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Stress, Substance Use and Sexual Risk Behaviors among Primary Care Patients in Cape Town, South Africa

Lyndsay Ammon Avalos^{1,2}, Jennifer R. Mertens³, Catherine L. Ward^{4,5}, Alan J. Flisher^{4,6,7}, Graham F. Bresick⁸, and Constance M. Weisner^{3,9}

¹Alcohol Research Group, Emeryville, California, USA

²University of California, Berkeley, School of Public Health, Department of Epidemiology, Berkeley, California, USA

³Division of Research, Kaiser Permanente, Oakland, California, USA

⁴Department of Psychiatry and Mental Health, University of Cape Town, Cape Town, South Africa

⁵Child, Youth, Family and Social Development, Human Sciences Research Council, Cape Town, South Africa

⁶Research Centre for Health Promotion, University of Bergen, Norway

⁷Adolescent Health Research Institute, University of Cape Town, Cape Town, Cape Town, South Africa

⁸School of Public Health and Family Medicine, University of Cape Town, Cape Town, South Africa

⁹Department of Psychiatry, University of California San Francisco, San Francisco, California, USA

Abstract

We assessed the relationship between stress, substance use and sexual risk behaviors in a primary care population in Cape Town, South Africa. A random sample of participants (and over-sampled 18–24 year olds) from 14 of the 49 clinics in Cape Town's public health sector using stratified random sampling (N=2,618), was selected. We evaluated current hazardous drug and alcohol use and three domains of stressors (Personal Threats, Lacking Basic Needs, and Interpersonal Problems). Several personal threat stressors and an interpersonal problem stressor were related to sexual risk behaviors. With stressors included in the model, hazardous alcohol use, but not hazardous drug use, was related to higher rates of sexual risk behaviors. Our findings suggest a positive screening for hazardous alcohol use should alert providers about possible sexual risk behaviors and *vice versa*. Additionally, it is important to address a broad scope of social problems and incorporate stress and substance use in HIV prevention campaigns.

Keywords

substance use; alcohol use; drug use; ASSIST; sexual risk behaviors; stressors

Introduction

There is evidence that exposure to stressful events and circumstances (i.e., stressors) increases the risk of HIV infection (Ewart and Suchday, 2002; Kalichman et al., 2005; Kalichman et al., 2006b; Latkin et al., 2005). Also, there is a positive association between substance use and sexual risk behavior (Campbell and Mzaidume, 2002; Mnyika et al., 1997; Mpofo et al., 2006; Myer et al., 2002; Palen et al., 2006). However, few studies have investigated the effect of stressors and substance use on sexual risk behaviors simultaneously (Kalichman et al., 2005; Kalichman et al., 2006b). In this study we examine the independent relationship between stressors, hazardous substance use and sexual risk behaviors in a population-based sample of individuals seeking primary care in public sector outpatient clinics in Cape Town, South Africa.

Stressors and Sexual Risk Behaviors

Prior research suggests that stressors resulting from neighborhood events and conditions may play an integral role in exacerbating disease processes and undermining health (Ewart and Suchday, 2002) including HIV infection (Kalichman et al., 2005; Kalichman et al., 2006b; Latkin et al., 2005). For example, Ewart & Suchday (2002) found that neighborhood disorder such as drug dealing in close proximity, the presence of drunken strangers near the home and gang fights as well as exposure to violence (whether the violence is inflicted on oneself by someone else or inflicted on a close friend or family member) has direct adverse effects on health outcomes. Latkin et al. (2005) found a direct connection between community stressors (such as neighborhood social disorder, violence, crime, loitering) and psychological distress. Psychological distress in turn was related to behavioral risk factors for HIV transmission. In addition, Wong et al. reported a relationship between exposure to community violence and sexual risk behavior (Wong et al., 2008). Kalichman et al. examined the relationship between stress and sexual risk behaviors in South Africa (Kalichman et al., 2005; Kalichman et al., 2006b). Specifically they assessed two domains of stressors; poverty-related stressors and personal threats. While they did not find a direct association between personal threat stressors and sexual risk behaviors, a significant association was found between poverty-related stressors and more risky behaviors. The empirical evidence linking stress and poor health (Kalichman et al., 2005; Kalichman et al., 2006b; Latkin et al., 2005), as well as the high morbidity and mortality rates in South Africa, underscore the need for further studies that examine the relationship between stress and sexual risk behaviors (Kalichman et al., 2005; Kalichman et al., 2006b).

