Drug and Alcohol Dependence 244 (2023) 109769

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Self-report and urine drug screen concordance among women with co-occurring PTSD and substance use disorders participating in a clinical trial: Impact of drug type and participant characteristics

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ARTICLE INFO

Keywords:
Self-report
Urine drug screen
Women
PTSD
Substance use disorder
Treatment

ABSTRACT

Background: Self-report measures are important in substance use assessment, yet they are susceptible to reporting errors. Urine drug screens (UDS) are often considered a more valid alternative. However, collecting in-person UDS may not always be feasible, contributing to the need to understand factors that influence the validity of self-reported substance use.

Methods: In this secondary analysis of data from 295 women with co-occurring PTSD and substance use disorders (SUD) who participated in a clinical trial testing behavioral interventions, we examined concordance and discordance between self-reported drug use and associated UDS results. Generalized linear mixed models were used to examine the impact of treatment type and participant characteristics on the associations between self-reported drug use and UDS results.

Results: Findings revealed higher disagreement between self-report and UDS for opioids and sedatives (ranging from.77 to.90) and lower disagreement rates for cannabis and cocaine (ranging from.26 to.33). Treatment type was not a significant moderator of the associations between self-report and UDS across all drugs. Among those with a positive opioid UDS, those who reported employment in the past three years were more likely to self-report no opioid use compared to their counterparts without employment in the past three years.

Conclusions: Findings add to the literature that supports the validity of self-reported cannabis and cocaine use. The greater discrepancies between self-report and UDS test results of opioids and sedatives suggest adjunctive UDS may be required, although a variety of factors other than inaccurate self-report may be associated with this discrepancy.

Self-report measures are an important element of substance use assessment in clinical settings and research studies that are feasible and cost-effective (Nordeck et al., 2020; Palamar et al., 2019). Yet, self-report measures of behavior are susceptible to reporting errors, reflecting one advantage of objectively verified measures of substances such as urine drug screen (UDS) tests (Dasgupta, 2018; Lim et al., 2015). UDS tests have been a critical component of substance use disorders (SUD) treatment and research and are typically considered the gold standard for detecting and monitoring substance use (Clark et al., 2016; Hadland and Levy, 2016). However, issues with the collection and interpretation of UDS have been noted (Abraham and Luty, 2010; Hadland and Levy, 2016; Moeller et al., 2017). For instance, substances

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https://doi.org/10.1016/j.drugalcdep.2023.109769
Received 15 August 2022; Received in revised form 17 December 2022; Accepted 9 January 2023
Available online 14 January 2023

with varying half-lives and differential periods of detection in urine may impact clinicians' accurate estimation of substance use in relation to the period of use of interest (Abraham and Luty, 2010; Moeller et al., 2017).

In specific populations (e.g., individuals in SUD treatment) where discordance (i.e., disagreement between results from biological drug tests vs. self-report) is a concern, researchers have recommended inclusion of both biological and self-report measures when possible (Nordeck et al., 2020). However, this becomes challenging in certain circumstances where face-to-face contact is not possible (e.g., when patients have limited access in rural settings or during a pandemic).

Most researchers have found that participants' self-report responses are corroborated (i.e., are the same as UDS results) over 70% of the time (Bagley et al., 2018; Basurto et al., 2009; Buchan et al., 2002; Decker et al., 2014; Macdonald et al., 2014; Nichols et al., 2014; Sharma et al., 2016; Williams and Nowatzki, 2005). The *specificity* of self-report [i.e., the percentage of non-drug using people who "correctly" (based on negative UDS result) self-report no use] tends to be higher (ranging from 89% to 99%, depending on the substance). In contrast, *sensitivity* [i.e., the percentage of drug-using people who "correctly" (based on positive UDS result) self-report use] tends to be lower (ranging from 56% to 92%, depending on the substance) (Basurto et al., 2009; Wilcox et al., 2013). While the constructs of sensitivity and specificity are typically utilized in the context of a clinical test's ability to accurately identify the presence or absence of a disease/diagnosis (Parikh et al., 2008), in the context of self-report of substance use, knowledge of the sensitivity and specificity of participants'/clients' self-reports can enhance researchers' or clinicians' confidence in the validity of self-reported use, particularly in situations when UDS collection in inaccessible.

Multiple factors influence the reliability and validity of self-report measures of substance use, including 1) drug type; 2) social and environmental contexts; and 3) characteristics of the individual, including psychiatric comorbidities (Del Boca and Darkes, 2003).

