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Substance Use in HIV-infected Women during Pregnancy: Self-report versus Meconium Analysis

Katherine Tassiopoulos¹, Jennifer S. Read², Susan Brogly^{3,*}, Kenneth Rich⁴, Barry Lester⁵, Stephen A. Spector⁷, Ram Yogev⁸, and George Seage III¹ for the Pediatric HIV/AIDS Cohort Study

¹Dept of Epidemiology, Harvard School of Public Health, Boston MA

²Eunice Kennedy Shriver National Institute of Child Health and Human Development, NIH, Bethesda MD

³Center for Biostatistics in AIDS Research, Harvard School of Public Health, Boston MA

⁴Dept of Pediatrics, University of Illinois at Chicago, Chicago IL

⁵The Warren Alpert Medical School of Brown University and Women and Infants Hospital

⁷Dept of Pediatrics, Division of Infectious Diseases, University of California, San Diego, La Jolla CA

⁸Dept of Pediatric & Maternal HIV Infection, Children's Memorial Hospital, Chicago IL

Abstract

We evaluated prenatal substance use in a cohort of 480 HIV-infected women and their uninfected children. Substance use was reported by 29%; the most common substances reported were tobacco (18%), alcohol (10%), and marijuana (7.2%). Fewer than 4% of women reported cocaine or opiate use. Substance use was more common in the first trimester (25%) than the second (17%) and third (15%) (trend p -value < 0.01), and was associated with race/ethnicity, education, birthplace, age and marital status. For 264 mother/infant pairs with meconium results, sensitivity of self-report was 86% for tobacco, 80% for marijuana and 67% for cocaine. Higher discordance between self-report and urine/blood toxicology was observed for cocaine, marijuana and opiates in a non-random subset of mothers/infants with these tests. Findings suggest reasonably complete self-reporting of substance use as confirmed by meconium analysis. Illicit substance use was low and substantially less than that reported in earlier studies of HIV-infected women, but alcohol and tobacco exposure was prevalent.

Keywords

substance use; prenatal exposure; meconium; HIV

Introduction

Licit and illicit substance use during pregnancy has been associated with poor infant and childhood outcomes. Tobacco, alcohol, marijuana and cocaine exposure may lead to low birth weight, delayed growth, behavioral problems, or cognitive deficits¹⁻²¹. The same

Corresponding Author: Katherine Tassiopoulos, DSc MPH, Harvard School of Public Health, Dept. of Epidemiology, 677 Huntington Ave, Kresge 816B, Boston, MA 02115, Tel: 617-432-3265, Fax: 617-566-7805, ktassiop@hsph.harvard.edu.

*Now at the Dept of Epidemiology, Boston University School of Public Health, Boston MA

outcomes also may be associated with prenatal exposure to antiretrovirals (ARVs) among HIV-exposed but uninfected children. Previous reports have identified a number of clinical conditions suggestive of possible mitochondrial dysfunction and *in utero* exposure to antiretroviral medication (ARV) in infected individuals^{22,23}. Since many ARVs can cross the placenta, the concern is that fetuses exposed *in utero* may also be at risk for some of these same mitochondrial disorders, the clinical expression of which includes neurodevelopmental and neurocognitive abnormalities and growth retardation^{24,25}.

Prenatal substance use may confound associations between exposure to ARVs and adverse outcomes, since women with substance use during pregnancy may report late for prenatal care^{26,27}. Historically, a substantial proportion of HIV-infected women in the United States became infected through behaviors related to substance use. There were high rates of smoking and alcohol use as well as use of illicit substances^{28,29}. Substance use in this population has declined over the past decade^{30,31}, likely reflecting the fact that the HIV epidemic has become generalized. To determine the effects of prenatal exposures to both substance use and ARVs, it is important to estimate the current level of substance use among HIV-infected women, particularly the timing of use during pregnancy.

Underreporting of substance use has been documented in general population studies³², among individuals seeking substance use treatment^{33,34} and among pregnant women^{35,36}. Reasons for underreporting include social desirability and fear of legal consequences³⁷. It is therefore important to collect a biological specimen to confirm self-reports.

