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Validity of Self-Reported Substance Use In MSM:

Comparisons with a General Population Sample

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Abstract

Purpose—To understand the validity of self-reported recent drug use in men who have sex with men (MSM).

Methods—We obtained a probability sample of Chicago men who have sex with men (MSM; n=216) and administered urine and saliva drug testing following a self-administered interview. Analyses examined participation in drug testing, the agreement between self-reported past month drug use and drug test results, correlates of underreporting, and the relative utility of drug testing vs. self-reports in identifying recent marijuana and cocaine use. For marijuana and cocaine, findings were compared with those obtained from a general population sample of men (n=241).

Results—Over three quarters of the participants in both samples provided at least one specimen for drug testing. Self reports in both samples showed a high degree of correspondence with drug tests for marijuana, but not for cocaine. Sensitivity for cocaine use reporting was 60% for the MSM sample and 40% for the general population males. Conditional kappa and sensitivity statistics for marijuana, cocaine, MDMA and methamphetamine suggested that self reports among MSM are provided with a high degree of validity. Underreporting was a correlate of social class (education, income and employment) in the general population, but not in the MSM sample. The utility of drug testing was dependent on social class in the general population sample.

Conclusions—Drug testing is feasible in epidemiological surveys of drug use. Self reports among MSM are at least as valid as those provided by a general population sample of males. In some instances (e. g. , cocaine use), they may actually be of higher quality. Although the findings support the merit of epidemiological studies of MSM drug use that have relied completely on self-report, drug tests may be useful for clarifying club drug ingestion patterns.

Keywords

substance use; MSM; validity; drug testing

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Introduction

Accumulating data suggest that respondents tend to underreport recent drug use in epidemiologic surveys [1]. Although a number of secondary analytic studies provide indirect and suggestive evidence [2-3], studies incorporating drug testing protocols as an adjunct to surveys provide more direct evidence of underreporting [4-8]. Findings from these studies suggest that underreporting of cocaine and heroin is more prevalent than underreporting of marijuana, although underreporting of all substances tested for, including tobacco, has been observed [9]. While general population studies generally corroborate those obtained from studies focused on “high risk” and “special” population samples [8,10-12], some studies suggest that underreporting of drug use may be greater among racial/ethnic minority populations in the United States [11,13,14].

Substance use has been studied extensively as a risk factor for HIV among men who have sex with men (MSM) [15-19]. Although conclusions from these studies are based on survey responses to questions about substance use and abuse, there has been no systematic examination of the validity of substance reporting among MSM. Information about reporting validity and its variation across subgroups of MSM could have considerable implications for conclusions regarding the epidemiology of substance use among MSM. For example, Crosby et al. report that substance use has declined in more recent cohorts of young MSM in San Francisco, as compared with cohorts drawn from an earlier time period [19]. These findings could alternatively be interpreted to suggest that survey disclosure patterns have changed over time. Given prevention messages suggesting the potentially risky nature of drug involvement among MSM, survey respondents may find it more socially undesirable to disclose drug use on surveys. Recent data from both convenience and probability samples suggest that MDMA, GHB, and other “club drugs” may be particularly salient as a correlate of high risk behavior for MSM and may show elevated prevalence among MSM [18,20]. As all of the data describing these trends are based on self-report, there is no way to assess the validity of conclusions regarding MSM specific trends. Prior research in general population samples, however, does suggest that those reporting club drug use tend to provide more accurate cocaine and marijuana self-reports than others [21].

Several perspectives suggest that substance use may be accurately reported by MSM in survey research. A social selection perspective suggests that given that studies of MSM often screen for sexual orientation at the recruitment stage [18,24,25], participants may have little reason to withhold disclosure of other types of sensitive behavior, such as illicit drug use, on the subsequent survey. To the extent that substance use is relatively more prevalent among MSM, a social norms perspective would suggest that drug abuse would be a less “sensitive” topic in this population and thus, easier to disclose. Finally, a “cognitive escape” [26] perspective suggests that drug use may be viewed by MSM as a means to facilitate and possibly rationalize behavior which is defined as “high risk” for HIV (e. g. , unprotected sex). To the extent that drug use constitutes a post-hoc rationalization for sexual behavior, sexually active MSM may be more likely to disclose their drug use in surveys (such as ours) where they are asked to report on a range of potentially risky sexual behaviors.

