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VALIDITY OF SELF-REPORTED DRUG USE INFORMATION AMONG PREGNANT WOMEN

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Abstract

Introduction—This study assesses validity of self-report for the use of major classes of illicit drugs and opioid-maintenance therapy among pregnant women at a substance abuse treatment program.

Methods—Analyses used data collected from 83 pregnant women in a prospective cohort study at the University of New Mexico. Study participants with a history of substance abuse were screened and, if eligible, enrolled during an early prenatal care visit. A follow-up interview was conducted shortly after delivery. Self-reported information about drug use later in pregnancy was compared with urine drug screen (UDS) results collected during the third trimester. Simple kappa (k) and prevalence-and-bias-adjusted kappa (PABAK) coefficients were calculated as the measures of agreement. Sensitivity and specificity of self-report for each drug class were estimated using UDS as the 'gold standard'.

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Results—The sample included a large proportion of ethnic minority (80% Hispanic/Latina and 7% American Indian) and socially disadvantaged (50% < less than high school education and 94% Medicaid-insured) pregnant women. On average, patients had 4.8 ± 3.0 urine drug screens during the third trimester. Sensitivity of self-report was low (<60%) for all classes of illicit drugs; however, marijuana and opioids demonstrated slightly higher sensitivity (57.9% and 58.3%, respectively) than other classes (<47%).

Conclusions—This study found substantial underreporting for all classes of illicit drugs among pregnant women in a substance abuse treatment program. Rates of underreporting are expected to be higher among the general population of pregnant women.

Keywords

pregnancy; drug use; self-report; validity

INTRODUCTION

Nearly 10% of people aged 12 or older report current illicit drug use in the U.S. (SAMHSA, 2014). Drug use among women who are pregnant or of childbearing age, in particular, represents a major public health concern. The National Survey on Drug Use and Health (NSDUH) indicates that 5.4% of pregnant women reportedly used 1 illicit drugs in the past month, and that minority racial/ethnic groups may be at even higher risk (SAMHSA, 2014). These prevalence data are generally considered to be a conservative estimate due to the effects of underreporting (Wendell, 2013). Several recent studies (Desai et al., 2014; Schauburger et al., 2014) have found significantly higher rates of prenatal substance use (21.6% and 13%, respectively). Despite these findings, research that seeks to evaluate the validity of self-reported drug use among minority pregnant women remains profoundly absent from the peer-reviewed literature.

Prevention or minimization of adverse pregnancy outcomes associated with drug use requires early identification and successful treatment of substance abuse. Clinicians continue to rely primarily on self-report over other methods to identify patients with substance dependence. Although analysis of drug metabolites provides a more objective measure of recent drug use (Bar-Oz et al., 2003; Jain, et al., 2013; Lange et al., 2014; Musshoff et al., 2006), biomarker testing poses several limitations in the clinical setting. Foremost are the complex ethical issues associated with screening in vulnerable populations, such as pregnant women (Lambert et al., 2010). Biomarker testing can also be costly, and require additional time and resources to obtain results.

By contrast, self-report is easy to implement, affordable, and provides immediate results. It is thus relied upon for national public health surveys (Tourangeau & Yan, 2007), and has gained increasing popularity as a key component in screening and motivational interviewing (Lundahl & Burke, 2009). However, the validity of self-report as a screening method for stigmatized health behaviors is complex (Greenfield et al., 2014; Jain et al., 2012; Voils et al., 2012). Specifically, it is well-established that factors such as setting, population, interviewer traits, and sensitivity of subject matter can influence the validity of self-report (Mabe & West, 1982). While not all factors are controllable, research that establishes self-

report validity in diverse contexts can lead to more accurate interpretation of results and more appropriate care. Unfortunately, such research is largely lacking for pregnant and minority populations who use illicit drugs. Our study aims to address this gap by assessing the validity of self-reported drug use for major classes of illicit drugs (cannabinoids, cocaine, opioids, amphetamines, benzodiazepines) and opioid-maintenance therapy (OMT) among predominantly Hispanic and Native American pregnant women.

