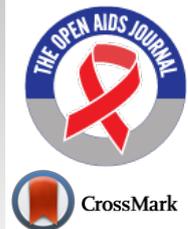




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RESEARCH ARTICLE

HIV-Related Knowledge, Attitudes, and Behaviors among Grade 10 Girls and Boys in Mpumalanga and KwaZulu-Natal: Cross-Sectional Results

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Abstract:

Background:

Young people in KwaZulu-Natal and Mpumalanga South Africa are at high risk of HIV and other sexually transmitted infections. Therefore, awareness programs are needed to reach these young people and change their knowledge, attitudes, and behaviors.

Objective:

The objective of this study is to use cross-sectional data from grade 10 female and male learners in randomly assigned intervention and control schools to examine their knowledge, attitudes, and sexual behaviors.

Methods:

Participants, who were in grade 10 in the 2018 school year and attending schools, were randomly assigned to the intervention and control arms for implementation of the Department of Basic Education's adapted life orientation curriculum that included scripted lesson plans. The study took place in two high HIV prevalence provinces in South Africa. Participants completed self-administered tablet-based surveys and female participants provided a dried blood spot for HIV testing.

Results:

Results demonstrate that two-fifths to one-half of male learners reported being sexually experienced and a quarter (KwaZulu-Natal) to a third (Mpumalanga) of the female learners reported the same. A greater percentage of learners in Mpumalanga reported consistent condom use than learners in KwaZulu-Natal. HIV prevalence among female grade 10 learners in both provinces was about 6-7%. No notable differences were observed between intervention and control school learners on the knowledge, attitudes, and behavior outcomes.

Conclusion:

The findings demonstrate the importance of developing HIV prevention programs for young people in high HIV prevalence provinces since these young people remain at high risk for HIV and other negative outcomes.

Trial Registration:

This study has been registered at ClinicalTrials.gov. The trial registration number is: NCT04205721. The trial was retrospectively registered on December 18, 2019.

Keywords: Adolescents, HIV prevention, South Africa, School-based curriculum, Pregnancy, HIV prevalence.

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1. INTRODUCTION

In 2017, adolescents and young people accounted for about one-third of new Human Immunodeficiency Virus (HIV) infec-

tions in South Africa [1, 2] and high burden communities in South Africa continue to have high incidence rates especially among young people [3, 4]. KwaZulu-Natal and Mpumalanga, where this study took place, are among the areas in South Africa with the highest HIV burden for all ages [5, 6].

Comprehensive HIV prevention includes behavioral, structural, and biomedical interventions [7, 8]. Successful

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prevention of HIV among young people requires engaging them early and often with a combination of prevention strategies, also including comprehensive sex education, access to sexual and reproductive health services, and voluntary medical male circumcision [9]. School-based comprehensive sex education is an attractive approach for reaching young people because school enrolment is mandatory until a certain age in most countries. Having said that, comprehensive sex education programs often fail to meet the needs of the target population. This may be a consequence of a weak curriculum due to conservative attitudes of parents, community members, and school officials and lack of engagement of these key stakeholders to strengthen the program [10]. Moreover, even when a curriculum is strong with appropriate content for the target population, there is a risk of weak implementation due to attitudes of educators, poor training of implementers, and a lack of support from the community [9 - 11].

To strengthen HIV prevention programs for young people, program implementers, policymakers, parents, and community members need to understand the knowledge, attitudes, and sexual behaviors of young people in their communities. Unfortunately, there is a gap in the availability of age disaggregated HIV-related data for young people partially because of challenges with their inclusion in research and evaluation efforts [9]. The objectives of this paper are to fill this gap by presenting knowledge, attitudes, behaviors, and HIV prevalence among a representative sample of grade 10 female and male learners from KwaZulu-Natal and Mpumalanga and demonstrate whether an HIV prevention program in the schools was associated with HIV knowledge, attitudes, and behaviors.

