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# The impact of non-concordant self-report of substance use in clinical trials research

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## Abstract

**Background—**Studies comparing self-report substance use data to biochemical verification generally demonstrate high rates of concordance. We argue that these rates are due to the relatively high true negative rate in the general population, and high degree of honestly in treatment seeking individuals. We hypothesized that high risk individuals not seeking treatment would demonstrate low concordance and a high false negative rate of self-reported substance use.

**Methods—**A sample of 500 individuals from a smoking cessation clinical trial was assessed over 1 year. Assessments included semi-structured interviews, questionnaires (e.g. Addiction Severity Index, etc.), and urine drug screen assays (UDS). Generalized estimating equations (GEE) were used to predict false negative reports for various substances across the study and determine the influence of substance use on the primary study outcome of smoking cessation.

**Results—**Participants demonstrated high false negative rates in reporting substances use, and the false negative rates increased as the study progressed. Established predictors of false negatives generalized to the current sample. High concordance and low false negative rates were found in self-report of nicotine use. A small but significant relationship was found in for effect of biochemically verified substance use on smoking cessation.

**Conclusions—**Biochemical verification of substance use is needed in high risk populations involved in studies not directly related to the treatment of substance use, especially in populations with high threat of stigmatization. Testing should continue through the time period of the study for maximal identification of substance use.

### Keywords

concordance; urine drug test; criminal justice; substance use; false negatives



Author disclosure

The authors have no conflicts of interest to declare.

All authors contributed to this manuscript and approve of the final version.

## Introduction

A large part of assessment in patient care as well as clinical research is based on patients' self-report of conditions and behaviors, and the results of these self-report assessments can only be as valid as the answers the patients provide. Some conditions are more highly scrutinized than others. The validity of self-reported substance use has been questioned in the literature by both medical professions and scientists for almost 50 years (e.g., Ball, 1967; Carroll, 1995; Daiter et al., 2007; Jain et al., 2013; Schuler et al., 2009; Wilcox et al., 2013). There are multiple reasons to expect a lack of concordance between self-reported substance use and biochemically verified substance use (e.g., urine drug screen assay; UDS, blood test, hair analysis). Admitting to excessive substance use is not socially desirable, is often illegal, may impact a person's study participation or medical treatment, and may further limit what medications they are prescribed or influence the referral process. Furthermore, research from the field of cognitive psychology has demonstrated that addictive behaviors are often implicit as opposed to explicit processes and therefore individuals may unintentionally be misrepresenting their substance use (Kozlowski, 1983; Kozlowski et al., 1996; Lamb et al., 1991; Tiffany, 1990; Winkelman & Berridge, 2004). Thus, there are a number of reasons both conscious and unconscious as to why someone may deny or underreport substance use. Despite these reasons, empirical investigations comparing self-report substance use data to biochemical verification generally demonstrate high rates of concordance, often greater than 80% agreement (Basurto et al., 2009; Fendrich & Johnson, 2005; Drake, 1998; Wilcox et al., 2013). Indeed, in a literature review of sixteen studies on the validity of self-report of substance use Drake (1998) concluded that self-report was a valid means of assessing substance use and reported high rates of concordance between self-report and chemical verification (i.e., UDS and hair analysis). Despite the continued skepticism of self-reported substance use, studies on concordance generally show that self-report is a valid method for determining substance use.

While the concordance rates reported in literature speak to the validity of self-report, these rates may not generalize to all settings and populations. The majority of the studies on concordance (e.g., Dillion et al., 2005; Jain et al., 2006; Jain et al., 2013; Melnikov et al., 2009; Schuler et al., 2009; Wilcox et al., 2013), including those in the Drake (1998) review, have examined patient samples that were presenting for an intake for substance use treatment, already in treatment for substance use, or had previously undergone treatment for substance use. It is possible that individuals who are not seeking treatment for substance use nor have a treatment history would be less inclined to provide accurate data about use in their self-report. Population data comparing alcohol sales to self-report of alcohol consumption supports the notion that individuals tend to globally under report their alcohol use (Stockwell et al., 2014). Due to the level of stigma and other problems associated with substance use it is possible that non-treatment seeking individuals from the general population would have a low rate of concordance when asked about alcohol use as well as illicit drug use.

