



Published in final edited form as:

J HIV AIDS Soc Serv. 2013 July 1; 12(3-4): 404–423. doi:10.1080/15381501.2013.819312.

Multiple levels of influence in predicting sexual activity and condom use among adolescents in Soweto, Johannesburg, South Africa

Janan Dietrich¹, Kathleen Sikkema², Kennedy N. Otwombe¹, Amy Sanchez², Busisiwe Nkala¹, Guy de Bruyn¹, Martin Van Der Watt¹, and Glenda E. Gray¹

¹Perinatal HIV Research Unit, University of the Witwatersrand, Chris Hani Baragwanath Hospital, Johannesburg, South Africa

²Department of Psychology and Neuroscience, Duke University, Durham, North Carolina, United States of America

INTRODUCTION

South Africa has the highest burden of HIV worldwide; 10.9% of the population is infected with HIV (Shisana et al., 2009). The prevalence of HIV in South Africa is highest amongst 15-24 year olds with females disproportionately affected (Shisana et al., 2009). HIV prevalence among adolescents aged 15-19 years in South Africa is estimated to be 6.7% among females and 2.5% among males (Shisana et al., 2009).

Risk factors for HIV among adolescents in South Africa include gender (Shisana et al., 2009; Wilson, Wright, Safrit, & Rudy, 2010), age (Shisana et al., 2009), substance use (Shisana et al., 2009), failure to use condom prophylaxis (Maticka-Tyndale, 2012), early sexual debut (Tenkorang, Rajulton, & Maticka-Tyndale, 2009), intergenerational sex (Wilson et al., 2010), gender inequality (Speizer et al., 2009) and low relationship power amongst females (Pettifor, Measham, Rees, & Padian, 2004). Early sexual debut is of concern because it is associated with frequent sexual intercourse, irregular contraceptive use, more sexual partners and unplanned pregnancies (Koenig et al., 2003; Pettifor, O'Brien, Macphail, Miller, & Rees, 2009). Sexual violence, including child abuse and forced sex, increases risk for HIV amongst female adolescents, because of its contribution to early sexual experiences amongst young females (Pettifor, Macphail, Rees, & Cohen, 2008; Pettifor et al., 2009). Intergenerational sex between older men and younger females contributes to early sexual debut and increases the HIV epidemic among 15-24 year old females (Pettifor et al., 2009; Shisana et al., 2009).

Soweto is an urban African township in Gauteng province, South Africa. The prevalence of HIV in Gauteng is 15.2% among 15-49 year olds (Shisana et al., 2009). The population in Soweto is estimated to be between 2.5 and 3 million people in an area of 63km² (City of Joburg, 2010). Challenges facing youth in Soweto include: lack of job opportunities (Statistics South Africa, 2012); high rates of school drop-out, especially among teenage girls due to pregnancy (Grant & Hallman, 2008); drug and alcohol abuse (Shisana et al., 2009) and transactional sex which poses a risk in terms of HIV transmission (Dunkle et al., 2004).

Effective health promoting behaviors is associated with correct and consistent condom use at every sexual act to prevent HIV and other sexually transmitted infections (Holmes, Levine & Weaver, 2004). In South Africa, the use of condoms has historically been disproportionate to awareness and availability of condoms (Eaton, Flisher, & Aaro, 2003). The past decade has seen a dramatic increase in the number of young South Africans reporting condom use at last sexual intercourse (Dinkelman, Lam, & Leibbrandt, 2007; Hendriksen, Pettifor, Lee, Coates, & Rees, 2007; Shisana et al., 2009; Simbayi, Chauveau, & Shisana, 2004). In a national survey conducted in 2008 (Shisana et al., 2009), 92.1% of 12-18 year old males and 83.9% of females in the same age group indicated condom use at last sexual intercourse (Chimbindi, McGarth, Herbst, Tint, & Newell, 2010a; Moyo, Levandowski, MacPhail, Rees, & Pettifor, 2008; Jama Shai, Jewkes, Levin, Dunkle, & Nduna, 2010). Correct and consistent condom use has to be improved even more rapidly for more dramatic effects on the HIV incident rates among young South Africans.

Adolescent sexuality is influenced at multiple levels. Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1989) explains sexual risk in terms of: the individual (microsystem), family, peers and romantic relationships (mesosystem), the larger social systems, such as the community, which dictate social norms and expectations (exosystem), and lastly the rules that govern society, such as legislation regarding adolescents (macrosystem) which provides a conceptual framework to examine HIV risk among adolescents in Soweto. To develop appropriate interventions for the Soweto adolescent population, it is critical to understand context-specific factors that influence sexual activity (vaginal and/or anal sex) and condom use. The influence of individual level psychological factors is often neglected (Nduna, Jewkes, Dunkle, Shai, & Colman, 2010; Puffer et al., 2010). Depression, for example, may be related to HIV risk. The prevalence of depressive symptoms among a cohort of 15-26 year old South Africans showed that 21% of females and 13.6% males had depressive symptoms and that depressive symptoms were indicative of a failure to use condoms (Nduna et al., 2010).

Parents are important in educating their children about sexuality and health promoting behaviors (Njoroge, Olsson, Pertet, & Ahlberg, 2010). Parent-adolescent communication is influenced by frequency of communication, content of communication, parent communication style, gender of parent, timing of communication and overall relationship between parent and adolescent (Dilorio, Pluhar, & Belcher, 2003). Despite mixed findings regarding the effects of parent-adolescent communication, the parent-adolescent relationship is an opportunity for parents to engage their adolescents in increasing health promoting behaviors (DiLorio, Dudley, Soet, & McCarty, 2004; Schouten, van den Putte, Pasmans, & Meeuwesen, 2007).