1.1. Study Context

This study took place in two provinces of South Africa: KwaZulu-Natal and Mpumalanga. In the 2016 Demographic and Health Survey (DHS), the prevalence of HIV among female and male youth (ages 15-24 years) in KwaZulu-Natal was 21.9% and 3.7%, respectively. The corresponding figures for Mpumalanga were 19.9% and 2.6% [5]. Notably, among female youth, HIV prevalence increases significantly by the age group: females of age 15-19 years had a prevalence of 5.9%, whereas those 20-24 years had a prevalence of 16.7%. Differences between the same age groups for male youth were less notable [5]. The distinctions between female and male youth are consistent with other studies that demonstrate that female youth (and adults) are at greater risk of HIV than their male counterparts [5]. Relatedly, a school-based study of grade 9 and 10 learners in KwaZulu-Natal undertaken in 2010 by Abdool Karim and colleagues [12] demonstrated that among female learners, adjusted HIV prevalence was 6.4%, genital herpes (HSV-2) prevalence was 10.7%, and pregnancy prevalence was 3.6%. Among male learners, the prevalence of HIV and HSV-2 was lower at only 1.4% and 2.6%, respectively [12].

In 2015, the Department of Basic Education (DBE) revised the Life Orientation (LO) curriculum with updated sexual and reproductive health content and included Scripted Lesson Plans (SLP) to help address problems with the fidelity of implementation of the previous life orientation curriculum.

Technical support for the piloting of the revised LO program was provided by the United States Agency for International Development (USAID)/President's Emergency Plan for AIDS Relief (PEPFAR) through a grant to Education Development Center (EDC). The intervention associated with this study involved training teachers in intervention schools on the new LO curriculum material and on how to use the scripted lesson plans. Trained teachers then implemented the lessons during the school year in a structured order during the Life Orientation class period. Teachers in the control schools implemented the standard of practice (non-revised LO curriculum without scripted lesson plans). Overall, in grades 8, 9, and 10, there were 8-10 lessons in the life orientation curriculum related to sexual and reproductive health content per year; the remaining lessons are related to other life skills and physical education.

2. MATERIALS AND METHODS

2.1. Data

Data for this study were collected between August and October 2018 using a cross-sectional survey with grade 10 learners in KwaZulu-Natal and Mpumalanga. Grade 10 in South Africa is a part of the last years of high school; young people complete high school at the end of grade 12. Notably, because young people may start school at a late age and many young people repeat grades, the ages of grade 10 learners may vary widely. Grade 10 learners were enrolled in the study that randomly divided learners into intervention and control schools. All learners in grade 10 in 2018 were eligible for the survey in the study schools. The evaluation team held various engagement meetings with national, provincial and district departments of education prior to fieldwork. Interviewers also met with principals and LO teachers to discuss and coordinate data collection efforts and introduced the study to grade 10 learners during their LO classes. Grade 10 learners younger than 18 years old were asked to take home the consent form and ask their parent or guardian for consent. Learners who returned a signed parental consent form were asked for their assent to participate in the study. Grade 10 learners who were already age 18 were asked to provide consent themselves. Learners who received consent and provided assent (or consent) completed a self-administered tablet-based survey that included both written and recorded questions in English and four local languages. Most surveys were completed either within a class period or immediately after school. The survey asked questions about knowledge of HIV, attitudes, sexual behaviors, and demographic characteristics of the participants. Participants could stop the survey at any time. All female learners in grade 10 who agreed to participate in the survey were also asked to provide assent (with parental consent) for the collection of a dried blood spot to measure HIV prevalence. Dried blood spots were collected from only female learners based on the broader evaluation design that examined changes in genital herpes prevalence over time in a smaller, longitudinal sample of female learners. Details of the design of the broader evaluation can be found elsewhere [13]. Table 1 shows the sample sizes for this study.

Ethical approval for the study protocol and consent and assent procedures were shared by the University of Pretoria

Faculty of Health Sciences Research Ethics Committee (Ref. No 153/2016) and the University of North Carolina at Chapel Hill Institutional Review Board (IRB Number 15-3217).

2.2. Variables

This study includes outcome variables on learners' knowledge, gender attitudes, perspectives of the Life Orientation (LO) class and teacher, and behaviors. The score for the knowledge index was created based on the average number of correct responses to eight questions related to learners' knowledge of HIV/AIDS. These include: (a) whether you can tell if someone has HIV by looking at them, (b) whether a person would know she/he has HIV from seeing/feeling symptoms, (c) whether all sexually transmitted infections (STI) are curable, (d) whether oral sex is related to STI risk, (e) the effectiveness of condoms when used consistently and correctly, (f) whether mosquitos can infect you with HIV, (g) whether you can get HIV from kissing an HIV positive person, and (h) whether a pregnant woman can do anything to prevent her baby from getting HIV. Table 2 presents some of these questions and the distributions for them across the samples.

