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Mediation effects of problem drinking and marijuana use on HIV sexual risk behaviors among childhood sexually abused South African heterosexual men[☆]

Larry D. Icard^{a,*}, John B. Jemmott III^b, Anne Teitelman^b, Ann O'Leary^c, and G. Anita Heeren^b

^a Center for Intervention and Practice Research, Temple University, College of Health Professions and Social Work, 1301 Cecil B. Moore Avenue, Ritter Annex, Suite B10, Philadelphia, PA 19121, USA

^bUniversity of Pennsylvania, Philadelphia, PA, USA

^cCenters for Disease Control and Prevention, Atlanta, GA, USA

Abstract

HIV/AIDS prevalence in South Africa is one of the highest in the world with heterosexual, transmission predominantly promoting the epidemic. The goal of this study is to examine whether, marijuana use and problem drinking mediate the relationship between histories of childhood sexual, abuse (CSA) and HIV risk behaviors among heterosexual men. Participants were 1181 Black men aged, 18–45 from randomly selected neighborhoods in Eastern Cape Province, South Africa. Audio computer assisted, self-interviewing was used to assess self-reported childhood sexual abuse, problem drinking, and marijuana (dagga) use, and HIV sexual transmission behavior with steady and casual partners. Data were analyzed using multiple mediational modeling. There was more support for problem, drinking than marijuana use as a mediator. Findings suggest that problem drinking and marijuana use, mediate HIV sexual risk behaviors in men with histories of CSA. Focusing on men with histories of CSA, and their use of marijuana and alcohol may be particularly useful for designing strategies to reduce, HIV sexual transmission in South Africa.

Keywords

South Africa; Heterosexual; Men; Mediation; Childhood sexual abuse; Problem drinking; Marijuana use; Eastern Cape

HIV/AIDS prevalence in South Africa is one of the highest in the world with heterosexual transmission predominantly promoting the epidemic. Men play a particularly critical role in containing the heterosexual transmission of HIV. Studies show that childhood sexual abuse (CSA) is related to HIV sexual risk behaviors among men and women (Benotsch et al.,

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* Corresponding author..

2001; O'Leary, Purcell, Remien, & Gomez, 2003; Sweet & Welles, 2012). However, no studies to date have sought to examine the relationship between CSA and sexual transmission risk behavior among a sample comprised exclusively of South African heterosexual men. The present study addresses this gap in the literature.

A meta-analysis of 169 international studies found that lifetime prevalence rates of CSA for females is 25% and for males is 8% (World Health Organization, 2001). A cross-sectional survey of in-school youth in southern African counties in 2003 and 2007 revealed that 19.6% of the female students and 21.1% of the male students aged 11–16 years reported that they had experienced forced or coerced sex (Andersson et al., 2012). Research with rural South African male and female youth in the Eastern Cape found 23.9% of the females and 12.8% of the males reported that they had experienced childhood sexual abuse (Jewkes, Dunkle, Nduna, Jama, & Puren, 2010). The exact prevalence of CSA in the general population is not known as definitions and measures of child sexual abuse differ across studies. Some studies define CSA as the occurrence of some form of direct or indirect physical genital contact experienced by a minor (Andersson et al., 2012; Arreola, Neilands, & Diaz, 2009; Dilorio, Hartwell, Hansen, & Prevention, 2002). Other studies define CSA more broadly to include the sending of electronic sexual images to a minor (Sweet & Welles, 2012). Studies also differ in defining the cut-off age for measuring CSA (Stoltenborgh, van Ijzendoorn, Euser, & Bakermans-Kranenburg, 2011). Measures range from age 13 (Dilorio et al., 2002; Jones et al., 2010; McCarthy, 2010; Wilson, 2010), to more circumscribed criteria, i.e., a sexual experience with a person at least 5 years older than the child if the child was 12 or younger or sexual experience with a person 10 years older if the child was ages 13–16 (Finkelhor, 1979, 2009).