The potential impact of the effect of relationship problems and health problems on sexual risk behavior in South Africa has not been studied. To our knowledge only one study among US high school students evaluated the relationship of physical disability and/or chronic disease to sexual risk behaviors (Jones and Lollar, 2008). However, research on social support has linked the absence of social ties to family and friends as well as a lack of community involvement to premature death, regardless of one's initial health (Berkman and Syme, 1979; House et al., 1982). Within poorer communities which may be faced with unemployment, poor housing and other poverty-related stressors, the effects of one's own or a loved one's ill health may exacerbate stress (Sarason et al., 1985). In addition, teenage pregnancy rates in South Africa have increased in recent years (Dorrington et al., 2006). Unplanned pregnancies are also stressors, as they increase demands on households for food and other resources, and may interfere with the parents' ability to work or study. Interpersonal problems also likely result in psychosocial stress which in turn may play an integral role in HIV infection by increasing sexual risk behavior.

Substance Use and Sexual Risk Behaviors

It is well-established that substance use is related to sexual risk behavior in some of Africa's nations (Campbell and Mzaidume, 2002; Mnyika et al., 1997; Myer et al., 2002). In South Africa, at the same time rates of HIV/AIDS are of great concern, rates of alcohol consumption are rising (Parry et al., 2004a) and the prevalence of problematic substance use among public sector primary care patients exceeds 10% (Ward et al., 2008). Thus, understanding the relationship between alcohol consumption and sexual risk behavior in South Africa is highly important (Kalichman et al., 2003; Kalichman et al., 2006a; Kalichman et al., 2005; Kalichman et al., 2006b; Morojele et al., 2006; Simbayi et al., 2004; Smit et al., 2006). While some of the recent studies have used validated substance use screening measures such as the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) or Alcohol Use Disorder Identification Test (AUDIT) (Kalichman et al., 2006a; Simbayi et al., 2004; Smit et al., 2006) others have not (Kalichman et al., 2005; Kalichman et al., 2006b). One study conducted in a community-based South African sample (Smit et al., 2006) assessed alcohol problems using the AUDIT and found a significant association between problematic alcohol use and having sex while using alcohol or drugs. Two other studies assessing alcohol use with a validated measure were conducted in South African specialty populations. For example, Simbayi et al. (2004) and Kalichman et al. (2006a) used the AUDIT to measure problematic alcohol use and found a significant relationship between problem drinking and sexual risk behaviors among a sample of men and women seeking services from sexually transmitted infection (STI) clinics in South Africa.

The two remaining studies evaluated any lifetime use of alcohol consumption in a sample of participants from three Cape Town communities (Kalichman et al., 2005; Kalichman et al., 2006b). While both studies found significant relationships between alcohol use and multiple sexual risk behaviors, alcohol use was defined as ever drinking alcohol in one's lifetime compared to never drinking alcohol. Findings from these studies underscore the need for research elucidating the role of current problematic alcohol use in relation to risky behavior as such knowledge has important implications for HIV and other STI interventions.

In addition to alcohol, illicit substance use is on the rise in South Africa. In particular, methamphetamine use is rapidly increasing and has become the main drug of abuse reported at treatment centers in the Western Cape (Morris and Parry, 2006). Studies targeting South African adolescents have found a relationship between illicit substance use and sexual risk behaviors. For example, in studies of contraceptive non-use among sexually active high school students, inhalants increased the risk of unprotected sex (Flisher and Chalton, 2001). Similarly, studies conducted outside South Africa found that illicit drug use was linked to condom non-use (Biglan et al., 1990; Hingson et al., 1990; Shrier et al., 1997) and multiple sexual risk behaviors (Ammon et al., 2005). Thus measuring problematic drug use as well as alcohol use in relation to sexual behavior is crucial.

Conceptual Model

This study adapts a conceptual model by Kalichman et al. evaluating stressors and substance use in relation to sexual risk behaviors (Kalichman et al., 2006b). Their model suggests that sexual risk behaviors are influenced by stressors resulting from a lack of basic needs and personal threats. We adapt this to include a third domain of stressors, i.e., interpersonal problems, which prior research has found to be important stressors which may affect health problems (Sarason et al., 1985). Importantly, to our knowledge this study is the first South African study to use a validated measure of current (past three month) *hazardous* substance use (WHO ASSIST Working Group, 2002) within this conceptual framework. Further it uses a population-based sample of public sector patients seeking primary health care, an important setting for providing screening and intervention. We hypothesize that poverty-related stressors,

personal threat stressors and interpersonal problem stressors will be related to higher rates of risky behaviors. We also hypothesize that those who screen positive for problematic substance use will have a higher rate of sexual risk behaviors compared to those who do not.

