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Drug Use During Pregnancy: Validating the Drug Abuse Screening Test Against Physiological Measures

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Abstract

This study examined the ability of the Drug Abuse Screening Test (DAST-10) to identify prenatal drug use using hair and urine samples as criterion variables. In addition, this study was the first to use “best practices,” such as anonymity, ACASI technology, and a written screener, to facilitate disclosure in this vulnerable population. 300 low-income, post-partum women (90.3% African-American) were recruited from their hospital rooms after giving birth. Participation involved (a) completing a computerized assessment battery that contained the DAST-10 and (b) providing urine and hair samples. Twenty-four percent of the sample had a positive drug screen. The sensitivity of the DAST-10 was only .47. Nineteen percent of the sample had a positive toxicology screen but denied drug use on the DAST-10. Findings suggest that brief drug use screeners may have limited utility for pregnant women and that efforts to facilitate disclosure via reassurance and anonymity are unlikely to be sufficient in this population.

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Keywords

DAST-10; pregnancy; drug use; screening

Self-report measures are, by far, the most commonly used method of gathering information about substance use. Compared with toxicology screens and collateral reports, self-report measures are cheap, easy to administer, and widely accessible. In addition, when taken voluntarily and with assurances of confidentiality, self reports have been shown to produce valid inferences concerning substance use and abuse (Babor, Stein-berg, Anton, & Del Boca, 2000; Basurto et al., 2009). In fact, a number of researchers have suggested that biochemical and collateral data contribute little unique information above and beyond the information obtained from properly collected self-report measures (Laforge, Borsari, & Baer, 2005; Babor et al, 2000).

Notably, however, the validity of self-reported substance use data decreases substantially when individuals believe that their responses may lead to negative consequences. Specifically, self report measures tend to be less valid when they assess (a) illicit drug use as opposed to alcohol use (Magura & Kang, 1996); (b) highly stigmatized drugs (e.g., cocaine and heroin) as opposed to more “socially accepted” drugs (e.g., marijuana; Golub, Liberty, & Johnson, 2005; Magura & Kang, 1996; Harrison & Hughes, 1997); (c) recent as opposed to more distal drug use (Colon, Robles, & Sahai, 2002; Harrison & Hughes, 1997); and (d) verbal responses (i.e., interviews) as opposed to written or typed responses (Harrison & Hughes, 1997). The accuracy of self reported drug use is also poor among individuals who are likely to face harsh consequences if they disclose drug use, such as those involved in the criminal justice system (Golub et al., 2005) and those enrolled in some kinds of drug treatment programs (particularly when assessed at follow-up, rather than at intake; Messina, Wish, Nemes, & Wraight, 2000; Harrison & Hughes, 1997).

Pregnant women are another group that may be particularly reluctant to report drug use. Pregnant women who choose to disclose drug use can face severe social and legal consequences, including criminal prosecution, jail time, and loss of custody (Bornstein, 2003). When faced with these consequences, pregnant women may choose to deny or substantially underreport drug use. However, only a handful of studies have examined this issue empirically by comparing self-reports of prenatal drug use to biological data (Ostrea, Brady, Gause, Raymundo, & Steven, 1992; Kokotailo, Langhough, Cox, Davidson, & Fleming, 1994; Markovic et al., 2000; Bessa et al., 2010; Shiono et al., 1995; Kline, Ng, Schittini, Levin, & Susser, 1997). Ostrea et al. (1992) analyzed meconium samples from 3010 newborns and found that, although 44% of newborns tested positive for drugs, only 11% of mothers self-reported drug use during pregnancy. Kokotailo et al. (1994) administered a self-report questionnaire and a urine screen to 117 pregnant women and found that 12.8% had positive urine screens but only 7.7% self-reported drug use. Markovic et al. (2000) collected self-report, urine and hair data from 789 pregnant women and found that while 3.7% self-reported cocaine use, 7.9% had positive urine screens and 24.1% had positive hair screens. More recently, Bessa et al. (2010) collected interview data and hair samples from 1000 teenagers shortly after they gave birth. Although 6% of these adolescents tested positive for drugs, none self-reported their substance use.

