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Risk Factors for HIV among Zambian Street Youth

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Abstract

The sub-Saharan African region has been disproportionately affected by HIV, and Zambia has one of the highest HIV prevalence rates within this region. Moreover, new incidences of HIV infection are increasing most rapidly among those 15–24 years of age. Though young people are at high risk for HIV infection, street youth are even more vulnerable given their exposure to high-risk behaviors. The current study examines multiple levels of social influence on HIV infection among 250 street youth in Zambia. Results reveal that though the majority of youth understand what behaviors increase their risk for HIV, youth still hold many misconceptions about HIV/AIDS. Additionally, youth who do not have a home to return to and those who report parental drug misuse were significantly more likely to be HIV positive. This study underscores the need for further education among street youth regarding HIV knowledge.

Keywords: community, family, HIV, peers, street youth, Zambia

It is estimated that more than 33 million people worldwide are now living with HIV, the virus that causes AIDS (World Health Organization [WHO], 2015). Although the sub-Saharan African region has just over 12% of the world's population, it accounted for almost 70% of the world's new HIV infections in 2012 (UNAIDS, 2013; WHO, 2015). The region is home to two-thirds of the world's known HIV cases, which leads to serious drains on the economy and medical services, while causing disruption to the families of persons afflicted with HIV. Zambia, a country located in sub-Saharan Africa, is home to 13 million people, with 45% of its citizens below the age of 15 years (Republic of Zambia, 2014). Approximately 36,000 Zambians died of AIDS in 2012 (UNAIDS, 2013), and approximately 13% of adults between 15 and 49 years of age are HIV positive, which is the most economically active age group (Zambia Central Statistical Office, 2015). With the recent scale-up of the antiretroviral therapy, the number of AIDS-related deaths have decreased, but it is still placing a tremendous burden on the country's fragile economy, especially when 67% of the country lives in severe poverty (UNAIDS, 2013).

As a result of both the high number of annual AIDS-related deaths and elevated poverty levels, it is possible that many youth living in Zambia are orphaned or leave home—becoming “street youth”—in order to help financially support themselves and/or their families. In fact, within Africa, Zambia has the second highest number of orphans and vulnerable children, and 50% of these types of children in Zambia are a result of HIV and AIDS (UNICEF Zambia, 2008). “Street youth” in Zambia specifically refers to those who spend their days on the street engaged in economic activity, such as begging. Many of these youth have a home to return to at the end of the day while others do not (Lemba, 2002). While it is estimated that more than 100 million children work and live on the streets worldwide (de Benítez, 2007), there are approximately 35,000 such children in Zambia (Ministry of Sport, Youth, and Child Development, 2004). The high-risk behaviors of street youth, such as substance use and transactional sex (trading sex for food, clothing, or money), which often arises from the social and economic conditions both within society and their family, places these youth at significantly higher risk for HIV infection compared to general adolescent populations (de Benítez, 2007; Muntingh, 2006). In addition to *community-level factors* (e.g., economic conditions in one's community, ease of obtaining drugs in one's community), *family-level factors* (e.g., low parental supervision, parental drug misuse) as well as *peer-level factors* (e.g., peer binge drinking, peer drug use) all contribute to youths' substance use behaviors (Luke, 2003; Nkowane et al., 2004; Peltzer, 2009).

Although HIV incidence transects every sociodemographic group, epidemiological surveillance systems indicate that new incidences of HIV infection are increasing most rapidly among those 15–24 years of age. Moreover, women tend to be more vulnerable to HIV and generally have higher rates compared to men (UNAIDS, 2013). While the vast majority of studies in this region do not test for HIV infection, one study in South Africa found an HIV prevalence rate of 11% among 11- to 19-year-olds (Jaspan et al., 2006), which is very similar to rates found among U.S. homeless youth (Pfeifer & Oliver, 1997). As such, the purpose of the current study is to examine risk factors (i.e., community, family, and peers) for HIV infection among 250 street youth in Lusaka, Zambia.