We evaluated substance use during pregnancy in the Surveillance Monitoring for ART Toxicities Study in HIV-uninfected Children Born to HIV-infected Women (SMARTT), a cohort of HIV-infected pregnant women and their uninfected children. Our primary objectives were to assess the prevalence of substance use by trimester of pregnancy, both by self-report and by meconium assay, and to identify sociodemographic factors associated with self-reported use.

Methods

Study Design

Study Population—The SMARTT protocol of the Pediatric HIV/AIDS Cohort Study (PHACS) is currently enrolling HIV-exposed but uninfected children of HIV-infected women to study the long-term effects of prenatal exposure to ARVs. The dynamic cohort, one of two cohorts in SMARTT, began enrolling HIV-uninfected infants and their HIV-infected mothers in April 2007. The 22 clinic sites are located in 12 states, predominantly on the east and west coasts but also including several southern and mid-western states, and in Puerto Rico. The study protocol was reviewed and approved by the institutional review board at each site, and written informed consent was obtained from each mother for herself and her child. Mothers are enrolled during pregnancy (at or after 23 weeks of gestation) through 72 hours after delivery. If an infant is determined to be HIV-infected, infant and mother are discontinued from the study and referred for HIV care. Enrollment into the dynamic cohort is ongoing. This analysis uses information available for women and children enrolled as of May 2009. All women who completed a substance use questionnaire (administered within seven days postpartum) were eligible for this analysis.

The PHACS study has a Federal Certificate of Confidentiality in place to protect study data from subpoena or use in Federal, state, or local civil, criminal, administrative, legislative, or other proceedings. At study enrollment and again prior to questionnaire administration, the certificate is explained to each woman. The informed consent includes reference to meconium testing for drug exposure to the fetus.

Outcome Measures—The substance use interview is based on the Substance Use Inventory used in the Maternal Lifestyles Study³⁸. It was administered in private by the site study coordinator or research assistant within seven days after birth, either at the hospital prior to discharge or at the clinic site. All interviewers received extensive training on the study questionnaire. The 89-question interview collected detailed information on licit and illicit substances that may have been used during pregnancy, including: tobacco, alcohol, marijuana, cocaine/crack, pain medications, antidepressants, heroin, methadone, opium, phencyclidine (PCP), MDMA (“Ecstasy”), benzodiazepines, stimulants, barbiturates, amphetamines, methamphetamine, inhalants, ketamine, lysergic acid diethylamide (LSD) or other hallucinogens. Frequency and quantity of use by trimester also were reported. Information also was collected on passive smoke exposure in the home during pregnancy for the following substances: tobacco, marijuana, powder and crack cocaine, amphetamines, methamphetamine, hallucinogens/LSD, and heroin/opium. For tobacco, information is collected by trimester on passive exposure both inside and outside the home.

Meconium, the first fecal matter passed by an infant over the first few days after birth, is often used in research studies as the gold standard for estimating the sensitivity of maternal self-report of substance use during pregnancy^{36,39}. Meconium begins to develop in the fetus about 16-20 weeks after conception. Substances ingested by the mother or fetus accumulate in meconium, which can therefore provide evidence of maternal substance use occurring on or after the second half of the second trimester of pregnancy.

In PHACS, meconium samples were collected from infants within 72 hours after delivery. Samples were temporarily stored at the clinic site and then forwarded in batches to our repository (Fisher Bioservices). To maintain maximum sensitivity samples were refrigerated at the sites in light-blocking containers and shipped on dry ice. Samples were analyzed for six classes of substances by U.S. Drug Testing Laboratories (cocaine and its metabolites; methamphetamine, amphetamine, and MDMA; opiates and their metabolites; PCP; marijuana; and cotinine [a metabolite of nicotine]). Samples were first screened for presence of the first five classes as part of a standard panel using enzyme multiplied immunoassay technique, and then were screened for cotinine. An initial screen was followed by gas chromatography-mass spectrometry (GC/MS) confirmation of presumptive positives. For our analyses, only samples with a GC/MS confirmation were considered positive. At the time of this analysis, not all available meconium samples had been forwarded to the testing lab. Only samples available from infants born by December 31, 2008 had been forwarded; we therefore have results on a subset of infants for whom we have maternal self-report data (264/480).