Unfortunately, few studies in this area have taken adequate steps to increase the validity of self-report. For example, research has clearly shown that anonymity (Durant, Carey, & Schroder, 2002) and the use of audio-enhanced computer-assisted self-interview (ACASI) techniques can facilitate disclosure of stigmatized behaviors (e.g., Newman et al., 2002). Despite this, only one of the above-noted studies (Ostrea et al., 1992) utilized true

anonymity, and none utilized ACASI data collection. Similarly, it is crucially important that participants providing self-report remain blind to the pending request for a biologic sample in order to prevent false inflation of self-report due to a “bogus pipeline” response set (Lowe, Windsor, Adams, Morris, & Reese, 1986). Despite this, the vast majority of studies in this area provide no information regarding whether participants are blind to the pending sample request when completing self-report interviews.

Finally, nearly all of the studies in this area obtained self-reports of drug use using interview methods, rather than validated, brief, drug use screeners. Interview-based approaches can be time consuming and generally require face to face involvement with a trained clinician, a procedure which tends to limit disclosure (Harrison & Hughes, 1997). Thus, although structured interviews have substantial advantages in terms of depth of information and diagnostic accuracy, they are not the most commonly used or practical method of obtaining self-report data in applied settings.

Using available data from a measure development study, the current study thus sought to evaluate the extent to which under-reporting of drug use would remain an issue when best practices were used to facilitate disclosure in a vulnerable sample. The current study also sought to evaluate under-reporting using a validated brief screener rather than a structured interview for determination of self-report rates. Specifically, we obtained self-reports of drug use using ACASI technology and a response set involving (a) anonymity, (b) a brief self-report drug use screener, rather than a structured interview, and (c) a lack of awareness of the pending request for biologic samples. We then compared this self-report data to the results of both urine and hair testing, with hair sample results confirmed by Gas or Liquid Chromatography/Mass Spectroscopy (GC/MS/MS or LC/MS/MS) methods.

Method

Participants

Participants were 300 women who had recently given birth at an obstetric hospital in Detroit. Women were excluded from the study if they had not slept since giving birth, were distressed about the health of their newborn, or did not understand English.

Measures

The Drug Abuse Screening Test (DAST-10)—The DAST-10 (Bohn, Babor, & Kranzler, 1991) is a 10-item measure of past-year drug use. All items assess drug use in general, without referring to specific types of drugs (e.g., “Are you unable to stop using drugs when you want to?”). Question # 1 asks whether participants have used drugs during the past year (“Have you used drugs other than those required for medical reasons?”). All other questions ask about potential consequences of drug use, (e.g., “Have you neglected your family because of your use of drugs?”). Response options on the DAST are “Yes” and “No” and each item is worth one point. Possible scores range from 0 to 10 with scores of 1–2 indicating potential drug problems and scores of 3 or higher indicating moderate to severe drug problems. The DAST-10 is a shortened version of the original, 28-item DAST (DAST-28; Skinner, 1982). Internal consistency of the DAST-10 ranges from .86 to .94 (Carey, Carey, & Chandra, 2003; Cocco & Carey, 1998). Sensitivity ranges from .41 to .95, and specificity ranges from .68 to .99 (Maisto, Carey, Carey, Gordon, & Gleason, 2000; Cocco & Carey, 1998; Yudko, Lozhkina, & Fouts, 2007).

Last trimester drug use—Drug use in the last trimester was measured by urine analysis, using a RediCup® instant-read device manufactured by Redwood Biotech; and by hair analysis, using a 1.5 inch sample (providing a 90-day window) by Psychomedics, Inc., with

gas chromatography/mass spectrometry confirmation of all screen-positive results. Participants were considered positive for drug use if either the urine or hair sample was positive. Notably, results from urine and hair samples are highly correlated. However, urinalysis has a much shorter window of drug use detection than hair analysis (generally 24–48 hours for urinalysis, vs. 90 days for a 1.5 inch hair sample). As a result, urine samples positive for opiates were not counted as positive in order to rule out false positives from hospital-administered anesthesia (though hair samples were, since it takes approximately 5–7 days for drugs to appear in hair). These measures, particularly hair testing, are an ideal “gold standard” criterion measure because of their well-established validity and because of the wide window of detection for hair analysis (Kintz, Villain, & Cirimele, 2006; Wada & Nakashima, 2006).

