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Importance of Stability of Early Living Arrangements on Behavior Outcomes of Children With and Without Prenatal Drug Exposure

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Abstract

Objective: We evaluated whether living arrangements of children with or without prenatal drug exposure would be associated with their behavior outcomes and adaptive functioning.

Methods: 1388 children with or without prenatal cocaine or opiate exposure were enrolled in a longitudinal cohort study at one month of age, were seen at intervals, tracked over time for their living situation, and evaluated for behavior problems and adaptive functioning at three years of age. Child Behavior Check List and Vineland Adaptive Behavior Scales (VABS) were administered. Using multiple regression models, we determined the factors that would predict behavior problems and adaptive functioning.

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Results: 1,092 children were evaluated. Total and externalizing behavior problems T scores of children in relative care were lower (better) than those in parental; externalizing behavior scores were lower than those in non-relative care ($p < 0.05$). Total behavior problem scores increased 2.3 and 1.3 points respectively with each move/year and each year of Child Protective Services' involvement. Compared to children in non-relative care, those in parental or relative care had higher (better) scores in the VABS total composite ($p < 0.023$), communication ($p < 0.045$), and daily living ($p < 0.001$). Each caretaker change was associated with a decrease of 2.65 and 2.19 points respectively in communication and daily living scores.

Conclusion: Children's living arrangements were significantly associated with childhood behavior problems and adaptive functioning. The instability of living situation was also a significant predictor of these outcomes. While family preservation continues to be the goal of the child welfare system, expediting decision toward permanency remains paramount once children are placed in foster care.

Keywords

Prenatal cocaine; prenatal opiate; out-of-home-care; child behavior

Most reports on outcomes of children in out-of-home care have involved children older than three years old.¹⁻⁴ Often the reason for out-of-home care is child maltreatment. In utero exposure to illegal drugs by itself or in conjunction with other risk factors is considered child maltreatment in many states. Thus, identification of drug exposure of the newly born in those states may result in the child being placed in out-of-home care directly from hospital nursery discharge.

With the high prevalence of substance use during pregnancy, and the effort by government to protect the children in many families affected by alcohol and other drug use, the burden placed on child welfare system has increased significantly with children being seen at a much younger age. In 2003, the number of children in foster care was estimated to be greater than 500,000.⁵ Of those who entered foster care, 14% were less than one year of age and 26% were between one and five years of age.⁶ Also, of the children in foster care for at least one year, 24% were between one and two years of age.⁷

In spite of a large number of children in non-parental care and the unpredictability in the duration of such living arrangement, very little is known about the outcomes of children who entered foster care from hospital nursery discharge because of maternal drug use.⁸ The few published studies have shown conflicting results. One study found that cognitive outcomes of prenatally exposed infants in parental care were better than those in kinship care,⁹ while in another report, children prenatally exposed to cocaine in non-parental care demonstrated better performance than those in parental care.¹⁰

A child's early placement in non-parental care raises issues related to child development.¹¹ The first few years in life comprise the formative stage characterized by evolving changes in brain structures and functions as the child adapts to postnatal environment and interacts with a parent or primary caretaker. Such adaptations and interactions may affect long-term outcomes.¹¹ Therefore, it is important in child development research, especially in examining those children exposed to drugs in utero, to consider postnatal environment and parental care as factors that may affect child outcomes.¹²

In the Maternal Lifestyle Study (MLS),¹³⁻¹⁵ we gathered information on child's living situation and we assessed at intervals behavioral outcomes of drug exposed children and their comparison cohort. The MLS enrolled a large number of children, who were tracked as to their living arrangements, their involvement with Child Protective Services (CPS), and

any out-of-home placement from hospital nursery discharge. We evaluated whether there is an association between the children's living situations and their behavior outcomes and adaptive functioning. We tested the hypothesis that behavior problems and adaptive functioning of children in non-parental care will not be different from those who remained in parental care.