The aim of the study was to examine whether individual, interpersonal and community level factors amongst adolescents in Soweto were associated with sexual activity and condom use.

METHODS

Subjects and Data Collection Procedures

A stratified sample of adolescents was selected from Soweto during October 2008 to March 2009. Soweto consists of about 40 townships/areas. Each area was a stratum. Fifteen adolescents were purposively selected per area with the number of participants divided into a 60:40% split (nine girls: five boys). We oversampled adolescent females. Females in this region are disproportionately affected by HIV; elsewhere in the world, males, particularly men who have sex with men, are at elevated risk compared to females. Field workers approached potential participants via schools, around malls, youth organizations and shops. Approximately 852 potential participants were approached; 152 (18%) were not interested in participating and 193 (23%) did not arrive for appointments or gave incorrect telephone numbers. One subject was removed from analysis due to an extensive amount of missing data.

Participants completed a 90-min interviewer-administered questionnaire at the Perinatal HIV Research Unit (PHRU), a research unit affiliated with the University of the Witwatersrand and situated at Chris Hani Baragwanath Hospital in Soweto. Consent was required for participation. Participants younger than 18 years required parent consent and the adolescent's assent. Participants were reimbursed ZAR50 (~\$7) to cover their transport costs. The institutional review boards at the University of the Witwatersrand and Duke University approved study procedures.

Outcome Measures

Outcome measures were linked with the levels of the ecological systems model (Table 1).

Demographic information—Gender, age, ethnicity, grade in school, family structure, parent/guardian information, household structure and household composition were included.

Sexual behavior—The following items were assessed: sexual orientation (heterosexual/straight, homosexual/gay, bi-sexual, undecided/don't know); age of first partner (boyfriend/girlfriend); age ranges of previous and current partners (16-21, 22-27, 28-33, 34-40, and over 40); pressure from boyfriends/girlfriends to engage in sex (no pressure at all, not much pressure, some pressure, a lot of pressure); ever had vaginal and/or anal sexual activity (yes/no); and how often a condom was used at sex in the past six months (always, sometimes, never). For condom use, only subjects who reported sexual activity were considered. These were split into "Consistent" and "Inconsistent" groups, with the "Consistent" group defined as "Always" using condoms in the past six months. For age ranges of previous and current partners, participants selected one option. Participants responded by ticking only the current partner. Those who did not have a current partner/s, ticked for a previous partner. The ages were dichotomised into "16-21" and ">21" years because there were fewer responses among those with partners >21 years. Pressure to engage in sex was grouped into "No pressure" and "Pressure," with "Pressure" defined as "Some pressure" or "A lot of pressure".

Attitudes about sex—Common attitudes toward sex and condom use (Hendriksen et al., 2007) were measured with a nine-item scale, endorsed as agree or disagree, (e.g., “Using condoms is a sign of not trusting your partner”). The scale was a sum, then a median was determined. This scale demonstrated moderate internal consistency ($\alpha=0.62$). This was the best combination of items based on the cronbach’s alpha measure. The median was used as a cutoff to categorise the ‘Attitudes about sex’. The cronbach’s alpha score is low and this may not be the best measure for internal consistency however the convention in this nature of studies is to test internal reliability using cronbach’s alpha.

Substance use—Hazardous alcohol use and illegal drug use in the past six months was assessed: “Have you been drunk in the past six months where you passed out?” and “Have you ever, even once, used any drug just to get high?”

Mental health factors—The Children’s Depression Inventory (CDI) (Kovacs, 1992) assessed depressive symptoms in the past two weeks (e.g., depressed mood, hedonic capacity, vegetative functions, self-evaluation, and interpersonal behaviors): each of 27 items was scored from 0-2. This scale demonstrated adequate internal consistency ($\alpha=0.79$).

The Rosenberg Self Esteem Scale (Rosenberg, 1965) assessed self-esteem. The scale consists of ten items with a four point Likert response format (strongly agree, agree, disagree and strongly disagree) and demonstrated adequate internal consistency ($\alpha = 0.73$). Self-esteem was categorized as: Low < 15; Normal > 15 < 25; High > 25.

Parent/caregiver relationship—The Parent Adolescent Communication Scale (PACS) (DiClemente et al., 2001) assessed frequency of communication on a four-point Likert scale (never, rarely, sometimes, and often) between parent and adolescent in the past six months regarding five specific items: sex related issues, how to use condoms, STIs, HIV/AIDS and pregnancy/getting someone pregnant. This scale demonstrated adequate internal consistency ($\alpha = 0.79$). PACS was dichotomized into “High” or “Low” on the basis of median split.

Experience and perpetration of violence—Participants were asked about experiences of violence (Vrana & Lauterbach, 1994): “Have you ever experienced an act of violence?”; “Have you ever been hit, slapped or physically hurt on purpose by a boyfriend/girlfriend?”; “Have you ever had sexual intercourse because someone used physical force or threatened you to have sex with him/her?” Item responses were “Yes” and “No”.

Statistical Analyses

Descriptive statistics were determined for demographic and predictor variables. To identify factors predictive of sexual activity and condom use, we modeled the probability of those who responded “Yes” to these items.

