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Predictors of HIV Transmission Risk Behavior and Seroconversion Among Latino Men Who have Sex with Men in Project EXPLORE

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Abstract

In the US, Latino MSM are disproportionately affected by HIV, yet there is a paucity of data for this risk group. To this end, we examined data on Latino and non-Latino white MSM who participated across six cities in a 2-year randomized behavioral intervention study—Project EXPLORE. At baseline, Latinos reported significantly more serodiscordant unprotected anal intercourse (SDUA) than non-Latinos. Longitudinal predictors of SDUA included marijuana, poppers, amphetamines and heavy drinking, as well as lower self-efficacy, poorer communication skills, weaker safe-sex norms and more enjoyment of risky sex. For HIV infection, Latinos had significantly higher seroconversion rate over follow-up than non-Latinos. Longitudinal predictors of seroconversion among Latinos included poppers and SDUA. Intervention effects did not significantly differ between Latino and non-Latinos. Findings support HIV intervention work with Latino MSM that includes skills training/counseling to address attitudes about safe sex and impact of substance use on HIV-risk behavior and acquisition.

Keywords

Hispanic/Latino; MSM; HIV prevention; AIDS/HIV; High-risk sexual behavior; Substance use

Introduction

Latinos, comprising approximately 15% of the population, are the largest minority group in the United States [1]. This ethnic group, however, is disproportionately impacted by HIV [2]. In 2007, Latinos accounted for 18% of those newly infected with HIV and 19% of people living with AIDS [2]. Amongst Latino men in the U.S. infected with HIV, male-to-male sexual contact is the most commonly reported transmission route: among Latino men diagnosed in 2007, 7% reported heterosexual contact risk, 11% injection drug use, and strikingly 60% of infections occurred in men reporting male-to-male sexual contact [2].

There is a paucity of data examining HIV prevention within Latinos in general and within Latino MSM in particular [3-6]. Variables identified as being associated with high-risk unprotected sexual behavior among Latino MSM include higher ethnic identification, age when sexual behavior was initiated (such that older sexual debut is associated with higher risk), sexual attraction, desire for acceptance from family or sexual partners, cultural messages (e.g., machismo), homophobic-related discrimination, drug and alcohol use, drug and alcohol use by sex partner, intentions and self-efficacy for safer sex, and poor communication about condom use [3-10]. Although informative, these studies are generally limited by cross sectional designs, geographic area, and lack of objective measurement of HIV status. Such limitations also exist in studies that compare Latino MSM to non-Latino white MSM [11, 12], including, due to small sample sizes, difficulties in having sufficient power to examine between-group differences. Although a limited amount of research has been done with this issue, much more is needed.

Data from the EXPLORE study, consisting of a sample of 4295 men across six metropolitan areas (i.e., Boston, Chicago, Denver, New York, San Francisco, Seattle), can begin to address some of these limitations. Accordingly, the present study examined: (1) differences between Latino MSM and non-Latino white MSM at baseline on factors believed to impact HIV risk—substance use, psychosocial factors and high-risk sexual behavior (i.e., SDUA), (2) predictors associated with SDUA within Latino MSM alone at baseline and over study follow-up, (3) comparison of HIV-seroconversion over study follow-up between Latino MSM and non-Latino white MSM; (4) predictors of HIV-seroconversion over study follow-up within Latino MSM alone, and (5) differential effect of the EXPLORE intervention for Latinos versus non-Latino white MSM [13]. The EXPLORE study has previously published findings of rates of HIV risk and HIV prevention intervention effects for a multi-site national MSM sample as a whole [14]. However, the current paper uniquely addresses both baseline (i.e., demographic, psychosocial, and HIV-risk behavior) and longitudinal data (i.e., SDUA; HIV infection) specific to Latino MSM who participated in the EXPLORE study.

