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Prescription Drug Misuse and Sexual Risk Behaviors Among Young Men Who Have Sex With Men (YMSM) in Philadelphia

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Abstract

This study examined the relationship between prescription drug misuse and sexual risk behaviors (i.e. unprotected sex, increased number of sex partners) in a sample of young men who have sex with men (YMSM) in Philadelphia. Data come from a cross-sectional study of 18-29 year old YMSM (N=191) who misused prescription drugs in the past 6 months. Associations were investigated in two regression models: logistic models for unprotected anal intercourse (UAI) and zero-truncated Poisson regression model for number of sex partners. Of 177 participants engaging in anal intercourse in the past 6 months, 57.6% engaged in UAI. After adjusting for socio-demographic variables and illicit drug use, misuse of prescription pain pills and muscle relaxants remained significantly associated with engaging in receptive UAI. No prescription drug class was associated with a high number of sex partners. This study provides additional evidence that some prescription drugs are associated with sexual risk behaviors among YMSM.

Keywords

prescription drug misuse; sexual behaviors; YMSM; sexually transmitted infections

1. Introduction

Nonmedical use or misuse of prescription drugs is a serious and growing public health problem in United States, particularly among young adults aged 18-25 (1-3). Nearly one-third of young adults reported having misused prescription drugs at some point in their

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Contributions:

AK developed the manuscript and conducted analyses. AK and SL developed implementation protocols and study design. AK conducted participant recruitment with help of research assistant. All authors contributed to and approved the final version of the manuscript.

Conflict of interest:

No conflicts of interest to report.

lifetime, which exceeds rates of use for most other drugs, including cocaine and heroin, among individuals in the same age group (3). Misuse of prescription drugs has been linked to a number of negative health outcomes among young adults, including drug dependence (4-6), drug overdose (7), psychiatric dysfunctions (8), and multiple risk practices (9, 10). A body of literature has investigated prescription drug misuse among young adults including various youth cultures (11), college population (12, 13), adolescents (14), or high-risk young adults (9, 15, 16). A few studies have also explored prescription drug misuse among men who have sex with men (MSM) (17-20).

Cochran, et al. (17) found that men reporting same-sex partners had greater odds of lifetime use of pain pills and tranquilizers, compared to men who did not have same-sex partners. Using a community-based sample of MSM, Kelly and Parsons (18) reported high prevalence of lifetime (49.2%) and recent (33.6%) prescription drug misuse within this population. Benotsch, et al. (19) reported findings from a sample of MSM attending a gay pride festival in which 38% reported lifetime, while 17% reported prescription drug misuse in the previous three months. Buttram, et al. (20) found that prescription opioid misuse was associated with other substance use, drug injection, substance dependence, and history of arrest among MSM in the Miami area. However, none of these estimates are specific to young MSM (YMSM, ages 18-29), although YMSM are more likely than older MSM to engage in tobacco, alcohol and drug use (17, 21-24). For example, a number of studies have documented higher use of marijuana (25), or “club drugs”, i.e. ecstasy, cocaine, crystal methamphetamine (24, 26, 27) among YMSM.

Young adults, who are more likely to have sex with multiple partners and to use condoms inconsistently or not at all (28), are also more likely to get infected with HIV and other sexually transmitted infections (STI) (29). YMSM, in particular, continue to be the risk group most severely affected by HIV in the U.S (30), with the highest rates of HIV infection (30, 31). From 2006-2009, a 21% increase in incidence of HIV among 13-29 year olds was observed, mainly driven by 34% increase in YMSM (32). YMSM are vulnerable to HIV and STIs for many reasons, including high levels of drug and alcohol abuse (33, 34). A number of studies of YMSM and drug use have determined association between illicit drug use and sexual risk behaviors (21, 25, 26, 35).

Despite this well-known inter section of drug use with sexual risk behaviors leading to acquiring HIV and STIs, only a few studies have examined associations between prescription drug misuse and sexual risk behaviors. A qualitative study of young injection drug users (36) found that prescription pain pills, tranquilizers, and stimulants were misused in the context of sexual risk behaviors. One study found that HIV-negative MSM who reported recent prescription drug misuse were more likely to engage in unprotected anal intercourse (UAI) (37). Another study reported that men who misused prescription drugs had higher rates of HIV risk behaviors, including more sexual partners and more unprotected sex (19). However, no study reported data specific for YMSM. In addition, no study to date differentiates between prescription drug classes. Since prescription drugs function differently (38) they may be associated with HIV and STI risk in dissimilar ways. While the motivations for use of prescription drugs, such as pain pills, tranquilizers, and stimulants vary (i.e. self-treatment of pain, insomnia, difficulty concentrating, recreational

use) (39-41), it is possible that these drugs can alter judgment and inhibition and lead young adults to engage in impulsive and unsafe behaviors (42).