At the discretion of the individual study clinics, some mothers (or their infants) had urine or blood toxicology testing. While toxicology testing was not specified by the protocol, information was abstracted from the medical records on any available toxicology results. Urine toxicology can detect substance use over a much shorter range of time relative to meconium, with this range depending on the substance tested and on whether testing was done on mother or infant. Serum toxicology covers an even shorter interval. These testing methods are therefore used to detect very recent or current use.

Covariate Information—Demographic information was collected from mothers as part of an interviewer-assisted questionnaire administered at the entry visit. Information also was abstracted from medical charts on maternal HIV disease severity (viral load, CD4 count and CD4 percent) during pregnancy.

Statistical Analysis

We summarized the percent of subjects reporting use of any substance (licit or illicit), any tobacco or alcohol use, and any illicit substances (marijuana, cocaine, heroin, opium, PCP or MDMA), both overall and by trimester of pregnancy. To estimate the prevalence of substances in meconium, we categorized each substance as positive or negative based on results of confirmatory tests.

When examining associations with substance use, we considered several maternal characteristics (age, race/ethnicity, education, current working status, income, country of birth, marital status) based on previous research indicating the association of certain of these characteristics with substance use⁴⁰⁻⁴². In addition, we examined viral load and CD4 percent as correlates of substance use, since substance use has been associated with higher viral loads during pregnancy⁴³.

All covariates were considered as binary or categorical variables. We assessed two outcomes –tobacco or alcohol use, and illicit substance use. Associations between self-reported substance use and individual covariates were first examined using Fisher's Exact Test or extended Fisher's Exact Test. Logistic regression models were used to examine multiple covariates at one time. Variables that were univariate predictors ($p \leq 0.15$) were considered for inclusion in the final multivariate models, as were variables that changed effect estimates by $\geq 15\%$. The Cochran-Armitage test for trend was used to assess use across trimesters.

Using meconium assays as the gold standard, we estimated the sensitivity and specificity of self-reported use for the second and third trimesters of pregnancy. This analysis was restricted to mother-infant pairs with both self-reported data and meconium results. The sensitivity of self-reported use was calculated separately for each substance as the percent of meconium samples with a positive test for which there was also a positive self-report for the substance in either the second or third trimester. The specificity of self-reported data was calculated as the percent of meconium samples with a negative test for which there was also a negative self-report for the substance in the second or third trimester. For tobacco use, two comparisons were done: one restricted to reports of active smoking, and one which incorporated passive smoke exposure inside or outside the home. For other substances we did not have information on passive exposure by trimester, and instead incorporated information on passive exposure reported for the pregnancy overall. Cohen's kappa coefficient was calculated for individual substances as an estimate of the agreement between self-reported use and meconium results.

We also report the proportion with urine or blood toxicology testing and the percent of individuals with positive toxicology tests. We estimated the prevalence of substance use for the subset of individuals tested, and compared toxicology test results to self-report by specific substance detected and trimester of detection. Since the determination for toxicology testing was made by individual clinic sites, we also examined differences in maternal characteristics between women who received toxicology tests and those who did not, using Fisher's Exact Test. We also compared these two groups by site, using the chi-square test. All analyses were conducted using SAS Version 9.1.3.

Results

Of 502 mothers with an entry visit as of May 2009, 480 mothers (96%) completed the substance use interview. Interviews were missed because of lack of time or unavailability of the mother during the entry visit, with only one refusal. Of 480 women with completed questionnaires, 5 had two pregnancies. Only the first pregnancy was included for these 5 women.

The characteristics of 480 women in the study population are summarized in Table I. About two-thirds were black or African-American. Most women were born in the United States mainland (67.5%) or in Puerto Rico (8.3%). Others were born in Central or South America or in other Caribbean countries (17.7%) or in Africa (6.5%). Most women had at least a high school education. The majority reported a household income of \$20,000 or less, 69% were single and never-married, and only 26% reported currently working. Most women with a viral load measure close to delivery had levels ≤ 400 copies/ml.

Table II shows the prevalence of self-reported substance use overall during the pregnancy and for each trimester. Any substance use during pregnancy was reported by 29%, most commonly tobacco (18%), alcohol (10%), and marijuana (7.2%). Fewer than 5% of women reported use of other substances. Fifty-seven percent of women reported use of only one substance (most often tobacco or alcohol); among the 60 women reporting use of multiple substances, 18 (30%) reported use of an illicit substance other than marijuana (data not shown). There was a significant decrease in any substance use by trimester, with 25% in the first trimester, 17% in the second, and 15% in the third ($Z = -3.80$, trend p -value < 0.01).