Studies of adults' reports of CSA have primarily focused on women (Dickson, Herbison, & Paul, 2009; Spiegel, 2003). The limited studies of CSA among men have tended to focus on gay and bisexual men (Jewkes et al., 2010; Purcell, Malow, Dolezal, & Carballo-Diequez, 2004; Spiegel, 2003). The sparse research on CSA among heterosexual men is based largely on convenience samples (Lloyd & Operario, 2012; Markowitz et al., 2011). Among the few studies utilizing randomly selected samples, Jewkes et al. (2011) found that childhood trauma measured by emotional abuse and neglect, physical abuse and neglect, and sexual abuse, was associated with rape perpetration in South African men. In a large multisite randomized trial of high-risk U.S. men and women, Dilorio et al. (2002) found men with a history of CSA were 1.23 times as likely to report problems with alcohol use. A qualitative study on a small sample investigating CSA in male victims perpetrated by females found substance abuse, suicide, and self-injury among the reported long term effects (Denov, 2004). Other studies report that alcohol and substance abuse, as well as less sexual satisfaction are common among adult men who are victims of CSA (Finkelhor, 1990; Leary & Gould, 2010; Wilsnack, Wilsnack, Kristjanson, Holm-Vogeltanz, & Harris, 2004a).

Recent efforts have been made to identify mediators of the effects of CSA on HIV sexual risk behaviors. Two behaviors in particular, alcohol and marijuana use, have been found to be associated with a history of CSA among adult men and women (Duncan et al., 2008; Howard & Wang, 2005; Wilsnack, Wilsnack, Kristjanson, Holm-Vogeltanz, & Harris, 2004b). Several authors have presented conceptual models theorizing paths through which

CSA influences cognitions and attitudes resulting in problem behaviors, including alcohol and drug-related behaviors causing HIV risk behaviors (Miller, 1999; Quina, Morokoff, Harlow, & Zurbriggen, 2004). Benotsch et al. (2001) tested, in a sample of self-identified gay and bisexual men, several possible mediators, including substance use and trauma-related anxiety. They reported that men who had been sexually abused in childhood or adulthood exhibited more symptoms of substance use than did other men. A study by O'Leary and colleagues (2003) found a history of CSA to be significantly associated with unprotected anal sex in a sample of HIV-positive men who have sex with men (MSM) in the US, and found this relationship to be mediated by suicidality (receptive anal intercourse), and hostility (insertive anal intercourse).

Numerous researchers have investigated the relationship between HIV sexual risk behaviors and the use of drugs or alcohol among CSA adult victims. Zierler et al. (1991), investigating the causes of transmission of HIV in a sample of women and men who volunteered for a testing and counseling program, found that survivors of CSA used alcohol or tranquilizers 70–80% more than participants not reporting CSA. Studies also show heterosexual men who reported CSA are more likely to use alcohol before sex and to have more sexual partners (Schraufnagel, Davis, George, & Norris, 2010).

The present study

Research indicates that CSA predicts adult involvement in HIV sexual risk behaviors, including unprotected sexual intercourse and sex with multiple partners (Brennan, Hellerstedt, Ross, & Welles, 2007; Koenig, Doll, O'Leary, & Pequegnat, 2004; Lloyd & Operario, 2012). Studies also reveal relationships between CSA and alcohol and substance use. Although the literature suggests that problem drinking and marijuana use are associated with CSA, an understanding of the causal pathways through which these problem behaviors operate to influence HIV sexual risk behaviors is incomplete. Understanding the mechanisms influencing HIV sexual risk behaviors among adult victims of CSA are best explored via mediation analysis (Baron & Kenny, 1986; Hayes and Preacher, 2008). We empirically tested whether associations between CSA and HIV sexual risk behaviors are mediated through problem drinking and marijuana use among Black South African men who have sex with women.

Method

Participants

Institutional review board (IRB) #8 at the University of Pennsylvania, which was the designated IRB under the federal wide assurance of the University of Pennsylvania and the University of Fort Hare, reviewed and approved this study. The participants were residents of townships near East London in Eastern Cape Province, South Africa, including Mdantsane, Scenery Park, Duncan Village, and Gompo Town, and the semi-rural area of Berlin who completed a baseline questionnaire as part of a neighborhood-based health promotion intervention trial.