In terms of drug type, studies indicate that the concordance between self-report and UDS tends to be higher for cannabis (Kappas ranging from.51 to.79) and lower for cocaine and opioids (Kappas ranging from.35 to.75; Basurto et al., 2009; Macdonald et al., 2014; Sharma et al., 2016), which may be a function of more widespread acceptance of cannabis use and greater stigmatization and criminalization of stimulants and opioids (Clark et al., 2016; McDonell et al., 2016).

Research has also shown that concordance may vary depending on the social and environmental context. For example, among patients under community corrections supervision (i.e., on probation, parole, or serving a sentence in the community), Clark and colleagues (2016) found a high rate of underreporting of substance use when compared to UDS results. Thus, individuals may be more likely to underreport drug use that might incur negative consequences (Walker and Cosden, 2007). Conversely, overreporting of cannabis use was found to be associated with favorable attitudes toward cannabis among university students, although this effect was small (Basurto et al., 2009). Furthermore, among participants engaged in SUD treatment programs, studies have found that the odds of non-disclosure of substance use decreased over time, and concordance between the self-report and UDS was significantly higher during treatment than during follow-up (Bagley et al., 2018; Decker et al., 2014). These findings suggest that correctional and treatment contexts or negative attitudes towards substance use may promote underreporting and low concordance rates between self-report and UDS tests.

The role of participant demographics and clinical characteristics have been widely examined in predicting the validity of self-reported drug use across various drug types. For example, Black/African American race (Clark et al., 2016; Fendrich and Johnson, 2005; White et al., 2014), younger age among treatment seekers (Kilpatrick et al., 2000), older age among people who smoke cigarettes, prescription opioid use (Clark et al., 2016; Hilario et al., 2015), being employed (Wilcox et al., 2013), and criminal history (Diugisto et al., Clark et al., 2016) have all been associated with lower concordance between self-reported substance use and UDS results. Explanations for these findings highlight the role of social desirability, stigma, distrust, and fears about adverse consequences (e.g., incarceration, loss of employment, loss of child custody) in contributing to underreporting, particularly among subgroups that have been historically subject to structural disadvantage and prejudice (e.g., Black/African Americans, those with a criminal history and mental illness (Del Boca and Darkes, 2003; White et al., 2014). Further, although findings on gender are mixed (Clark et al., 2016; Solbergsdottir et al., 2004; Wilcox et al., 2013), females are more likely to experience stigma and shame related to substance use, especially during pregnancy (Stone, 2015), which could increase the likelihood of underreporting or lower concordance compared to males, depending on the drug type, drug use history, and assessment context (i.e., treatment setting versus clinical trials research).

1. Current study

Overall, findings suggest that discrepancies between self-reported substance use and UDS may vary based on drug type, individual characteristics, and the contextual pressures and influences on specific individuals. While previous studies have provided important information on the role of these factors in influencing concordance rates between self-report and UDS, few studies have examined this question among individuals with co-occurring SUDs and posttraumatic stress disorder (PTSD) and among those receiving psychosocial treatments. PTSD comorbidity with SUD (PTSD+SUD) is highly prevalent and associated with worse functioning and treatment outcomes (Tripp et al., 2019). PTSD is characterized by avoidance of discussing personal (traumatic) information and profound shame (López-Castro et al., 2019), which may extend to self-report of substance use. Thus, more information is needed on whether PTSD+SUD comorbidities and the treatment interventions they engage in may impact concordance between self-report and UDS measures, which may inform future intervention development/modification.

To address these issues, we examined the prevalence and factors associated with concordance between self-report of substance use and UDS in the largest women-only trial to date for PTSD+SUD (Hien et al., 2010). Our aims were to 1) describe the concordance and discordance rates between self-reported drug use and UDS results among a sample of women with co-occurring PTSD and SUD participating in a clinical trial testing behavioral interventions; 2) to determine whether type of treatment moderates the association between self-reported use and UDS test results in this sample, and 3) to examine whether key demographic variables (e.g., race, age, employment, and criminal history background) moderate the association between self-reported use and UDS test results. Findings from this study will provide much needed information regarding factors that shape reliability and validity of self-report substance use assessments.

2. Methods

2.1. Participants and procedure

Data for this secondary analysis were derived from the "Women and Trauma" study conducted within the National Drug Abuse Treatment Clinical Trials Network (CTN-0015). Detailed information on the study protocol and primary outcomes have been published elsewhere (Hien et al., 2009). In brief, the Women and Trauma study examined the effectiveness of two manualized treatments: 1) Seeking Safety (SS), a treatment for co-occurring PTSD and SUD, in comparison to 2) Women's Health Education (WHE), an active control health education group (Hien et al., 2009). Participants (N = 353 women) were randomized into the two treatment arms: SS (n = 176) and WHE (n = 177). See Table 1 for participant characteristics. Seven community treatment programs (CTPs) participated in the study. CTPs were in urban (n = 5) and suburban (n = 2) settings, located in the Western (n = 1), Midwestern (n =

Table 1
Original Sample Participant characteristics (N = 353).