The gender attitudes outcome was obtained using 17 questions based on the Gender Equitable Men's scale [14]. In Table 2, we present two of the items to demonstrate the type of questions asked (Appendix Table 1 for all the gender attitude questions included). For each question, respondents were asked whether they agree a lot, agree somewhat, or do not agree at all. These were coded as 1 to 3 with higher scores reflecting greater gender-equitable attitudes; questions that were asked in the opposite direction with regard to gender-equitable norms were reverse-scored as shown in Appendix Table 1. The final score was calculated by summing all the items in the scale and dividing them by 17 (the final values are between 1 and 3).

Two other outcomes are based on the LO class experience. In 2018, learners were asked five questions about their participation in class; these five items were used to create an index for participation where higher values reflect greater participation. The response options were: not at all, sometimes, and most of the time, coded 1, 2, and 3, respectively. The questions included in this index are presented in Table 2 and presented as the percentage that reported most of the time or sometimes to each question by province and intervention group. The second LO outcome is learners' perspective of the LO teacher and is based on three questions; these questions are presented in Table 2. The response options for these questions were: not true at all, a little true, mostly true, and very true, coded as 1-4, respectively. Higher scores reflect learners' more positive perspectives of the LO teacher.

We also included behavioral and biological outcomes, including sexual experience, consistent condom use, ever pregnant (or gotten a girl/woman pregnant), and HIV prevalence (only for grade 10 female learners). Information on these variables is presented in Table 3 by the province and intervention group. Only those who ever had sex were asked about consistent condom use in the last three months. Finally, we included HIV prevalence as an outcome examined in the 2018 cross-sectional female learner sample. The prevalence of

HIV in 2018 is shown in Table 3.

All models control relevant demographic and household factors. These include the age group of the learner (11-14, 15-17, 18-19, and 20-25); religion (Christian, traditional religion, other); orphanhood status (not an orphan, single orphan, double orphan); food security (any days without food in past 3 days; no days without food in last 3 days); whether there is an HIV positive person in the household (yes, no, don't know); whether the learner repeated a grade in school (never, once, twice, 3+); and the primary caregiver in the household (mother/father, grandparent, other).

2.3. Analysis Approach

All analyses were conducted province wise and the 2018 grade 10 samples of females (or males) were compared between intervention and control schools to estimate the association of the intervention with the outcome of interest. We used linear regression to examine continuous outcome variables and logistic regression to examine binary outcome variables. All multivariate regression models included the control variables listed above. All models adjusted for school-level clustering and included appropriate weights for the sample. Analyses were performed in Stata version 16.

3. RESULTS

In total, in 2018, we surveyed 2,374 female learners in grade 10 in Mpumalanga (1,286 in intervention and 1,088 in control schools) and 2,850 female learners in grade 10 in KwaZulu-Natal (1,440 in intervention and 1,410 in control schools). Response rates for grade 10 female learners in Mpumalanga were 84% and 81% for intervention and control schools, respectively; while for KwaZulu-Natal, response rates were 81% and 79%, respectively. Among the boys in grade 10, the sample size is smaller, and the response rates were lower. See Table 1 for details of the sample.

Table 1 also includes demographic characteristics of the female and male grade 10 samples taken from the intervention group. The mean age for female grade 10 learners in both the provinces was about 16 years. For male learners in grade 10, the average age was slightly older at about 16.5 years. Over 80 percent of learners in Mpumalanga were Christian, whereas in KwaZulu-Natal, the percentage of female learners who were Christian was lower i.e about 60 percent; also, a slightly lower percentage of male Christian learners from KwaZulu-Natal was reported (51-55%). In both the provinces, about a third of learners were single orphans and an additional 10-14% were double orphans; a slightly greater percentage of grade 10 learners in KwaZulu-Natal were single or double orphans as compared to Mpumalanga.