METHODS

Study Design and Population

The data obtained in the prospective cohort, Biomarkers in Pregnancy Study, at UNM was utilized for this analysis. The study methodology has been described elsewhere (Bakhireva et al., 2012; Bakhireva et al., 2014). Briefly, 102 pregnant women were recruited from a UNM hospital- (UNMH) affiliated specialty prenatal care clinic serving patients with current or past history of substance use. Patients were eligible for the study if they were 18 years of age, had a singleton pregnancy, were fluent English-speakers, and were 35 weeks' gestation. To receive ongoing treatment at the clinic, all patients were required to attend regular counseling sessions, and participate in routine urine drug screens (UDS) at most or all of their prenatal care visits. The clinic provides care to pregnant women who have opioid dependence, as well as those who have other types of substance use disorders. Both were eligible to participate. This study has been approved by the UNM Human Research Review Committee. Written, informed consent to participate was completed by all participants. This consent included permission for investigators to abstract UDS results from patients' electronic medical records. In addition to standard safeguards to protect participant confidentiality, a Certificate of Confidentiality was obtained from the National Institutes of Health to further ensure protection of privacy.

Enrollment took place during one of the first prenatal care visits. Following consent, participants completed a structured baseline interview to provide data on substance use around their last menstrual period (LMP) and throughout pregnancy to-date. All study interviews were administered in English in a private room by trained researcher with no direct affiliation to the clinic. General demographic and lifestyle characteristics, as well as medical and reproductive histories were captured. The second interview was conducted during the hospital stay after delivery to capture substance use information for the period between the baseline interview and delivery. This included third trimester data for most participants.

Self-Reported Drug Use and Urine Drug Screen Data

During both interview sessions, participants were asked to self-report frequency of use (no use, occasional, once a month, once every 2 to 3 weeks, once a week or almost every day) for the following classes of drugs: marijuana, cocaine/crack, heroin, amphetamines, methadone, buprenorphine, opioid analgesics, benzodiazepines, and barbiturates. Street names of drugs based on those used in the 2011 NSDUH (SAMHSA, 2011) were read to participants to improve recall.

Self-reported frequency of drug use was dichotomized as ‘no use’ versus ‘any use’ in order to be comparable with the UDS results, which were reported as positive or negative. All patients at the clinic were required to submit routine and repeated urine samples at their prenatal care appointments (on average, 4.8 ± 3.0 tests per patient). Of note, patients at the clinic did not face any legal penalties as a direct result of disclosing drug use or testing positive on a UDS. Urine samples were sent to Tricore Reference Laboratories (Albuquerque, NM), and analyzed using enzyme multiplied immunoassay technique (EMIT). EMIT is a reliable, highly-sensitive and commonly-used test for drug monitoring in substance use treatment programs, and has an accuracy range of 87–95% (Melanson, 2012; Reisfield et al., 2007). Samples were analyzed for the following exposures: amphetamines, barbiturates, benzodiazepines, buprenorphine, cannabinoids, cocaine, methadone, and opiates. As no study participants had exposure to barbiturates (by either UDS or self-report), this drug class was excluded from the analysis. Cutoff levels and detection ranges are reported in Online Resource 1. Results from patient UDS tests were accessed through their electronic medical records.

Outcome Measures and Statistical Analysis

Of the 102 patients in the original cohort, 4 had an adverse pregnancy outcome (spontaneous abortion, termination, or stillbirth), 8 were lost to follow-up, and 7 had some missing substance use information. For these reasons, the final sample size for this analysis was reduced to 83 patients. For the purpose of power calculations in this study, sensitivity of self-report for methadone, assumed to be 99%, was compared to sensitivity for another drug class with lower sensitivity. A sample size of 22–32 patients per group was determined to achieve > 80% power to detect a difference between the group proportions (difference in sensitivity) of 0.49–0.34 using a two-sided Z test at alpha level 0.05. This is a moderate effect size.

