Assessing young people's perceptions of HIV risks in Nyanza, Kenya: Are school and community level factors relevant?

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Abstract

Majority of studies examining the relationship between risk perception and sexual behaviors, have focused on the later with limited emphasis on the former as an outcome variable. More importantly, the few studies that examined risk perception and its determinants limited their analysis to individual-level measures failing to capture how school and community level factors contribute to shaping perceptions of HIV risks. Using data collected from primary school youth in Nyanza, Kenya and employing hierarchical linear modeling, this study examined the effects of both individual and school/community level factors on perceived risks of contracting HIV. For boys, high risk perception was associated with higher knowledge about HIV, rejecting myths surrounding HIV transmission, higher condom use self-efficacy and sexual risks. For girls, it was sexual pressure, sexual risks and knowing someone infected with HIV that resulted in increased risk perceptions. Beyond individual level variables, some school/community level factors are significantly associated with risk perception. Boys and girls in communities with higher estimates of AIDS deaths reported higher risk perceptions.

Keywords: Perceptions; HIV; Youth; Schools and Communities; Knowledge; Kenya.

Introduction

The concept of risk is value-laden and often given different interpretations by scholars. Taking cues from Giddens (1990), Hall (2001) argued, for instance, that the fundamental meaning of risk is changing with the erosion of tradition and religion in the west, and the acceleration of technological, political and cultural changes of globalization. As such, while risk has been closely associated with fate, as something that is beyond human control in traditional societies, modern societies do not view risks as circumstances beyond their control. They rather view risk as something over which individuals can exercise control and take responsibility to modify. Similarly, Bernstein (1996) argues that the difference between modern times and the past is the mastery of risk and the notion that the future is more than a whim of the gods. These modern conceptualizations not only interpret risks as manageable, but also serve to acknowledge that there is a whole spectrum of perspectives from which this concept could be considered.

The present study focuses on risk as behaviors that predispose human beings either to negative or positive outcomes. As such, risk is considered from the holistic view of a negative or positive outcome occurring from participating in an event. In this case we only consider risk as an outcome and not a predictor of that outcome. Typically, perceptions of risk are considered predictors of engaging in certain behaviours. These may be those associated with negative outcomes as in what are referred to as risk or risky behaviours, or those associated with reduced likelihood of negative outcomes as in risk reducing or avoidant behaviours/harm reduction. For example, in the domain of HIV research, sexual activity without a condom is considered a risk behaviour while sexual activity with a condom a risk avoidant or reducing behaviour. In this paper, we instead examine perception of risk as an outcome and ask what leads to how much at risk people perceive themselves to be for a particular outcome. We acknowledge that risk

perceptions are subjective and often based on thoughts, beliefs and constructs that are different from 'objective' or 'real' risks (see Sjoberg, 1979; Boholm, 1996). Objective or real risk has been defined as risks that exist irrespective of our awareness or knowledge of them (Ulleberg & Rundmo, 1996; Oltedal et al. 2004). Perceived risk is a reflection of what may be considered real or objective (Sjoberg, 1979; Ulleberg & Rundmo, 1996) and an attempt by individuals to understand and assess their real risks of exposure to a particular outcome. In the latter case, beliefs and attitudes related to the particular outcome in question, together with beliefs and attitudes related to its etiology and placement of oneself within that etiology will influence perceptions of one's own risk. Given the placement of risk perception in the etiology of behaviour change, Ulleberg & Rundmo (1996) have argued that understanding what determines risk perception is extremely important as it provides insights into how to reduce and avoid accidents, diseases, disasters, violence, and pain.

Pyschosocial and cognitive models used in AIDS risk reduction and HIV prevention have largely underscored risk perception as crucial for safer sexual behaviors. Akwara et al. (2003) argued, for instance, that the relationship between risk perception and sexual behaviour is an essential step, and indeed the first stage towards change from risk-taking to safer sex. Following the assumptions underlying these cognitive models a number of studies have examined the relationship between risk perception and sexual behavior (see Akwara et al. 2003; Barden O'Fallon et al., 2004; Anderson et al. 2007; Tenkorang et al. 2010; Tenkorang and Maticka-Tyndale 2008; Tenkorang et al. 2009). The majority of these studies have considered risk perception as a predictor of sexual behaviors, with limited focus on risk perception itself as an outcome to be explained. More importantly, the few studies that have examined risk perception and its determinants limited their analysis to individual-level measures failing to capture how

structural, in the case of this paper, school and community level factors contribute to shaping perceptions of risks (see Beutel and Anderson, 2013; Do and Meekers, 2009; Kohler et al. 2007; Ward et al. 2004; Macintyre et al. 2004). A notable study that examined the impact of community level poverty on the risk perception of young South Africans found significant relationship between the two variables with youth from poor neighborhoods less likely to report high risk perceptions related to HIV acquisition (Tenkorang, 2013). This finding suggests the relevance of structural factors to understanding risk perceptions and corroborates some critiques that research needs to go beyond cognitive and psychological understandings of perceived risks to a more nuanced approach that includes group norms, community-wide myths and historical and community experiences (see Macintyre et al. 2004; Tenkorang 2013). Using data from young people attending primary schools in Nyanza province, Kenya, this study contributes to the extant literature by examining the effects of both individual and school/community factors on perceived risks of contracting the AIDS virus.

