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## Psychosocial health problems increase risk for HIV among urban young men who have sex with men: Preliminary evidence of a syndemic in need of attention

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### Abstract

**BACKGROUND**—Young men who have sex with men (YMSM) experience disparities in HIV rates and potentially in mental health, substance abuse, and exposure to violence.

**PURPOSE**—We assessed the extent to which these psychosocial health problems had an additive effect on increasing HIV risk among YMSM.

**METHODS**—An urban sample of 310 ethnically-diverse YMSM reported on psychosocial health problems, sexual risk behaviors, and HIV status. A count of psychosocial health problems was calculated to test the additive relationship to HIV risk.

**RESULTS**—The prevalence of psychosocial health problems varied from 23% for regular binge drinking to 34% for experiencing partner violence. Rates of sexual risk behaviors were high and 14% of YMSM reported receiving a HIV+ test result. Psychosocial health problems co-occurred, as evidenced by significant bivariate odds ratios between 12 of the 15 associations tested. Number of psychosocial health problems significantly increased the odds of having multiple anal sex partners (OR = 1.24), unprotected anal sex (OR = 1.42), and an HIV positive status (OR 1.42), after controlling for demographic factors.

**CONCLUSIONS**—These data suggest the existence of co-occurring epidemics, or “syndemic,” of health problems among YMSM. Disparities exist not only in the prevalence of HIV among YMSM, but also in research to combat the epidemic within this vulnerable population. Future research is needed to identify risk and resiliency factors across the range of health disparities and develop interventions that address this syndemic.

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Twenty-five years into the epidemic, HIV/AIDS continues to be a major public health problem in the United States, but risk is not distributed evenly across the population. It has been estimated that half of the approximately 40,000 annual new HIV infections occur in youth below the age of 25 and substantial health disparities exist based on race, gender and sexual orientation (1). Recent HIV surveillance data suggest that the majority of HIV-infected adolescent (76%) and young adult males (74%) are infected through sex with men, with only a small percentage of males exposed by injection drug use (8% and 8%) and/or heterosexual contact (12% and 13%). Rising rates of sexually transmitted infections (STIs) and sexual risk taking behaviors suggest a potential surge in the HIV infection rates among young MSM

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(YMSM), especially racial minorities (2,3). In the CDC's *Young Men's Survey* of over 4,000 YMSM age 15-22 conducted in seven U.S. cities from 1994 - 1998, 7.2% were found to be HIV infected (by race: White 3.3%, Hispanic 6.9%, African-American 14.1%), 82% were unaware they were HIV infected, and only 15% were receiving treatment (4). Relative to prevalence rates in a comparable national sample of heterosexual youth, these rates are particularly alarming. For example, 0.2% of the 16 to 21 year old male applicants for the Federal Job Corps program tested HIV positive (5). In other words, the YMSM were 36 times as likely to be HIV positive compared to the disadvantaged out-of-school male youth that apply for the Job Corps program.

As alarming as these epidemiological data are, even more disturbing is the lack of preparedness to address HIV risk and prevention among YMSM. The vast majority of school-based sex education programs do not address the concerns and questions of many YMSM (6), and data suggest that YMSM are less likely to receive school-based sex education at all (7) despite their desire for it (8). In fact, four recent reviews that identified more than 60 published articles on randomized controlled trials or quasi-experimental studies on HIV risk reduction interventions for adolescents (~age < 19) failed to find one effective intervention targeted at YMSM (9-12). A recent meta-analysis of HIV behavioral interventions targeting MSM similarly did not find a single RCT where the mean age was less than 23 (13) and the CDC's HIV/AIDS Prevention Research Synthesis Team recently concluded that there is a significant gap in HIV prevention programs targeting YMSM (14). The Mpowerment Project is a community-level HIV prevention intervention for young gay men ages 18-27 (mean age = 23.4) found to decrease rates of sexual risk taking in the targeted communities (15), and is the closest example of an HIV intervention targeting younger gay men. In the absence of an effective HIV vaccine, behavioral interventions targeting adolescent and young adult MSM are the best hope for reducing risk.