The purpose of this study is to examine the relationship between prescription drug misuse and sexual risk behaviors in a community sample of YMSM who report recent misuse of prescription drugs. Specifically, we examine what types of prescription drugs used by YMSM are associated with risky sexual practices (i.e. UAI, and higher number of sexual partners). While using this exploratory approach, we are also aware of previous studies (25, 26, 35, 37) which found associations between "club" drug use and UAI. Therefore, in the present analysis, we are accounting for use of illicit drugs, and other socio-demographic characteristics potentially related to engagement in sexual risk behaviors. We focus specifically on UAI as the primary route of HIV transmission among YMSM (43). Given the significance of sexual transmission in new HIV infections among YMSM, the ongoing prescription drug epidemic, and the need to develop effective HIV interventions, it is important to determine whether prescription drug misuse is associated with sexual risk behavior in this population.

2. Methods

2.1. Participants, Sampling, and Procedures

Eligible participants were males ages 18-29; had engaged in misuse of a prescription drug (i.e., pain pill, tranquilizer, stimulant) at least once in the last 6 months; reported having oral or anal sex with a male partner during the past 6 months; were English speaking; and resided in Philadelphia. "Misuse" was defined as taking prescription drugs "when they were not prescribed for you or that you took only for the experience or feeling it caused" (3, 44). Study recruitment was conducted in Philadelphia between November 2012 and July 2013. Participants were located using a combination of sampling strategies (targeted and chain-referral sampling) in variety of settings (45, 46). Extensive efforts were taken to maximize diversity of the sample. For example, participants were recruited in a range of contexts, such as parks, streets, neighborhoods, bars, clubs, college campuses, and organizations serving YMSM. Recruitment was conducted at different times during the day and at night. Sampling was stratified by age (three age ranges: 18-21, 22-25, 26-29) to ensure equal representation of different groups of YMSM. To further enhance the diversity of sample, only two referrals per enrolled participant were allowed into the sample as part of chain-referral sampling process. A brief screening tool was used (either in person, or over the phone) to determine eligibility for the study. Eligible individuals were verbally consented prior to conducting face-to-face structured interview. All study participants received a $25 cash incentive at the end of the interview.

A survey was developed using iSurvey Software (Contact Software Ltd, Wellington, New Zealand) and loaded onto iPads. The instrument was administered by one of two interviewers (first author or research assistant). Interviews, which lasted approximately 60 minutes, were conducted in a private office at Drexel University School of Public Health, or natural settings, such as fast food restaurants, cafes, and parks. Participants were provided with cards containing response options to facilitate standardization on some interview questions. Referral information, such as resources for HIV testing or counseling, were

offered to interested participants at the end of the interview. The research protocol was approved by the institutional review board at Drexel University and a Certificate of Confidentiality was obtained from U.S. Department of Health and Human Services (USDHHS).

2.2.Measures

2.2.1.Demographic variables—All data were self-reported. Demographic information included age (utilized continuously in regression analysis), race/ethnicity (recoded dichotomously as 0="White" or 1="non-Whites"), and sexual orientation (dichotomized into 0="gay identified" and 1="non-gay identified, i.e. bisexual, heterosexual, other"). We also assessed educational status with a question "Are you currently in school?" (0="No", 1="Yes"). Unstable housing was assessed by question "In the last 6 months, where did you sleep most nights?" (dichotomized into 0="own home/apartment, dorm, or parent's home", 1="boyfriend's, sex partner's, relative's, or foster home, motel, shelter, car, street, park, squat, halfway house or treatment center, jail, or transitional housing program"). Employment was assessed by question "Are you currently employed?" (0="No", 1="Yes"). We also asked whether the participants engaged in any sex trade (defined as sex trade being one of their sources of income) in the past six months (0="No", 1="Yes"). HIV status was self-reported by answering question "What is your HIVstatus?" and recorded as HIV-positive, HIV-negative, or "status unknown "on the survey and then re-coded dichotomously as HIV-positive or non-HIV-positive (HIV-negative or status unknown). We also asked if the participant has ever been diagnosed with various STI (gonorrhea, chlamydia, HCV, HPV, HSV, syphilis). If never diagnosed with any STI responses were coded 0="No", if ever diagnosed with any STI responses were coded 1="Yes".