Methods

Study Site and Procedures

The study employed a multi-stage cluster, stratified sampling design. Consistent with other South African research, we stratified the 49 Community Health Centres (CHCs) providing primary care in Cape Town by race as defined under apartheid, because of the continuing association with health disparities and substance use (Mager, 2004; McIntyre and Gilson, 2000). Proportions of race groups served at each clinic were estimated by the nursing and reception staff, because demographic characteristics such as race are not recorded by the CHCs. Stratification was based on clinics serving populations in which 80% or more were Coloured; 80% or more were Black; and those serving more equal proportions of each racial group. Fourteen clinics were randomly selected proportional to the annual number of visits: six from the larger Coloured stratum and four from each of the other two strata. Patients aged 18–24 were over-sampled as they visit the clinic less frequently and are found to be at higher risk. A total of 6,135 patients were sampled, and 2,618 (43% response rate) were interviewed. The reasons selected patients were not interviewed are as follows: the patient had already been seen by the doctor and left the clinic by the time the interviewer sought them ($n=2688$, 76%), the interviewer with the necessary gender or language match was absent that day ($n=293$, 7%), the patient did not speak 1 of the 3 languages included in the study ($n=136$, 4%), the patient was too ill to be interviewed ($n=58$, 2%), interviewer believed the patient was too cognitively impaired to consent ($n=30$, <1%), the patient was accompanied by a child and did not want to be interviewed in the child's presence ($n=8$, <1%), the patient refused ($n=142$, 4%). These non-response rates appear to be primarily related to practical arrangements within the clinics, such as aspects of patient flow through the clinic and waiting times, and are unlikely to reflect systematic bias in terms of the variables of interest (Ward et al., 2008).

Sample

A total of 2,618 patients (1,128 men, 1,490 women) were recruited as they waited for their medical visit. The weighted sample consisted of a majority of Black participants (60%), followed by Coloured (39%), with few Whites (1%) or Indians (<1%). Only 9% was less than 25 years old, nearly half were married (45%), and 10% had less than a high school education. (For more information on the construction of the weights, see Data Analysis Section). Less than a third of the sample was employed (30%) and 44% reported the head of the household was unemployed. Twenty-two percent of the participants lived in informal housing, 9% reported they did not have electricity, and 6% did not have access to piped water. Most participants were interviewed in Xhosa (58%), 38% were interviewed in Afrikaans, and 24% in English.

Measures

The questionnaire was developed in English, translated into Afrikaans and Xhosa and checked through back-translation into English.

Demographic Characteristics

Demographic data collected included age (18–24 vs. ≥ 25 years), race (black vs. coloured/other) and gender.

Sexual Risk Behavior

The sexual risk behavior variable included a count of the number of risk behaviors out of six. Five of the risk behaviors were related to practices within the past year; had a partner who ever traded sex for drugs, transportation, or money (including with respondent), had a partner who was a man who has ever had sex with a man, had a partner who used injection drugs, had a partner who had an STI, or had multiple partners (2+). The final risk behavior was failure to use a condom at last intercourse.

Hazardous Substance Use

We used the ASSIST (Alcohol, Smoking and Substance Involvement Screening Test) (WHO ASSIST Working Group, 2002) to assess hazardous alcohol and drug use. It is a validated brief screening questionnaire designed for use by primary health care workers in a range of health care settings to screen for hazardous or harmful use of alcohol, tobacco, and illicit drugs. The ASSIST asks six questions for alcohol and each type of drug and tobacco, including frequency of use, having a “strong desire or urge” to use, having had legal, financial, social, or health consequences of use, failure to do what was normally expected because of use, having someone express concern about use, and having failed to cut down or stop using. Possible ASSIST scores for alcohol and each drug range from 0 to 33.

We adapted the ASSIST to local conditions in two ways (Ward, et al. 2005; Ward et al., 2008). Methaqualone was added to the list of drugs due to its high frequency of use in South Africa. In addition, local drug names for both cannabis (dagga) and methaqualone (Mandrax) were included. As per the WHO ASSIST scoring instructions, specific scores were calculated for each substance where use was reported in the prior three months. These can be categorized as low- (including zero), medium- and high-risk use. Medium risk indicates problematic use, while high risk indicates high probability of dependence (Henry-Edwards et al., 2003). We dichotomized the risk category at the threshold of hazardous risk so that medium and high risk were coded “1” and low and no risk was coded “0.” The instrument has high reliability (Newcombe et al., 2005; WHO ASSIST Working Group, 2002).