Comparing self-reports to drug tests, in this study, we investigate the validity of self-reported marijuana, cocaine, heroin, methamphetamine and ketamine use among randomly-sampled MSM living in Chicago. In addition, the validity of marijuana and cocaine reports and the relative utility of drug tests vs. self-reports (where “utility” is defined as the ability to detect substance use) from the MSM sample are compared with a general population sample of males from the same city.

Methods

Survey & Sampling Methodology

A sample of MSM were interviewed in the City of Chicago between September, 2002 and January 2003. As a supplement to a city-wide general population survey [5,13] we interviewed 216 men, ages 18-55 who had a history of consensual sex with other men or who identified themselves as gay or bisexual. Subjects were sampled in the city of Chicago using multistage probability methods [27]. City blocks were randomly sampled from zip codes identified by a community advisory board made up of gay community representatives and advocates. Within each sampled block, all households were contacted and within each, one adult, between the ages of 18 and 55 years old, was randomly selected and screened for eligibility. Those found eligible were asked to complete an Audio Computer Assisted Self-Interview (ACASI) containing questions about recent and lifetime substance use, following a format devised by the National Survey on Drug Use and Health (previously known as the National Household Survey on Drug Abuse; [28]). Towards the end of the interview protocol, subjects were asked to provide oral fluid and urine specimens for drug testing. Overall survey response and cooperation rates for the MSM Supplement were 35% and 70% respectively, rates not uncommon for research conducted on highly sensitive topics within urban settings known to pose multiple barriers to survey research [29,30].¹

These data were compared to an additional ACASI survey of the general population that used multi-stage probability sampling to survey over 600 residents between June, 2000 and January, 2002 [5]. The general population protocol was identical to that used in the MSM sample with three exceptions. The upper bound for the general population sample was 40 years instead of 55 years. In addition to urine and saliva samples, respondents were asked to contribute hair samples to be tested for drugs. Men in the MSM sample were asked about recent sexual behavior while those in the general population were not. Here we only include males from this general population study (n=241) and we only incorporate their urine and saliva specimens in our analysis. The two samples are thus highly comparable as both were randomly selected within Chicago only months apart, using a nearly identical instrument, data collection protocol, and survey organization. Drug testing was incorporated into both survey protocols in order to evaluate the feasibility of testing procedures as well as the utility of tests in identifying drug use and validating self-reports.

Drug Testing Procedures

As in the protocol described in Fendrich et al. [5], immediately following the survey, subjects were asked to participate in drug testing. The MSM supplement employed two types of tests: urine and oral fluid. Subjects were offered additional incentives for drug test participation; they were not told about the drug testing procedures until after the conclusion of the drug use questionnaire. For oral fluid testing, subjects were asked to spit into a plastic tube presented by the interviewer. For urine testing, subjects were asked to urinate privately into a plastic cup also provided by the interviewer. Specimens were sent to the United States Drug Testing Laboratories in Des Plaines, Illinois for toxicological analyses. Urine testing was analyzed via the No ExcuseSM procedure and the oral fluid testing was analyzed via the Oral StatSM procedure. All specimens of sufficient quantity were tested for the following substances: amphetamines, cocaine, marijuana, and opiates. Specimens that screened positive for each of these substances were confirmed using gas chromatography/mass spectrometry. All confirmed

¹Using formulas recommended by the American Association for Public Opinion Research (AAPOR[29]), the response rate is calculated using the formula for response rate #3, which is defined as the number of completed interviews divided by the eligible sample. The cooperation rate is defined as the number of completed interviews divided by the number of completed interviews plus the number of refusals (AAPOR cooperation rate formula #1).

opiate samples that identified monoacetyl morphine or morphine (either alone or in combination with codeine) were classified as positive tests for heroin. Supplemental toxicological tests on urine also screened and confirmed for the presence of ketamine and Rohypnol. Specific information about time frames for drug detection using different testing procedures has been detailed elsewhere [31].

