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Psychopathology and Special Education Enrollment in Children with Prenatal Cocaine Exposure

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Abstract

Objective—This study evaluated how enrollment in special education services in 11 year old children relates to prenatal cocaine exposure, psychopathology, and other risk factors.

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Method—Participants were 498 children enrolled in The Maternal Lifestyle Study, a prospective, longitudinal, multisite study examining outcomes of children with prenatal cocaine exposure. Logistic regression was used to examine the effect of prenatal cocaine exposure and psychopathology on enrollment in an individualized education plan (a designation specific to children with special education needs), with environmental, maternal, and infant medical variables as covariates.

Results—Prenatal cocaine exposure, an interaction of prenatal cocaine exposure and Oppositional Defiant Disorder, child Attention Deficit Hyperactivity Disorder, parent-reported internalizing behaviors, and teacher-reported externalizing behaviors, predicted enrollment in an individualized education plan. Other statistically significant variables in the model were male gender, low birth weight, being small for gestational age, white race, caregiver change, low socioeconomic status, low child intelligence quotient, caregiver depression, and prenatal marijuana exposure.

Conclusions—Prenatal cocaine exposure increased the likelihood of receiving an individualized education plan with adjustment for covariates. Psychopathology also predicted this special education outcome, in combination with and independent of prenatal cocaine exposure.

Key Terms

cocaine; special education; behavior; prenatal substance exposure

Prenatal cocaine exposure (PCE) is thought to have adverse effects on academic function in children from preschool through adolescence including deficits in cognition, school performance, academic achievement, language, attention, psychopathology, and behavioral self-regulation^{1, 2}. These studies, however, reveal variable effects in each of these categories of function. We previously reported that children with PCE were more likely to receive an individualized education plan (IEP), a specific special education designation, at 7 years than children without PCE.³ Moreover, these effects were observed with adjustment for potentially confounding variables, including child intelligence quotient (IQ), indicating that these PCE effects are independent of cognitive difficulties. We also know that high rates of behavior concerns and mental disorders are reported in children enrolled in special education or with learning disabilities in populations without PCE. These include depression^{4, 5}, Attention Deficit Hyperactivity Disorder (ADHD) and disruptive behavior disorders⁵⁻⁸, anxiety⁵, overall levels of psychopathology⁹ and poor emotional health¹⁰. Thus, it is possible that the effects of PCE on special education are related to psychopathology in these children. One purpose of this study is to determine if children with PCE and psychopathology are more likely to receive an IEP than children with PCE without psychopathology or children without PCE with or without psychopathology. The second purpose of this study was to determine if the increased rate of IEP enrollment in children with PCE that we observed at age 7 remained at age 11 since an increase or decrease can have a significant impact on utilization of education services.

METHODS

Study Design and Subjects

The Maternal Lifestyle Study is a multisite, longitudinal investigation of PCE conducted at 4 university centers (Wayne State University, University of Tennessee at Memphis, University of Miami and Brown University). Each site had study approval from the institutional review board and a certificate of confidentiality from the National Institute on Drug Abuse. Informed consent was obtained from all participants.

Between May 1993 and May 1995, mothers at these centers were enrolled in the study within 24 hours after delivery¹¹⁻¹³. Initial screening included the mother's labor and delivery chart, the newborn admission chart, and a meconium sample. A drug use questionnaire that addressed the mother's use of nicotine, alcohol, marijuana, cocaine, opiates, and other illicit drugs was given by research staff trained and certified in the reliable administration of all of the study interviews. PCE was determined by mothers admitting cocaine use during pregnancy and/or a positive meconium assay for cocaine metabolites utilizing gas chromatography/mass spectrometry confirmation. Non-exposed children were born to mothers who denied cocaine use, confirmed by negative meconium test results. The sample included a cohort of exposed infants (n=658) that was group matched within site with a group of non-exposed comparison (COMP) children (n=730). Matching was done by gestational age categories (<32 weeks, 33-36 weeks, and >36 weeks), child gender, race and ethnicity¹⁴. At the 1-month visit, the biological mother was interviewed for a detailed inventory of her legal and illegal drug use during pregnancy using the Maternal Interview of Substance Use (MISU)¹⁴. Prenatal cocaine use was categorized into high, some, and none^{14, 15}. "High" cocaine use referred to >3 times per week in the first trimester based on the biological mother's report. Any other use was referred to as "some" cocaine use. Reports of the frequency and quantity of other substances per trimester were averaged to produce indices of the number of cigarettes (heavy use >10/day), amount of absolute alcohol (heavy use >0.5 oz/day), and the number of marijuana joints (heavy use > 0.5 /day) consumed during the pregnancy.