As reported elsewhere (Jemmott et al., 2013), participants enrolled in the trial during a 25-month period beginning in November 2007. Before recruiting from a neighborhood, research team members met with community leaders to enlist their support. We then held a meeting to inform men about the study and advertised it using posters and other materials. Using geographical clusters tied to census data in the catchment area matched-pairs of neighborhoods were randomly selected. We recruited men at different hours of the day and days of the week at a variety of venues (e.g., taxi ranks, shebeens [people's homes that are dedicated to alcohol sale and drinking], marketplaces) to reach a diversity of men. Men aged 18–45 years who lived in a selected neighborhood, reported vaginal intercourse in the previous 3 months, did not report plans to relocate beyond a reasonable distance from the study site within the next 15 months, and had a photo ID were eligible. We employed audio computer-assisted self-interviewing (ACASI), which provided both audio and video presentation of the questions and response options on a laptop computer to collect data.

Measures

The measures, which had been pilot tested with over 250 men, were available in isiXhosa (following translation and back translation from English), English, and a combination of isiXhosa (audio) and English (visual). We assessed condom use outcomes separately for steady partners (a woman with whom they had a romantic relationship for at least 6 months) and casual partners. Condom use was assessed as the proportion of condom-protected acts of vaginal intercourse within the last three months, condom use at last vaginal intercourse, and the frequency of condom use during vaginal and anal intercourse, rated on a 5-point scale from 1 *never* to 5 *always*. The condom use measures were selected because they are widely used in HIV/STD risk-reduction intervention trials (Crosby et al., 2009; El-Bassel et al., 2010; Jemmott, 3rd, Jemmott, Fong, & Morales, 2010; Kalichman et al., 2007). We used the 4-item CAGE (Cutting down, Annoyance by criticism, Guilty feeling, and Eye-openers) questionnaire (Ewing, 1984), as a continuous variable to assess problem alcohol consumption ($\alpha = 0.73$). We measured marijuana use with the question, how many days in the past month the man had smoked dagga (marijuana). Childhood sexual abuse was measured as the mean response to five binary items used in HIV/STD risk-reduction intervention trials (El-Bassel et al., 2010): Before you were 16 years of age, did anyone have intercourse with you against your will; did anyone force you to lick or suck her vagina or his penis; did anyone put his or her mouth on your penis against your will; did anyone force you to put your finger or an object in her vagina; did anyone put his penis or an object in your bottom or behind or rectum? Participants also completed measures of sociodemographic variables, theoretical mediator variables, health promotion behaviors, and mediators that will be examined in future articles.

We took several steps to increase the validity of self-report measures that have been used in previous HIV/STD risk-reduction intervention studies (Jemmott, 3rd, Jemmott, Braverman, & Fong, 2005; Jemmott et al., 2005; Jemmott, 3rd, Jemmott, & Fong, 1992, 1998; Jemmott, 3rd, et al., 2010; Jemmott, Jemmott, & O'Leary, 2007). To reduce problems in memory, we asked respondents to recall sexual behaviors over a relatively brief period (i.e., 90 days), wrote the dates comprising that period on a whiteboard, and gave them calendars clearly highlighting the dates. We emphasized the importance of responding honestly, informing

them that their responses would be used to create programs for South African men like themselves. We assured participants we would keep their responses confidential. The use of ACASI may also serve to increase participants' motivation to respond accurately (Hewett, Mensch, & Erulkar, 2004; Johnson, Fendrich, & Mackesy-Amiti, 2010; Metzger et al., 2000).

Data analysis

Correlations were performed to establish the relationship between CSA and sexual behavior. Chi-square and t-tests were used to determine if there was a statistically significant difference between men who experienced CSA and men who did not experience CSA for each of the HIV sexual risk behaviors of interest.