Literature review

Street youth and substance use

Among 15- to 21-year-old Zambian youth, lifetime alcohol use has been found to be almost 50%, whereas marijuana use was 86%, and inhalant usage was 47% (Nkowane et al., 2004), which is similar to rates among U.S. homeless youth (Bousman et al., 2005). Although the median age of first alcohol use is 15 years for males and females in Zambia, boys have been found to have higher usage rates and the prevalence of alcohol increases with age (Magnani et al., 2002). Drinking alcohol is also associated with using other drugs (Peltzer, 2009). In addition, marijuana use increases youths' chances of engaging in sex, as found in a study of Zambian in-school adolescents (Siziya, Muula, Kazembe, & Rudatsikira, 2008). Among U.S. homeless youth, marijuana use is correlated with having more sexual partners and failure to use condoms during sex (Bailey, Camlin, & Ennett, 1998). Personal reasons given by Zambian youth for using substances, such as acceptance, curiosity, fun, coping, and enhanced sexual experiences, represent individual risk factors (Magnani et al., 2002; Nkowane et al., 2004; Peltzer, 2009).

Risk factors for HIV

Community-level risk factors—including poor economic conditions—are associated with substance use (Peltzer, 2009) on numerous levels. For example, cultural and community norms such as acceptance and ease of obtaining alcohol (Swahn et al., 2011) are demonstrated by the fact that 90% of Zambian youth report that alcohol is “very easy” to obtain in their community (Nkowane et al., 2004). In general, community-level risk factors have been linked to HIV infection in young women (Gabrysch, Edwards, & Glynn, 2008). Thus, poor economic conditions and cultural factors place street youth at high risk for HIV through substance use.

Family-level risk factors—including low parental monitoring, parental substance misuse, and family economic conditions—are associated with substance use and HIV. While research has yet to examine these various factors simultaneously, low parental monitoring (Peltzer, 2009) and parental substance misuse (Nkowane et al., 2004) have been linked to street youths' substance use and/or unsafe sexual practices.

Social networks are reference peer groups with whom homeless youth associate and spend most of their time (Tyler, 2008). Youth often select friends who are similar in behavior (Cotterell, 2007; Haynie & Osgood, 2005), and peers may introduce youth to both pro-social and delinquent activities (Haynie & Osgood, 2005). When street youth are immersed in social networks consisting of other street youth, group norms can send the message that drugs are acceptable and important for survival. When street youth conform to behaviors that engender risk (i.e., drug use), they place themselves at greater risk for HIV. In sub-Saharan Africa, peers are important as distributors of sexual knowledge (Luke, 2003) and Zambian youth report using substances because of their peers (Nkowane et al., 2004). While we know that the risk behaviors of social networks are closely tied to homeless youth's own HIV risk behaviors in U.S. research on homeless youth (Ennett, Bailey, & Federman, 1999; Rice, Milburn, Rotheram-Borus, Mallet, & Rosenthal, 2005; Tyler, 2013), very little is known about how peers and social networks of Zambian street youth operate.

Studies examining protective factors (i.e., promoting resiliency in youth such as HIV knowledge or high self-control) among street youth are rare; however, a few studies conducted in sub-Saharan Africa report that youth with higher condom use efficacy were more likely to have used a condom during their last sexual encounter (Meekers & Klein, 2002; Park, Sneed, Morisky, Alvear, & Hearst, 2002; Slonim-Nevo, Mukuka, & Tembo, 2001). Furthermore, school enrollment is shown to significantly decrease the odds of both alcohol and illicit drug use among sub-Saharan African school-age children by 24 and 29 times, respectively (Peltzer, 2009). Finally, some research conducted in sub-Saharan Africa has found that religious affiliation is protective against using alcohol and drugs (Mugisha & Zulu, 2004).