Measures

All of the measures that we used are either based on our previous work³ or have been established in the literature. Medical characteristics were collected at birth (Table 1).

Demographics—parent/caregiver age, race, marital status, education level, and Medicaid insurance status were collected at one month.

Maternal/caretaker IQ—measured with the Peabody Picture Vocabulary Test¹⁶ at 30 months or 5 years as a continuous variable.

Postnatal substance use—measured at 4 months, 8 months, then yearly using the Caretaker Inventory of Substance Use (CISU)³, a caretaker interview which quantifies frequency and amounts of cocaine, opiates, marijuana, tobacco, and alcohol with the same indices for heavy use as the MISU. Use at any time was used in analyses.

Socioeconomic status (SES)—measured using the 4 factor Hollingshead Index of Social Position^{17, 18} at 11 years. Low SES was defined as being a level 4 (lowest).

Home environment—measured with the Home Observation for Measurement of the Environment (HOME)¹⁹ at 10 months, 5.5 years, and 9 years averaged over age and dichotomized into two groups; the lowest 20% and upper 80%. Data for this instrument is collected in the home and measures the quality and quantity of stimulation and support available to a child in the home environment. It has been used extensively in research to reveal relationships between several aspects of the home environment and children's developmental outcomes²⁰.

Chronic caregiver depression—measured with the Beck Depression Inventory (BDI)²¹ at 4 months, 30 months, 5.5 years, 7 years, 9 years, and 11 years. We then dichotomized each time point into those caregivers that had moderate to severe depression

as indicated by a BDI score of ≥ 17 . We then selected those participants that had ≥ 3 scores ≥ 17 to indicate chronic depression.

Domestic violence—assessed yearly between 4 and 11 years using a questionnaire (CISU) and defined as “Yes” if a caregiver reported any physical or sexual abuse at any annual visit for the child and caretaker(s).

Child abuse—defined by removal of the child from the home due to suspicion of physical and/or sexual abuse or medical exam findings suggestive of physical or sexual abuse. This was gathered from caretaker interview and review of child protective service interactions.

Primary caretaker changes—(child with biological mother or other caregiver) recorded at one month, then yearly. This was recorded at annual caretaker interviews where the caretaker was identified.

Child IQ—measured at 9 years using the Wechsler Intelligence Scale for Children-III (WISC III) ²² and dichotomized into low (<85) and non-low (≥ 85) scores.

Psychopathology—measured at 11 years using the Diagnostic Interview Schedule for Children IV (DISC), a computer-assisted caregiver interview of Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) based child psychopathology ²³. Scores were computed for Conduct Disorder (CD), Oppositional Defiant Disorder (ODD) and ADHD, (including hyperactive-impulsive type, inattentive type, and combined type). These data were dichotomized into those meeting diagnostic criteria for these disorders and those who do not.

Behavior problems (caregiver ratings)—measured at 11 years using the Child Behavior Checklist (CBCL), a caregiver-report questionnaire that includes standardized scores for externalizing, internalizing and total behavior problems ²⁴. We examined internalizing and externalizing problems as continuous T scores. We also examined the anxious/depressed subscale for those above a T score of 65, indicating clinical significance. This was done since only externalizing diagnoses described above were examined using the DISC and we wanted to examine the relationship between internalizing problems and IEP enrollment.

Behavior problems (teacher ratings)—measured at 11 years using the Teacher Report of CBCL (TRF), a teacher-report questionnaire that also includes scores for externalizing, internalizing and total behavior problems in the same manner as the CBCL ²⁵. We examined these data in the same manner as the CBCL.

Special education enrollment—based upon IEP enrollment coded from school records at age 11 by research staff trained for inter-rater reliability ³. IEPs are legal documents developed by multidisciplinary education teams that record goals and services for children eligible for special educational services. This was selected as our measure of special education since it is a nationally recognized designation despite differences in documentation by state ²⁶.

