
Do peer educators make a difference? An evaluation of a youth-led HIV prevention model in Zambian Schools

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Abstract

Restless Development's youth-led model places trained Volunteer Peer Educators (VPEs), aged 18–25 years, in schools to teach HIV prevention and reproductive health (RH). VPEs also run youth centers, extracurricular and community-based activities. This evaluation assesses (i) program effects on students' HIV/RH knowledge, attitudes and behaviors using a non-randomized quasi-experimental design among 2133 eighth and ninth grade students in 13 intervention versus 13 matched comparison schools and (ii) program costs. Intervention students had significantly higher levels of knowledge related to HIV [odds ratio (OR) 1.61, 95% confidence interval (CI) 1.18–2.19; $P < 0.01$] and RH (OR 1.71; 95% CI 1.21–2.49; $P < 0.01$), more positive attitudes toward people living with HIV and greater self-efficacy to refuse unwanted sex and access condoms. No evidence of differences in ever having had sex was found (28% in the intervention; 29% in the comparison schools). However, intervention students were more likely not to have had sex in the previous year (OR 1.26, 95% CI 1.03–1.56; $P < 0.05$) and to have had only one sex partner ever (OR 1.43, 95% CI 1.00–2.03; $P < 0.05$). The average annual cost of the program was US\$21 per beneficiary. In conclusion, the youth-led model is

associated with increased HIV and RH knowledge and self-efficacy and lowered levels of stigma and sexual risk-taking behaviors.

Introduction

Since the early 1990s, school-based HIV education has been a cornerstone of youth-focused HIV prevention efforts [1, 2]. The majority of these interventions have been adult-led with some incorporating peer education components that train students to share information with their fellow students. A World Health Organization (WHO) review of the effectiveness of sex education and HIV education interventions in schools in developing countries found only 22 studies published between 1990 and 2005 that met the review criteria, of which only two were peer-led and curriculum based [1, 3]. These peer-led studies contributed limited evidence given a biased selection of schools, small sample sizes ($n = 150–481$) and short follow-up time (4–8 months) [4, 5], and as a result, the review authors concluded that insufficient evidence existed to support the scale-up of school-based peer-led approaches and called for more rigorous evaluations [3]. Other synthesis articles since the WHO review have also found a paucity of data regarding the effectiveness of peer-led approaches in school settings [6, 7]. More recently, published data, however, are contributing

to a growing pool of evidence supporting peer-education efforts in schools to promote HIV prevention knowledge, attitudes and behaviors among students in developing countries [8–10].

Absent from these reviews and research results though is an assessment of a third approach to school-based education that is neither adult-led nor reliant on student-to-student peer education. This alternative approach is a youth-led model developed by Restless Development (restlessdevelopment.org; formerly known as Students Partnership Worldwide). In Zambia, Restless Development has piloted a curriculum-based school-based model to teach 5th through 12th graders about HIV prevention, reproductive health and life skills. Two key strategies characterize this youth-led model, which is known as the School HIV/AIDS Education Program (SHEP). One strategy is the training and deployment of volunteer peer educators (VPEs) who are older than the students but younger than teachers—usually around 18–25 years old. VPEs are high-school or college/university graduates who have leadership, communication and team building skills. Pairs of VPEs are assigned to live and work at a school for two full terms of an academic year (7–9 months). VPEs receive monthly stipends (approximately 80–90 US dollars in 2008). They also undergo 3 weeks of residential training, have monthly supervisory visits, and attend a 1-week refresher training that occurs about mid-point during their placement. Overall, training these young people has two benefits: first, in this cultural context, it is more acceptable for students to learn about sensitive topics from trained older youth than from teachers, who tend to be uncomfortable talking about sex, pregnancy and HIV with their students. Second, the training creates a cadre of young people who do important work in a country where it is difficult for many to get into a university or find employment. The other strategy is a comprehensive approach to the program that addresses life skills and sexual behaviors including abstinence, being faithful and condom use. The centerpiece of the SHEP approach is a weekly 40-min classroom lesson taught by VPEs in a participatory manner. In addition, the SHEP program has four other main components referred to as pillars. These

pillars, in addition to the weekly classroom lessons, are: (i) a Youth Resource Center (YRC) offering a library and counseling, (ii) extracurricular activities coordinated by the VPE, (iii) community educational events on specific topics (e.g. preventing early marriage) and (iv) capacity building for teachers through periodic workshops on specific topics.