Comparing across the provinces, a slightly higher percentage of learners in KwaZulu-Natal reported food insecurity as compared to Mpumalanga. A greater percentage of young people from KwaZulu-Natal compared to Mpumalanga reported that they lived with someone who was HIV positive in their household. In both the provinces, a greater percentage of female grade 10 learners reported living with someone who was HIV positive than their male counterparts. In both the provinces, a greater percentage of

female learners than male learners had never repeated a grade.

Table 1. Demographic characteristics of sample of girls and boys in grade 10 surveyed in 2018 from Mpumalanga and KwaZulu-Natal, South Africa.

	Mpumalanga				KwaZulu-Natal			
	Grade 10 Girls		Grade 10 Boys		Grade 10 Girls		Grade 10 Boys	
	I	C	I	C	I	C	I	C
Number observations	1,286	1,088	1,015	992	1,440	1,410	1,081	1,173
Age, mean (range), years	16.0 (11-25)	15.7 (11-25)	16.6 (11-25)	16.4 (11-25)	15.9 (11-25)	16.0 (11-25)	16.6 (11-25)	16.5 (11-25)
Religion, %	-	-	-	-	-	-	-	-
Christian	90.6	93.5	80.3	85.8	60.0	59.8	51.1	55.4
Traditional	7.9	5.1	14.1	10.8	31.8	32.9	37.1	30.5
Other	1.5	1.4*	5.6	3.5**	8.3	7.3	11.8	14.0**
Orphanhood, %	-	-	-	-	-	-	-	-
Single orphan	32.0	31.8	34.7	30.8	33.3	34.3	34.5	35.1
Double orphan	10.1	7.7	9.4	9.9	11.1	11.0	13.5	10.5
Food security, %	-	-	-	-	-	-	-	-
Any days without food in past 3 days	19.3	18.3	22.6	22.1	23.4	25.6	26.0	25.9
No days without food in past 3 days	80.7	81.7	77.4	77.9	76.6	74.4	74.0	74.1
HIV positive person in household, %	-	-	-	-	-	-	-	-
Someone is HIV positive	15.7	13.3	8.3	7.1	23.0	24.8	11.9	11.7
No one is HIV positive	56.3	60.4	62.3	63.2	49.4	49.4	59.3	59.4
Don't know if anyone in household is HIV positive	28.0	26.3	29.4	29.7	27.6	25.9	28.8	28.8
Repeated grade in school, %	-	-	-	-	-	-	-	-
Never	55.4	61.0	33.9	41.2	50.8	49.9	32.3	32.3
Once	24.7	26.7	30.5	28.9	30.0	31.5	32.1	31.5
Twice	12.9	7.6	22.2	18.0	10.7	11.0	20.4	22.0
Three or more times	7.0	4.8***	13.4	11.9**	8.5	7.6	15.3	14.1
Caregiver in household, %	-	-	-	-	-	-	-	-
Mother or father	80.4	81.2	80.5	78.7	79.4	78.4	78.4	80.0
Grandparent	12.0	12.6	10.3	11.8	13.1	13.0	11.0	11.8
Other	7.6	6.1	9.3	9.5	8.5	8.5	8.1	8.5

I – Intervention group; C – Control group; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; for F-test of differences between intervention and control group.

Table 2. Descriptive results of knowledge and life orientation class engagement by province and intervention group of girls and boys in grade 10 surveyed in 2018 from Mpumalanga and KwaZulu-Natal, South Africa.

	Mpumalanga				KwaZulu-Natal			
	Grade 10 Girls		Grade 10 Boys		Grade 10 Girls		Grade 10 Boys	
	I	C	I	C	I	C	I	C
KNOWLEDGE - Respondents indicated correctly whether the following statements are true or false, %	-	-	-	-	-	-	-	-
You can usually tell if someone has HIV/AIDS by the way they look. (FALSE)	64.3	62.3	57	55.9	61.6	62.2	56.4	56
Oral sex poses no risk for STIs. (FALSE)	48.4	53.7*	48.1	47.9	40	44.8*	41.5	41.5
You can get HIV from kissing a person who is HIV-positive. (FALSE)	77.5	75.6	69.5	69.4	72.5	75.4	67.2	69.4
A woman who is pregnant can do nothing to prevent her baby from being born with HIV. (FALSE)	64.5	64.7	55.4	49.8*	59.3	62.8	49.3	54.9*
GENDER ATTITUDES - Respondents agreed a lot with the following statements, %	-	-	-	-	-	-	-	-
It is the man who decides when to have sex.	20.6	19.8	33.7	33.8	12.8	16.5*	28.2	27.3
A man needs other women even if things with his wife/partner are fine.	41.7	42.9	42	40.2	32.9	34.9	32.7	32.1
PARTICIPATION IN LO CLASS - Respondent indicated the following occurs sometimes or most of the time (reference category is not at all), %	-	-	-	-	-	-	-	-
I participate in class discussions in LO	95.6	94.2	92.4	91.1	92.6	93.2	92.6	93.3