Statistical Analysis

Chi-Square was used to determine the effects of PCE on IEP. Logistic regression was then used to examine the effects of PCE on 11-year enrollment on IEP enrollment with adjustment for covariates. To determine if PCE effects on special education at age 11 were related to psychopathology, we included interactions between PCE and behavioral

measurements (CBCL, TRF, and DISC diagnoses, see Measures) in the logistic regression models. Covariates included *a priori* were gender, low birth weight (LBW, <1500 g), and study site. Additional characteristics were examined in preliminary analyses as candidate covariates based on conceptual considerations and our previous work³ (Tables 1 and 2). Candidate covariates that were correlated with PCE and IEP enrollment ($P \leq .10$) were included in the logistic regression analysis. Measures that met this criterion included small for gestational age (SGA, gender specific weight <10th percentile for gestational age); minority status (nonwhite versus white); low SES at 11 years; any primary caregiver change (>1); Medicaid insurance status; maternal prenatal tobacco or marijuana use; low caregiver IQ; caregiver depression; low child IQ; ADHD; internalizing problems (CBCL); externalizing problems (TRF); and any caretaker postnatal tobacco use.

Regression analysis used stepwise elimination of the covariates that made the least contribution to the model and had the least effect on other parameters. The eliminated covariates were then added back to the model in a stepwise manner to test for confounding effects. All covariates in the final model were required to be related at $P \leq .10$ to IEP enrollment except for the 3 selected *a priori* (gender, LBW, and study site).

RESULTS

Sample Characteristics

Of the 1388 infants, 115 had prenatal exposure to opiates and were not included due to confounding factors with PCE. Of those 1273, 404 were missing school reports at 11 years old. Of those 869, 498 were included in the final logistic regression model (See Consort Diagram, Figure 1). Participant attrition was due to missing IEP outcome data, DISC assessments, TRFs, child IQ assessments, and data on SES and SGA. Compared with children not included in the study, included children were more likely to be black, and have prenatal alcohol exposure (Table 1). In addition, those with 11-year data had a higher percentage of caregivers who had postnatal alcohol and marijuana use and were more likely to have lived in environments with domestic violence. There were no significant differences in newborn medical characteristics, child IQ, or behavioral ratings between the 2 groups.

Children with PCE were more likely than COMP to be black; be born to low SES families; have unmarried mothers; be on Medicaid; and have mothers with less education, lower IQ, no prenatal care and were older (Table 2). They were more likely to have prenatal exposure to alcohol, tobacco, and marijuana; were exposed to more postnatal caregiver use of cocaine, alcohol, tobacco, and marijuana; had greater probability of primary caretaker change; and had greater likelihood of being exposed to child abuse. Children with PCE also had lower birth weight and shorter length; more likely to be SGA, less likely to be first-born, more likely to have lower IQ, and have higher externalizing scores on the CBCL and TRF.

For those enrolled in an IEP in the regression model ($n=112$), 45 (40%) were designated as Learning Disabled, 15 (13.4%) Mental Retardation, 5 (4.5%) Physically or Otherwise Health Impaired, 7 (6.25%) Speech/Language Impaired, 6 (5.3%) ADHD, 1 (0.9%) Orthopedic Impairment, 5 (4.5%) Behavior/Emotional Handicap, 2 (1.8%) Other. 7 participants (6.25%) did not have data on these IEP designations.

Effects of PCE and Behavior on IEP Enrollment

In unadjusted analysis for the sample with 11 year school reports available ($n=869$), children with PCE (25.8%) were more likely than COMP (20.1%) to have an IEP (odds ratio: 1.38 [95% CI: 1.00–1.91]; $P=.05$). Children in the logistic regression sample ($n=498$) with PCE (26.8%) were also more likely than COMP (19.5%) to have an IEP (odds ratio: 1.52 [95% CI: 1.00–2.32]; $P=.05$).