The purpose of this paper is to present data evaluating the effectiveness of the SHEP youth-led model, compared with schools without SHEP, in enhancing young people's knowledge, attitudes and protective behaviors related to HIV and reproductive health and to provide data on the costs associated with implementing SHEP in Zambia. Restless Development's role during the evaluation was the implementation of the SHEP model, facilitation of access to schools and Ministry of Health officials and the dissemination of study findings in the participating schools. In order to ensure impartiality, the evaluation, including the development of the protocol, identifying and hiring of research staff, data collection, management and analysis, was conducted independently by Family Health International.

Methods

Study design and school selection

A non-randomized quasi-experimental design was used to compare outcomes between cross-sectional samples of students in 15 SHEP schools and students in 15 non-SHEP schools. The 15 SHEP schools were randomly selected from a list of 28 government run schools where the program had been operating for a minimum of 3 years and where SHEP VPEs were still active in the school. From that list, the schools were stratified by the size of their eighth- and ninth-grade student populations and a random sample of eight schools with 100 or more students and seven schools with fewer than a 100 students was generated. Comparison government schools were selected to match the intervention schools, as closely as possible, on the following characteristics: (i) school location (same district and rural/urban location); (ii) size of student population and (iii) male:female

student ratio. During the matching process, the team was unable to match two SHEP schools so replacement schools were selected.

Data collection

Between June 12 and July 28 2008, the data collectors conducted 2456 interviews at the 30 schools using personal digital assistants (PDAs). Altogether, 2476 students were randomly selected from the eighth and ninth grade classes. Of the screened students, two were ineligible as they were not actually in the eighth or ninth grade, nine declined to participate and nine terminated the interview early mainly due to time constraints. Interviews took on average 26 min excluding the consent process. Interview topics covered by the questionnaire included knowledge questions on HIV/AIDS, condom use, reproductive physiology, attitudes and sexual behaviors (see Methods). At the time of the evaluation, there were no other interventions similar to SHEP systematically being implemented in the comparison schools. However, many schools individually offered anti-aids clubs, school events and classroom lessons on HIV/AIDS and reproductive health. In order to better understand comparison school students' experiences, the interview included questions about exposure to non-SHEP classroom and club activities around HIV/AIDS and RH information. The questionnaire was pre-tested among students in non-study schools and questions were refined based on the pre-test results.

During data collection, it was discovered that two of the selected comparison schools had transitioned into SHEP extension schools in 2008, with peer educators located in an intervention school nearby visiting the extension schools and providing some of the program elements. Given that these two extension schools, originally selected as comparison schools, were receiving some of the intervention directly from the program implementers, they and their matched intervention schools were removed from the analysis ($n = 322$). In addition, a PDA froze during one interview and even though the data collector completed the interview using a paper form, the initial information on the PDA was lost.

This incomplete interview was removed from the analysis. As a result, a total of 2133 students from 13 intervention schools and 13 matched comparison schools are included in the analysis.

Ethical approval

This study received ethical approval from the ERES Converge Institutional Review Board in Zambia and Family Health International's Protection of Human Subjects Committee. Parent/teachers associations (PTAs) at each participating school provided permission to conduct the interviews among their eighth and ninth graders and informed parents of the study. This PTA approval acted as a proxy for parental consent. In addition, all students underwent a verbal informed consent process prior to participation.

Behavioral measures

HIV knowledge

Twenty-four questions were asked of youth regarding their knowledge of HIV transmission and prevention. The median score on this composite scale was 19. The knowledge variable was dichotomized, with everyone who scored 19 or higher labeled as having higher levels of HIV knowledge and everyone who scored 18 or less as having lower levels of HIV knowledge. Respondents who answered that they had never heard of HIV/AIDS ($n = 172$, 8% of sample) were not asked the 24 HIV knowledge questions and were grouped with those having low levels of HIV knowledge.