Data Analysis

Validity of Self Reported Drug Use—Within each sample, self-reports of marijuana and cocaine use in the past month were evaluated against oral and urine drug tests in combination (i. e. , whether or not a positive result was indicated by either test). We computed Cohen’s kappa as a general measure of agreement between the self-report and drug test [32], as well as conditional kappa (where the “standard” rating is a positive drug test [33]). ²Drawing on Fleiss (32), we consider kappa values <.40 as poor agreement, values between .40 and .59 fair agreement, values between .60 and .74 as good agreement, and values >.74 as excellent agreement. Since drug testing may be viewed as a standard against which the self-report can be evaluated, we looked at the self-report “sensitivity” (the proportion testing positive who report use) as an indicator of self-report validity.

Binary indices of underreporting were constructed for marijuana and cocaine use reports by coding whether a positive oral/urine test was observed in the absence of self reported use in the past month. The associations between MSM status and underreporting were tested using chi-square tests, followed by pooled logistic regression analyses controlling for age, race, and socioeconomic status and sample (MSM vs. non-MSM). Additional bivariate analyses were conducted to investigate correlates of underreporting and the extent to which these correlates varied by sample status. Chi-square tests and odds ratios were computed; for ordinal variables, the score test for trend of odds was calculated. Using the Bonferroni correction for multiple tests, a p-value of .008 was required to consider a result statistically significant at $\alpha=.05$. This presentation employs unweighted analyses.

Utility of Drug Testing

We employed GEE mixed model regression [34] using Stata’s xtlogit procedure [35] to test the relative utility of drug testing for the detection of drug use within each sample. This approach treats an indication of drug use as a repeated measure within subjects. Within-subject variance was modeled as a random effect and adjusted for, along with demographic covariates (age, race/ethnicity, and income). The models tested the effect of type of assessment (biological test or self-report) on drug use outcomes. All analyses presented here were also unweighted.

Results

Sample Characteristics

The MSM sample (see Table 1) ranged in age from 18 to 55 years of age, with over three quarters at least 31 years old. With respect to race/ethnicity, over three quarters of the sample were white and only 14% were Black or Hispanic. This was a generally high SES sample, with over one third reporting an income of at least \$70,000. Compared to the general population sample, the MSM sample was significantly older (subjects up to age 55 years old were included in the sample), with a significantly lower proportion of non-white subjects, and a significantly higher proportion reporting higher incomes.

²Calculation of conditional kappa [33] is identical to calculation of kappa with the following three differences: “Observed agreement” is the proportion in the cell where subjects with a positive drug test also report recent drug use; “1” in the denominator is replaced with the proportion of positive drug tests; “expected agreement” is the expected proportion of subjects in the cell where subjects with a positive drug test also report recent drug use.

Comparative Prevalence: Drug Tests vs. Self-Reports in the MSM Sample

Sufficient amounts of urine or saliva were collected for subsequent tests for 80% of participants from the MSM sample and 87% of the men from the general population sample. Valid supplemental drug tests for ketamine/Rohypnol (conducted on urine specimens) were obtained from 57% of MSM.

The prevalence of drug use by self-report and biological test within each sample is shown in Table 2. Although biological tests for all drugs listed on Table 2 were available from the general population males, the base rates of recent self-reports for all substances except cocaine and marijuana were too low to merit cross sample comparisons. While rates of self-reported past month marijuana use in both samples are similar, past month cocaine use reports diverge from the rates testing positive, in different directions, for the general population males and the MSM sample. Higher rates of past month cocaine use for men in the MSM sample are obtained via self-reports, while higher rates of past month cocaine use for men in the general population are obtained from drug tests. Within the MSM sample, the rate of self-reported past month methamphetamine use (3.7%) was about the same as the rate testing positive (3.6%). The rate of self-reported past month use of ketamine (3.2%) was much lower than the rate testing positive (10.6%).

Agreement Between Drug Tests and Self Reports

To examine the validity of drug use self-reports within each sample, kappa and conditional kappa statistics were computed (see Table 2). For the MSM sample, the kappa statistics indicated a “fair” (.40) to “good” (.60) level of agreement (Fleiss, 1981) for marijuana, methamphetamine, and cocaine. With the exception of ketamine, the conditional kappa statistics for the MSM sample approached or exceeded levels considered to be indicative of good agreement. Correspondingly, within this same sample, point estimates for sensitivity for all substances except ketamine were at least .60. Although we observed a fairly high level of prevalence for ketamine by our supplementary testing, validity statistics suggest a lack of self-report validity for this substance. Despite six positive tests, there were no self-reports for heroin in the MSM sample (indicating poor validity of self-report).