Logistic regression analyses showed that children with PCE were more likely to have an IEP with adjustment for covariates (Table 3). In addition, the PCE $\times$ ODD interaction was significant (Figure 2), indicating that children with PCE and ODD were more likely to have an IEP than children with ODD but not PCE or children without ODD. The increased likelihood of an IEP was also related to ADHD, internalizing problems on the CBCL, and externalizing problems on the TRF, male gender, LBW, being a non-minority (white race), any caregiver change, low SES, and low child IQ and chronic caregiver depression. Children born SGA and those with prenatal marijuana exposure were less likely to have an IEP.

We also examined relations between levels of prenatal cocaine use and IEP and found no significant association with heavy use. ODD was also not associated with PCE.

IEP Enrollment at 7 compared to 11 years

Of those included in the 11 year analysis, 412 participants (82.7%) were included in the 7 year analysis and 86 (17.3%) were not. The rates of IEP in this study were higher at age 11 than they were in our report at age 7³ in the PCE group [25.8% vs. 16.5%, respectively (Chi-Square=72.2, $P<.001$)] and also in the COMP group [20.1% vs. 11% respectively (Chi-Square=99.0, $P<.001$)]. Using generalized linear mixed models, we examined the relationship between PCE and IEP placement over time for those included in both the 7 and 11 year analyses. Overall, IEP placement between years 7 and 11 increased from 13% to 24% ($p<0.001$). Over and above this time effect, PCE also increased the likelihood of IEP placement (odds ratio=1.633: [95% CI: 1.077-2.476]). IEP placement was approximately 7% higher for those with PCE than those without PCE ($p=0.021$). We also tested the interaction between time and PCE to see if there was a differential effect over time of PCE on IEP placement. Within this sample, the interaction between time and PCE was not statistically significant ($p=0.764$) indicating that the impact of PCE on IEP placement was constant over time.

Although most children with IEPs at 7 years still had an IEP at 11 (84%), there was turnover in both groups. At 11 years, 190 children (22.6%) received an IEP. Of those, 49.5% had PCE and 50.5% were COMP which is not significantly different from these proportions at 7 years (Breslow-Day Chi-Square .472, $P=.492$). 17.3% of children with PCE receiving IEPs at 11 years did not have an IEP at 7 years compared to 14.5% of COMP, but this difference was not statistically significant. While reported rates of IEP enrollment in the U.S. (8.4%²⁷ and 12.8%²⁸) vary according to age group and time frame studied, children with PCE (25.8%) and COMP (20.1%) had significantly higher than average rates of IEP enrollment.

DISCUSSION

Effects of PCE and Behavior on IEP Enrollment

Our findings suggest that associations between PCE, psychopathology and IEP enrollment at age 11 can be explained along three independent, yet potentially inter-related pathways with adjustment for environmental, social, medical, and cognitive covariates. PCE alone, the interaction between PCE and ODD, and other measures of psychopathology alone (ADHD, CBCL internalizing problems and TRF externalizing problems) each showed separate effects on IEP enrollment.

The PCE $\times$ ODD interaction indicates that ODD is a moderator of the association between PCE and IEP enrollment. This finding supports our hypothesis that children with both PCE and psychopathology are the most likely to receive an IEP. However, this effect appears to be unique to ODD as there were no interaction effects between PCE and any of the other measures of psychopathology. The fact that the ODD effect occurred only in the presence of PCE could suggest that children with PCE and ODD represent a particular subgroup that is

recognized as in need of special education and could be related to the additive cognitive deficits ²⁹⁻³³, behavioral problems ³⁴⁻³⁷ and the association with ODD ³⁸ in children with PCE.

The independent effect of PCE on IEP enrollment is similar to what we observed in these children at age 7 which may not seem surprising as we also reported that most of the children with an IEP at age 7 were also in the IEP group at 11.

Our findings that ADHD diagnoses, TRF externalizing problems, and CBCL internalizing problems, predict IEP enrollment are supported by studies demonstrating that children with psychiatric disorders are also more likely to receive special education services ³⁹. As mentioned earlier, there are high rates of ADHD ⁸, and internalizing problems in special education populations ⁵. Internalizing problems, such as anxiety and depression, also negatively influence school performance in children ⁴⁰⁻⁴² and anxiety reduction can help recover school function ⁴³. In addition, ADHD often co-occurs with internalizing problems ⁴⁴, making those with multiple behavioral issues particularly in need of special education services.

