Effects of Peer-led Health Education on Secondary School Students as HIV Risk Reduction Strategy in Botswana:

Baseline Results

November 2012

Stepping Stones International (SSI) is a non-governmental, non-profit organization that unlocks the potential of orphaned and vulnerable adolescents (aged 12–18+) to a world of opportunities. SSI is the first program of its kind in Botswana focused exclusively on adolescent development. SSI uses a holistic approach by nurturing the mental, physical, and social well-being of our youth to create realizable opportunities for them to become self-sufficient. Through the leadership program, our youth gain life skills, leadership, entrepreneurship and community mobilization competencies to assist them in the attainment of post-secondary education or full-time employment. Our team possesses knowledge and expertise in the fields of adolescent care and support services. Visit www.steppingstonesintl.org

The peer education program at Stepping Stones International (SSI) is funded by the Botswana National HIV/AIDS Prevention Support (BNAPS) Project at the National AIDS Coordinating Agency (NACA) under the support from the International Bank for Reconstruction and Development (IBRD) of the World Bank.

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TABLE OF CONTENTS

ACRONYMS

AAHE	American Association for Health Education
AIDS	Acquired Immunodeficiency Syndrome
BAIS III	Botswana AIDS Impact Survey III
BNAPS	Botswana National HIV/AIDS Prevention Support Project
HIV	Human Immunodeficiency Virus
IBRD	International Bank for Reconstruction and Development
IDU	Injection Drug User
IFRC	International Federation for the Red Cross & the Red Crescent
IGS	Intergenerational Sex
MCP	Multiple Concurrent Partnership
M&E	Monitoring & Evaluation
NACA	National AIDS Coordinating Agency
Open Epi	Open Source Epidemiologic Statistics for Public Health
ORs	Odds Ratios
SD	Standard Deviation
SSI	Stepping Stones International
SPSS	Statistical Package for Social Science
UNAIDS	Joint United Nations Program on HIV/ AIDS
UNICEF	United Nations Children’s Fund

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Executive Summary

Introduction

HIV and AIDS have robbed nations of its future leaders and obliterated families during its three decade rampage. HIV and AIDS remain pervasive challenges haunting many young African adolescents because many believe that they are not at risk. Peer-led health education interventions have been the mainstay HIV prevention strategy targeting young people for the past two decades. Several studies suggest that when well-designed and implemented, peer-led health education is effective in reducing HIV risks.

Objectives

The primary objectives are to evaluate whether peer led interventions at SSI will result in the reduction of HIV risk factors among secondary students during the implementation period; and use the baseline data as a benchmark for setting implementation targets for the programs.

Methodology

The SSI peer education program is an intervention modeled as an operational research, which collected baseline data to inform the peer program design as well as used to set program targets. This will be followed by continuous and end line data collection to monitor program progress and evaluate interventions at the end of the implementation cycle. Interim data may be collected at the end of 12 months as a quality improvement benchmark during the 18 month implementation cycle. The implementation of interventions will be phased out, allowing the program to start with some selected schools, and gradually expanding to the remaining schools in selected districts in an organized fashion.

The determined sample at baseline 1,458 of which 94.5 percent consented. This report is based on information collected from 1,373 (94.5 percent) of the respondent population. Data were collected from 23 secondary schools drawn from Good Hope, Kweneng East, Selebi Phikwe, Palapye, Bobirwa and Francistown districts. Respondents were randomly selected from selected schools based on the pre-prepared computer random number generator. The sample population was a representation of rural and urban student population.

Results

The baseline sample consisted of 54.3 percent female and 45.7 percent male respondents. The majority (75.2 percent) of the sample was in the 15 – 19 year age group and the remainder in the 10 – 14 year old age group (24.2 percent) and 20 – 24 year old age group (0.6 percent). The mean age of the respondent population at baseline was 15.8 years [standard deviation = 1.54].
Four of every ten respondents interviewed at baseline were in grade 11 (from 4) with almost equal distribution of respondents attending grade 8 and 9. Two-thirds of the respondents were being cared for by both parents (33.9 percent) and single mothers (31.6 percent). The remainder was under the care of the extended family system.

Outcome Indicator 1: The percentage of respondents reporting that it is acceptable in their community to have multiple concurrent partners was 1.7 percent. Male respondents were 2.79 times more likely to state that multiple concurrent partnerships is acceptable than their female counterparts, $OR_{adjusted} = 2.79, 95\%\ CI: 1.16, 6.67, p<0.01$.
According to the respondents, multiple concurrent relationships in their communities are primarily motivated by the need for economic security and the desire for sexual variety.

Outcome Indicator 2: At baseline, 85.0 percent of the respondents believed that having more than one sexual partner at the same time increases the risk of HIV infection. Male respondents were least likely to cite multiple concurrent partnerships as a risk factor for HIV infection by 38% compared to female respondents, $OR_{adjusted} = 0.62, 95\%\ CI: 0.46, 0.85, p<0.05$.
Asked to justify their beliefs that multiple concurrent partnerships increases the risk of HIV infection, the majority of the respondents stated that as one's sexual network increases, it becomes more plausible that some of the partners may be HIV infected, hence the increased risk.

Outcome Indicator 3: At the time of baseline data collection, 27.6 percent (n = 379) of the respondent population had sexual partners. Among these respondents, 29.8 percent reported to have ever discussed multiple concurrent partnerships as an HIV risk factor with their sexual partners.

Further analysis (multiple logistic regression modeling) found no significant evidence that sex, age, education, geographic location, districts had effect on the respondents' behaviors to discuss multiple concurrent partnership with their partners, $p>0.05$. Outcome Indicator 4: Results at baseline show that 74.3 percent of the respondents were confident to terminate their relationship with their sexual partners if they discovered that their partners were involved with other sexual partners.
Multiple logistic regression modeling found that respondents from Good Hope ($OR_{adjusted} = 3.17$, *95% CI: 1.32, 7.58,* $p<0.01$) and Selebi Phikwe ($OR_{adjusted} = 1.17$, *95% CI: 1.07, 2.76,* $p<0.05$) were significantly confident to terminate multiple concurrent relationships compared with respondents from the reference group.

Outcome Indicator 5: At baseline, 15.7 percent of the respondents (n = 216) reported to have had multiple concurrent partners 12 months prior to data collection. The overall mean number of concurrent multiple partnerships at baseline was 2.28 partners. Of these respondents (n = 216), 87.8 percent reported to have reduced the number of sexual partners. The mean number was after reducing sexual partners was 0.88 both male and female respondents (Median = 1 sexual partner).

Outcome Indicator 6: Results show that 6.5 percent (n = 89) of the respondents in targeted school reported that it is acceptable in their community to have sexual relationships with partners ten or more years older than themselves. The majority these respondents believed that age was not a factor to deter relationships with an old sexual partner if there was love.

Outcome Indicator 7: At baseline, 73.3 percent of the respondents believed that having sexual relationship with a partner ten or more years older than themselves increases the risk of HIV infection. Further analysis found no significant evidence that sex, age, education, geographic location, districts had effect on the respondents' belief on whether intergeneration sex increases HIV infection or not, $p>0.05$.

Outcome Indicator 8: Baseline results found that 1.2 percent (n = 17) of the respondent population had been involved in sexual relationships with partner ten or more years older than themselves. Three of the respondents reported to have stopped the relationships, while 14 were still involved in these relationships. Female respondents (64.3 percent, n = 9) were more likely to report being sexually involved in intergenerational sexual relationships than male counterparts. The difference between female and male respondents' involvement in intergenerational sex was statistically not statistically significant, $p>0.05$.

Outcome Indicator 9: At baseline, 24.7 percent of the male respondents reported to have been circumcised. On average, form 4 students were least likely to report being circumcised than respondents in form 1 by 53.0 percent, $OR_{adjusted} = 0.47$, *95% CI: 0.30, 0.75,* $p <0.01$. Results also indicate that urban respondents were five times more likely to report being circumcised compared with respondents from rural areas, $OR_{adjusted} = 5.26$, *95% CI: 3.27, 8.47,* $p< 0.001$.

Outcome Indicator 10: Baseline results show that 90.3 percent of the sample population reported to have never had sexual intercourse. The majority of the sexually inactive respondents were in the 10 – 14 year age group.

Results also show that sexual activity in this population increases with age. Respondents in the 20 – 24 year old age group for example, were 17 times more likely to report having had sexual intercourse than respondents in the 10 – 14 year old age group, $OR_{adjusted} = 17.30$, *95% CI: 2.88, 103.88,* $p<0.001$. Male respondents were about twice more likely to report having had sexual intercourse than their female counterparts, $OR_{adjusted} = 1.87$, *95% CI: 1.27, 2.74,* $p<0.05$. At baseline, the mean age of sexual debut in this population was 15.8 years [SD = 1.54, Median 16 years]. Male respondents tend to initiate sexual activity at 15.6 years and female respondents at 16.2 years.

Conclusion

The results offer SSI an opportunity to design evidence based interventions that would contribute to the reduction of risks associated with HIV infection in Botswana, and provide SSI with benchmark for setting target indicators for monitoring and evaluating the effects of the peer education interventions.

Recommendations

The success of any peer education program depends on multiple determinants. The determinants include the design of the program and effectiveness of the delivery methods of the proposed intervention package, competencies, skills and capacity of SSI staff, and more importantly on the skills and commitment of the peer educators. Selecting the right peer educators and providing them with sustained and appropriate training and supportive infrastructure will be critical for SSI peer led education program.
Baseline results show high percentage of respondents' knowledge of perceived risks associated with both multiple concurrent partnerships and intergenerational sexual relationships. However, the high level of knowledge is not positively correlated to risk reduction practices such as discussing multiple concurrent partnerships with sexual partners and reducing number of sexual partners ten or more years older than the respondents.

To address this gap, SSI should consider:

- Re-directing its peer education interventions from knowledge based to building youth's self efficacy skills and competencies by guiding them to conduct self risk assessment and set individual tailored goals that reduce HIV risk factors. Youth should be directed to commit and sustain risk reduction strategies including abstinence [for those who are sexually inactive], secondary abstinence [for those who have had sex], safe sexual behaviors [for those who are sexually active], HIV testing and counseling, safe male circumcision, access to sexual reproductive health information, and alcohol and substance abuse.

Given that the baseline level of most of the BNAPS high level outcome indicators are high, SSI should set its coverage/reach as well as target indicators aimed at obtaining statistically significant outcomes at the end of the implementation cycle. To achieve statistically significant outcomes, the peer education implementation life cycle should be set at 18 or 24 months.

Research shows that peer led education programs are effective when they are integrated into other existing programs and other organizations.

- SSI should consider repackaging and integrating its peer education interventions into existing HIV and AIDS programs using available linkages in its working environment. This may include community mapping and dialogue involving community members (village administration, political establishments, parent teacher associations, and teachers unions), parents (uncles and aunties), state as well as non-state institutions to optimize scare resources.

- It is recommended that SSI incorporate into its program national strategic plans/guidelines such as multiple concurrent strategic plans, safe male circumcision and counseling strategic plan and the national behavior change and communication strategy and materials to link its efforts to the Botswana national HIV and AIDS prevention efforts.

- In addition, SSI should consider developing segmented and targeted messages to address age specific, gender specific, location specific health issues guided by the baseline results.

Breaking the back of HIV transmission and creating HIV free generation require sustained efforts that include a mix of peer education approaches that involve multiple plays and stakeholders. This coordinated approach has potential to positively motivate and encourage young people to engage in risk reduction strategies.

1 Introduction

1.1. Background

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) remain the major public health, economic, societal, and development challenges in the world. The Joint United Nations Program on HIV and AIDS (UNAIDS) estimates that globally, two million [1.8 million – 2.4 million] young people are living with HIV; and sub-Saharan Africa bears the high burden of HIV infection than any other part of the world (UNAIDS Global Epidemic Report, 2010). As a result, the picture of young people living with HIV is predominately African (United Nations Children's Fund, (UNICEF, 2011).

HIV and AIDS have robbed nations of its future leaders and obliterated families during its three decade rampage and they remain pervasive challenges haunting many young African adolescents (Tiendrebeogo, Meijer, Engleberg, 2003). The difficulty of breaking the back of HIV and AIDS among young people is challenged by their belief that they are not at risk. Tiendrebeogo et al., (2003) found that ⅔of sexually active youth do not believe that they are at risk of being infected by HIV. In addition, the road from childhood to adulthood for the majority of young people, most especially young girls is a perilous trajectory due to multiple risk behaviors, which result in the rapid spread of HIV (UNICEF, June 2011). Furthermore, there is lack of youth -tailored, relevant and evidence-based programs on HIV and AIDS. Where such programs exit, they are more likely not have been evaluated for their effectiveness.

Given the state of adolescents' vulnerabilities to HIV and AIDS, public health interventions that mitigate these vulnerabilities are vital for minimizing HIV infection. UNICEF (2011) indicates that nine out of ten young people living in the developing world face several profound challenges that put them at risk of HIV infection. Preventing the transmission of HIV and AIDS among young people is one of the core areas that will break the back of HIV and AIDS. Achieving this goal will require implementation of evidence-based and relevant interventions in countries where HIV and AIDS epidemics are generalized.

1.2. Problem Statement: HIV and Youth in Botswana

In spite of substantial investments in HIV and AIDS prevention programs, Botswana is still grappling with one of the highest HIV prevalence rates in the world (Ntseane & Preece, 2003). The prevalence of HIV among young people is still at a worrying rate. According to the Botswana AIDS Impact Survey (BAIS III, 2008) 8.3 percent of youth in the 15 – 24 age groups were infected with the AIDS virus in 2008. In 2009 alone, about 6,000 [4,300 – 8,800] new HIV occurred among young Batswana in this age group and thousands more were projected to become infected (UNAIDS 2010). BAIS III data indicate that the likelihood that young people aged 15 – 19 years will get infected with HIV in Botswana is 3.6 percent and this percentage leaps to 12.7 when youth are in the 20 – 24 year old age group.