Studies of concordance comparing self-report data with biochemical verification in samples drawn from the general population have generally produced concordance rates comparable to what is seen in substance use treatment populations (e.g., Akinci et al., 2001; Basurto et

al., 2009; Fendrich & Johnson 2005). However, this high level of concordance is driven primarily by a high rate of true negative responses (i.e., people who claim not to be using and this claim is confirmed with biochemical verification). Population data indicates that only 9.4% of the United States population has used illicit drugs in the past month (Substance Abuse and Mental Health Services Administration, 2014). If it can be assumed that people have no motivation to claim substance use (e.g., getting into a substance use treatment program) when they are in fact not using, it would therefore be difficult to have a concordance rate below 90% due to the low base rate of substance use generally. Therefore, the high rate of concordance observed in the general population is driven up by true negative responses which are the result of a low base rate of substance use. However, when the false negative rate (i.e., people who claim they are not using but have positive chemical verification) is examined the concordance rate drops. For example, in a study of marijuana in youth who were not in treatment, Akinci and colleagues (2001) found a concordance rate of 87% but the false negative rate was 31.5%. Basurto and colleagues (2009) found a concordance rate of 98% in a sample of college students reporting cocaine use, but the false negative rate was 42.9%. Finally in a general population sample, Fendrich and Johnson, (2005) found concordance rates of 93.6% for marijuana and 93.9% for cocaine, but the false negative rates were 69.6% and 22.8% respectively. It should be noted that the false positive rate was less than 2% in all these studies. There are three general conclusions that can be drawn from the concordance literature. First, individuals in treatment for substance use tend to be honest about their use. Second, individuals who are truly not using substances tend to be honest about not using them. Third, individuals who are not treatment seeking but are using substances have the have the lowest concordance/highest rate of false negatives, but the false negative rate varies widely (e.g., 30 - 70%).

The wide range of variability in estimates of false negatives for substance use can partially be explained by mediating factors. The studies examining factors associated with denial of substance use have been fairly consistent in their findings. Individuals are more likely to have higher false negative rates if they use substances perceived to be more addictive or dangerous (i.e., cocaine, opiates, and methamphetamine) as opposed to use of substances believed to be less addictive and dangerous (i.e., alcohol and marijuana). Participant characteristics linked with lower concordance and higher false negative rates include people of lower socio-economic status, the mentally ill, males, African Americans, members of the criminal justice population, and young adults or an adolescence (Bahorik 2014; Bai et al., 2014; Basurto et al., 2009; Fendrich & Johnson, 2005; Ledgerwood et al., 2008; Schuler et al., 2009; Delaney-Black et al., 2010). In general, individuals appear more likely to deny use when there is a heightened level of consequences associated with their use. More stigmatized substances are more frequently denied and demographics which are stereotyped to be more likely to use substances are more inclined to deny their use.

The pattern of findings on concordance and false negatives discussed thus far has important implications for clinical trials research. The findings suggest that individuals who are in clinical trials testing the efficacy of substance use treatments would likely be honest about their substance use, especially for the substance that is the target of treatment. However, individuals who are participating in clinical trials where substance use is not the focus, particularly if they perceive a high level of threat, stigma, and stereotype discrimination

associated with substance use (e.g., youth, African Americans, tobacco smokers, mentally ill individuals, low SES samples, members of the criminal justice system) are more likely to deny use. This is a problem because substance use has been linked to a number of detrimental physical and psychological outcomes and can greatly impact the results of the trial (Dixion, 1999; Hopwood et al., 2011; Lucas et al., 2001; Nair et al., 2004; Prince et al., 1999). While we were able to find several studies examining the validity of self-report in clinical trials for substance use, we could not find any examining the concordance and false negative rate of self-report and biochemically verified substance use in clinical trials targeting the treatment of non-substance related conditions.