2.2.2. Drug use variables—Prescription drug misuse was defined as taking prescription drugs "when they were not prescribed for you or that you took only for the experience or feeling it caused" (SAMSHA, 2010). First, participants were asked to respond to a Yes/No question asking if they misused different prescription pain pills, tranquilizers, stimulants, and other prescription pills (muscle relaxants, and erectile dysfunction drugs [EDD]) in the last six months). Participants were read a comprehensive list of the prescription drugs for each of drug classes noted above (i.e. 18 pain pills, 16 tranquilizers, 8 stimulants, 5 muscle relaxants, 3 EDD). If they answered "Yes" to any of drugs on the list they were coded as using that prescription drug class, and if they answered "No" to all of the examples on the list they were coded as not using that prescription drug class. In similar approach, we also inquired about misuse of over-the-counter (OTC) medications, i.e. antihistamines such as Benadryl, decongestants such as Sudafed, and cough medicines such as Robitussin, or Coricidin Cough & Cold "Triple Cs" (coded 0="No", 1="Yes"). Second, to assess the severity of current misuse, participants were asked, "Approximately, how many pills (pain pills/tranquilizers/stimulants/muscle relaxants/EDD/OTC) did you use in the past six months, that were not prescribed to you, or that you took only for the experience or feeling it caused?". For each drug type (pain pills/tranquilizers/stimulants/muscle relaxants/EDD/OTC), a median number of misused pills was calculated to classify participants as "low" or "high" users. Given that participants reported smaller quantities of muscle relaxants, EDD, and OTC, with median being 0 for each, we only report whether participants used or did not

use these drugs in the past 6 months. Participants were also asked whether they used marijuana, ecstasy, cocaine,or crystal methamphetamine in the previous six months (each coded 0="No", 1="Yes"). Finally, participants were asked whether they used each of prescription (pain pills, tranquilizers, stimulants), or each of illicit drugs before or during any sexual activity in the preceding 6 months (coded 0="No", 1="Yes" for each type of drug).

2.2.3. Sexual Risk Variables—The dependent variables used in this analysis included dichotomous measures assessing engagement in any unprotected anal intercourse (UAI) in the preceding 180 days. Since we were also interested in possible differences between insertive and receptive UAI, we also present separate analyses for two types of UAI. Participants were asked, "In the last 6 months, how often did you use a condom during anal insertive/anal receptive sex"? Response options were 0 - never, 1- less than half the time, 2- half the time, 3 - more than half the time, 4 - always. Values were dichotomized to 0 (used condoms all the time, during anal sexual acts, did not have unprotected sex) and 1 (did not use condoms all the time, during anal sexual acts, had unprotected sex). Finally, we also queried the total number of sexual partners (male, transgender, and female) during the past 180 days (continuous measure).

2.3. Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics were first calculated for all variables of interest. We then examined unadjusted bivariate associations between the independent variables and the three variables describing sexual behaviors. Due to the large number of comparisons, all p-values were adjusted using the false discovery rate controlling procedure (47). For each outcome, independent variables associated at $p<0.10$ were retained in multivariate models. All independent continuous variables were mean-centered (48). Due to different distributions of the outcome variables, two distinct regression models were used: logistic regression for anal intercourse(s), and zero-truncated Poisson regression for number of partners. We ran separate multivariate models for different classes and dimensions of prescription drug misuse (see footnote in Table 3). Odds ratios (ORs), incidence rate ratios (IRRs) and 95% confidence intervals (CIs) were calculated. For zero-truncated Poisson regression, robust standard errors for the parameter estimates were obtained as recommended by Cameron and Trivedi (49) to control for mild violation of the distribution assumption that the variance equals the mean. To prevent over-fitting the logistic regression model, collinearity between predictor variables was assessed using a correlation matrix procedure. Variables were considered collinear if the value of the correlation coefficient was greater than 0.6 (50). None of variables showed this level of collinearity. Hosmer and Lemeshow tests confirmed that the predictors were a good fit for each model. The explanatory power of the models estimating unprotected sex was estimated with Nagelkerke's R^2 (51).

3. Results

3.1. Sample characteristics

A total of 939 individuals were screened and 221 (23.5%) met the enrollment criteria. Among the 221 eligible YMSM, 198 (89.6%) agreed to participate and were interviewed. Seven participants (3.5%) were excluded from the sample after it was determined that they either had not satisfied at least one of enrollment criteria or had already been interviewed. The final sample was comprised of 191 YMSM (Age 18-21: 60, Age 22-25: 66, Age 26-29: 65).