Methods

Participants

The methods for the EXPLORE study have previously been described in greater detail [14-17]. Recruitment for the study occurred from January 1999 through February 2001 in six U.S. cities: Boston, Chicago, Denver, New York, San Francisco, and Seattle. Inclusion criteria for the EXPLORE study were men who were uninfected with HIV, were 16 years or older (although none of the sample was under age 18 at enrollment for the present analysis), had anal sex with another man during the past year, and had not been involved in a mutually

monogamous relationship in the past 2 years with a male partner who was HIV-uninfected. Participants were excluded if they were not fluent in English. Men were randomized to receive a behavioral intervention versus standard risk reduction counseling. The experimental intervention, described in detail by Chesney et al. [16], consisted of 10 core counseling modules delivered within one-on-one counseling sessions.

Measures

Participants were asked to enroll in the study approximately 2 weeks after an initial HIV screening. After randomization, participants were evaluated every 6 months for up to 48 months (depending on the time for which a participant enrolled) for a behavioral assessment, HIV pre-test counseling, and blood specimen collection. Participation continued until the end of the study in July 2003. Data was collected using audio computer-assisted self-interviewing technology (ACASI). Additional details on recruitment, data collection, measures, and procedures are described elsewhere [14-17]. The following variables were included for the current study: demographic variables, beliefs about safer sex, perceived enjoyment of risky sex, substance use, symptoms of depression, history of childhood sexual abuse, sexual behavior, randomization status and HIV testing data over the course of the study.

Demographic Variables—Demographic variables included in this study included age (coded as less than 25, 26–30, 31–35, 36–40, greater than 40), education (less than high school, high school or GED, some college, after college), household annual income (less than \$12000, \$12000–\$29999, \$30000–\$59999, more than \$60000), employment status (full time, part time, unemployed, other), geographic location (Boston, Chicago, Denver, New York, San Francisco, Seattle) and ethnicity (Latino, non-Latino white).

Attitudes Associated with High-risk Sexual Behavior—Four areas related to high-risk sexual behavior were examined: self-efficacy for adopting safer sexual behaviors, poor communication skills regarding safer sexual practices, social norms regarding safe sex, and perceived enjoyment of risk-related sexual behaviors [14, 16]. Of these, three (i.e., self-efficacy, communication skills, social norms) are scales consisting of 9, 6, and 5 items, respectively, that were rated on a 6-point scale. Factor-based scales were created by summing scores for each item and rescaling scores to 0–100. As in prior studies with this cohort, scores were dichotomized at the mid-point of the range (i.e., 50) and used to create variables that reflected disagreement with safe sex behaviors, wherein “1” would correspond to lower self-efficacy, poorer communication skills, and weaker perception that social norms favor safe sex.

In addition, participants were asked questions related to their perceived enjoyment of risk-related sexual behavior. Two questions assessed enjoyment of unprotected insertive and receptive anal sex. Responses were recorded on a 4-point scale ranging from “dislike very much” to “enjoy very much” that were dichotomized for analysis by combining responses that indicated enjoyment (i.e., enjoy somewhat; enjoy very much) and dislike (i.e., dislike somewhat, dislike very much) of the sexual behavior.

Substance Use—Drug use was assessed for the prior 6 months and collected on a 5-point scale (never; less than 1 week; 1–2 days a week; 3–6 days a week; and every day), with responses categorized as “never used” or “ever used” [14, 15]. The following non-prescription drug categories were assessed: (1) marijuana or hashish; (2) poppers or inhaled nitrates (including ampules); (3) crack or rock cocaine (smoked) or cocaine (snorted or sniffed); (4) amphetamines, such as speed, crystal or crank (swallowed, snorted or smoked); (5) hallucinogens, such as PCP, Special K, angel dust, acid, LSD, mushrooms, or Ecstasy;

and (6) injection drugs. Alcohol use was assessed for the prior 6 months and categorized as “never” (no drinks in past month), “light” (3 or fewer drinks/day though drinking less than 3 days/week), “moderate” (4–5 drinks/day and drinking less than 3 days/week; or 1–5 drinks/day and drinking 3–6 days/week; or 1–3 drinks/day and drinking 7 days/week) and “heavy” (more than 4 drinks/day and drinking 7 days/week; or drinking more than 6 drinks/day).