Multivariate logistic regression analyses were conducted to identify variables predictive of sexual activity and use of condoms separately. All variables were considered for entry into the multivariate model on the basis of two criteria: (1) if a variable attained a p value $\leq .1$ at the univariate level and (2) if the inclusion resulted in a non-significant p -value in the Hosmer and Lemeshow goodness of fit statistic (Hosmer, 2000). The following predictor

variables were retained: demographic (gender, age) sexual behavior (age at time of getting first partner, age group of previous and partners, pressure to engage in sex; attitudes about sex; substance use (hazardous alcohol use; illegal drug use); mental health (depression, self-esteem); parent/caregiver relationship (PACS); and experience of violence (ever experienced an act of violence, ever been hit, slapped or physically hurt on purpose by a boyfriend/girlfriend, ever had sexual intercourse because someone used physical force or threatened you to have sex with him/her). Additionally, predictors of sexual activity and condom use was analysed by gender. For each model, odds ratios and their 95% confidence intervals were determined. The Kaplan-Meier method was used to determine the time to sex debut by gender under right censoring (Kaplan & Meier, 1958). All the analyses were performed at the 5% significance level using SAS 9.2 software.

RESULTS

Demographic Information

The sample consisted of 506 adolescents aged 16-18 years of age (median is 17; *IQR*: 16-18 years): 41% ($n = 208$) were male and 59% ($n = 298$) female. Most of the sample spoke IsiZulu (50%, $n = 253$), attended school in Soweto (90%, $n = 449$), lived in brick structures such as a house or flat (90%, $n = 457$) and obtained drinking water from a tap in the home (98%, $n = 497$). A third of the sample (31%, $n = 158$) had repeated a grade at school (Table 1). The median number of people living in a household was 5 (*IQR*: 4-7). More than half of the sample (59%, $n = 299$) indicated that both of their parents were alive. Half of the households were female-headed (50%; $n = 253$) and mainly headed by mothers (64%, $n = 163$).

Half of the sample (52%, $n = 262$) was sexually active, whereas of those who were sexually active, 64% ($n = 168$) reported always using a condom. The rest never or sometimes used a condom. Most had partners aged 16-21 years (Table 2). Almost a third reported experiences of violence (26%, $n = 133$).

Logistic Regression For Sexual Activity

In univariate regression (Table 3), individual level factors (being male, older in age, hazardous alcohol use, illegal drug use and having low self-esteem), dyad level factors (having a partner older than 21 years, pressure to engage in sex and ever been hit, physically hurt by partner), and community/peer level factors (having permissive attitudes about sex, having experienced an act of violence) were associated with sexual activity. In multivariate logistic regression (Table 3), being male (*OR*: 2.6, *CI*: 1.4-4.8), hazardous alcohol use (*OR*: 2.4, *CI*: 1.1-5.2), having a partner older than 21 years (*OR*: 4.5, *CI*: 1.5-13.8), having permissive attitudes toward sex (*OR*: 1.6, *CI*: 1.3-2.1) were associated with sexual activity (vaginal and/or anal sex). In the final model, the mental health factor, self-esteem was not a significant predictor of sexual activity. In addition, older age and experience of violence were not significantly associated with sexual activity.

Predictors of sexual activity in the multivariate model (Table 4) by gender showed that for females sexual activity was significantly associated with increasing age (*OR*: 2.7, *CI*:

1.4-5.5), partners older than 21 years (*OR*: 3.3, *CI*: 1.4-7.6) and permissive attitudes about sex (*OR*: 1.6, *CI*: 1.2-2.1). Sexual activity for males was significantly associated with increasing age (*OR*: 3.4, *CI*: 1.1-10.0), hazardous alcohol use (*OR*: 4.0, *CI*: 1.1-14.7) permissive attitudes about sex (*OR*: 1.7, *CI*: 1.2-2.5).

Logistic Regression For Condom Use

In univariate regression, individual level factors (increasing age at the time of having a first partner, decreasing depressive symptoms and low self-esteem), dyad level factors (having partners older than 21 years) and community level factors (experiences of violence) were significant. In the multivariate model, increasing age at time of having a first boyfriend/girlfriend (*OR*: 1.2, *CI*: 1.1-1.4) was a significant predictor of condom use while those with partners older than 21 years were less likely to use them (*OR*: 0.29, *CI*: 0.13-0.68).

Predictors of condom use in the multivariate model by gender (Table 5) showed that for females, condom use was significantly associated with age of first partner (*OR*: 1.4, *CI*: 1.01-1.9) while those who had partners older than 21 years (*OR*: 0.3, *CI*: 0.1-0.9) were less likely to use condoms. There were no significant predictors of condom use for males in the multivariate model.

DISCUSSION

The study makes a unique contribution by explaining sexual activity and condom use in terms of the ecological systems theory. More than half of the adolescents in this sample reported having engaged in vaginal or anal intercourse. This finding is congruent with data from the South African Demographic and Health Survey (2003) in which 42% of women and 63% of men reported sexual intercourse by age 18 (Department of Health, 2007). Prior research indicates that the average age of sex debut for males is significantly earlier than for females (Shisana et al., 2009), a pattern replicated in this sample. On average, males reported first sexual experience before 16 and females reported first sexual experience before 17, although age at sex debut for both genders was later than national findings (Shisana et al., 2009). Given the association between early sex debut and HIV risk factors such as early pregnancy (Speizer et al., 2009), causal sexual partners (Harrison, Cleland, Gouws, & Frohlich, 2005) and more sexual partners (Harrison, Cleland, & Frohlich, 2008), the later average debut reported in this sample likely serves as a protective factor against some aspects of HIV risk behavior.

Despite this positive finding, a third of sexually active adolescents reported inconsistent or no condom use. Recent national data showed a significant and encouraging gain of condom use among 15-24 year olds (Shisana et al., 2009). National data reported male and female condom use at last sex at 87% and 73% respectively. Although condom use among the general population of young South Africans has increased significantly since 2002, condom use continues to be low in the Gauteng province where Soweto is located (Shisana et al., 2009). Soweto adolescents therefore remain at greater risk for HIV infection.

