

## ORIGINAL RESEARCH ARTICLE

# Perceived Risk and Condom Use among Adolescents in Sub-Saharan Africa: A Latent Class Analysis

Julie A. Cederbaum<sup>1\*</sup>, Tamika D. Gilreath<sup>1</sup> and Anamika Barman-Adhikari<sup>2</sup>

<sup>1</sup>University of Southern California School of Social Work, 669 W. 34<sup>th</sup> Street, Los Angeles, CA 90089, USA; <sup>2</sup>University of Denver School of Social Work, Craig Hall, Room 406; 2148 High St. School of Social Work, University of Denver, Denver, CO, 80208, USA.

\*For Correspondence: Email: [jcederba@usc.edu](mailto:jcederba@usc.edu); Phone: 213-740-4361

## Abstract

While studies have examined factors associated with condom use behaviors, few have assessed risk perception and condom use among SSA adolescents. This work sought to fill this gap. Data for this study are derived from the National Survey of Adolescents (2004-2005), a survey of 12-19 year olds in Burkina Faso, Ghana, Malawi, and Uganda. Latent class analysis was conducted. Two risk profiles emerged in the data. Percent of adolescents in the high perceived risk sub-groups ranged from 49.6% - 90.8% and moderate risk from 29.1-83.8%. Those in the high perceived risk class were 2.26 to 5.10 times more likely to report condom use. The findings provide additional information about the factors that influence condom use among adolescents in these four countries. Because an individual's development is influenced by his/her settings and systems, expanded views of behavior must be included in prevention efforts. (*Afr J Reprod Health* 2014; 18[4]: 26-33).

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**Keywords:** Condom Use, Knowing Someone with HIV/AIDS, Perceived Risk, Health Belief, sub-Saharan Africa

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## Résumé

Alors que des études ont étudié les facteurs associés aux comportements de l'utilisation du préservatif, il n'y en a que très peu qui ont évalué la perception du risque et l'utilisation du préservatif chez les adolescents d'Afrique subsaharienne. Ce travail a cherché à combler cette lacune. Les données pour cette étude sont tirées de l'Enquête nationale auprès des adolescents (2004-2005), une enquête auprès des adolescents âgés de 12 à 19 ans au Burkina Faso, au Ghana, au Malawi et en Ouganda. L'analyse de structure latente a été menée. Deux profils de risque sont apparus dans les données. Le pourcentage des adolescents dans les sous-groupes à risque élevé perçus variait de 49,6% - 90,8% et un risque modéré de 29,1 à 83,8%. Ceux de la classe de risque perçu élevé étaient 2.26 à 5.10 fois plus susceptibles de déclarer l'utilisation du préservatif. Les résultats fournissent des informations supplémentaires sur les facteurs qui influencent l'utilisation du préservatif chez les adolescents dans ces quatre pays. Parce que le développement d'un individu est influencé par ses paramètres et ses systèmes, il faut inclure des vues élargies de comportement dans les efforts de prévention. (*Afr J Reprod Health* 2014; 18[4]: 26-33).

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**Mots-clés:** utilisation du préservatif, connaissance d'une personne atteinte du VIH / sida, risque perçu, croyance à la santé, Afrique sub-saharienne

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## Introduction

Although programs have been instituted to prevent the proliferation of HIV in Sub-Saharan Africa (SSA), challenges remain<sup>1-5</sup>. SSA adolescents are confronted with multiple behavioral, physiological and socio-cultural factors known to contribute to their vulnerability to sexual and reproductive health issues<sup>6-7</sup>. These include: lack of awareness, inaccurate knowledge about contraception and sexually transmitted infections [STIs], peer and societal norms that do not deter youth from

engaging in unprotected sex, multiple sex partners, lack of personal control over resisting sex or practicing safe sex, lack of age appropriate sexual health counseling services, and poverty<sup>2,8-10</sup>. One's heightened awareness regarding their vulnerability to HIV is associated with their sexual behaviors, such as condom use. Few studies have provided typologies of perceived risk among these adolescents based on their levels of susceptibility to sexual risk and personal exposure to HIV/AIDS. This study attempted to identify and characterize subgroups of adolescents based on their risk

perception. A secondary aim was to examine factors associated with class membership (such as age, gender, urbanity). This is important for two reasons. First, while we know that perception of risk can predict behaviors, less is known about the variability of attitudes and perceived risk in a cultural context; what is salient in one country may not replicate in another. Second, given that attitudes and risk perception may vary across contexts, differentiating risk perception helps preventionists determine targeted messages to influence behavior change. Last, we explore condom use. This is not an attempt to predict behavior change, but rather differentiate condom behaviors by perceived risk subgroup.