Depression Symptoms—Symptoms of depression were measured using a shortened version of the Center for Epidemiologic Studies Depression scale (CES-D)/National Institute of Mental Health scale (correlation with full CES-D = 0.92) [18]. This measure asked respondents to rate how often during the past week [never/rarely (scale score = 1), sometimes (1–2 days; scale score = 2), often (3–4 days; scale score = 3), mostly or always (5–7 days; scale score = 4)] they experienced the following: felt like they could not shake off the blues even with help from their family or friends, had trouble keeping their minds on what they were doing, felt that everything they did was an effort, had trouble sleeping, felt lonely, felt sad or felt like they just “couldn’t get going.” This seven-item scale has been validated [19]. However, because a cut-off point has not been established for this shortened version, in the current study—as was done in another, similarly structured EXPLORE analysis from our group [20]—the additive score was constructed, divided into quartiles, and dichotomized as “having depressive symptoms” if a participant’s score was in the top three quartiles (e.g., a score of 12.25 or higher) and “not having depressive symptoms” if the score was in the lowest quartile.

History of Childhood Sexual Abuse—Participants were asked the following: (1) “before you were 13 years old, did you have any sexual experience with someone who was five years or more older than you?”; and (2) “between the time you turned 13 and your 17th birthday, did you have any sexual experiences with someone who was ten years or more older than you?” Responses were used to create a dichotomous variable so that if a participant positively endorsed either of these two questions he was considered to have a history of childhood sexual abuse [14, 16, 20].

High-risk Sexual Behavior—Participants were assessed every 6 months for the previous 6 months using standard questions that asked about insertive and receptive anal sex, with and without condoms, and by partner status (HIV positive, HIV negative, HIV unknown status). In this study we use any serodiscordant unprotected anal (SDUA) sex at baseline and over study follow-up, defined as self-reported insertive or receptive anal sex without a condom with a partner whose HIV status was either known to be positive or whose HIV status was unknown.

HIV Sero-status—Blood samples were collected every 6 months and assessed for HIV sero-status using an enzyme-linked immunosorbent assay. Samples found to be reactive were retested and those repeatedly found reactive confirmed through Western blot assay or immunofluorescence assay.

Data Analysis

SAS statistical software was used to conduct these analyses. Data were collected at the baseline visit and then every 6 months for a period of up to 48 months.

Comparison of Demographics and Risk Analysis at Baseline—Latino and non-Latino white MSM were compared at baseline on demographic variables and factors believed to impact HIV risk—substance use, psychosocial factors, and high-risk sexual behavior (i.e., SDUA). Differences in distribution of demographic variables were assessed using the Chi-square test. Association of ethnicity (i.e., Latino or non-Latino white) with

risk factors (i.e., substance use, psychosocial factors, SDUA) was assessed using logistic regression. Models were adjusted for significant demographic factors: age, education and study enrollment site.

Predictors of SDUA Among LATINO MSM at Baseline and Follow-up—Logistic regression procedures were used to assess predictors of SDUA sexual behavior within Latino MSM at baseline and during follow-up. Baseline predictors that were statistically significant at the $P < 0.05$ alpha level, after adjusting for study site, were entered in a multivariable model. These analyses were replicated using longitudinal follow-up data. Using GEE models [21, 22], univariate longitudinal predictors of SDUA sexual behavior that were statistically significant at the $P < 0.05$ alpha level, after adjusting for study site and randomization arm, were entered in a multivariable model. GEE equations account for the within subject correlations of the repeated measures across time.

Comparison of HIV-Seroconversion RATES at Follow-up—HIV infection rates and confidence intervals amongst Latino and non-Latino white MSM were computed using Poisson regression. Cox proportional hazards was used to compare infection rates between the two groups, adjusted for study site and randomization arm.