Consistent with expectations, multiple levels of influence were associated with sexual activity and condom use, including individual, interpersonal, and community (normative

attitudes) factors. The findings show that gender, having partners older than 21 years of age, hazardous alcohol use and permissive attitudes about sex were associated with sexual activity, while risky sexual behavior through inconsistent or no condom use was associated with having had a first boyfriend or girlfriend at a younger age and having boyfriends or girlfriends older than 21 years. For females in particular, having an older partner was associated with both a greater likelihood of engaging in sexual activity and inconsistent condom use once sexually active.

Young girls continue to be at increased risk for HIV infection, as relationships with older partners is associated with early sexual debut (Speizer et al., 2009) and consequently lack of condom use at first sex (Leclerc-Madlala, 2008). Research in sub-Saharan Africa shows that young women are less likely to negotiate condom use with older partners, thereby increasing risk for HIV infection (Cockcroft et al., 2010; Leclerc-Madlala, 2008). Education about condoms has little impact on girls' behaviors if they are unable to negotiate with sexual partners (Sayles et al., 2006). Individual-level interventions aimed at increasing condom self-efficacy may be helpful to establish early, consistent condom use, although interventions must also address interpersonal, family, and community factors that contribute to risk from older partners.

Unfortunately, fostering healthy sexual behavior is particularly difficult in the context of substance use. Alcohol use results in impaired judgment and is usually associated with high-risk sexual behaviors which include unprotected sex (Fritz, Morojele, & Kalichman, 2010; Kalichman, Simbayi, Kaufman, Cain, & Jooste, 2007). Risk reduction counseling for adolescents who use alcohol excessively can address ways of minimizing risk for sexual activity and HIV. Efforts must incorporate a comprehensive approach including behavioral strategies (for instance, keeping condoms on hand or reducing exposure to social contexts that trigger drinking), substance abuse treatment programs to and policies that may reduce adolescents' access to alcohol.

A strength of the current study is the use of ecological systems theory to explore multiple levels of influence on adolescent HIV risk behavior. Consistent with this theory, associations in the current sample between risk behaviors and individual and interpersonal factors, as well as normative attitudes, indicate that multi-level interventions are best equipped to create lasting risk reduction. In addition to individual and interpersonal programs, community-level interventions within the ecological systems theory framework are needed to target norms that encourage intergenerational sexual relationships, as well as broader sexual attitudes that contribute to HIV risk. Misconceptions about condoms can discourage their use (Selikow, Ahmed, Flisher, Mathews, & Mukoma, 2009). Further exploration of community values and norms that contribute to permissive sexual attitudes and negative beliefs about condom use is needed.

Contrary to expectations, psychosocial and family level factors such as mental health and parent-adolescent communication were not significant predictors of sexual activity and condom use. A number of predictors such as low self-esteem, partner violence, and forced sex were significant at the univariate level but were not significant in the multivariate model. Given prior research showing that depression (Nduna et al., 2010) and traumatic stress

(Kalichman, Gore-Felton, Benotsch, Cage, & Rompa, 2004) were associated with increased risk behaviors in South African men and women, these findings are surprising. Exploration of potential mediators is warranted. The impact of mental health may be particularly pronounced for highest-risk adolescents or those with poor parent support. Additionally, given gender differences in predictors of risk behaviors, it is likely that multi-level influences on sexual activity and condom use may differ for male and female adolescents. Differences in gender and relationship norms, for example, may explain why age of sexual partner significantly predicts condom use for females but not males.

Limitations

Limitations of the study include the cross-sectional design, which allowed us to determine correlates of sexual activity and condom use but not causal relationships. Data were based on self-reports and the interview-administered method, which is subject to response bias. In some instances sexual behaviors may be underreported or exaggerated due to interviewer administration.

IMPLICATIONS AND FUTURE DIRECTIONS

Reaching a more complete understanding of the interaction of ecological factors contributing to sexual risk behaviors in South African adolescents will enable the development of interventions tailored to those in greatest need. Further research is required to test various counseling interventions that apply multiple levels of risk assessments and tailored counseling. The findings of this study will be used to adapt a HIV risk reduction counseling intervention for adolescents in Soweto by incorporating multiple levels of influence.

Acknowledgments

This study was funded by the National Institute of Mental Health (grant number 5R21MH83308) and the South African AIDS Vaccine Initiative (SAAVI). The authors thank all of the participants for their time and dedication to the study. The authors acknowledge the contributions of Phindile Maesela, Atholl Kleinhans, Mamakiri Khunwane, Precious Modiba, Sibongile Dladla, Matamela Makongoza and all of the fieldworkers.

REFERENCES

- Bronfenbrenner, U. Ecological systems theory. In: Vasta, R., editor. *Annals of child development*. Vol. Vol. 6. JAI; Greenwich, CT: 1989. p. 187-251.
- Chimbindi NZ, McGarth N, Herbst H, Tint K, Newell M. Socio-demographic determinants of condom use among sexually active young adults in rural KwaZulu-Natal, South Africa. *Open AIDS Journal*. 2010; 4:88–95. [PubMed: 20648225]
- City of Joburg. [Retrieved 05 Jul, 2010] The making of Soweto. 2010. from <http://www.joburg.org.za/content/view/920/159/>
- Cockcroft A, Kunda JL, Kgakole L, Masisi M, Laetsang D, Ho-Foster A, Andersson N. Community views of inter-generational sex: Findings from focus groups in Botswana, Namibia and Swaziland. *Psychology Health Medicine*. 2010; 15(5):507–514. doi: 926796014 [pii] 10.1080/13548506.2010.487314.
- Department of Health. Medical Research Council. OrcMAcro. South African demographic and health survey Pretoria. Department of health; South Africa: 2007.