Knowledge of abstinence as pregnancy prevention

Students were asked if they had heard of methods to avoid pregnancy and, if so, what were those methods. After the initial response, interviewers were trained to ask respondents two more times if they knew of any other method. Respondents who had not heard of pregnancy prevention methods or did not say 'abstinence' as a method were coded as 'not knowing', while respondents who did report abstinence were coded as 'knowing abstinence' as a pregnancy prevention method.

Knowledge of condom use for pregnancy prevention

The same questions for abstinence knowledge were used to assess knowledge of condoms to prevent pregnancy. Respondents who had not heard of pregnancy prevention methods or did not say condoms as a method were coded as not knowing, while respondents who did report condoms were coded as 'knowing condoms' as a pregnancy prevention method.

Knowledge of reproductive physiology

Students were asked three questions regarding reproductive physiology and pregnancy: Can a girl get pregnant the first time she has sex? Can a girl get pregnant if she has sex only once? Can a girl get pregnant if she has sex standing up? The median number answered correctly was 2. The reproductive physiology variable was dichotomized, with everyone who scored 2 or higher labeled as having higher levels of reproductive physiology knowledge and everyone who scored less as having lower levels of knowledge.

Condom-use knowledge

The following four statements tested participants' knowledge about correct condom use: a male condom can be used more than once. A male condom should always be put on before sexual intercourse starts. A male condom should be put on the penis only if the penis is fully erect or stiff. Using two condoms at the same time provides more protection against HIV. One point was given for each correct response and the final variable was dichotomized with everyone who answered 3 or more questions correctly (the median was 3) labeled as having high condom-use knowledge.

Attitudes toward people living with HIV/AIDS

Respondents were asked four stigma questions: Would you be willing to share a meal with someone you know has HIV or AIDS? If a pupil has HIV but is not sick, should he or she be allowed to continue attending school? If you knew a shopkeeper or food seller had the HIV virus, would you buy food from

them? If a teacher has HIV but is not sick, should he or she be allowed to continue teaching at school? One point was given for each affirmative response. The attitude variable was dichotomized, with everyone who answered all four questions positively (the median = 4) labeled as having positive attitudes and all others labeled as having less positive attitudes toward people living with HIV.

Self efficacy

Two different self-efficacy questions were asked: if a student knows how to refuse unwanted sex (agree/disagree) and if student was able to get a male condom if wanted (agree/disagree).

Sexual behavior

Respondents were asked if they had ever had sexual intercourse (yes/no). Among those who have ever had sex, we examined how many sex partners they have ever had (dichotomized into one partner or more than one partner) and if they had had sex in the past year (yes/no). We then examined among those students who had had sex in the past year, how many partners they had had in the past year (dichotomized into one partner or more than one partner) and condom use at last sex (yes/no).

Behavioral data analysis

For the behavioral data, descriptive statistics are presented for all variables, overall and by intervention group (SHEP or non-SHEP). To adjust for clustering, generalized estimating equation (GEE) methods with the logit link function for binary variables and design-corrected chi-square tests (Rao-Scott Chi-Square) for variables with more than two response categories were used to compare background characteristics of SHEP and non-SHEP students. Multivariable regression analyses were used to answer the main research question, using GEE methods with appropriate link functions and an exchangeable working correlation matrix to account for clustering. The individual student was the unit of analysis and analyses controlled for the following variables that might be related to the outcome but not likely influenced by the SHEP

intervention: age, sex, knowing a close family member or friend who is living with or has died from HIV, current grade, belonging to an out of school club that provides HIV or pregnancy prevention information and orphan status. All tests were two sided and conducted at the 0.05 level. Statistical analyses were performed using SAS software, version 9.1 (SAS Institute, Cary, NC, USA).

Cost component

The objectives of the cost component were to calculate the annual economic cost to run SHEP, the annual cost per SHEP intervention pillar and the annual cost per school and per beneficiary reached. The 2006–07 timeframe (from October through September) was selected as the most recent year with complete cost information available. Interviews with Restless Development staff were conducted to clarify details of the SHEP structure and implementation during 2006–07, including discrete phases of the program (i.e. volunteer recruitment, volunteer training, supervision of volunteers, etc.), and individual activities within each phase. Restless Development financial staff provided information on annual program expenditures. Data were also collected on resources used by SHEP but not reflected in expenditure accounts: for example, the cost of time contributed by non-SHEP staff to SHEP recruitment and training activities was extracted from project records and added to SHEP personnel costs. Annual cost of capital items was calculated using standard techniques [11]. The market value of donated volunteer accommodation and SHEP office space was estimated through inquiries made to local sources. Finally, Restless Development administrative overhead was allocated to the SHEP based on the proportion of full-time equivalent program staff in the SHEP. All these costs then were summed to arrive at the annual economic cost of the SHEP.

