research indicates that comprehensive sexuality education including promotion of condom use among those who are sexually active is a more effective approach, the policy of the Ministry of Education has to be respected by teachers and researchers involved in HIV/AIDS prevention programmes in Uganda.

Conclusion

Previous research conducted in sub-Saharan Africa has shown infrequent and constrained communication between adolescents and their parents/caregivers on issues relating to sexuality. The PREPARE project showed that a school-based intervention led to increased frequency and improved perceived quality of parent/caregiver-adolescent communication about sexuality-related issues. These findings suggest that parent/caregiver-adolescent sexuality communication can be promoted through enriching the existing curriculum with information on topics related to adolescent sexuality, training teachers in the delivery of more learner-centred approaches and mobilizing parents/caregivers through schools. Long-term follow up is required, not only in order to examine the duration of effects on communication, but also to determine behavioural outcomes of the intervention.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The PREPARE study was approved by the Western Norway Regional Committee for Medical and Health Research Ethics. The study protocol was also approved by Makerere University School of Medicine Research and Ethics Review Committee and granted ethical clearance by the Uganda National Council for Science and Technology.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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