We summarize associations of maternal characteristics with illicit substance use and with alcohol or tobacco use in Table III. Hispanic women were less likely than black or white women to report illicit substance use, while black women were less likely than either white or Hispanic women to report alcohol or tobacco use. Older women were more likely to report substance use.

Only samples available from infants born by December 31, 2008 were used in this analysis. For the 402 infants born by this date meconium samples were successfully collected for 295 (73%); 281 samples were forwarded to the testing lab (14 samples mistakenly discarded). The most common reasons for missed sample collections were that meconium had already passed or because hospital staff were unaware of the collection requirement. Only nine women refused meconium collection; four of these women (44%) reported some substance use. In a multivariate model, Hispanic women were more likely to have had meconium collected. To explore whether meconium collection was associated with self-reported use, we compared substance use reported by mothers of infants with and without meconium collection. There was no difference in the proportion of women (29%) reporting substance use overall according to availability of meconium. There were also no differences by specific substance.

Of 281 meconium samples forwarded to the testing lab, 264 (94%) had adequate quantities for testing. Table IV summarizes substance use as indicated by meconium assay. Of the 264 samples, 17% were confirmed positive for tobacco, 1.9% for marijuana and 2.7% for cocaine using GC/MS. In Table V, we summarize the comparisons between self-reported 2nd or 3rd trimester use and meconium results. The sensitivity for self-reported tobacco compared to meconium (with self-reports of passive smoke exposure included) was 86% ($\kappa = 0.26$, p -value < 0.01), and the positive predictive value of self-reported tobacco exposure was 29% (31/106). When passive tobacco exposure was not included, the sensitivity for tobacco was 67% and the positive predictive value increased to 75% (24/32). The sensitivity for self-reported marijuana use was 80% ($\kappa = 0.61$, p -value < 0.01), and for cocaine was 67% ($\kappa = 0.80$, p -value < 0.01). Inclusion of passive exposure information did not affect the results for cocaine or marijuana.

Thirty-three percent of mothers/infants had urine or blood toxicology tests. The majority of tests (70%) were done in the third trimester or at birth, 18.5% were done in the second trimester, and 11.5% in the first. Twenty-five percent of mothers/infants tested positive for one or more substances.

When urine or blood toxicology results were compared to self-report, a lower sensitivity was observed than for the comparison between meconium and self-report. The sensitivity for cocaine was 31%, for marijuana 30%, and for opiates 20%. Four of the 10 mothers/infants with positive 2nd or 3rd trimester cocaine toxicology also had a meconium sample available; 3 (75%) of these meconium samples were positive for cocaine. Six of the 12 mothers/infants with positive marijuana toxicology had a meconium sample. One (17%) of these meconium samples was positive for marijuana. For opiates, there were 4 mothers/infants with a positive toxicology result. One of these subjects had an available meconium sample and this was negative for opiates. There were several maternal factors associated with having a toxicology test – less than a high school education, birthplace within the U.S., and not currently working. There was also significant variability in testing by clinic site – 0% to 80% ($\chi^2=116.8$, p -value < 0.01).

Discussion

Our results indicate that self-reported measures of substance use in this cohort of HIV-infected women are fairly reliable when compared to meconium test results. We also observed that inclusion of passive exposure reports is important for the reliability of tobacco exposure reporting. Sensitivity of self-reported cocaine use compared to meconium was similar to that previously reported³⁶, while sensitivity for tobacco use in our study was higher than for a previous study (61%) which did not incorporate passive smoke exposure⁴⁴. In addition, our results suggest that meconium may not be a gold standard for tobacco exposure, particularly when this exposure is light or intermittent, as with passive exposure. When we included reports of passive exposure to tobacco smoke during the second or third trimester the sensitivity of self-reports relative to meconium increased. However, the positive predictive value of self-reported information was greatly reduced (from 75% to 29%) because the majority of women who reported passive exposure to tobacco smoke did not have a positive meconium assay.