Stressors

We considered three domains of stressors: lacking basic needs, personal threats and interpersonal problems. The stressor questions were taken from the International Classification of Primary Care, Second Edition (ICPC-2) (World Health Organization, 1998), with the addition of one question which asked about unplanned pregnancies. The ICPC-2 lists 23 stressors that may be reasons for seeking health care. Rates of births to teenagers are very high in South Africa, can be a considerable family stressor and are associated with increased risk for HIV infection (Bradshaw et al., 2004; Smit et al., 2004), but are not addressed in the ICPC-2. The stressors included in the three domains are described in the following respective sections.

Lacking Basic Needs—Of the six stressors in the lacking basic needs domain, two were taken from the ICPC-2 and addressed occurrences within the prior 12 months, while four addressed the respondents' current living circumstances. The two questions from the ICPC-2 asked whether the respondent had problems getting food or water, and whether they had lost their home. The other four lacking basic needs items included: no piped water at home, no electricity for lighting at home, the head of the household is not employed, and respondent lives in a shack, wendy house/backyard dwelling, tent or other traditional dwelling, as opposed to a house or flat. These are items from the South African census and correlate with health-related deprivation in urban areas (McIntyre et al., 2002).

Personal Threats—Four items taken from the ICPC-2 comprise the personal threats domain. These pertain to experiences in the past year and include: been in a situation in which you were

seriously injured, had legal problems or problems with the police, lost your job/been unemployed/had problems with your pension, had important things stolen from you. The grouping was based on a prior study which combined similar stressors from a different instrument into one domain (Kalichman et al., 2006b).

Interpersonal Problems—The interpersonal problems domain consists of two categories of stressors, and a separate item taken from the ICPC-2, as well as one question added based upon previous research (Ward et al., 2008). The first category deals with having lost or having an ill family member and includes a positive response to any of the following; 1) lost your partner, your partner died or left, or you divorced, 2) lost your child, 3) lost a parent or other family member (not your child or partner), 4) had problems with partner being ill, 5) had problems with child being ill, 6) had problems with an illness in a parent or another family member (not your partner or child). The second category, relationship problems, consists of stating “yes” to any of the following six; 1) had problems in your relationship with your partner (husband, wife, boyfriend, or girlfriend) 2) had problems in your relationship with your child, 3) had problems in your relationship with your parents or another family member (not your child or partner), 4) had problems in a relationship with a friend or with others (not your family), 5) had problems in your relationship with your neighbors, 6) had problems with your co-workers or supervisors at work. Suffering from bad health, was the third possible interpersonal problem stressor. The fourth item was added to the questionnaire by the study team, “Have you or anyone else in your household had an unplanned pregnancy?” As discussed above, this was included because rates of teenage pregnancies are very high in South Africa (Dorrington et al., 2006) and are often a reason for a primary care visit.

Data Analysis

Weights were constructed to adjust for the over-quota of 18 to 24 year-olds, differential non-response rates (by gender, age, and race) within clinics, the size of the clinics proportion to the full population served by Cape Town's Community Health Centres and the stratified sampling design. Weights ranged from 0.02 to 12.1 (median=0.34; interquartile range =0.14–0.72). All analyses were weighted accounting for the study's multi-stage, clustered, stratified design. Pearson's Chi-square (corrected for survey design using the second-order correction of Rao and Scott (Rao and Scott, 1984) and converted into an F statistic) was used to evaluate categorical data. The distribution of the dependent variable (number of sexual risk behaviors) followed a Poisson distribution. A Poisson model was fit first, but due to overdispersion (extra-Poisson variation) the negative binomial model was found to be a better fit (Hilbe, 2007). Therefore, a negative binomial regression model was conducted to model the association between stressors, hazardous substance use and the number of sexual risk behaviors while adjusting for age, gender and race. To determine which predictor variables to include in the final model we conducted bivariate analyses with each predictor (demographic characteristics, stressors, hazardous substance use) and the dependent variable, sexual risk behaviors. Significant predictors ($p < 0.05$) were considered in multivariable analyses. To assess the relationship between stressors and demographic characteristics without hazardous substance use we first fit a model with all significant demographic characteristics and stressors. The final model included all demographic characteristics, stressors and hazardous substance use measures significantly associated with sexual risk behavior in the bivariate models. The measure of effect is an incidence rate ratio (IRR).

Results

Twenty-six percent of the participants reported a minimum of one sexual risk behavior (Table 1). Of all participants, 20% reported one sexual risk behavior, 5% reported 2 risk behaviors, and <1% reported each of 3, 4, 5, and 6 sexual risk behaviors. The two most prevalent sexual

risk behaviors were having multiple sex partners in the last year (14.8%) and not using a condom at last intercourse (12.6%) (Table 2).