Theoretical framework

This study is informed by an ecological framework (Blum, McNeely, & Nonnemaker, 2002; Bronfenbrenner, 1979; Jessor, 1992), which emphasizes not only risk and protective factors (Jessor, 1992) but also the integration of multiple levels of social elements to understand health outcomes including HIV infection (Gabrysch et al., 2008). The multiple levels may influence one another and each includes both risk and protective factors. For example, within the family domain, higher levels of parental supervision are protective, whereas parental substance misuse is a risk. The current study examines three levels of influence (i.e., community, family, and peers) in order to understand the specific mechanisms underlying street youths' risks for HIV. Thus, all or any of the three levels or individual elements within each level could potentially explain the underlying reasons for youth's HIV infection. We hypothesized that those who did not have a home to return to, were not enrolled in school, were older, and those who binge drank would be more likely to be HIV positive. Protective factors were expected to be negatively correlated with HIV status, whereas family, community, and peer risks were hypothesized to be positively correlated with HIV status.

Methods

Sample

Data collection occurred in June and July 2014 in Lusaka, Zambia. The study was conducted under the collaboration of the Tropical Diseases Research Center (TDRC) in Zambia, the Zambia Alcohol and Drug Programme (ZADP), and the University of Nebraska, USA, based on our prior collaborative work in Zambia on street youth. The study sites were chosen at the recommendation of local experts and service providers in order to be representative of Lusaka. The eight sites were: (1) Ng'ombe compound; (2) Linda compound; (3) Kabanana compound; (4) Chawama compound; (5) Chibolya compound; (6) downtown shopping area; (7) Great North Road; and (8) the bridge area (by the Zambia Electricity Supply Company), which is a popular hangout for street youth, as it acts as a shelter, a place to meet up with other street youth, and a place to beg because its location is accessible to traffic flowing into town but a location where police seldom check. The total sample included 250 street youth.

Procedure

The sampling selection strategy was designed to sample both male and female street youth between the ages of 14 and 24. "Street youth" refers to those who spend their days on the street engaging in economic activity, such as begging. While many of these youth have a home to return to at the end of the day, others do not (Lemba, 2002). To ensure greater representativeness, we sampled from local agencies who serve high-risk youth as well as sampling unmonitored youth who spend a lot of their time on the streets. The Zambia Alcohol and Drug Programme (ZADP) has network connections with several agencies throughout the country that serve this population and helped facilitate access to youth both within their agencies and on the streets. This agency offers various services such as counseling, social reintegration and support programs, and emergency intervention.

Six Research Assistants (RAs), selected on the basis of their experience, conducted the interviews. Of these, two were students studying Social Work at the National Institute of Public Administration, two were Psychosocial Counselors, one was a Psychologist, and one was a retired Registered Nurse. Interviewer training was done in Lusaka and covered screening, consent/assent, questionnaire administration, and confidentiality. The training also took into consideration Nyanja as the main local language used in Lusaka and the training materials and questionnaire were translated from English into Nyanja. This was to ensure that all of the RAs interpreted the questionnaire in the same way and then later translated back into English. Each RA was assigned a set of ID numbers to avoid replication and mix-ups during the actual data collection process. Interviewers worked closely with the agency and its network to recruit study participants. Upon initial contact, interviewers carefully screened youth for eligibility. All interviews were conducted in a private room provided by the ZADP and its networks. Study procedures were explained to youth who then signed a consent/assent form prior to participation.

The interview took about 30 to 45 minutes to complete, and youth were provided with a snack and a small transport fee as incentives. At the completion of the structured interview, the youth were counseled by a qualified counselor and asked if they would be willing to submit to an HIV test. If so, they were to be transported to the University Teaching Hospital (UTH) for HIV voluntary counseling and testing. However, many youth were very suspicious and refused to be taken to UTH, as many myths abound, such as "Blood would be taken from them for rituals." Therefore, we changed our strategy by performing a rapid HIV test onsite using blood collected via a finger prick. Though this study received a waiver of parental consent, youth below 16 years of age were not eligible to assent for the HIV test themselves. However, if they wanted to take the HIV test, they had the option of having their consent form signed by a ZADP official. A psychosocial counselor (in practice) and nurse did the counseling and blood collection for HIV testing, respectively, for all consenting youth. Positive tests were repeated using a second rapid HIV test. Those who tested reactive and positive were referred for follow-up care and treatment. Hard copies of the questionnaires together with the test results were filled in by the interviewers (i.e., nurse and counselors). Only the deidentified data set was available to researchers for data analysis. The counselors and nurse were the only individuals who knew the identity of the

interviewees and their test results. This study was approved by the Tropical Diseases Research Center ethics review committee and by the Institutional Review Board at the institutions involved, with final approval granted from the Ministry of Health, Lusaka.