METHODS

The MLS is a prospective, longitudinal study on the evaluation of the effects of maternal lifestyle choices during pregnancy on childhood outcomes and is conducted in four centers of the National Institute of Child Health and Human Development Neonatal Research Network. These sites include Brown University (Providence, RI), University of Miami (Miami, FL), The University of Tennessee, Memphis (Memphis, TN), and Wayne State University (Detroit, MI). Data management, research coordination, and statistical design and analysis were initially provided by The Biostatistics Coordinating Center at George Washington University, Washington, DC and currently by the Research Triangle Institute International (Research Triangle Park, NC). Brown University coordinated the training and administration of the neurobehavioral battery of assessments. A detailed description of this study has been reported previously.^{14, 16} Approval to conduct the study was obtained from the Institutional Review Board at each site. Informed consent was obtained and the study was conducted with a Certificate of Confidentiality issued by the National Institute on Drug Abuse.

Enrollment of Subjects

Mother-infant dyads were enrolled in 1993-1995 to determine acute outcomes associated with cocaine and or opiate exposure (Phase 1).¹³ Prenatal drug exposure was determined by a mother admitting cocaine/opiate use during pregnancy and/or a positive meconium assay for cocaine or opiate metabolites. Non-exposed children were those born to mothers who denied cocaine and opiate use, confirmed by negative meconium test results. Marijuana, alcohol, and tobacco exposures were present in both exposed and non-exposed groups. From the exposed children, we derived a cohort for longitudinal follow-up (Phase 2) that was matched within site with a group of non-exposed children by gestational age categories (<32 weeks, 33-36 weeks and >36 weeks), child's gender, and race. Children were considered enrolled when they came for the initial Phase 2 clinic visit. Details of the follow-up selection procedure have been published.^{14, 15}

Data collection included results of physical and neurological assessment in the newborn period, medical complications for both mother and infant, and discharge information, such as any CPS involvement and whether baby was discharged under care of biological mother, relatives, or non-relatives (foster family or pre-adoptive home), or was placed in congregate care or group home. Enrolled infants were assessed at intervals for developmental outcomes. Caretakers were interviewed during each clinic visit to obtain information on CPS involvement, child's living situation, number of children and adults in the home, socioeconomic status, parental involvement, number of address changes, number of caretaker changes, and on-going caretaker drug, tobacco, alcohol, and marijuana use.

Behavior Problems and Adaptive Functioning Measures

At the 3 year-visit, the Child Behavior Checklist (CBCL)¹⁷ and the Vineland Adaptive Behavior Scales (VABS)¹⁸ were administered. The CBCL is a 100-item, parental report questionnaire designed to obtain standardized data on social-emotional problems between 12 and 36 months of age. The CBCL provides a profile of the child's social and behavioral functioning relative to children of the same age and gender. Computer scoring results in

broad band summary T scores on externalizing, internalizing, and total behavior problems. Higher scores indicate more behavior problems, with norm (SD) of 50 (10). Included in the internalizing behavior are scales on anxious/depressed, withdrawn, and somatic problems while included in the externalizing behavior problems are aggressive behavior, and destructive behavior. Thought, attention, and social problems are included in the total problems in addition to internalizing and externalizing problems.

The VABS is an instrument designed to assess handicapped and non-handicapped persons from birth to adulthood in their personal and social functioning.¹⁸ The VABS is organized around four Behavior Domains: Communication, Daily Living Skills, Socialization, and Motor Skills. Standard score equivalents for domain raw scores and Adaptive Behavior Composite Standard scores are derived. Higher scores indicate better functioning in the total composite or in each domain with standard norm (SD) = 100 (15).

Statistical Methods

Bivariate analyses were carried out using chi square test or ANOVA. When outcomes were compared across multiple groups, we adjusted for multiple comparisons with Tukey-Kramer Method. A separate model for each CBCL and Vineland domain was constructed using a stepwise approach that maximized the predicted power of the final model, used the strongest explanatory variables and controlled for multicollinearity. We identified *a priori* the variables that were likely to explain the variance in these outcomes; these included: clinic site, child's birth weight, birth head circumference, gender, race, mother's age, mother's education, drug use during pregnancy (any cocaine, any opiate, cocaine and opiate, marijuana, tobacco, alcohol, alcohol binge), CPS involvement, duration of CPS involvement, child's living arrangement, family structure (child's primary caretaker, maternal and paternal involvement), caretaker education and SES, stability of living situation (number of changes in caretaker, number of moves) and household composition (number of adults, siblings, and other children in the household). The variables selected as covariates have been reported as descriptors of postnatal environment, household chaos, and risks^{19, 20} that may affect early childhood attachment relationships,²¹ and child's physical and mental health.²²⁻²⁴ Estimation of an initial basic model started with all variables, and a rule of $p > 0.10$ was used to initially exclude variables. Each of the covariates in the final model was independent with a significant association with the outcome. The child's living arrangement or living situation with or without CPS involvement was categorized into living with biological parent(s), relatives, and non-relatives; this living situation variable was retained in each model. Study site was also controlled for in all models. The models for CBCL total, internalizing and externalizing scores, and for the Vineland total scores with its constituent domains, were so similar that a single CBCL model and a different single Vineland model was chosen to provide model estimates for these assessments and their components.