Younger age, gender and race were each significantly associated with one or more sexual risk behaviors. Forty-four percent of the 18–24 year olds reported at least one sexual risk behavior compared to only 25% of the older participants ($p < 0.001$). Males (39%) compared to females (19%) were more likely to report sexual risk behaviors.

Several *personal threats* stressors were related to engaging in sexual risk behavior. Participants with legal problems, as well as those who were victims of a serious injury (Injury) or those who had important things stolen from them (Crime) were significantly more likely to report engaging in sexual risk behaviors (Table 1). Only one *lacking basic needs* stressor was significantly associated with sexual risk behavior. Participants who lived in a house in which the head of the household was unemployed were less likely to engage in risky behaviors compared to participants living in households in which the head was employed ($p < 0.05$). Stress resulting from relationship problems was the only *interpersonal problems* stressor related to risky sexual behavior. Participants with relationship problems (35%) were more likely to report sexual risk behavior compared to participants without relationship problems (21%, $p < 0.01$). Finally, hazardous alcohol users (52% versus 22%, $p < 0.001$) and hazardous drug users (53% versus 25%, $p < 0.001$) were more likely to engage in sexual risk behaviors compared to non-hazardous substance users.

Among the *personal threat stressors*, losing one's job or pension was not significantly related to any sexual risk behaviors (Table 2). However, victims of a serious injury and participants who had important things stolen from them were more likely to engage in five of the six risk behaviors, having a partner who ever traded sex for drugs or money, having a partner who used injection drugs, having a partner who was a man who has had sex with another man, having a partner who had an STI and not using a condom during last sexual intercourse ($p < 0.05$ for all).

Very few significant differences were found between the *lacking basic needs* stressors and the individual sexual risk behaviors (Table 2). Participants living in a situation in which the head of the household was unemployed were less likely to report having sex with a partner who has had an STI, having multiple sex partners and not using a condom at last sexual intercourse ($p < 0.05$ for all).

Each of the four *interpersonal problems* stressors was significantly related to one sexual risk behavior. For example, participants with relationship problems were less likely to use a condom at last intercourse compared to participants without relationship problems ($p < 0.05$).

Hazardous alcohol use was significantly related to all sexual risk behaviors with the exception of a partner who has ever had sex with a man ($p < 0.05$). Hazardous drug use was not significantly associated with using a condom at last intercourse, but was significantly related to all other sexual risk behaviors ($p < 0.05$).

Table 3 shows the negative binomial regression models examining the relationship between demographic characteristics, stressors, hazardous substance use and sexual risk behaviors. The column of table three titled, “unadjusted models” displays the bivariate results for each specific predictor and the dependent variable, sexual risk behaviors. For example, in a model with only hazardous alcohol use predicting sexual risk behaviors, hazardous alcohol use was significantly associated with a higher rate of sexual risk behaviors. All significant predictors were included in Model 1 and/or Model 2.

The first multivariable model (Table 3, Model 1) included all significant predictors of sexual risk behaviors with the exception of the two hazardous substance use variables. The results

suggest that younger participants and males had a higher rate of sexual risk behaviors compared to older participants and females (IRR: 1.6, 2.7, respectively, $p < 0.05$). Blacks were less likely to engage in sexual risk behaviors compared to others (IRR: 0.7, $p < 0.05$). After adjusting for demographic characteristics, two *personal threats* stressors remained significantly associated with sexual risk behaviors. Participants with legal problems had a higher rate of sexual risk behavior compared to participants without legal problems (IRR: 1.3, $p < 0.05$). In addition, victims of a serious injury were more likely to report sexual risk behaviors compared to participants who had not suffered a serious injury (IRR: 1.5, p -value < 0.05). Living in a situation in which the head of the household was not employed was the only *lacking basic needs* stressor significantly related to sexual risk behavior (IRR: 0.7, $p < 0.05$). Participants who reported relationship problems had a higher rate of sexual risk behaviors (IRR: 1.5, $p < 0.05$). Relationship problems were the only *interpersonal problem* stressors significantly related to sexual risk behavior.

Inclusion of hazardous substance use in the model affected the significance of one personal threats stressor (suffering from an injury) and the single lacking basic needs stressor (head of household not employed) (Table 3, Model 2). However, the IRRs remained predominately the same for all demographic characteristics and other stressors. Controlling for other variables in the model, hazardous alcohol users had a higher rate of sexual risk behavior compared to non-hazardous alcohol users (IRR: 1.5, $p < 0.05$). Hazardous drug use was not significantly related to sexual risk behavior in the multivariable model.