### ***Perception of Risk***

The interest in adolescent sexual and reproductive health in SSA is linked to the disparate numbers of youth living with HIV/AIDS. Various structural factors have also been linked to increased rates of risky behaviors among SSA youth. Particularly in rural areas, adolescents are less likely to report knowing where to obtain condoms<sup>11-12</sup>. Further, urbanity (closely associated with higher education and greater access to services and media exposure) can increase the likelihood of condom use<sup>2</sup>. Due to their low status in society, women often lack the power to make decisions regarding their sexual behaviors. Therefore, even with high levels of perceived risk, condom use among young women in SSA might remain low. The link between perceived risk and sexual behaviors highlights how behavior is influenced by the extent to which an individual feels personally at risk of contracting a disease that they perceive to have serious consequences, is aware of ways to avoid infection, believes that the benefits of taking preventative action outweighs the costs, and believes that such measures would work<sup>13</sup>. The ways in which people come to learn about a disease seems to play an indirect role in factors such as perceived risk<sup>14</sup>. Risk perception is associated with sexual debut and sexual behavior<sup>10</sup>. Attitudes also influence behaviors<sup>15</sup>.

Familiarity with someone who is infected with HIV can personalize the risk and stimulate behavior change<sup>16</sup>. Findings regarding the

influence of perceived risk on safer sex behaviors, however, are mixed<sup>17-21,8</sup>. A study by Camlin and Chimbwete<sup>18</sup> looked at personal knowledge of a close relative or household member and condom use at last sexual act; knowing someone infected with HIV/AIDS did not increase rate of condom use. A study of youth in Philadelphia found that those who reported knowing someone with AIDS were also significantly more likely to report ever having had sex<sup>19</sup>; this supports the work of another<sup>17</sup> who found that knowing someone with AIDS was associated with sexual debut. Kayiki and Forste<sup>8</sup> noted no differences in likelihood of condom use by personal contact with someone who is HIV infected. However, in a study of young men in Ghana, individuals who perceived themselves to be at high-risk of HIV were more likely to have used condoms<sup>20</sup>. Further, a South African study found that changes in behavior were greatest among those who knew someone who had died of AIDS<sup>21</sup>. Based on this inconsistency, knowing how someone with AIDS/who has died from AIDS influences risk perception remains unclear.

### ***The Present Study***

This study aimed to use a person centered approach (latent class analysis) to identify categories of level of perceived risk among sexually active adolescents in SSA based on observed clustering of their perceptions of sexual risk or vulnerability to HIV/AIDS. Once these clusters were identified, the study aimed to explicate sociodemographic predictors of class membership including condom use. Findings will have programmatic implications by identifying typologies of perceived risk by country which can highlight areas of focus for sex education within a specific cultural context.

### **Methods**

Data are derived from the National Survey of Adolescents (2004-2005). Nationally representative data were collected through household based surveys of adolescents 12-19 years in Burkina Faso, Ghana, Malawi, and Uganda<sup>7</sup>. The overall intent was to gather

information on risk-taking and health-seeking behaviors related to HIV/STIs, and unintended pregnancy. The study explored characteristics that can increase vulnerability to risk including behavioral, socio-cultural, and economic factors<sup>7</sup>. Overall, individual response rates ranged from 86.6% in Uganda to 95.2% in Burkina Faso<sup>22</sup>. Further information on the sample is publicly available<sup>29</sup>.