Mediation analysis

To address the question of what influence childhood sexual abuse has on HIV sexual risk behaviors through problem drinking and marijuana use, mediation analyses were conducted controlling for age using a single multiple mediation method (Hayes and Preacher, 2008). Fig. 1 depicts the mediation model and shows our hypothesis of how CSA (independent variable) was distributed into its indirect effect on specific HIV sexual risk behaviors (dependent variables) through the two mediators, problem drinking and marijuana use, and its direct effect on specific HIV sexual risk behaviors (path c'). The relationships between CSA and the two mediators, marijuana use and problem drinking are represented through paths a_1 and a_2 . The effects of the two mediators on the specific HIV sexual risk behaviors are represented in paths b_1 and b_2 . The total indirect effect of CSA on each HIV sexual risk behavior is the sum of the indirect effects of the two mediators $\Sigma(a_1 b_1 + a_2 b_2)$. Testing a single multiple mediation model rather than separate simple mediation models offers several advantages. Adding up the indirect effects in several simple mediation analyses to obtain the total indirect effect could result in bias, as multiple mediators are typically intercorrelated (Preacher and Hayes, 2008b). Additionally, a single multiple mediation model allows us to determine to what extent a specific variable mediates an effect between an independent and dependent variable, conditional on the presence of other mediators. It also reduces the likelihood of parameter bias resulting from omitting mediators. Furthermore, it allows us to determine the relative magnitude of the specific effects associated with all mediators (Hayes and Preacher, 2008; Preacher and Hayes, 2008a).

Controlling for age, we analyzed CSA as an independent variable to estimate its direct association with each HIV sexual transmission behavior, path c' . We estimated the associations between CSA and problem drinking and marijuana use (path a) and the associations between problem drinking and marijuana use and each HIV sexual risk behavior (path b). All outcomes were binary variables; therefore associations were tested with logistic regression models. The indirect or meditational effects were calculated using the product of the unstandardized paths ($a \times b$). Pairwise contrasts were conducted to test whether indirect effects of the two mediators were equal in size. Bias-corrected accelerated (BCa) bootstrapping with 5000 replications was used to obtain asymptotic 95% confidence intervals (CIs) around the indirect effects (Table 2). Analyses were conducted using SPSS 20 and an SPSS macro developed by Hayes (2008).

Results

Table 1 gives basic demographic information and information on the variables of interest for all participants and participants with and without a history of CSA. Of the 1181 participants, 247 (20.9%) reported histories of CSA. The men ranged in age from 18 to 45 years ($M = 26.7$, $SD = 6.61$). Only 5.8% were married, but 80% had a steady partner. Table 1 shows that men with a history of CSA were slightly younger ($M = 25.6$, $SD = 6.05$) than the men who did not report a history of childhood sexual abuse ($M = 26.9$, $SD = 6.77$) ($p = 0.007$). About half (48.2%) of the men who had not experienced CSA reported having a casual sex partner in 90 days, as compared with more than half (61.5%) of the men with histories of CSA ($p < 0.001$). Men who reported CSA history reported on average a larger number of days in using marijuana ($M = 5.43$, $SD = 9.42$) compared with men who did not report a history of CSA ($M = 4.19$, $SD = 8.74$) ($p = 0.026$). Men with a history of CSA were significantly more likely to report vaginal sex with multiple steady partners (33.2% vs. 21.5%, $p < 0.001$), more likely to report having unprotected anal sex with a steady partner (13.1% vs. 5.4%, $p < 0.001$), and more likely to report having anal sex with multiple steady partners (9.1% vs. 2.8%, $p < 0.001$) compared with men who did not reported CSA. Men who reported a history of CSA were significantly more likely to report having unprotected vaginal sex with a casual partner (27.1% vs. 16.8%, $p < 0.001$), vaginal sex with multiple casual partners (27.1% vs. 19%, $p < 0.005$), unprotected anal sex with a casual partner (7.1% vs. 3.1%, $p < 0.001$), and anal sex with multiple casual partners (8.1% vs. 2.8%, $p < 0.001$) than men with no reported CSA histories.

As shown in Table 2, behaviors that were significantly predicted by both mediators included unprotected vaginal sex with casual partners, having vaginal sex with multiple steady and casual partners, unprotected anal sex with steady and casual partners, and having anal sex with multiple steady and casual partners. None of the pairwise contrasts was statistically significant, which indicates that the magnitudes of the indirect effects of marijuana and problem drinking did not differ significantly.