Kappa and conditional kappa values for marijuana assessing the validity of past month reports were good to excellent for men from the general population sample. Indeed a conditional kappa of .85 suggests that when general population men tested positive for marijuana use, they usually reported use of this substance. This was generally not the case with respect to cocaine reporting. Past month kappa for general population men was fair while conditional kappa was poor.

Compared with the MSM sample, the general population men had higher levels of drug-test self-report agreement for marijuana but lower levels for cocaine. The findings are reflected in comparisons based on sensitivity statistics. The general population men had nominally *higher* sensitivity for marijuana and nominally *lower* sensitivity for cocaine. The comparisons with respect to cocaine approached statistical significance. The point estimate for sensitivity of cocaine use reporting for the MSM sample (.63), falls just above the 95% confidence bounds for this same statistic in the main study sample (.12, .62), suggesting *significantly* lower levels of sensitivity in the main study for cocaine.

Underreporting

The proportions of respondents in each sample who tested positive for a substance but did not self-report use of that substance are shown in Table 3. For marijuana reporting the overall rate of underreporting was nominally higher for the MSM sample compared to the general population sample. In contrast, the overall rate of cocaine underreporting was nominally lower for the MSM sample. Neither of these bivariate findings reached statistical significance.

(although cocaine underreporting differences *approached* significance at the .10 level). Logistic regression analyses (controlling for age, race/ethnicity and income; not shown here) resulted in similar conclusions. Correlates of underreporting were only significant in general population males, where results suggested an inverse association with indicators of social class such as education, employment, and income.

Relative Utility of Drug Testing

The results of the mixed-model logistic regressions are shown on Table 4. Since bivariate analyses revealed significant effects for socioeconomic indicators on underreporting of cocaine use, and since these indicators (education, employment and income) are associated with one another, we employed a single term in these models (income). Income categories were collapsed as necessary to eliminate zero-count cells. Models initially employed a source (test or self-report) by income level interaction term. Where this interaction term was not significant, it was dropped from the model.

In the analysis of cocaine detection in the general population sample, while the main effect of source of information (biological test vs. self-report) was not significant, the source-by-income interaction was significant (OR=9.79, 95% CI 2.28-42.04). Contrasts indicated that men in the lower income category were more likely to test positive for cocaine (OR=4.47, 95% CI 1.30-15.28), but were not more likely to self-report cocaine use in the past month. Moreover, contrasts indicated significant underreporting of cocaine use in the lower income group only (OR=7.64, 95% CI 1.87-31.12). In the analysis of marijuana detection in the general population sample, source had no effect. Self-reports and biological tests were equally informative for marijuana use in this sample. The odds of having a self-report or drug test detect recent marijuana use was inversely associated with age in the MSM sample.

In the analyses of cocaine and marijuana detection in the MSM sample, the income-by-source interactions were not significant in any of the models. Source of information had no effect for detection of either substance. Past month self-reports were equally predictive of detection when compared with biological tests. There were no other significant predictors of detection in the MSM, although, as with general population males, a non-significant trend suggested that age was inversely associated with marijuana detection.

Discussion

This research supports the feasibility of urine and saliva testing for drug use across samples, with relatively high rates of subjects in both the MSM and general population study contributing specimens. The data suggest that both the MSM and general population samples provide valid reports about recent marijuana use, although the general population sample's statistics suggested that their reports are more consistent with the drug tests. MSM provide more valid recent reports of their cocaine use than general population males, as is evidenced by sensitivity and conditional kappa statistics.

The utility analyses reinforced some of the findings from the validity analyses. Drug tests and surveys are not significantly different with respect to their ability to detect past month prevalence. At the same time, our findings reinforce confidence in numerous previous studies that have reported on MSM drug use behavior without employing drug testing. While this was somewhat consistent with expectations, further research will be necessary to identify the relative ability of the social selection, social norms, and cognitive escape perspectives to account for this.