### Measures

#### Data Analysis

Latent class analysis (LCA) was conducted using Mplus 5.21<sup>24,25</sup>. Multinomial logistic regression analyses were completed simultaneous with class estimation to account for measurement error related to class assignment. An initial series of models were run separately to determine the appropriate number of classes for perceived risk in each country. For each, an initial 1-class (no covariates) model was assessed, followed by a series of models with covariates specifying increased number of classes (e.g., 2-class) representing different patterns of perceived risk. Optimal model selection was based upon recommended indices including low Adjusted Bayesian Information Criterion (BIC) relative to other models, significant Lo-Mendell-Rubin Likelihood Ratio Test (LMR LRT), and acceptable quality of classification<sup>26</sup>. Additionally, data

sparseness was considered as a salient factor for model identification. Sample weights were included in analyses to adjust for survey non-response and sample selection probabilities. FIML procedures were used to address missing data.

## Results

The results of the Latent Class Analyses (LCA) presented below represent patterns of perceived risk. A two-class model provided the best overall fit to the data in all countries. In all models multinomial logistic regression was conducted simultaneously with LCA. Risk categories are based on levels of perceived risk and are thus not uniform among all countries. Thresholds for perceived risk were based on the probability of being in one of three categories: high (more than .55 probability of reporting any perceived susceptibility), moderate (.31-.54 probability of reporting any perceived susceptibility), and low (less than .30 probability of reporting any perceived susceptibility). We created a second categorization for the class based on the probability of reporting either knowing someone with AIDS or who has died from and AIDS; the threshold to include “with AIDS” in the class was .70. Specifics by country can be found below. Table 1 shows two-class LCA analyses; LCA conditional probabilities are reported in Table 2. Regression analyses are reported in Table 3.

**Table 1:** Two-class LCA Models

		<b>Burkina Faso</b>			<b>Uganda</b>		
Model	Description	Adjusted BIC	LMR LRT p-value	Entropy	Adjusted BIC	LMR LRT Value	Entropy
1	One-class (no covariates)	7256.270	–	–	6034.491	–	–
2	Two-class	7097.840	0.0029	0.484	5938.070	0.0001	0.758
3	Three-class	7058.702	0.1198	0.577	5916.410	0.1417	0.520
		<b>Ghana</b>			<b>Malawi</b>		
Model	Description	Adjusted BIC	LMR LRT Value	Entropy	Adjusted BIC	LMR LRT Value	Entropy
1	One-class (no covariates)	3004.915	–	–	5329.819	–	–
2	Two-class	2968.657	0.0078	0.973	5213.971	0.0000	0.702
3	Three-class	2964.362	0.0565	0.958	5225.276	0.8312	0.641

**Table 2:** Two-Class Unrestricted LCA Model of Conditional Probabilities of Perceived Risk for each Country.

<b>Burkina Faso</b>	<b>High Perceived Risk w/AIDS</b>	<b>High perceived risk No AIDS</b>
Class Prevalence	49.6	50.4
Know someone with AIDS		
No	0.449	0.961
Yes	0.551	0.039
Know someone who died from AIDS		
No	0.094	0.703
Yes	0.906	0.297
Worried about Health		
Not Worried	0.123	0.186
Somewhat Worried	0.213	0.204
Very Worried	0.664	0.610
Worried about being pregnant		
Not Worried	0.567	0.515
Somewhat Worried	0.158	0.191
Very Worried	0.276	0.294
<b>Uganda</b>	<b>Moderate Perceived Risk w/ AIDS</b>	<b>Low Perceived risk No AIDS</b>
Class Prevalence	90.8	9.2
Know someone with AIDS		
No	0.129	0.796
Yes	0.871	0.204
Know someone who died from AIDS		
No	0.013	0.437
Yes	0.987	0.563
Worried about Health		
Not Worried	0.437	0.507
Somewhat Worried	0.277	0.196
Very Worried	0.286	0.297
Worried about being pregnant		
Not Worried	0.272	0.581
Somewhat Worried	0.183	0.176
Very Worried	0.545	0.243
<b>Ghana</b>	<b>High Perceived risk w/AIDS</b>	<b>Moderate Perceived Risk No AIDS</b>
Class Prevalence	29.1	70.9
Know someone with AIDS		
No	0.000	0.998
Yes	0.100	0.002
Know someone who died from AIDS		
No	0.262	0.651
Yes	0.738	0.349
Worried about Health		
Not Worried	0.376	0.374
Somewhat Worried	0.320	0.225
Very Worried	0.304	0.401
Worried about being pregnant		
Not Worried	0.405	0.403
Somewhat Worried	0.194	0.132
Very Worried	0.401	0.465
<b>Malawi</b>	<b>Moderate Perceived Risk w/ AIDS</b>	<b>Low Perceived Risk No AIDS</b>
Class Prevalence	83.8	16.2
Know someone with AIDS		
No	0.339	1.000
Yes	0.661	0.000
Know someone who died from AIDS		
No	0.046	0.664
Yes	0.954	0.336
Worried about Health		