RESULTS

Characteristics of Subjects at Enrollment and Follow-up

A total 1338 children were enrolled in the follow-up phase of MLS. Of the enrolled children, 658 were exposed (600 - cocaine, 115 - opiate, 57 - cocaine and opiate) and 730 were non-exposed. Enrollment by site was as follows: Detroit – 591, Memphis – 352, Miami – 234 and Providence – 211. Of the enrolled children, 1092 came for the 36-month follow-up clinic visit, while the remaining 296 children had no follow-up assessment. There were no differences between those who missed their visit and those with follow-up as to maternal age and education, the proportion of male children, mean birth weight, and rates of prenatal exposure to cocaine, cocaine plus opiates, marijuana, tobacco, or alcohol. Differences

between those without follow-up and with follow-up were in the proportion of white subjects (22% versus 14.2%), head circumference [mean (SD) of 32.4 (2.7) cm versus 32.0 (3.1)], and any opiate exposure (11.1% versus 7.5%).

CPS Reporting from Discharge to the 36-month Clinic Visit

At discharge, 41% (270/658) of exposed infants were reported to CPS, compared to 1.8% (12/730) of the comparison infants. As shown in table 1, the rates of CPS reporting for the exposed infants varied by site, with the higher percentages, 78.1% (89/114) and 72.9% (78/107) in Miami and Providence, respectively; much lower rates occurred in Detroit and Memphis. Variation in rates of CPS reporting were due to differences in the state's child protection statute; i.e., directive in regard to requiring the reporting of infants who have been exposed to drugs in utero (Florida)²⁵, less explicit and allowed for flexibility (Rhode Island)²⁶, not explicit in the mention of in utero drug exposure as a factor in child maltreatment (Michigan),²⁷ or made no mention of drug exposure as a reason for reporting child maltreatment (Tennessee).²⁸ Also shown in table 1 are the rates of CPS reporting at any time after discharge and at the 36-month visit by site. The rates of CPS reporting declined by 36 months except at Memphis, where there was an increase from 9.6% at discharge to 15% among exposed children and at Detroit where the overall rate increased slightly.

Living Arrangements from Discharge to the 36-month Clinic Visit

Not all children reported to CPS were placed in non-parental care. But the variability in CPS reporting among study sites also accounted for the variability in percentages of infants discharged to caretaker other than the biological mother (Table 1). The highest percentage of exposed children sent home with non-relatives at discharge was in Providence (39.3%) and the lowest was in Memphis (3.0%). Two infants in Miami, one in Memphis, and one in Providence were discharged under care of their biological father.

Table 2 shows the changes in living situation of the children since hospital discharge and at the yearly clinic visit until 36 months. While the number of children for each living arrangement exhibited slow change from one visit to the next, the yearly snapshots tended to underestimate the actual amount of underlying movement to other living arrangements between visits. Overall, there was an 11% decline in children living with the biological mother over the 3 years and an increase in all other living situations, except institutions/group homes. In addition to one death that occurred prior to discharge, by the 36 month-visit, 12 deaths had occurred; causes included: physical abuse - 3, AIDS/HIV - 2, SIDS - 2, pulmonary conditions - 3, central nervous system disorders - 2. At the 36-month visit, 288 or 20.7% had changes in living situation since discharge from the nursery. 233 of the 288 (80.9%) were children with prenatal drug exposure. Of the 288 who had changes in living situation since discharge, 133 (46.2%) involved a foster care placement by CPS, while 155 (53.8%) had changes in living situation without formal supervision of CPS.