- DiClemente RJ, Wingood GM, Crosby R, Cobb BK, Harrington K, Davies SL. Parent-adolescent communication and sexual risk behaviors among African American adolescent females. *Journal of Pediatrics*. 2001; 139(3):407–412. [PubMed: 11562621]
- DiLorio C, Dudley WN, Soet JE, McCarty F. Sexual possibility situations and sexual behaviors among young adolescents: the moderating role of protective factors. [Research Support, U.S. Gov't, P.H.S.]. *Journal of Adolescent Health*. 2004; 35(6):528, e511–e520. doi: 10.1016/j.jadohealth.2004.02.013. [PubMed: 15581534]
- Dilorio C, Pluhar E, Belcher L. Parent-child communication about sexuality: A review of the literature from 1980-2002. *Journal of HIV/AIDS Prevention and Education for Adolescents and Children*. 2003; 5:7–32.
- Dinkelman T, Lam D, Leibbrandt M. Household and community income, economic shocks and risky sexual behavior of young adults: Evidence from the Cape area panel study 2002 and 2005. *AIDS*. 2007; 21(Suppl. 7):S49–56. doi: 10.1097/01.aids.0000300535.05226.a90002030-200711007-00006 [pii]. [PubMed: 18040164]
- Dunkle KL, Jewkes RK, Brown HC, Gray GE, McIntyre JA, Harlow SD. Transactional sex among women in Soweto, South Africa: Prevalence, risk factors and association with HIV infection. *Social Science and Medicine*. 2004; 59(8):1581–1592. doi:10.1016/j.socscimed.2004.02.003S0277953604000504 [pii]. [PubMed: 15279917]
- Eaton L, Flisher AJ, Aaro LE. Unsafe sexual behaviour in South African youth. *Social Science and Medicine*. 2003; 56(1):149–165. doi: S0277953602000175 [pii]. [PubMed: 12435558]
- Fritz K, Morojele N, Kalichman S. Alcohol: The forgotten drug in HIV/AIDS. *Lancet*. 2010; 376(9737):398–400. [PubMed: 20650516]
- Grant MJ, Hallman KK. *Studies in Family Planning*. 2008; 39(4):369–382. [PubMed: 19248721]
- Harrison A, Cleland J, Frohlich J. Young people's sexual partnerships in KwaZulu-Natal, South Africa: Patterns, contextual influences, and HIV risk. [Research Support, N.I.H., Extramural Research Support, Non-U.S. Gov't]. *Studies in Family Planning*. 2008; 39(4):295–308. [PubMed: 19248716]
- Harrison A, Cleland J, Gouws E, Frohlich J. Early sexual debut among young men in rural South Africa: Heightened vulnerability to sexual risk? [Research Support, N.I.H., Extramural Research Support, Non-U.S. Gov't Research Support, U.S. Gov't, P.H.S.]. *Sexually Transmitted Infections*. 2005; 81(3):259–261. doi: 10.1136/sti.2004.011486. [PubMed: 15923298]
- Hendriksen ES, Pettifor A, Lee SJ, Coates TJ, Rees HV. Predictors of condom use among young adults in South Africa: The Reproductive Health and HIV Research Unit national youth survey. *American Journal of Public Health*. 2007; 97(7):1241–1248. doi: AJPH.2006.086009 [pii]10.2105/AJPH.2006.086009. [PubMed: 17538062]
- Holmes KK, Levine R, Weaver M. Effectiveness of condoms in preventing sexually transmitted infections. *Bulletin of the World health Organization*. 2004; 82(6):454–461. [PubMed: 15356939]
- Hosmer, DW.; Lemeshow, S. *Applied logistic regression*. John Wiley and Sons, Inc; Hoboken, NJ: 2000.
- Jama Shai N, Jewkes R, Levin J, Dunkle K, Nduna M. Factors associated with consistent condom use among rural young women in South Africa. [Randomized Controlled Trial]. *AIDS Care*. 2010; 22(11):1379–1385. doi: 10.1080/09540121003758465. [PubMed: 20730637]
- Kalichman SC, Gore-Felton C, Benotsch E, Cage M, Rompa D. Trauma symptoms, sexual behaviors, and substance abuse: Correlates of childhood sexual abuse and HIV risks among men who have sex with men. *Journal of Child Sexual Abuse*. 2004; 13(1):1–15. [PubMed: 15353374]
- Kalichman SC, Simbayi LC, Kaufman M, Cain D, Jooste S. Alcohol use and sexual risks for HIV/AIDS in Sub-Saharan Africa: Systematic review of empirical findings. *Prevention Science*. 2007; 8(2):141–151. doi: 10.1007/s11121-006-0061-2. [PubMed: 17265194]
- Kaplan EL, Meier P. Nonparametric estimation from incomplete observations. *Journal of American Statistical Association*. 1958; 53:457–481.
- Koenig M, Zablotska I, Lutalo T, Nalugoda F, Wagman J, Gray R. Coerced first intercourse and reproductive health outcomes among adolescent women in Rakai, Uganda. *International Family Planning Perspectives*. 2003; 30:156–163. [PubMed: 15590381]
- Kovacs, M. *The children's depression inventory*. Multi-Health Systems; New York: 1992.