The goal of this study was to examine the concordance and false negative rates for substance use in a randomized clinical trial for smoking cessation treatment. The intervention targeted individuals in the criminal justice system under supervision in the community (e.g., probation or parole), a sample believed to have a high false negative rate. The data was analyzed to test the following hypotheses. 1) The participants would demonstrate a high false negative rate in self-reported substances use. 2) Established predictors of false negatives (i.e., age, race, gender, socioeconomic status, mental health, criminal justice history) will generalize to the current sample. 3) Because this was a smoking cessation clinical trial individuals will have a high concordance rate and comparatively low false negative rate when asked about smoking cigarettes. 4) Substance use will be associated with treatment effectiveness for smoking cessation.

## Method

### Participants

The sample randomized 500 smokers under community corrections supervision. Community corrections is an umbrella term referring to individuals who are under probation, parole, or serving their actual sentence in the community. Individuals under community corrections supervision may also have been arrested, but not yet sentenced. In many cases our participants were part of a program known as Treatment Alternatives for Safer Communities (TASC) which demonstrates sizeable dissimilarity in structure, but has branches in all 50 states. TASC is a presentencing program for felony offenders, which is intended to help treat substance abuse through supervision of substance use (via unscheduled UDS), and referrals to other agencies such as substance abuse counseling, graduate equivalency degree (GED) preparation, vocational guidance counseling or other services deemed potentially beneficial by the arrested individual's caseworker. For a full description of TASC see Clark and colleagues (2013). The participant characteristics can be seen in Table 1. There were 355 (67.0%) males, 323 (64.6%) African Americans, and 177 (35.4) non-Hispanic, White individuals. The mean age was 37.4 years (*SD* = 11.3 years). Demographic data were collected during the baseline assessment of a smoking cessation clinical trial, which compared the effectiveness of bupropion to bupropion and behavioral counseling (5R01CA14166305, see Cropsey et al., in press for further details of study design). This clinical trial involved 10 study visits. These visits included a baseline assessment, four weekly meetings during the first month where medication was given, a two month follow-up where medication was given, a three month follow-up marking the end of treatment, and

follow-ups at 6, 9, and 12 months to monitor relapse. Individuals who received behavioral counseling received four sessions of approximately 20 minutes of counseling during their first four visits. These data are representative of everyone who was enrolled and randomized into the study at baseline assessment, 6 month follow-up, 9 month follow-up and 1 year follow-up. Missing data were excluded on a pairwise basis; sample size varied at different time points due mainly to attrition. There were 500 participants at baseline, 345 (69%) participants at the 6 month follow-up, 349 (70%) participants at 9 month follow-up, and 371 (74%) participants at 1 year follow-up. Predictor variables for this study were all taken from the initial baseline assessment to examine concordance rates at later follow-up points.

## Procedure

The design of the study involved a comprehensive assessment through both semi-structured interviews (MINI International Neuropsychiatric Interview (Sheehan et al., 2009); MINI and the Addiction Severity Index, McLellan et al., 1985) and questionnaires which assessed demographics, substance use history, criminal justice history, mental health, and physical health. The Addiction Severity Index assessed both lifetime as well as drug or alcohol use in the past 30 days for each substance. The responses to these questions were then compared to the results of a urine drug screen assays (UDS) to determine concordance rate. The participants were informed during the consent process that they would be urine drug tested at every visit and that there use of any substances would remain confidential. To further safeguard confidentiality, a Certificate of Confidentiality was obtained from the Federal Government protecting the data from non-consensual release by state or federal court mandates. UDS were collected at every study visit and analyzed using the Olympus 640AU Chemistry Immuno Analyzer. Drugs of use that were analyzed included alcohol (detecting ethyl glucuronide metabolites) as well as amphetamines, barbiturates, benzodiazepines, cannabis, cocaine, opioids, and methadone. The Emit® II Plus Opiate Assay was used to detect opioid metabolites. The opioid metabolites detected by this assay included morphine (e.g., hydrocodone, oxycodone, etc.), morphine-3 glucuronide (metabolites of heroin), and codeine. Methadone was detected through a separate assay. Chemical verification of cigarette smoking was assessed through a UDS testing for the presence of the metabolite Cotinine. The One-Step Cotinine Test Device (COT; Reditest®; Redwood Toxicology Laboratory) uses a lateral flow one-step immunoassay to detect cotinine levels above 200 ng/mL. The entire assessment procedure including UDS lasted about 2 hours on average and participants were compensated 20 dollars for their time. This protocol was approved by the UAB Institutional Review Board.