In generalized HIV/AIDS epidemics, like that in Botswana, multiple prevention approaches remain the key for arresting the spread of HIV transmission. Health education is one such HIV/AIDS prevention strategy. According to the American Association for Health Education (2012), health education is a social science derived from the biological, environmental, psychological, physical, and medical sciences to promote health, prevent diseases and disability through education-driven behavior change. Health education involves the development of individual, group, institutional, community and systemic strategies to improve health knowledge, attitudes, skills and behavior. Its purpose positively influences the health behavior of individuals and communities as well as the living and working conditions that influence health. When used among in school settings, health education builds students' knowledge, skills, and positive attitudes about health and motivates students to improve and maintain their health, prevent disease, and reduce risk behaviors (AAHE, 2012).

Health education interventions aimed at improving the knowledge, capacity and skills to avoid risk behaviors through peer-to-peer delivery strategies, remain the mainstay of HIV prevention among young people (International Federation of the Red Cross & Red Crescent (IFRC, 2009)).

1.3. Peer Education as HIV Risk Reduction Strategy

Peer-led health education interventions have been the mainstay HIV prevention strategy targeting adolescents and other vulnerable populations for the past two decades (IFRC, 2009). However, the effectiveness of peer-led health education interventions as HIV risk reduction and prevention strategy has been inconsistent despite widely used (IFRC, 2009; UNICEF, 2011). The philosophy behind peer education as HIV risk reduction strategy is based on the paradigm that it influences behavior change at an individual, group and societal levels by modifying norms or stimulating collective action that contributes to disease prevention/risk reduction (Reference). Peer led education is grounded on the premise that information is transmitted more easily by people with shared background and interests in areas such as personal characteristics, popular culture, and role demands (Reference).

In addition, youth peer educators are less likely to be seen as figures of authority 'preaching' from a judgmental perspective about how youth should behave. Rather, the process of peer led education is perceived as receiving advice from a friend 'in the know' who has similar concerns and an understanding of what it is like to be a young person (Reference).

Research shows that a young person's peer group has a strong influence on the way he or she behaves (Reference). This is true for both risky and safe behaviors. Not surprisingly, young people get a great deal of influence from their peers on issues that are especially sensitive or culturally taboos. When used effectively, peer education can be a powerful tool for influencing positive health behaviors. It is also recognized that organizations using peer education as HIV/AIDS risk reduction strategy must first create credibility of peer educators within their target group in order to create base upon which peer education is developed (Reference).

1.4. Literature Review: The Effects of Peer Education as a Health Prevention Strategy

Many studies have been conducted to evaluate the effectiveness of peer led education for the past two decades, with inconsistent outcomes (IFRC, 2009; UNICEF, 2011). Medley, Kennedy, O'Reilly & Sweat (2009) performed a systematic review and meta-analysis on peer education studies conducted in sub-Saharan Africa, Asia, Latin America and the Caribbean targeting youth, commercial sex workers, injection drug users (IDUs), transport workers, heterosexual adults, and miners. Medley et al., (2009) found that peer led education significantly increased HIV risk knowledge (OR = 2.28; 95% CI: 1.88, 2.75); reduced substance abuse risk factors among injection drug users (OR = 0.37; 95%CI: 0.20, 0.67); and increased condom use behaviors (OR = 1.92; 95% CI: 1.59, 2.33). Medley et al., (2009) state that peer led education was also associated with moderate improvement of HIV behavioral outcomes; however, the interventions failed to demonstrate a link between peer education and the incidence of HIV reduction.

In a meta-analysis study drawn from North America, Finland and Australia, Mellanby, Rees & Tripp (2000) found that peer led education interventions significantly promoted positive health behaviors related to substance abuse more than adult led health education programs. Field quasi experimental studies have also demonstrated significant outcomes of peer led education. Meekers, Stallworth, & Harris (1997), found that peer led education in Botswana significantly increased the belief that people use condoms to avoid sexual risks. Meekers et al., (1997) also found that peer led interventions reduced the belief among females that sex was a precursor of marriage.

In a quasi experimental study among high school student in Yemen, Al-lyani, Basaleem, Al-Sakkaf, Crutzen, Kok, & van den Borne (2011) attributed peer led education to the reduction of stigma and discrimination towards people infected with HIV. Al-lyani et al., (2011) also reported that peer education significantly increased condom use and reduced misconception about HIV transmission among high school students. In a South African field experimental study, Marsh & Mash (2012) found that peer-led education was significantly associated with increased postponement of sexual debut, from 11.9% to 21.4%, $p < 0.05$. However, the study did not find any significant difference between intervention and control groups on the effects of peer led interventions on respondents' behavior to reduce number of sexual partners (Mash & Mash, 2012).

Other studies have, however, did not find any significant effects the peer-led interventions on young peoples' risk reduction behaviors. A systematic review of peer led interventions conducted in the European Union from 1999 to 2010, Tolli (2009) found no statistical evidence of the effectiveness of peer education interventions, $p > 0.05$. Tolli's findings are collaborated by IFRC (2009) which noted that not all peer led education interventions are effective. According to IFRC (2009), despite being highly utilization, peer education programs do not incorporate monitoring and evaluation strategies to measure their effectiveness. The literature highlights important lessons learned that should be considered when designing peer led education programs. Peer led education must be modeled into rigorous operational research framework as a benchmark for quality improvement with monitoring and evaluation measures as a prerequisite.

2 Purpose of Project

2.1. Purpose

The purpose of the BNAPS Project is to assist the Government of Botswana in increasing coverage, efficiency, and sustainability of targeted and evidence based HIV/AIDS efforts (World Bank, 2012). BNAPS is an International Bank for Reconstruction and Development (IBRD) at the World Bank to support Botswana's efforts to mitigate and reduce the spread of HIV/AIDS epidemic through the Botswana National HIV/AIDS Prevention Support (BNAPS) Project (The World Bank, 2012).

Stepping Stones International (SSI), a nonprofit organization working with youth aged 12 – 18+ years, is one of the recipients of the BNAPS funding. SSI believes that the development of well-tailored, evidence-based, and appropriately delivered peer-led education interventions among young people require effective and informed planning to optimize the efficacy of HIV prevention. The baseline data serves as a benchmark for setting targets on outcome indicators, monitoring and evaluating program performance at the end of the implementation cycle.

As SSI implements the peer led education program, its management is interested in ensuring that the interventions contribute to BNAPS' overall purpose to mitigate and reduce HIV infection in Botswana.

2.2. Objectives at SSI

The primary objectives for the baseline data collection are two-fold.

- To evaluate whether peer led interventions at SSI will result in the increase of HIV knowledge and reduction of HIV risk factors among secondary students, and
- To use the baseline data as a benchmark tool for monitoring progress and quality control of the interventions as well as use information for improving the implementation process.

3 Methods and Procedures

3.1. Pre-Post Cross-Sectional Study Design

The SSI peer education program is a cross-sectional study design characterized by collection of data at baseline (September 2012) followed by implementation of peer-led education (intervention) and collection of data at the end of the funding cycle (June 2014). In order to incorporate scientific rigor, the intervention is modeled as an operational research with a phased out implementation. That is, implementation will start with some selected schools, and gradually expanded to other schools in an organized manner.

The operational research takes the form of a non-equivalent quasi-experimental design. While the non-equivalent quasi-experimental design fails to meet randomization criteria, i.e., equal distribution of confounding factors between intervention and non-intervention arms (Fisher et al., 2002); it does, however, apply probabilistic random sampling techniques for selecting sample population into the control and experimental arms. The approach controls for selection and biases. The phased-out implementation approach will allow SSI to treated selected school as experimental and control groups though out the implementation phase.

The baseline data were collected between August and September 2012. The end line data is expected after a minimum of 18 months implementation period. SSI will collect interim data at the end of 12 as a quality control and improvement strategy.

3.2. Intervention Setting

The baseline, implementation of the peer education program activities, and the collection of the end line data will be carried in BNAPS prescribed districts (Table 1) and in schools selected by SSI (Appendix I: Table 2).

Schools were selected to allow representation of the student population from both rural and urban settings as well as from junior and senior secondary schools. Senior secondary schools were automatically included from each selected district. Junior secondary schools were purposively selected aimed at including urban and rural schools.

3.3. Sample Size Determination

The sample was calculated to detect statistical differences among core outcome indicators between baseline and end line data i.e., the sample size was calculated to give adequate power for detecting statistically significant effects of the peer led intervention at end line compared to baseline. Sample determination parameter was derived from the peer education study conducted in South Africa (Mash & Mash, 2012) because there are no known recent studies in Botswana that evaluated the effects of peer led education. Mash and Mash (2012) found that the effects of peer-led education significantly contributed to postponement of sexual debut by 10.0 percent (from 11.9 percent in the intervention arm compared with 21.9 percent in the non-intervention arm).

The assumption in this program is that SSI interventions will significantly postpone sexual risk behaviors by 7 percent during the 18 months implementation cycle. Based on this assumption, the Fleiss (1981, p. 41) one-sided sample size calculation formula was used to calculated the appropriate sample size for detecting statistically significant difference between two proportions (End line proportion – Baseline proportion). The sample was adjusted for the finite population correction, a 10% refusal/non response rate, and 4% loss of respondents during the implementation period due parental transfers and school drop-out. In addition, the sample was also inflated using a 1.53 design effect. Following these adjustments, the sample was estimated to 1,458 at baseline.

Sample determination formula [Lesego]

The sample from each selected district was selected based on proportional to size. Districts that had a high proportion of student population contributed a high proportion of the sample population (Appendix I, Table 2).

3.4. Sample Population

The sample population for this intervention is secondary school students aged 10 to 24 years. Secondary school education in Botswana includes forms 1 to 5 (8th grade to 12th grade). While peer education will be provided to all students in selected schools, data were collected among students in forms 1, 2 and 4. The inclusion of students in forms 1, 2 and 4 will afford SSI to have the same pool of students at the end of the implementation. Forms 3 and 5 students were excluded from the baseline data collection because they will have graduated out of the junior and senior secondary schools at the time of the end line data collection.

3.5. Tool Development, Data Collection and Piloting

Data at baseline were collected using a standardized questionnaire designed to capture outcome indicators. The tool was developed based on the BANPS outcome indicator question guidelines (Appendix IV). Data were collected using a face-to-face interviewer approach by trained data collectors. The tool was piloted on respondents of similar age and characteristics at SSI. The tool was modified following piloting on issues such as question sequence and clarity. The core concepts of the questionnaire were defined in Setswana during research team training to ensure consistency of the required information.

3.6. Data Management

Data management protocols were instituted to achieve quality assurance and quality control. Quality assurance strategies included the design of the intervention with reference to baseline and end line data collection to controlling for known operational research limitations. Training data collectors was conducted as a quality control strategy. Training familiarized the data collection team with theoretical as well as practical aspects of data collection. Training was also performed to minimize interview bias and enforce interview consistency. The training also covered survey concepts including interview techniques and procedure for data collection.

Only data collectors who met competencies required for data collection were selected. Two SSI employees supervised the data collection team and provided on-spot training while in the field. Questionnaires were checked for completeness immediately after data collection by the field supervisors followed by a review by the Technical Advisor (M&E) for missing values, errors, inconsistency and completeness. The Technical Advisors provided feedback on the quality of data to the field supervisors on weekly basis. Completed questionnaires were reviewed and signed for entry.

Data processing included data entry, cleaning, and editing. The Technical Advisor supervised the day-to-day data processing activities aimed at minimizing processing errors. Continuous checks of entered data were performed using frequency tables and cross-tabulation of core outcome variables and independent variables to identify transporting errors and perform immediate editing. Data were entered by one data entry clerk and backed up on daily basis. Collected data were housed at SSI Phakalane office. Electronic data were accessible to only the data entry clerk and the Technical Advisor. Paper data were shredded after data cleaning and electronic data stored in computers protected by a password.

3.7. Data Analysis Framework at Baseline

Baseline data were analyzed using IBM SPSS version 20 for Windows and Open Source Epidemiologic Statistics for Public Health (OpenEpi version 2.3). The analysis framework was based on parametric data analysis approach. At pre-analysis stage, data were cleaned and edited to ensure data accuracy, consistency and completeness. Outcome variables were re-coded to fit with the outcome definitions stipulated in the BNAPS monitoring and evaluation guidance. Missing records were identified and complete-analysis was performed where the majority of the values were missing. Descriptive analysis was performed to determine central tendency, dispersion and shape of the outcome variables. The primary outcome indicators at baseline were determined based on contingency frequency tables. Results of the contingency frequency tables formed the basis upon which BNAPS high outcome indicators were calculated.

The primary aim of the analysis at baseline was to establish a benchmark for the high level BNAPS outcome indicators. Consequently, the analysis was largely descriptive in nature based on contingency cross-tabulation frequency tables. The outcome indicators were reported in percentages consistent with indicator definition requirement provided by BNAPS.

Chi-Squares measure of association [X^2] was based on categorical data (outcome and predictor indicators). The predictor indicators included respondents' sex (1 = female, 0 = male), age (1 = 10 – 14 years, 2 = 15 – 19 years, 3= 20 – 24 years), level of education (1 = form 1, 2 = form 2, 3 = from 4), geographical location (1 = rural, 0= urban) and residential districts (0 = Kweneng East which was selected as a reference district, 2 = Selebi Phikwe, 3 = Bobirwa, 4 = Good Hope, 5 = Palapye, 6 = Francistown).

Disaggregating the sample by predictor indicators was required to examine whether these predictors had statistical effects on the outcome indicators. Such information is important because it forms the basis for designing evidence based interventions. The Chi-Square measure of association was based on the formula below:

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Model})^2}{Model}$$

Further analysis was performed to measure baseline effect size based on odds ratios. Odds ratio measures the probability that an event will occur [= 1], and its complimentary probability that the event will not occur [= 0]. The unadjusted (crude) odds ratios [OR unadjusted] for each outcome indicator were computed using OpenEpi 2x2 epidemiological tables (Dean & Sullivan, 2009) disaggregated by respondents' sex, age, level of education, geographical location, and residential districts. The general formula for calculating odds ratios is provided below:

$$OR = \frac{ad}{bc}$$

Multiple logit regression modeling was performed to control for confounding factors of the predictor variables on outcome indicator events. Forced entry (default regression procedure in SPPS) was applied for calculating adjusted odds ratios *(OR adjusted)* between outcome variables and predictor variables. The multiple logit regression model applied at baseline is shown below:

$$\ln\left(\frac{P}{1-P}\right) = \alpha + \beta_1 Sex_1 + \beta_2 Age_2 + \beta_3\, Level\ of\ Edu_3 + \beta_4 Location_4 + \beta_5 District_5$$

The p-value $\leqslant 0.05$ was used as a determinant threshold for statistically significant measure of association [X^2] and effect size *(OR unadjusted and OR adjusted)*. The 95% confidence intervals were used to validate p-values results of measure of effect size. A 95% confidence interval which did not contain a zero was determinant for a statistically significant measure of effect sizes.