- Leclerc-Madlala S. Age-disparate and intergenerational sex in Southern Africa: The dynamics of hypervulnerability. *AIDS*. 2008; 22(Suppl. 4):S17–25. doi: 10.1097/01.aids.0000341774.86500.5300002030-200812004-00003 [pii]. [PubMed: 19033752]
- Maticka-Tyndale E. Condoms in Sub-saharan Africa. *Sexual Health*. 2012; 9(1):59–72. doi: 10.1071/SH11033. [PubMed: 22348634]
- Moyo W, Levandowski BA, MacPhail C, Rees H, Pettifor A. Consistent condom use in South African youth's most recent sexual relationships. *AIDS and Behavior*. 2008; 12(3):431–440. doi: 10.1007/s10461-007-9343-3. [PubMed: 18228125]
- Nduna M, Jewkes RK, Dunkle KL, Shai NP, Colman I. Associations between depressive symptoms, sexual behaviour and relationship characteristics: A prospective cohort study of young women and men in the Eastern Cape, South Africa. *Journal of the International AIDS Society*. 2010; 13:44. doi: 1758-2652-13-44 [pii]10.1186/1758-2652-13-44. [PubMed: 21078150]
- Njoroge KM, Olsson P, Pertet AM, Ahlberg BM. Voices unheard: Youth and sexuality in the wake of HIV prevention in Kenya. *Sexual and Reproductive Healthcare*. 2010; 1:143–148. [PubMed: 21122613]
- Pettifor A, Macphail C, Rees H, Cohen M. HIV and sexual behavior among young people: The South African paradox. *Sexually Transmitted Diseases*. 2008; 35(10):843–844. doi: 10.1097/OLQ.0b013e31818318c0. [PubMed: 18716569]
- Pettifor A, O'Brien K, Macphail C, Miller WC, Rees H. Early coital debut and associated HIV risk factors among young women and men in South Africa. *International Perspectives on Sexual and Reproductive Health*. 2009; 35(2):82–90. doi: 3508209 [pii]10.1363/ifpp.35.082.09. [PubMed: 19620092]
- Pettifor AE, Measham DM, Rees HV, Padian NS. Sexual power and HIV risk, South Africa. *Emerging Infectious Diseases Journal*. 2004; 10(11):1996–2004.
- Puffer ES, Meade CS, Drabkin AS, Broverman SA, Ogwang-Odhiambo RA, Sikkema KJ. Individual- and family-level psychosocial correlates of HIV risk behavior among youth in rural Kenya. *AIDS and Behavior*. 2010 doi: 10.1007/s10461-010-9823-8.
- Rosenberg, M. *Society and the adolescent self-image*. Princeton University Press; Princeton, NJ: 1965.
- Sayles JN, Pettifor A, Wong MD, MacPhail C, Lee SJ, Hendriksen E, Coates T. Factors associated with self-efficacy for condom use and sexual negotiation among South african youth. *Journal of Acquired Immune Deficiency Syndrome*. 2006; 43(2):226–233. doi: 10.1097/01.qai.0000230527.17459.5c.
- Schouten BC, van den Putte B, Pasmans M, Meeuwesen L. Parent-adolescent communication about sexuality: the role of adolescents' beliefs, subjective norm and perceived behavioral control. *Patient Education and Counseling*. 2007; 66(1):75–83. doi: S0738-3991(06)00349-1 [pii]10.1016/j.pec.2006.10.010. [PubMed: 17137742]
- Selikow TA, Ahmed N, Flisher AJ, Mathews C, Mukoma W. I am not “umqwayito”: a qualitative study of peer pressure and sexual risk behaviour among young adolescents in Cape Town, South Africa. *Scandinavian Journal of Public Health*. 2009; 37(Suppl. 2):107–112. doi: 37/2_suppl/107 [pii]10.1177/1403494809103903.
- Shisana, O.; Rehle, T.; Simbayi, L.; Zuma, K.; Jooste, S.; Pillay-van-Wyk, V.; the SABSSM III Implementation Team. *South African national HIV prevalence, incidence, behaviour and communication survey 2008: A turning tide among teenagers?*. HSRC Press; Cape Town, South Africa: 2009.
- Simbayi LC, Chauveau J, Shisana O. Behavioural responses of South African youth to the HIV/AIDS epidemic: A nationwide survey. *AIDS Care*. 2004; 16(5):605–618. doi: 10.1080/095401204100017164050YKXCXDKVE75P8YN7 [pii]. [PubMed: 15223530]
- Speizer IS, Pettifor A, Cummings S, Macphail C, Kleinschmidt I, Rees HV. Sexual violence and reproductive health outcomes among South African female youths: A contextual analysis. *American Journal of Public Health*. 2009; 99(Suppl. 2):S425–431. doi: AJPH.2008.136606 [pii]10.2105/AJPH.2008.136606. [PubMed: 19372525]
- Statistics South Africa. [Retrieved 19 June, 2013] Census 2011. 2012. from <http://statssa.gov.za>

- Tenkorang EY, Rajulton F, Maticka-Tyndale E. Perceived risks of HIV/AIDS and first sexual intercourse among youth in Cape Town, South Africa. *AIDS and Behavior*. 2009; 13(2):234–245. doi: 10.1007/s10461-008-9470-5. [PubMed: 18846419]
- Vrana S, Lauterbach D. Prevalence of traumatic events and post-traumatic psychological symptoms in a nonclinical sample of college students. *Journal of Traumatic Stress*. 1994; 7(2):289–302. [PubMed: 8012748]
- Wilson CM, Wright PF, Safrit JT, Rudy B. Epidemiology of HIV infection and risk in adolescents and youth. *J Acquir Immune Defic Syndr*. 2010; 54(Suppl 1):S5–6. doi: 10.1097/QAI.0b013e3181e243a100126334-201007011-00002 [pii]. [PubMed: 20571423]