The epidemic of HIV among YMSM does not exist in a vacuum, instead YMSM experience multiple psychosocial health disparities. For example, in the CDC's *Young Men's Survey* (YMS) almost 90% of 15-22 year old MSM reported using alcohol, 66% reported illicit drug use, 29% used drugs on a regular basis, and 28% reported polydrug use (all in the 6 months prior to the interview) (16). A comparison of YMS data to general population samples of youth concluded that rates of alcohol use were similar, but rates of illicit drugs were higher (16). Rates of mental illness among YMSM are difficult to estimate because sexual orientation has not been assessed in major epidemiological studies of youth mental health. However, data from non-representative samples of youth show high rates of psychosocial stressors, such as verbal, physical, and sexual abuse, which are correlated with depression, suicidality, and risk-taking behaviors (17-19). One study with a representative school-based sample found that self-identified non-heterosexual male youth were significantly more likely (odds ratio = 3.74) to have reported a recent suicide attempt than their heterosexual peers (20). Collectively, these studies suggest disparities in substance use, mental health, and victimization/abuse among YMSM.

The focus on multiple co-occurring diseases and disorders differs from the traditional biomedical approach of treating them as distinct entities. The conceptualization of multiple co-occurring afflictions has tended to vary by academic discipline. In Medicine and Psychology, the term "comorbidity" is commonly used to describe diagnoses that co-occur at rates higher than the joint probability of each individual disorder. A major focus of mental illness comorbidity research is to determine if two disorders are alternate manifestations of a single liability, if one causes the other, if the comorbid condition is a unique disorder, or if comorbidity is due to measurement error (21). In the fields of Public Health and Medical Anthropology, the term "syndemic" has been increasingly used. In 1994, Singer coined the term to describe what he saw as inextricable and mutually reinforcing connections between substance abuse,

violence, and AIDS among the urban poor (i.e. the “SAVA syndemic”) (22). The differences between these perspectives are not simply semantic—comorbidity research tends to focus on the nosological issues of boundaries and overlap of diagnoses, while syndemic research focuses on communities experiencing co-occurring epidemics that additively increase negative health consequences (23). For example, it is possible for two disorders to be comorbid, but not represent a syndemic (i.e. the disorders are not epidemic in the studied population or their co-occurrence is not accompanied by additional adverse health consequences). Beyond the focus on disease clustering and interaction, the term syndemic also implies a focus on health disparities and the social conditions that perpetrate them (24).

Among adult MSM, Stall and colleagues (25) recently extended the SAVA epidemic (22) to include other psychosocial health problems, including polysubstance use, depression, and sexual abuse. The interconnections of these problems additively exacerbated the effects of the HIV epidemic among adult MSM. Locating the HIV epidemic in the context of a syndemic of psychosocial risk factors underscores the existence of multiple health disparities among gay and lesbian individuals, who experience higher morbidity and barriers to care (26,27). In addition, it places HIV risk and prevention in a broader contextual framework going beyond more traditional cognitively-based theoretical approaches. Evidence for the existence of a syndemic is preliminary yet compelling among adult MSM, and has important implications for HIV prevention.

While each of these psychosocial health problems has been linked to HIV/AIDS among adult MSM, few studies have tested for the additive effects of the syndemic. The report by Stall and colleagues (25) is one exception, however their sample primarily included adult MSM (i.e. only 20% were ages 18-29). This study builds on previous syndemic research by examining a set of psychosocial health problems among YMSM, and testing the presence and impact of the combination of these variables on HIV risk.

## METHODS

### Participants and Procedures

A community-based sample of 310 ethnically-diverse, 16-24 year old, self-identified YMSM from Chicago participated in the study. Youth were recruited consecutively over 12 months in 2004-2005 from multiple sources including: flyers posted in retail locations frequented by LGBT individuals (i.e. stores, coffee shops, restaurants), flyers posted in LGBT youth-serving agencies, email advertisements posted on high school and college list-serves, palm cards distributed in LGBT-identified neighborhoods, and snowball sampling. No recruitment occurred in traditional high-risk social venues such as bars, dance clubs, sex clubs or bathhouses, and recruitment source was not assessed. Prior to enrollment in the study, a trained staff member assessed each potential participant’s decisional capacity to consent. Only two staff members were used for all assessments to help prevent repeat participation. Verbal consent was obtained to maximize protection of confidentiality and relevant institutional IRBs approved a waiver of parental consent for minor participants. Surveys were administered in a private room at a community-based health center providing primary care, STI and HIV specialty care and social services to the LGBT community. Using a computer-assisted self-interview (CASI), youth completed a 90 minute survey assessing demographics, psychosocial health variables and sexual risk behaviors. YMSM received \$30 for participating.