(Table 4) contd....

	Mpumalanga				KwaZulu-Natal			
	Grade 10 Girls		Grade 10 Boys		Grade 10 Girls		Grade 10 Boys	
	I	C	I	C	I	C	I	C
I ask teachers questions during LO	87.5	84.0*	84.9	83	80.7	82.8	80.7	82.8
I listen to what the teacher is teaching in LO	97.3	97.1	94.7	94.9	95.5	95.1	95.5	95.1
I am motivated to learn about LO	96.2	97.6*	92.9	94.8	93	93.6	93	93.6
I put time & effort into doing LO assignments/studying for tests	96.2	96.3	91.4	93.1	92.9	92	92.9	92
PERSPECTIVE OF LO TEACHER - Respondent indicated the following is mostly true or very true (reference category is not true or a little true), %	-	-	-	-	-	-	-	-
My LO teacher encourages students to learn material	75.2	74.6	73.5	71.1	75.6	73.6	75.6	73.6
My LO teacher understands material he/she presents	80.4	80	75.2	75	80.5	77.6	80.5	77.6
My LO teacher wants all students to feel respected	91	89.1	84.5	84	85.3	83.9	85.3	83.9

I – Intervention group ; C – Control group; * p £ 0.05; ** p £ 0.01; *** p £ 0.001: for F-test of differences between intervention and control group.

Table 2 presents the descriptive results of knowledge, gender attitudes, and the LO outcomes. While not all the items used to determine the knowledge and gender scores are presented in Table 2, the items included provide a representation of all observed results (see Appendix Table 1 for all the gender attitude items). Few differences were observed between intervention and comparison groups on the variables examined, with a small number of exceptions. In some cases, the intervention group had greater knowledge or more positive gender attitudes while in other cases, the control group had more knowledge or positive gender attitudes.

Generally, grade 10 female and male learners had positive perspectives of their LO class and teacher. Few differences were observed between provinces, between intervention groups, or across the two sexes. These LO questions were asked about the general curriculum and were not specific to the new SLP.

Table 3 presents the descriptive results for the behavioral and biological outcomes. Among grade 10 female learners from Mpumalanga, about a third had sex with no difference between intervention and control girls. In KwaZulu-Natal, about a quarter of grade 10 female learners ever had sex; a significantly greater percentage of control girls had sex compared to intervention girls (27.5% and 24.1%, respectively). In both provinces, a greater percentage of male learners than female learners reported that they had sex. A greater percentage of learners from Mpumalanga also reported consistent condom use as compared to learners from KwaZulu-Natal. Sexually experienced male youth in the intervention group in Mpumalanga were significantly more likely to report consistent condom use in the past 3 months than their counterparts in the control group.

The pregnancy outcome (ever been pregnant or gotten a partner pregnant) is presented in Table 3 for the full sample and for the sample of learners who ever had sex. In the full sample, about 7-8 percent of grade 10 female learners from Mpumalanga and 10-11 percent from KwaZulu-Natal reported that they had been pregnant. About one-fifth (20-23%) of female grade 10 learners from Mpumalanga who ever had sex reported having ever been pregnant. The percentage was higher among female grade 10 learners from KwaZulu-Natal to be 35-44 percent. Among female learners in KwaZulu-Natal who ever had sex, a higher percentage in the intervention group had a pregnancy experience compared to those in the control group

(44% vs. 35). Among males in Mpumalanga who ever had sex, a significantly greater percentage in intervention schools reported making their partner pregnant than those in control schools (19.5% vs. 14.1%).