As shown in Table 1, the median age in our sample of YMSM was 23 years (IQR: 21, 27). Study participants were predominantly non-white (66.5%), and the majority self-identified as gay/homosexual (57.1%). A third of participants (31.7%) were students, and almost half were employed (48.2%). Over one third of the sample was either homeless or marginally housed (37.7%), and close to a quarter of participants reported engaging in sex work in the last 6 months (23.6%). HIV positivity was reported by 15.7% of participants, while 44% reported being diagnosed with at least one STI in their lifetime.

The men in our sample misused variety of prescription drugs in the last 6 months (Table 1). The most commonly misused classes of prescription drugs were tranquilizers (81.2%) and pain pills (78.5%). In addition, 37.2% misused prescription pain pills, and 35.1% misused tranquilizers before sexual activity. Over half of the participants reported misuse of stimulants (52.4%), while smaller percentage (11.0%) used them before engaging in sex. The median number of misused pain pills was 15 (IQR: 2, 105), tranquilizers 12 (IQR: 1, 96) and stimulants 1 (IQR: 0, 6). Close to one third of participants reported misusing other classes of prescription drugs (muscle relaxants 28.8%, EDD 22.5%) and OTC medications (30.9%). Over two-thirds of participants smoked marijuana (76.5%), and 57.6% used marijuana before sex in the last 6 months. Among illicit drugs of interest, 35.1% used cocaine, 25.7% ecstasy, and 16.2% crystal methamphetamine, and a smaller percentage of the sample used these drugs before sex (15.2%, 17.3%, and 11.0%, respectively) the last 6 months.

In Table 1 we also report sexual behaviors of our participants in the past 6 months. A small number of participants (n=14) reported only oral sex with men in the last 6 months, and were subsequently excluded from analyses. Of the men reporting anal intercourse (N=177), 57.6% engaged in UAI. Among YMSM reporting anal receptive sex (N=122), 59.0 % reported receptive UAI at least on one occasion. Among those reporting anal insertive sex (N=146), 56.2% reported having UAI. The median number of sex partners in the past six months was 5 (IQR: 2, 10; range: 1-303).

3.2. Bivariate Associations with Sexual Risk Behavior

Table 2 displays results from the binary analyses examining correlates of unprotected sex and number of partners, expressed as unadjusted OR, or IRR. In the bivariate analysis, UAI was more likely among older participants (significantly for overall and insertive UAI, marginally for receptive UAI). YMSM who self-identified as gay were significantly more likely to engage in receptive UAI, and marginally more likely to engage in overall UAI.

Current students were marginally less likely to engage in insertive UAI, and significantly less likely to report a high number of partners. Those engaged in sex work were significantly less likely to report receptive UAI, but significantly more likely to report high number of partners. Participants with unstable housing were also significantly more likely to have high number of sex partners. HIV + participants were marginally more likely to have a higher number of sex partners. Finally, UAI (overall, receptive and insertive) was significantly more likely among YMSM with a history of STI diagnosis.

Overall and receptive UAI was more likely among those who misused pain pills before having sex. Receptive UAI was also marginally more likely among those who misused prescription pain pills in the last 6 months. Those who misused tranquilizers before sex were significantly less likely to engage in UAI, in particular in insertive UAI. The use of stimulants before sex was marginally associated with increased number of partners. Those who misused muscle relaxants were marginally more likely to engage in overall UAI, and, significantly more likely to engage in receptive UAI. Similarly, misuse of OTC was marginally associated with UAI, while use of EDDs was significantly associated with reporting high number of sex partners. Among illicit drugs, UAI (overall, receptive and insertive) was significantly more likely among those who used ecstasy, ecstasy before sex, crystal methamphetamine (with exception of receptive UAI), and crystal methamphetamine before sex. Finally, those who used ecstasy, cocaine, and crystal meth, and those who used cocaine and crystal meth before sex were more likely to have a higher number of sex partners.

3.3. Multivariate Associations with Sexual Risk Behavior

Table 3 presents results from multiple regression analyses performed to describe the relationships between recent prescription drug misuse and sexual risk behaviors. After controlling for effects of demographic variables and illicit drug use, receptive UAI was significantly more likely among those who misused pain pills (OR=3.11, 95% CI: 1.20, 8.04, $p<0.05$), and muscle relaxants (OR=4.09, 95% CI: 1.42, 11.80, $p<0.01$). Participants who misused tranquilizers before sex were less likely to engage in unprotected anal sex (OR=0.41, 95% CI: 0.20, 0.82, $p<0.05$), and in particular in insertive UAI (OR=0.30, 95% CI: 0.13, 0.71, $p<0.01$).