## Analyses

Sample characteristics were calculated using means and percentages. The two treatment conditions (bupropion and bupropion plus behavioral counseling) were collapsed into one group for the analyses. Concordance between self-reported substance use and UDS results, as well as false negative rates for each substance (alcohol, marijuana, cocaine, opioids), were calculated as percentages. Concordance and false negative rates were generated for each of the four primary substance categories of use (alcohol, marijuana, cocaine, opiates) as well as for nicotine. Variables with a documented association with false negative reports were entered into generalized estimating equations (GEE) predicting false negative reports

for that substance across the four time points where concordance data existed (Baseline, 6-month Follow-up, 9-month Follow up, 12-Month Follow up). The dependent variable was false negative reporting at each time point.

A GEE was also used to determine the influence of substance use on the primary study outcome of smoking cessation. The effect of a UDS that was positive for any substance was entered as the predictor variable and a UDS that was negative for cotinine was the dependent variable. This relationship was examined across all 10 study visits.

## Results

### Non-Concordance Reports of Substance Use

Table 2 shows the concordance rates for all four time points and all four drug types. When all substances and all time points were examined 37.5% of all reports were non-concordant. Non-concordance rates were similar across substances with alcohol (13.9%), marijuana (14.0%), and cocaine (14.3%), being almost identical, and opiates being slightly lower (8.9%). Non-concordance increased over time. At the baseline assessment only 18.6% of the participants provided non-concordant reports. The rate more than doubled at the six month follow-up increasing to 48.0%. It remained similarly high at the 9 month (46.3%) and 12 month (51.4) time points.

When only the proportion of individuals with a positive UDS (55.4% of all screens) for a specific substance was examined, 62.6% were non-concordant. In other words, almost two-thirds of individuals who tested positive for a substance, denied their use on self-report. The rate of non-concordance varied by substance. Specifically, 51.5% of alcohol screens, 56.7% of marijuana screens, 79.2% of cocaine screens, and 75.0% of opiate screens were non-concordant overall. Interesting, concordance was highest at baseline and decreased across time. Of those with a positive UDS, the concordance rates were 40.6% at the baseline assessment, 79.4% at the 6-month follow-up, 78.3% at the 9-month follow-up, and 81.1% at the 12-month follow-up (Table 2).

### Participant Characteristics Associated with False Negatives

The univariate characteristics associated with non-concordance can be seen in Table 3. For alcohol use, non-concordance was associated with older age, a history of court offenses, male gender, and Black race. Marijuana use non-concordance was associated with younger age, male gender, Black race, and meeting criteria for an anxiety or depressive disorder. Cocaine use non-concordance was associated with older age, Black race, a history of person offenses, and less education. Finally, opioid use non-concordance was associated with not having an anxiety or depressive disorder, White race, not having committed a person offense, and a higher level of education.

The multivariate associations between the concordance rate and the significant univariate predictor variables can also be seen in Table 3. In a GEE examining non-concordance between self-report and UDS for alcohol use, non-concordance was associated with older age, male gender, and Black race. Marijuana use non-concordance was associated with younger age, and Black race. Cocaine use non-concordance was associated with older age,

Black race, a history of person offenses, and less education. Opioid use non-concordance was associated with White race.