3.8. Ethical review, informed consent and confidentiality

Baseline data were collected after ethical clearance from the Ministry of Education and Skills Development and approval of the school heads. Data were collected from respondents who voluntarily gave their consent. Prior to granting such consent, the respondents had been provided full information regarding the nature and purpose of data collection at baseline. This allowed respondents to make an informed decision, without having been subjected to coercion, undue influence or inducement.

In order to ensure confidentiality for the consenting respondents, identification details such as names, physical addresses, and national identification numbers were not requested. In addition, access to physical and electronic records was restricted to the SSI monitoring and evaluation team and the BNAPS staff. In order to preserve the privacy of the respondents, efforts were made to interview selected respondents in private without any disturbance or scrutiny of the public's attention.

3.9. Intervention Quality Improvement

SSI has incorporated an interim data collection and analysis at 12 months as part of the quality improvement processes based on the Plan-Do-Check-Act (PDCA) framework. PDCA is part of the continuous and ongoing monitoring of progress aimed at improving implementation performance activities.

3.10. Potential Limitations

Peer education programs have been implemented through country-wide life skills program in Botswana. This may impact the intervention outcomes on most knowledge-based indicators. In addition, implementing effective interventions requires adequate and continuous funding levels to sustain implementation. Currently, SSI does not have adequate funds to implement an integrated and comprehensive peer led education program package over the proposed minimum intervention lifecycle of 18 months.

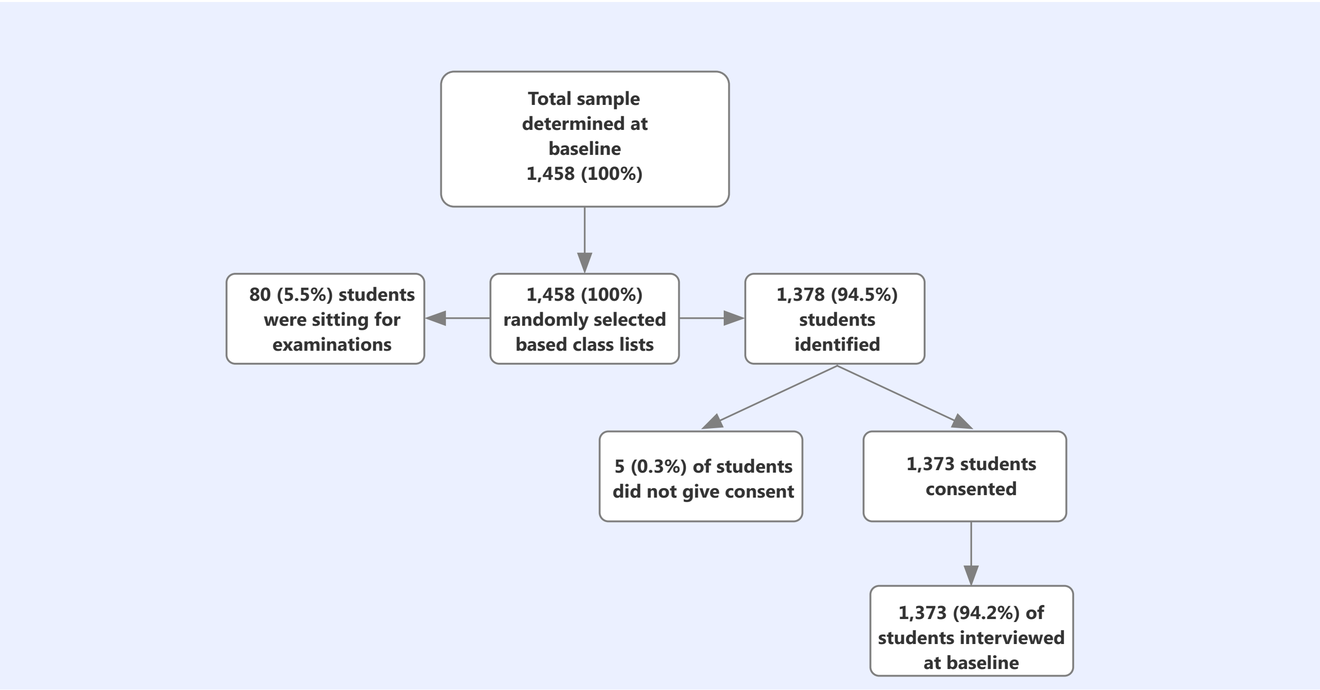
4 Results

This section presents data at baseline in an organized manner tailored to provide sample selection flowchart, respondents' characteristics, and BNAPS' high level outcome indicators. For each outcome indicator, data were disaggregated by respondents' sex, age, level of education, geographical location, and districts. Chi-Square measure of association and measure of effect size were also performed.

4.1. Sample Flow at Baseline

At baseline, a total of 1,458 sample was determine as statistically adequate to measure the effects of the peer education interventions at the end of the 18 month implementation period. Of the proposed sample, 94.2 percent of the respondents voluntarily consented to provide data at baseline (Figure 1). Results described at baseline are based on information provided by 1,373 consenting respondents. Of the 5.8 percent respondents who were not interviewed, 0.3 percent voluntarily declined to be interviewed and 5.5 percent could not be reached on the day of data collection and during follow up because they were sitting for examinations.

Figure 1: Flowchart for sample selection at baseline



4.2. Sample Distribution at Baseline

Table 1 provides sample distribution by intervention group, nationality, and districts. All respondents at baseline were Batswana of whom 77.1 percent were from new intervention schools while the remainder where from school in which SSI had been working previously. Data were sampled proportion to the size of the student population from the selected schools. Francistown, for example, was oversampled to provide equal proportional representation of the student population from the selected schools, while Kweneng East contributed a small sample size because the total number of students in the selected school(s) was small (Table 1).

Respondents at each participating school were selected based on simple random selection technique. SSI collected the total number of students in each class prior to data collection from school heads/guidance counselors. The list was used to randomly selected respondents using computer Stat Trek's random number generator prior to the arrival of selected school. Upon arrival at each school, field supervisors in collaboration with school authorities selected students in forms 1, 2 and 4. In each class, selection started in the front row on the right hand side ending at the back row on the left hand side.

Table 1: Sample distribution by data collection period, intervention group, nationality and districts [*N = 1,373*]

	Targeted Number	Number Interviewed	Percent Coverage [%]
Data Collection Period			
Baseline [August/Sept 2012]	1,458	1,373	*[94.2]*
End line [Expected Sept 2013]	-	-	-
Group			
Old intervention schools	1,058	980	*[92.6]*
New Intervention schools	400	393	*[98.3]*
Nationality of Respondents			
Batswana	1,458	1,373	*[100]*
Intervention Districts			
Good Hope	305	296	*[97.0]*
Kweneng East	25	23	*[92.0]*
Selebi Phikwe	159	154	*[96.9]*
Bobirwa	216	212	*[98.1]*
Palapye	302	299	*[99.0]*
Francistown	451	389	*[86.3]*

4.3. Respondents’ Characteristics at Baseline

Table 2 presents the respondents’ sex, age, level of education, geographical location, and primary caregivers.

Table 2: Distribution of respondent population by sex, age, level of education, geographical location, and primary caregivers [*N = 1,373*]

	Number	Percent (%)
Sex		
Male	627	*(45.7)*
Female	746	*(54.3)*
Age		
10 – 14	332	*(24. 2)*
15 – 19	1,032	*(75.2)*
20 – 24	9	*(0.6)*
Age [Mean, SD]	15.76	*(1.54)*
Level of education		
Form 1	408	*(29.7)*
Form 2	379	*(27.6)*
Form 4	586	*(42.7)*
Education [Mean, SD]	9.56	*(1.30)*
Location of schools		
Urban	842	*(61.3)*
Rural	531	*(38.7)*
Guardian		
Both parents	466	*(33.9)*
Mother only	434	*(31.6)*
Father only	49	*(3.6)*
Self/Family member	24	*(1.7)*
Grandparents	180	*(13.1)*
Aunt/Uncle	126	*(9.2)*
Sibling [Sister/Brother]	81	*(5.9)*

Female respondents made up the majority (54.3 percent) of the sample population. ¾ of the respondents were in the 15 – 19 year age group, while approximately a ¼ were in the 10 – 14 year old age group. The remainder of the sample was in the 20 – 24 year old age group. The mean age at baseline was 15.8 [14.2 – 17.3] years (Table 2). The majority of the respondents were attending form 4 (42.7 percents) at the time of data collection and 61.3 percent were attending schools located in urban settings. Most respondents were under the care of both mother and father (33.9 percent) and single mothers (31.6 percent), while 28.2 percent were under the primary care of the extended family system which included grandparents, aunties, uncles, and siblings (Table 2).

4.4 Outcome Indicators at Baseline

The outcome indicators address the risks and preventive measures associated with multiple concurrent partnerships, intergenerational sex, safe male circumcision, and sexual abstinence. SSI peer education program addresses 10 of the BNAPS high level outcomes indicators (Appendix I).

Each of the indicators is presented in total number with accompanying percentage distribution. The indicator is disaggregated by respondents' sex, age, level of education, geographical location (urban or rural) and districts (Appendix I).

For each outcome indicators, unadjusted (crude) odds ratios are presented with accompanying 95% confidence intervals. Adjusted odds ratios based on multiple logistic regression modeling and 95% confidence intervals are presented after controlling for confounding factors (Appendix II).

Outcome 1: *Percentage of respondents reporting that it is acceptable in their community to have multiple sexual partners.*

Data at baseline indicate that 1.7 percent of the respondents reported that multiple concurrent partnerships are acceptable in their community or ward (Table 3). Results also show that almost every one of the respondents at baseline (98.3 percent) perceived multiple concurrent partnerships as an unacceptable practice.

Table 3: Percentage (%) of students reporting acceptability of multiple concurrent partnerships in their community/ward [*N* = *1,373*]

Yes	23 (*1.7*)
No	1,350 (*98.3*)
Total	**1,373 (*100*)**

Table 4 below illustrates respondents' perceived beliefs about acceptability/non-acceptability of multiple concurrent partnerships disaggregated by sex, age, education and geographical location. Further analysis show that of the 23 respondents who accept multiple concurrent partnerships, male respondents tend to favor multiple concurrency partnership than female respondents (Table 4). Chi-Squares (X^2) measure of association found significant association between respondents' perceived beliefs on multiple concurrent partnerships and respondents' sex ($X^2_{(df2)} = 5.82, p \leq 0.05$). No significant associations were found between respondents' beliefs on multiple concurrent partnerships and respondents' age, level of education, geographical location, and districts, $p > 0.05$.

Table 4: Distribution (%) of respondents' perceived beliefs about acceptability/non-acceptability of multiple concurrent partnerships disaggregated by sex, age, level of education and geographical location, and districts with unadjusted odds ratios and 95% confidence intervals.

	Yes *(%)*	No *(%)*	OR$_{unadjusted}$	95% CI	
Do you believe MCP is acceptable?					
Female[R]	7 *(0.9)*	739 *(99.1)*	.	.	.
Male	16 *(2.6)*	611 *(97.4)*	2.76	1.15	7.23**
Do you believe MCP is acceptable?					
10 – 14 years[R]	3 *(0.9)*	*329 (99.1)*	.	.	.
15 – 19 years	19 *(1.9)*	*1,013 (98.1)*	2.05	0.66	8.77
20 – 24 years	1*(11.1)*	*8(88.9)*	13.35	0.46	140.2
Do you believe MCP is acceptable?					
Form 1[R]	5 *(1.2)*	403 *(98.7)*	.	.	.
Form 2	4 *(1.1)*	375 *(98.9)*	0.86	0.20	3.42
Form 4	14 *(2.4)*	572 *(97.6)*	1.97	0.72	6.15
Do you believe MCP is acceptable?					
Rural[R]	7 *(1.3)*	524 *(98.7)*	.	.	.
Urban	16*(1.9)*	826 *(98.1)*	1.45	0.60	3.80
Do you believe MCP is acceptable?					
Kweneng East	0 *(0.0)*	23 *(100.0)*			
Selebi Phikwe	0 *(0.0)*	154 *(100.0)*			
Bobirwa[R]	1 *(0.5)*	215 *(99.5)*	.	.	.
Good Hope	6 *(2.0)*	290 *(98.0)*	4.44	0.65	103.5
Palapye	6 *(2.0)*	293 *(98.0)*	4.39	0.64	102.4
Francistown	10 *(2.6)*	379 *(97.4)*	5.66	0.94	124.7

*Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001*

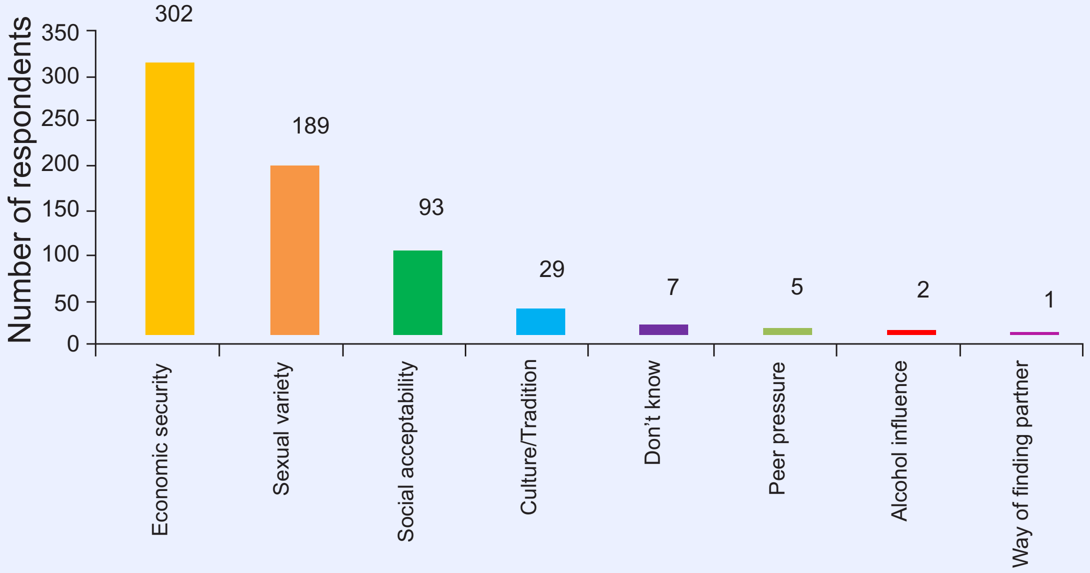
[R] *Indicates that this variable was used as a reference for calculating odds ratios.*

Measures of effect size found that male respondents were almost three times more likely to accept multiple concurrent partnerships than female respondents, $OR_{unadjusted} = 2.76, 95\%\ CI: 1.15, 7.23, p<0.05$ (Table 4). The effects of respondents' sex and the odds of accepting or rejecting multiple concurrent partnerships remained statistically significant even after controlling for confounding factors, $OR_{adjusted} = 2.75, 95\%\ CI: 1.20, 6.76, p<0.05$ (Appendix II, Exploratory Model 1).