Not Worried	0.582	0.670
Somewhat Worried	0.150	0.114
Very Worried	0.268	0.216
Worried about being pregnant		
Not Worried	0.410	0.505
Somewhat Worried	0.158	0.120
Very Worried	0.432	0.375

**Table 3:** Odds Ratios – Perceived Risk, Demographics, and Condom use.

	<b>Burkina Faso</b>	<b>Uganda</b>	<b>Malawi</b>	<b>Ghana</b>
Covariates	High Perceived Risk w/AIDS vs. High Perceived Risk <u>OR (95% CI)</u>	High Perceived Risk w/AIDS vs. Moderate Perceived Risk w/AIDS <u>OR (95% CI)</u>	Moderate Perceived Risk w/AIDS vs. Low Perceived Risk <u>OR (95% CI)</u>	Moderate Perceived risk w/AIDS vs. Moderate Perceived Risk <u>OR (95% CI)</u>
Urban	1.26 (0.68-2.35)	0.74 (0.27-2.05)	2.44 (1.17-5.07)*	0.77 (0.47-1.27)
Age	1.11 (0.96-1.27)	1.06 (0.89-1.25)	1.12 (0.99-1.27)	1.01 (0.86-1.20)
Female	1.36 (0.82-2.27)	0.77 (0.39-1.53)	2.60 (1.56-4.33)*	1.36 (0.82-2.27)
Condom Use	2.26 (1.30-3.94)*	5.10 (2.14-12.17)*	1.09 (0.64-1.83)	0.82 (0.50-1.32)

\*p&lt;0.05

**Burkina Faso**

The sample (N=1163) was 41.2% male; average age was 17.2 years. Approximately 27% of respondents were residing in urban locales.

‘**High perceived risk with AIDS**’ class included 49.6% of the sample with respondents in this class having a 0.66 probability of being “very worried” about their health and a 0.28 probability of being “very worried” about pregnancy. Among respondents in this class, .96 reported knowing someone who has died from AIDS. The ‘**High perceived risk no AIDS**’ included 50.4% of the sample. There was only a 0.27 probability of reporting knowing someone who had died from AIDS. However, perceived susceptibility remained high; there was a .61 probability of reporting being “very worried” about their health.

Multinomial logistic regression analyses highlight that those who reported using condoms were 2.26 times more likely to be in the ‘**High perceived risk with AIDS**’ class compared to the ‘**High perceived risk no AIDS**’ class (CI=1.30-3.94). Neither urban residence, age, or being female were significant predictors of class membership

**Uganda**

The sample (N=1065) was 48.3% male and the average age of adolescents was 17 years.

Approximately 13% of respondents were residing in urban locales.

The ‘**High perceived risk with AIDS**’ class accounted for 90.8% of the sample. The probability that they were “very worried” about their health was 0.55 (0.29 probability of being “very worried” about pregnancy). Respondents did, however, have a 0.87 probability of knowing someone with AIDS and a 0.98 probability of knowing someone who had died of AIDS. ‘**Low perceived risk with no AIDS**’ accounted for 9.2% of the sample with the probabilities of being “very worried” about health and pregnancy were 0.30 and 0.24, respectively. There was a 20% chance of reporting that they knew someone with AIDS and a 0.56 probability of knowing someone who died from AIDS.