Kappa statistic (k) was used to determine the level of agreement between self-reported drug use and UDS results for each of the major drug classes. Kappa coefficient is based on the difference between observed agreement and agreement expected to be present by chance alone. Its value is standardized to lie on a scale of -1 to 1, with higher values corresponding to a higher degree of agreement between the two methods (Viera & Garrett, 2005). In order to overcome the dependence of kappa statistic on prevalence, a limitation known as kappa paradox (Sim & Wright, 2005), prevalence-and-bias adjusted kappa (PABAK) was also calculated.

Prevalence of substance use was estimated by the percentage of study participants who were positive for a particular drug class by either self-report or UDS. Per self-report, a patient was classified as a ‘user’ if she reported any use of a particular drug between the baseline and follow-up interviews (this corresponded to the third trimester for most patients), and a ‘non-user’ if she reported abstinence during the same time frame. Similarly, a patient was identified as a ‘user’ if she tested positive at least once for that drug on a UDS, and a ‘non-user’ if all UDS results were negative for that drug during the third trimester. Prevalence estimates for each drug class in our analysis are not mutually exclusive, as most participants were polydrug users.

In addition to kappa, sensitivity and specificity of self-reports for each drug class were estimated using UDS as the 'gold standard'. Sensitivity estimated a proportion of UDS positive patients who were correctly identified as such by self-report. Specificity estimated a proportion of UDS negative patients who were correctly identified as non-users by self-report. Given that the frequency of drug use could potentially affect validity indices, analyses were repeated for the most prevalent drug classes (i.e., cocaine, marijuana, and opioids) after stratification by frequency of drug use: occasional (once per month or less) versus regular (once every 2-to-3 weeks, once per week, or almost every day) use.

Finally, given that the number of urine drug screens during the third trimester varied among study participants, logistic regression was performed to evaluate the effect of the number of urine drug screens (predictor) on agreement/disagreement between the self-report and UDS results (outcome). Agreement for the purpose of this analysis was considered 'positive' if both the self-report and UDS for a particular drug were concordant (either positive or negative), and 'negative' if results of the two methods were discordant.

RESULTS

Table 1 presents the demographic characteristics of the study population. The maternal age of participants ranged from 18 to 41 years with a mean age of 26.1 ± 4.8 years. The mean gestational age at the time of enrollment was 22.1 ± 7.8 weeks. The study population was predominantly comprised of Hispanic/Latina (80.1%) and American Indian (7.2%) patients. Over half (53.0%) of participants lacked a high school degree or an equivalent in formal education. Only 9.6% were employed, and nearly all (94.0%) held either Medicaid or another public insurance. The majority of participants (87.9%) reported unplanned pregnancy. Most (78.3%) reported at least some use of tobacco products after LMP. More than half (55.1%) reported alcohol use after LMP and 20.5% were continuous alcoholusers, as confirmed by positive ethanol biomarker(s) test result at delivery (Bakhireva et al., 2014).

The prevalence of various classes of drug use is presented in Table 2. The majority of patients were receiving OMT (63.9% methadone and 21.7% buprenorphine). Among illicit drugs, opioids (heroin and/or opioid analgesics) (36.1%), marijuana (25.3%), and cocaine/crack (24.1%) were the most prevalent. A perfect agreement was observed between self-report and UDS for methadone ($k=1.0$; PABAK=1.0), indicating that 100% of patients who tested positive on a UDS for methadone disclosed its use. For buprenorphine, substantial agreement was observed between the two methods ($k=0.79$; PABAK=0.79). Among illicit drugs, marijuana had the highest agreement ($k=0.61$, 95% CI: 0.41; 0.83). Specificity of self-report for all drug classes was high (90%), indicating that self-reported non-users were confirmed by negative urine drug screens in the vast majority of cases. While sensitivity of self-reported methadone use was 100%, sensitivity for illicit drugs was much lower. For example, sensitivity of self-report for marijuana and opioids was 57.9% and 58.3%, respectively, indicating that less than 60% of the study participants who tested positive for these classes of drugs disclosed their use. Sensitivity for cocaine, benzodiazepines, and amphetamines was even lower (47%, 40%, and 37%, respectively).