There was no evidence of effects between respondents' beliefs on multiple concurrent partnerships and respondents' age, education, and geographical location and district even after multiple logistic regression modeling (Table 4 and Appendix II, Exploratory Model 1). Asked to provide reasons for accepting multiple concurrent partnerships, baseline results show that respondents who accepted multiple concurrent partnerships (n = 23), did so because they believe their cultural accepts the practices (Appendix I, Table 5).

When respondents were asked to describe factors that may influence people in engage in multiple concurrent partnerships, almost half (48.1 percent) of the respondents (n = 628) cited economic security. According to the respondents, other primary factors influencing multiple concurrent partnerships include the desire for sexual variety (30.1 percent), and social acceptability as well as cultural acceptability (19.4 percent). Figure 2 and Appendix I, Table 6 provides the respondents' perceived reasons that influence people in their communities to engage in multiple concurrent partnerships.

Figure 2: Respondent's perceived reasons for engaging in multiple concurrent partnerships (n=628)



Outcome2: *Percentage of students who agree that having more than one sexual partner at the same time increases the risk of HIV infection.*

Results show that 85.0 percent of the respondents agreed that having more than one sexual partner at the same time increases the risk of HIV infection (Table 5). However, 15.0 percent of the respondents do not believe that multiple concurrent partnerships are a risk factor for HIV infection.

Table 5: Percentage (%) of students agreeing that having more than one sexual partner increases risk of HIV infection [*N = 1,373*]

Yes	1,167 (*85.0*)
No	206 (*15.0*)
Total	**1,373 (*100*)**

When asked to state the reasons for believing that multiple concurrent partnerships increase the risk of HIV infection, the majority indicated that in multiple concurrent partnerships, it would be difficult to know partners who are infected. Respondents also stated that in a network of multiple relationships, it is more likely that some of the sexual partners might be infected.

Figure 3 illustrates the percentage distribution of respondents' reasons for believing that multiple sexual partnerships are a risk factor for HIV infection.

Figure 3: Percent distribution of perceived reasons for agreeing that MCP increases the risk of HIV infection (N=1,163)

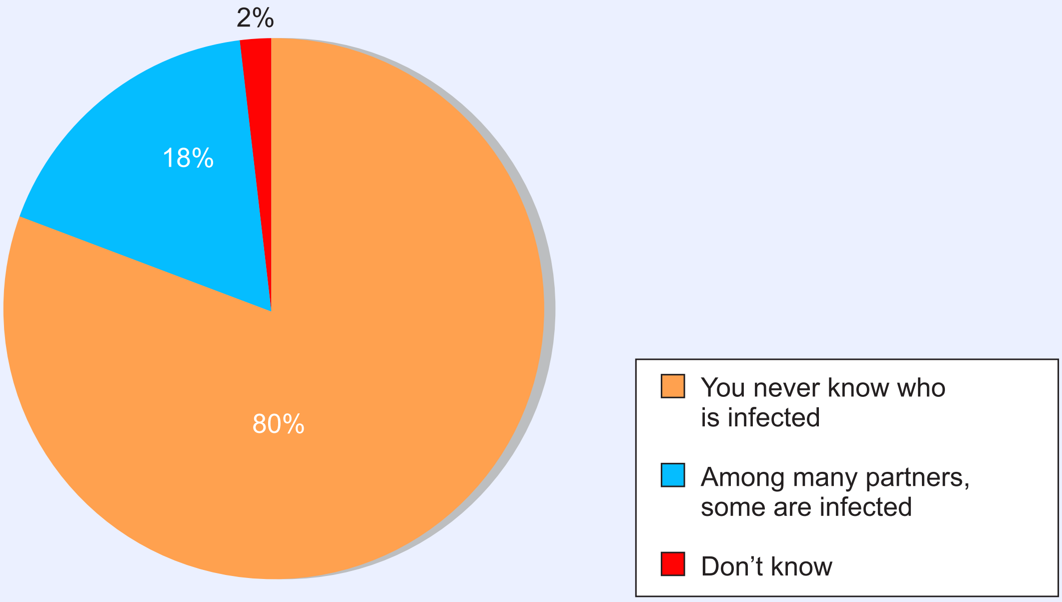


Table 6 provides disaggregated data by sex, age, education and geographical location of respondents' opinions regarding HIV risks associated with multiple concurrent partnerships. Overall, results show that eight of every ten respondents interviewed at baseline believed that multiple concurrent partnerships increase the risk of HIV infection. Female respondents were more likely to cite multiple concurrent partnerships as a risk factor for HIV infection more than their male counterparts. The absolute percentage difference between male and female respondents' knowledge of multiple concurrent partnership as a risk factor for HIV infection was 5.9 percent (Table 6).

There was significant association between respondents' knowledge levels that multiple concurrent partnerships increases HIV infection and respondents' sex, $X^2_{(df1)} = 9.1, p \leq 0.01$, and residential districts, $X^2_{(df5)} = 48.8, p \leq 0.001$). No evidence of association was found between respondents' response to agree or disagree that multiple concurrent partnerships increase HIV infection and respondents' age, level of education, and geographical location, $p > 0.05$.

Table 6: Percent distribution of respondents' who agree that having multiple concurrent partnerships increases HIV infection disaggregated by sex, age, level of education and geographical location with accompanying unadjusted odds ratios (N = 1,373)

	Agree *(%)*	Disagree *(%)*	$OR_{unadjusted}$	95% CI	
MCP increases HIV Infection					
Female ^{R}	654 *(87.7)*	92 *(12.3)*	.	.	.
Male	513 *(81.8)*	114 *(18.2)*	0.63	0.44	0.85**
MCP increases HIV Infection					
10 – 14 years ^{R}	284 *(85.5)*	*48 (14.5)*	.	.	.
15 – 19 years	876 *(84.9)*	*156 (15.1)*	0.95	0.66	1.34
20 – 24 years	*7(77.8)*	*2(22.2)*	0.59	0.13	4.27
MCP increases HIV Infection					
Form 1 ^{R}	341 *(83.6)*	*67(16.4)*	.	.	.
Form 2	317*(83.6)*	62 *(16.4)*	1.01	0.67	1.47
Form 4	509 *(86.9)*	77 *(13.1)*	1.30	0.90	1.85
MCP increases HIV Infection					
Rural ^{R}	446 *(84.0)*	85 *(16.0)*	.	.	.
Urban	721*(85.6)*	121 *(14.4)*	1.14	0.84	1.53
MCP increases HIV Infection					
Kweneng East ^{R}	18 *(78.3)*	5 *(21.7)*	.	.	.
Selebi Phikwe	136 *(88.3)*	18 *(11.7)*	2.09	0.63	6.18
Bobirwa	159 *(75.0)*	53 *(25.0)*	0.83	0.26	2.28
Good Hope	569 *(90.7)*	27*(9.1)*	5.82	1.81	16.37***
Palapye	276*(92.3)*	23 *(7.7)*	3.33	1.02	9.49*
Francistown	309*(79.4)*	80 *(20.6)*	1.07	0.35	2.87

*Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001*

^{R} *Indicates that this variable was used as a reference for calculating odds ratios.*

Crude measures effect size between outcome 2 and predictor variables show that respondents' sex and residential districts were significantly associated. Male respondents were less likely to cite multiple concurrent partnerships as a factor for HIV infection by 37.0 percent compared with female respondents, *$OR_{unadjusted}$ = 0.63, 95% CI: 0.44, 0.85, p <0.01* (Table 6). After controlling for confounding factors, respondents' sex remained a significant predictor of respondents' belief that multiple concurrent partnerships is a risk factor for HIV infection, $OR_{adjusted}$= 0.62, 95% CI: 0.46, 0.85, p<0.01.

Respondents from Good Hope were more almost six times more likely to state that multiple concurrent partnership increases HIV infection than respondents from Kweneng East, *$OR_{unadjusted}$ = 5.82, 95% CI: 1.81, 16.37* (Table 6). However, the association was due confounding factors, *$OR_{adjusted}$ = 1.78, 95% CI: 0.60, 5.25, p>0.05*. The odds of agreeing that multiple concurrent partnership increases HIV infection were three times high for respondents from Palapye compared with respondents from Kweneng East before (*$OR_{unadjusted}$ = 3.33, 95% CI: 1.02, 9.49, p<0.05*) and after controlling for confounding factors (*$OR_{adjusted}$ = 3.61, 95% CI: 2.19, 5.96, p>0.001*).

Multiple logistic regression modeling after found other variables such as being in form 4 and being from Selebi Phikwe were statistically significant predictors of respondents' knowledge of recognizing multiple concurrent partnerships as a risk factor. Results show that after controlling for confounding factors, form 4 respondents were almost twice likely to agree that multiple concurrent partnership increases HIV infection more than respondents in the reference group (form 1), *$OR_{unadjusted}$ = 1.71, 95% CI: 1.07, 2.74, p<0.05*. Results also show that respondents in Selebi Phikwe were twice likely to agree that multiple concurrent partnership increases HIV infection more than respondents in the reference group (Kweneng East), *$OR_{unadjusted}$ = 2.15, 95% CI: 1.23, 3.76, p<0.01*.

Crude measures of effects and multiple logistic regression did not find sufficient evidence regarding the effects of respondents' age and geographical location on the respondents' knowledge that multiple concurrent partnership increased HIV infection (Appendix II, Exploratory Model 2).

Outcome 3: Percentage of students who ever discussed multiple concurrent partnerships with their sexual partners in the last 3 months

Baseline data show that 27.6 percent (n = 379) of the respondent population had a sexual partner at the time of data collection. Of these respondents, 29.8 percent reported to have ever discussed the risks associated with multiple concurrent partnerships 3 months prior to the day data were collected (Table 7).

ÇĂĽ'ǵ 7: Percentage (%)of students who ever discussed MCP with their sexual partners in the last 3 months among those with sexual partners [*N = 379*]

òśℓ	و وی (*29.8*)
b◘	و ييي □*70.2*)
Ç◘Ć	يى لآ □***100***)

Results show that for every ten respondents interviewed at baseline, seven respondents never discussed multiple concurrent partnerships as a risk factor associated with HIV infection with their sex partners. Chi-Square measure of association did not find sufficient evidence between respondents' behavior to discuss multiple concurrent partnerships with their sexual partners and respondents' sex, age, level of education, geographical location, and districts, p > 0.05.

Figure 4 shows the distribution of respondents' behaviors associated with ever or never discussing multiple concurrent partnerships as a HIV risk factor with their partners by age. Results show that respondents in the 20 – 24 year old age group never discussed multiple concurrent current partnerships as a HIV risk factor compared with respondents in the 15 – 19 year old age group (absolute percentage difference = 31.5) and respondents in the 10 – 19 year old age group (absolute percentage difference = 23.1).

Figure 4: Distribution of respondents who reported discussing/not discussing multiple concurrent partnership with their sexual partners in the last 3 months (n=378)

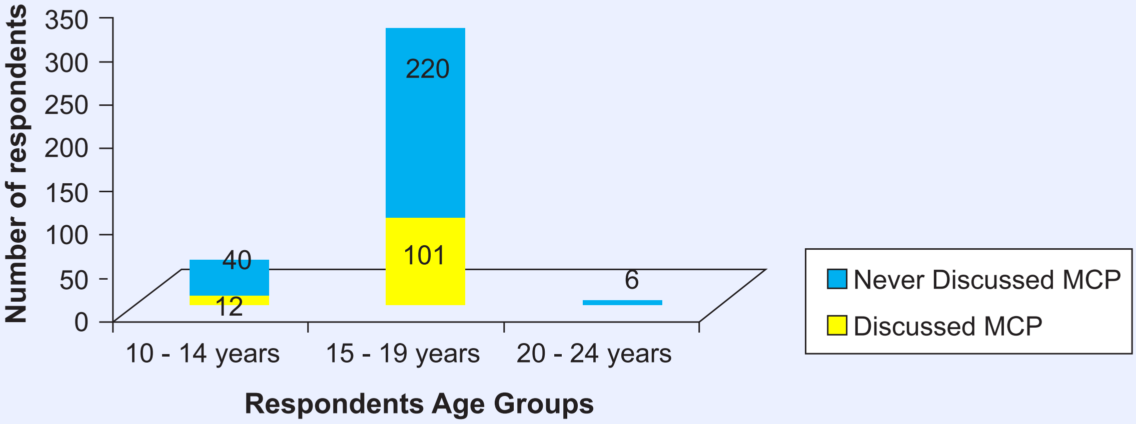


Table 8 disaggregated results of respondents' behaviors for ever or never discussing multiple concurrent partnerships as a HIV risk factor with their sexual partners three months prior to baseline data collection by respondents' sex, age, education, geographical location, and districts.