Discussion

Our results suggest that both stressors and hazardous substance use have independent relationships with sexual risk behaviors. We found strong relationships between several personal threat stressors and risky sexual behavior even after hazardous alcohol use was considered. In addition, several demographic characteristics were significant predictors of sexual risk behaviors.

The relationship between several personal threat stressors and sexual risk behavior did not diminish after including hazardous alcohol use and hazardous drug use in the model. These findings demonstrate the robust relationship between these stressors and sexual risk behaviors. Our findings are contrary to previous research which did not find a direct relationship between such stressors and HIV risk behavior (Kalichman et al., 2007; Kalichman et al., 2005). The discrepancy may be a result of differing methods to evaluate personal threat stressors. For example, our study evaluated whether the participant experienced each individual personal threat stressor, whereas Kalichman et al. (Kalichman et al., 2007) assessed the perceived degree of a problem the stressor was and then evaluated personal threat stressors as a scale. In addition, our study used different instruments to assess the various stressors.

We did not find a significant link between a lack of basic needs and sexual risk behaviors, both contradicting and supporting previous research. In one study, Kalichman et al (2005) reported a significant direct relationship. However, another study from a township and surrounding settlements, reported a direct relationship between a lack of basic needs for Africans, but not for Coloured participants (Kalichman et al., 2005). The current study did not find a significant association when hazardous alcohol use and hazardous drug use were included. This discrepancy may be due to the sampling differences between the studies. Our study was based in public settings. It included a sample of all public primary health clinics in Cape Town, increasing the likelihood of a more homogeneously lower socio-economic-status population. In Kalichman's study, participants were recruited from three different sociodemographic areas (Kalichman et al., 2006b). Our lack of a significant finding may be an artifact of little to no variance in our population with regard to the lacking basic needs stressor domain. Further

research needs to be conducted on a lack of basic necessities and how such a stressor may relate to sexual risk behaviors for HIV and other sexually transmitted infections.

Adding to the literature we found a significant relationship between one interpersonal problem stressor and engaging in sexual risk behavior. Experiencing relationship problems is related to higher rates of sexual risk behaviors. Further research using qualitative and longitudinal quantitative methods could illuminate the direction of this relationship, which this cross-sectional study cannot do.

In this sample of primary health care patients in Cape Town, South Africa, hazardous alcohol use was strongly related to sexual risk behavior. Not only were hazardous alcohol users engaging in a greater number of risky behaviors, but they were also more likely not to use a condom at last sexual intercourse. These findings are similar to previous research on alcohol use and sexual risk behaviors in South Africa (Flisher and Chalton, 2001; Flisher et al., 2000; Kalichman et al., 2005; Kalichman et al., 2006b; Mpofu et al., 2006; Palen et al., 2006).

In our study, hazardous drug use was not related to sexual risk behavior when controlling for hazardous alcohol use. When hazardous alcohol use was excluded from the multivariable model, the relationship between hazardous drug use and sexual risk behavior remained unchanged, and not significantly associated with higher rates of sexual risk behaviors. These results contradict previous findings which have found a significant association between drug use and sexual risk behaviors in South Africa (Kalichman et al., 2006b; Simbayi et al., 2006). A possible explanation for these contrary findings is the use of different instruments and time frames for assessing drug use. For example, in the Kalichman (2006b) study, drug use corresponded to any lifetime drug use, whereas our study evaluated current hazardous drug use. While Simbayi (Simbayi et al., 2006) found an association between methamphetamine use and risky sexual behaviors, they compared methamphetamine users to other non-methamphetamine drug users. A second possible explanation is that the most prevalent drug in the current study was marijuana at the time this study was conducted. Marijuana may have less dramatic effects on behavior than “harder” drugs such as methamphetamines, which are now becoming highly prevalent in South Africa (Volkow et al., 2007).

As previously reported (Ward et al., 2008), slightly more than one-fifth of our sample screened positive for hazardous substance use during a period in which reports indicate an increase in alcohol consumption in South Africa (Parry et al., 2004a). Our results not only show a significant relationship between hazardous substance use and sexual risk behaviors, but they also suggest the possible consequences that an increase in substance use may have on the HIV epidemic. Screening and interventions for hazardous substance use in public sector primary care clinics may also reduce sexual risk behaviors linked to HIV and other STIs, and this population may be an important target for HIV interventions.