Subgroup analyses for cocaine, marijuana, and opioid users by frequency of drug use (occasional vs. regular) demonstrated that the sensitivity of self-reports decreased with more frequent drug use, whereas specificity increased among frequent users (Table 2). For example, 33.3% of occasional cocaine users disclosed their use of cocaine, compared to only 28.6% of regular users. Similarly, the sensitivity of self-report for opioids (47.4% vs. 16.7%) and marijuana (42.9% vs. 38.5%) was higher among occasional compared to regular users. Logistic regression analysis revealed no association between the number of urine drug screens and the agreement between two methods (agreement vs. no agreement) for each drug class (p-values for all drug classes were greater than 0.05; data not shown).

DISCUSSION

This study found substantial variation in the validity of self-report by drug class, suggesting the influence of social desirability biases. Prior studies have described how different drugs are often perceived with varying degrees of stigma, and how the perceived stigmatization of a particular drug may change depending on the context (Harrell, 1997; Harrison, 1997). Numerous additional factors that can affect social desirability biases have been recognized, including patient characteristics (such as pregnancy), interview setting, and patients' fears of possible disciplinary actions (Babor et al., 2000; Del Boca & Noll, 2000). A related contextual factor that needs to be acknowledged is the increasing number of U.S. states enacting laws that penalize women for prenatal drug use (Carlson, 2014). It is important to consider the effects of such laws on women's willingness to accurately report their substance use, especially as a measure of help-seeking (Poland et al., 1993; Weber, 1993). Our study was conducted in a specialized prenatal substance use clinic in New Mexico, where state laws do not support prosecuting women for child abuse if they use drugs prenatally (Stone-Manista, 2009). Thus, in contrast to other states moving towards more punitive measures against prenatal substance use, pregnant women in NM likely face fewer concerns about consequences for disclosure. We therefore suspect that the rates of underreporting in our sample may be lower compared to other states, where self-reported prenatal drug use by women is faced with substantive legal penalties.

In this study, participants on OMT were prescribed either buprenorphine or methadone. Whereas we found perfect agreement (100% sensitivity and specificity) between self-report and UDS for methadone, only 83% sensitivity with 100% specificity was observed for buprenorphine. From the purview of social desirability biases, we anticipated high levels of agreement for OMT use given that all study participants were recruited from a specialized prenatal care clinic that administers OMT. Prior studies have shown that interviewing patients who are enrolled in treatment programs improves self-report validity, especially when the particular substance of abuse is believed by the patient to be mutually known or knowable, i.e., through required routine UDS (Babor et al., 2000; Yonkers et al., 2011). The lower levels of agreement for buprenorphine was somewhat anticipated. The rising rates of diversion of buprenorphine in the U.S. and other developed countries has been increasingly documented (Winstock, 2008; Yonkers et al., 2011). Thus, we suspect that the lower validity may be related to non-prescription use by some participants.

Among illicit drugs, sensitivity of self-report for opioids and marijuana was the highest (58.3% and 57.9%, respectively), compared to lower sensitivity for amphetamines (37.5%), benzodiazepines (40%), and cocaine (47.4%). However, confidence intervals did overlap. The lower sensitivity of self-report for amphetamines, benzodiazepines, and cocaine was expected, as the known potential harm to the fetus caused by prenatal exposure to these drugs may increase women's perceived risks for stigmatization. Studies in the general population find consistently greater validity for these drugs compared to cocaine and other 'hard drugs' (Chermack, 2000; Delaney-Black et al., 2010). Thus, our findings among pregnant women are consistent with findings in the general population.