Discussion

Findings suggest that problem drinking and marijuana use mediate HIV sexual risk behaviors in men who reported experiencing CSA. A significant indirect relationship was observed between experiencing CSA, problem drinking and marijuana use, and unprotected vaginal sex with a casual partner, vaginal sex with multiple steady and casual partners, unprotected anal sex with steady and causal partners, and anal sex with multiple steady or casual partners. Marijuana use and problem drinking did not have a significant indirect effect on the relationship between experiences of childhood sexual abuse and unprotected vaginal sex with a steady partner. The higher rates of CSA reported by men in this study compared to CSA rates for males globally (World Health Organization, 2001) may result from our use of ACASI which has been found to increase participants' motivation to respond accurately (Metzger et al., 2000).

From the sociodemographic data several implications appear. We found that younger men were more likely to report CSA than were older men, which may result from the difficulties

older men experience in acknowledging that they had experienced CSA. Men with a history of CSA were also found to be less likely to have completed high school. This finding is consistent with the literature that shows poor educational achievement to be a negative consequence of CSA (Boden, Horwood, & Fergusson, 2007; Buckle, Lancaster, Powell, & Higgins, 2005). The findings that a significantly higher percentage of men who had experienced CSA reported having a casual partner in the last 90 days is also consistent with the literature (Duncan et al., 2008; Hayatbakhsh et al., 2007). Consistent with our findings, other studies have shown higher rates of multiple partners among men with CSA histories compared with men without CSA histories (Dilorio et al., 2002; Holmes, Foa, & Sammel, 2005). It should also be noted that, consistent with the literature, men who reported CSA were significantly more likely to engage in all of the HIV sexual risk behaviors (Dilorio et al., 2002; O'Leirigh, Safren, & Mayer, 2012; Markowitz et al., 2011; Pence et al., 2012; Wilson, 2010; Zierler et al., 1991).

Studies of heterosexual men in the United States show men are more likely to use condoms with their casual partners (Catania et al., 1992; Hunt, Myers, & Dyche, 1999). We found however problem drinking and marijuana use to significantly affect HIV sexual risk behaviors for both casual and steady partners of men with histories of CSA.

Notwithstanding this finding, we also observed marijuana and problem drinking to have a greater effect on HIV sexual risk behaviors of CSA men and their casual partners than steady partners. The findings between men's risk behaviors with casual and steady partners provide some insights into the complexities of the relationships between marijuana use, problem drinking, and HIV sexual risk behaviors among men who have experienced CSA and the need for further research.

This is perhaps the first study to examine the effects of problem drinking and marijuana use on the HIV sexual risk behaviors in a large randomly selected sample of men in South Africa who have sex with women. Studies of CSA reported by adult males have primarily been conducted in Europe and North America among bisexual and gay men or both heterosexual men and women (Finkelhor, 1994; Markowitz et al., 2011; Pereda, Guilera, Forns, & Gómez-Benito, 2009).

Strengths of this study include the large sample comprised exclusively of men who have sex with women recruited from randomly selected neighborhoods in a high-level heterosexual epidemic and the use of ACASI with questions heard in isiXhosa and displayed in English. The reliance on self-reports of behavior is a limitation. Additionally, while the nature of the sample afforded a unique opportunity to learn about the effects of problem drinking and marijuana use among South African men with histories of CSA in the Eastern Cape, the findings may not generalize to all South African men.

In conclusion, this study examined whether problem drinking and marijuana use mediate the relation between CSA and HIV sexual risk behavior in heterosexual men. Problem drinking and marijuana use mediated the relations of history of childhood sexual abuse to unprotected vaginal sex with casual sexual partners, having multiple sexual partners, and having unprotected anal sex with a steady or casual sexual partner. The findings have implications for HIV prevention practitioners and researchers. Studies suggest difference in men's risk

behaviors for casual and steady partners. However, the findings suggest that interventions are needed to dissuade HIV transmission behaviors among men with histories of CSA irrespective of their sexual partner. Intervention targeting men with histories of CSA could reduce heterosexual transmission in South Africa.