Variables	Seeking Safety (n = 176)	Women's Health Education (n = 177)
	Mean (SD) or %	
Age (years)	39.3(9.5)	39.0(9.1)
Education (years)	12.7(2.3)	12.4(2.6)
Race/Ethnicity		
African American/Black	33.0	35.0
European American/White	47.16	44.1
Latina	3.98	9.0
Multi-racial	15.34	11.3
Other	0.6	0.6
Marital Status		
Married	14.8	20.3
Single	37.5	36.2
Divorced/Separated	47.7	43.5
Employment		
Employed	40.3	40.1
Unemployed	54.6	55.4
Student/Retired/Disabled	5.1	4.5
Number of Prior Treatment Episodes	5.1(7.4)	5.0(8.2)
Number of Study Treatment Sessions Completed	6.2(4.5)	6.0(4.3

Note. There were no statistically significant differences between the treatment groups on these variables.

1), Northeastern (n = 2), and Southeastern (n = 3) United States. All CTPs offered a combination of outpatient individual and group treatment components, reflecting varying theoretical orientations and philosophies of addiction treatment. Participants attended their treatment as usual (TAU), which, on average, consisted of attending one mental health or substance use treatment session per week while participating in the study. On average, participants were 39.2 (SD = 9.3) years old, and 45.6% were White/European American, 34% were Black/African American, 13.3% Mixed, and 6.5% Hispanic/Latina. Given the small sample sizes of the Hispanic/Latina and Mixed subgroups, they were excluded resulting in sample size of 327 participants. Data collection consisted of a baseline assessment, weekly assessments during six weeks of treatment (2 sessions per week), and follow-up assessments at 1 week and 3-, 6-, and 12-months posttreatment. See Hien et al. (2009) for more details.

2.2. Measures

2.2.1. Sociodemographics

At baseline, information was collected on participants' age, race (Black/African American and White/European American), education (coded as no more than 12 years vs. more than 12 years of education), any employment in the past 3 years (yes/no) and criminal history (i.e., lifetime number of crimes committed as assessed via the Addiction Severity Index-Lite; Cacciola et al., 2007).

2.2.2. Substance use

Self-reported drug use was measured via the Substance Use Inventory (SUI; Weiss et al., 1995) which consists of a series of questions about the frequency, dollar amount spent, and mode of use (e.g., oral, injected) of a variety of substances in the previous seven days. Substances assessed included marijuana, cocaine, heroin, sedatives/hypnotics, stimulants, phencyclidine and hallucinogens, and other drugs including prescription opioids. UDS tests were used to biologically verify substance use. A standard 10-drug SureStep urine drug screen card was used to detect the following substances: amphetamines, barbiturates, benzodiazepines, methadone, antidepressants, cocaine, methamphetamines, opioids (including heroin), phencyclidine, and cannabinoids. The self-report and UDS tests were administered at all weekly study visits under observation of a trained research assistant.

2.3. Data analysis

We categorized weekly SUI and UDS tests during treatment into 6 weekly measures (i.e., week 1, week 2, etc.). Participants' self-report on the SUI was coded as "Positive" if they endorsed one or more days of any substance use in the previous seven days. Overall, there were 10 time points analyzed (6 weekly time points during treatment, 1 week post-treatment, and 3-, 6-, and 12-month follow-ups). We selected the drug types with the most data points for analysis. Some drug types were combined if they were from the same drug class, which resulted in four categories of self-reported drugs: cocaine/stimulants, opioids (including heroin), cannabis, and sedatives (barbiturates and benzodiazepines). If the UDS was missing at any week for any drug class, it was considered missing. Participants were excluded from the analyses if they had missing data for either SUI and/or UDS across all time points. Of 327 participants retained for analyses, 25 were excluded from the analyses because they never showed up after the baseline assessment. Seven additional participants were excluded because they had no self-report or UDS data across all time points, resulting in a final sample size of 295. Those who were excluded from the analyses due to missing data were not significantly different from those included in the final analyses in terms of age, race/ethnicity, education level, and treatment group assignment.