Although not statistically significant we observed a few trends. YMSM who misused muscle relaxants and OTC medications in the past 6 months had a trend towards engaging in UAI (muscle relaxants: OR=1.90, p=0.08 and OTC medications: OR=1.86, p=0.09). Similar to bivariate findings, UAI remained marginally more likely among participants who misused prescription pain pills before sex (any UAI: OR=1.96, p=0.06; receptive UAI: OR=2.53, p=0.07). After controlling for demographic and illicit drug use variables, no prescription drug was associated with having higher numbers of sex partners.

4. Discussion

To our knowledge, this represents one of the first studies to examine associations of prescription drug misuse and engagement in sexual risk behaviors in a sample of YMSM, a population that continues to be the risk group most severely affected by HIV in the U.S.

(30). In this study we found that YMSM, recruited from various settings in Philadelphia, were a heterogeneous population reporting misuse of a variety of prescription drugs. Study findings corroborate previous limited research on prescription drug misuse among MSM (19, 37), which indicated possible associations between prescription drug misuse and UAI. Further, we have also identified specific classes of prescription drugs that are more likely to be associated with engagement in various sexual risk behaviors among YMSM. An additional strength of this report is that it includes separate analyses for receptive and insertive UAI, which contributes to limited literature indicating that certain drugs may be more associated with receptive UAI compared to insertive UAI (25).

In the present study we found that those who engaged in misuse of prescription pain pills and muscle relaxants in the last 6 months were more likely to engage in receptive UAI. It is possible that YMSM use prescription pain pills and muscle relaxants to enable or dull the pain of receptive anal sex. While the association between use of pain pills before sex and UAI was not statistically significant, it trended in a positive direction, a finding that adds to previous studies examining drug use before sex (52, 53). Similarly, the association between misuse of OTC medications (such as cough syrup) and UAI was not statistically significant but trended in a positive direction, adding to previous study reporting that sexual activity was significantly associated with use of codeine cough syrup among male youths (54). In contrast, we found that those who misused prescription tranquilizers before sex had lesser odds of engaging in UAI, insertive UAI in particular. While it is known that tranquilizers have pharmacological properties contributing to drowsiness, or inability to sustain erection, this finding requires further investigation. Further, we are cautious in interpreting whether the use of prescription drugs before sex is coincidental or intentional (36). Less than 50% of those who used prescription pills in the past 6 months have used them before sex (pain pills 47%, tranquilizers, 44%, stimulants, 21%), which suggests that prescription pills were misused for variety of reasons. Past research suggests that the association between illicit drugs use and sexual risk behaviors among YMSM differs depending on various other factors, such as personality characteristics (55, 56), mental health (57) or circumstances surrounding the sexual encounter (52, 58). It is likely that these findings are applicable to prescription drugs as well.

It is also important to note that a number of associations between prescription drugs and unprotected sex were confounded by use of illicit drugs. Overall, the most commonly used illicit drug was marijuana, with over three quarters of participants having used it in the last 6 months, and over half of the sample reported using it before sex. While other studies have found an association between marijuana use and sexual risk in YMSM (25), we did not observe such an association, possibly due to almost universal marijuana use. In all multivariate models, use of “club drugs” (ecstasy in particular and crystal methamphetamine to the lesser extent) was one of the strongest predictors of engaging in UAI. This confirms previous findings of strong association between use of these drugs and unprotected sex in YMSM (26, 59, 60). Unlike prescription pills, the majority of participants who used club drugs in the last 6 months did so in the context of sexual activity (ecstasy 59%, crystal meth 64%).

In addition, there was a strong association between some demographic factors and UAI. Similar to some other studies of MSM (61), gay-identified YMSM were more likely than non-gay identified YMSM to engage inreceptive UAI. However, there was no association between self-reported sexual identity and engagement in insertive UAI. YMSM reporting sex work were more likely to engage in protected receptive anal intercourse, but as likely to engage in insertive UAI as other YMSM. We also observed that older participants were more likely to engage in UAI. Some researchers have speculated that connections to the gay community increase chances of engaging in sexual risk behaviors (62). Moreover, older and/or gay-identified YMSM may participant in settings where drug use is more prevalent or is associated with sex (i.e. clubs, bathhouses) (22). Also, it is possible that other individual or network-level risk factors play a role in sexual risk behaviors among YMSM (56, 63). For example, UAI in itself is not necessarily risky if performed within a monogamous, negative seroconcordant relationship. However, determining UAI in a monogamous context among YMSM in this study was challenging: we did not make distinctions between inconsistent use of condoms with primary and non-primary partners given the transient nature of primary relationships at this age (64) and in our sample (~10% reported being monogamous at the time of interview and/or having only one partner in the past 6 months),