Background

Currently estimated at 6.2%, Kenya's adult HIV prevalence is known to have improved considerably (NACC, 2011). Nyanza province, which borders Lake Victoria in southwestern Kenya counts as one of the most heavily, affected areas with an estimated prevalence of 14% (Oloo 2012). Like most places in sub-Saharan Africa, however, the HIV burden (estimated at 11-15%) is higher among young people (see Lee 2012; NACC 2012; Maticka-Tyndale 2005). In spite of the high HIV prevalence, majority of young people, including those in Nyanza province do not perceive themselves at risk of contracting HIV (see Tenkorang and Maticka-Tyndale, 2008; Maticka-Tyndale and Tenkorang 2010; Akwara et al. 2003). This is consistent with data from elsewhere in sub-Saharan Africa that indicate that majority of youth perceive themselves at

no risk of HIV infection (Anderson et al. 2007; Tenkorang et al. 2009; Beutel and Anderson 2013). This is particularly problematic given that such perceptions have been demonstrated to play a crucial role in either reducing or eliminating risky sexual behaviors, i.e., those associated with elevated HIV transmission and acquisition. Against this backdrop, some studies have attempted to explain why the majority of youth consider themselves safe, or not vulnerable, in spite of the real risks they face with HIV infection. For instance, Weinstein (1980, 1982), referred to this inconsistency as mainly due to a high sense of invulnerability and optimistic bias displayed by youth regarding HIV infection.

Studies using data from several countries in Africa have examined young people's risk perceptions and identified some key factors as crucial in affecting such perceptions. Using data from Kinshasa, Zaire, Bertrand et al. (1995) identified age, education, socio-economic status, knowledge about ways of transmitting HIV, knowing someone who has died of AIDS and prior risky sexual behaviours as significant predictors of perceived risks of HIV infection. In a similar study conducted in South Africa, Macintyre et al. (2001) found that boys who engaged in risky sexual behaviors and those with a higher score on condom use self-efficacy perceived their risks of contracting HIV as high. For girls, living in a household with a chronically ill member increased their risk perception. In examining changes in risk perception among youth in Cape Town, South Africa, Beutel and Anderson (2013) made similar observations attributing increase in risk perceptions to sexual risks and knowledge as to whether someone died of the disease.

While all these studies provide important insights into what determines risk perception, they focused almost exclusively on individual level influences with limited emphasis on structural, in our case school and community level effects. People live in varied social contexts that are capable of influencing their risk perceptions. It is important to consider the social factors

that influence not only the vulnerability of individuals, but also their understanding of their level of risk for acquiring HIV (Aggleton et al. 1994). In this regard, school and community environments form unique social contexts that may be capable of affecting individuals' perceptions of their susceptibility or risk of contracting HIV. It is argued, for instance, that the socio-economic environment prevailing in communities could impact risk perceptions through access to resources and information regarding HIV/AIDS. According to Macintyre et al. (2004), the issue of risk goes beyond the socio-economic strata occupied by the school or community to the physical conditions existing within these communities. For instance, communities with well-ordered environments may produce perceptions among individuals living in them that they are at low risk of anything negative, including HIV/AIDS; while those with disordered and violent environments may be associated with perceptions of greater risks, including HIV/AIDS. These theoretical suppositions are consistent with findings from a study among youth in Cape Town, South Africa that indicate that youth who lived in poorer communities had high risk perceptions, compared to youth in relatively wealthy communities (Tenkorang et al. 2013). Schools have also been identified as effective channels for the dissemination of HIV information. Gallant and Maticka-Tyndale (2004) point out that schools have an established infrastructure, are linked to communities through families, and have established mechanisms for the introduction of HIV interventions and for accessing students. In this paper we examine the effects of established individual-level factors (knowledge, attitudes and prior sexual experience etc.) together with community and school level factors (such as the presence of prevention programmes in schools and communities, the number and visibility of AIDS-related deaths, recognition of sources of vulnerability to HIV infection within the community, and HIV prevention messaging) on perception of risk of acquiring HIV.

Data and Methods

Data used for this study were collected from standard 6 and 7 students in 160 public schools and communities. Approximately 8 to 20 schools were selected from each of the 11 districts in Nyanza province using stratified proportional random sampling. Data for this study are structured such that pupils are nested within 160 schools/communities with each community having a single primary school. Surveys were administered in schools with all students present on the day of data collection. Students were divided into single sex classrooms where survey facilitators read questions out loud to pupils in English and the most common local dialect by a multi-lingual team. Pupils marked their answers on their questionnaires. Questionnaires were scanned into a database for analysis. School and community level data were collected based on the observations of research assistants and interviews with 8 to 20 adult informants in each community including tribal leaders, traditional healers, leaders of women's groups, religious leaders and parents of adolescents in each community. This research was approved by the Ethics Review Board at the University of Windsor and the Provincial Director of Education in Nyanza province of Kenya.