### Measures

**Demographics**—Participants reported their age, race/ethnicity, and sexual orientation as shown in Table 1. SES was assessed by asking participants, “How would you categorize the home you grew up in?”

**Substance Use**—Substance use was assessed with the AIDS-Risk Behavior Assessment (ARBA) (28), a computer-assisted structured interview designed specifically for use with youth to assess their self-reported sexual behavior and substance use. The ARBA was derived from five well-established measures used in large-scale studies to examine substance use, sexual behavior, and HIV/AIDS-risk behaviors in youth (28). Binge drinking was assessed with the following question, “During the last year, how often did you have 5 or more drinks of alcohol in one day (including the evening)?” Regular binge drinking was coded positive (i.e. equal to 1) for responses of “weekly” and “every day” and responses of less than weekly were coded negative (i.e. equal to 0). Use of street drugs was coded positive if participants endorsed the question: “In the last year have you used any kind of street drug? This would include drugs such as cocaine, crack cocaine, methamphetamine, Ecstasy, Rohypnol, GHB, hallucinogens, etc.” Marijuana use was assessed with the following item, “During the last year, approximately how often did you smoke marijuana?” Regular marijuana use was coded positive for participants smoking at least one or more times per week.

**Psychological Distress**—The Global Severity Index (GSI) of the 18 item version of the Brief Symptom Inventory (BSI-18) (29) was used to measure psychological distress in the past week. Previous reports have found the BSI-18 to have adequate reliability (coefficient alpha = .89) and convergent validity (correlation with full 53 item version = .84) (30). Evidence supports the use of the GSI as a measure of the degree of general psychopathology, rather than the use of individual subscales (31). Following the BSI-18 scoring instructions, raw scores were converted to T-scores and a case was considered positive if  $T > 62$  (29). In this sample coefficient alpha was .92.

**Partner Violence**—Partner violence was assessed with three items asking about experiences of being threatened, physically hurt, or bullied by a same-sex romantic partner. For example, one item asked, “Have you ever been hurt physically by someone with whom you have had a same-sex romantic relationship such as a boyfriend or partner?” A response was scored positive if they answered “yes” to any of these items. This measure was not added until after the first 22 participants had completed the assessment and missing data was not associated with any of the independent or dependent variables. Therefore, missing data on partner violence was completely at random (MCAR) as defined by Little and Rubin (32).

**Sexual Assault**—Three items were used to measure sexual assault. The first asked if the participant had ever had non-consensual receptive anal sex. The second question asked if the participant had ever been attacked sexually because of his sexual orientation. The last item inquired if the participant had ever been sexually assaulted or forced to have sex by a romantic partner. A response was coded positive if the participant answered “yes” to any of these items.

**Syndemic**—The number of psychosocial health problems was calculated by summing the scores for each of the six dichotomous psychosocial health problems: regular binge drinking, street drug use, regular marijuana use, psychological distress, intimate partner violence, and sexual assault. From here on, we refer to this count of psychosocial health problems as the syndemic variable.

**Sexual Risk Taking**—A version of the AIDS-Risk Behavior Assessment (ARBA) (28) adapted for sexual minority youth was used to assess sexual risk taking. Multiple anal sex partners was coded positive for individuals who reported more than one receptive or insertive anal sex partner in the last three months, based on two free response items assessing number of sex partners for each behavior. Unprotected anal sex was coded positive for individuals who reported less than consistent condom use (i.e.  $> 1$ ) for receptive or insertive anal sex in the last 12 months, based on a Likert scale with options ranging from “1 = Always” to “5 = Never.”

HIV status was assessed based on the following question, “Have you ever been told by a doctor, etc that you have HIV?”