Finally, Table 3 presents HIV prevalence among the grade 10 female learners surveyed in 2018. In Mpumalanga, 5.5 percent of female learners in intervention schools and 7.5 percent in control schools were HIV positive; this difference was significant. In KwaZulu-Natal, a slightly higher percentage (7%) of intervention girls were HIV positive as compared to female learners in control schools (6%); this difference was not significant.

Table 4 presents the multivariate results of all the outcomes and the intervention effect which shows a comparison between the intervention and control learners by province and sex group. Overall, there were few significant effects suggesting that the program had little association with the outcomes included in both provinces and among male and female learners. A few notable exceptions are worth mentioning for Mpumalanga. First, female learners in intervention schools reported greater participation in their life orientation class than those in the control schools. Second, learners in the intervention schools were significantly less likely to be HIV positive than learners in control schools.

Among male learners in Mpumalanga who ever had sex, those in intervention schools were significantly more likely to report using a condom consistently in the past 3 months than their counterparts in control schools. No significant findings were found among female or male learners from KwaZulu-Natal.

In the multivariate analysis of the behavioral outcomes, there were some consistent independent variables worth noting (contact first author for details). First, female and male learners in both the provinces who repeated grades and who were older were significantly more likely to be sexually experienced. Additionally, in KwaZulu-Natal, learners (female and male) who had an HIV positive member in their household were significantly more likely to be sexually experienced; females, not knowing the HIV status of a household member, were also associated with sexual experience. Among female learners from Mpumalanga, those who went any days without food in the last three days (food insecurity) were more likely to be sexually experienced. Factors associated with pregnancy

among female learners were; having repeated a grade in school, older age, and having someone with HIV positive status in the household. Finally, for the HIV outcome, in Mpumalanga, female learners who were orphans, those who had a non-parent or grandparent as the primary household head, and those who had someone who was HIV positive in their household or did not know the HIV status of people in their household were significantly more likely to be HIV positive. In KwaZulu-Natal, older age, being a double orphan, and having someone HIV positive in the household were associated with the learner being HIV positive herself.

4. DISCUSSION

Our results demonstrate that young people in grade 10 in Mpumalanga and KwaZulu-Natal are sexually active and at risk of pregnancy and sexually transmitted infections. In particular, two-fifths to one-half of male learners and a quarter (KwaZulu-Natal) to a third (Mpumalanga) of the female grade 10 learners surveyed reported being sexually experienced. A greater percentage of learners (female and male) in Mpumalanga reported consistent condom use than learners in KwaZulu-Natal. This corresponds to higher pregnancy among sexually experienced youth in KwaZulu-Natal than in Mpumalanga, suggesting that greater condom use may be helping keep pregnancy experience lower in Mpumalanga. HIV prevalence in both provinces was similar to be about 6-7%. Learners who were HIV positive may have experienced HIV at the time of birth and not through sexual activity; with the data available, it was not possible to make this distinction.

We saw few significant differences between the intervention and control group across the provinces and among female and male learners. We observed only one positive behavioral result: intervention males in Mpumalanga reported significantly greater consistent condom use than control males in the same province. For all other outcomes, including the knowledge, gender attitudes, participation in the life orientation class, and sexual activity, no differences were observed among male learners in either province. Likewise, for female learners in KwaZulu-Natal, no significant differences were observed between the intervention and control groups. In Mpumalanga,

female learners in the intervention group reported significantly greater participation in their life orientation class than female learners in the control group. Additionally, HIV prevalence was significantly lower among female learners in the intervention group than the control group in Mpumalanga; this last result may reflect a small number of cases where HIV may have been acquired at birth.

This study does not find significant positive intervention outcomes associated with young people's sexual and reproductive health needs. This may be a reflection of a weakly designed intervention— that is, modifying a small number of lessons in the life orientation curriculum (between 8-10 LO lessons in the school year were on sexual and reproductive health topics) may not be adequate to positively change knowledge, attitudes and behaviors in this setting. Relatedly, a modified curriculum-based program with teacher training and SLP, may not have been comprehensive enough to lead to significant changes in learners' health outcomes. Other studies of school-based HIV prevention interventions with more comprehensive designs in South Africa had similar null results. For example, the randomized cluster trial of the PREPARE program that included 21 educational sessions, school health services, and school safety activities found no significant differences between intervention and control high school participants on sexual risk behaviors at 12-months follow-up [15]. Conversely, a 50-hour sexual health program in South Africa (Stepping Stones) had significant effects on genital herpes suggesting the need for a more intense program to affect behavioral outcomes [16].