This study is unique as the first to explore the relationship between behavior problems and special education in children with PCE. There are two potential educational implications from our findings. First, the association of PCE with special education enrollment has broad service utilization and education financial burdens for school districts that are homes to many children with PCE that may need additional resources to educate them. Secondly, these findings have potential repercussions for screening children in need of special education services as well as implementing education plans. For example, externalizing behaviors in a student at school may be an indicator to activate an assessment team to investigate further into low academic achievement and thus the need for special education services. Also, if behavior problems are contributing to special education enrollment in an independent manner, education plans to treat these behaviors may be required to improve academic achievement. Further studies would first be necessary to substantiate these phenomena.

Our measures of psychopathology also have some important characteristics. The measures from the DISC are actual diagnosis of each disorder rather than symptom counts. Thus, these are children with serious problems, not children within the normal range. Continuous symptom counts from the CBCL and TRF complement this information. In addition, the information comes from both the caregiver (DISC and CBCL) and teacher (TRF). This increases the generalizability of the findings as they do not rely on a single respondent and they represent observations in different settings.

IEP Enrollment at 7 compared to 11 years

Higher rates of IEP enrollment in children with PCE continue at 11 years as it did at 7 years, which indicates a persistent effect of PCE on utilization of special education services. Interestingly, rates of IEP enrollment increased in both the PCE and COMP groups. However, it is unclear if this is a unique finding as we found no other available studies examining IEP enrollment over time, especially in this population. The higher overall rates of IEP enrollment in both groups compared to national data needs to be explored further as several covariate effects (see below) may influence this finding.

Effects of Covariates

Boys were more likely to receive an IEP than girls, supporting previous reports²⁷. White race increased the likelihood of receiving an IEP as it did at age 7³. Other studies vary from

finding similar race effects on special education ⁴⁵, increased likelihood for non-white children to have special education services ⁴⁶, and no race differences in IEP enrollment ⁴⁷.

Caregiver change predicted IEP. Caregiver instability is also related to behavior and adaptive functioning problems in children ⁴⁸ which could pose an additional risk for needing educational services.

Low SES predicting IEP is consistent with the literature relating poverty to poorer school performance ³⁹, intellectual disabilities, and special education services ⁴⁹. Low-income parents may also not understand the amount of services available to their children ⁵⁰, thus making their children more likely to receive IEPs before educational strategies outside of an IEP have been explored. Low child IQ predicting IEP enrollment is expected because IQ testing is often used in determining special education needs.

Chronic caregiver depression predicting IEP enrollment at 11 years further emphasizes how adverse environmental factors can influence resource utilization. This finding is unique in that it examines chronic caregiver depression over each child's lifetime. The depressive symptoms were also not limited to biological mothers as 38% of our sample had at least one caregiver change. Previous studies have been limited to examining how maternal postnatal depression has adverse effects on academic achievement, cognition, and behavior in children and adolescents ages 5 to 16 years old ⁵¹⁻⁵³. One of these studies⁵¹ also did not find that chronic or recent exposure to maternal depression in their 16 year old sample had significant effects on cognitive functioning. However, none of these studies evaluated maternal depression beyond 5 years after the childrens' births and none specifically evaluated enrollment in special education services.

The finding that SGA negatively predicted IEP enrollment appears to contradict previous studies demonstrating academic difficulties in children with SGA ⁵⁴⁻⁵⁶. However, LBW *did* predict IEP enrollment which is consistent with findings that those with LBW are more likely to be enrolled in special education services^{57, 58}. None of these previous studies used IEP enrollment as a special education outcome measure.

Our finding that prenatal marijuana exposure negatively predicts IEP enrollment also contradicts previous studies which demonstrate cognitive difficulties and poorer school achievement in a low-income, minority sample ^{59, 60}. However, as with the effects of SGA and LBW in our model, these studies did not examine IEP enrollment as an outcome.