Measures

Dependent variable

HIV status was not asked on the questionnaire, but those respondents who consented were tested for HIV infection after the interview. These results were then added to the data set. HIV status was coded 0 = negative and 1 = positive HIV test result.

Independent variables

Community variables comprised two measures. *Neighborhood economic conditions* included six items that asked youth, for example, if their household had electricity, flush toilet, and telephone (0 = yes; 1 = no). An index was created such that a higher score indicated poorer economic conditions. This measure has been used in prior research with African youth (Thurman, Brown, Richter, Maharaj, & Magnani, 2006). *Ease of obtaining drugs in one's community* was assessed by asking youth, "In terms of obtaining any type of drugs in your community" would you say it is ... 1 = very difficult to 4 = very easy. This measure has been used in prior research with African youth (Nkowane et al., 2004).

Family variables comprised two measures. *Parental drug misuse* included three items which asked youth, (1) "Have you ever thought your parent(s) had a drug problem?" (2) "Did you ever argue or fight with your parent(s) when he/she was high?" and (3) "Did you ever encourage your parent(s) to quit using drugs?" (0 = no; 1 = yes). The three items were summed but because of skew, this variable was dichotomized 0 = parent(s) did not have a drug problem and 1 = parent(s) did have a drug problem (Hodgins, Maticka-Tyndale, El-Guebaly, & West, 1993). *Parental employment* was a single item indicator that asked youth if their father or mother was employed (0 = no; 1 = yes).

Peer variable included one measure. *Peer drug use* was a single item indicator which asked youth, "How many of your close friends use drugs?" (1 = none, 2 = a couple, 3 = quite a few, and 4 = all of them). This measure has been used in prior research with Zambian youth (Magnani et al., 2002).

Individual binge drinking was assessed by recoding the "frequency of drinking" measure which asked youth, "In the past 30 days, on the days you drank alcohol, how many drinks did you usually drink per day?" (0 = none to 7 = seven or more drinks). This measure was recoded such that if a female responded as having 4 or more drinks in one day (5 or more drinks for males), then the youth was coded as "1" binge drinking; otherwise "0" for not binge drinking in the previous 30 days.

Protective-level variables included three measures. *HIV knowledge* was a 12-item index (Raffaelli et al., 1995) that asked youth about their knowledge of HIV with regard to transmission, prevention, and misconception. For example, "A pregnant woman can pass HIV to her child," and "Using a condom during sex decreases risk of HIV and other STIs infections" (0 = false; 1 = true). The items were coded such that higher scores indicate greater

HIV knowledge (see Table 1 for a full list of items). *Self-esteem* was a 10-item scale (Rosenberg, 1965), which asked youth, for example, “I feel that I have a number of good qualities” and “I feel I do not have much to be proud of” (1 = strongly agree to 4 = strongly disagree). Certain items were reverse-coded and then summed such that a higher score indicated greater self-esteem ($\alpha = .53$). *Self-control* (Grasmick, Tittle, Bursik, & Arneklev, 1993) was a 24-item scale that asked youth, for example, “Sometimes I will take a risk just for the fun of it” and “When I’m really angry, other people better stay away from me” (1 = strongly agree to 4 = strongly disagree). Items were summed so that higher scores indicated greater self-control ($\alpha = .85$).