Child, Caretaker, and Household Characteristics by Living Arrangements

Of those 1,092 children seen at the 3 year visit, 49 (4.5%) were brought to the clinic visit by someone who could not provide detailed information on the child's household and caretaker demographics; thus we report information in 1,043 children. Table 3 shows maternal-child dyad characteristics at enrollment according to the 36-month living arrangements, which were categorized into: 1) parental care, 2) relative care without parents in the home, and 3) non-relative care or care by a foster family or pre-adoptive parents. The percentage of children in non-parental care did not vary significantly among the four study sites (range: 16.9% to 20.9%) and the percentage of non-relative care ranged from 3.6% in Memphis to 8.0% in Providence. Birth weight, head circumference, and gender and race distribution did

not differ among the three groups of living arrangements. Most of the children in relative and non-relative care had prenatal cocaine exposure, 86.8% and 88.3% respectively; only small percentages, 3.8% and 3.4% respectively had opiate and no cocaine exposure.

Table 4 compares the household, caretaker, and CPS variables among the different living situations. Compared to children in parental care, those in relative and non-relative care had higher proportions with CPS involvement and more frequent changes in caretaker.

Behavior Outcomes, Unadjusted Analysis

The unadjusted mean scores for behavior problems and VABS by living situation and prenatal drug exposure are shown in Table 5. Data from the CBCL and the VABS were missing in 62 and 110 children respectively; the primary caretakers were not available for the administration of these instruments. Overall, within a given living situation, there were only small non-significant unadjusted effects associated with prenatal drug exposure. No significant differences were noted among exposed and comparison children living with biological parent(s) in any of the behavioral measures. However, there was a significant unadjusted difference between children living with their biological parents, either exposed or not exposed, and the exposed children in non-relative care for several of the VABS scores. The results of the multiple regression analyses for the total CBCL and VABS composite and their subscales are shown in Tables 6 and 7. Although drug exposures were initially controlled for, prenatal cocaine and other drug exposures were not retained in the final regression models.

Behavior Problems: Living Arrangements and Other Risk Factors

Table 6 shows the significant factors derived from the regression models that were related to behavior problems at 3 years of age. After adjustment for covariates, the CBCL total problem T scores were significantly associated with the children's living situation ($p < 0.04$); those in relative care had lower adjusted mean scores (52.5) than those in parental care (55.4), $p = 0.019$ or in non-relative care (55.8), $p = 0.06$. A similar significant association was seen with the externalizing behavior problem, with adjusted mean scores of 52, 54.7, and 55.5, respectively for those in relative, parental, and non-relative care. The living situation had no significant association with internalizing behavior. Longer duration of CPS involvement, caretaker education less than 12 years, and more frequent moves per year were associated with higher scores on total, externalizing, and internalizing problems. For every year of CPS involvement, we observed an increase of 1.3 points in total, 1.3 points in externalizing, and 1.4 points in internalizing behavior problems. For every move per year, the associated increases for total, externalizing, and internalizing problem scores were 2.3, 2.0 and 2.4 points respectively. Birth head circumference and caretaker education also were related to behavior problems scores.

Adaptive Functioning, Living Arrangements and Other Risk Factors

Table 7 shows the regression results for outcomes related to adaptive functioning using the VABS. There were center differences. Larger birth head circumference, higher educational level of the caretaker, paternal involvement, and female gender were significantly associated with better adaptive functioning, i.e., higher total composite and domain scores. The more frequent changes in caretaker were associated with lower scores in the total composite and in all domains except for motor. The child's living situation was only marginally related to the total VABS score ($p < 0.072$) but was significantly related to the daily living domain scores; children in non-relative care had significantly lower scores compared to those in parental care or in relative care, while scores of those in relative care were not significantly different from those in parental care.

DISCUSSION

Our findings show that children with prenatal drug exposure are likely to have CPS involvement. Because of the statutes in many states on child protection involving in utero drug exposure, a large number of newly born infants are discharged to a caretaker other than the biological mother. Among exposed children, changes in living situation do occur even with no CPS involvement. The living arrangement, small head circumference, and caretaker education <12 years were significant predictors of child behavior outcomes. Factors that threaten the stability of the child's living situation such as number of moves, number of changes in caretaker, and duration of CPS involvement were also significant predictors of childhood behavior problems and adaptive functioning.