For our first aim, we estimated the discordance between the SUI and UDS reports for each drug class using four measures: sensitivity, specificity, positive predictive value, and negative predictive value, at each time point. The averages of each measure across all treatment sessions and follow up time points were calculated. We calculated discordance between SUI and UDS, as follows: a) sensitivity - the proportion of participants who self-reported no drug use among those with a positive UDS; b) specificity - the proportion of cases who self-reported drug use among those with a negative UDS; c) positive predictive value (PPV) reflects the proportion of positive UDS among those who self-reported no drug use; and d) negative predictive value (NPV) reflects the proportion of negative UDS among those who self-reported drug use. The sample size of participants included in these analyses ranged from 155 to 352 depending on time point and drug type.

For the second aim, we used generalized linear mixed models (GLMM) to examine whether there were significant associations between self-report and UDS results for each drug class, separately. Additionally, we included treatment assignment (SS vs WHE) and time effects in each model to test whether the probability of self-reporting drug use was significantly different between treatment groups (SS vs. WHE) and associated with timepoint in treatment. The confidence intervals were calculated based on the Wald test approximation. To account for multiple comparisons for the drug classes, we used Bonferroni adjustment. Note that the within-subjects factor (i.e., time point) was treated as a continuous variable indicating 10 different time points (i.e., 6-weekly time points during treatment, and 1-week, 3-,6-, and 12-months follow-ups). Three hundred and nineteen participants were included in this analysis.

For the third aim, we explored the potential moderating effects of five key sociodemographic variables that have been found to impact the relationship between self-report and UDS results, treatment assignment, and treatment time, respectively. These five sociodemographic variables included age, race (i.e., Black/African American vs White/European American), education, employment in the past 3 years, and number of crimes committed. The full GLMM models started with three main predictor variables (i.e., UDS, treatment assignment, and time) plus all two-way interaction terms between each sociodemographic variable and the three main predictor variables. We used the backward elimination approach to remove non-significant two-way interaction terms from the full models. Our final models included all main effect terms and significant two-way interaction terms. Two hundred ninety-five participants were included in the third aim. All analyses were performed in R (version 4.0.2).

3. Results

3.1. Aim 1: examine the relationship between UDS and self-reported substance use

When assessing discordance, sensitivity (i.e., the proportion of participants who self-reported no drug use [i.e., under-reported substance use] among those with a positive UDS) was the highest for sedatives (0.90), then opioids (0.77), and much lower for cannabis (0.33) and cocaine/stimulants (0.26). Specificity (i.e., the proportion of participants who self-reported drug use among those with a negative UDS) was low and consistent across all drugs and was within the range of 0.02–0.03 for all the drugs. The positive predictive value (PPV; reflects the proportion of positive UDS among those who self-reported no drug use) was generally low: for sedatives (0.14), followed by cocaine/stimulants (0.07), cannabis (0.05), and opioids (0.03). In terms of the negative predictive value (NPV; the proportion of negative UDS among those who self-reported drug use), findings were as follows: opioids (0.70), sedatives (0.52), cannabis (0.27) and cocaine/stimulants (0.13). (See Table 2).

3.2. Aim 2: examination of treatment assignment on the associations between UDS and self-report substance use

The interaction between treatment and UDS on self-reported substance use was not significant ($p > .05$), indicating treatment type was not a significant moderator of the association between the two variables.

3.3. Aim 3: examine the potential moderating effects of participant demographic and psychosocial characteristics on the associations between UDS and self-reported substance use

The interactions between UDS and the participant characteristics were not significant (ps >0.05) for cannabis and sedatives. See Table 3 for results. Time in treatment, treatment assignment, age, race, education, employment status in the past 3 years, and number of crimes committed in the past were all included in the models. For cocaine/stimulants, the time by number of crimes committed interaction was a significant predictor of self-report of no drug use ($p = .03$), controlling for other variables in the model including UDS. To illustrate this interaction, we plotted the predicted probability of self-reporting cocaine use when the UDS was positive (See Plot 1/Fig. 1) across time and at different levels of number of crimes committed (0, 1, 5, and 10). As can be seen in Fig. 1, among participants with a positive UDS, those with no or low number of crimes showed a no or slightly decreasing trend in self-reporting no cocaine use over the course of treatment duration, while for those with higher number of crimes (e.g., 5, 10), there is a sharp decrease in probability of self-reporting no drug use. Those with higher number of crimes tended to be more likely to self-report no cocaine use in the beginning of the treatment. The plot also showed at baseline the predicted probability of self-reporting no cocaine use was inversely related to the number of crimes.