Table 1. Frequencies of HIV knowledge for total sample ($N = 250$)

	Correctly answered		Incorrectly answered/ Don’t know	
	<i>N</i>	Percent	<i>N</i>	Percent
Transmission Subscale				
1. The virus that causes AIDS is in a person’s blood and they only get sick later. (T)	207	82.8%	43	17.2%
2. A pregnant woman can pass the HIV to her child. (T)	155	62.0%	95	38.0%
3. Having sex with many people increases the risk of getting infected with HIV. (T)	242	96.8%	8	3.2%
4. You can get HIV by sharing needles with other people. (T)	230	92.0%	20	8.0%
5. You can get HIV from a transfusion of contaminated blood. (T)	224	89.6%	26	10.4%
Prevention Subscale				
6. Using a condom during sex decreases risk of HIV and other STIs infections. (T)	212	85.1%	37	14.9%
7. Washing shared needles with bleach decreases risk of transmitting the HIV. (T)	87	35.1%	161	64.9%
Misconception Subscale				
8. You can tell if someone has HIV by looking at them. (F)	194	77.6%	56	22.4%
9. You can get HIV by hugging someone who has AIDS disease. (F)	232	92.8%	18	7.2%
10. You can get AIDS by eating from the same plate as an HIV infected person. (F)	227	90.8%	23	9.2%
11. You can get HIV by swimming in a pool with someone who has the AIDS disease. (F)	205	82.0%	45	18.0%
12. Someone who takes baths every day has less chance of getting HIV and AIDS. (F)	74	29.7%	175	70.3%

Note: T = True; F = False. The correct answer to each question appears at the end of the statement.

Demographic variables

Gender was coded 0 = male and 1 = female. *Age* was the youth’s age at the time of the interview, and *homeless* was a single item, which asked youth if they have a home to return to

(0 = yes; 1 = no). If the youth said no, they were coded as homeless. *School enrollment* asked youth if they are attending school full-time (0 = no; 1 = yes) and whether they are *married* (0 = no; 1 = yes).

Statistical analysis

All data analyses were performed using SPSS. Frequencies were used to assess the number of youth who correctly answered questions about HIV knowledge. Next, we tested whether the HIV knowledge questions differed across HIV status, age, gender, and homelessness using chi-square tests for dichotomous variables and Student's *t* tests for continuous variables. Bivariate associations between HIV status with all study variables were assessed using Pearson's correlation (*r*). Simple logistic regression models, which represent the relationship between a single independent variable with the dependent variable, HIV status, were used to calculate odds ratios (OR) and corresponding *P*-values. Significance was defined with an alpha of less than 0.05. Finally, a logistic regression model assessed the relationship between all variables with HIV status.

Results

The total sample included 250 street youth, 179 males and 69 females (two youth did not respond to the gender question), ages 14 to 24 years (median age = 20.0). Approximately 13% of youth (*N* = 23) reported that they did not have a home to return to and 32% of young people (*N* = 79) were attending school full time. Thirty-one percent of males (*N* = 55) and 25% of females (*N* = 17) were classified as binge drinkers. Finally, 16 youth (10 males and 6 females) tested positive for HIV, which is 6.4% of the total sample.

Youth were asked a series of questions regarding their knowledge of HIV. Table 1 presents frequencies for the number of youth who correctly (or incorrectly) answered each item. Overall, the vast majority of youth understand that "Having sex with many people" increases their risk of becoming infected with HIV (almost 97% of youth responded correctly to this question). In contrast, 70% of youth incorrectly assumed that taking a bath every day lowers the risk for contracting HIV and AIDS.

Next, we tested whether each of the 12 HIV knowledge questions (referenced in Table 1) differed significantly across HIV status, age, gender, and homelessness. Three of these relationships were found to be significant. First, females were significantly more likely to correctly believe that "You can get HIV by sharing needles with other people" compared to their male counterparts ($\chi^2 = 4.792$; $p < .05$). Second, males were significantly more likely to positively endorse the false statement "You can tell if someone has HIV by looking at them" ($\chi^2 = 4.733$; $p < .05$) compared to females. Finally, younger-aged youth were significantly more likely to correctly believe the item "Using a condom during sex decreases risk of HIV and other STI infections" ($t = 3.114$; $p < .01$) compared to older-aged youth.