The MLS staff did refer children when appropriate to CPS for risks of maltreatment prior to discharge and during each clinic visit. Further investigation of the home situation by CPS may or may not have led to the child's removal from parental care. Behavior outcomes of the MLS children in parental care were not different from those in non-relative care. Tyler et al.⁹ reported that children with prenatal drug exposure, who lived with their mothers did better in cognitive outcome than those in kinship care after a brief follow-up of 6 months. In MLS, that continued placement of the child in parental care after prenatal drug exposure did not result in worse outcomes compared to those in non-parental care, suggests that appropriate procedures were in place for screening for risks of keeping the infant under care of a current or former substance using mother, while making "reasonable efforts" to keep families together; this was as guided by the 1980 Public Law 96-272, the Adoption Assistance and Child Welfare Act that was in place when the study began.

The outcomes reported on children placed in relative care have shown conflicting results. The comparable if not better behavior outcomes of the MLS children in relative care compared to those in parental care are consistent with the report of Keller et al.²⁹ who found that children in kinship foster care closely resembled children in the general population; these children differed significantly from those in non-relative foster care who had lower adaptive abilities and higher scores in behavior problems. For children at 5 to 11 years of age, those in placement prior to 6 months of age in non-relative foster care had higher behavior problem index scores compared to children in non-relative adoptive homes or children living with biological parent(s).² On the other hand, from another study among two-year old children with prenatal cocaine exposure, those in non-parental care performed better in several areas of development than those in parental care; the protective effect was attributed to the optimal environment in non-relative care.¹⁰ Brooks and Barth¹ in evaluating outcomes of older drug-exposed children found that exposed children in kinship or non-kinship foster care were more than two to three times more likely to exhibit problem behavior compared to non-exposed children in kinship care. The children were older than those in MLS, although some had been in out-of-home care since birth. Dubowitz and Sawyer³⁰ reported that 63% of children from kinship care had teacher rating of having good classroom behavior.

Favorable behavior outcomes when children are in relative care may be related to greater stability in the living situation, since children continue to interact with people known to them from early age. But there may be bias in reporting; relative caregivers tend to rate fewer children as difficult to handle compared to non-relative caregivers.^{31, 32} Also, the rating and perception of child behavior may be related to age of the caretaker; children reared by middle-aged or older grandparents are reported to have increased behavior problems compared to those reared by younger relatives.³⁰ Other factors may affect parenting by a relative caretaker and influence behavior of children. These include the caretaker's medical condition or ill health, financial difficulty, lack of social support, low

educational attainment, and or inadequate coping strategies especially with existing psychological stress and depression.³³

The number of grandparents assuming the role of parents is steadily increasing. In 2000 in the U.S., greater than 5.5 million grandparents were living with their grandchildren.³⁴ Of those co-residents with their grandchildren, 42% were responsible for their grandchildren and of whom, 54% were responsible for the grandchild's care for 3 years or longer. The consequences of such living situations to both the grandparent caregiver and the children, especially in the absence of parents who continue to use drugs will require further research.

The numerous issues pertinent to young children in foster care, have been addressed by the American Academy of Pediatrics Committee on Early Childhood, Adoption and Dependent Care.¹¹ In the first three to four years of life, brain structures governing functions of learning, coping with stress, and personality are established, with influences from the environment through these early years. Disruption of primary care giving environment³⁵ may result from early out-of-home care of children of substance using mothers even with the intent of providing a safe environment for children. Changes in care-giving or living situation can impair development of child-adult attachment,³⁶⁻³⁸ and may add to the consequences of inadequate parenting.³⁹ Unstable placement histories have negatively contributed to child behavior functioning and development.^{40, 41} In older children, those with at least one custody change have higher behavior problem scores.⁴² Also, placement instability has been associated with increase in mental health costs.⁴³

Usher and co-investigators⁴¹ have indicated that placement movement is an important indicator of the quality of out-of-home care since with more placements, the probability of reunification decreases. The Adoption and Safe Families Act of 1997 (ASFA), Public Law 105-89, was enacted to truncate extended stays in foster care and the associated greater number of changes in living arrangements by providing financial incentives to states for adoption activities. Our findings affirm the need for permanency in a child's placement when a decision is made that living with the biological mother is not safe for the child.