Table 1

Ecological Model Mechanisms

Ecological level	Variables
Individual level	Demographic characteristics (age, gender) Alcohol/drug use or abuse Depression Self-Esteem
Dyad	Age group of partners Pressure to have sex Experience of partner violence
Family	Parent adolescent communication
Community/peers	Attitudes about sex Violence experienced in the community
Institution	Adaptation of a HIV Prevention Program: CDC risk reduction model

Table 2

Demographic Characteristics

Variable	N (%)
Median age (<i>IQR</i>)	17 (16-18) 506 (100)
Median no. of people living in household (<i>IQR</i>)	5 (4-7) 506 (100)
Median no. of rooms in household (<i>IQR</i>)	4 (4-6) 506 (100)
Gender	Male 208 (41) Female 298 (59)
Schooling area	In Soweto 449 (90) Out of Soweto 49 (10)
Schooling history	Repeated classes 158 (31) Not repeated 348 (69)
Parental status	Both parents alive 299 (59) Single parent 167 (33) Orphan 40 (8)
Parental marital status	Married 174 (39) Never married 182 (40) Other 95 (21)
Head of household (Age bracket in years)	Female (18-60) 253 (50) Male (18-60) 167 (33) Female (>60) 62 (12) Male (>60) 22 (5)
Housing	Brick house or flat 423 (83) RDP house or flat 30 (5) Shack 45 (8)
Source of drinking water	Tap water in home 497 (99) Community tap 7 (1) Other 0 (0)
Sexual orientation	Heterosexual 464 (92) Bisexual 23 (5)

Variable	N (%)
Homosexual	8 (2)
Undecided	23 (5)

Note: The totals may not be equal to sample size due to missing values

Table 3

Distribution of Sexual Predictor Variables by Gender

Variable	Males (%)	Females (%)
Median "Attitudes about sex" score (<i>IQR</i>)	11 (10-12)	10 (9-11)
Median depression score (<i>IQR</i>)	8 (5-12)	9 (6-13)
Partners age-group		
16-21	188 (96)	223 (85)
>21	7 (4)	39 (15)
Pressure to engage in sex		
No pressure	98 (47)	161 (55)
Pressure	109 (53)	131 (45)
Hazardous alcohol use		
Yes	36 (25)	23 (15)
No	110 (75)	134 (85)
Ever used drugs to get high		
Yes	58 (28)	28 (9)
No	150 (72)	269 (91)
Self-esteem		
High	36 (17)	60 (20)
Low	6 (3)	14 (5)
Normal	166 (80)	224 (75)
PAC		
High	83 (40)	153 (51)
Low	125 (60)	145 (49)
Experienced an act of violence		
Yes	70 (34)	63 (21)
No	138 (66)	232 (79)
Ever hit/physically hurt by partner		
Yes	29 (14)	58 (20)
No	178 (86)	239 (80)

Table 4

	Univariate		Multivariate	
	OR (CI)	p	OR (CI)	p
Predictors of Sexual Activity				
Gender				
Male	3.2 (2.2-4.6)	<0.0001	2.6 (1.4-4.8)	0.002*
Female	1	1	1	1
Age				
18	3.3 (2.1-5.2)	<0.0001	1.7 (0.87-3.4)	0.12
17	2.1 (1.3-3.3)	0.001	1.9 (0.91-3.4)	0.09
16	1	1	1	1
Partners age group				
>21	2.7 (1.3-5.4)	0.0061	4.5 (1.5-13.8)	0.009*
16-21	1	1	1	1
Pressure to engage in sex				
Pressure	2.1 (1.5-3.0)	<0.0001	1.4 (0.8-2.5)	0.2
No pressure	1	1	1	1
Attitudes about sex	2.1 (1.7-2.5)	<0.0001	1.6 (1.3-2.1)	0.0002*
Hazardous alcohol use				
Yes	3.0 (1.5-6.0)	0.0016	2.4 (1.1-5.2)	0.028*
No	1	1	1	1
Illegal drug use				
Yes	3.5 (2.1-6.0)	<0.0001	1.8 (0.9-3.9)	0.12
No	1	1	1	1
Depression	1.01 (0.99-1.04)	0.4	N/A	N/A
Self Esteem				
High	1.1 (0.7-1.7)	0.68	1.4 (0.7-3.0)	0.34
Low	3.2 (1.1-8.8)	0.03	1.05 (0.15-7.2)	0.96
Normal	1	1	1	1
PAC				

	Univariate		Multivariate	
	OR (CI)	p	OR (CI)	p
High	0.9 (0.6-1.3)	0.8	N/A	N/A
Low	1	1		
Experienced an act of violence				
Yes	1.7 (1.1-2.5)	0.01	0.8 (0.4-1.4)	0.4
No	1	1	1	1
Ever hit, physically hurt by a partner?				
Yes	2.0 (1.2-3.2)	0.006	1.1 (0.5-2.2)	0.9
No	1	1	1	1

Note: OR = odds ratio; CI = confidence interval; "1" refers to the reference category