Findings in regression models show that condom use was associated with a five-fold increase in the likelihood of being in the ‘**High perceived risk with AIDS**’ compared to the ‘**Low perceived risk with no AIDS**’ class (OR=5.10, 95% CI=2.14-12.17). Urban residence, age, nor being female was associated with class membership.

**Ghana**

The sample (N= 444) was 60.9% male and the average age of adolescents was 16.9 years. Approximately 21% of respondents were residing in urban locales.

'**Moderate perceived risk with AIDS**' accounted for 29.1% of the sample. These youth had a 0.30 probability of being very worried about their health and a 0.40 probability of being very worried about pregnancy. The probability of knowing someone living with AIDS was .10; there was a 73% chance that they knew someone who had died from AIDS. The '**Moderate perceived risk no AIDS**' class accounted for 70.9% of the sample with the probabilities of being very worried about health or pregnancy were 0.40 and 0.47, respectively. This group had a very low probability of knowing someone with AIDS (.002) or report having known someone who had died of AIDS (.35). Again, none of the covariates were associated with class membership.

### *Malawi*

The sample (N=857) was 46.3% male and the average age of adolescents was 17.5 years. Approximately 46% of respondents were residing in urban locales.

The '**Moderate perceived risk with AIDS**' class accounted for 83.8% of the sample with 0.25 probability of reporting being "very worried" about their health, and over 40% chance of reporting being "very worried" about pregnancy. This group had a 0.65 probability of reporting knowing someone with AIDS and a 0.95 probability of knowing someone who died from AIDS. '**Low perceived risk no AIDS**' class accounted for 16.2% of the sample. Respondents within this class had a low probability of being worried about their health (0.22) or pregnancy (0.38). The probability of know someone living with AIDS was 0 but there was a 0.33 probability that class respondents knew someone who had died of AIDS.

For youth in Malawi, both urban residence (OR=2.44, CI=1.17-5.07) and being male (OR=2.60, CI=1.56-4.33) increased the likelihood of being in the "**Moderate perceived risk with AIDS**" class.

## **Discussion**

The current study highlighted distinct risk sub-groups associated with risk perception. Although

there were inconsistencies across the four countries in the make-up of the "perceived risk" classes (differentiated by condom use), those who reported condoms were more likely to perceive themselves at high risk (i.e Burkina Faso and Uganda). In countries where no LCA categories included a "high perceived risk" group, we saw other factors (e.g. urbanity) as the influencer. What this highlights is that health beliefs are important to our understanding of condom use among adolescents in sub-Saharan Africa and that there are distinctions in risk perception by cultural context. Condom use did not vary by whether the individual knew someone living with or who had died of AIDS. Based on these findings, knowing someone with HIV alone is not enough to influence behaviors; adolescents need to believe they are at risk for a negative outcome take the protective steps to ameliorate this risk. This finding supports the need for the continued exploration of the role that personal experience with HIV/AIDS asserts in decision-making (if any) and how personal experience with HIV/AIDS may interlink with health and pregnancy concerns.

Only in Malawi did sociodemographic factors contribute to risk perception, specifically gender and urbanity. The findings related to urbanity may be due, in part, to the make-up of the Malawian sample (46% urban). However, the importance of urbanity is supported by the work of others who found that likelihood of risk reduction behaviors are more prevalent in urban areas<sup>1,35,36</sup>, lending to the belief that there is not only increased access, but also increased perceived risk and self-efficacy in risk reduction. It was expected that urbanity would play a greater (and more consistent) role in being grouped as "high perceived risk" given that individuals in urban areas tend to have higher levels of education and greater access to media and prevention messages. The mixed findings do not negate the continued importance of urbanity; this should remain an essential factor in future investigation.

Age was not predictive of risk in any country which may be attributable to lack of variance among respondents in these samples. We know that by middle adolescence, young people are becoming more independent while are also contending with increased feelings (both

emotional and sexual) towards others<sup>27</sup>. We would have expected to see increased risk perception with older age; while not predictive here, age remains important to control for in future investigations.