Predictors of HIV Infection Among Latino MSM at Follow-up—Among the Latino MSM subset, Cox proportional hazard regression modeling [23] was adopted to model the influence of baseline predictors on HIV seroincidence over the course of study follow-up. Statistically significant predictors of HIV infection at the $P < 0.05$ alpha level were entered in a final multivariable Cox proportional hazard regression model and variable elimination using backward selection was used to select a final model. All models were adjusted for study site and randomization arm.

Comparison of EXPLORE Intervention Effect—To explore whether Latino status was an effect modifier of the EXPLORE intervention effect (i.e., did the intervention work better, similar or worse for Latino MSM compared to their non-Latino white MSM counterparts), a Cox proportional hazard model was used to estimate the hazard ratio of the intervention effect on HIV infection within Latino and non-Latino white subgroups.

Results

Of the 4295 participants enrolled with baseline assessment of race/ethnicity data, 3764 (88%) are included in this study because they self-identified as either Latino (652/3764 = 17%) or non-Latino white (3112/3764 = 83%).

Comparing Latinos to Non-Latino Whites: Demographic, Substance Use, and Psychosocial Variables

Table 1 provides descriptive information on characteristics of the sample by ethnicity. When comparing Latinos to non-Latino whites at their baseline assessment visit, Latinos were significantly more likely to: be younger, have lower educational attainment, report lower annual household income, and be unemployed. Table 2 shows that Latinos, compared to non-Latino whites, were less likely to report moderate alcohol use (AOR = 0.66; 95% CI: 0.47–0.92), using marijuana (AOR = 0.81; 95% CI: 0.67–0.97), using hallucinogens (AOR = 0.68; 95% CI: 0.55–0.84), and using amphetamines (AOR = 0.69; 95% CI: 0.52–0.91), after adjusting for age, education and study site; whereas Latinos were more likely to report using injection drugs (AOR = 1.46; 95% CI: 1.10–1.94) and having a history of childhood sexual abuse (AOR = 2.44; 95% CI: 2.03–2.93). Additionally, in comparing Latinos to non-Latino whites, Latinos were significantly less likely to perceive that they would enjoy

unprotected insertive or receptive anal sex (AOR = 0.79; 95% CI: 0.64–0.97), after adjusting for age, education and study site.

Comparing Latinos to Non-Latino Whites: Serodiscordant Unprotected Anal Sex (SDUA; Data Not Shown)

In baseline univariate models, adjusting for age, education and site, Latino MSM were at significant increased odds of engaging in SDUA compared to non-Latino whites (AOR = 1.20; 95% CI: 1.00–1.44).

Baseline Predictors of SDUA Among Latino MSM Only

In univariate models adjusting for study site, statistically significant predictors of a higher odds of engaging in SDUA at baseline among Latino participants included: use of marijuana, use of poppers, amphetamine use, use of hallucinogens, depressive symptoms, lower self-efficacy for adopting safer sexual behaviors, poorer communication skills regarding safer sex practices, weaker safe-sex norms, a history of childhood sexual abuse, and greater perceived enjoyment of risky sex (see Table 3). In a multivariable model adjusting for study site, variables that remained statistically significant independent predictors of SDUA included: low self-efficacy for adopting safer sexual behaviors (AOR = 3.10; 95% CI: 1.71–5.61), poorer communication skills regarding safer sex practices (AOR = 1.69; 95% CI: 1.13–2.53), and greater perceived enjoyment of risky sex (AOR = 2.17; 95% CI: 1.45–3.26) (see Table 3).