Alternatively, the program, as designed, may have been inappropriately implemented. From discussions on the program, the evaluation team learned that learners in the intervention schools did not receive all the relevant lessons; in the last year of the program, approval of the modified grade 10 curriculum came late. Given this scenario, minimal or no differences in knowledge, attitudes and behaviors would be expected between young people in intervention and control schools. Finally, it is possible that the combination of these two scenarios - that the program was weakly designed and poorly implemented—led to non-significant results as presented here.

Table 3. Descriptive results of self-reported sexual behavior and HIV prevalence (grade 10 girls in 2018 only) by province and intervention group among girls and boys in grade 10 surveyed from Mpumalanga and KwaZulu-Natal, South Africa.

	Mpumalanga				KwaZulu-Natal			
	Grade 10 Girls		Grade 10 Boys		Grade 10 Girls		Grade 10 Boys	
	I	C	I	C	I	C	I	C
Ever had sexual intercourse, %	-	-	-	-	-	-	-	-
Yes	33.9	34.4	48.7	50	24.1	27.5*	44.4	44.3
Used a condom every time in past 3 months (among those who ever had sex), %	-	-	-	-	-	-	-	-
Yes	67.8	65	75.5	66.3**	55.5	49.3	64	63.4
Ever pregnant or gotten a girl/woman pregnant, %	-	-	-	-	-	-	-	-
Among full sample of girls (or boys)	7.8	6.9	9.5	7.5	10.7	9.6	6.5	6
Among those who ever had sex	23	19.7	19.5	14.1*	44.1	34.9*	14.4	13.8
HIV prevalence, %	5.5	7.5*	na	na	7	6	na	na

I – Intervention group ; C – Control group; na – not available; * p £ 0.05; ** p £ 0.01; *** p £ 0.001: for F-test of differences between intervention and control group.

Table 4. Multivariate model of whether there is a significant difference between the intervention and control group among grade 10 girls and boys by province (coefficient and standard error), South Africa 2018.

	Mpumalanga		KwaZulu-Natal	
	Girls	Boys	Girls	Boys
Knowledge score	-0.00 (0.01)	0.00 (0.02)	-0.01 (0.02)	-0.02 (0.02)
Gender score	0.02 (0.03)	0.00 (0.03)	-0.01 (0.02)	-0.02 (0.03)
Participate in LO class score	0.04 (0.02)*	0.01 (0.04)	0.01 (0.02)	-0.00 (0.02)
Perspective of LO teacher score	0.06 (0.05)	0.04 (0.04)	0.07 (0.05)	0.06 (0.06)
Ever sex	-0.17 (0.18)	-0.13 (0.14)	-0.15 (0.13)	0.01 (0.15)
Condom use last 3 months (among those ever had sex)†	0.16 (0.22)	0.46 (0.16)**	0.23 (0.19)	0.02 (0.17)
Ever pregnant (full sample)	-0.02 (0.21)	0.24 (0.19)	0.24 (0.17)	0.06 (0.19)
HIV prevalence‡	-0.51 (0.16)***	na	0.19 (0.21)	na

Note. All models control for age group, orphanhood, if there is an HIV positive person in the household, food insecurity, religion, caregiver in the household, and number of times repeated a grade. na: not applicable

Sample sizes: MP girls = 2,327; MP boys = 1,947; KZN girls = 2,786; KZN boys = 2,186. (some model n's smaller due to missing data)

† Only among those who had sex in the last three months – MP girls = 619; MP boys = 794; KZN girls = 535; KZN boys = 762.

‡ Sample size for HIV analysis: MP girls = 2,216; KZN girls = 2,587

* p ≤ 0.05; ** p ≤ 0.01; *** p ≤ 0.001.