Table 8: Percent distribution of respondents' who ever discussed multiple concurrent partnerships with their sexual partners in the last 3 months with unadjusted odds ratios and 95% CI

	Yes *(%)*	No *(%)*	OR$_{unadjusted}$	95% CI	
Discussed MCP with partner in the last 3 months?					
Female^{R}	70 (*32.4*)	146 (*67.6*)	.	.	.
Male	43 (*26.4*)	120 (*73.6*)	0.62	0.39	0.96*
Discussed MCP with partner in the last 3 months?					
10 – 14 years^{R}	12 (*23.1*)	*40 (76.9)*	.	.	.
15 – 19 years	101 (*31.5*)	*220 (68.5)*	1.53	0.78	3.15
20 – 24 years	*0(0.0)*	*6(100.0)*			
Discussed MCP with partner in the last 3 months?					
Form 1^{R}	20 (*25.6*)	58(*74.4*)	.	.	.
Form 2	20(*30.8*)	45 (*69.2*)	1.29	0.61	2. 70
Form 4	73 (*30.9*)	163 (*69.1*)	1.30	0.73	2.35
Discussed MCP with partner in the last 3 months?					
Rural ^{R}	48 (*27.9*)	124 (*72.1*)	.	.	.
Urban	65 (*31.4*)	142 (*68.6*)	1.18	0.76	1.85
Discussed MCP with partner in the last 3 months?					
Kweneng East^{R}	2 (*28.6*)	5 (*71.4*)	.	.	.
Selebi Phikwe	9 (*27.3*)	24(*72.7*)	0.95	0.15	8.07
Bobirwa	13 (*24.1*)	41(*75.9*)	0.79	0.14	6.53
Good Hope	33 (*29.7*)	78(*70.3*)	1.06	0.20	8.21
Palapye	21(*29.6*)	50 (*70.4*)	1.05	0.19	8.34
Francistown	35(*34.0*)	68(*66.4*)	1.28	0.24	10.00

Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001

^{R} *Indicates that this variable was used as a reference for calculating odds ratios.*

Male respondents were least likely to discuss multiple concurrent partnerships with their sexual partners than female respondents by 38%, OR unadjusted = 0.62, 95% CI: 0.39, 0.96, $p<0.05$. The effects diminished after controlling for confounding factors, $p>0.05$. Multiple logistic regression analysis found no sufficient evidence of the effects of respondents, sex, age, education, geographical location, and districts on respondents' behavior to ever or never discuss multiple concurrent relationship with their partners at baseline, $p>0.05$ (Multiple logistic regression analysis - Appendix II, Model 3).

Outcome 4: Percentage of people who are confident to say no to multiple concurrent sexual partnerships.

At baseline, ¾ of the respondents expressed confidence to terminate their relationships if they discovered that their partners were involved with other sexual partners (Table 9).

Table 9: Percentage (%) of students who are confident to terminate sexual relationship should they discover that their partners were involved with other sexual partners (*N = 1,373*]

Yes	1,020(*74.3*)
No	353 (*25.7*)
Total	**1,373 (*100*)**

The confidence to terminate relationships in an event that partners had other partners increased as the level of education increased (Figure 5). Chi-Square measure of association found significant association between respondents' confidence to terminate relationships and respondents' sex ($_{(df1)} = 4.9, p \leq 0.05$), education level (X^2(df2) = 8.7, p ≤0.05), and residential district (X^2 (df5) = 19.4, p ≤0.01).

Table 10 disaggregated results of respondents' confidence to terminate their relationships if they discovered that their sexual partners are in other relationships by sex, age, education and geographical location, and districts.

Table 10 shows that female respondents were more likely to express confidence to terminate relationships in the event that their sex partners have other partners (absolute percentage difference = 5.2). Results also show that respondents in the 20 – 24 year old age group were less confident to terminate sexual relationship with a partner who has other partners compared with respondents in 10 – 19 year old age group (absolute percentage difference = - 17.8).

Figure 5: Distribution of respondents' self-reported confidence to say no to multiple concurrent partnership by educational level

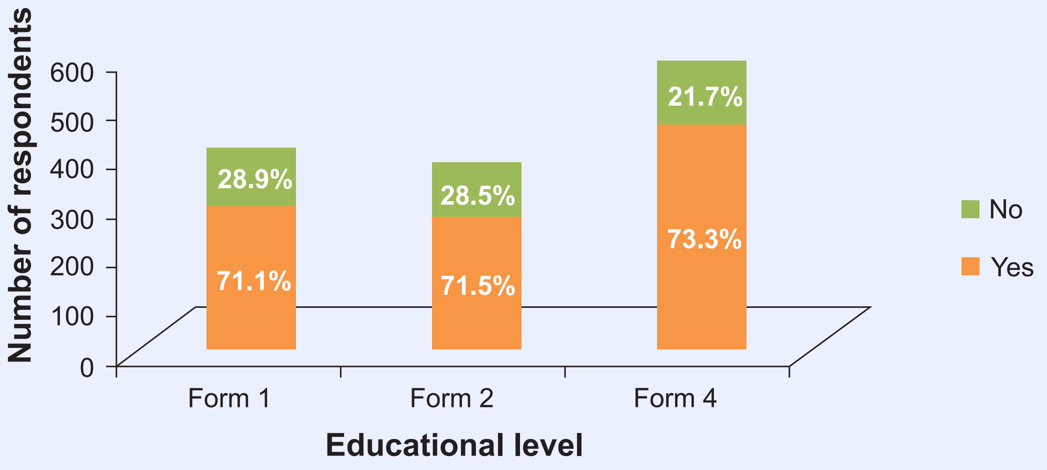


Table 10: Percent distribution of respondents' who are confident to terminate relationship if they discovered that their sexual partners are in other relationships disaggregated by sex, age, level of education and geographical location with accompanying unadjusted odds ratios and 95% confidence intervals

	Yes *(%)*	No *(%)*	Unadjusted OR	95% CI	
Confidence to terminate relationship in an event that your partner is in MCP?					
Female^{R}	572 *(76.7)*	174 *(23.3)*	.	.	.
Male	448 *(71.5)*	179 *(28.5)*	0.76	0.60	0.97*
Confidence to terminate relationship in an event of MCP?					
10 – 14 years^{R}	237*(71.4)*	*95 (28.6)*	.	.	.
15 – 19 years	778 *(75.4)*	*254 (24.6)*	1.27	0.96	1.68
20 – 24 years	5*(55.6)*	*4(44.4)*	0.50	0.12	2.14
Confidence to terminate relationship in an event that your partner is in MCP?					
Form 1^{R}	290 *(71.1)*	118*(28.9)*	.	.	.
Form 2	271*(71.5)*	108*(28.5)*	1.02	0.75	1.39
Form 4	459 *(78.3)*	127 *(21.7)*	1.47	1.10	1.97*
Confidence to terminate relationship in an event that your partner is in MCP?					
Rural^{R}	408 *(76.8)*	123 *(23.3)*	.	.	.
Urban	612*(72.7)*	230 *(27.3)*	0.80	0.62	1.03
Confidence to terminate relationship in an event that your partner is in MCP?					
Kweneng East^{R}	12 *(52.2)*	11 *(47.8)*	.	.	.
Selebi Phikwe	124 *(80.5)*	30 *(19.5)*	3.75	1.48	9.49**
Bobirwa	160 *(75.5)*	52 *(24.5)*	2.81	1.14	7.85**
Good Hope	236 *(79.7)*	60*(20.3)*	3.59	1.48	8.67**
Palapye	205 *(68.6)*	94 *(31.4)*	1.99	0.83	4.76
Francistown	283*(72.8)*	106 *(27.2)*	2.44	1.02	5.79**

Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001

^{R} Indicates that this variable was used as a reference for calculating odds ratios.

Male respondents were less likely to terminate relationships with their partners compared with female respondents by 24.0 percent, *OR* $_{unadjusted}$ *= 0.76, 95% CI: 0.60, 0.97*. Results also show that respondents from Selebi Phikwe, Bobirwa, Good Hope, and Francistown were significantly confident to terminate relationships with their partner in an event of partners engaging in multiple concurrent partnerships compared with Kweneng East respondents (Table 10).

Effects remained significant after controlling for confounding factors between respondents' intention to terminate relationships and being from Good Hope, *OR* $_{adjusted}$ *= 3.17, 95% CI: 1.32, 7.58, p<0.01* and Selebi Phikwe, *OR* $_{adjusted}$ *= 1.71, 95% CI: 1.07, 2.76, p<0.05* (Appendix II, Exploratory Model 4).

Outcome 5: *Percentage of people reporting to have reduced their number of sexual partners in the last 12 months.*

At baseline, 15.7 percent (n = 216) of the sample reported to have had multiple concurrent partnerships in the last 12 months. When asked whether they have reduced the number of sexual partners, 205 responded to the question. Of these respondents, 87.8 percent reported to have reduced sexual partners in the last 12 months (Table 11).

Table 11: Percentage (%) of students with more than one sexual partner who reported to have reduced the number of partners *(N = 205)*

Yes	180 (*87.8*)
No	25(*12.2*)
Total	**205 (*100*)**

At baseline, the mean number of sexual partners for the respondent population was 2.28 [ranging from 1 to 9) 12 months prior to data collection. Male respondents tended to report more sexual partners, *M = 2.4, 95% CI: 2.2, 2.7* compared to their female counterparts, *M = 2.2, 95% CI: 1.9, 2.4* (Figure 6). The mean difference of concurrent sexual partners in the last 12 months between male and female respondents was not significant, *F (2, 214) = 2.28, p>0.05*.

When respondents were asked about the number of sexual partners they had at the time of data collection, the average number of concurrent sexual partners was *M = 0.88, 95% CI: 0.8, 1.0*. The mean difference of number of sexual partners during the time of data collection between male and female respondents was not significant, *F (1,214) = 0.6, p>0.05*.

Table 12 disaggregated results between respondents' behaviors to reduce number of sexual partners and relationships' by sex, age, education and geographical location, and districts. Respondents were also asked whether people in the community had reduced number of sexual partners in the last 12 months. Results show that 74.7 percent of the respondents believed that people in their communities had not reduced the number of sexual partners in the last 12 months.

Figure 6: Mean number of sexual partners reported in the last 12 months by male and female respondents at baseline

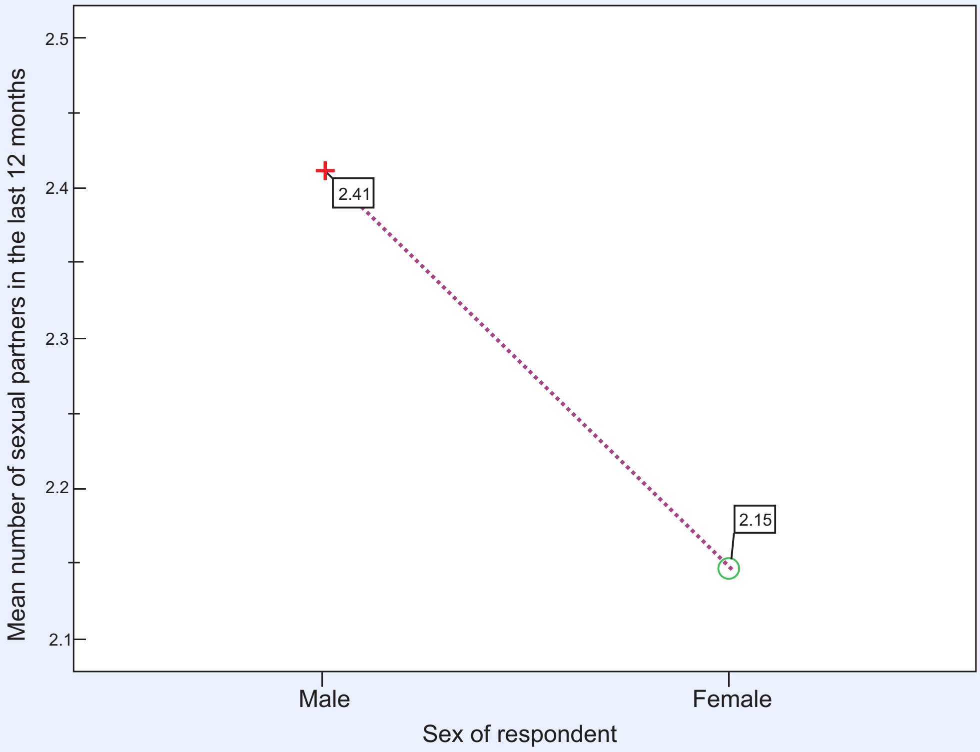


Table 12: Percent distribution of respondents' reporting to have reduced their number of sexual partners in the last 12 months disaggregated by sex, age, level of education and geographical location with accompanying unadjusted odds ratios (N = 1,373)

	Yes *(%)*	No *(%)*	Unadjusted OR	95% CI	
Reduced sexual partners in the last 12 months?					
Female[R]	91 *(88.3)*	12 *(11.7)*	.	.	.
Male	89 *(87.3)*	13 *(12.7)*	0.90	0.38	2.12
Reduced sexual partners in the last 12 months?					
10 – 14 years[R]	12 *(70.6)*	*5 (29.4)*	.	.	.
15 – 19 years	164 *(89.6)*	*19 (10.4)*	3.56	1.03	11.12*
20 – 24 years	4 *(80.0)*	*1 (20.0)*	1.63	0.54	49.04
Reduced sexual partners in the last 12 months?					
Form 1[R]	21 *(80.8)*	5 *(19.2)*	.	.	.
Form 2	32 *(84.2)*	6 *(15.8)*	1.27	0.32	4.89
Form 4	127 *(90.1)*	14 *(9.9)*	2.15	0.63	6.48
Reduced sexual partners in the last 12 months?					
Rural[R]	79 *(88.8)*	10 *(11.2)*	.	.	.
Urban	101 *(87.1)*	15 *(12.9)*	0.85	0.35	2.01
Reduced sexual partners in the last 12 months?					
Kweneng East	4 *(100.0)*	-			
Selebi Phikwe[R]	12 *(85.7)*	2 *(14.3)*	.	.	.
Bobirwa	26 *(89.7)*	3 *(10.3)*	1.43	0.15	10.83
Good Hope	49 *(87.5)*	7 *(12.5)*	1.16	0.15	6.05
Palapye	35 *(79.5)*	9 *(20.5)*	0.65	0.09	3.24
Francistown	54 *(93.1)*	4 *(6.9)*	2.22	0.26	14.03

*Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001*

[R] *Indicates that this variable was used as a reference for calculating odds ratios.*

Crude measures of effect show that respondents in the 15 – 19 age group were 3.56 times more likely to report reducing sexual partners in the last 12 months than respondents in the 10 – 14 age group, *OR = 3.56, 95% CI: 1.03, 11.12, p>0.05* (Table12). However, the results were not significance after controlling for confounding factors. No sufficient evidence was found on the effects of respondents' sex, education, geographical location, and districts on respondents' behavior to reduce number of sexual partners using multiple logistic regression (Appendix II, Model 5).