### Analytic Procedure

Listwise deletion was used to account for missing data, which included the 22 participants missing the partner violence items completely at random (MCAR) and 2 participants missing data on other variables. Bivariate odds ratios were computed for each pair of variables to determine if the six psychosocial health problems clustered together to form a syndemic. Bivariate odds ratios were also calculated for each psychosocial health problem and the sexual risk taking and HIV outcomes. To test for the additive effect of the syndemic, a logistic regression model was used with syndemic as the independent variable and sexual risk taking and HIV status as dependent variables. Age, race, and SES were included as control variables. To determine the relative importance of the different types of psychosocial health problems, the 6 problems were collapsed into three domains by scoring the domain positive if youth endorsed any of the problems in that domain: substance use (binge drinking, marijuana use, street drug use), psychological distress (BSI), and violence (sexual assault, partner violence). These three domains were entered into a multivariate logistic regression model with sexual risk taking and HIV status as dependent variables.

## RESULTS

Table 1 summarizes the demographic characteristics of the sample. YMSM ranged in age from 16-24 years ( $M=20.3$ ,  $SD = 2.4$ ) and 54% were under age 21. Seventy percent were from communities of color, and 70% characterized the home they “grew up in” as “middle class.” The majority of the participants identified as gay (82%), with a minority identifying as bisexual (16%).

Eighty-one percent of the sample reported drinking alcohol in the last year, 24% reported using a street drug in the last year, 51% reported having used marijuana in the last year, and 34% reported some form of partner violence. The mean (standard deviation) BSI T-score was 57.93 (10.28). Table 2 presents rates of psychosocial health problems, sexual risk behaviors, and HIV status for the urban, ethnically diverse YMSM. Fourteen percent of the sample reported a known HIV positive serostatus and approximately 40% of the sample reported engaging in each HIV risk behavior. Notable in the table is the extent to which the psychosocial health problems are related to each other; of the 15 odds ratios calculated, 12 were significant and positive. For example, participants who engaged in regular binge drinking had over five times the odds of street drug use. Psychosocial health problems were also related to unprotected anal sex. For example, participants who used street drugs had almost four times the odds of engaging in unprotected anal sex in the last 12 months. The psychosocial health problems were generally unrelated to having multiple anal sex partners in the last three months, with the exception of street drug and marijuana use, which approximately doubled the odds of having had multiple anal sex partners in the last three months. Regular marijuana use, sexual assault, and partner violence were positively and significantly related to HIV serostatus, while regular binge drinking, street drug use, and psychological distress were not.

Our next set of analyses focused on the relationship between the syndemic variable (i.e. count of psychosocial health problems) and vulnerability to HIV infection and likelihood of engaging in high-risk sexual behaviors. Approximately twenty-five percent of YMSM scored zero on the syndemic variable, 27% scored one, 20% scored two, 13% scored three, 12% scored four, 2% scored five, and 1% scored six. Table 3 contains the results of the logistic regression models evaluating the relationship between the sexual health outcomes and the syndemic variable, controlling for demographic factors. The only significant demographic factor was age; which was not significant for the sexual risk outcome variables, but increased the odds of having an



HIV positive status by 25% for each year of age. Additionally, there was a trend for Black youth to be more likely to report an HIV positive status (OR = 2.48,  $p = .054$ ). The syndemic variable was significantly associated with all three outcomes, with each additional psychosocial health problem increasing the odds of multiple anal sex partners by 24%, unprotected anal sex by 42%, and an HIV positive status by 42%. YMSM with four or more psychosocial health problems had three times the prevalence of HIV relative to those with fewer problems (30% versus 10%).

To determine the relative importance of the major components of the syndemic variable, a multivariate logistic regression analysis was conducted with each sexual health outcome as the dependent variable and substance use (regular binge drinking, street drug use, regular marijuana use), psychological distress, and violence (partner, sexual assault) as the independent variables. Age was included as a demographic predictor of HIV status, but no other demographics were included because they proved to be non-significant in the prior model and because of the limited power for these multivariate logistic regression models. As shown in Table 4, substance use significantly increased the odds of having multiple anal sex partners (OR = 2.18,  $p < .01$ ) and unprotected anal sex (OR = 2.51,  $p < .001$ ). Violence significantly increased the odds of having an HIV positive status (OR = 2.64,  $p < .05$ ) and there was a trend for substance use (OR = 1.71,  $p = .15$ ). We caution readers against over-emphasizing statistical significance in this analysis because power is limited to disentangle the independent effect of correlated predictors in a multivariate logistic regression model with this sample size; the odds ratios in Table 4 should be considered preliminary estimates of the size of effects in each domain.