The agreement between meconium assays and self-report is reassuring since the only measure of first trimester exposures in SMARTT is self-reported. However, while our self-report measures indicated moderate to high agreement with meconium the agreement was not complete. Our results show that the incorporation of meconium or other biological confirmation of self-report is worthwhile in research studies where accurate measurement of substance use is essential.

For the subset of subjects who had urine or blood toxicology tests, we observed low agreement with self-report for cocaine, marijuana and opiates. For the small number with both a positive toxicology result and an available meconium sample, overall agreement between meconium and positive toxicology was high for cocaine but low for marijuana and opiates. Clinic sites have indicated that these tests are most often done when there is suspicion of recent substance use. Because of the small numbers with both types of biological samples these comparisons should not be over-interpreted, and it is also difficult to draw conclusions regarding the positive toxicology results since we do not know whether they are from a screening assay or confirmatory testing. However, it is worthwhile to point out that the application of urine or blood toxicology tests for suspicion of current use may explain the negative meconium results for marijuana, since sporadic substance use can result in positive urinalysis but negative meconium analysis³⁹. Also, false positive screens, particularly for opiates, can result from cross-reactivity with several other compounds^{45,46}.

While our data show that illicit substance use during pregnancy is low, 21% of women did report using either alcohol or tobacco in the first trimester. Also, 41% of women reported passive tobacco smoke exposure inside or outside the home. Prenatal exposure to passive

tobacco smoke has been linked to preterm birth, low birth weight, and behavioral problems^{7,12,47,48}. Prenatal exposures to alcohol and tobacco may be as harmful as exposure to cocaine or opiates⁴⁹⁻⁵¹. There is also a potential concern for perinatal HIV transmission since alcohol consumption can lead to ARV non-adherence, due to a belief among some HIV-positive adults of adverse interactions between alcohol and HIV medications^{52,53}. Biomarkers of fetal exposure to alcohol have been recently developed⁵⁴; while their sensitivity and specificity are still being evaluated, future studies might benefit from incorporating these biomarkers, since information on the dangers of alcohol use are widely known and pregnant women may have strong incentive to underreport the extent of their use⁵⁵.

Our results also support other evidence that use of cocaine, marijuana, heroin and other opiates, as well as injected drug use, has substantially decreased relative to use reported by earlier cohorts of HIV-infected pregnant women. Among 876 women enrolled in the Women and Infants Transmission Study between 1990 and 2000, 39% used hard drugs (cocaine, heroin/opiates, street methadone and injected drugs) during pregnancy as measured by self-report or urinalysis²⁹. In the dynamic SMARTT cohort, nearly a decade later, fewer than 4% of women reported use of hard drugs, and no women reported injection drug use. In the SMARTT cohort self-reported rates of trimester-specific use, including a decline in use over trimester, are similar to those in a recent general population study of pregnant women⁵⁶.

Similar to previous studies, we found that substance use during pregnancy was associated with race or ethnicity and lower education level⁴⁰⁻⁴². However, in contrast to an earlier study of uninfected women showing younger age associated with use⁴⁰, we found older age associated with more reporting of use. This finding also may reflect the changing epidemic, with younger women constituting a more recently-infected segment of the cohort. There is some evidence that teenage women constitute a group less likely to use substances while pregnant⁵⁷.

There were several strengths to our study. The first is collection of trimester-specific self-report information. This will be important when controlling for confounding in studies of the effects of prenatal exposure to ARV, which also can vary by timing²⁵, and also illustrates the decrease in substance use over trimesters, suggesting that once women found out they were pregnant many stopped their use. Secondly, meconium has a favorable profile relative to other biological specimens, including a longer detection window than urine, and fewer collection difficulties than blood or neonatal hair. Also, while incomplete disclosure of substance use is well-documented, efforts were made to maximize disclosure by securing a federal confidentiality certificate and by emphasizing to all women the protections this certificate confers.

Some limitations must be acknowledged. While our biological measure of substance use was prospectively collected, self-reports were only recorded after delivery, which might lead to problems with recall, particularly for the first and second trimesters. Secondly, meconium does not detect use during the entire second trimester. For this second trimester meconium is therefore not a highly sensitive measure. Also, since both self-reports and positive meconium results for marijuana and cocaine were low it is important to note that this limits the ability to test and interpret the sensitivity and specificity for these measures, which in this study were both observed to be high.