Outcome 6: *Percentage of students in the targeted schools reporting that it is acceptable in their community to have sexual relationships with someone who is ten or more years older.*

Results show that 6.5 percent of the respondents reported that it was acceptable in their communities for people to have sexual relationships with individual who are ten or more years older than themselves (Table 13). The majority of these respondents believe that in a relationship, age does not really matter rather love is the most important factor.

Table 13: Percentage (%) of students in the targeted school reporting that it is acceptable in their community to have sexual relationships with someone who is ten or more years older *[N = 1,373]*

Yes	89 (*6.5*)
No	1,284 (*93.5*)
Total	**1,373 (*100*)**

Overall, nine out of every ten respondents interviewed at baseline believe that sexual relationship with a partner ten or more years older than themselves as unacceptable. Baseline results also show that ⅓ of these respondents view relationship with someone 10 or more years older as a factor that increases the likelihood of HIV infection among youth (Appendix II, Table 18).

Respondents also cited imbalanced power dynamics when a young person is in relationships with someone 10 or more years older. Respondents reasoned that older partners may force the younger partner to do what the older partner wants or that sexual issues are not likely to be discussed on equal terms (Appendix II, Table 18).

The Chi-Square measure of association between respondents' opinion on whether relationships with someone 10 or more years old is acceptable or not and respondents' sex, age, level of education, geographical location, and districts did not find any significant association.

In addition, measure of effect using 2x2 contingency tables and multiple logistic regression model on the effects of respondents' sex, age, level of education, geographical location and districts on respondents' opinion to accept or not accept relationships with someone 10 or more years old were not significant (Table 14).

Table 14: Percent distribution of respondents' reporting that it is acceptable in their communities to have sexual relationships with partners who are 10 or more years older disaggregated by sex, age, level of education and geographical location with accompanying unadjusted odds ratios

	Yes *(%)*	No *(%)*	Unadjusted OR	95% CI	
Acceptable to be in relationship with someone 10 or more years older?					
Female^{R}	37 *(5.0)*	709 *(95.0)*	.	.	.
Male	33 *(5.3)*	594 *(94.7)*	1.07	0.65	1.73
Acceptable to be in relationship with someone 10 or more years older?					
10 – 14 years^{R}	15 *(4.5)*	*317 (95.5)*	.	.	.
15 – 19 years	53 *(5.1)*	*979 (94.9)*	1.14	0.65	2.12
20 – 24 years	2 *(22.2)*	*7 (77.8)*	5.97	0.79	29.62
Acceptable to be in relationship with someone 10 or more years older?					
Form 1^{R}	17 *(4.2)*	391*(95.8)*	.	.	.
Form 2	17*(4.5)*	362 *(95.5)*	1.08	0.53	2.17
Form 4	36 *(6.1)*	350 *(93.9)*	1.51	0.84	2.78
Acceptable to be in relationship with someone 10 or more years older?					
Rural^{R}	33 *(6.2)*	498 *(93.8)*	.	.	.
Urban	37*(4.4)*	805 *(95.6)*	0.69	0.43	1.13
Acceptable to be in relationship with someone 10 or more years older?					
Kweneng East^{R}	1 *(4.3)*	22 *(95.7)*	.	.	.
Selebi Phikwe	3 *(1.9)*	151 *(98.1)*	0.44	0.04	12.01
Bobirwa	14 *(6.6)*	198 *(93.4)*	1.55	0.25	34.64
Good Hope	18 *(6.1)*	278 *(93.9)*	1.42	0.24	31.28
Palapye	10 *(3.3)*	289 *(96.7)*	0.76	0.12	17.39
Francistown	24*(6.2)*	365 *(93.8)*	1.45	0.25	31.36

*Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001*

^{R} *Indicates that this variable was used as a reference for calculating odds ratios.*

Outcome 7: *Percentage of people who believe that having a sexual partner who is ten or more years older increases risk of HIV infection.*

At baseline, seven of every ten respondents interviewed, believed that having a sexual partner ten or more years older than themselves increases the risk of HIV infection (Table 15).

Table 15: Percentage (%) of people who believe having a sexual partner who is ten or more years older increases the risk of HIV [*N* = *1,373*]	
Yes	1,007(*73.3*)
No	366 (*26.7*)
Total	**1,373 (*100*)**

When data were disaggregated sex, age, education and geographical location, and districts (Table 16), percent distribution among predictor valuables was almost equal. Chi-Square measure of association between respondents' belief on whether relationships with someone 10 or more years old increases the risk of HIV infection or not and respondents' sex, age, level of education, geographical location, and districts did not reveal any significant association, p>0.05.

OR unadjusted and OR adjusted on the effects of respondents' sex, age, level of education, geographical location and districts on respondents' belief that sexual relationships with someone 10 or more years old increases HIV infection did not find any significant evidence (the 95% confidence intervals of the predictor variables included a zero and 95% confidence interval was > p0.05). Table 16 provides disaggregated percent of respondents' responses and unadjusted odds ratios. Adjusted odds ratios based on the multiple logistic regression modeling is presented in Appendix III, Model 7.

Table 16: Distribution of respondents reporting that having sexual relationships with someone 10 or more years older increases the risk of HIV infection disaggregated by age, level of education, geographical location, and districts with accompanying unadjusted odds ratios and 95% confidence intervals

	òśℓ *(%)*	b▪ *(%)*	Ü▪Ăŕ ╫ℓĠśŕ h w	لآي□ / L
Does sexual relationship with a partner 10+ more year increase risk of HIV infection?				
Female	يىي *(73.1)*	وهو □لآيو		
Male	ويى *(73.7)*	ويي *(26.3)*	ىهاو	وياه	وىاو
Does sexual relationship with a partner 10+ more year increase risk of HIV infection?				
10 – 14 years ^{R}	ىىو *(70.2)*	*22 Ủƴ2Ȅů*	↑	↑	↑
15 – 19 years	يي ي *(74.4)*	*ƴƩz ỦƴƷȄů*	ىواو	ىلآاه	ويي او
20 – 24 years	ي *(66.7)*	*Ƶ ỦƵƵȄƵů*	ي ياه	وواه	ىوى
Does sexual relationship with a partner 10+ more year increase risk of HIV infection?				
Form 1 ^{R}	ىلآو *(71.8)*	ويوو *(28.2)*	↑	↑	↑
Form 2	يىو *(73.1)*	وهو *(26.9)*	يهاو	ي ياه	يى او
Form 4	يىى *(74.6)*	لآىو *(25.4)*	يواو	ي ياه	يى او
Does sexual relationship with a partner 10+ more year increase risk of HIV infection?				
Rural ^{R}	يلآى *(74.4)*	يىو *(25.4)*	↑	↑	↑
Urban	ووي *(72.7)*	هىو *(27.3)*	ولآاه	و ياه	يو او
Does sexual relationship with a partner 10+ more year increase risk of HIV infection?				
Kweneng East	ىو □لآاهي	لآ *(39.1)*			
Selebi Phikwe ^{R}	لآوو *(77.3)*	يى *(22.7)*	يواو	ى ياه	يى
Bobirwa	لآيو *(75.0)*	يى *(25.0)*	ولآاو	ي ياه	و يى
Good Hope	ووو *(75.0)*	ى ي *(25.0)*	ولآاو	ي ياه	يي
Palapye	ووو*(74.2)*	ي ي *(25.8)*	ي ياو	ى ياه	يي
Francistown	و يو*(69.7)*	يوو *(30.3)*	يياو	هياه	وي

*Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001*

^{R} *Indicates that this variable was used as a reference for calculating odds ratios.*

Outcome 8: *Percentage of people in the target age group and wards reporting to have reduced sexual partnerships with partners who are ten or more years older than the respondent in the last 12 months*

Results at baseline show that 1.2 percent of the total sample population (n = 17) reported to have been involved in a sexual relationships with a partner ten or more years older than themselves. When asked whether they were still involved in these relationship, 82.4 percent (n = 14) of those who reported being involved with partners 10 or more years older than themselves were still is such relationships (Table 17).

ÇĂĽ▄ 17: Percentage (%) of students reporting that they were still sexually involved with a partner who is ten or more years older than themselves in the last 12 months [*N* = *17*]

òśℓ, still involved	ى *(0.2)*
òśℓǂ Lĵ Ȯ■◘ĊĂℓ ▓ĵ ľ ╙Ăℓ Lĵ ℓśŕ Ȯ◘	و و *0.8)*
b◘ǂ L■◘ ▄■┼śŉ ╙Ăōś ℓśŝĵ Ă▄ŉś▄ĂĠ■ℓ ╙♫ℓ Ŏ-Ŏ╙ people who are 10 or more years older than me	ى *0.2)*
bśōśŉĽśś■ ╨ō◘▄śŕ Ŏ-Ŏ╙ℓ ◘▓ś◘■ś ﻬﻭ ◘ŉ▓◘ŉś years older than me	ﻭ ي ى ي *(98.8)*
Ç◘ĊĂ▄	**ﻭ ي ى ى *(100)***

Table 18 illustrates respondents' reported behaviors on whether they were still involved in sexual relationships with a partner 10 or more years older than themselves disaggregated by sex, age, education, geographical location, and district. Baseline results suggest that eight of every ten respondents who reported being involved in a sexual relationship with someone 10 years or older than themselves in the last 12 months, continued doing so during the interview (Table 18).

Female respondents (64.3 percent, n = 9) were reported still being involved in sexual relationships with partners older than themselves compared with their male counterparts (35.7 percent). In other words, male respondents were least likely to get involved in sexual relationships with a partner 10 or more years older than themselves by 34%, *OR = 0.66, 95% CI:, 0.20, 1.98* (Table 18). However, this relationship was statistically not significant, *p >0.05* (Table 18).

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[1] This indicator applies to only to those who ever engaged in a sexual relationship with someone who is 10 years or older than them in the last 12 months.

Table 18: Distribution of respondents reporting still involved in sexual partnerships with a partner ten or more years older than themselves disaggregated by sex, age, level of education and geographical location with accompanying unadjusted odds ratios

	Yes *(%)*	No *(%)*	Unadjusted OR	95% CI	
Still sexually involved with a partner 10 or more years older?					
Female [R]	9 *(1.2)*	737 *(98.8)*	.	.	.
Male	5 *(0.8)*	622 *(99.2)*	0.66	0.20	1.98
Still sexually involved with a partner 10 or more years older?					
10 – 14 years [R]	5 *(1.5)*	*327(98.5)*	.	.	.
15 – 19 years	9 *(1.1)*	*1023(98.9)*	0.58	0.19	1.97
20 – 24 years	0 (0)	*9 (100.0)*			
Still sexually involved with a partner 10 or more years older?					
Form 1	5 *(1.2)*	403 *(98.8)*			
Form 2 [R]	4 *(1.1)*	375 *(98.9)*	0.86	0.20	3.42
Form 4	5 *(0.9)*	579 *(99.1)*	0.70	0.19	2.60
Still sexually involved with a partner 10 or more years older?					
Rural [R]	5 *(0.9)*	526 *(99.1)*	.	.	.
Urban	9 *(1.1)*	833 *(98.1)*	1.14	0.38	3.76
Still sexually involved with a partner 10 or more years older?					
Kweneng East [R]	1 *(4.3)*	22 *(95.7)*	-	-	-
Selebi Phikwe	2*(1.3)*	152 *(98.7)*	0.29	0.21	8.91
Bobirwa	0 *(0.0)*	212 *(100.0)*	-	-	-
Good Hope	4 *(1.4)*	292 *(98.6)*	0.30	0.04	7.78
Palapye	2*(0.7)*	297 *(99.3)*	0.15	0.01	4.56
Francistown	5*(1.3)*	384 *(98.7)*	0.29	0.04	7.11

*Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001*

[R] *Indicates that this variable was used as a reference for calculating odds ratios.*

Baseline data also suggest that urban respondents were more likely to report being involved in sexual relationship with partners 10 or more years older than themselves by 14.0 percent compared with rural respondents (Table 18). Further analysis using multiple logistic regression modeling found no significant evidence of the effects of respondents' sex, age, education, location and district on intergenerational sexual relationships in this population at baseline (Appendix III, Model 8).

Despite lack of statistical significance between outcome and predictor variables even after controlling for confounding factors, the trend does demonstrate the female respondents and respondents in urban areas are more likely to get into relationships with partners who are 10 or more years older than themselves, p >0.05 (Appendix III, Model 8).