For opioids, both race (beta=−2.65, Z = −2.43, p-value=.015) and past three-year employment status (beta= 2.39, Z = 2.35, p-value=.019) moderated the relationship between UDS and self-report of no drug use. Subgroup analyses revealed that among those who had negative UDS, there were no significant differences in self-reporting no drug use between Black and White participants (beta=−0.07, Z = −0.11, p-value=.92), and between those with and without past

Table 3
Test of participant characteristics, UDS, and interaction effects for four drug types (N = 295).

Predictors	Estimate	SE	z value	Pr (>|z|)
Cocaine/Stimulants				
(Intercept)	2.734	0.958	2.856	0.004
Cocaine/stimulants UDS at baseline	-3.852	0.260	-14.836	0.000
Employment in Past 3 Years[a]	.068	0.296	0.231	0.817
Education[b]	.077	0.319	0.242	0.809
Time	0.013	0.039	0.344	0.731
Number of Crimes	0.090	0.037	2.428	0.015
Race[c]	.462	0.336	1.376	0.169
Treatment Group[d]	-.073	0.294	-0.249	0.804
Age	0.009	0.019	0.478	0.632
Time x Number of Crimes	-0.009	0.004	-2.185	0.029
Opioids				
(Intercept)	4.692	1.786	2.626	0.008
Opioids UDS at baseline	-2.122	0.750	-2.830	0.004
Employment in Past 3 Years[a]	.471	0.621	0.757	0.448
Age	-0.003	0.037	0.073	0.941
Number of Crimes	-0.009	0.011	-0.799	0.424
Time	0.011	0.063	0.178	0.858
Education[b]	.721	0.653	-1.10	0.269
Treatment Group[d]	.331	0.596	0.555	0.579
Race[c]	-.098	0.731	-0.134	0.893
Employment in Past 3 Years[a] x Opioid UDS at baseline	2.39	1.017	2.350	0.018
Race x Opioid UDS at baseline	-2.648	1.089	-2.431	0.015
Cannabis				
(Intercept)	4.774	1.426	3.347	0.001
Cannabis UDS at baseline	-3.389	0.316	-10.709	0.000
Education[b]	.657	0.385	1.705	0.088
Race[c]	-.474	0.386	-1.229	0.219
Employment in Past 3 Years[a]	.150	0.346	0.432	0.665
Time	-0.302	0.179	-1.688	0.091
Number of Crimes	0.059	0.040	1.469	0.142
Age	-0.038	0.031	-1.201	0.230
Treatment Group[d]	.730	0.351	2.081	0.037
Time x Number of Crimes	-0.006	0.005	-1.411	0.158
Time x Age	0.008	0.004	1.950	0.051
Sedatives				
(Intercept)	4.415	1.386	3.185	0.001
Sedative UDS at baseline	-1.770	0.368	-4.814	0.000
Number of Crimes	0.011	0.020	0.566	0.572
Employment in Past 3 Years[a]	-.300	0.468	-0.642	0.521
Time	0.026	0.053	0.492	0.623
Age	0.009	0.029	0.319	0.750
Education[b]	.163	0.481	0.339	0.735
Treatment Group[d]	-.128	0.462	-0.278	0.781

[a] Any employment in the past 3 years.
[b] The reference group is people with at most 12 years of education.
[c] Notes: The reference group for race is African American.
[d] The reference group is Seeking Safety.

Table 2
Mean (SD) discordance values based on drug type (across all time points).

Drug Type	Sensitivity	Specificity	NPV	PPV	Kappa	Proportion
cannabis	0.330 (0.092)	0.035 (0.018)	0.273 (0.104)	0.046 (0.022)	-0.166 (0.049)	0.563 (0.088)
cocaine/stimulants	0.263 (0.056)	0.030 (0.012)	0.131 (0.062)	0.069 (0.014)	-0.358 (0.109)	0.561 (0.086)
opioids	0.766 (0.173)	0.021 (0.009)	0.703 (0.204)	0.033 (0.013)	-0.019 (0.016)	0.561 (0.088)
sedative	0.899 (0.050)	0.019 (0.009)	0.518 (0.238)	0.137 (0.014)	-0.025 (0.016)	0.557 (0.088)

Note: Sample size of participants ranged from 155 to 351 depending on time point and drug type. Sensitivity - the proportion of cases who self-reported no drug use (i.e., under-report) among those with a positive UDS; Specificity - the proportion of cases who self-reported drug use among those with a negative UDS; Positive predictive value (PPV) reflects the proportion of positive UDS among those who self-reported no drug use; and Negative predictive value (NPV) reflects the proportion of negative UDS among those who self-reported drug use.