Results from this study also indicate that there are less robust associations between higher number of sex partners and prescription drugs. Although we found bivariate associations between high number of sex partners and misuse of prescription stimulants or EDDs, multivariate analysis indicated no significant relationships between these variables. It is important to note, however, that almost one quarter of YMSM in our sample reported use of EDDs in the last 6 months, which is significantly more than previously reported in YMSM population (24). In all of the multivariate models investigating association between prescription drugs and higher number of sex partners, we observed that unstable housing and engagement in sex work were strong independent predictors of greater number of partners. Similarly to other studies (24, 65), this indicates that unsafe social environment may act synergistically with having a high number of sexual partners.

Researching correlates of risky sexual behavior can serve the purpose of identifying types of behaviors and individuals that could be targeted by prevention programs. While sexually active YMSM can undertake less risky behaviors, such as not misusing drugs, using condoms consistently and correctly if they have anal sex, or reducing the number of sex partners (66), it is also important for health-care providers and public health practitioners to ensure that YMSM who are engaging in these behaviors receive risk-reduction interventions (67). Our study findings could therefore guide practitioners and members of the public health community towards devising strategies and policies that will prevent the negative effects of prescription drug misuse on YMSM, and will benefit YMSM individuals and their communities. Providers who serve YMSM should routinely ask about prescription drug misuse and refer those needing support to appropriate services. Screening and brief interventions at the time of direct contact have shown promise in reducing drug use (68), or sexual risk behaviors (69) among MSM and could have promise in reducing misuse of prescription medications in the same population.

This study has several limitations that need to be considered when interpreting the findings. First, results are based upon cross-sectional data, which limits the conclusions to associations between variables rather than identifying causal relationships. Second, the sample is comprised of YMSM in Philadelphia, who were engaged in recent prescription drug misuse. Although we conducted extensive out reach to derive a diverse sample of YMSM who misuse prescription drugs, our results may not generalize to the larger population of YMSM, or to YMSM in other cities, or non-urban areas. Lastly, data are based on self-reportand may be subject to social desirability issues, especially among YMSM concerned with the stigma associated with reporting drug use and risky sexual behaviors.

In summary, the results of this study fill a gap in the YMSM and HIV literature on prescription drug misuse and its relationship to sexual risk behaviors. While prescription drugs have legitimate uses, a significant number of sexual minority youth use them for different reasons than those intended (70), including engaging in sexual risk behaviors. Our results suggest that prescription drug misuse is a relevant factor associated with sexual risk behaviors, along with other factors such as illicit drug use and the social environment. Finally, our results indicate that YMSM who misuse prescription medications are a high-risk population that should be a focal point for public health interventions.

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Table 1

Participants' Demographics, Drug and Sex Behaviorsin the past 6 months (N=191)

Demographics	**N (%)**
Age, years (median, IQR)	23 (21, 27)
Race	
Non-Hispanic White	64 (33.5)
Black/African American	71 (37.2)
Multiracial	35 (16)
Other (incl. Hispanic)	17 (8.9)
Asian/Pacific Islander	2 (1)
Native American	2 (1)
Sexual Identity	
Gay/Homosexual	109 (57.1)
Bisexual/Heterosexual/Other	82 (42.9)
Currently in school	61 (32.1)
Currently employed	92 (48.2)
Unstable housing	72 (37.7)
Engaged in sex work	45 (23.6)
HIV +	30 (15.7)
Ever Diagnosed with STI	84 (44.0)
Prescription (Rx) Drug Misuse	
Rx Pain pills	150 (78.5)
# ofPain pills used (median; IQR)	(15; 2, 105)
Used Rx Pain Pills Before Sex	71 (37.2)
Rx Tranquilizers	154 (81.2)
# ofTranquilizers used (median; IQR)	(12; 1, 96)
Used Rx Tranquilizers Before Sex	67 (35.1)
Rx Stimulants	100 (52.4)
# ofStimulants used (median; IQR)	(1; 0, 6)
Used Rx Stimulants Before Sex	21 (11.0)
Muscle Relaxants (MR)	55 (28.8)
Erectile dysfunction drugs (EDD)	43 (22.5)
Over-the counter drugs (OTC)	59 (30.9)
Illicit Drug Use	
Marijuana	146 (76.5)
Used Marijuana Before Sex	110 (57.6)
Ecstasy	49 (25.7)
Used Ecstasy Before Sex	29 (15.2)
Cocaine	67 (35.1)
Used Cocaine Before Sex	33 (17.3)
Crystal Meth	31 (16.2)