Specificity of self-report for all classes of drugs was close to 100%, except for opioids (89.7%). Lower specificity for opioids can be explained by their short detection window (1–4 days) in UDS. Hence, drug screens might not capture all women with self-reported opioid use. It should be noted that prescription opioids given during labor and delivery did not affect the results of this study, as only the results of the UDS conducted before labor and delivery were included.

Finally, we found a higher prevalence of underreporting among more frequent users of illicit drugs. This is consistent with previous studies, which concluded that frequent users tend to underreport both the amount and frequency of their substance use in comparison to occasional users (Delaney-Black et al., 2010; Yonkers et al., 2011). Among pregnant women, heavy and frequent substance use is associated with increased risks of adverse outcomes. It is possible that regular users downplay the frequency of their substance use more than occasional users due to embarrassment or concerns for stigmatization.

This study had several limitations. First, the reported time frames of urine drug screens and self-report did not perfectly overlap for all participants. Specifically, participants were asked to report their drug use between the baseline interview and the time of delivery with a mean time interval of 16.8 ± 7.6 weeks, while UDS results were obtained during the third trimester of pregnancy (13 weeks). As a result, participants who were enrolled during their second trimester, but discontinued drug use during the third trimester, could potentially have been classified as false positives (i.e., self-reported drug use but tested negative on a UDS). However, given that the specificity for all drug classes was high, this scenario is highly unlikely. A similar potential limitation resulting from the imperfect overlap between UDS and self-report was that patients who were enrolled later in the third trimester could have had positive UDS prior to enrollment (which we abstracted from their medical records), but may not have reported that drug use due to recall. It is possible that some of these patients were classified as false negatives. However, the majority of patients were recruited in the late second trimester (mean gestational age at recruitment: 22.1 weeks), and therefore, the likelihood of false negatives is minimal.

Given that the study sample was drawn from a specialized prenatal clinic that provides care to women with history of substance abuse, generalizability may be limited. Participants were enrolled in a unique setting that is arguably more sensitive to and less stigmatizing of prenatal substance use than would likely be found in a general prenatal clinic. We therefore believe our estimates of underreporting are conservative. Indeed, these findings suggest that

epidemiological studies, which often rely solely on self-report, could potentially fail to capture more than half of the illicit drug users. The degree of underreporting detected in our study was substantial, and highlights the potential severity of inaccurate self-reporting among pregnant women in the U.S., likely due to the influence of social desirability biases.

A relatively small sample size and low prevalence of certain drug classes, such as benzodiazepines and amphetamines, are also limitations of this study. Therefore, PABAK coefficients were used to address the influence of low prevalence on kappa statistic. In addition, this study could not differentiate between the use of prescription opioids and heroin, since the UDS employed at the clinic did not differentiate between opioid subtypes. Nevertheless, any opioid use during pregnancy is a significant finding that our study was able to capture. Future studies would benefit from the ability to separate opioid analgesics from heroin.

An important strength of this study is the inclusion of Hispanic and Native American pregnant patients, who are underrepresented in other cohorts. While NSDUH findings highlight the disproportionate effects of substance use among Hispanics and Native Americans (SAMHSA, 2014), further investigations into these effects in the context of pregnancy is largely lacking. We are aware of no prior studies that have evaluated self-report validity for different drug classes among pregnant women who predominantly identify as Hispanic or Native American. By describing such a sample, our research calls attention to substance use as an important issue to consider within reproductive medicine research, and highlights the importance of establishing self-report validity among these populations.

Another important strength of the study was the ability to evaluate validity of self-report for multiple drug classes within a single cohort. Prior studies have typically focused on only one or two drug classes (Bibb et al., 1994; El Marroun et al., 2010), or combined all drug classes into a single ‘any drug use’ category (Christmas, 1992; Horrigan & Piazza, 1999). This study thus contributes a more complex understanding of variability in self-report for different types of drugs.