### Concordance of self-report of Nicotine use

This data was taken from a larger clinical trial examining the effect of bupropion and counseling on smoking cessation. There was a high rate of concordance been self-report of smoking and biochemical verification (96.6%). The false negative rate was also low (3.4%). Cotinine was used to verify smoking status.

### Influence of Biochemically Verified Substance Use on Smoking Cessation

There were a total of 10 visits during the clinical trial. To determine the influence of substance use on study outcome (smoking abstinence) all 10 time points were used. The results of a GEE examining the effect of a positive UDS for any substance on smoking abstinence indicated a small but statistically significant relationship (*Wald Chi-Square* = 11.06; $p = .001$).

## Discussion

Consistent with our hypotheses, participants demonstrated a high false negative rate in reporting substances use, meaning that regardless of the category of substance, individuals tended to deny use. This was expected given that the demographics of our sample have been associated with high rates of false negative reporting (i.e., young adults, African Americans, low SES individuals, members of the criminal justice system). The literature suggests that stigmatization drives behavior to avoid these negative associations and avoid potential threat (Hively & El-Alayli, 2014; Inzlicht & Kang, 2010; Joanisse, Gagnon, & Voloaca, 2013; Shantz & Latham, 2012). The characteristics of individuals who were non-concordant appear to be consistent with this hypothesis. The false negative rate increased as the study progressed, this was not an anticipated finding, but is also consistent with the concordance literature (Schuler et al., 2009).

Established predictors of false negatives generalized to the current sample. The more stigmatized substances (opiates and cocaine) were denied at much higher rates than the less stigmatized substances (alcohol and marijuana). The specific pattern of relationships differed by substance of use, but in general demographics facing greater stigma threat associated with substance use (younger individuals, African Americans, men) produced higher rates of false negatives. The literature on deception is fairly consistent in showing that predicting or detecting deception is very difficult and often no better than chance (Bond & DePaulo, 2008; Warren, Schertler, & Bull, 2009). Additionally, it has been argued that many of the mechanisms underlying addictive behavior operate outside of conscious awareness (Kozlowski et al., 1996; Tiffany, 1990). It is possible that some individuals are more susceptible to these patterns than others or that more stigmatized substances are less congruent with individual's self-image. This is certainly an area in need of further research, but regardless of the cause, knowing who is likely to present false negative reports can inform interventions geared to increase accurate self-report.

The concordance rate between self-report of cigarette smoking and biochemical verification was high, while the false negative rate was low. It is possible that individuals felt more inclined to report cigarette use because there is typically less stigma associated with cigarette smoking in comparison with harder substances. This explanation would certainly fit with the research on stereotype threat; however, the concordance literature likely offers a better explanation. Individuals tend to be more honest about substance use when that substance in the target of treatment. This is supported by the fact that individuals in substance use treatment tend to provide high rates of concordance about their use (Drake, 1998). Furthermore, while concordance rates are high in substance use treatment, these results appear to diminish when individuals are asked about substances that are not the target of treatment (Jain et al., 2013; Musshoff et al., 2006). These high rates of concordance may only apply to individuals who are currently being treated for a specific substance. Rockett and colleagues (2006) found in an emergency department sample that patients reporting a history of attending substance use treatment had a lower concordance rate than patients who denied a history of substance use treatment. Because cigarette smoking was the treatment target for the participants in our study it is likely that they were inclined to be more honest about their smoking behavior. If illicit substance use had been the target of treatment it is possible they would have denied smoking cigarettes, although smoking may not be perceived as stigmatizing in this sample as in other samples due to the high prevalence of smoking (70-80%) among individuals in the criminal justice system (Cropsey et al., 2010; 2008; 2004). Our data in conjunction with the literature suggests that when people seek treatment for substance use they will be honest about the substance which is the target of treatment even in the face of stigma; however, they may deny use of substances that are not the target of treatment.