Although these data were based on nationally representative samples of adolescents, the present study does have limitations. First, the data are self-reported; adolescents may have over or underreported condom use. Further, secondary analyses of existing data required that we use measures to fit the constructs, but because they were not the primary focus of the data collection, they may be weaker. Last, these four countries have some differences in their approach to HIV risk reduction education (i.e. the governments' uptake of prevention messages, cultural variations, and rates of HIV infection in the country) and thus the concerns about HIV risk and HIV myths likely vary. For example, Uganda has historically taken a comprehensive and timely approach to the campaign against the AIDS epidemic, using the ABC (abstinence, be faithful, use condoms) approach (more recently, the government has backed abstinence-based education)<sup>28</sup> whereas efforts in Ghana have been more recent<sup>29</sup>.

Despite these limitations, the findings provide additional information regarding the factors that influence perceptions of risk and condom use among adolescents in these four countries. The findings support the Health Belief Model which posits that increased perceived risk is attributable to engagement in risk reducing behaviors. Here, only in the two countries where we had a latent class which fell into the "high perceived risk" category did we see an increased likelihood of condom use. Because an individual's development is influenced by his/her settings and the systems that directly or indirectly influence those systems, it is necessary to continue to expand our view of behavior beyond the individual and include important environmental factors into prevention efforts. While we did not find an influence of HIV serostatus on condom use directly, there is evidence of its association with risk perception. As such, continuing to explore how personal experience with HIV/AIDS influences risk engagement will help to tailor interventions that

aim in increase awareness and risk perception in sub-Saharan African youth.

## Contribution of Authors

Julie A. Cederbaum was responsible for the theoretical framework, outline, description of original study design and measures, and discussion sections. Tamika D. Gilreath was responsible for the methodological conceptualization and statistical analyses. Anamika Barman-Adhikari was responsible for the review of literature and overall editing.

## References

1. Bankole, A, Ahmed, FH, Neema, S, Ouedraogo, C, Koyani, S. Knowledge of correct condom use and consistency of use among adolescents in four counties in Sub-Saharan Africa. *Afr J Reprod Health*. 2007; 11:197-220.
2. Bankole, A, Biddlecom, A, Guiella, G, Singh, S, Zulu, E. Sexual behavior, knowledge and information sources of very young adolescents in four sub-Saharan African countries. *Afr J Reprod Health*. 2007; 11:28-43.
3. Biddlecom, AE, Awusabo-Asare, K, Bankole, A. Role of parents in adolescent sexual activity and contraceptive use in four African countries. *Int Perspect Sex Reprod Health*. 2007; 35:72-81.
4. Biddlecom, AE, Munthali, A, Singh, S, Woog, V. Adolescents' views of and preferences for sexual and reproductive health services in Burkina Faso, Ghana, Malawi, and Uganda. *Afr J Reprod Health*. 2007; 11:99-110.
5. Kabiru, CW, Ezeh, A. Factors associated with sexual abstinence among adolescents in four sub-Saharan African countries. *Afr J Reprod Health*. 2007; 11:111-132.
6. Doyle, AM, Mavedzenge, SN, Plummer, ML, Ross, DA. The sexual behavior of adolescents in sub-Saharan Africa: Patterns and trends from a national survey. *Trop Med Int Health*. 2012; 17:796-807.
7. Neema, S, Biddlecom, A, Zulu, E. National survey of adolescents, 2005: Uganda [Computer file]. ICPSR22411-v1. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2008-07-24.
8. Kayiki, SP, Forste, R. HIV/AIDS related knowledge and perceived risk associated with condom use among adolescents in Uganda. *Afr J Reprod Health*. 2011; 15:57-63.
9. Kibombo, R, Neema, S, Ahmed, FH. Perceptions of risk to HIV infection among adolescents in Uganda: Are they related to sexual behavior? *Afr J Reprod Health*. 2007; 11: 168-181.