Longitudinal Predictors of SDUA Among Latino MSM Only

In univariate models adjusting for study site and randomization arm, statistically significant predictors of a higher odds of engaging in SDUA longitudinally among Latino participants included: light, moderate and heavy alcohol use, use of marijuana, use of poppers, crack use, amphetamine use, use of hallucinogens, depressive symptoms, lower self-efficacy for adopting safer sexual behaviors, poorer communication skills regarding safer sex practices, weaker safe-sex norms, and more perceived enjoyment of risky sex (see Table 3). In a multivariable model adjusting for study site and randomization arm, variables that remained statistically significant independent predictors of an increased odds of engaging in SDUA over study follow-up included: heavy alcohol use (AOR = 1.56; 95% CI: 1.03–2.36), marijuana use (AOR = 1.32; 95% CI: 1.04–1.68), popper use (AOR = 1.91; 95% CI: 1.50–2.44), amphetamine use (AOR = 1.98; 95% CI: 1.44–2.73), lower self-efficacy for adopting safer sexual behaviors (AOR = 1.80; 95% CI: 1.27–2.55), poorer communication skills regarding safer sex practices (AOR = 1.88; 95% CI: 1.49–2.36), weaker safe-sex norms (AOR = 1.39; 95% CI: 1.05–1.86), and more perceived enjoyment of risky sex (AOR = 2.17; 95% CI: 1.66–2.83) (see Table 3).

Comparing Latinos to Non-Latino Whites: HIV-seroconversion (Data Not Shown in a Table)

There were 259 HIV-1 infections in the EXPLORE study, with an overall rate of 2.1 per 100 person-years [17]. Over the course of the study 8.0% of Latinos (52/652) and 5.5% of non-Latino whites (171/3112) tested positive for HIV. Latinos had an overall rate of 2.99 per 100 person-years (95% CI: 2.23–3.92), whereas non-Latino whites had an overall rate of 1.90 per 100 person-years (95% CI: 1.63–2.21). Adjusting for study site and randomization arm, Latino MSM had a significantly higher overall rate of HIV infection over study follow-up than their non-Latino white peers (AHR = 1.44; 95% CI: 1.05–1.99).

Longitudinal Predictors of HIV-seroconversion Among Latino MSM Only

Among Latino participants, within univariate analyses adjusting for study site and randomization arm, a higher probability of becoming infected with HIV over study follow-

up were related to: use of marijuana, use of poppers, amphetamine use, use of hallucinogens, and sexually engaging in SDUA. In a multivariable model, adjusting for study site and randomization arm, variables that remained statistically significant independent predictors of becoming infected with HIV over study follow-up among Latino participants included: popper use (AHR = 1.97; 95% CI: 1.08–3.59) and engaging sexually in SDUA (AHR = 1.94; 95% CI: 1.02–3.66) (see Table 4).

Comparing Latinos to non-Latino Whites: Intervention Effect (Data Not Shown)

It was previously reported that the EXPLORE intervention did not significantly reduce the risk of HIV infection: a modest 18% (95% CI: –5%, 36%) reduction in risk of HIV infection was observed [17]. In an exploratory analysis, we computed the EXPLORE intervention effect within the subset of the Latino group of MSM and within the non-Latino whites. We observed a 13% reduction in the Latino men (95% CI: –51%, 50%) and a 19% reduction in the non-Latino whites (95% CI: –10%, 40%), giving no suggestion that the reductions observed were different in the Latino subgroup.

Discussion

In this large multi-site sample of MSM in the U.S., crosssectionally, Latino MSM reported significantly higher rates of SDUA compared to non-Latino white MSM, and were more likely to acquire HIV during the study period than non-Latino white MSM. These findings highlight the continuing need for prevention interventions for Latino MSM.

We then examined predictors of SDUA in Latinos crosssectionally and longitudinally, as well as predictors of acquiring HIV within the Latino MSM in this trial. Multivariable predictors of SDUA at baseline included low self-efficacy for adopting safer sexual behaviors, poor communication regarding safe sex practices, and higher perceived enjoyment of risky sex. In longitudinal analyses, additional predictors of SDUA included weaker safe-sex norms and substance use (i.e., marijuana, poppers, amphetamines, heavy alcohol). Predictors of acquiring HIV for Latino MSM in the sample included using poppers and SDUA sexual behavior. Many of these variables are part of several theoretical models of HIV risk taking such as social cognitive theory, [24, 25] social action theory [26] and the AIDS Risk Reduction model [27]. Accordingly, some of the frequently seen predictors of HIV risk reduction seen in general population samples of MSM may apply to Latino MSM as well. The saliency of such predictors, however, may differ from that of non-Latino white MSM. Additional study is needed of potential personal characteristics and situational factors that may enhance the power of existing social cognitive and health psychology models to predict HIV risk behaviors among Latino MSM [28, 29].