Procedure

Participants were recruited from their hospital rooms shortly after giving birth. All participants were asked to complete a broad computerized assessment battery that included the DAST. Subsequently, participants were asked to provide hair and urine samples that could be used to assess recent drug use. All participants completed the computerized assessment anonymously, without knowledge of the pending request for hair and urine samples, and with separate consent for the computerized assessment and the hair/urine collection.

Analyses

ROC curve data, sensitivity (percentage of women with a positive toxicology screen who are identified as positive by the DAST), specificity (percentage of women with a negative toxicology screen who are identified as negative by the DAST), positive predictive values (PPVs; percentage of women who are positive on the DAST who also have a positive toxicology screen), and negative predictive values (NPVs; percentage of women who are negative on the DAST who also have a negative toxicology screen) were calculated. Analyses focused on the identification of (a) any drug use, (b) marijuana use alone, and (c) all drugs besides marijuana. Marijuana was examined individually because a much larger percentage of participants had used marijuana as compared with any other single drug and because marijuana use tends to be less stigmatized than other types of drug use in this population.

As noted earlier, the criterion variable for all analyses was the presence of either a positive urine test or a positive hair test for the drug in question. Cut-off scores used to calculate PPVs and NPVs were based on ROC curve data and published standards.

Results

Participants were primarily African American (90.3%) and low income (84.5% were receiving some form of public assistance). Two hundred fifty-one participants (83.7%) were single, and 96 (32.0%) had neither graduated from high school nor received a GED. Demographic characteristics of the sample were representative of the urban hospital population from which participants were recruited. Fifty-two participants (18.8%) had a positive hair or urine screen for marijuana; 24 participants (8.5%) had a positive screen for cocaine, amphetamines, or opiates; and 66 participants (23.7%) had a positive screen for any drug. Although there was a great deal of overlap between results from hair and urine screens, hair screens detected more drug use than did urine screens. Specifically, 212 participants (76.0%) were negative for any drug on both screens, 20 participants (7.2%) were positive for any drug on both screens, 34 participants (12.2%) were positive for any drug on hair but not urine screens, and 7 participants (2.5%) were positive for any drug on

urine but not hair screens (6 participants were positive on either hair or urine screens but were missing data on the other type of screen and, therefore, could not be included in analyses).

The DAST-10

Scores on the DAST-10 ranged from 0 to 8 with a mean of .42 ($SD = .94$, Cronbach's $\alpha = .62$). Two hundred nineteen participants did not endorse any items on the DAST-10. Fifty-one participants (out of 274 with complete data) had a positive drug use screen but denied past year drug use on the DAST-10 (i.e., answered "no" to question #1).

It should also be noted that 23 participants had a negative drug use screen but reported, on the DAST-10, that they had used drugs during the past year. These data, however, are more difficult to interpret since past-year drug use that occurred more than three months ago would not be detected by urine or hair screens (See Table 1).

As seen in Table 2, the performance of the DAST-10 in identifying any last trimester drug use (73.9%, area under the ROC curve = .64) did not improve upon the base rate classification (76% of participants did not test positive for drugs). Using the lowest possible cutoff (a score of 1), sensitivity was poor (.47) but specificity was good (.82) in identifying any drug use. The DAST-10 performed similarly in identifying marijuana use alone (correct classification = 76.4%) and in identifying drug use other than marijuana (correct classification = 73.4%; Table 2). Using a higher cut-score of 2 failed to yield improvements in overall detection ability for any of the external criteria (Table 3) but did result in extremely high specificity (.92–.94).