There was a consistent pattern of associations suggesting that indices of socioeconomic status were inversely associated with validity. Those who were poorest and least well educated were

more likely to underreport marijuana and cocaine use. Those with less education may have been less able to correctly interpret the meaning of the survey questions. Alternatively, they may have been more concerned with privacy and the dangers of confidentiality breach, an interpretation that is consistent with previous research [36].

One important limitation of this study is that comparative analyses were limited to cocaine and marijuana. MSM focused analyses on other substances suggest that self-report validity may vary considerably within this sample. In addition, this research is based on relatively small sample sizes, and relatively small numbers of subjects testing positive for drug use. We do not evaluate the validity of the drug tests themselves. A final limitation concerns demographic differences across the two comparison groups which are underscored on Table 1.

Following up on findings with respect to the underreporting of ketamine, we found that out of 13 testing positive for ketamine, ten denied recent use. As noted previously [37], these ten deniers were all interviewed within the same time frame (mid September through October, 2002). Three of the ten reported ketamine use within the past year. These same three reported and tested positive for past month ecstasy use [37]. This raises the possibility that “underreporting” may possibly have reflected inadvertent ingestion of ketamine contaminated pills among subjects who are regular club drug users. Pill contamination and consumer uncertainty about pill content is a widespread problem that previously motivated at least one harm reduction organization in the US [38] to periodically screen and test pills that are distributed in the dance club scene. The rise of club drug use along with the increasing prevalence of prescription medication misuse among college students and adults [39,40] suggest that uncertainty regarding pill content may cloud epidemiological investigations that rely strictly on self-report.

This study provides important evidence that the collection of biological samples for purposes of drug use validation is feasible within MSM samples. It also suggests that the validity of survey self-reports of marijuana and cocaine are equal to and in some cases may be of higher quality among MSM samples, relative to the general population of males in the same community. This study suggests that inclusion of drug testing protocols may be useful for increasing our understanding of the club drug phenomenon among MSM.

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Table 1

Sample characteristics

	General Population Sample (N=241)		MSM Sample (N=216)	
	N	Percent	N	Percent
Age				
18-25	99	41%	22	10%
26-30	58	24%	30	14%
31-40	84	35%	82	38%
41 +	0	0%	82	38%
		$X^2(3) = 138.98, p < .001$		
Race/Ethnicity				
White	87	36%	170	79%
Black	74	31%	18	8%
Hispanic	48	20%	14	6%
Other	30	13%	14	6%
		$X^2(3) = 84.41, p < .001$		
Income				
\$20,000 or less	60	25%	26	12%
\$20-40,000	64	26%	48	22%
\$40-70,000	68	28%	68	31%
\$70,000 or more	38	16%	73	34%
		$X^2(3) = 26.29, p < .001$		
Education				
High School or less	91	38%	17	8%
Some college	62	26%	49	23%
College graduate	88	37%	150	69%
		$X^2(2) = 67.21, p < .001$		
Employment				
Full Time	153	64%	164	76%
Part Time	22	9%	17	8%
Not working	64	27%	35	16%
		$X^2(2) = 8.38, p < .02$		

Table 2
Sample prevalence of drug use by self-report and biological test and measures of agreement¹

Sample	Drug	Source	N	Number Positive	Percent Positive	Kappa	Cond. Kappa ²	Sens.	95% CI
General Pop	Cocaine	Oral or Urine	209	15	7.2				
		SR Past Month	241	7	2.9	0.48	0.32	0.33	(0.12-0.62)
	Marijuana	Oral or Urine	209	47	22.5				
		SR Past Month	240	61	25.4	0.67	0.74	0.81	(0.64-0.91)
MSM	Cocaine	Oral or Urine	172	8	4.7				
		SR Past Month	216	16	7.4	0.44	0.59	0.63	(0.25-0.92)
	Heroin	Oral or Urine ³	153	6	3.9				
		SR Past Month	216	0	0.0	NA	NA	NA	
	Ketamine	Urine	123	13	10.6				
		SR Past Month	216	7	3.2	0.32	0.20	0.23	(0.05-0.54)
	Marijuana	Oral or Urine	172	39	22.7				
		SR Past Month	216	55	25.5	0.58	0.65	0.74	(0.58-0.87)
	MDMA	Urine	140	1	0.7				
		SR Past Month	216	12	5.6	0.16	1.00	1.00	(0.03-1.00)
	Methamphetamine	Urine	140	5	3.6				
		SR Past Month	216	8	3.7	0.66	0.59	0.60	(0.15-0.95)
	Rohypnol	Urine	123	1	0.8				
		SR Past Month	216	0	0.0	NA	NA	NA	