Calculation of the cost per intervention pillar required a method for allocating volunteer-related costs (i.e. recruitment, training and volunteer subsistence) across pillars. We obtained VPE activity diaries from five purposively selected study SHEP

schools and selected diaries from every fifth week of the program year, generating data covering 25 weeks of volunteer activities. SHEP monitoring and evaluation staff reviewed the diaries and coded activities to correspond to each pillar. These activity counts were then weighted using estimates of average time spent to carry out each activity. Resulting values were then used to calculate a percentage distribution of volunteer effort across pillars, and this distribution was used to allocate volunteer-related costs across pillars. All other costs (i.e. permanent SHEP staff and overhead costs) were allocated evenly across the five pillars, and costs were summed to yield the annual cost per pillar. The annual economic cost of the SHEP was divided by the number of schools that participated in SHEP in 2006–07 to obtain an average cost per school and by the number of 5th–12th grade students in those schools and the number out of school youth who utilized the school YRC to obtain a cost per youth reached.

Results

Respondent characteristics

Background characteristics were similar across the intervention and comparison groups in terms of age, sex, religion, orphan status and how old they were when they started school (Table I). While age categories did not significantly differ among the intervention and comparison groups, it is interesting to note that almost 10% of the sample was 19 and older, and another 44% were between 16 and 18 years of age. These ages represent youth who are at different developmental stage than the eighth or ninth grader who started school at the official age of seven and, if progressed yearly, should be between 14 and 15 years of age at the time of data collection. Also, over 44% of the respondents did not live with either parent.

Comparison students' exposure to SHEP and other school-based programs

As part of the interview, students were asked about exposure to the SHEP program. Among comparison school students, only 195 (19%) had heard of the

Table I. Background characteristics

	Total (<i>n</i> = 2133), <i>n</i> (%)	SHEP students (<i>n</i> = 1088), <i>n</i> (%)	Non-SHEP students (<i>n</i> = 1045), <i>n</i> (%)	<i>P</i> -value ^a
Age				0.58
Early adolescence (11–13 years)	185 (8.70)	76 (7.00)	109 (10.4)	
Early-mid adolescence (14–15 years)	808 (37.9)	404 (37.1)	404 (38.7)	
Mid-late adolescence (16–18 years)	925 (43.4)	498 (45.8)	427 (40.9)	
Late adolescence (19+ years)	215 (10.0)	110 (10.1)	105 (10.1)	
Sex				0.95
Female	1005 (47.1)	512 (47.1)	493 (47.2)	
Male	1128 (52.9)	576 (52.9)	552 (52.8)	
Religion				0.31
Catholic	356 (16.7)	161 (14.8)	195 (18.7)	
Protestant	1694 (79.4)	894 (82.1)	800 (75.6)	
Muslim	7 (0.33)	3 (0.28)	4 (0.38)	
Other	76 (3.60)	30 (2.80)	46 (4.40)	
Orphan Status				0.57
Both parents alive	1343 (63.0)	681 (62.6)	662 (63.4)	
Single orphan	561 (26.3)	297 (27.3)	264 (25.3)	
Double orphan	229 (10.7)	110 (10.1)	119 (11.4)	
Living situation (with)				0.37
Both parents	353 (16.6)	181 (16.6)	172 (16.5)	
Mother only	675 (31.7)	371 (34.1)	304 (29.1)	
Father only	152 (7.10)	77 (7.10)	75 (7.20)	
Neither parents	953 (44.7)	459 (42.2)	494 (47.3)	
Age when started school				0.29
<7 years	507 (23.8)	232 (21.3)	275 (26.3)	
At 7 years	791 (37.1)	402 (37.0)	389 (37.2)	
>7 years	639 (30.0)	351 (32.3)	288 (27.6)	
Do not know	196 (9.20)	103 (9.50)	93 (8.90)	
Current grade				0.22
8th grade	1049 (49.1)	559 (51.4)	490 (46.9)	
9th grade	1084 (50.8)	529 (48.6)	555 (53.1)	
Knows someone close with HIV (yes)	464 (23.7)	252 (24.6)	212 (22.7)	0.48
Currently belong to an out of school club that provides HIV and/or pregnancy information (yes)	182 (8.50)	107 (9.80)	75 (7.20)	0.07

^aComparison of proportions between SHEP group and non-SHEP group.