Measures

The dependent variable used for the study asked respondents their own perceptions of acquiring AIDS. Specifically, youth were asked "What are your chances of getting AIDS?" Response categories included 'no chance', 'medium chance' and 'great chance'. 'No chance' was used as the reference category in data analysis. Independent variables were measured both at the individual and school/community levels. Individual level measures included psychosocial

and socio-demographic/lifecourse indicators. Psychosocial variables used in the analysis include knowledge about HIV/AIDS and myths surrounding the transmission of HIV. Factual knowledge is a scale created from six questions that asked youth if they thought HIV/AIDS could be prevented by avoiding sex, having fewer sexual partners, being faithful to an uninfected partner, not sharing razor blades, using condoms and making sure injections were done with clean needles. All six indicators loaded on a single latent construct which we call *Knowledge about HIV Prevention*. Higher positive values on the scale indicate more knowledge about HIV transmission, while lower scores indicate less knowledge. Reliability of the scale, as determined by Cronbach's Alpha, is estimated at 0.82. Six indicators capturing *myths surrounding HIV transmission* also loaded on a single latent construct. Questions included whether HIV could be transmitted through wearing clothes, sharing food, by mosquitoes, having sex with thin people, shaking hands and not eating a good diet. Higher positive values on the scale indicate rejection of myths surrounding the AIDS virus, while lower values indicate endorsement of such myths. Reliability of the scale, as determined by Cronbach's Alpha, is estimated at 0.78. Other psycho-social factors that might affect risk perception include information pursued by youth about HIV/AIDS and information derived as a result of communicating with family members. The former variable was captured by asking students whether they had pursued information about HIV/AIDS by asking a question in the school question box, asking a question of a teacher, a parent, reading about HIV/AIDS in the information corner, and asking a question at the school health club. Communication about HIV/AIDS was measured with questions asking whether a student had spoken with a variety of family members about HIV and AIDS. Responses loaded on two constructs: *talked to male relatives* (father, uncle, older brother, grandfather) and talked to female relatives (mother, aunt, older sister, grandmother).

Following examples of research in South Africa and elsewhere, we measured youth's perception of the seriousness of AIDS by their reports of whether they personally knew someone who had died of AIDS, with 'yes' and 'don't know' dummy coded against the reference category, 'no'. Other psychosocial factors included are behavioral self-efficacy measured as abstinence and condom use self-efficacy. These are scales comprised of the weighted sum of responses that asked if youth believed they could say no to sex; that when a girl says no she means it; were able to have a boyfriend/girlfriend for a long time without indulging in sexual intercourse; could tell boyfriend/girlfriend that they would abstain from sexual intercourse until marriage; could tell their boyfriend/girlfriend about condoms, and could insist on condom use during sexual intercourse. Responses to these questions were on a five-point ordinal Likert-like scale ranging from 'definitely yes' to 'definitely no'. The first four loaded on a latent construct we called abstinence self-efficacy, while the last two loaded on another construct called condom use self-efficacy. Reliability of the scales, as determined by Cronbach's Alpha, is estimated at 0.60 for each scale.

Socio-demographic and economic influences were captured by variables such as ethnicity, religion, age and socio-economic status. Ethnicity was measured by youth personally identifying as Luo, Kisii and with smaller ethnic groups collapsed as 'other'. Similarly youth identified as 'Protestants', 'Catholics' and 'Other groups' for religious denomination. Age was measured as self-reported by youth and a locally devised indicator of socio-economic status was also created. Several studies have shown how lifecourse variables such as pressures to engage in sexual intercourse and risky sexual behaviors affect risk perceptions. Pressure to engage in sex was operationalized with a scale comprised of the weighted summations of responses to questions that asked if students had ever been pressured to engage in sexual intercourse because

their own bodies pushed them, their friends encouraged them, an older person encouraged them, their boyfriend/girlfriend wanted to, they would receive money/gifts, someone had arranged it, they didn't know how to resist, they had watched someone else have sex, or someone was physically forcing them. Higher positive values on the scale indicated experience of pressures to engage in sexual intercourse for a greater number of sources. Reliability of the scale, as determined by Cronbach's Alpha, is estimated at 0.75. Risky sexual behavior was measured with a variable that categorized participants as never having engaged in sex (no risk), having engaged in sex but used condoms at last sexual intercourse (low risk) and having engaged in sex and not using condoms at last sexual encounter (high risk).

School and community level variables included an estimate of the number of people who died in the community as result of AIDS, community awareness of social and cultural practices that contributed to HIV transmission, whether HIV/AIDS programs were incorporated into community festivals, and whether there was an HIV prevention education programme in schools.