LIMITATIONS

Limitations of this study are, as prior³, that the IEP data are based on school record review. The data were gathered from schools in 4 different states that may vary thresholds for enrollment in special education and documentation of standards and assessments on IEP forms ²⁶. Attrition also reduced our sample size in the final analysis to 39% of the non-opiate exposed participants at recruitment and 59% of those who had an IEP at 11 years. Participants with IEPs may also be over-represented in the final sample since teachers and parents may have increased willingness to complete study instruments due to concerns that these children have special education needs. We also did not have data on other special education designations beyond IEPs, such as 504 plans, which would have given us a broader view on special education utilization. Also, this study may not generalize to other populations since this is a minority population including children and parents with low IQ scores with lower SES.

Recall bias could have affected mother's report of drug use over the entire pregnancy. However, there is evidence that postnatal self-report measures of maternal cocaine use are as

effective as antenatal measures in predicting neurobehavioral outcomes⁶¹, and meconium sampling was used to verify PCE. Finally, it is possible that we underestimated cocaine effects by adjusting for variables such as low IQ and behavior problems that are on the “causal pathway” between cocaine and the special education outcomes⁶². However, we believed that it would be too difficult to interpret special education findings without considering these factors.

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Figure 1.
Consort Diagram

Figure 2. PCE and ODD Interaction Effects on IEP Enrollment

Percent of children with enrollment in IEP in the PCE and comparison groups with and without meeting diagnostic criteria for ODD (unadjusted). PCE and ODD interaction effects predicted enrollment in IEP (see Table 3)

TABLE 1

Sample Characteristics According to Attrition

Characteristic		Included (n=498)	Excluded (n=890)	p-value
<i>Maternal characteristics</i>				
Race, n (%)	White	59 (11.9)	161 (18.1)	0.003
	Black	407 (81.7)	656 (73.7)	
	Hispanic	24 (4.8)	64 (7.2)	
	Other	8 (1.6)	9 (1.0)	
Low SES (Hollingshead 5), 1 mo, n (%)		122 (25.3)	187 (22.0)	0.175
Marital status, single, n (%)		405 (81.3)	714 (80.5)	0.707
Insurance, Medicaid, n (%)		403 (80.9)	728 (81.8)	0.688
Education <12 y, n (%)		188 (37.8)	357 (40.2)	0.385
IQ, mean (SD)		73.8 (17.3)	74.1 (17.5)	0.714
No prenatal care, n (%)		51 (10.2)	117 (13.2)	0.112
Age, mean (SD), y		28.4 (5.7)	28.3 (5.9)	0.657
<i>Prenatal drug use, n (%)^a</i>				
Cocaine use		205 (41.2)	395 (44.4)	0.246
Heavy cocaine use		50 (10.8)	84 (10.6)	0.871
Alcohol use		325 (65.3)	500 (56.2)	0.001
Heavy alcohol use		68 (14.7)	106 (13.4)	0.164
Tobacco use		257 (51.6)	491 (55.2)	0.202
Heavy tobacco use		106 (22.9)	191 (24.1)	0.918
Marijuana use		115 (23.1)	209 (23.5)	0.869
Heavy marijuana use		24 (5.2)	32 (4.0)	0.598
<i>Postnatal caregiving environment, n (%)</i>				
<i>Postnatal drug use^b</i>				
Cocaine use		61 (12.3)	85 (10.1)	0.224
Heavy cocaine use		17 (3.4)	34 (4.0)	0.274
Alcohol use		420 (84.3)	627 (74.6)	<0.001
Heavy alcohol use		201 (40.4)	244 (29.0)	<0.001
Tobacco use		334 (67.1)	522 (62.1)	0.066
Heavy tobacco use		237 (47.6)	381 (45.3)	0.699
Marijuana use		140 (28.1)	182 (21.6)	0.007
Heavy marijuana use		50 (10.0)	55 (6.5)	0.069
Caregiver depression (%)		31 (6.2)	64 (7.9)	0.264
Low quality of HOME, low 20% (%)		98 (19.8)	159 (20.5)	0.743
Primary caregiver change, 1mo-11y (%)		189 (38.0)	332 (37.5)	0.872
Low SES (Hollingshead 5), 11 y (%)		81 (16.3)	81 (15.7)	0.805
Child abuse, 1 mo to 11 y (%)		125 (25.1)	198 (22.5)	0.269
Domestic violence, 4-11 y (%)		69 (13.9)	85 (9.7)	0.017