In Table 2, chi-square comparisons were done given the dichotomous nature of the variables. Results show that two variables were statistically significant. Those who do not have a home to return to (i.e., homeless youth) were significantly more likely to be HIV positive (31.3%) compared to youth who do have a home to return to. Additionally, youth who reported that a parent/caretaker misused drugs were significantly more likely to be

HIV positive (12.5%) compared to youth whose parents did not have a drug problem. These numbers should be interpreted with caution, however, as the cell sizes were quite small for some of the groups. Group comparisons were also done using *t* tests for continuous variables by HIV status but none of these relationships were statistically significant (results not shown).

Table 2. Frequencies and group comparison for dichotomous variables by HIV Status

	T Total		HIV+		HIV–		χ^2 Test
	N	%	N	%	N	%	
Gender (1 = female)	69	27.8	4	25.0	65	28.0	.07
Homeless ^a	35	14.0	5	31.3	30	12.8	4.23*
School fulltime ^a	79	31.6	4	25.0	75	32.1	.34
Married ^a	26	10.4	3	18.8	23	9.8	1.28
Binge drinking ^a	72	29.0	7	43.8	65	28.0	1.80
Parents' drug misuse ^a	9	3.6	2	12.5	7	3.0	3.90*
Parents' employed ^a	145	58.2	9	56.3	136	58.4	.03

Note: * $p < .05$; ** $p < .01$. ^a1 = yes. $N = 250$.

Table 3 shows Pearson's correlation (*r*) for HIV status with all study variables (far left side of table), simple logistic regression models (Models 1–4) and the full model (Model 5). In terms of the correlations, HIV-positive status is significantly associated with being homeless, age, binge drinking, and parental drug misuse. That is, youth who do not have a home to return to ($r = .22$; $p < .01$), older-aged youth ($r = .15$; $p < .05$), and youth who reported binge drinking in the prior 30 days ($r = .21$; $p < .01$) were all significantly more likely to be HIV positive. Youth were more likely to be HIV positive if their parent/care-taker misused drugs ($r = .15$; $p < .05$). Next, these four significant variables were used to run simple logistic regression models with HIV status as the dependent variable (see Models 1–4 in Table 3).

In Model 1, being homeless was significantly related with HIV status. That is, youth who did not have a home to return to were more than three times more likely to be HIV positive (Odds Ratio (OR) = 3.09; $p < .05$). There were no significant results in Models 2 and 3. In Model 4, parental drug misuse approached significance: those who had a parent with drug-use problems were more than four and a half times more likely to be HIV positive (OR = 4.63; $p = .07$). The results for the full model (Model 5) revealed that none of these variables were significant when combined into a single model, though they still explained 8% of the variance in HIV status.

Table 3. Pearson's correlation and logistic regression models for HIV status

		<i>r</i>	Model 1		Model 2		Model 3		Model 4		Model 5 (Full model)	
			OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>
1	HIV positive	—										
2	Female	-.07										
3	Homeless	.22**	3.09	.04							2.39	.15
4	Age	.15*			1.17	.12					1.14	.19
5	School enrollment	-.14										
6	Married	.01										
7	Binge drinking	.21**					2.02	.18			1.40	.54
8	HIV knowledge	-.05										
9	Self-esteem	.04										
10	Self-control	-.06										
11	Peer drug use	.04										
12	Comm. drug access	-.14										
13	Economic conditions	.06										
14	Parental drug misuse	.15*							4.63	.07	3.11	.22
15	Parental employment	-.04										
Nagelkerke <i>R</i> ²		—		.04		.03		.02		.03		.08

Note: Comm. = Community; OR = Odds Ratio; *N* = 250

Discussion

This study examined risk factors (i.e., community, family, and peers) for HIV among 250 street youth in Lusaka, Zambia. In terms of HIV knowledge, results highlight that though youth can correctly identify some of the ways in which HIV can be transmitted, youth still hold many misconceptions. For example, a sizeable number of youth are unaware that a pregnant woman can pass HIV to her child. Additionally, we find that HIV knowledge varies by gender and age.