SHEP Peer Education Program; 70 (7%) reported having seen or heard a health message from a VPE and only 35 (3%) reported that they had ever talked with a VPE. In addition, none of the comparison arm students reported attending an SHEP community event during the year.

In terms of non-SHEP activities, more than half of the comparison students (58.3%; *n* = 610) reported having a class during the past school year that taught them about HIV/AIDS; 29% (*n* = 303) said they belonged to an in-school club that provides HIV/AIDS information and one-third (33%,

$n = 342$) had attended a school event that focused on HIV/AIDS.

Knowledge, attitudes and self-efficacy

As depicted in Table II, students in the SHEP intervention schools compared with non-SHEP students were 1.6 times more likely [95% confidence interval (CI) 1.2–2.2] to answer 19 or more HIV prevention and transmission questions correctly and 1.7 times more likely (95% CI 1.2–2.5) to answer 2 or more of the reproductive physiology questions correctly, compared with non-SHEP students. SHEP students were also significantly more likely to know abstinence and condom use as pregnancy prevention methods. No evidence was found of a difference between SHEP and non-SHEP students in terms of general condom-use knowledge. SHEP students, however, were almost twice as likely compared with non-SHEP students to answer all four questions regarding attitude toward people living with HIV positively (95% CI 1.4–2.6). SHEP students also had greater self-efficacy with significantly more SHEP students compared with non-SHEP students knowing how to refuse unwanted sex [odds ratio (OR) = 1.4, 95% CI 1.1–1.9] and

able to get a male condom if wanted (OR 1.2, 95% CI 1.0–1.5). The analysis also explored differences in study outcomes for males versus females by testing an interaction effect. The result of these interaction analyses did not provide evidence of any difference for males compared with females in terms of exposure to SHEP and the desired outcomes (data not shown).

Sexual behavior

The percentage of respondents reporting ever having had sex did not significantly differ between SHEP and non-SHEP students (28 versus 29%, respectively). Overall, more than 3 of every 4 of the 612 youth who have had sex were male and age 18 or younger. The average age of first having had sex was 14 for males and 15 for females. The main reasons for having sex among males was to satisfy curiosity (45%), playing around (15%) and to show love (10%). Among females, 25% said they did not know or remember, while the other main reasons given were to satisfy curiosity (22%), forced or raped (15%), to show love (13%) and partner insisted (9%).

Among students who have ever had sex, there was no evidence of a difference in having used a condom

Table II. Knowledge, attitudes and self-efficacy: comparing SHEP to non-SHEP students

	SHEP n (%)	Non-SHEP n (%)	Adjusted OR (95% CI)
Knowledge			
HIV prevention and transmission (19+ of 24 questions answered correctly)	643 (59.1)	511 (48.9)	1.61 (1.18–2.19)**
Pregnancy prevention			
Abstinence	538 (49.5)	437 (41.8)	1.47 (1.07–2.04)*
Condom use	623 (57.2)	537 (51.4)	1.26 (1.03–1.54)*
Reproductive physiology (2+ of 3 questions correct)	725 (66.6)	576 (55.1)	1.73 (1.21–2.49)**
Condom use	681 (62.6)	655 (62.7)	0.99 (0.83–1.20)
Attitudes			
Attitudes toward people living with HIV/AIDS (all four questions answered positively)	696 (64.0)	529 (50.6)	1.90 (1.37–2.64)***
Self-efficacy			
Know how to refuse unwanted sex	855 (78.6)	758 (72.5)	1.40 (1.07–1.85)*
Able to get male condom if wanted	569 (52.3)	493 (47.2)	1.23 (1.01–1.50)*

Adjusted for age, sex, current grade, knowing someone infected or who has died from HIV, belonging to an out of school club that provides HIV or pregnancy prevention information, orphan status. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

at first sex (34% among intervention students and 32% among comparison students) Table III. However, SHEP students were 1.4 times more likely (95% CI 1.0–2.0) than non-SHEP students to have had only one sex partner in their lifetimes and 1.3 times more likely (95% CI 1.0–1.6) to have not had sex in the past year than non-SHEP students. For youth who had sex in the past year ($n = 246$), the study arms did not significantly differ in the number of sex partners in the past year (SHEP = 69% versus non-SHEP = 60% having only one sex partners in the past year) or condom use at last sex (46 versus 48%, respectively).