10. Tenkorang, EY, Maticka-Tyndale, E, Rajulton, F. A multi-level analysis of risk perception, poverty and sexual risk-taking among young people in Cape Town, South Africa. *Health Place*. 2011;17:525-535.
11. Bankole, A, Singh, S, Woog, V, Wulf, D. Risk and protection: youth and HIV/AIDS in sub-Saharan Africa. New York: The Alan Guttmacher Institute; 2004.
12. Gupta, N, Mahy, M. Sexual initiation among adolescent girls and boys: Trends and differentials in sub-Saharan Africa. *Arch Sex Behav*. 2003;32:41-53. doi: 10.1023/A:1021841312539.
13. Rosenstock, IM. Health belief model. In Kazdin AE, editor. *Encyclopedia of Psychology* APA and Oxford Press: Washington, DC; 2000. p. 78-80.
14. Burkholder, GJ, Harlow, LL, Wachkwich, J. Social stigma, HIV/AIDS knowledge, and sexual risk. *J Appl Biobehav Res*. 1999;4:27-44. doi: 10.1111/j.1751-9861.1999.tb00053.x
15. Ajzen, I, Fishbein, M. *Understanding attitudes and predicting social behavior*. Upper Saddle River, NJ: Prentice Hall; 1980
16. MacNeil, JM, Anderson, S. Beyond the dichotomy: linking HIV prevention with care. *AIDS*. 1998;12:S19-S26.
17. Anderson, KG, Beutel, AM, Maughan-Brown, B. HIV risk perceptions and first sexual intercourse among youth in Cape Town South Africa. *Int Fam Plann Perspect*. 2007;33:98-105.
18. Camlin, C, Chimbwete, C. Does knowing someone with AIDS affect condom use: an analysis from South Africa. *AIDS Prev Educ*. 2003;15:231-244.
19. Cederbaum, JA, Marcus, SC, Hutchinson, MK. Impact of knowing someone with HIV/AIDS on parent-child communication and HIV risk behaviors. *J HIV/AIDS Prev Child Youth*. 2007;8:31-44. doi: 10.1300/J499v08n02\_03
20. Estrin, D. In Ghana, young men's condom use is linked to lack of barriers, perceived susceptibility to HIV infection. *Int Fam Plann Perspect*. 1999;25:106-107.
21. Palekar, R, Pettifor, A, Behets, F, MacPhail, C. Association between knowing someone who died of AIDS and behavior change among South African youth. *AIDS Behav*. 2008;12: 903-912. doi: 10.1007/s10461-007-9325-5
22. Biddlecom, A, Gregory, R, Lloyd, CB, Mensch, BS. Associations between premarital sex and leaving school in four sub-Saharan African countries. *Studies Fam Plann*. 2008;39: 337-350. doi: 10.1111/j.1728-4465.2008.00179.x
23. Munthali, A, Zulu, E, Nyovani, M, Moore, AM, Konyani, S, Kaphuka, J, Maluwa-Banda, D. Adolescent sexual and reproductive health in Malawi: Results from the 2004 national survey of adolescents. New York: Guttmacher Institute; 2006.
24. Lubke, GH, Muthen, B. Investigating population heterogeneity with factor mixture models. *Psychol Methods*. 2005;10:21-39. doi: 10.1037/1082-989X.10.1.21
25. McCutcheon, A. *Latent class analysis*. Beverly Hills, CA: Sage; 1987.
26. Nylund, KL, Asparouhov, T, Muthen, BO. Deciding on the number of classes in latent class analysis and growth mixture modeling: a monte carlo simulation study. *Structural Equation Modeling*. 2007;14:535-569. doi: 10.1080/10705510701575396
27. Centers for Disease Control and Prevention. *Child Development: Early Adolescence* [internet]. [cited November 21, 2011]. Available from: <http://www.cdc.gov/ncbddd/child/earlyadolescence.htm>
28. Green, EC, Halperin, DT, Nantulya, V, Hogle, JA. Uganda's HIV prevention success: the role of sexual behavior change and the national response. *AIDS Behav*. 2006;10:335-346. doi: 10.1007/s10461-006-9073-y
29. Kaiser Family Foundation. Report documents role of education in HIV prevention efforts in Ghana [internet]. 2009 [cited November 21, 2013]. Available from: <http://kaiserhealthnews.org/daily-reports/2009/february/13/dr00056967.aspx?referrer=search>