Limitations

Our findings should be interpreted within the study's limitations. First, these data are based on self report and are thus subject to the limitations of self-report bias. For example, the prevalence of hazardous substance use is subject to biases such as problems recalling drug use and social desirability of responses (Johnson and Fendrich, 2005). However, the ASSIST has been found to be reliable and acceptable for screening use internationally (WHO ASSIST Working Group, 2002), and to have validity similar to other established self-report instruments (Newcombe et al., 2005). Due to the timing of the study, the more recent epidemic in methamphetamine use (Parry et al., 2004b) is not reflected in our data. We also missed a large number of patients. However, this was most likely caused by factors related to the clinics' ability to process patients, and not to the variables under study, and so is unlikely to have introduced any systematic bias.

Finally, this study is a cross-sectional design. Therefore, all findings can only be interpreted as associations and we cannot draw causal inferences. Future longitudinal studies should be conducted to establish causal associations between stressors, hazardous substance use and sexual risk behaviors.

Conclusion

Our study has important implications for targeted HIV prevention efforts. Our findings suggest that a patient who screens positive for hazardous alcohol use should also be screened for sexual risk behaviors and vice versa. Additionally, our findings accentuate the importance of addressing the broader scope of social problems and incorporating societal factors in HIV prevention campaigns.

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Table I

Demographic characteristics, substance use, and stressors by engagement in 1+ sexual risk behaviors (n=2618)

	Proportion of Total Sample (n=2618) (%)	Proportion of Total Sample with 1+ Sexual Risk Behavior (26%) (%)	p-value *
Demographics			
<i>Age</i>			
18–24	8.7	44.1	<0.001
25+	91.3	24.5	
<i>Gender</i>			
Male	36.2	38.8	<0.001
Female	63.8	18.8	
<i>Race</i>			
Black	59.5	22.6	0.0098
Coloured/Other	40.5	31.2	
Stressors			
<i>Personal Threats</i>			
<i>Legal Problems</i>			
Yes	9.7	43.2	<0.001
No	90.3	24.6	
<i>Injury</i>			
Yes	8.0	55.3	<0.001
No	92.0	23.6	
<i>Crime</i>			
Yes	19.8	36.0	0.0096
No	80.2	23.7	
<i>Lost job or grant</i>			
Yes	64.7	26.3	0.9599
No	35.3	26.2	
<i>Lack of Basic Needs</i>			
<i>Problems getting food or water</i>			
Yes	32.3	27.2	0.7188
No	67.7	25.8	
<i>Lost Home</i>			
Yes	3.8	25.7	0.9103
No	9.6	26.2	
<i>No electricity in home</i>			
Yes	8.6	25.0	0.8953
No	91.4	26.2	
<i>No water in home</i>			
Yes	5.9	34.6	0.3884
No	94.1	25.6	
<i>Live in dwelling</i>			

	Proportion of Total Sample (n=2618) (%)	Proportion of Total Sample with 1+ Sexual Risk Behavior (26%) (%)	p-value*
Yes	21.8	26.2	0.9625
No	78.2	26.1	
<i>Head of house not employed</i>			
Yes	55.7	19.3	0.0181
No	44.3	34.9	
Interpersonal Problems			
<i>Lost a family member or have an ill family member</i>			
Yes	52.8	26.8	0.798
No	47.1	25.8	
<i>Suffering from bad health</i>			
Yes	42.1	24.5	0.3888
No	57.9	27.3	
<i>Relationship problems</i>			
Yes	37.1	35.3	0.0015
No	62.9	20.9	
<i>Unexpected pregnancy in the house</i>			
Yes	14.4	28.9	0.2852
No	85.6	25.8	
Hazardous Substance Use			
<i>Alcohol Use</i>			
Yes	12.6	51.9	<0.001
No	87.4	22.4	
<i>Drug Use</i>			
Yes	3.4	52.7	<0.001
No	96.6	25.2	

* p-value compares engagement in 1 or more sexual risk behavior to not engaging in sexual risk behaviors.

Table II

Sexual risk behaviors by stressors and hazardous substance use

	Partner who ever traded sex for drugs or money (%)	Partner who used injection drugs (%)	Partner who has ever had sex with a man (%)	Partner who has had an STI (%)	Had multiple sex partners (2+) (%)	Did not use a condom (%)
Proportion of total sample	2.1	0.9	0.7	4.6	14.8	12.60
Stressors						
Personal Threats						
<i>Legal Problems</i>						
Yes	6.5*	1.8	2.0*	5.9	21.4*	22.5*
No	1.6	0.7	0.6	4.5	14.2	11.7
<i>Injury</i>						
Yes	8.7*	4.6*	6.0*	22.0*	24.7	31.9*
No	1.5	5.0	0.3	3.0	13.8	11.1
<i>Crime</i>						
Yes	5.3*	2.4*	2.4*	10.8*	15.6	20.0*
No	1.2	0.4	0.3	3.1	14.4	11.0
<i>Lost job or grant</i>						
Yes	2.2	0.9	0.7	3.9	13.8	13.3
No	1.7	0.7	0.8	6.0	16.8	11.5
Lack of Basic Needs						
<i>Problems getting food or water</i>						
Yes	4.2*	1.2	1.1	6.4	11.0	16.1*
No	1.5	0.7	0.6	3.8	16.0	11.0
<i>Lost Home</i>						
Yes	3.3	2.5	6.0*	12.2	11.9	14.6
No	2.0	0.8	0.5	4.6	14.8	12.7
<i>No electricity in home</i>						
Yes	<1*	0.0	0.3	4.3	15.6	8.2
No	2.2	0.9	0.8	4.6	14.7	13.0
<i>No water in home</i>						