Substance use predicted treatment success for smoking cessation. Positive UDS was associated with lower urine positives for cotinine indicating that individuals using substances were less likely to quit smoking. This analysis was conducted to demonstrate the value of accurate knowledge of substance use in relation to study outcomes. Substance use was a statistically significant confound and should be controlled for in assessing the associations between the predictor variables and smoking cessation. Taken as a whole our results indicate that in populations where high levels of false negatives are anticipated and reduction of substance use is not the primary outcome of the study, substance use should be measured via biochemical verification as self-report is not as trustworthy under these conditions. Substance use is strongly linked to a variety of detrimental health outcomes (Dixion, 1999; Hopwood et al., 2011; Lucas et al., 2001; Nair et al., 2004; Prince et al., 1999), and can impact study results if not properly measured and controlled.

There were some limitations to the generalizability of these data. We conducted our study using a criminal justice sample. While this sample may not be as generalizable to less stigmatized populations we wanted to examine false negatives in a high risk population for substance use where stigma threat could potentially exacerbate the false negative rate. These findings are likely to generalize to other high risk populations that possesses these characteristics (e.g., mentally ill individuals, the homeless, HIV positive individuals), but different results may be found in more stable and affluent groups. Another limitation of the data is that smoking cessation and not substance use was the primary outcome in the clinical

trial and this study is a secondary analysis of this data. Nicotine dependence is an addiction that may carry less threat of stigma than illicit drug use, particularly in high risk populations. It is possible that individuals in treatment for a different physical or mental health care reason may have produced a different false negative rate. Finally, while we hypothesized that stigma threat was linked to false negative rates, we did not directly measure stigma threat and this conclusion is hypothetical at this point. Nor did we utilize any measure of the unconscious processes which have been argued to underline addictive behaviors. Future research should look to address these limitations by assessing false negative rates in a general population sample, studying clinical trials of physical and mental health treatments other than addiction, and measuring unconscious processes, stigma threat, and other constructs which may help to explain why people deny substance use.

Our findings have several implications for future clinical trials as well as clinical treatment. Our constellation of findings demonstrate the need for biochemical verification of substance use in high risk populations involved in studies not directly related to the treatment of substance use. Furthermore, testing should be continued throughout the length of the trial as our data and others (Shuler et al., 2009) indicate that concordance decreases over time. In terms of clinical practice, the literature is clear that compartmentalization of recovery (e.g., trying to quit using alcohol, but not cigarettes) is less efficacious than pursuing total abstinence (Bobo et al., 1998; Kalman, Kim, DiGirolamo, Smelson, & Ziedonis, 2010). Individuals should be tested for all substances of abuse and persuaded to make complete abstinence from all substances the goal. On the whole, our findings speak to the necessity of using biochemical verification whenever high rates of substance use can be expected, but especially in populations where threat of stigmatization is high.

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## Highlights

- In a sample of individuals at risk for substance misuse we observed a high false negative rate between self-reported substance use and biochemical verification.
- Established predictors of false negatives (i.e., age, race, gender, socioeconomic status, mental health, criminal justice history) generalized to the current sample. The false negative rate was especially influenced by a time by substance interaction (i.e., 20.2% for alcohol at baseline versus 91.9% for cocaine at one year follow-up).
- Substance use was associated with treatment effectiveness for the main clinical outcome of the study, which indicates the need for biochemical verification of substance use in clinical trials given the high false negative rate.