Latino MSM are members of a high-risk group that have been generally underserved within HIV prevention and intervention research [28, 30–32]. A deficit of information about HIV risk patterns of Latino MSM has impeded the development of culturally appropriate HIV prevention interventions for this group [3, 14, 31, 32]. For example, there has been only one reported randomized control trial that addressed an HIV prevention intervention directed specifically at Latino MSM [33]. Furthermore, a recent review on HIV prevention interventions for high-risk sexual behavior suggested that interventions focused on MSM in general are less effective for Latino MSM [34]. The EXPLORE intervention was not meant to address HIV prevention within Latino MSM and, in line with this, our findings failed to indicate that Latino MSM benefited differentially from the intervention than did non-Latino whites.

There are some limitations of the current study to be noted. The selection of high-risk MSM limits generalizability to a wider population of MSM. In addition, although there was a large

sample of Latino MSM in this study compared to the extant research, EXPLORE was not set up as a study of cultural and related contextual influences on HIV sexual risk taking and seroconversion. Accordingly, there were a number of important cultural factors—such as acculturation, language, country of birth, immigration status, and length of time in the U.S.—that might be important for HIV prevention efforts with Latinos but which were not assessed [35, 36]. Inclusion of such Latino cultural factors may be beneficial in developing HIV prevention interventions research for use with Latino MSM [3, 4, 35, 36]. Context or situational-related variables should also be studied given findings that, among Latino MSM, unprotected anal intercourse has been associated with factors such as difficult sexual situations [29], sexual attraction, discrimination [8], as well as perceived closeness to the sexual partner, seroconcordance, and concern about sexually transmitted diseases with that partner [28]. Finally, measurement of substance use may have impacted findings in that participants were asked to recall substance use for the past 6 months and use was measured as a binary (i.e., yes, no) variable.

Based on these findings, future studies should examine the contextual reasons that factors associated with safe sex behavior—self-efficacy, communication skills, safe-sex norms—were significantly related to SDUA among Latino MSM yet these factors were not significantly different between the two MSM groups. Similarly, greater enjoyment of high-risk sexual behavior was significantly related to SDUA even though Latinos were less likely to report this than non-Latino white MSM. Study is also needed on the roles of depression and childhood sexual abuse on HIV-related risk behavior within Latino MSM, as this and other studies [8, 28, 37] have provided conflicting findings as to their role. Additionally, studies should also include a strengths-based perspective to identify the factors that aide Latino MSM in practicing safe sexual behavior and avoiding HIV acquisition [30]. Based on longitudinal rather than solely cross-sectional data, our findings provide stronger indication of the causal relationships between predictors and our outcomes of interest.

The current findings support examining potential topics for HIV intervention work with Latino MSM that include training and counseling to address perceived ability to engage in safe sex behavior, enjoyment of high-risk sexual behavior, and the impact of substance use on HIV acquisition. Additional research is needed to examine substance use and sexual relationships in Latino MSM, and it would likely be useful to integrate substance use counseling with HIV prevention messages among Latino MSM who use substances. Findings also suggest the need for HIV prevention intervention research that considers the differential needs of Latino MSM and how the interaction of ethnicity and sexual orientation may impact HIV risk behavior and infection.