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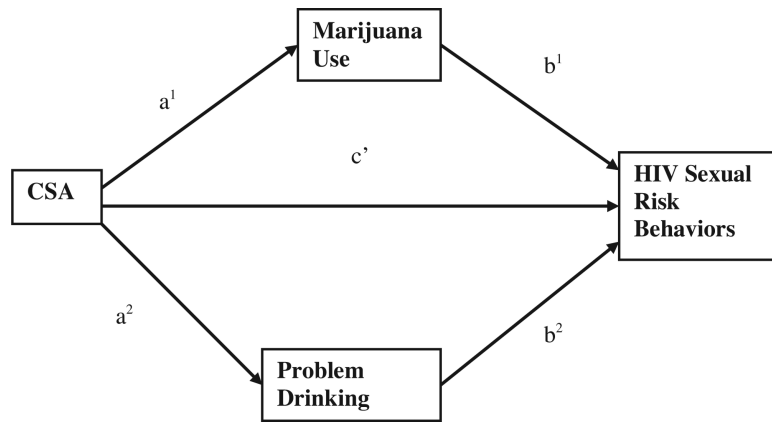


Fig. 1.
Illustration of mediation model.

Table 1

Sociodemographic characteristics of men reporting Childhood Sexual Abuse (CSA) or No CSA, Eastern Cape Province, South Africa 2007-2009.

Variable	Total	CSA history	No CSA	<i>p</i> value
Age ^a	26.7 ± 6.61	25.6 ± 6.05	26.9 ± 6.77	0.007
Completed High School	518/1181 (43.9%)	91/247 (36.8%)	427/934 (45.7%)	0.014
Unemployed	793/1181 (67.1%)	225/247(91.1%)	855/934 (92.0%)	0.798
Married ^b	67/1114 (5.7%)	14/247(5.7%)	54/934 (5.9%)	0.946
Steady Partner last 90 days ^b	945/1181 (80.2%)	189/247(76.5%)	758/934 (81.2%)	0.104
Casual Partner last 90 days ^b	602/1181 (51.0%)	152/247 (61.5%)	450/934 (48.2%)	<0.001
Problem Drinking ^b	902/1181 (76.4%)	208/247 (84.2%)	694/934 (74.3%)	0.001
Marijuana (dagga) use in last 30 days ^a	4.46 ± 8.9	5.43 ± 9.42	4.19 ± 8.74	0.026
Unprotected Vaginal Sex Steady Partner	558/1181 (47.3%)	119/247 (48.1%)	439/934 (47.0%)	0.742
Unprotected Vaginal Sex Casual Partner ^b	226/1180 (19.2%)	66/247 (27.1%)	160/933 (16.8%)	<0.001
Vaginal Sex Multiple Steady Partner ^b	282/1177 (24.0%)	82/247 (33.2%)	200/930 (21.5%)	<0.001
Vaginal Sex Multiple Casual Partner ^b	245/1178 (19.2%)	68/247 (27.1%)	177/931 (19.0%)	0.005
Unprotected Anal Sex with a Steady Partner ^b	78/1124 (6.9%)	29/222 (13.1%)	49/903(5.4%)	<0.001
Unprotected Anal Sex with a Casual Partner ^b	41/1059 (3.9%)	15/212 (7.1%)	26/848(3.1%)	0.006
Anal Sex Multiple Steady Partner ^b	45/1124 (4.0%)	20/221 (9.1%)	25/903 (2.8%)	<0.001
Anal Sex Multiple Casual Partner ^b	41/1059 (3.9%)	17/212 (8.1%)	24/848 (2.8%)	<0.001
Ever had insertive anal sex with a male	26/1181 (2.2%)	16/247 (6.5%)	10/934 (1.1%)	<0.001
Ever had receptive anal sex with a male	10/934 (1.1%)	10/247 (4%)	6/934 (.6%)	<0.001

^aValues summarized are means ± SD with corresponding *p*-values from *t*-tests.