In summary, our study suggests that drug use during pregnancy is substantially underreported for most major drug classes, including among women who regularly participate in urine drug screens. Although opioids and marijuana were more accurately reported than other drug classes, the level of underreporting remained substantial. We therefore caution future epidemiological studies against relying exclusively on self-report, given the significant role of social desirability biases. An approach that combines self-report with an objective measure, when ethical and feasible, is expected to improve accuracy of research findings. Future studies would benefit by further exploring differences in self-report validity among chronic versus occasional users, and by comparing differences in self-report validity for different racial/ethnic groups of pregnant women. Finally, research that explores factors that facilitate accuracy of self-report, particularly among minority populations, is greatly needed to inform policymakers and improve care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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SIGNIFICANCE

Validity of self-report in ascertaining substance use has known limitations stemming from recall bias and social stigma. However, self-report validity for prenatal use of illicit drugs remains understudied, and the degree of underreporting in this population is unknown. Understanding the limitations of self-report can help obstetrics practitioners use discretion in their reliance on this method, with important implications for maternal and fetal health outcomes. This study compared self-reported prenatal illicit drug use to urine drug screens. Results were stratified by drug class to show variation in self-report validity between drugs of abuse. Substantial underreporting was found, especially among frequent users.

Table 1

Description of the Study Population (N=83)

Patient Characteristics	Mean $\pm$ s.d.
Maternal age (range: 18–41 years)	26.1 $\pm$ 4.8
Gestational age at enrollment (weeks)	22.1 $\pm$ 7.8
Gestational age at delivery (weeks)	38.8 $\pm$ 2.8
	%
Ethnicity: Hispanic/Latina	80.1
Race:	
White	87.9
American Indian	7.2
Black/African American	3.6
Other	1.3
Marital Status:	
Single, never married	55.4
Married/not-married, living with partner	36.2
Divorced/Separated/Widowed	8.4
Educational Level	
Less than high school graduate	53.0
High school graduate or GED	25.3
College or higher	21.7
Employed	9.6
Health Insurance Status:	
No insurance	4.8
Employer or self-purchased insurance	1.2
Medicaid or other public insurance	94.0
Primary language: English	97.6
Place of birth: U.S.	97.6
Smoking: any smoking during pregnancy	78.3
Alcohol use	
Abstainers	45.9
Early pregnancy only	34.6
Continuous use	20.5
Primigravida	25.3
Unplanned pregnancy	87.9
Presence of chronic conditions	36.1

Table 2
Measures of Agreement between Self-Reported Drug Use and Urine Drug Screens.

	Prevalence (N=83) No. (%) *	Kappa	95% C.I. for kappa	PABAK **	Sensitivity (%)	Specificity (%)
Marijuana	21 (25.3)	0.61	0.41;0.83	0.76	57.9	96.9
Occasional use	7 (8.4)	0.51	0.21;0.75	0.75	42.9	98.4
Regular use	5 (6.0)	0.51	0.23;0.79	0.76	38.5	98.4
Cocaine	20 (24.1)	0.55	0.32;0.78	0.73	47.4	98.4
Occasional use	5 (6.0)	0.41	0.14;0.68	0.72	33.3	98.4
Regular use	1 (1.2)	0.40	0.12;0.67	0.74	28.6	100.0
Methadone	53 (63.9)	1.00	--	1.00	100.0	100.0
Buprenorphine	18 (21.7)	0.79	0.57;1.00	0.79	83.3	100.0
Opioids	30 (36.1)	0.50	0.29;0.71	0.61	58.3	89.7
Occasional use	10 (12.0)	0.40	0.16;0.64	0.58	47.4	89.7
Regular use	5 (6.0)	0.20	-0.07;0.49	0.66	16.7	98.1
Benzodiazepines	5 (6.0)	0.36	-0.04;0.76	0.86	40.0	96.2
Amphetamines	8 (9.6)	0.52	0.16;0.88	0.88	37.5	100.0

* Prevalence stratified by the frequency of use (occasional vs regular) is presented per self-report only since it was reported by subjects.

** PABAK, prevalence-and-bias-adjusted kappa statistic