Cost

The total annual cost of the SHEP program for 2006–07 was slightly less than 2.1 billion Kwacha in Zambian currency, which equates to US\$501516 (1 US\$ = 4187 Zambia Kwacha) [12]. The largest cost components were volunteer recruitment, training and subsistence (31.7%), salaries and benefits of Restless Development administrative staff (18.0%), salaries and benefits of SHEP permanent staff (17.5%) and events for secondary target groups (14.6%) Table IV. In 2006–07, SHEP was active in 61 schools, giving an average annual cost per school of US\$8222. A total of 24 332 beneficiaries—21 498 students in grades 5 through 12 and 2834 out-of-

school youth—were exposed to the SHEP in the school youth resource centers. Dividing total annual cost by 24 332 yields an average annual cost per beneficiary of US\$20.61.

The average cost per school during the 2006–07 program year was also broken down to show the costs of the five pillars. The Adolescent Sexual and Reproductive Health Life Skills Education pillar had the highest cost (US\$2197), followed by the training and support pillar (US\$1911) and the community outreach pillar (US\$1552). The extracurricular activities and youth resource centers cost US\$1337 and US\$1242, respectively. Cost differences between pillars stem mainly from differences in volunteer-related costs since most other costs were allocated evenly across the pillars. Two exceptions included other direct costs related to stakeholder training, which were allocated fully to the ‘training and support’ pillar, and other direct community outreach costs, which were allocated fully to the ‘community outreach’ pillar.

Discussion

The evaluation findings provide evidence that the SHEP is associated with many of the desired knowledge, attitudes and behaviors for HIV prevention and reproductive health. These data have

Table III. Sexual behavior: comparing SHEP to non-SHEP students

	SHEP <i>n</i> (%)	Non-SHEP <i>n</i> (%)	Adjusted OR (95% CI)
Ever sexually active	308 (28.3)	304 (29.1)	0.80 (0.57–1.12)
Among respondents who have ever had sex ($n = 612$; SHEP = 308; non-SHEP = 304)			
Condom use at first sex	106 (34.4)	96 (31.6)	1.23 (0.80–1.91)
One sex partner ever	150 (48.7)	125 (41.5)	1.43 (1.00–2.03)*
No sex in past year	194 (63.0)	169 (56.2)	1.26 (1.03–1.56)*
Among respondents sexually active in the past year ($n = 246$; SHEP = 114; non-SHEP = 132)			
One sex partner past year	79 (69.3)	80 (60.1)	1.62 (0.72–3.65)
Condom use at last sex	51 (45.1)	63 (47.7)	0.93 (0.57–1.53)

Adjusted for age, sex, current grade, knowing someone infected or who has died from HIV, belonging to an out of school club that provides HIV or pregnancy prevention information, orphan status. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

Table IV. Total annual cost of the SHEP program, 2006–07

Line items	Total (US\$)
Salaries and benefits (SHEP perm staff)	87 823
Volunteer recruitment, training and subsistence	159 103
Supervision of volunteers	44 187
Events for secondary target groups	73 065
Site evaluation	13 772
Support and office	25 407
Annualized capital	7750
Salaries and benefits (Admin and M&E staff)	90 409
Total annual cost	501 516
Annual cost per school (61 schools)	8222
Annual cost per beneficiary reached ($n = 24\ 332$)	20.61

M&E, Monitoring and evaluation.