Outcome 9: *Number of men referred to health facilities for safe male circumcision (as confirmed by referred cards from CSOs).*

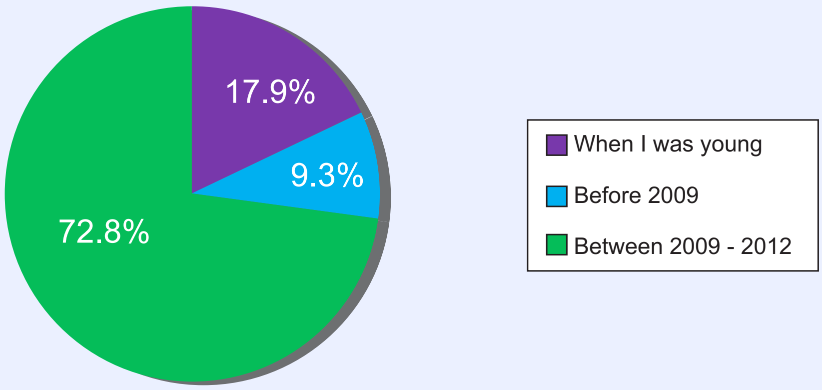
Male respondents were asked whether they had undergone circumcision in their lifetime. Baseline results show that 24.7 percent of the male respondents reported to have undergone circumcision at baseline (Table 19)

Table 19: Percentage (%) of self-reported to have been circumcised [*N = 627*]

Yes	155 *(24.7)*
No	472 *(75.3)*
Total	**627(*100*)**

Of the respondents who reported to have been circumcised, 72.8 percent were circumcised during the 2009 – 2012 time period (Figure 7)

Figure 7: The reported time frame for being circumcised (n=151)



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[2] Health card verification was not sought at baseline for two reasons. First, Botswana requires that data collectors can only ask for respondents' health cards after seeking ethical clearance from the IRM. Second, only registered health professional are allowed to have access to patient's health cards because it contains confidential health information.

Nine of every ten circumcised respondents reported to have been circumcised at a government health facility. Comparatively, younger respondents (mean age = 15.6) were more likely to report being circumcised more than older respondents (mean age = 15.9) (Figure 8). However, when age was disaggregated, a higher percentage of respondents in the 20 – 24 year old age group (50.0 percent) reported to have been circumcised than those in the 10 – 19 year old age group.[3]

Figure 8: Mean age and 95% confidence intervals of male respondents reporting to either have been circumcised or not

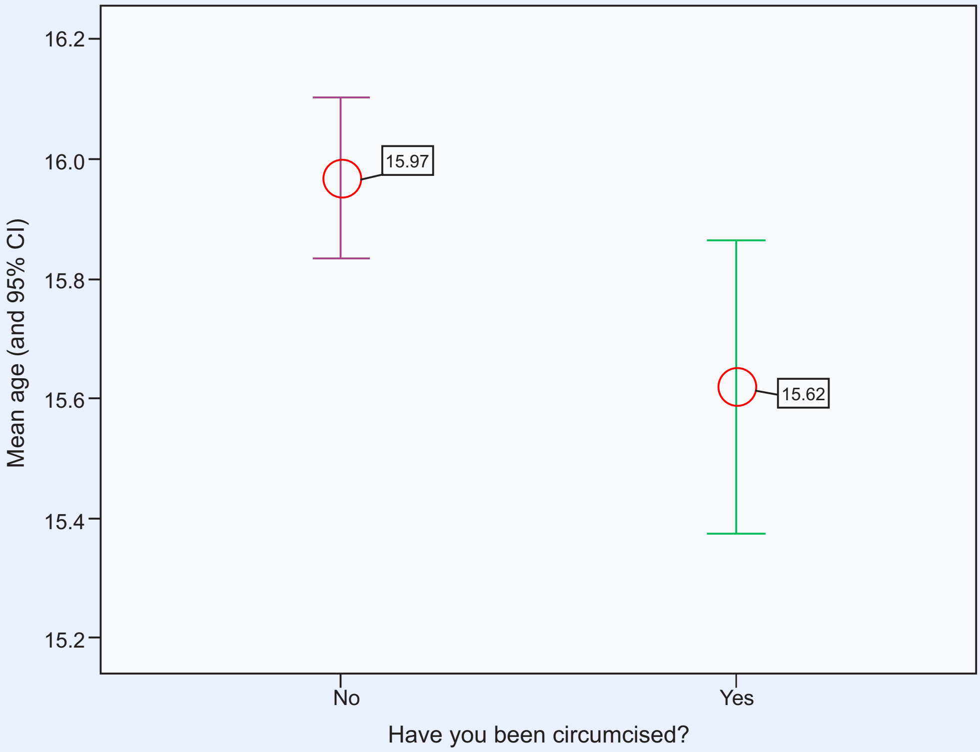

Table 20 presents respondents' reported circumcision status disaggregated by age, education, geographical location, and district. Results at baseline found significant association between respondents' self-reported circumcision status and respondents education $(X^2_{(df1)} = 8.9, p \leqslant 0.05)$, geographical location $(X^2_{(df1)} = 49.9, p < 001)$ and district of residence $(X^2_{(df5)} = 63.7, p<001)$ was significant.

OR unadjusted show that respondents in form 4 were least likely to report being circumcised compared with respondents in form 1 by 47%. This probably explains why the overall average age of respondents who reported being circumcised is lower than those who are not circumcised, $OR_{unadjusted} = 0.53$, *95% CI: 0.34, 0.85,* $p<0.01$ (Table 20).

Results also show that urban respondents are about five times more likely to report being circumcised than rural respondents, $OR_{unadjusted} = 4.92$, *95% CI: 3.11, 8.02,* $p<001$. Comparatively, respondents from Palapye (OR unadjusted = 3.20, 95% CI: 1.57, 6.90, p<0.001) and Francistown $(OR_{unadjusted} = 2.37$, *95% CI: 1.17, 5.10,* $p<0.001)$ were about three and twice (respectively) times more likely to report having being circumcised than those from Kweneng East (Table 20).

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[3] However, caution must be excised when interpretation this outcome because the sample of respondents in the 20 – 24 year old age group is very small compared to the 10 – 19 year old age group.

Table 20: Percent distribution of male respondents reporting being circumcised disaggregated by age, level of education, geographical location and districts with accompanying unadjusted odds ratios and 95% confidence intervals

	Yes *(%)*	No *(%)*	Unadjusted OR	95% CI	
Been circumcised?					
Female	-	-			
Male	155 *(24.7)*	472 *(75.3)*	.	.	.
Been circumcised?					
10 – 14 years [R]	38 *(29.8)*	83 *(68.6)*	.	.	.
15 – 19 years	115 *(22.9)*	*387 (77.1)*	0.65	0.42	1.01
20 – 24 years	2*(50.0)*	*2(50.0)*	2.17	0.22	21.49
Been circumcised?					
Form 1 [R]	59 *(29.8)*	139 *(70.2)*	.	.	.
Form 2	50*(27.8)*	130 *(72.2)*	0.91	0.58	1.42
Form 4	46 *(18.5)*	203 *(81.5)*	0.53	0.34	0.85**
Been circumcised?					
Rural [R]	24 *(9.7)*	224 *(90.3)*	.	.	.
Urban	131*(34.6)*	248 *(65.4)*	4.92	3.11	8.02***
Been circumcised?					
Kweneng East	-	23 *(100.0)*			
Selebi Phikwe [R]	11 *(18.0)*	50 *(82.0)*	.	.	.
Bobirwa	12 *(12.1)*	87 *(87.9)*	0.63	0.25	1.56
Good Hope	12 *(8.7)*	126*(91.3)*	0.43	0.18	1.07
Palapye	63 *(41.4)*	89 *(58.6)*	3.20	1.57	6.90***
Francistown	57*(34.3)*	109 *(65.7)*	2.37	1.17	5.10**

Unadjusted measures of effects are based on Odds Ratio with *p =0.05, **p=<0.01 ***p<0.001

[R] Indicates that this variable was used as a reference for calculating odds ratios.

Multiple logistic regression modeling was performed to assess the effects of age, education, geographical location and districts on respondents' self-reported circumcision status. When district was added into the model, the Hosmer-Lemeshow test of goodness of fit was significant *(P<0.05)*, suggesting that the model is not parsimonious. District was therefore excluded from the model.

The resultant adjusted model found that respondents in form 4 were least likely to report being circumcised than respondents in form 1 by 53.0 percent, $OR_{adjusted} = 0.47$, *95% CI: 0.30, 0.75, p= 001*. Results also reveled that urban respondents were five times more likely to report being circumcised than rural respondents, $OR_{adjusted} = 5.26$, *95% CI: 3.27, 8.47, p<0.001* (Appendix III, Model 9). Compared with Kweneng East, adjusted odds ratios were similar in all districts (Appendix III, model 9).

Outcome 10: *Percentage of students [10 – 14 years, 15 – 19 years and 20 – 24 years] reporting no sexual activity.*

Results indicate that every nine of the ten respondents (90.3 percent) interviewed at baseline were sexually inactive. The majority of the sexually inactive respondents were in the 10 – 14 year old age group (Table 21).

Table 21: Percentage (%) of youth [10 – 24 years] reporting no sexual activity [*N = 1, 373*]

Age categories	No	Yes	Total
10 – 14	328 *(98.8)*	4 *(1.2)*	332 *(100)*
15 – 19	908 *(88.0)*	124 *(12.0)*	1,032 *(100)*
20 – 24	4*(44.4)*	5 *(55.6)*	9*(100)*
	1,240*(90.3)*	133*(9.7)*	1,373*(100)*

Table 22 illustrates respondents' sexual activity disaggregated by age, education, geographical location, and district. Results show that male respondents were more likely to report having had sex than their female counterparts. Sexual activity tends to increase with age (Table 22). The test for measures of association was significant between respondents' self-reported sexual activity and respondents sex $(X^2_{(df1)} = 7.8, p = 0.005)$, age $(X^2_{(df1)} = 55.3, p < 001)$, and education $(X^2_{(df2)} = 96.9, p<001)$.

$OR_{unadjusted}$ show that male respondents $(OR_{unadjusted} = 1.67$, *95% CI: 1.16, 2.40, p<0.05)*, students aged 20 – 24 years (OR unadjusted = 93.83, 95% CI: 17.92, 555.3, p<0.001), and respondents in form 4 $OR_{unadjusted} = 10.23$, *95% CI: 5.23, 21.72, p<0.001)* had significant effect on respondents' sexual activity compared with reference groups (Table 22). After controlling for confounding factors, odds ratio show that male respondents were 1.87 times more likely to report having had sexual intercourse more than female respondents, $OR_{adjusted} = 1.87$, *95% CI: 1.27, 2.74, p<0.05* (Appendix III, model 10).
Respondents who were in form 4 at baseline were about six times more likely to report having had sexual intercourse than respondents in form 1 respondents, $OR_{adjusted} = 5.76$, *95% CI: 2.49, 13.02, p<001* (Appendix III, model 10).

Results also show that older youth in the 20 – 24 year old age group were 17 times more likely to report sexual intercourse more than respondents in form 1, $OR_{adjusted} = 17.30$, *95% CI: 2.88, 103.88, p<0.001*(Appendix III, model 10).

Table 22: Percent distribution of respondents' aged [10 – 14, 15 – 19 and 20 – 24 years] reporting sexual activity disaggregated by sex, age, level of education and geographical location with accompanying unadjusted odds ratios (N = 1,373)

	Yes *(%)*	No *(%)*	Unadjusted OR	95% CI	
Ever had sexual intercourse?					
Female ^{R}	57 *(7.6)*	689 *(92.4)*	.	.	.
Male	76 *(10.3)*	551 *(87.9)*	1.67	1.16	2.40**
Ever had sexual intercourse?					
10 – 14 years ^{R}	4 *(2.2)*	*328 (97.8)*	.	.	.
15 – 19 years	124 *(12.0)*	*908 (88.0)*	11.19	4.49	35.96***
20 – 24 years	5 *(77.8)*	*4(22.2)*	93.83	17.92	555.3***
Ever had sexual intercourse?					
Form 1 ^{R}	9 *(2.2)*	399 *(97.8)*	.	.	.
Form 2	14 *(3.7)*	365 *(96.3)*	1.70	0.73	4.14
Form 4	110 *(18.8)*	476 *(81.2)*	10.23	5.32	21.72***
Ever had sexual intercourse?					
Rural ^{R}	46 *(8.7)*	485 *(91.3)*	.	.	.
Urban	87*(10.3)*	755 *(89.7)*	1.22	0.84	1.79
Ever had sexual intercourse?					
Kweneng East	-	23 *(100.0)*			
Selebi Phikwe ^{R}	8 *(5.2)*	146 *(94.8)*			
Bobirwa	17 *(8.0)*	195 *(92.0)*	1.59	0.67	3.99
Good Hope	29 *(9.8)*	267 *(90.2)*	1.98	0.91	4.72
Palapye	31*(10.4)*	268 *(89.6)*	2.11	0.97	5.01
Francistown	48 *(12.3)*	341*(87.7)*	2.57	1.23	5.93**

^{R} *Indicates that this variable was used as a reference for calculating odds ratios.*
**p =0.05, **p=<0.01 ***p<0.001*

Results at baseline also show that the age at first sexual debut in this sample population was 15.8 years (standard deviation = 1.54). Male respondents tend to initiate sexual activity at a slightly younger age (M = 15.6 years) compared with female respondents (M = 16.2 years). The median age at first sexual debut was 16 years in both sexes.

5 Discussions

Botswana is one of the countries hardest hit by HIV in the world. By 2008 HIV prevalence was estimated at 17.6 percent in the population 18 months and above, with an annual incidence of 2.9 percent. The HIV epidemic is already generalized among young people with 3.5 percent infected in the 10 – 14 age group, 4.9 percent among 15 – 19 age group and 15.4 percent in the 20 – 24 age group (BAIS III, 2008). In the 15-24 age group, young women are twice more likely to be infected with HIV than young men, and many of young Batswana are not undiagnosed and therefore do not know their HIV status (BAIS III, 2008).

Promoting risk reduction strategies in young people using different HIV prevention intervention including peer education is critical in breaking the back of HIV in Botswana. This section interprets the baseline based on the main high level outcomes drawn from grey as well as peer reviewed journal.

5.1. The Respondent Population

The distribution of the respondent population by sex at baseline (54.3 percent for females and 45.7 percent for males) falls within the Botswana secondary school enrollment trends by sex observed over the past two decades. An annual percentage is around 52.0 percent for females and 48.0 percent for males (Bennell, Chilisa, Hyde, Makgothi, Molobe & Mpotokwane, 2001; World Bank, 2010).

The baseline sample suggests that the SSI collected information from a sample that is representative of the Botswana secondary school enrolment population. Given that the sample population was randomly selected and the size is big, information at baseline can be extrapolated to reflect the opinions of the Batswana secondary school student population.