Data Analysis

Ordinal logit regression models are employed given that the dependent variable is polytomous and ordinal. The structure of the data under consideration where students are nested within schools and communities, suggest however that a multi-level analytical approach be employed. The use of a multi-level approach may be useful in two important ways, First, that we are able to deal with the methodological problem of clustering given the hierarchical nature of the data, and second, that we are able to examine the relationship between variables measured at both individual and school/community levels. The ordinal logit model is specified as:

$$\log\left[\frac{P(Y_{ij} \leq 1)}{1 - P(Y_{ij} \leq 1)}\right] = \beta_{0c} + \sum_{k=1}^{K+1} \beta_k x_{ijk} + v_{ij}, c = 1, ..., \ell - 1 \dots\dots\dots\dots\dots\dots\dots(1)$$

Where β_{0c} are the $\ell-1$ intercept terms that help model the marginal frequencies in the ℓ ordered categories (Hedeker et al. 2000:384). A positive value for the regression coefficient k in equation (1) indicates a positive relationship between the dependent variable and the covariate. In the context of this research, the outcome variable is coded as 0=no risk, 1= medium risk, 2=great risk. Thus, a covariate with a positive coefficient would imply falling into higher order category, i.e. higher risk perceptions. The exponentiation of which would mean youth are more likely to report they have great risks of contracting HIV, compared to no or medium risks. On the other hand, a covariate with a negative coefficient would mean falling into lower order categories, i.e. no risk perception. The exponentiation of the covariates would mean youth are less likely to report they perceive their risks to be great, compared to no or medium.

At level 2, we model each intercept as a function of the school/community. Thus, we allow the intercept in equation (1) to vary randomly across school/communities. For instance, with 'whether AIDS deaths are publicly announced in community festivals' as the community-level variable we have:

$$\beta_{0c} = \gamma_{00} + \gamma_{01} * FESTIVAL_j + u_{0j} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(2)$$

Where γ_{00} is the overall mean odds for the various schools/communities, γ_{01} is the mean difference in the slopes for variables at the school/community level (FESTIVALS) and u_{0j} is the unique effect of community j on the dependent variable. A significant value for γ_{00} (the intercept) means significant differences among schools/communities regarding risk perceptions. A positive value obtained for γ_{01} means youth in communities with HIV/AIDS programs

incorporated into community festivals perceive medium to high risks of contracting HIV than no risks, compared to those in communities without any HIV programs.

Results

Univariate results shown in Table 1 suggest that on the average youth sampled for the study are aged 14 years. Majority identified as belonging to the Luo ethnic group and as Christians (Catholics or Protestants). When asked about their chances of contracting HIV/AIDS, quite a substantial number of youth, in particular female youth, thought they had no risk of contracting the virus. Similarly, majority of female youth indicated they had never experienced sexual intercourse (no risk), while quite a substantial number of male youth reported having experienced high risk sex (sex without condoms). This is consistent with the finding that male youth report higher pressure to engage in sexual intercourse compared to female youth. The majority of youth indicated they did not know someone infected with HIV/AIDS, but most respondents knew someone who had died of the disease. Factual knowledge about HIV/AIDS is low among both male and female youth in Nyanza. It is thus not surprising to find that respondents had lower scores for rejecting myths surrounding the transmission of HIV. Communication about HIV with family members is gendered as male youth communicate more with male relatives compared to female youth who communicate more with female relatives. While condom use self-efficacy is higher among male youth than female youth, female youth reported high abstinence self-efficacy than male youth. Turning to Table 1b we find that in the majority of schools and communities AIDS deaths are not acknowledged, HIV programs are incorporated in community festivals, the dominant message for youth is abstinence, schools have an HIV prevention education programme, and community leaders identified social and cultural

events as contributing to HIV vulnerability among youth. It is also clear that on the average

HIV/AIDS is discussed twice in PTA meetings and that an average of about 25 people are

reported as having died of HIV/AIDS in each community. Majority of schools are also sponsored

by Christian denominations (Protestant and Catholic).

Bivariate results are presented separately for males and females in Table 2. Results

indicate statistically significant associations between demographic and psycho-social predictors

and risk perception. Older youth are significantly more likely to report medium or high risk

perceptions compared to younger youth. Also, both male and female youth who reported higher

levels of sexual pressure were more likely to report medium or high risks compared to saying

they have no risks of contracting the virus. Regarding sexual risks, it is clear that compared to

male and female youth who had never engaged in sexual intercourse (no risks), those who did

and used condoms at last sex (low risk) and youth who had sex but never used condoms (high

risk) were all significantly more likely to report medium or high risks of contracting HIV

compared to no risks. Compared to those who did not know, male and female youth who know

someone infected with HIV reported medium or high risks compared to no risks. Similarly, male

youth with high knowledge about HIV, rejected myths about HIV and had high condom-use self-

efficacy were all significantly more likely to say they have medium or high risks of contracting

HIV compared to no risks. While female youth who communicated with male relatives had

medium or high risks perceptions, male youth who communicated with female relative reported

medium to high risks compared to no risks.

Results also indicate that school/community level variables are significantly associated

with risk perception. Male and female youth living in communities with high number of deaths

resulting from HIV/AIDS reported medium or high risks perceptions, compared to no risks. It is

surprising to find however that male youth living in communities where HIV/AIDS deaths are acknowledged were rather less likely to say they have medium to high risks compared to no risks. Compared to those in Catholic schools, female youth in schools sponsored by Protestants and secular organizations were less likely to report medium to high risks perceptions than no risk perception.