Discussion

These data reveal an alarming amount of drug use among low-income, pregnant women. Nearly 25% of the sample had a positive toxicology screen for any drug and nearly 10% had a positive screen for cocaine, amphetamines, and/or opiates. These findings are consistent with data from other urban, prenatal samples (Markovic et al, 2000; Ostrea et al, 1992) and underscore the critical need for improved drug use prevention efforts in this population.

Results also suggest that under-reporting of illicit drug use remains a substantial concern despite the use of anonymity, ACASI self-report technology, and a validated brief drug use screener, all of which have been shown to facilitate detection of drug use (e.g., Durant et al., 2002; Newman et al., 2002). In addition, participants were introduced to the study by a highly trained female research assistant with extensive experience recruiting African-American women. Despite these practices, the DAST-10 still identified *less than half* of women using drugs during the last trimester of pregnancy; nearly 20% of the sample had a positive toxicology screen but denied drug use on the DAST-10; and the sensitivity of the DAST was only .47. Such findings suggest that brief drug use screeners may have limited utility for pregnant women and that efforts to facilitate disclosure via reassurance alone are unlikely to be sufficient in this population.

It is important to note that fears of disclosure may be realistic for this sample. The Child Abuse Prevention and Treatment Act (CAPTA) mandates that infants "affected by" prenatal exposure to illicit drugs be reported to Child Protective Services and criminal prosecution of women using drugs during pregnancy does occur in some states (Bornstein, 2003). Moreover, African-American women are particularly likely to be reported to Child Protective Services (Chasnoff, Landress, & Barrett, 1990; Fluke, Yuan, Hedderson & Curtis, 2003) and may, therefore, be especially reluctant to disclose substance use.

Overall, findings highlight the need for alternative, less threatening methods of assessing substance use among pregnant women. One possibility might be to ask women about their drug use before they became pregnant. A past history of drug use is one of the strongest predictors of prenatal drug use (Griffin, 2010). In fact, in the current study, a simple question about drug use prior to pregnancy (“In the three months before becoming pregnant did you use cocaine, amphetamine, opiates, or marijuana?”) resulted in an overall correct classification of 82.7%, which improved upon both the performance of the DAST and the base rate prediction of no drug use. Another alternative to self-report is prenatal screening with biomarkers (e.g., hair and urine samples). However, there are many obstacles to this approach including cost (particularly for methods with a sufficiently wide window of detection), avoidance of care by women who use drugs (Bornstein, 2003), and the need for testing to be cautiously and ethnically administered in order to avoid prejudicial profiling (e.g., Chasnoff, Landress, & Barrett, 1990).

Limitations

This study was conducted in an obstetrics ward with low income, African-American women and results may not generalize to other settings and populations. In addition, the study relied on retrospective reporting of past-year drug use and data may be subject to recall bias. We also note that the DAST-10 assessed past-year drug use, while the toxicology screens only assessed drug use during the third trimester. Nonetheless, this study is the first to compare the widely-used DAST to both urine and hair analysis, and we believe findings contribute significantly to the literature on self-reported drug use.

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Table 1

Self-Reported, Past-Year Use of Any Drugs (DAST-10, Question #1) by Toxicology Screen Results

	Negative drug screen	Positive drug screen
No self-reported drug use	187 (68.2%)	51 (18.6%)
Self-reported drug use	23 (8.4%)	13 (4.7%)

Note. $N = 274$.

Table 2

Accuracy of the DAST (Cutoff Score =1) in Identifying Drug Use Among Post-Partum Women

	Any drug use	Marijuana use	Other drug use
Sensitivity	.47	.53	.32
Specificity	.82	.82	.77
PPV	.43	.39	.11
NPV	.84	.89	.93
Classification Accuracy	73.9%	76.4%	73.4%

Note. $N = 274$.

Table 3

Accuracy of the DAST (Cutoff Score =2) in Identifying Drug Use Among Post-Partum Women

	Any drug use	Marijuana use	Other drug use
Sensitivity	.23	.24	.18
Specificity	.94	.94	.92
PPV	.54	.46	.16
NPV	.80	.85	.93
Classification Accuracy	77.9%	81.2%	86.0%

Note. $N = 274$.