5.2. Multiple Concurrent Partnership

Results at baseline indicate that young people in this sample population had acquired high level of knowledge and perceived HIV risks associated with multiple concurrent partnerships. Baseline data show that the majority of young people oppose multiple concurrent partnerships and acknowledged that this practice increases the risks of HIV acquisition. In addition, most young people at baseline were confident to terminate relationships in an event that their partners were sexually involved with other partners; and most reported to have reduced the number of sexual partners. These findings are consistent with recent studies conducted among young people in other sub-Saharan African countries, which have demonstrated an increased knowledge levels and perceived HIV risk factors (Oladepo & Fayemi, 2011; Ezeamat & Ndukwu, 2011; Odu & Akanle, 2008).

The results suggest that HIV and AIDS behavior change and health promotion interventions implemented over the past years in Botswana have had positive effects on increasing HIV risk factors among secondary school students. Results at baseline suggest that old SSI intervention areas (Good Hope and Selebi Phikwe), for example, had significant confidence to terminate sexual relationships with partners involved with other partners. The increased knowledge and change in behaviors may have had contributed to the reduction of HIV prevalence from 18.2 percent in 2004 to 10.7 percent in 2008 among young people aged 10 – 24 years of age (BAIS III, 2008).

However, the current prevalence is still high and requires innovative risk reduction approaches. The current levels of prevalence may be exacerbated by increased risk behaviors by a small proportion yet substantive to keep the threat of HIV high in this population. For example despite the high knowledge of the risks associated with multiple concurrent partnerships, the majority (70.0 percent) of respondents who were involved in sexual relationships barely discussed risk factors associated with multiple concurrent partnerships.

The results demonstrate the existing gap between knowledge and actual behavioral practices, suggesting that acquisition of knowledge in itself does not necessary imply people will reduce behaviors that put them at risk of HIV infection. Current peer education programs must focus on using high knowledge levels to develop services that allow young people to develop self efficacy skills and competencies for long term HIV risk reduction practices. Peer education programs must challenge youth and guide them to set individual goals for adopting HIV risk reduction strategies including self HIV assessment and taking action based on self-assessment results.

Effective peer education programs must also be cognizant of the underlying contextual and structural environment that drive young people to engage in multiple concurrent relationships and other risk behaviors. The baseline results collaborate with existing literature (NACA, 2008) showing that people are driven into multiple concurrent partnerships to achieve economic security, satisfy sexual desires seen as appropriate within their socio-cultural norms and values. In addition, anecdote reports that health delivery services in Botswana are not youth friendly, making it difficult for youth to access HIV risk reduction information.

In developing programs that reduce HIV risk factors among young, organizations must continuous search new research findings and the country strategic plans to design interventions that are relevant and that contribute to the national HIV agenda. In Botswana for example, multiple concurrent partnerships are regarded as one of the primary risk factors of HIV infection. Multiple concurrent partnerships are sexual networks which occur when a man or woman has more than one sexual relationship at the same time, which may overlap for days, weeks, months or years. Multiple concurrent partnerships are widely believed to be one of the primary drivers of HIV transmission in sub-Saharan Africa, where ⅔of the world's HIV positive population reside and where more than 70.0 percent of all new HIV infections occur (Mah & Halperin, 2010; Shelton, 2010; UNAIDS 2010).

Mathematical models predict that under specific conditions, small increase in the prevalence of concurrent partnerships could substantially increase the rate of spread of HIV (5 – 7). However, a recent cohort study on the effect of concurrent sexual partnerships on the rate of HIV incidence in high prevalence population found no evidence about the efficacy of concurrency sexual relationships and HIV transmission.

Tanser, Barnighausen, Hund, Garnett, McGrath, & Louise-Newell (2011) followed up a cohort of HIV negative women for 5 years and quantified the effects of sexual behavior profiles of men in the surrounding communities. Using women who sero-converted to HIV positivity during follow-up as an outcome variable, Tanser et al., (2011) found no evidence to suggest that concurrency is an important causal factor of HIV incidence. These findings have an important public health implication, which require modification of HIV risk reduction interventions in generalized HIV epidemics such as Botswana.

5.3. Intergenerational Sex

Baseline results show that only a small percentage of the respondent population (1.2 percent, n=17) are involved in cross-generational sexual relationships. While this percentage is a cause for celebration, complacency may cause more harmful. The 1.2 percent found that baseline translates to over 2,000 secondary school students engaging in cross-generational sex.
Leclerc – Madlala (2008) notes that in addition of being common throughout sub-Saharan Africa, intergenerational relationships are associated with unsafe sexual behavior such as low condom use. Studies on age-disparate and intergenerational sex suggest a complex interplay of meanings and motives that prompt both men and women across socioeconomic strata to engage in intergenerational sex. Leclerc-Madlala (2008) observes that programs that address intergenerational sex must address the "perceived beneficial" elements at a number of levels of the social fabric in addition to economic and symbolic factors.

In the context of growing economic inequalities and cultural expectations, men are expected to give and women to receive monetary or other form of compensation for sex. Relationships with older men are common and readily available way through which young women gain materially, affirm self worth, achieve social goals, increase longer-term chances, or otherwise add value and enjoyment of life (Leclerc-Madlala, 2008; Nkosana & Rosenthal, 2007). High risk intergenerational sex may also occur when older men, knowingly infected young girls where through unprotected sex. This is common in cultures that believe having sex with a virgin cures HIV (Muula, 2008).

The results at baseline highlight some of the disadvantages and benefits of cross-general sex observed in other countries (Leclerc-Madlala, 2008 Nkosana & Rosenthal, 2007). The perceived disadvantages of intergenerational sex at baseline, for example, included issues associated with power imbalances, manipulation, and the economic advantage. While such factors may be at play in many intergenerational partnerships, respondents who support the practice such relationships was associated with "love". Nkosana and Rosenthal's (2007) found that relationships between young girls and older men were associated with sense of equal partnership. It is therefore not surprising that young girls involved in intergenerational sexual relationship may fail to appreciate the precarious nature of HIV risk factors of such relationships.

5.4. Safe Male Circumcision

Male circumcision is one of the oldest and most widely used biomedical procedures across diverse cultures and religions (WHO, 2008). It is today recognized as an effective prevention strategy for acquiring HIV infection among male population (WHO/UNAIDS, 2007). Results at baseline show that only two of every ten young male respondents interviewed are circumcised. These are consistent with studies conducted in Africa which found that Botswana is one of the countries that lie in the belt where about 80.0 percent of the male population is not circumcised (WHO, 2009). The baseline results highlight that circumcision is a missed opportunity among young men in Botswana. Most of these young men are either sexual activity or more likely to become sexually active and therefore exposed HIV.

Randomized controlled trials (RCTs) conducted in Kenya, South African, and Uganda found an average of 50.0 to 60.0 percent protective effect of safe male circumcision in respect of female to male transmission of HIV (Auvert, Taljaard, Lagarde, Sobngwi-Tambekou, Sitta, & Puren, 2005; Gray, Kigozi, Serwadda, 2007; Bailey, Moses & Parker, 2007). Mathematical modeling suggests that mass safe male circumcision programs can substantially lower HIV incidence in generalized HIV epidemics (UNAIDS/WHO/SACEMA, 2009). Botswana may significantly benefit in reducing the incidence of HIV infection with scaled-up safe male circumcision that involves young people. Young people are the key target groups for breaking the back of HIV and realizing a free HIV generation in Botswana. Scaled-up safe male circumcision drive can have sustained impact if it is integrated into the existing government and socio-cultural institutions that promote safe circumcision.

5.5. Abstinence

Results at baseline show that the majority of the secondary school students are sexually inactive. The results offer peer education interventions a great opportunity to emphasis delaying sexual debut as an important risk reduction strategy and HIV prevention for this population. However, the results reveal that sexual activity increases with age. As young people reach the 20 – 24 year old age group, sexual activity increases 17 times in this group more than young people in the 10 – 14 years of age. Programs that aim at encouraging sexual abstinence while also encouraging and emphasizing safer sex strategies for individuals who are sexually active have been shown to reduce short term as well as long term HIV risk behaviors among young people (Science Daily, 2008).

Abstinence interventions aim at promoting youth to delay sexual debut by providing information, changing youth attitudes about sex, and improving young people with decision making skills for delaying sexual debut (AMREF, 2007). "Abstinence-only" programs, which promote complete sexual abstinence as the only effective method for preventing unintended pregnancy and sexually transmitted infections including HIV, may not be practical in this population. Instead, a comprehensive sexual education programs that include sex education and information on abstinence, delay of sexual debut, partner limitation, condom use, and secondary-abstinence may be effective.

Studies show that many young people in southern Africa engage in risky sexual behaviors and do not always consider themselves to be at risk of HIV infection (Ghys, Gouws, Lyela, Garcia-Calleja, Barrerre, Serrano et al., 2010). In a 2010, the tertiary education baseline audit found that 47.3 percent of the student population in Botswana consider themselves at low risk of acquiring HIV infection (NACA, 2008). The worrying trend in Botswana is that by 20 years of age, more than half of young people engage in risk sexual behaviors on the backdrop of low safe sex practices.

Abstinence interventions also emphasis social, psychological, and health gains to be realized by abstaining from sexual activities. In discussing abstinence one has also to realize that due to gender inequality, marriage, and faithfulness does not necessarily protect women from HIV infection. It is therefore imperative to have young men develop the mastery consciousness that faithfulness in a relationship is best and only effective way to protect themselves and their partners from HIV exposure.

Systematic review studies on the efficacy of AIDS risk reduction interventions found that ⅓of the interventions showed efficacy in postponing sexual debut among virgins and an increase in the “secondary” abstinence among those who had been sexually active (11). Systematic reviews of 22 interventions conducted in the developing world found that 72.7 percent of the interventions significantly delayed sexual activity, reduced the frequency of sex, decreased the number of sexual partners, increased condom use and contraceptives, and reduced the incidence of unprotected sex (24).

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[4] Secondary abstinence in this report refers to young people who decide to postpone sexual intercourse following sexual debut.

6 Conclusion

Peer education remains the most widely utilized and accepted HIV prevention strategy. Research suggests that its effectiveness depends on how well the programs are designed and implemented. The baseline results provide SSI with information to develop informed and evidence based interventions and to set targets for meeting the BANPS outcome indicators. It also provides SSI with information for setting reach to achieve defined outcome indicators.

Developing an effective peer led education will require SSI to take into consideration the contextual and structural environment under which risk factors take place. In addition, the SSI peer led education program should be built on the premise that HIV transmission is necessitated by an accumulation of multiple and often times complex factors. The best way to address multiple and complex factors is to design holistic HIV risk reduction and prevention interventions that are integrated and delivered as a package within the national strategic direction and existing infrastructures.

7 Recommendations

The success of any peer education program is determined by several programmatic factors. These include the skills, competencies and commitment of program staff, the depth and relevance of the interventions, the environment under which the interventions are implemented, availability of adequate resources, and by the skills and commitment peer educators.
It is therefore critical to select the right young people to become peer educators; and to provide them with appropriate training and supportive working environment.

- SSI should consider involving school faculty and student body representatives in recruiting youth who will be right for the program. Where possible, peer education programs should be developed within the extra-curriculum school programs with school prefects assuming such roles.

There is gap between knowledge and actual behavioral practices, suggesting that acquisition of knowledge in itself does not necessary imply risk reduction.

- SSI should consider using the high knowledge levels to redirect its peer education interventions to building youth's self efficacy skills and competencies for HIV prevention by challenging and guiding them to perform self risk assessment and set goals for HIV risk reduction. Youth must be directed to behaviors such as abstaining from sexual activity, getting HIV counseling and testing, always using condom if they are sexually active, reducing multiple sexual relationships and cross- generational sex and/or undergoing safe male circumcision as part of risk reduction strategies.

- Given that most of the BNAPS high level outcome indicators are knowledge oriented, and the knowledge level is currently high, SSI must set and aim its end line targets challengingly high to ensure significant change at the end of the implementation cycle. In addition, the implementation cycle should be set at a maximum of 18 months.

Peer education programs are more effective when they are integrated into existing programs such as school health education and/or life skill program. For example, an integrated peer education program would ensure that the activities of each program would feed into each other. Peer educators could play a part in supporting or implementing the variety of complementary activities that the HIV/AIDS prevention program might include, such as condom education, safe male circumcision counseling, drama/theater, and advocacy.

- SSI should consider repackaging its peer education intervention into an integrated package using linkages available in their working environment. SSI should consider dialogue involving community members (Chiefs, gatekeepers, local politicians, and traditional healers), parents (uncles and aunties), state and non-state institutions which work in HIV/AIDS prevention programs.

- SSI should consider conducting a rapid community mapping exercise to identify state and non-state actors involved in HIV and AIDS interventions aimed at forging working relationships to optimize resources.

- One of the most important components of an integrated program is that peer educators should be able to refer their "contacts" to existing services. For integration to work, peer educators must be familiar with services that are available and accessible in their communities, and the service providers must be knowledgeable about the peer education program.

- SSI should consider adapting and incorporating national strategic plans (to include multiple concurrent strategic plans and guidelines, safe male circumcision and counseling protocols) as part of contributing to national HIV prevention efforts.

- In addition to achieving the targeted "reach" with key peer education messages, SSI must design segmented and targeted messages that are gender, age, location specific.

Reduction in HIV transmission needs sustained efforts and a mix of peer education training approaches as well as multiple communication channels to disseminate messages and practices that motivate young people to engage in risk reduction.

- The effect of behavioral strategies could be increased by aiming for many goals (e.g., delay in onset of first intercourse, reduction in number of sexual partners, increases in condom use, etc) that are achieved by use of multilevel approaches.

- Interventions derived from behavioral science have a role in overall HIV prevention efforts, but they are insufficient when used by themselves to produce substantial and lasting reductions in HIV transmission between individuals or in entire communities.

Efforts to delay sexual debut should be incorporated into comprehensive sexual education programs and should begin early, offering age-appropriate messages over time. Comprehensive sexual education programs are typically targeted towards youth and are predominately school-based. Opportunities to reach out-of-school youth, who may be at heightened vulnerability, should be identified as well through the uncles and aunties interventions. Comprehensive programs may include messages that:

- Reinforce positive individual and group norms for abstinence
- Teach safer sex practices for young people who are already sexually active
- Offer opportunities to practice skills in negotiating for safer sex or refusing sex

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