In our attempt in MLS to disentangle the effects of prenatal drug exposure from the effects of the children's living situations, we found non-significant drug exposure effects in multiple regression analyses. Due to limitations in study design and constrained number of subjects in our study, we cannot completely exclude the possibility that the differences we observed in outcomes may be due to either drug exposure or to conditions that led to the child's care placement. We have observed that the infants who were discharged to caretakers other than the biological parent were more often those with prenatal drug exposure. Also, it is possible that the effects of drug exposure may be subtle in early childhood.⁴⁴⁻⁴⁶ In a previous report from MLS on the 36-month outcome,¹⁵ we found no differences in the behavior rating scores when cocaine-exposed or opiate-exposed children were compared to those with no exposure. Other investigators also reported a lack of prenatal cocaine exposure effects on early childhood motor and mental developmental outcomes;⁴⁷ follow-up however of a subpopulation from the cohort at age 10 years, revealed that prenatal cocaine was associated with poorer executive functioning compared to non-exposed children.⁴⁸

Our study results show a significant association between living arrangement and childhood behavior problems and adaptive functioning. Factors indicating instability of the child's living situation such as the number of moves, changes in caretaker, the duration of CPS involvement, and other household characteristics are also significant predictors of behavior outcomes. While family preservation continues to be the goal of the child welfare system, expediting decision toward permanency remains paramount once children are placed in foster care. Therefore, when children are identified as being at risk for maltreatment, the

choice of caretakers and living arrangements should account for how stable those arrangements are likely to be over the long term to promote optimal behavior outcomes and adaptive functioning in the children.

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Table 1

Child Protective Services (CPS) Reporting at discharge, new CPS cases after discharge, and reporting at 36 months and living situation at discharge and 36 months, for all subjects and for exposed subjects by site.

| Site | Subjects n | CPS Reporting | | | | Living Situation At Discharge [#] | | | | Situation at 36 months ^{##} | | | | |
|------------|---------------|---------------------------|-----------------------------|------------------------------|----------------------------|--|-------------|-----------------|----------|--------------------------------------|-----------------|----------|-------------|-----------------|
| | | CPS at Discharge n (%) | % New Cases Since Discharge | % CPS Report up to 36 Months | % CPS Report at 36 Months* | % Mother | % Relatives | % Non-Relatives | % Mother | % Relatives | % Non-Relatives | % Mother | % Relatives | % Non-Relatives |
| Detroit | All | 91 (15.4) | 17.6 | 33.0 | 16.7% | 95.4% | 1.5% | 3.2% | 83.1% | 10.5% | 6.4% | 83.1% | 10.5% | 6.4% |
| | Exp | 87 (32.1) | 24.7 | 56.8 | 27.0% | 90.4% | 3.7% | 5.9% | 68.1% | 20.1% | 11.8% | 68.1% | 20.1% | 11.8% |
| Memphis | All | 352 (16 (4.5)) | 18.2 | 22.7 | 9.3% | 96.9% | 1.4% | 1.4% | 81.1% | 15.4% | 3.6% | 81.1% | 15.4% | 3.6% |
| | Exp | 166 (16 (9.6)) | 29.5 | 39.2 | 15.2% | 94.0% | 2.4% | 3.0% | 65.2% | 27.3% | 7.6% | 65.2% | 27.3% | 7.6% |
| Miami | All | 234 (94 (40.2)) | 6.0 | 46.2 | 12.3% | 86.8% | 5.6% | 7.7% | 79.1% | 15.3% | 5.5% | 79.1% | 15.3% | 5.5% |
| | Exp | 114 (89 (78.1)) | 6.1 | 84.2 | 23.1% | 72.8% | 11.4% | 15.8% | 60.3% | 28.2% | 11.5% | 60.3% | 28.2% | 11.5% |
| Providence | All | 211 (81 (38.4)) | 3.8 | 42.2 | 20.9% | 73.5% | 6.2% | 20.4% | 79.1% | 12.9% | 8.0% | 79.1% | 12.9% | 8.0% |
| | Exp | 107 (78 (72.9)) | 4.7 | 77.6 | 41.3% | 48.6% | 12.1% | 39.3% | 57.3% | 26.7% | 16.0% | 57.3% | 26.7% | 16.0% |
| Total | All | 1388 (282 (20.3)) | 13.7 | 34.0 | 14.7% | 90.9% | 3.0% | 6.1% | 81.3% | 12.9% | 5.8% | 81.3% | 12.9% | 5.8% |
| | Exp | 658 (270 (41.0)) | 19.5 | 60.5 | 25.4% | 81.5% | 6.1% | 12.3% | 64.4% | 24.3% | 11.2% | 64.4% | 24.3% | 11.2% |

* Based on 1043 subjects with living situation information at the 36 month visit.