We did not have meconium results for all infants. To date meconium has only been tested for infants born by December 31, 2008. However there were no differences in maternal characteristics or self-reported substance use for mothers of infants born on or before this

date and those born after. In addition, we were not able to obtain meconium for 27% of infants born by the above date. If women concerned about disclosing use were both less likely to report this use and more likely to refuse sample collection, this could have biased the results. However, when we compared self-reported use for women with a meconium sample to use for women without a sample, there was no difference in prevalence other than the suggestion that women who refused meconium collection were actually more likely to report use.

Collection of meconium for research purposes is challenging. Ostrea et al (1992) reported 8% missed meconium samples and Derauf et al (2003) reported 16% missed samples. For both studies, infants were enrolled at only one site – the hospital in which they were delivered. The Maternal Lifestyle Study³⁶ with a higher missed collection rate of 25.5% included 4 enrollment sites. In our study, there are 22 sites, with infants from several sites born at unaffiliated hospitals, where meconium collection is more difficult. Primary challenges to collection include hospital staff unaware of study protocols, infants delivered at outside hospitals after unexpected labor, quicker transition from meconium to stool, preterm infants that do not produce sufficient meconium, and meconium samples exhausted for standard of care testing. While some of these difficulties are unavoidable, clinic sites have developed innovative methods of maximizing collection, including: maintaining consistent communication with hospital nurseries; instructing mothers to save diapers or to remind hospital staff about collection; adding written instructions to mothers' and infants' medical charts; providing meconium collection kits and research clinic phone numbers to nurseries in advance of delivery; and showing appreciation to hospital staff for the extra efforts entailed by this collection.

The dynamic SMARTT cohort enrolls only HIV-uninfected infants and their infected mothers. In addition, substance use has been associated with risk of perinatal HIV transmission²⁹ and still remains associated with viral load even in the current era of highly-effective antiretroviral therapy (HAART)⁴³; therefore SMARTT is likely not enrolling women who are the heaviest substance users. Our results are therefore generalizable to women receiving adequate prenatal care including HAART.

It will be important in SMARTT to examine possible associations between the substance use detected here and adverse outcomes in children, and also to adjust for substance use as a potential confounder.

In summary, self-reported substance use, as confirmed with meconium assay, is fairly reliable in this cohort of HIV-infected women. Our results indicate that use of illicit substances is low but that alcohol and tobacco exposures are relatively common and could pose health risks for infants born to these women.

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Table I
Characteristics of 480 HIV-Infected Women in the Dynamic SMARTT Cohort

Maternal Characteristic	N (%)
Race/Ethnicity	
Black or African-American	303 (63.1)
Hispanic	137 (28.6)
White/other	40 (8.3)
Age (years)	
15-21	73 (15.2)
22-34	314 (65.4)
35-46	93 (19.4)
Education Level < High School	177 (36.9)
Birthplace	
In mainland United States	324 (67.5)
Outside mainland United States	156 (32.5)
Marital Status	
Married	114 (23.7)
Widowed/Divorced	34 (7.1)
Never Married	332 (69.2)
Income (U.S. dollars)	
≤ 20,000	292 (60.8)
21-40,000	104 (21.8)
> 40,000	42 (8.7)
Missing	42 (8.7)
Currently Working	124 (25.8)
Viral Load Closest to Delivery (copies/mL)	
≤ 400	371 (77.3)
401-1000	17 (3.5)
> 1000	78 (16.3)
Missing	14 (2.9)
CD4 Percent Closest to Delivery	
< 15	49 (10.2)
15-25	120 (25.0)
> 25	276 (57.5)
Missing	35 (7.3)

Table II
Self-Reported Substance Use during Pregnancy by HIV-Infected Women (N=480)