Characteristic	Included (n=498)	Excluded (n=890)	p-value
<i>Newborn medical characteristics and child intelligence</i>			
Gestational age, mean (SD), wk	36.3 (3.9)	36.2 (4.1)	0.584
Birth weight, mean (SD), g	2625 (782.9)	2632 (838.2)	0.877
Length, mean (SD), cm	46.7 (4.8)	46.7 (5.1)	0.950
Head circumference, mean (SD), cm	32.1 (2.8)	32.1 (3.1)	0.962
LBW, <1500 g, n (%)	55 (11.0)	101 (11.4)	0.863
SGA, n (%)	119 (23.9)	209 (23.6)	0.889
Apgar score, 1 min, median (range)	8 (1-10)	8 (0-10)	0.733
Apgar score, 5 min, median (range)	9 (4-10)	9 (1-10)	0.562
Male, n (%)	255 (51.2)	472 (53.0)	0.513
First born, n (%)	100 (20.1)	198 (22.3)	0.346
Child IQ, mean (SD)	87.3 (12.9)	87.9 (13.3)	0.505
Low child IQ, <85, n (%)	221 (44.4)	213 (24.3)	0.499
Low child IQ, <70, n (%)	35 (7.0)	30 (6.0)	0.489
<i>DISC Diagnosis Outcomes, n (%)</i>			
ODD	45 (9.0)	41 (8.7)	0.832
ADHD	37 (7.4)	43 (9.1)	0.352
CD	17 (3.4)	18 (3.8)	0.743
<i>CBCL T-Scores, mean (sd)</i>			
Internalizing	50.8 (10.2)	51.4 (10.8)	0.426
Externalizing	54.5 (11.2)	54.6 (11.8)	0.832
<i>TRF T-Scores, mean (sd)</i>			
Internalizing	53.3 (10.6)	54.5 (11.0)	0.243
Externalizing	57.8 (10.8)	58.6 (10.7)	0.407

SGA indicates small for gestational age.

^a Heavy use determined by MISU at 1 month from mothers who reported any use at initial screening.

^b Reported by caregiver via CISU at any point from 4 months to 11 years.

TABLE 2

Sample Characteristics According to Cocaine Exposure

Characteristic		PCE (n=205 [41.2%])	Comparison (n=293 [58.8%])	p-value
<i>Maternal characteristics</i>				
Race, n (%)	White	15 (7.3)	44 (15.0)	0.046
	Black	179 (87.3)	228 (77.8)	
	Hispanic	8 (3.9)	16 (5.5)	
	Other	3 (1.4)	5 (1.7)	
Low SES (Hollingshead 5), 1 mo, n (%)		61 (31.6)	61 (21.0)	0.009
Marital status, single, n (%)		187 (91.2)	218 (74.4)	<0.001
Insurance, Medicaid, n (%)		180 (87.8)	223 (76.1)	0.001
Education <12 y, n (%)		98 (47.8)	90 (30.8)	<0.001
IQ, mean (SD)		71.2 (16.1)	75.5 (17.8)	0.008
No prenatal care, n (%)		41 (20.0)	10 (3.4)	<0.001
Age, mean (SD), y		30.3 (4.6)	27.1 (6.0)	<0.001
<i>Prenatal drug use, n (%)^a</i>				
Cocaine use		205 (100.0)	---	---
Heavy cocaine use		50 (24.4)	---	---
Alcohol use		161 (78.5)	164 (56.0)	<0.001
Heavy alcohol use		52 (25.4)	16 (5.5)	0.112
Tobacco use		168 (82.0)	89 (30.4)	<0.001
Heavy tobacco use		66 (32.2)	40 (13.7)	<0.001
Marijuana use		86 (42.0)	29 (9.9)	<0.001
Heavy marijuana use		18 (8.8)	6 (2.1)	0.010
<i>Postnatal caregiving environment, n (%)</i>				
<i>Postnatal drug use^b</i>				
Cocaine use		58 (28.3)	3 (1.0)	<0.001
Heavy cocaine use		17 (8.3)	0 (0.0)	0.969
Alcohol use		185 (90.2)	235 (80.2)	0.002
Heavy alcohol use		117 (57.1)	84 (28.7)	<0.001
Tobacco use		182 (88.8)	152 (51.9)	<0.001
Heavy tobacco use		130 (63.4)	107 (36.5)	<0.001
Marijuana use		84 (41.0)	56 (19.1)	<0.001
Heavy marijuana use		31 (15.1)	19 (6.5)	0.041
Caregiver depression (%)		13 (6.3)	18 (6.1)	0.928
Low quality of HOME, low 20% (%)		41 (20.0)	57 (19.6)	0.910
Primary caregiver change, 1 mo-11y (%)		134 (65.4)	55 (18.8)	<0.001
Low SES (Hollingshead 5), 11 y (%)		41 (20.0)	40 (13.7)	0.059
Child abuse, 1 mo to 11 y (%)		62 (30.2)	63 (21.5)	0.027
Domestic violence 4-11 y (%)		35 (17.1)	34 (11.6)	0.082