[#] 1 exposed subject at Memphis died prior to discharge.

^{##} 12 subjects died by 36 months, 5 at Detroit, 4 at Memphis and 3 at Miami; 7 exposed subjects died by 36 months, 4 at Detroit and 3 at Memphis.

Table 2

Number of children by each type of living arrangement for each visit from discharge. For each living arrangement, the number of children who left and the number who entered that specific arrangement since previous visit are shown.

| Living situation | Discharge | 12 months | 24 months | 36 months |
|---|------------------|------------------|------------------|------------------|
| Biological mother | 1262 | 1195 | 1155 | 1118 |
| <i>Subsequently left this situation to others</i> | 94 | 59 | 55 | |
| <i>Entered from other arrangements</i> | | 32 | 22 | 19 |
| <i>Number- died</i> | | 5 | 3 | 1 |
| Biological father, mother not in the home | 5 | 22 | 37 | 38 |
| <i>Subsequently left this arrangement to others</i> | 3 | 5 | 13 | |
| <i>Entered from other arrangements</i> | | 20 | 20 | 14 |
| Grandparent(s) | 35 | 46 | 54 | 72 |
| <i>Subsequently left this arrangement to others</i> | 21 | 9 | 13 | |
| <i>Entered from other arrangements</i> | | 32 | 17 | 31 |
| Other relatives | 1 | 44 | 50 | 56 |
| <i>Subsequently left this arrangement to others</i> | 0 | 12 | 11 | |
| <i>Entered from other arrangements</i> | | 43 | 18 | 17 |
| Non-relative foster care | 67 | 71 | 80 | 87 |
| <i>Subsequently left this arrangement to others</i> | 26 | 8 | 7 | |
| <i>Entered from other arrangements</i> | | 31 | 17 | 15 |
| <i>Number – died</i> | | 1 | | 1 |
| Institution/group home | 17 | 3 | 2 | 5 |
| <i>Subsequently left this arrangement to others</i> | 17 | 1 | 0 | |
| <i>Entered from other arrangements</i> | | 3 | 0 | 3 |

Table 3

Comparison of maternal-child dyads demographic and prenatal drug exposure variables by the child's living arrangement (parental care or with biological parent(s), relative care, and non-relative care) at the 36-month visit.

| Variables | Biological Parent(s) | Relative Care | Non-relative Care | p value |
|----------------------------|----------------------|------------------|-------------------------|---------|
| | N=877 | N=106 | N=60 | |
| Detroit | 83.1% | 10.5% | 6.4% | 0.114 |
| Memphis | 81.1% | 15.4% | 3.6% | |
| Miami | 79.1% | 15.3% | 5.5% | |
| Providence | 82.2% | 12.9% | 8.0% | |
| Birth weight, g, mean (SD) | 2632 (847) | 2427 (753) | 2565 (734) [†] | 0.053 |
| Head Circ, cm, mean (SD) | 32.1 (3.2) | 31.3 (2.9) | 32.2 (2.6) [†] | 0.055 |
| Race (Black) | 78.4% [*] | 86.8% | 75.0% | 0.122 |
| Male | 53.2% | 45.3% | 51.7% | 0.299 |
| Maternal age <26 yr | 38% | 38% [#] | 18% [†] | 0.055 |
| Maternal Education <12 yr | 36% ^{**} | 52% | 55% ^{††} | <0.001 |
| Cocaine and opiate | 2.4% ^{***} | 9.4% | 13.3% ^{†††} | <0.001 |
| Any cocaine | 34.7% ^{***} | 86.8% | 88.3% ^{†††} | <0.001 |
| Opiate | 6.3% ^{**} | 13.2% | 16.7% ^{††} | <0.001 |
| Marijuana | 21.3% ^{***} | 38.1% | 30.0% | <0.001 |
| Tobacco | 48.5% ^{***} | 84.0% | 86.7% ^{†††} | <0.001 |
| Alcohol | 58.2% [*] | 69.8% | 71.7% [†] | 0.012 |
| Alcohol, binge | 12.3% | 17.0% | 18.3% | 0.193 |
| Any poly drug exposure | 72.4% ^{***} | 94.3% | 95.0% ^{†††} | <0.001 |