three main program implications. First, the behavioral evidence supports implementing the SHEP model to increase knowledge and reduce sexual risk behaviors among students. SHEP students had higher levels of knowledge and better attitude and self-efficacy scores on several outcome measures than non-SHEP students. This is particularly important given that 20 years or more into the epidemic, the general level of HIV knowledge among Zambian youth is high, with students in this evaluation answering a median of 19 of 24 HIV-knowledge questions correctly. We conducted an item analysis in order to explore the questions answered correctly by respondents who scored above 19 in comparison with the questions answered correctly by those who scored less than 19. This exploratory analysis revealed that 45% more of the higher scoring students knew that HIV exists in semen and vaginal fluids than did their lower scoring peers. Thirty-five percent more of the higher scoring students than the lower scoring students also knew that HIV is different from AIDS, that HIV exists in human milk, that the risk of transmitting HIV is low when using a condom during sex and that people can protect themselves from HIV by having only one partner who is not infected with HIV. While knowledge

does not always translate into behaviors, equipping students with this information remains an important part of a comprehensive HIV prevention program. SHEP students also exhibited more behavior change than their non-SHEP peers. SHEP students were significantly more likely to report having had only one lifetime partner and, among sexually active students, having abstained in the past year than students from the comparison schools, representing two important risk-reduction strategies.

Second, the SHEP model may be strengthened by examining ways to address delayed initiation of sex, and among sexually active students, the use of safer sexual practices. The percentage of students reporting ever having had sex, and the age when they first had sex, did not differ significantly between SHEP and comparison school students, although the study was unable to determine if the age of first sex happened before or after exposure to the intervention. In addition, while fewer SHEP students reported having had sex in the past year compared with their non-SHEP peers, those who were sexually active in the past year did not differ significantly in terms of using condoms or number of partners. These findings highlight the challenges of addressing the needs of both sexually active and non-sexually active youth in the same curriculum. Moreover, both the SHEP intervention and comparison schools had students as young as 11 and as old as 28 attending eighth and ninth grade classes, and more than half of the study sample comprised students who were 16 or older. Developmentally, these older youth—in their mid-to-late adolescence—may have different needs than those focused on in a curriculum designed for younger eighth and ninth graders.

Third, SHEP costs are within the range of other school-based behavioral interventions among youth in Africa. A 2003 World Bank publication surveyed seven school-based programs and found estimates of cost per beneficiary per year ranging from US\$1.40 to US\$71 [13]. These programs varied widely in design and implementation, making comparisons of cost per beneficiary across programs somewhat problematic. One other Restless Development site, in Tanzania, reported costs of US\$24.12

per beneficiary, which is only slightly higher than the US\$20.61 per beneficiary calculated in this study [13]. None of the other programs cited in the World Bank study except the Restless Development/Tanzania site used resident peer educators, and the costs of housing and feeding the VPEs are a substantial part of the cost of the SHEP.

There are limitations to this evaluation that warrant consideration. For the behavioral component, the cross-sectional study design restricts conclusions to those of association rather than causation. Matching intervention and comparison schools on numerous characteristics represented another challenge, particularly in rural settings. The differences in the matching characteristics, or any other inherent differences between the SHEP intervention and the comparison schools, may mean that the differences found between these two study arms are due to factors other than the SHEP intervention. Also, two of the SHEP intervention schools could no longer provide VPE with accommodations at the schools during the year of data collection. Such changes in program implementation may have weakened the associations found between the SHEP intervention and the desired outcomes in this evaluation. For the economic component, budget and time constraints prevented the building of cost estimates from the ‘bottom-up’ at the study schools, and instead a ‘top-down’ approach was used to allocate shared costs, which although simpler to implement is not able to capture school-to school variation in resource use and therefore costs. Thus, the estimate of average cost per school and per beneficiary per year likely masks variation in these costs across schools and individuals.

In conclusion, the Restless Development youth-led SHEP model is associated with increased knowledge, attitudes and protective behaviors among eighth and ninth grade students. In contrast to many school-based programs, Restless Development supports full-time VPEs in one location for 7–9 months and extends beyond classroom lessons/extracurricular activities to conduct community outreach and engage teachers and communities to build enabling environments for youth. The SHEP approach also equips young people who are the VPEs with valuable skills and experiences. Future research on this model should examine the

relative impact of the different SHEP pillars on youth behavior and explore the mediating factors, such as life skills, that may lead to the practice of safer reproductive health behaviors.

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Conflict of interest statement

None declared.

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