Characteristic	PCE (n=205 [41.2%])	Comparison (n=293 [58.8%])	p-value
<i>Newborn medical characteristics and child intelligence</i>			
Gestational age, mean (SD), wk	36.1 (3.9)	36.5 (3.9)	0.300
Birth weight, mean (SD), g	2523 (692.7)	2697 (834.0)	0.012
Length, mean (SD), cm	46.2 (4.5)	47.1 (5.0)	0.029
Head circumference, mean (SD), cm	31.9 (2.5)	32.3 (3.0)	0.107
LBW, <1500 g, n (%)	22 (10.7)	33 (11.3)	0.852
SGA, n (%)	62 (30.2)	57 (19.5)	0.006
Apgar score, 1 min, median (range)	8 (1-10)	8 (1-9)	0.960
Apgar score, 5 min, median (range)	9 (4-10)	9 (4-10)	0.318
Male, n (%)	104 (50.7)	151 (51.5)	0.860
First born, n (%)	17 (8.3)	83 (28.3)	<0.001
Child IQ, mean (SD)	85.1 (11.0)	88.8 (13.8)	0.001
Low child IQ, <85, n (%)	103 (50.2)	118 (40.3)	0.028
Low child IQ, <70, n (%)	15 (7.3)	20 (6.8)	0.833
<i>DISC Diagnosis Outcomes, n (%)</i>			
ODD	18 (8.8)	27 (9.2)	0.868
ADHD	17 (8.3)	20 (6.8)	0.539
CD	6 (2.9)	11 (3.8)	0.617
<i>CBCL T-Scores, mean (sd)</i>			
Internalizing	50.8 (10.3)	50.9 (10.1)	0.910
Externalizing	55.8 (10.7)	53.5 (11.5)	0.028
<i>TRF T-Scores, mean (sd)</i>			
Internalizing	53.5 (10.2)	53.2 (10.9)	0.764
Externalizing	59.2 (10.3)	56.8 (11.0)	0.015

SGA, indicates small for gestational age.

^a Heavy use determined by MISU at 1 month from mothers who reported any use at initial screening.

^b Reported by caregiver via CISU at any point from 4 months to 11 years.

TABLE 3

Odds Ratio (95% CI) for Factors Predicting IEP enrollment in Logistic Regression Model

Factor	IEP (n=496, 22.5%)	n	%
PCE	2.89 (1.15-7.29)	205	41.2
ODD	1.40 (0.51-3.48)	45	9.0
PCE × ODD	7.71 (1.40-42.46)	18	3.6
ADHD	4.55 (1.74-11.88)	37	7.4
CBCL Internalizing	1.03 (1.00-1.06)		
TRF Externalizing	1.03(1.00-1.05)		
Female Gender	0.34 (0.19-0.58)	243	48.8
LBW	2.23 (1.05-4.70)	55	11.0
SGA	0.44 (0.23-0.86)	119	23.9
Racial Minority	0.33 (0.14-0.76)	439	88.2
Caregiver Change	2.22 (1.21-4.08)	189	38.0
Low SES	2.08 (1.08-4.00)	81	16.3
Low Chile IQ (<85)	6.36 (3.40-11.89)	221	44.4
Caregiver Depression	2.57 (1.04-6.36)	36	7.2
Prenatal Marijuana Exp.	0.47 (0.24-0.95)	115	23.1
Site (<i>P</i>)	0.104		
R ²	0.404		