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Table 1

Demographic characteristics of study participants by Latino ethnicity

Demographic Characteristics	Latino (<i>n</i> = 652) <i>n</i> (%)	Non-Latino white (<i>n</i> = 3112) <i>n</i> (%)	Test statistic
Age			$\chi^2 = 137.9^{**}$ (df = 4)
<25	209 (32.1)	467 (15.0)	
26–30	159 (24.4)	642 (20.6)	
31–35	133 (20.4)	674 (21.7)	
36–40	84 (12.9)	577 (18.5)	
>40	67 (10.3)	752 (24.2)	
Education			$\chi^2 = 130.7^{**}$ (df = 4)
Less than high school	24 (3.7)	30 (1.0)	
High school or GED	88 (13.5)	204 (6.6)	
Some college	226 (34.7)	723 (23.3)	
College	213 (32.7)	1167 (37.5)	
After college	101 (15.5)	986 (31.7)	
Household annual income, US\$			$\chi^2 = 149.8^{**}$ (df = 3)
<12000	138 (21.3)	323 (10.4)	
12000–29999	246 (37.9)	743 (23.9)	
30000–59999	207 (31.9)	1276 (41.1)	
60000	58 (8.9)	766 (24.7)	
Employment status			$\chi^2 = 32.3^{**}$ (df = 3)
Full time	453 (69.5)	2414 (77.6)	
Part time	87 (13.3)	273 (8.8)	
Unemployed	90 (13.8)	274 (8.8)	
Other	22 (3.4)	151 (4.9)	
Geographic location			$\chi^2 = 153.0^{**}$ (df = 5)
Seattle	71 (10.9)	592 (19.0)	
Boston	78 (12.0)	590 (19.0)	
Chicago	71 (10.9)	467 (15.0)	
Denver	110 (16.9)	563 (18.1)	
New York	207 (31.8)	395 (12.7)	
San Francisco	115 (17.6)	505 (16.2)	

**
P<0.01

Table 2

Substance Use and Psychosocial characteristics by Latino ethnicity

	Latino	Non-Latino white	Latino compared to Non-Latino white		
	n (%)	n (%)	Unadjusted odds ratio	95% CI	Adjusted odds ratio ^a
Alcohol and substance use					
Alcohol use					
None	68 (10.5)	298 (9.6)	1.00	–	1.00
Light	298 (46.1)	1437 (46.3)	0.91	(0.68, 1.22)	0.87
Moderate	177 (27.4)	1057 (34.1)	0.73*	(0.54, 1.00)	0.66*
Heavy	103 (15.9)	311 (10.0)	1.45*	(1.03, 2.05)	1.13
Marijuana use	304 (47.1)	1444 (46.5)	1.03	(0.87, 1.22)	0.81*
Popper use	220 (34.1)	1205 (38.8)	0.82*	(0.69, 0.98)	0.98
Crack use	24 (3.7)	117 (3.8)	0.99	(0.63, 1.54)	0.64
Amphetamines use	76 (11.8)	401 (12.9)	0.90	(0.69, 1.17)	0.69**
Hallucinogens use	159 (24.6)	757 (24.4)	1.01	(0.83, 1.23)	0.68**
Injection drug use	84 (13.0)	276 (8.9)	1.53	(1.18, 1.99)	1.46**
Psychosocial factors related to HIV risk taking					
Depression	328 (51.0)	1423 (45.9)	1.23.*	(1.04, 1.46)	1.00
Low self-efficacy for adopting safer sexual behaviors	99 (15.6)	477 (15.8)	0.99	(0.78, 1.25)	1.06
Poor communication skills regarding safer sex practices	219 (35.6)	1018 (34.9)	1.03	(0.86, 1.24)	1.12
Weaker safe-sex norms	108 (17.1)	535 (18.0)	0.94	(0.75, 1.18)	0.95
History of childhood sexual abuse	378 (58.3)	1090 (35.1)	2.60**	(2.19, 3.09)	2.44**
Greater perceived enjoyment of risky sex	469 (72.9)	2480 (80.3)	0.66**	(0.54, 0.80)	0.79**

^a Adjusted for study site, age, and education^{*} $P < 0.05$ ^{**} $P < 0.01$

Table 3

Univariate and multivariable predictors of serodiscordant unprotected anal (SDUA) sex among Latino MSM at baseline and over study follow-up ($n = 652$)