* p < .05

Table 5

Predictors of Sexual Activity by Gender

	Male				Female			
	Univariate		Multivariate		Univariate		Multivariate	
	OR(95% CI)	P	OR(95% CI)	P	OR(95% CI)	P	OR(95% CI)	P
Age								
18	2.8 (1.35-5.8)	0.006	2.3(0.8-6.3)	0.12	4.0(2.2-7.2)	<0.0001	2.7(1.4-5.5)	0.005*
17	2.7(1.3-5.6)	0.008	3.4(1.1-10.0)	0.027*	1.7(0.9-3.2)	0.086	1.5(0.8-3.1)	0.24
16	1	1	1	1	1	1	1	1
Partners age group								
>21	2.4(0.28-20.6)	0.4	N/A		4.4(2.0-9.4)	0.0002	3.3(1.4-7.6)	0.005*
16-21	1	1	1	1	1	1	1	1
Pressure to engage in sex								
Pressure	2.2(1.2-4.0)	0.01	1.4(0.6-3.4)	0.44	1.9(1.2-3.0)	0.008	1.3(0.8-2.3)	0.34
No pressure	1	1	1	1	1	1	1	1
Attitudes about sex	1.8(1.4-2.4)	<0.0001	1.7(1.2-2.5)	0.003*	2.0(1.6-2.6)	<0.0001	1.6(1.2-2.1)	0.001*
Hazardous alcohol use								
Yes	4.5(1.3-15.8)	0.02	4.0(1.1-14.7)	0.04*	1.9(0.8-4.7)	0.16	N/A	
No	1	1	1	1	1	1		
Illegal drug use								
Yes	2.9(1.3-6.1)	0.007	1.8(0.7-4.9)	0.24	2.5(1.1-5.6)	0.023	0.8(0.3-2.2)	0.6
No	1	1	1	1	1	1	1	1
Depression	1.01(0.96-1.1)	0.7	N/A		1.03(1.0-1.07)	0.08	0.97(0.9-1.02)	0.29
Self esteem								
High	0.9(0.4-2.0)	0.87	N/A		1.3(0.7-2.3)	0.38	1.3(0.6-2.7)	0.45
Low	2.3(0.3-20.6)	0.44			6.2(1.7-23.0)	0.006	5.6(0.97-33.0)	0.055
Normal	1	1	1	1	1	1	1	1
PAC								
High	1.1(0.6-2.1)	0.68	N/A		0.9(0.6-1.5)	0.7	N/A	
Low	1	1	1	1	1	1	1	1

	Male			Female			
	Univariate <i>OR(CI)</i>	<i>p</i>		Univariate <i>OR(CI)</i>	<i>p</i>	Multivariate <i>OR(CI)</i>	<i>p</i>
Ever hit/physically hurt by partner							
Yes	1.5(0.6-3.8)	0.37	N/A	2.8(1.5-5.0)	0.0007	1.7(0.8-3.4)	0.1
No	1	1		1	1	1	1

Note: *OR* = odds ratio; *CI* = confidence interval; "1" refers to the reference category

* *p* < .05

Table 6

Predictors of Condom Use by Gender

	Male			Female		
	Univariate OR(CI)	p	Multivariate OR(CI)	Univariate OR(CI)	p	Multivariate OR(CI)
Age						
18	0.99(0.36-2.7)	0.99	N/A	1.5(0.5-4.1)	0.43	N/A
17		0.82		1.2(0.4-3.7)	0.73	
16	0.89(0.32-2.5)	1		1	1	
Age of first partner	1.2(1.005-1.4)	0.044	1.2(1.0-1.5)	1.3(1.01-1.7)	0.043	1.4(1.01-1.9)
Partners age group						
>21	0.2(0.03-1.03)	0.07	0.2(0.03-1.1)	0.45(0.2-1.1)	0.07	0.3(0.1-0.9)
16-21	1	1	1	1	1	1
Pressure to engage in sex						
Pressure	1.3(0.6-2.8)	0.47	N/A	0.29(0.1-0.7)	0.004	0.4(0.1-1.1)
No pressure	1	1	1	1	1	1
Attitudes about sex	0.8(0.7-1.05)	0.12	N/A	1.0(0.7-1.4)	0.998	N/A
Hazardous alcohol use						
Yes	0.7(0.3-1.8)	0.47	N/A	0.7(0.2-2.3)	0.52	N/A
No	1	1	1	1	1	1
Illegal drug use						
Yes	0.9(0.4-1.9)	0.73	N/A	0.74(0.3-2.1)	0.57	N/A
No	1	1	1	1	1	1
Depression	0.9(0.88-1.0)	0.051	0.9(0.9-1.0)	0.9(0.88-0.98)	0.004	0.98(0.9-1.1)
Self esteem						
High	1.1(0.4-3.2)	0.81	N/A	2.7(0.8-8.6)	0.1	1.9(0.5-6.9)
Low	0.6(0.1-3.8)	0.59		0.3(0.09-1.2)	0.09	1.3(0.2-7.9)

	Male			Female		
	Univariate <i>OR(CI)</i>	<i>p</i>	Multivariate <i>OR(CI)</i>	Univariate <i>OR(CI)</i>	<i>p</i>	Multivariate <i>OR(CI)</i>
Normal	1	1	1	1	1	1
PAC						
High	0.8(0.4-1.8)	0.62	N/A	2.4(1.1-5.4)	0.031	2.2(0.8-6.1)
Low	1	1	1	1	1	1
Experienced an act of violence						
Yes	1.6(0.7-3.9)	0.26	N/A	0.51(0.2-1.2)	0.11	N/A
No	1	1	1	1	1	1
Ever hit/physically hurt by partner						
Yes	0.4(0.1-1.03)	0.06	0.5(0.1-2.1)	0.3	0.51(0.2-1.2)	0.11
No	1	1	1	1	1	1
Ever physically coerced into sex?						
Yes	0.2(0.06-0.9)	0.03	0.5(0.2-1.5)	0.2	0.3(0.1-0.97)	0.045
No	1	1	1	1	1	1

Note: *OR* = odds ratio; *CI* = confidence interval; "1" refers to the reference category

* *p* < .05