Demographics	**N (%)**
Used Crystal Meth Before Sex	21 (11.0)
Sex Behaviors	
Number of Partners (median, IQR)	(5; 2, 10)
Engaged in unprotected intercourse	
Anal (N=177)	102 (57.6)
Anal Receptive (N=122)	72 (59.0)
Anal Insertive (N=146)	82 (56.2)

Table 2

Bivariate Associations of Individual Characteristics with Sexual Risk Behavior in the Past 6 months

Independent Variable	Any UAI, N=177 Unadjusted OR (95% CI)	Receptive UAI, N=122 Unadjusted OR (95% CI)	Insertive UAI, N=146 Unadjusted OR (95% CI)	Number of sex partners N=191Unadjusted IRR (95% CI)
Demographics				
Age (years)	**1.14 (1.04, 1.25)****	**1.10 (0.98, 1.24)**†	**1.14 (1.03, 1.27)***	1.09 (0.96, 1.22)
Race (non-White)	0.60 (0.31, 1.15)	0.54 (0.25, 1.18)	0.70 (0.34, 1.43)	1.53 (0.86, 2.72)
Sexual identity (non-gay)	**0.56 (0.31, 1.03)**†	**0.26 (0.12, 0.58)*****	0.70 (0.36, 1.36)	0.94 (0.46, 1.91)
Currently in school	0.69 (0.37, 1.31)	0.84 (0.40, 1.78)	**0.52 (0.26, 1.06)**†	**0.38 (0.23, 0.61)*****
Currently employed	1.16 (0.64, 2.11)	1.11 (0.54, 2.29)	1.12 (0.58, 2.15)	0.88 (0.44, 1.76)
Unstable housing	0.92 (0.49, 1.70)	0.88 (0.42, 1.83)	1.02 (0.51, 2.07)	**2.75 (1.51, 5.03)*****
Engaged in sex work	0.67 (0.33, 1.36)	**0.43 (0.18, 1.00)***	1.13 (0.50, 2.58)	**3.76 (1.97, 7.20)*****
HIV +	1.59 (0.69, 3.62)	1.50 (0.59, 3.83)	2.13 (0.82, 5.50)	**1.89 (0.88, 4.07)**†
Dx with STI Ever	**1.89 (1.02, 3.48)***	**2.21 (1.03, 4.73)***	**1.93 (1.00, 3.76)***	0.97 (0.50, 1.89)
Prescription Drugs				
Rx Pain Pills	1.70 (0.84, 3.45)	**2.15 (0.97, 4.78)**†	1.75 (0.80, 3.82)	1.63 (0.81, 3.30)
# of PP (high vs. low)	1.48 (0.81, 2.70)	1.42 (0.68, 2.99)	1.37 (0.71, 2.65)	1.59 (0.81, 3.12)
Used Before Sex	**2.00 (1.05, 3.82)***	**2.00 (0.86, 4.67)**†	1.56 (0.78, 3.10)	1.39 (0.70, 2.76)
Rx Tranquilizers	1.17 (0.55, 2.50)	1.31 (0.55, 3.13)	1.62 (0.72, 3.63)	1.16 (0.45, 2.97)
# ofTranq. (high vs. low)	1.22 (0.67, 2.23)	1.47 (0.70, 3.10)	1.29 (0.67, 2.48)	1.60 (0.82, 3.15)
Used Before Sex	**0.48 (0.26, 0.90)***	0.54 (0.25, 1.19)	**0.54 (0.27, 1.08)**†	1.38 (0.70, 2.72)
Rx Stimulant	0.83 (0.46, 1.51)	1.06 (0.52, 2.18)	0.83 (0.43, 1.60)	1.11 (0.55, 2.24)
# ofStimul. (high vs. low)	0.93 (0.51, 1.68)	1.14 (0.55, 2.35)	0.98 (0.51, 1.89)	1.05 (0.52, 2.10)
Used Before Sex	1.17 (0.43, 3.19)	1.64 (0.48, 5.67)	1.19 (0.40, 3.54)	**2.42 (0.87, 6.74)**†
Muscle Relaxants (MR)	**1.87 (0.95, 3.66)**†	**2.97 (1.21, 7.27)***	1.64 (0.80, 3.39)	1.21 (0.54, 2.72)
EDD	1.11 (0.55, 2.24)	1.10 (0.46, 2.60)	1.12 (0.53, 2.41)	**3.09 (1.55, 6.16)*****
OTC	**1.73 (0.89, 3.37)**†	1.58 (0.70, 3.57)	1.43 (0.70, 2.94)	1.28 (0.64, 2.57)
Illicit drugs				
Marijuana	1.07 (0.52, 2.18)	1.34 (0.57, 3.12)	0.77 (0.34, 1.72)	1.24 (0.53, 2.92)
M Used Before Sex	1.06 (0.58, 1.95)	1.04 (0.50, 2.15)	0.87 (0.45, 1.70)	1.38 (0.70, 2.72)
Ecstasy	**2.39 (1.15, 4.93)***	**2.55 (1.10, 5.89)***	**2.50 (1.13, 5.53)***	**2.23 (1.08, 4.63)***
E Used Before Sex	**3.16 (1.21, 8.25)***	**3.55 (1.11, 11.31)***	**2.50 (0.96, 6.27)**†	1.69 (0.87, 3.28)
Cocaine	1.32 (0.70, 2.47)	1.64 (0.75, 3.56)	1.41 (0.71, 2.81)	**2.61 (1.36, 5.00)****
C Used Before Sex	1.33 (0.59, 3.00)	1.11 (0.40, 3.09)	1.83 (0.74, 4.56)	**3.77 (1.86, 7.64)*****
Crystal Meth	**2.99 (1.21, 7.37)***	2.10 (0.75, 5.80)	**5.85 (1.91, 17.94)*****	**5.43 (2.89,10.21)*****