	Partner who ever traded sex for drugs or money (%)	Partner who used injection drugs (%)	Partner who has ever had sex with a man (%)	Partner who has had an STI (%)	Had multiple sex partners (2+) (%)	Did not use a condom (%)
Proportion of total sample	2.1	0.9	0.7	4.6	14.8	12.60
Yes	<1*	0.0	<0.1*	9.6	22.0	6.4
No	2.2	0.9	0.7	4.3	14.3	13.0
<i>Live in dwelling</i>						
Yes	2.1	0.3*	0.6	7.0	17.0	6.7*
No	2.0	1.0	0.8	4.0	14.2	14.2
<i>Head of house not employed</i>						
Yes	2.0	0.7	0.5	2.7*	10.8*	8.6*
No	2.1	1.0	1.1	7.1	20.0	17.7
Interpersonal Problems						
<i>Lost a family member or have an ill family member</i>						
Yes	2.3	1.0	0.8	5.4*	13.6	14.2
No	2.1	0.6	0.7	3.8	16.4	11.1
<i>Suffering from bad health</i>						
Yes	2.2	1.0	0.9	5.3	12.5*	13.3
No	2.0	0.7	0.6	4.2	16.3	12.4
<i>Relationship problems</i>						
Yes	2.7	1.3	1.2	6.8	18.3	17.3*
No	1.7	0.6	0.4	3.4	12.8	9.9
<i>Unexpected pregnancy in the house</i>						
Yes	1.1	0.7	1.5	4.8	18.7*	13.5
No	2.3	0.9	0.7	4.6	14.1	12.7
Hazardous Substance Use						
<i>Alcohol Use</i>						
Yes	9.6*	2.4*	1.4	14.2*	37.9*	17.3*
No	1.0	<1	<1	3.3	11.4	11.9
<i>Drug Use</i>						

	Partner who ever traded sex for drugs or money (%)	Partner who used injection drugs (%)	Partner who has ever had sex with a man (%)	Partner who has had an STI (%)	Had multiple sex partners (2+) (%)	Did not use a condom (%)
Proportion of total sample	2.1	0.9	0.7	4.6	14.8	12.60
Yes	9.1*	5.5*	6.0*	9.5*	29.2*	21.6
No	1.8	0.7	0.5	4.4	14.3	12.3

* p < 0.05 comparing engagement in risk behavior to not engaging in sexual risk behavior.

Table III

Negative binomial regression models evaluating the relationship between stressors, hazardous substance use and sexual risk behaviors

	Unadjusted Models [†] (IRR)	Model 1 [‡] (IRR)	Model 2 [‡] (IRR)
Demographic Characteristics			
Age			
18–24 (vs. 25+)	1.7*	1.6*	1.6*
Gender			
Male (vs. female)	3.1*	2.7*	2.6*
Race			
Black (vs. other)	0.6*	0.7*	0.7*
Personal Threats			
Legal	1.8*	1.3*	1.3*
Injury	3.2*	1.5*	1.5
Crime	1.8*	1.1	1.1
Lost job/grant	0.9		
Lack of Basic Needs			
Problems getting food and water	1.2		
Lost home	1.4		
No electricity in home	0.8		
No water in home	1.1		
Live in dwelling (vs. house)	0.9		
Head of house not employed	0.5*	0.7*	0.7
Interpersonal Problems			
Lost a family member or have an ill family member	1.1		
Suffering from bad health	1		
Relationship problems	1.6*	1.5*	1.5*
Unexpected pregnancy in the house	1.1		
Hazardous Substance Use			
Hazardous alcohol use	2.8*		1.5*
Hazardous drug use	2.3*		1

$p < 0.10$.

[†]Bivariate models predicting the number of sexual risk behaviors,

[‡]Multivariable models predicting the number of sexual risk behaviors, (IRR) = Incidence rate ratio,

* $p < 0.05$, *italics*,