## Table 1

Sample Characteristics

| Characteristic | | N | Mean (SD) or % |
|---|---|---|---|
| Gender | Male | 335 | 67.0 |
| | Female | 165 | 33.0 |
| Race | African American/Black | 323 | 64.6 |
| | Caucasian - non Hispanic | 177 | 35.4 |
| Age | | 500 | 37.40 (11.30) |
| Education | Less than High School Education | 158 | 31.7 |
| | High School Education or GED | 341 | 68.2 |
| Marital Status | Never Married | 252 | 54.8 |
| | Married | 50 | 10.9 |
| | Divorced/Separated | 142 | 30.9 |
| | Widow | 16 | 3.5 |
| Person Offenses | | 132 | 26.6 |
| Property Offenses | | 239 | 48.2 |
| Substance Offenses | | 390 | 78.6 |
| Court Offenses | | 255 | 51.4 |
| Antisocial Personality Disorder, Lifetime | | 67 | 13.5 |
| Total Arrests; lifetime | | 496 | 10.47 (14.39) |
| Total Monthly Income | | 499 | 576.05 (725.59) |

Note: GED = Graduate Equivalence Degree

## Table 2

Concordance rates for Alcohol, Marijuana, Cocaine and Opioids

| | | Baseline % ( *n* ) | Six Months % ( *n* ) | Nine Months % ( *n* ) | Twelve Months % ( *n* ) |
|---|---|---|---|---|---|
| All Participants | Alcohol | 6.2% (31/500) | 17.4% (52/298) | 20.3% (57/281) | 17.4% (48/276) |
| | Marijuana | 4.0% (20/500) | 19.1% (57/298) | 20.3% (57/281) | 20.3% (56/276) |
| | Cocaine | 5.6% (28/500) | 18.1% (54/298) | 19.6% (55/281) | 20.7% (57/276) |
| | Opioids | 5.8% (29/500) | 9.4% (28/298) | 10.3% (29/281) | 12.3% (34/276) |
| False Negative | Alcohol | 29.5% (31/105) | 61.9% (52/84) | 64.0% (57/89) | 55.2% (48/87) |
| | Marijuana | 20.2% (20/99) | 73.1% (57/78) | 72.2% (57/79) | 70.9% (56/79) |
| | Cocaine | 46.7% (28/60) | 91.5% (54/59) | 85.9% (55/64) | 91.9% (57/62) |
| | Opioids | 56.9% (29/51) | 77.8% (28/36) | 85.3% (29/34) | 87.2% (34/39) |

**Table 3**

| Predictors | Alcohol | | | Marijuana | | | Cocaine | | | Opioid | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *B (Std. Error)* | *Wald Chi-Square* | *Sig.* | *B (Std. Error)* | *Wald Chi-Square* | *Sig.* | *B (Std. Error)* | *Wald Chi-Square* | *Sig.* | *B (Std. Error)* | *Wald Chi-Square* | *Sig.* |
| Age | −0.03 (0.01) | 11.15 | 0.001 | 0.06 (0.01) | 24.23 | <0.001 | −0.02 (0.01) | 7.07 | 0.008 | 0.01 (0.01) | 0.48 | 0.489 |
| White | −1.01 (0.24) | 18.14 | <0.001 | −0.72 (0.29) | 6.31 | 0.012 | −0.60 (0.26) | 5.34 | 0.021 | 0.53 (0.26) | 4.06 | 0.044 |
| Female | −0.58 (0.24) | 5.88 | 0.015 | −0.47 (0.27) | 3.02 | 0.082 | −0.14 (0.24) | 0.32 | 0.570 | 0.22 (0.29) | 0.59 | 0.441 |
| Less than High School Education | 0.13 (0.20) | 0.39 | 0.533 | 0.04 (0.24) | 0.03 | 0.872 | −0.43 (0.22) | 3.80 | 0.051 | 0.43 (0.28) | 2.24 | 0.134 |
| Anxiety or Depression Diagnosis | −0.04 (0.23) | 0.03 | 0.853 | −0.42 (0.26) | 2.71 | 0.100 | −0.09 (0.25) | 0.12 | 0.726 | −0.59 (0.32) | 3.47 | 0.063 |
| Person Offenses | −0.19 (0.22) | 0.72 | 0.397 | 0.20 (0.24) | 0.73 | 0.393 | −0.73 (0.23) | 10.09 | 0.001 | −0.37 (0.35) | 1.14 | 0.285 |

Characteristics Associated with Concordant Reports of Substance Use by Substance