Six multivariate models are presented in Tables 3 and 4, three each for males and females. The first model includes individual level predictors of risk perception, the second model examines the effects of school and community level variables on risk perception and the third both individual and school/community level variables. Consistent with the bivariate findings, the multivariate results indicate that boys who engaged in high risk sex (sex without condoms), had higher knowledge about HIV, rejected myths about HIV transmission, had higher condom use self-efficacy, talked to female relatives about HIV and knew someone infected with HIV were more likely to report medium or high risk perceptions, compared to no risk perceptions. Boys in communities with a higher estimated number of AIDS deaths had medium to high risk perceptions, compared to no risk perceptions. It is intriguing to find however that boys in communities where AIDS deaths are acknowledged were less likely to report medium to high risk perceptions than no risk perceptions, compared to those in communities where AIDS deaths were announced. Female youth who reported higher pressure to engage in sex, engaged in low risk (sex with condoms) and high risk sex (sex without condoms) and knew someone who had died of HIV were significantly more likely to report medium to high risk perceptions, compared to no risks. Female youth in communities with higher estimates of AIDS deaths reported medium to higher risk perceptions compared to no risks. Compared to Catholics, Protestant female youth

were significantly less likely to report their risk perceptions as medium or high relative to no risks.

Discussions

Social and cognitive models that drive HIV preventive efforts in sub-Saharan Africa identify risk perception as essential and crucial to behavior change and reducing HIV risks. Underlying these models is often the assumption that individuals make rational and logical decisions mostly preceded by a cost-benefit assessment of the situation at hand, of which perceived vulnerability plays an important role. In spite of its relevance, minimal scholarly attempts have been made at understanding risk perception. The few studies that examined what influences risk perceptions have been limited to individual psychosocial and demographic determinants (see Macintyre et al. 2003; Ward et al. 2004; Beutel and Anderson 2013). This paper fills an important research gap by examining both individual and school/community level factors that affect the risk perceptions of youth in Nyanza, Kenya. Our findings indicate that knowledge about HIV/AIDS and rejection of myths surrounding HIV transmission are positively related to risk perception among male but not female youth. The finding underscores assumptions underlying cognitive and behavioral models that information and awareness about disease is necessary for prevention especially as it heightens perceived vulnerability which is pivotal in making rational or logical decisions. The finding is consistent with some studies across sub-Saharan Africa that also identifies knowledge as informative to risk perceptions (Bernadi, 2002; Njogu & Martin, 2003). However, the lack of significance of knowledge about HIV on the perceptions of risk of young Nyanza females may indicate that although important, knowledge may not be directly beneficial for females, especially in a context where their sexuality is mostly controlled by their male partners. This conclusion is supported by the results for sexual pressure

and prior sexual behavior which were strongly associated with perceived risks of contracting HIV for females. Regarding sexual pressure, the results showed that while males reported higher pressures to engage in sexual intercourse, in the multivariate model the influence of such pressures evidenced in the bivariate relationship were accounted for by the other social cognitive and experiential factors and pressure did not affect their risk perceptions. However, females did report increased susceptibility to HIV as a result of increased pressures to engage in sexual intercourse. For females, the bivariate effect of knowledge and myth rejection was accounted for by the more experiential factors such as pressure, sexual experience, and knowing someone who died of AIDS. Similar results are observed for the impact of sexual behaviour on risk perceptions. Both genders reported increased vulnerability to HIV infection as a result of high risk sex (sex without condoms); however, it was only females who reported vulnerability to HIV infection as a result of low risk sex (sex with condoms). These findings point to two major conclusions: First, that youth in Nyanza, in particular, female youth recognize sexual intercourse as a potential or real risk for HIV infection, and second, that previous sexual encounters influence how individuals judge their subjective risks to contracting the AIDS virus. These findings are largely consistent with other studies that establish sexual experience as strongly associated with perceived vulnerability of HIV infection (Macintyre et al. 2003; Tenkorang & Maticka-Tyndale, 2008; Maticka-Tyndale and Tenkorang, 2010). However, in these other studies, sexual behaviour was modeled as a potential outcome of risk perception. Gender differences are further observed with the impact of condom-use self-efficacy on risk perception. Compared to females, males indicated higher condom-use self-efficacy and reported greater perceptions of risk as a result of increased confidence to use condoms. The gender difference in the ability and confidence to use condoms further demonstrates the gender imbalance that

characterize sexual relationships which often has male partners dictating the nature of the sexual activity to their female counterparts especially regarding condom use (see Varga, 2003; Maticka-Tyndale & Tenkorang, 2010). The positive association between condom-use self-efficacy and risk perception is also testament that youth recognize that their vulnerability and believe this could be reduced by increased condom use.