## DISCUSSION

This study extends previous syndemic research to support the existence of co-occurring epidemics of psychosocial health problems among urban YMSM that additively magnify sexual health risk in this vulnerable population. First we reported on rates of psychosocial health problems in a relatively large community sample of urban, ethnically-diverse YMSM. Although comparable rates of the same psychosocial health problems (e.g. regular binge drinking) are not available from population based samples of youth ages 16 - 24, data do exist on the underlying behaviors (e.g. consumption of alcohol in the last year). Data from the 16 – 25 year old sample of the 2004 administration of the National Survey on Drug Use and Health (NSDUH) showed 74% of youth used alcohol in the last year, 19% used an illicit drug (besides marijuana) in the last year, and 28% used marijuana in the last year (33). Although the rates of alcohol consumption are similar across our sample of YMSM and the population-based NSDUH sample, annual rates of street/illicit drug use and marijuana use were higher among our sample of YMSM (24% and 51% respectively). In terms of mental health, the mean BSI T-score of the sample of YMSM was approximately one standard deviation above the norm (mean T-score is 50 and SD is 10 based on published norms in adults ages 18-69 (29), mean was 58 in our sample of YMSM), suggesting a potential elevation in psychological distress within the sample. A substantial proportion of YMSM reported intimate partner violence (36%) or sexual assault (32%). In terms of specific forms of violence, 21% reported being hurt physically and 11% reported being sexually assaulted or raped by their intimate partner. Although the variables are not directly comparable, national data from the high school Youth Risk Behavior Surveillance (YRBS), showed 9% of boys reported being “hit, slapped, or physically hurt on purpose by their girl/boyfriend in the last 12 months” and 4% of boys reported “ever being physically forced to have sexual intercourse when they did not want to” (34). In terms of HIV infections rates, the YMSM from our study show higher seroprevalence (14%) relative to national and community studies of general youth that report prevalences of under 1% (5,35,36). While these data suggest elevated rates of psychosocial health problems and HIV among YMSM, it is important to acknowledge the limitations of

comparing data from a community-based sample of urban YMSM to other studies with differences in methodology and measurement approaches. Future syndemics research on YMSM would benefit from the assessment of sexual orientation in national studies of youth and/or the use of sampling methodologies that could allow for estimation of unbiased prevalences, such as Respondent Driven Sampling (37).

While 15% of the sample had four or more psychosocial health problems, 25% of the sample did not report a single psychosocial health problem, and another 28% of the sample only reported one problem. These data illustrate a diversity of developmental pathways, and the resiliency of a substantial proportion of these ethnically diverse, urban YMSM. Previous literature on YMSM has been criticized for being too problem focused, thereby ignoring the strengths and competencies that these youth exercise to successfully transverse difficult developmental challenges to achieve resilience (38). Some argue that the vast majority of youth who engage in same-sex sexual behavior are not experiencing the kinds of psychosocial health problems assessed in the present article (39). Our data corroborate this view; 53% reported zero or only one psychosocial health problem. A recent review of adolescent resilience research found virtually no studies of gay, lesbian, bisexual, or transgender youth, leaving a significant void in the literature (40). It is critical that future research identifies the internal and external strengths that lead to such resilience in the face of documented stressors and societal stigma.

Our analyses also documented significant inter-relationships among these psychosocial health problems. Of the 15 possible relationships between variables, 12 were significant and positive, suggesting that these psychosocial health problems tend to co-occur among YMSM. Many studies have reported the clustering of risk behaviors in adolescents in nationally representative (e.g. 41,42) and community samples of youth (e.g. 43,44,45), using a variety of analytic approaches (e.g. 46,47-49). However, most of this data has been from samples that are presumably heterosexual. One exception is Rothenman-Borus's study of 14-19 year old Black and Hispanic MSM, which found that sexual risk acts, substance abuse, conduct problems, and emotional distress did not form a multiple problem behavior cluster (50). Given the limited research and inconsistent findings regarding the clustering of psychosocial health problems among YMSM, further research is needed to understand these patterns and their consequences.