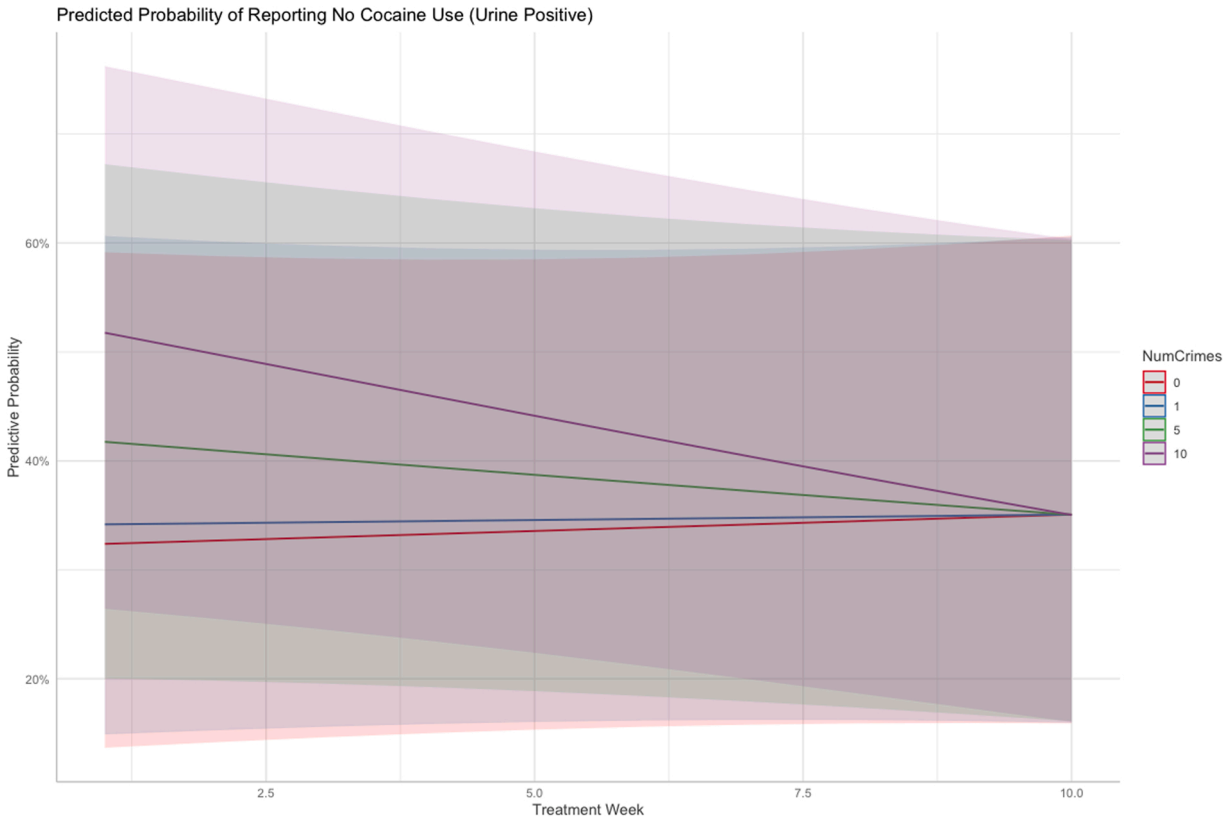

Fig. 1. Predicted probability of reporting no cocaine use (urine positive).

three-years employment (beta=0.51, Z = 0.88, p-value=.38). Among those who had positive UDS, there was no significant difference in self-reporting drug use between Black and White participants (beta=−4.25, Z = −1.47, p-value=.14). In contrast, those with past three years employment and a positive UDS were more likely to self-report no drug use than those without employment in the past 3 years and a positive UDS (beta=4.28, Z = 1.94, p-value=.052), although the relationship was only marginally significant.

4. Discussion

This secondary analysis examined the correspondence between self-reported drug use and UDS results among a sample of women with PTSD+SUD who participated in a randomized clinical treatment trial. Moderation effects were also explored to determine whether treatment assignment and key demographic variables (race, age, employment, and criminal history) influenced the associations between self-report and UDS.