A major contribution of this study is the inclusion of school and community variables as important determinants of risk perception. Null models (not shown) indicate that beyond individual level measures, there are some unobserved school and community level factors that influence perceived vulnerability of HIV infection. For instance, we find that boys and girls in communities with higher estimates of AIDS deaths reported higher perceptions of risk. At the individual-level, similar observations are made for boys and girls who reported knowing someone infected with HIV. These findings provide some support for the 'experiential theory' or the 'theory of social proximity to disease' that postulates that knowing someone who has died of AIDS or living with an AIDS patient brings the disease closer to the awareness of the people and may invoke behavioural changes through the perceptions they hold about their risks. Rutenberg et al. (2002) argue for instance that a higher level of mortality and the disclosure of such deaths in African societies may affect behavior change through increased perceived vulnerability to HIV. These findings are consistent with others from Zaire and South Africa where exposure to HIV and AIDS deaths were positively associated with risk perception (Bertand et al. 1995; Macintyre et al. 2003). It is intriguing however to have found that male youth who lived in communities where AIDS deaths were acknowledged were rather less likely to report greater risk perception compared to those in communities with no such acknowledgements made. Although counter-intuitive, there may be some reasons. First, the mere announcement of AIDS deaths may

not suffice, as it depends on the nature and frequency of such announcements. This is against the backdrop that AIDS deaths are highly stigmatized and may not be announced as frequently as expected. Second that the impact of such deaths depends on the relationship between the deceased and the community (social proximity) to the extent that some community members' death depending on their social status may be remembered and have an impact on risk perception and others not. Results also show that young girls in schools sponsored by Protestants were less likely to report medium or high risk perceptions, compared to those in Catholic schools. While conceding that there is limited research on how the structural dimensions of religion affect individual-level behaviors (see Trinitapolis and Regnerus, 2006), a few studies that examine the effects of broader religious denominations on perceived risks and sexual behaviors conclude that compared to other Christian denominations, Protestants tend to overlook church teachings on sexuality and that church authorities are also less likely to indoctrinate their members (Garner 2000; Trinitapolis & Regnerus 2006). This may partly explain the low perceived vulnerability of HIV infection among female youth attending Protestant-sponsored schools.

Despite the interesting findings, there are several short-comings worth discussing. The two primary limitations are the cross-sectional and self-report nature of the data. While all data were collected at the same time and are therefore cross-sectional, some questions asked youth to report events that had already occurred such as prior sexual behaviour, experiences of pressure, AIDS deaths in the community, communication with others, while other questions tapped into knowledge and attitudes at the time of the survey. Thus, we can have some measure of confidence in the time ordering of the experiences (before survey administration) and the attitudes and knowledge (at the time of survey administration). However, we must also take notice that reports of prior behavior may be influenced by current attitudes and perceptions

which may influence the validity of such reports. This speaks to the limitation of self-report data which is prone to errors related to memory and the influence of current perceptions and attitudes on prior events.

Conclusions

This study has contributed to an area of inquiry that has not received much attention, that of factors that influence perceptions of one's own vulnerability or risk of becoming infected with HIV. Considering the important role that risk perception plays in the multiplicity of social cognitive models it is surprising that less attention has been given to examining influences on risk perception, especially those that go beyond individual level factors. Results presented here suggest that, at least for young men, risk perception may be an intermediary between other social cognitive factors such as knowledge and attitudes related to self efficacy and behaviors. Thus, knowledge and self efficacy may have both a direct (as hypothesized in most social cognitive models) influence on behavior and also an indirect effect through risk perception. This is worth examining in future research. For young women, however, these results support results in other research that suggest that, at least in this region of SSA, their lack of control of sexual encounters may be impeding the influence that knowledge and perceptions such as self efficacy may have. This too is worthy of further research, especially with respect to its implications for interventions to enhance the sexual health of young women. Finally, results demonstrating that community-level factors influence risk perception are also of considerable importance and suggest that further examination of how events in communities influence risk perception is worthwhile both to improve understanding and also to contribute insights into improving interventions targeting reductions in the spread of HIV.

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Table 1a: A Univariate analysis of selected dependent and independent variables

	Boys N=4146	Girls N=4037
Dependent variable		
No chances at all (ref)	36.9	54.6
Moderate chance	39.9	28.9
Great chance	23.3	16.5
Independent variables (Level 1)		
Mean Age (range, 11 to 17)	14.65	14.32
Ethnicity		
Luo (ref)	57.4	55.7
Kissi	34.9	37.1
Others	7.7	7.2
Religion		
Catholic (ref)	48.2	45.1
Protestant	45.4	51.3
Other	6.4	3.6
Socio-economic status of respondent (range, 22.73 to 100)	55.97	56.98
Sexual pressure (range, -.87 to 2.56)	.126	-.130
Sexual risks		
No risk	39.8	73.0
Low risk	16.0	7.9
High risk	44.2	19.1
Factual knowledge about AIDS (range, -2.04 to 2.58)	-.337	-.277
Transmission myths (range, -1.20 to 2.529)	-.322	-.215
Talked to male relative about AIDS (range, -1.89 to 2.46)	.389	-.399
Talked to female relative about AIDS (range, -2.0 to 1.842)	-.476	.489
Level of pursuing information about AIDS (range, -2.08 to 1.33)	-.030	.031
Self-efficacy for condom use (range, -2.50 to 1.61)	.144	-.148
Pro-abstinence (youth can say no) (range, -2.79 to 1.93)	-.073	.075
Know someone who died of HIV/AIDS		
No (ref)	46.5	41.1
Yes	53.5	58.9
Know someone infected with HIV/AIDS		
No (ref)	61.4	57.5
Yes	38.6	42.5