Independent Variable	Any UAI, N=177	Receptive UAI, N=122	Insertive UAI, N=146	Number of sex partners
	Unadjusted OR (95% CI)	Unadjusted OR (95% CI)	Unadjusted OR (95% CI)	N=191Unadjusted IRR (95% CI)
CM Used Before Sex	3.55 (1.14, 11.03)*	5.29 (1.14, 24.59)*	4.93 (1.37, 17.75)*	4.86 (2.31, 10.26)***

† < 0.1

* <0.05

** <0.01

*** <0.001

Table 3

Multivariate Associations of Prescription Drug Misuse with Sexual Risk Behavior in the Past 6 months

Rx class	Any UAI(N=177)	Receptive UAI(N=122)	Insertive UAI(N=146)	Number of partners (N=191)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	IRR (95% CI)
Rx Pain Pills	-	**3.11 (1.20, 8.04)** ***c***	-	-
Used Rx Pain Pills Before Sex	1.96 (0.96, 3.99)[b]	2.53 (0.92, 6.97)[d]	-	-
Used Rx Tranquilizers Before Sex	**0.41 (0.20, 0.82)** ***b***	-	**0.30 (0.13, 0.71)** ***e***	-
Used Rx Stimulants Before Sex	-	-	-	1.39 (0.56, 3.45)[g]
Muscle Relaxants(MR)	1.90 (0.91, 3.95)[a]	**4.09(1.42, 11.80)** ***c***	-	-
EDD	-	-	-	1.28 (0.59, 2.76)[f]
OTC	1.86 (0.91, 3.80)[a]	-	-	-

*****<0.001**

R^2 in multivariate models ranged from 0.17 to 0.34.

* **<0.05**

** **<0.01**

a **– adjusted for demographics (age, sexual identity, and STI diagnosis) and use of illicit drugs (ecstasy and crystal meth)**

b **–adjusted for demographics (age, sexual identity, and STI diagnosis) and use of illicit drugs before sex (ecstasy and crystal meth)**

c **–adjusted for demographics (age, sexual identity, sex work, and STI diagnosis) and use of illicit drugs (ecstasy)**

d **–adjusted for demographics (age, sexual identity, sex work, and STI diagnosis) and use of illicit drugs before sex (ecstasy and crystal meth)**

e **–adjusted for demographics (age, school status, and STI diagnosis) and use of illicit drugs before sex (ecstasy and crystal meth)**

f **–adjusted for demographics (school status, unstable housing, sex work, HIV diagnosis) and use of illicit drugs (ecstasy, cocaine, and crystal meth)**

g **adjusted for demographics (school status, unstable housing, sex work, HIV diagnosis) and use of illicit drugs before sex (cocaine, and crystal meth)**