Results revealed higher disagreement between self-report and UDS for opioids and sedatives (sensitivity ranging from.77 to.90) and lower disagreement rates for cannabis and cocaine (sensitivity ranging from.26 to.33), which is generally consistent with the extant literature (Basurto et al., 2009; McLouth et al., 2022). The higher agreement rates for cannabis may be a function of more favorable attitudes towards this substance which may have allowed for more willingness to self-disclose. In contrast, the higher underreporting/disagreement rate for opioid use may be a function of the greater stigmatization of these drugs. Thus, individuals may be more likely to have discordant self-report for opioids (including heroin) when compared to a positive UDS given the drug's higher potential to incur negative legal and social consequences (Walker and Cosden, 2007). Moreover, our sample was comprised of females with co-occurring PTSD. Female gender and PTSD have been associated with the pairing of stigma, shame, and guilt due to substance use which may be amplified in those with dual diagnoses compared to a single diagnosis; this may have also influenced the underreporting of opioids including heroin, which is generally perceived as a "harder" drug. Nevertheless, given that the self-report measures were collected within a confidential research context where negative treatment or legal consequences were unlikely if one admitted to using heroin, one would have expected higher rates of self-report among those with a positive UDS. A similar case could be made for sedatives, which are typically prescribed and less stigmatized. Yet, in this study, that was not the case, as evidenced by lower self-report and UDS concordance rates. It is also possible that drugs that may have been prescribed, such as opioids (for pain) and sedatives (for anxiety and sleep), were not purposefully underreported, but instead, there may have been confusion about taking them as prescribed versus misusing them.

Results also revealed that treatment group was not a significant moderator of the association between UDS and self-report. This contrasts with a study of adolescents with opioid dependence participating in a RCT of 12 weeks of treatment with buprenorphine-naloxone (BUP) versus 2 weeks of detoxification with BUP (DETOX). Adolescents in the BUP treatment were less likely to self-report positive cocaine or opioid use compared to those in the DETOX treatment (Wilcox et al., 2013). Differences in the samples (adult women with co-occurring PTSD and SUD versus adolescents) and treatments (psychosocial therapies versus medication) may have contributed to differential findings.

Our analyses of the potential moderating effects of demographic and psychosocial characteristics on the associations between UDS and self-reported substance use revealed several findings. Both race and employment status in the past three years moderated the association between UDS and self-reporting no drug use, particularly among people who use opioids. Although subgroup analyses did not reveal statistically significant differences between Black and White participants in their self-report of substance use regardless of whether the UDS was negative or positive for opioids. The small sample size of those with positive

opioid UDS may have limited the power to detect significant differences. In contrast, among those with a positive UDS, the finding that those who reported employment in the past three years were more likely to self-report no drug use compared to their counterparts without employment in the past 3 years suggest possible fears about negative consequences and/or social desirability effects. Nevertheless, given the small sample size of those with positive opioids, findings should be taken with caution and replicated.

Among people who use cocaine/stimulants, the time by number of crimes committed interaction was a significant predictor of self-report of no drug use (controlling for other variables in the model). Our graphic visualization of the data showed that, among individuals with a positive cocaine/stimulant UDS, those with no or low number of crimes demonstrated a slightly decreasing trend in self-reporting no cocaine use over the course of treatment duration. In contrast, participants with higher number of crimes (e.g., 5, 10), tended to be more likely to self-report no cocaine use in the beginning of the treatment, however, they showed a sharp decrease in the probability of self-reporting no drug use over time. At the beginning of treatment, those with a criminal history may underreport their cocaine use for a myriad of reasons including social desirability, distrust, or concerns about negative legal consequences. However, over time, feelings of trust and safety in treatment may have reduced the under-reporting of cocaine in those women with a history of more crimes. Participants may have felt more comfortable disclosing use within a study where confidentiality is strictly enforced versus disclosure in an environment that may impose consequences for use.