The results from simple logistic regression reveal that youth who do not have a home to return to are more likely to be HIV positive. It is plausible that for survival reasons, this group of youth engages in high-risk behaviors, one of which may be trading sex. Though we were unable to test this in the current study, previous research shows that being orphaned is linked to street youths' substance use and/or unsafe sexual practices (Thurman et al., 2006). Additionally, our results show that parental drug misuse is associated with youth's HIV-positive status. It is possible that parents who misuse drugs pass the message to their child that drug use is acceptable, which may result in higher drug use among youth, and drug use is a risk factor for HIV. For example, prior research finds that parental substance misuse is linked to street youths' substance use and/or unsafe sexual practices (Nkowane et al., 2004).

At the bivariate level, youth who reported past month binge drinking were more likely to be HIV positive. It is likely that drinking large quantities of alcohol puts youth in a vulnerable position where others may sexually victimize them (Oyefara, 2005; Wutoh et al., 2006). Additionally, substance use and sexual behavior are inextricably linked: in a study of six countries in sub-Saharan Africa, students who had 20 to 30 drinks in the past 30 days

were almost 20 times more likely to ever have had sex (Page & Hall, 2009). Thus, drinking likely coincides with unsafe sexual behaviors, which increases youths' risks for HIV.

Though simple logistic regression results reveal that being homeless (i.e., not having a home to return to) and parental drug misuse are important for explaining youths' HIV-positive status, none of the other variables in the models reached statistical significance. One possible explanation for this may be due to the low prevalence rate of HIV among our sample, which was approximately 6%. Related, because females generally report having higher rates of HIV infection compared to males (Glynn et al., 2001), and our sample included a small number of females (28%), this may also have accounted for the lower prevalence rate of HIV found in our sample compared to prior research (Jaspan et al., 2006). Finally, it is plausible that because this is such a high-risk population, it is difficult to tease out any single factor that increases risk of HIV. Instead, it is likely that numerous factors simultaneously influence youths' HIV risk.

Some limitations should be noted. First, because the data are self-reported we are unable to verify youths' responses such as their binge drinking or their friends' drug use. Second, the cross-sectional data precludes inferences about causality. For example, though being homeless likely influences survival techniques used by some youth, which subsequently influenced their HIV status, it is possible that some youth were HIV positive prior to becoming homeless. Third, we asked youth if they had a home to return to. In hindsight, it would have been beneficial to know length of time away from home, as a longer time period may have been a better predictor of HIV status. Finally, although we had 250 street youth, less than 7% of these youth were HIV positive. Thus, there is sufficient power for evaluating HIV knowledge questions, but somewhat limited power to detect a large number of predictors of HIV status.

Conclusion and recommendations

Despite these limitations, this study highlights the fact that being homeless and having a parent with drug use problems are risk factors associated with street youths' HIV-positive status. Additionally, this is one of the few studies in sub-Saharan Africa that has done HIV testing with street youth while simultaneously examining social risk factors (e.g., community, family, and peers) for HIV status. Furthermore, this study underscores the fact that though education about HIV is increasing, there is still room for further improvement as many youth still incorrectly answer questions about how HIV is transmitted and prevented. Education targeting street youth regarding HIV knowledge as well as potential risks for HIV and its link with substance use and sexual risk behavior is warranted.

Future studies should include measures of sexual risk-taking behavior (e.g., trading sex) along with substance use and HIV testing as well as strive to obtain larger samples of females so that we can more accurately determine the prevalence rate of HIV among Zambian street youth. Additionally, future research may wish to examine positive elements that could be protective behavioral strategies against using alcohol and drugs, which may serve to lower the risk for HIV. Given that substance use is inextricably linked with engagement in risky sexual behaviors, which escalate HIV transmission and acquisition, a

continued focus on this region and this particular population is critical in order to determine protective mechanisms that will help youth abstain from substance use and subsequently, risky sexual behavior. Though the protective mechanisms we examined were not significant, future research should expand the study of protective factors to learn more about how these might operate to offset risk for this population.

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