Substance	Any Trimester N (%)	1st Trimester N (%)	2nd Trimester N (%)	3rd Trimester N (%)
Any Substance	139 (29.0)	118 (24.6)	83 (17.3)	73 (15.2)
<i>p-value, Cochran-Armitage test for trend < 0.01 (any substance use)</i>				
Tobacco (cigarettes) ^a	88 (18.3)	84 (17.5)	54 (11.3)	48 (10.0)
Alcohol ^a	49 (10.2)	41 (8.5)	15 (3.1)	13 (2.7)
Marijuana ^a	35 (7.3)	31 (6.5)	17 (3.5)	11 (2.3)
Pain Medications ^{a, b}	21 (4.4)	8 (1.7)	14 (2.9)	7 (1.5)
Cocaine/Crack	15 (3.1)	11 (2.3)	6 (1.3)	4 (0.8)
Antidepressants	12 (2.5)	8 (1.7)	6 (1.3)	6 (1.3)
Methadone	5 (1.0)	5 (1.0)	5 (1.0)	5 (1.0)
Heroin ^a	3 (0.6)	2 (0.4)	1 (0.2)	1 (0.2)
PCP ^a	1 (0.2)	0	0	0
MDMA (Ecstasy)	2 (0.4)	2 (0.4)	0	0
Opium	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)
Benzodiazepines ^a	1 (0.2)	1 (0.2)	1 (0.2)	0
Other Drugs ^c	2 (0.4)	2 (0.4)	2 (0.4)	1 (0.2)

^a missing some trimester-specific information

^b Includes OxyContin, Vicodin, Morphine, Darvocet, Percocet, Demoral, Dilaudid, Tylenol with Codeine, Robitussin A-C or other cold medicine with Codeine.

^c Formaldehyde with albuterol

No reported use of stimulants, barbiturates, amphetamines, methamphetamine, inhalants, ketamine, LSD or other hallucinogens.

Table III
Associations with Self-Reported Use of Illicit Substance^a or Alcohol/Tobacco (N=480)

Maternal Characteristic	Illicit Substance (%)	Odds Ratio (CI) ^b	Alcohol/Tobacco (%)	Odds Ratio (CI)
Race/Ethnicity				
Black or African-American	12.2	3.76 (1.05, 13.4)	21.1	ref
White/other	15.0	4.78 (1.04, 22.0)	35.0	2.43 (1.13, 5.24)
Hispanic	2.2	ref	24.8	2.50 (1.36, 4.60)
Education Level				
< High School (HS)	14.7	2.49 (1.29, 4.81)	31.6	1.92 (1.21, 3.06)
HS Grad or Above	6.6	ref	18.5	ref
Birthplace				
In United States	13.9	18.1 (2.38, 140)	29.1	5.02 (2.54, 9.91)
Outside US	0.6	ref	11.5	ref
Currently Working				
No	11.5	3.08 (1.13, 8.37)	25.3	1.29 (0.73, 2.27)
Yes	4.0	ref	17.7	ref
Age (years)				
15-21	12.3	ref	19.2	ref
22-34	8.3	1.03 (0.43, 2.43)	24.2	2.16 (1.08, 4.29)
35-46	11.8	2.82 (0.96, 8.30)	23.7	2.59 (1.11, 6.06)
Marital Status				
Married	5.3	ref	11.4	ref
Widowed/Divorced	5.9	0.80 (0.14, 4.69)	32.4	3.42 (1.27, 9.15)
Never Married	11.5	1.59 (0.60, 4.21)	26.5	2.71 (1.37, 5.33)

^a marijuana, cocaine, heroin, opium, PCP or MDMA

^b 95% confidence interval

Table IV
Meconium Assay Results (N=264)

Substance	Samples with Results N	Positive Samples N (%)
Tobacco	233	39 (16.7)
Marijuana	258	5 (1.9)
Cocaine	263	7 (2.7)

No samples positive for methamphetamine, amphetamine, MDMA, PCP or opiates.

Table V

Comparison between Self-Report and Meconium Results

	Tobacco ^a		Marijuana		Cocaine	
	Positive	Negative	Positive	Negative	Positive	Negative
SELF-REPORT^b						
<i>Positive</i>	31	75	4	4	4	0
<i>Negative</i>	5	117	1	244	2	252
<i>Total</i>	36	192	5	248	6	252
<i>Sensitivity</i>		86%		80%		67%
<i>Specificity</i>		61%		98%		100%
<i>Cohen's kappa</i>		0.26		0.61		0.80
<i>(p-value)</i>		(<0.01)		(<0.01)		(<0.01)

^a Self-report includes passive tobacco smoke exposure.

^b Indicates self-report for 2nd and 3rd trimesters.

In all comparisons, there were some missing values for meconium assay or self-report.