Table 1b. A univariate analysis of school/community level variables

School/Community level	% N=160
Whether deaths due to AIDS are publicly announced?	
No (ref)	92.5
Yes	7.5
Mean estimate of the number of people in community died of AIDS	24.9
Mean number of PTA Meetings where HIV/AIDS is discussed	1.5
Primary school had HIV prevention education	
No (ref)	37.1
Yes	62.9
AIDS risks from traditional practices	
No (ref)	20.1
Yes	79.9
AIDS risks from social events	
No (ref)	20.8
Yes	79.2
Most important message for youth	
Other messages (ref)	33.3
Abstinence	66.7
HIV programs incorporated into festivals?	
No (ref)	22.0
Yes	78.0
Religious groups sponsoring school	
Catholic (ref)	33.8
Protestant	46.2
Muslims	20.0

Table 2: A bivariate analysis of risk perception and selected independent variables

Variables	Boys	Girls
Individual level	Exp$^\beta$	Exp$^\beta$
Age	1.05 (.023)**	1.05 (.029)*
Ethnicity		
Luo (ref)	1.00	1.00
Kissi	.908 (.117)	1.03 (.134)
Others	.851 (.183)	1.12 (.150)
Religion		
Catholic (ref)	1.00	1.00
Protestant	1.01 (.066)	.963 (.069)
Other	.770 (.157)	1.15 (.206)
Socio-economic status of respondent	.990 (.030)	.980 (.030)
Sexual pressure	1.15(.040)***	1.29(.048)***
Sexual risks		
No risk (ref)	1.00	1.00
Low risk	1.38(.106)***	1.62(.123)***
High risk	1.54(.075)***	1.55(.097)***
Factual knowledge about AIDS	1.17(.038)***	.981 (.039)
Transmission myths	1.07 (.039)*	1.05 (.049)
Talked to male relative about AIDS	.990 (.037)	1.11 (.046)**
Talked to female relative about AIDS	1.09 (.043)**	.969 (.040)
Level of pursuing information about AIDS	.969 (.039)	.990 (.046)
Self-efficacy for condom use	1.15(.045)***	.991 (.039)
Pro-abstinence (youth can say no)	.957 (.039)	.971 (.039)
Know someone who died of AIDS		
No (ref)	1.00	1.00
Yes	1.20(.063)***	1.12 (.077)
Know someone infected with HIV		
No (ref)	1.00	1.00
Yes	1.25(.079)***	1.24(.080)***
School/Community level		
Whether deaths due to AIDS are publicly announced?		
No (ref)	1.00	1.00
Yes	.610(.138)***	1.07 (.229)
Estimate of the number of people in community died of AIDS	1.02(.010)***	1.01(.010)***
Number of PTA Meetings where HIV/AIDS is discussed	1.03 (.045)	1.03 (.041)
Primary school had HIV prevention education		
No (ref)	1.00	1.00
Yes	1.21 (.136)	1.07 (.126)
AIDS risks from traditional practices		
No (ref)	1.00	1.00

Yes	1.02 (.143)	1.17 (.159)
AIDS risks from social events		
No (ref)	1.00	1.00
Yes	.884 (.146)	.900 (.141)
Most important message for youth		
Other messages (ref)	1.00	1.00
Abstinence	1.02 (.144)	1.09 (.115)
HIV programs incorporated into festivals?		
No (ref)	1.00	1.00
Yes	1.23 (.159)	1.01 (.127)
Religious groups sponsoring school		
Catholic (ref)	1.00	1.00
Protestant	.962 (.169)	.725(.131)***
Muslims	.754 (.203)	.737(.156)***

Note; **p<.05; ***p<.01. Robust standard errors are reported in brackets

Table 3: Multi-level logit models of risk perception among young boys in Nyanza, Kenya

Variables	Model 1	Model 2	Model 3
Individual level	Exp$^\beta$	Exp$^\beta$	Exp$^\beta$
Age	1.02 (.024)		1.02 (.240)
Ethnicity			
Luo (ref)	1.00		1.00
Kissi	.920 (.108)		1.06 (.131)
Others	.964 (.185)		1.03 (.193)
Religion			
Catholic (ref)	1.00		1.00
Protestant	.983 (.068)		.990 (.068)
Other	.792 (.159)		.806 (.068)
Socio-economic status of respondent	.990 (.010)		.990 (.010)
Sexual pressure	1.05 (.042)		1.05 (.042)
Sexual risks			
No risk (ref)	1.00		1.00
Low risk	1.16 (.119)		1.17 (.118)
High risk	1.35(.080)***		1.36(.080)***
Factual knowledge about AIDS	1.15(.039)***		1.15(.039)***
Transmission myths	1.08 (.037)**		1.08 (.037)**
Talked to male relative about AIDS	.965 (.040)		.963 (.040)
Talked to female relative about AIDS	1.10 (.049)**		1.10 (.049)*
Level of pursuing information about AIDS	.944 (.040)		.939 (.040)
Self-efficacy for condom use	1.13(.044)***		1.13(.045)***
Pro-abstinence (youth can say no)	.965 (.040)		.966 (.040)
Know someone who died of AIDS			
No (ref)	1.00		1.00
Yes	1.10 (.066)		1.10 (.067)
Know someone infected with HIV			
No (ref)	1.00		1.00
Yes	1.15 (.083)*		1.16 (.084)*
School/Community level			
Whether deaths due to AIDS are publicly announced?			
No (ref)		1.00	1.00
Yes		.656(.158)***	.689 (.150***
Estimate of the number of people in community died of AIDS		1.03(.010)***	1.03(.010)***
Number of PTA Meetings where HIV/AIDS is discussed		1.02 (.043)	1.02 (.040)
Primary school had HIV prevention education			
No (ref)		1.00	1.00
Yes		1.13 (.131)	1.18 (.131)
AIDS risks from traditional practices			
No (ref)		1.00	1.00