4.1. Limitations and future directions

As participants were females with co-occurring PTSD+SUD, the findings may not be generalizable to those with single disorders (i.e., PTSD or SUD only). Moreover, the participants were concurrently enrolled in CTP SUD treatment and the consequences of positive UDSs collected in the clinical program is unknown. The data points for participants varied depending on the time point in treatment and drug type, thus some findings may exclude the population of women with missed visits and who were using substances. Future research should consider tracking time enrolled in CTP SUD treatment as well as the proportion of participants who continue to access SUD treatment beyond follow-up timepoints, which may enhance generalizability of findings. Finally, there was a lack of precise time overlap between the half-life and elimination of certain drugs and the self-report measure (which was within the past 7 days) used in this study. For example, whereas opioids and stimulants are typically detected in UDS tests within 2–4 days of recent use, sedatives and cannabis/THC metabolites may be detected for weeks in a person's urine (after prior heavy use and even if there was no recent use) (Moeller et al., 2008; Verstraete, 2004). Thus, a participant could have self-reported they did not use THC in the past seven days but still showed up positive on the UDS if they had heavy use in the prior month. Conversely, someone who used cocaine/opioids in the early part of the 7-day window of the self-report measure may obtain a negative UDS for those drugs towards the end of the 7-day window because the drug is no longer detectable at the time. Recall bias may also influence self-report of use. Thus, concordance between a negative UDS and a negative self-report does not definitively rule out substance use in the past 7 days. Biological factors (e.g., age, body mass index), other illicit or licit drug use interactions, dosage, and duration of use can affect drug metabolite excretion which may contribute to a mismatch between self-reported use and UDS results (Moeller et al., 2017). Future studies should employ closer timeline methodologies (e.g., assessment of time of self-report and UDS tests) to ensure greater overlap between self-report of substance use and UDS testing (Oden et al., 2011), and examine biological factors (e.g., age, body mass index) that may influence concordance between self-report and UDS results. Researchers may also consider alternative biological methods of drug screening (e.g., blood, hair, saliva) as well as additional laboratory-based confirmatory testing to corroborate preliminary findings (Moeller et al., 2017). Improving interviewing techniques related to self-reported substance use, particularly when self-report and UDS may be discrepant, may also be a fruitful area to consider. Finally, given that the data were collected over 10 years ago, the contextual factors occurring in the past (e.g., social, political, and environmental challenges) may not be generalizable to current circumstances (e.g., COVID-19 pandemic and heightened focus on health disparities and need for health equity; Centers for Disease Control and Prevention, 2022). Nevertheless, the unique challenges that women with co-occurring PTSD+SUD face as they receive SUD treatment (e.g., perceived stigma, childcare challenges) have remained across time (McHugh et al., 2018) and thus findings may still be relevant to current SUD treatment populations.

4.2. Conclusions and clinical implications

This study opens opportunities for understanding the contexts of assessment using self-report of substance use (Pytell and Rastegar, 2021). Our findings revealed that clinicians can have greater confidence in self-reports of cannabis and cocaine, in the absence of a UDS. In contrast, the greater discrepancies between self-report of opioids and sedatives and the UDS tests suggests adjunctive UDS may be required. Given the small sample sizes that the latter findings were based on, however, additional research with larger samples is warranted. Findings also suggest additional work is needed among treatment providers and systems to create environments that foster a greater sense of trust and safety among those most vulnerable including those with a legal history or who are employed and use opioids and cocaine/stimulant use. Clinicians are advised to educate their clients on the privacy and confidentiality of their self-reports and what can be expected if their UDS is positive/negative. Overall, findings suggest that despite discrepancies between UDS and self-report of substance use, treatment type did not modify the association between these variables. Only two sociodemographic variables (employment and criminal history) emerged as significant moderators/predictors of the association between UDS and self-report, among people who use opioids and cocaine/stimulant. Thus, in situations where there are legal or employment consequences associated with substance use, validating self-report with UDS may be considered. Overall, the positive findings for the strong concordance between self-report of cannabis and cocaine and UDS is encouraging and supports the use of well-validated self-report assessments for those drug types during delivery (in-person or through telehealth) of SUD treatment. The discordance between self-report of opioids and sedatives may be attributed to other factors unrelated to accurate self-report and thus more research is needed to replicate and extend those findings.

Role of Funding Source

The work presented in this manuscript was supported by grants from the National Institute on Drug Abuse (NIDA; U10 DA13035 (Edward Nunes, PI), U10 DA13714 (Dennis Donovan, PI), U10 DA13038 (Kathleen Carroll, PI), U10 DA13732 (Eugene Somoza, PI), U10 DA13727 (Kathleen Brady, PI), U10 DA013720 (Jose Szapocznik, PI), U10 DA013046 (John Rotrosen), R25DA035161 (Lesia M. Ruglass and Denise A. Hien, MPIs) and the National Institute on Alcohol Abuse and Alcoholism (NIAAA; R01AA025853, Denise A. Hien and Antonio Morgan-López, MPIs). This study is registered under ClinicalTrials.gov (NCT00078156). The NIDA and NIAAA did not have a role in the study design, collection, analysis, and interpretation of data; nor in the writing of the report or the decision to submit the article for publication.

CRediT authorship contribution statement

L.M. Ruglass, T.K. Killeen, and A.A. Morgan-López conceptualized and designed the research question. Y. Zhao and A. Shevorykin

conducted the statistical analyses. All authors drafted the initial manuscript, interpreted results, and critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

Declaration of Competing Interest

None.

Acknowledgments

We thank the reviewers on the NIDA National Drug Abuse Treatment Clinical Trials Network Publication Committee for their review and feedback on this manuscript.

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