Beyond the examination of intervention effects, these results point to the importance of addressing young people’s sexual and reproductive health. Our HIV prevalence results are similar to an earlier study with young people in high schools in KwaZulu-Natal that demonstrated an adjusted HIV prevalence of 6.4% among a sample of female students with a mean age of 16 years [12]. In addition, our HIV prevalence is similar to that found in the South Africa DHS 2016 survey for young females of age 15-19 years (5.9%) [5]. In our sample, the percentage of male grade 10 learners who reported sexual experience is similar to that found for 15-19 year old in the South Africa DHS [5]. For female grade 10 learners, the percentage of females who reported sexual experience is lower (24-34%) than that found in the DHS (43%); this may reflect under-reporting by girls participants or it might reflect the focus here on school girls who may be less sexually active than a representative sample that included girls who were not in school.

This study has a number of limitations. First, the data for this study are cross-sectional and thus it is not possible to discuss causal influences of the LO program. Second, the young people who tested positive for HIV in our sample may have had HIV since birth and therefore, HIV risk would not be related to the intervention. Third, we used self-reported outcomes of sexual experience, condom use, and pregnancy experience. Some learners may have under-reported these outcomes while others may have over-reported the same. This study used audio-assisted survey tools to help reduce potential reporting bias. Finally, as mentioned above, the evaluation team did not control roll-out of the intervention. Implementation was weak and not undertaken with fidelity; this impacts the ability to assess if there are associations between the program and the outcomes discussed.

CONCLUSION

While we would be remiss to use these data to promote broader scale-up of the SLP Life Orientation curriculum, important lessons can be gleaned from this study. Young people in these two provinces of South Africa have high HIV prevalence and are exposed to sexual and reproductive health

risks that will affect their future. Awareness programs are needed to reach these young people early, and change their knowledge, attitudes, and behaviors. Without comprehensive, multi-sector programs, young people will continue to be at risk of negative sexual and reproductive health outcomes and will not be able to reach their fullest potential.

LIST OF ABBREVIATIONS

- DBE** = Department of Basic Education
- DHS** = Demographic and Health Survey
- EDC** = Education Development Center
- HIV** = Human Immunodeficiency Virus
- HSV-2** = Genital Herpes
- IRB** = Institutional Review Board
- LO** = Life Orientation
- PEPFAR** = President’s Emergency Plan for AIDS Relief
- SLP** = Scripted Lesson Plans
- STI** = Sexually Transmitted Infections
- USAID** = United States Agency for International Development

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The approval for the study protocol and consent and assent procedures was provided by the University of Pretoria Faculty of Health Sciences Research Ethics Committee (Ref No 153/2016) and the University of North Carolina at Chapel Hill Institutional Review Board (IRB Number 15-3217).

HUMAN AND ANIMAL RIGHTS

All procedures for this study were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

CONSENT FOR PUBLICATION

For this study, Informed consent was obtained from all participants and their guardians.

AVAILABILITY OF DATA AND MATERIALS

Data used in this study are publicly accessible through the UNC Dataverse system. MEASURE Evaluation, 2019, “Impact Evaluation of a School-Based Sexuality and HIV-Prevention Education Activity in South Africa”, <https://doi.org/10.15139/S3/SAQ9CQ>, UNC Dataverse, V1.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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Appendix Table 1. Description of gender attitude questions used in survey of grade 10 learners.

Gender attitude items used to create score	Coding of items
1. It is the man who decides when to have sex	Agree a lot = 1 Somewhat agree = 2 Do not agree = 3
2. Men are always ready to have sex	
3. Women are always ready to have sex	
4. Men need sex more than women do	
5. A man needs other women even if things with his wife/partner are fine	
6. A woman needs other partners even if things with her husband/partner are fine	
7. You don't talk about sex, you just do it	
8. A woman should not initiate sex	
9. A woman who has sex before she is married does not deserve respect	
10. A man who has sex before he is married does not deserve respect	
11. Women who carry condoms on them are loose	
12. Men who carry condoms on them are loose	
13. In my opinion, women can suggest using condoms just like a man	Do not agree = 1 Somewhat agree =2 Agree a lot = 3
14. A couple should decide together if they want to have children	Agree a lot = 1 Somewhat agree = 2 Do not agree = 3
15. It is only the woman's responsibility to avoid getting pregnant	
16. If a man gets a woman pregnant, a child is the responsibility of both	
17. It is important that a father is present in the lives of his children, even if he is no longer with the mother	Do not agree = 1 Somewhat agree =2 Agree a lot = 3

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