Yes		.945 (.134)	.930 (.136)
AIDS risks from social events			
No (ref)		1.00	1.00
Yes		.843 (.140)	.834 (.133)
Most important message for youth			
Other messages (ref)		1.00	1.00
Abstinence		1.04 (.139)	1.01 (.135)
HIV programs incorporated into festivals?			
No (ref)		1.00	1.00
Yes		1.07 (.154)	1.02 (.149)
Religious groups sponsoring school			
Catholic (ref)		1.00	1.00
Protestant		1.01 (.162)	1.05 (.160)
Muslims		.877 (.202)	.908 (.195)
Random intercepts	.-426(.122)***	-.753 (.247)***	-.587 (.240)***
Variance components	.512***	.584***	.502***
Intra class correlation	.135	.151	.132

Note: **p<.05; ***p<.01. odds ratios are reported with robust standard errors in brackets

with the exception of the intercepts where we report the coefficients

Table 4: Multi-level logit models of risk perception among young girls in Nyanza, Kenya

Variables	Model 1	Model 2	Model 3
Individual level	Exp$^\beta$	Exp$^\beta$	Exp$^\beta$
Age	1.03 (.029)		1.03 (.029)
Ethnicity			
Luo (ref)	1.00		1.00
Kissi	1.05 (.136)		1.09 (.153)
Others	1.20 (.150)		1.19 (.166)
Religion			
Catholic (ref)	1.00		1.00
Protestant	.988 (.071)		1.01 (.071)
Other	1.18 (.150)		1.19 (.202)
Socio-economic status of respondent	.998 (.010)		.998 (.010)
Sexual pressure	1.17(.058)***		1.17(.055)***
Sexual risks			
No risk (ref)	1.00		1.00
Low risk	1.34 (.144)**		1.37 (.144)**
High risk	1.35(.116)***		1.36(.117)***
Factual knowledge about AIDS	.952 (.040)		.947 (.041)
Transmission myths	1.04 (.048)		.960 (.049)
Talked to male relative about AIDS	1.08 (.046)		.933 (.046)
Talked to female relative about AIDS	.953 (.040)		.953 (.041)
Level of pursuing information about AIDS	.969 (.045)		.988 (.047)
Self-efficacy for condom use	.998 (.039)		.987 (.039)
Pro-abstinence (youth can say no)	.969 (.040)		.964 (.040)
Know someone who died of AIDS			
No (ref)	1.00		1.00
Yes	1.03 (.079)		1.01 (.079)
Know someone infected with HIV			
No (ref)	1.00		1.00
Yes	1.20 (.081)**		1.20 (.081)**
School/Community level			
Whether deaths due to AIDS are publicly announced?			
No (ref)		1.00	1.00
Yes		1.05(.228)	1.08 (.233)
Estimate of the number of people in community died of AIDS		1.01 (.010)	1.01 (,010)**
Number of PTA Meetings where HIV/AIDS is discussed		1.03 (.044)	1.04 (.038)
Primary school had HIV prevention education			
No (ref)		1.00	1.00
Yes		1.06 (.127)	1.02 (.123)
AIDS risks from traditional practices			
No (ref)		1.00	1.00

Yes		1.10 (.152)	1.09 (.143)
AIDS risks from social events			
No (ref)		1.00	1.00
Yes		.897 (.140)	.919 (.143)
Most important message for youth			
Other messages (ref)		1.00	1.00
Abstinence		1.04 (.119)	1.04 (.118)
HIV programs incorporated into festivals?			
No (ref)		1.00	1.00
Yes		.988 (.140)	.972 (.135)
Religious groups sponsoring school			
Catholic (ref)		1.00	1.00
Protestant		.753(.131)**	.771 (.171)**
Muslims		.770 (.159)	.797 (.118)
Random intercepts	.400.094)***	.016 (.255)	.268 (.233)
Variance components	.295***	.308***	.292***
Intra class correlation	.0823	.0856	.0815

Note: **p<.05; ***p<.01. odds ratios are reported with robust standard errors in brackets

with the exception of the intercepts where we report the coefficients