While considerable previous research has documented associations between individual psychosocial health problems—namely alcohol use, marijuana use, street drug use, psychological distress, and violence—and HIV risk among adult MSM, few studies have examined the additive effects of multiple risk factors, especially among YMSM. Our data suggest that the number of psychosocial health problems additively increase risk for HIV among urban YMSM. For example, each problem increased the odds of an HIV positive status by 42% and also increased the odds of sexual health risk behaviors. Multivariate analyses suggest that substance use and being the victim of violence show the strongest relationship to sexual health and HIV risk. If these findings replicate, an important next step will be to understand the cause of the clustering. The Center for Disease Control and Prevention (CDC) has laid out a number of potential reasons for the clustering of health-related problems that deserve further exploration in relations to YMSM (23). First, these health concerns may be linked because of shared risk and protective factors. For example, sensation seeking and impulsivity have both been associated with all of the health outcomes studied here (e.g. 51) and therefore may represent a common risk factor. Another common risk factor may be that YMSM have few places to meet each other. Gay bars are one of the most visible and accessible places to meet, yet the omnipresent alcohol and sexually charged environment may contribute to substance use and risky sex. Second, these health concerns may result from deleterious response to similar environmental factors like stigma and victimization, which have repeatedly been found to be higher among GLBT youth (52,53). These stressful experiences may increase risk for a number of health problems. Third, there could be reciprocal or interdependent effects

between the psychosocial health problems. For example, one drug could serve as a “gateway” to other substance use, mental health problems, and engagement in HIV risk behaviors. More research is needed to identify which, if any, of these factors may be responsible for the clustering of these epidemics among YMSM and then target these factors for prevention and treatment.

Study limitations must be considered when interpreting these findings. These data are cross-sectional and, therefore, we cannot draw conclusions about causality. For example, it is possible that HIV risk stems from having multiple psychosocial health problems or multiple psychosocial health problems emerge as a consequence of sexual risk behaviors. All data were collected through self-reports and subject to social desirability; YMSM may have minimized or over-reported risk behaviors. However, research suggests that self-reported data of sensitive issues collected via computer-assisted techniques may reduce reporting bias (54,55). Our assessments included only limited numbers of items and varying time phrase for each topic of interest, and therefore it was not possible to construct continuous scales that would likely have had superior psychometrics. To the extent that measurement error exists, it will tend to result in underestimates of the true associations between constructs (56). Similarly, we did not conduct testing to confirm HIV status, which could have led to misclassification problems. Subjects were recruited from one urban geographic area where substance use and sexual activity may occur at higher rates than elsewhere. In addition, the survey was administered at a community-based site offering HIV/STI specialty services in addition to primary care and social support services. As such, our findings may not generalize to other samples of YMSM. Finally, despite the sample being relatively large for studies of YMSM, the sample size had limited power to conduct the types of multivariate analyses performed by Stall and colleagues in their large study of adult MSM (N = 2,674). Nonetheless, this was a young, ethnically diverse urban sample of MSM, about which relatively little is known, and these data shed new light on the presence of an emerging syndemic that demands intervention to stem the HIV epidemic.

In conclusion, YMSM are experiencing a growing HIV epidemic. The current findings support a syndemic of co-occurring psychosocial health problems among YMSM that may be linked to this epidemic. Similar to evidence among adult MSM (25), these health problems were additively related to HIV risk. Disparities exist not only in the occurrence of these health problems, but also in research to prevent HIV in this highly vulnerable population. Several interventions show efficacy in reducing HIV risk among adult MSM (57) and ethnically diverse heterosexual youth (58), but insufficient attention has been paid to the HIV prevention needs of YMSM. The only way to combat the growing HIV epidemic among YMSM is to develop, implement, test, and disseminate interventions tailored to this group. Research is critically needed to identify individual and social risk and resilience factors and rapidly translate these findings into validated HIV prevention interventions targeted at YMSM.

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Table 1

## Sample demographics

	N	%
Age		
16-20	167	53.9
21-24	143	46.1
Race/Ethnicity		
White	94	30.3
Black	102	32.9
Hispanic/Latino	80	25.8
Asian/Pacific Islander	10	3.2
Other/Multiracial	24	7.7
Socioeconomic Status		
Lower	57	18.4
Middle	217	70.2
Upper	35	11.3
Sexual Orientation		
Gay	254	81.9
Bisexual	49	15.8
Other/Questioning	7	2.2