¹ Analyses exclude persons with no test results

² Calculation of conditional kappa [33] is identical to calculation of kappa with the following three differences: "Observed agreement" is the proportion in the cell where subjects with a positive drug test also report recent drug use; "1" in the denominator is replaced with the proportion of positive drug tests; "expected agreement" is the expected proportion of subjects in the cell where subjects with a positive drug test also report recent drug use.

³ Excludes 19 cases where poppy seed ingestion was indicated

Table 3
Substance use under reporting by sample and sociodemographic indicators

Variable	Levels	Cocaine		Marijuana	
		Gen Pop (%)	MSM (%)	Gen Pop (%)	MSM (%)
Race/ethnicity	Non-white	6.62	2.94	6.67	2.94
	White	1.41	1.46	0.00	6.57
Age Category	[chi-square]	$X^2(1) = 2.75$	$X^2(1) = 0.32$	$X^2(1) = 4.95$	$X^2(1) = 0.70$
	18-25	2.22	0.00	5.56	5.88
	26-35	7.78	0.00	4.49	1.72
	36-45	3.45	0.00	0.00	9.43
Education	46-55	-	6.98	-	6.98
	[test for trend]	$X^2(1) = 0.79$	$X^2(1) = 5.59$	$X^2(1) = 1.32$	$X^2(1) = 0.99$
	HS or less	10.47	6.25	10.59	0.00
	some college	2.04	0.00	0.00	5.41
Employment	college grad	0.00	1.69	0.00	6.78
	[chi-square]	$X^2(2) = 10.62^*$	$X^2(2) = 2.57$	$X^2(2) = 13.61^*$	$X^2(2) = 1.21$
	full time	1.55	1.60	2.34	5.60
	part time	5.00	0.00	0.00	7.14
Income	not working	12.07	3.13	10.34	6.25
	[chi-square]	$X^2(2) = 9.63^*$	$X^2(2) = 0.64$	$X^2(2) = 7.13$	$X^2(2) = 0.04$
	\$0-20,000	15.09	4.00	9.62	8.00
	\$20-40,000	3.51	2.63	1.75	10.53
	\$40-70,000	0.00	0.00	3.45	3.92
	> \$70,000	0.00	1.79	0.00	3.57
	[test for trend]	$X^2(1) = 12.68^{**}$	$X^2(1) = 0.62$	$X^2(1) = 4.02$	$X^2(1) = 1.59$
Overall Underreporting Rate		4.78%	1.74%	4.33%	5.81%

*
p<.05

**
p<.01 (Bonferroni adjusted)

Random Effects Logistic Regression: Predicting Cocaine and Marijuana Use from Past Month Self-report and Biological Tests¹

Table 4

Sample	Predictor	Cocaine		Marijuana	
		Adj OR	95% CI	Adj OR	95% CI
General Population Sample (N=228)	Test vs. Self-report	0.78			
	Age	1.08	0.53	1.15	0.61
	Race: Non-white vs. white	1.35	1.00	1.17	0.90
	Income	0.46	0.44	4.17	0.56
	Income \$40,000 or less over \$40,000	1.00	0.09	2.42	0.73
MSM (N=215)	Test x Income				
	\$40,000 or less over \$40,000	9.79	2.28	42.04**	
	Test vs. Self-report	1.00			
	Age	0.60	0.31	1.17	0.58
	Race: Non-white vs. white	1.01	0.97	1.05	0.94
	Income	1.79	0.67	4.80	0.31
	\$20,000 or less	1.36	0.35	5.32	1.50
	\$20-40,000	0.75	0.20	2.75	0.38
	\$40-70,000	0.92	0.26	3.21	2.71
	\$70,000 or more	1.00		1.00	0.64
					0.28
					1.27

¹ Combined results of oral fluid and urine tests

[†] p<.10

* p<.05

** p<.01