^bValues summarized are *n*(%) with corresponding *p*-values from Chi-Square tests.

Table 2

Unstandardized coefficients (standard error), p values, and Bias Corrected and Accelerated (Bca) Confidence Intervals (CI) for analyses of mediators of the relations of childhood sexual abuse to HIV sexual risk behaviors.

Dependent variable/mediators	Effect of child abuse on mediator (<i>a</i>)	Effect of mediator on HIV sexual risk variables (<i>b</i>)	Direct effect of child abuse on HIV sexual risk variables (<i>c'</i>)	Indirect effect of child abuse on HIV sexual risk variables through mediators $\Sigma(a_1b_1 + a_2b_2)$	BCa 95% CI of mediated effects	
					Lower	Upper
Unprotected vaginal sex with steady partner						
Marijuana use	3.29 (1.69) 0.052	.011 (.007) 0.096		.040 (.034)	-.004	.147
Problem drinking	.221 (.070) <0.001	.419 (.161) 0.009		.095 (.048)	.018	.215
Both mediators			.007 (.386) 0.984	.135 (.057)	.036	.260
Unprotected vaginal sex with casual partners						
Marijuana use	3.29 (1.69) 0.052	.019 (.008) 0.010		.065 (.044)	.001	.200
Problem drinking	.222 (.070) 0.001	.674 (.210) 0.001		.150 (.065)	.029	.269
Both mediators			1.51 (.425) <0.001	.215 (.079)	.040	.320
Multiple steady partner vaginal sex						
Marijuana use	3.30 (1.69) 0.050	.014 (.007) 0.053		.049 (.042)	-.001	.173
Problem drinking	.221 (.070) 0.002	.547 (.194) 0.005		.124 (.060)	.031	.280
Both mediators			1.52 (.408) 0.002	.173 (.070)	.060	.335
Multiple casual partners vaginal sexual						
Marijuana use	3.27 (1.69) 0.050	.007 (.008) 0.402		.020 (.033)	-.020	.123
Problem drinking	.221 (.070) 0.002	.547 (.202) <0.001		.121 (.060)	.035	.272
Both mediators			1.21 (.423) 0.004	.143 (.067)	.044	.307
Unprotected anal sex with steady partner						
Marijuana use	3.54 (1.79) 0.049	.017 (.012) 0.142		.065 (.068)	-.014	.347
Problem drinking	.250 (.076) 0.001	.497 (.331) 0.133		.124 (.090)	-.014	.337

Dependent variable/mediators	Effect of child abuse on mediator (<i>a</i>)	Effect of mediator on HIV sexual risk variables (<i>b</i>)	Direct effect of child abuse on HIV sexual risk variables (<i>c'</i>)	Indirect effect of child abuse on HIV sexual risk variables through mediators $\Sigma(a_1b_1 + a_2b_2)$	BCa 95% CI of mediated effects	
					Lower	Upper
Both mediators			2.37 (.578) <0.001	.188 (.103)	.014	.436
Unprotected anal sex with a causal partner						
Marijuana use	2.580 (1.80) 0.153	.032 (.015) 0.029		.0845 (.080)	-.008	.340
Problem drinking	.235 (.075) 0.002	.821 (.464) 0.076		.199 (.125)	.002	.488
Both mediators			2.52 (.682) 0.002	.284 (.150)	.0387	.626
Multiple steady partner anal sex						
Marijuana use	3.54 (1.79) 0.049	.042 (.014) 0.002		.155 (.108)	.007	.466
Problem drinking	.250 (.076) 0.001	1.44 (.478) 0.002		.373 (.164)	.108	.753
Both mediators			2.66 (.681) 0.001	.532 (.182)	.193	.909
Multiple casual partner anal sex						
Marijuana use	2.58 (1.80) 0.153	.018 (.015) 0.228		.046 (.064)	-.027	.276
Problem drinking	.235 (.076) 0.002	.579 (.450) 0.198		.146 (.126)	-.061	.435
Both mediators			1.92 (.736) <.001	.192 (.131)		