	Baseline			Longitudinal		
	Univariate adjusted ORs ^a	95% CI	Multivariable adjusted ORs ^a	95% CI	Univariate adjusted ORs ^b	Multivariable adjusted ORs ^b
Alcohol and substance use						
Alcohol use						
None	1.00	–			1.00	–
Light	1.07	(0.63, 1.82)			1.56**	(1.14, 2.12)
Moderate	1.27	(0.72, 2.25)			2.10**	(1.51, 2.91)
Heavy	1.21	(0.65, 2.27)			2.96**	(2.02, 4.36)
Marijuana use	1.57**	(1.14, 2.17)	1.27	(0.87, 1.87)	1.65**	(1.37, 1.98)
Popper use	1.61**	(1.15, 2.25)	1.18	(0.80, 1.75)	2.35**	(1.93, 2.87)
Crack use	1.71	(0.71, 4.11)			1.46*	(1.01, 2.11)
Amphetamines use	1.78*	(1.07, 2.96)	0.94	(0.48, 1.81)	2.32**	(1.82, 2.96)
Hallucinogens use	1.80**	(1.23, 2.60)	1.45	(0.88, 2.39)	1.45**	(1.16, 1.81)
Injection drug use	0.95	(0.59, 1.52)			1.01	(0.73, 1.38)
Psychosocial factors related to HIV risk taking						
Depression	1.39*	(1.02, 1.91)	1.00	(0.69, 1.45)	1.49**	(1.26, 1.76)
Low self-efficacy for adopting safer sexual behaviors	4.37**	(2.59, 7.38)	3.10**	(1.71, 5.61)	2.54**	(1.93, 3.33)
Poor communication skills regarding safer sex practices	2.28**	(1.61, 3.23)	1.69*	(1.13, 2.53)	2.03**	(1.66, 2.48)
Weaker safe-sex norms	1.77*	(1.15, 2.75)	1.33	(0.81, 2.19)	1.36**	(1.10, 1.68)
History of childhood sexual abuse	1.46*	(1.06, 2.01)	1.30	(0.90, 1.88)	1.22	(0.97, 1.55)
Greater perceived enjoyment of risky sex	3.11**	(2.13, 4.52)	2.17**	(1.45, 3.26)	1.87**	(1.51, 2.33)
						2.17**
						(1.66, 2.83)

^a Adjusted for study site
^b Adjusted for study site and randomization arm
^{*} $P < 0.05$
^{**} $P < 0.01$

Table 4

Longitudinal univariate and multivariable predictors of HIV infection among Latino MSM only over study follow-up ($n = 652$)

	Univariate adjusted HRs ^a	95% CI	Multivariable adjusted HRs ^a	95% CI
Alcohol and substance use				
Alcohol use				
None	1.00	—		
Light	3.20	(0.75, 13.59)		
Moderate	2.91	(0.65, 13.02)		
Heavy	4.28	(0.94, 19.57)		
Marijuana use	1.81 [*]	(1.02, 3.23)	(dropped)	
Popper use	2.35 ^{**}	(1.35, 4.09)	1.97 [*]	(1.08, 3.59)
Crack use	0.61	(0.08, 4.53)		
Amphetamines use	2.16 [*]	(1.07, 4.35)	(dropped)	
Hallucinogens use	2.36 ^{**}	(1.33, 4.18)	(dropped)	
Injection drug use	1.43	(0.66, 3.10)		
Psychosocial factors related to HIV risk taking				
Depression	1.69	(0.96, 3.00)		
Low self-efficacy for adopting safer sexual behaviors	1.68	(0.87, 3.25)		
Poor communication skills regarding safer sex practices	1.21	(0.67, 2.18)		
Weaker safe-sex norms	1.70	(0.87, 3.33)		
History of childhood sexual abuse	1.06	(0.60, 1.86)		
Greater perceived enjoyment of risky sex	1.75	(0.84, 3.65)		
Sexual risk taking				
SDUA	2.31 ^{**}	(1.24, 4.33)	1.94 [*]	(1.02, 3.66)

^aAdjusted for study site and randomization arm

^{*} $P < 0.05$

^{**} $P < 0.01$