**Table 2**  
Rates and relationships of psychosocial health problems, sexual risk behaviors, and HIV status.

	1) Regular Binge Drinking	2) Street Drug Use	3) Regular Marijuana Use	4) Psychological Distress	5) Sexual Assault	6) Partner Violence	7) Multiple Anal Sex Partners	8) Unprotected Anal Sex	9) HIV Positive
Prevalence	22.9%	23.5%	24.2%	32.3%	32.3%	34.4%	40.0%	43.9%	14%
2	5.41 (3.01 – 9.71)								
3	3.74 (2.11 – 6.63)	4.76 (2.67 – 8.46)							
4	1.77 (1.02 – 3.05)	2.29 (1.33 – 3.94)	1.83 (1.07 – 3.13)						
5	--	--	1.97 (1.52 – 3.37)	1.78 (1.08 – 2.93)					
6	--	2.07 (1.19 – 2.63)	2.03 (1.16 – 3.54)	2.14 (1.29 – 3.55)	5.28 (3.08 – 9.06)				
7	--	2.42 (1.42 – 4.15)	1.91 (1.13 – 3.23)	--	--	--			
8	1.77 (1.02 – 3.05)	3.95 (2.27 – 6.85)	2.89 (1.34 – 3.91)	1.78 (1.08 – 2.93)	--	2.21 (1.35 – 3.63)	6.48 (3.56 – 11.80)		
9	--	--	2.33 (1.19 – 4.59)	--	2.05 (1.06 – 3.94)	2.11 (1.06 – 4.21)	4.46 (1.91 – 10.37)	3.52 (1.82 – 6.82)	

Note: -- indicates odd ratio is non-significant. All odds ratios shown, 2-tailed  $p < .05$ .



**Table 3** Logistic regression models to evaluate the association between syndemic and sexual health outcomes, controlling for demographics factors.

Predictors	Multiple Anal Sex Partners		Unprotected Anal Sex		HIV Positive	
	OR	95% CI	OR	95% CI	OR	95% CI
Race						
White	1.00		1.00		1.00	
Black	1.40	0.73 – 2.68	0.53	0.27 – 1.02	2.48	.99 – 6.26
Latino	1.04	0.53 – 2.05	0.81	0.42 – 1.58	1.22	0.44 – 3.38
Other	1.87	0.81 – 4.32	0.74	0.32 – 1.73	0.42	0.08 – 2.15
SES						
Lower	1.00		1.00		1.00	
Middle	1.06	0.47 – 2.35	1.43	0.63 – 3.23	0.85	0.26 – 2.77
Upper	0.79	0.30 – 2.05	1.47	0.56 – 3.86	0.76	0.19 – 3.08
Age	1.10	0.98 – 1.22	1.05	0.94 – 1.17	1.25	1.06 – 1.48
Syndemic	1.24	1.05 – 1.47	1.42	1.19 – 1.68	1.42	1.12 – 1.80
Model		R <sup>2</sup> = .06 Corr Class = 64.3%		R <sup>2</sup> = .12 Corr Class = 67.8%		R <sup>2</sup> = .14 Corr Class = 87.1%

Note: OR = Odds Ratio; CI = Confidence Interval. R<sup>2</sup> = Nagelkerke R Square. Corr Class = % of cases correctly classified. Syndemic = count of psychosocial health problems (Range: 0 – 6). CIs that do not include one are statistically significant at p < .05.

**Table 4**  
Logistic regression models to evaluate the association between syndemic components and sexual health outcomes.

Predictors	Multiple Anal Sex Partners		Unprotected Anal Sex		HIV Positive	
	OR	95% CI	OR	95% CI	OR	95% CI
Age	N/A		N/A		1.22	1.04 - 1.12
Substance Use	2.18	1.33 - 3.56	2.51	1.53 - 4.11	1.86	0.90 - 3.82
Psychological Distress	1.00	0.60 - 1.68	1.51	0.90 - 2.54	1.31	0.64 - 2.71
Violence Model	1.09	0.67 - 1.78	1.45	0.89 - 2.37	2.53	1.21 - 5.31
		R <sup>2</sup> = .05 Corr Class = 59.8%		R <sup>2</sup> = .10 Corr Class = 66.1 %		R <sup>2</sup> = .08 Corr Class 86.7= %

Note: OR = Odds Ratio. CI = Confidence Interval. N/A = independent variable not included in the model. R<sup>2</sup> = Nagelkerke R Square. Corr Class = % of cases correctly classified. CIs that do not include one are statistically significant at p < .05.