* p<0.05: biological parent vs. relative care

p<0.05: relative vs. non-relative

† p<0.05: non-relative vs. biological parent

** p<0.01: biological parent vs. relative care

p<0.01: relative vs. non-relative

†† p<0.01: non-relative vs. biological parent

*** p<0.001: biological parent vs. relative care

p<0.001: relative vs. non-relative

††† p<0.001: non-relative vs. biological parent

Table 4

Comparison of household, caretaker and CPS variables by child's living situation (with biological parent, relative care and non-relative care) at the three-year visit.

| Variables | Biological Parent(s) | Relative Care | Non-relative Care | P value |
|--------------------------------------|--------------------------|-----------------------------|------------------------------|---------|
| | N=877 | N=106 | N=60 | |
| Median (range) no. adults | 2 (1-8) | 2 (0-5) | 2 (1-5) | 0.672 |
| Median (range) other children | 1 (0-10) [*] | 2 (0-11) | 2 (0-9) [†] | <0.01 |
| Median (range) no. siblings | 1 (0-9) [*] | 1 (0-6) ^{###} | 0 (0-2) ^{†††} | <0.001 |
| Father sees child | 72.8% ^{***} | 38.7% [#] | 23.3% ^{†††} | <0.001 |
| Mother sees child | 98.2% ^{***} | 69.8% ^{##} | 46.7% ^{†††} | <0.001 |
| Per capita income, mean (SD) | \$4966 (4134) | \$4888 (4207) ^{##} | \$6982 (4351) ^{†††} | 0.003 |
| Caretaker financial services | 77.6% | 84.9% ^{###} | 50% ^{†††} | <0.001 |
| Caretaker medical services | 74.6% [*] | 85.8% | 88.3% [†] | 0.003 |
| Caretaker education <12 y | 38.6% | 35.2% [#] | 15.5% ^{†††} | 0.003 |
| 12 y | 39.0% | 35.2% | 36.2% | |
| >12 y | 26.4% | 29.5% | 48.3% | |
| Number of moves/yr | 0.36 (0.42) | 0.43 (0.44) | 0.46 (0.56) | 0.090 |
| Number of caretaker changes | 1.1 (0.5) ^{***} | 2.2 (0.8) ^{###} | 2.1 (0.7) ^{†††} | <0.001 |
| Any CPS report | 23.1% ^{***} | 82.1% ^{###} | 100% ^{†††} | <0.001 |
| Any CPS placement | 3.8% ^{***} | 37.7% ^{###} | 90.0% ^{†††} | <0.001 |
| Median (range) duration CPS, months | 12 (2-36) ^{***} | 24 (2-36) [#] | 35 (4-36) ^{†††} | <0.001 |

* p<0.05: biological parent vs. relative care

p<0.05: relative vs. non-relative

† p<0.05: non-relative vs. biological parent

** p<0.01: biological parent vs. relative care

p<0.01: relative vs. non-relative

†† p<0.01: non-relative vs. biological parent

*** p<0.001: biological parent vs. relative care

p<0.001: relative vs. non-relative

††† p<0.001: non-relative vs. biological parent

Table 5

Unadjusted Means(SD) for CBCL Total, Externalizing, Internalizing Behavior Problems T Scores, VABS Total Composite, Communication, Daily Living, Social and Motor Domain Scores by living arrangements and by drug exposure.#

| | Group 1 Biological Parent (s) Non-Exposed N=514 | Group 2 Biological Parent (s) Exposed n=317 | Group 3 Relative Care Non-Exposed n=10 | Group 4 Relative Care Exposed n=86 | Group 5 Non-Relative Care Non-Exposed n= 5 | Group 6 Non-Relative Care Exposed n= 51 | Significant group comparisons p<0.05* |
|-------------------------|--|--|---|---|---|--|---|
| Total Behavior Problems | 55.5 (10.5) | 56.3 (10.5) | 52.6 (8.8) | 55.2 (10.2) | 66.0 (14.3) | 58.6 (11.7) | n. s. |
| Externalizing Behavior | 54.9 (10.4) | 55.5 (9.8) | 53.1 (7.9) | 54.7 (10.7) | 68.2 (15.8) | 58.1 (11.4) | 1, 4 vs. 5 |
| Internalizing Behavior | 55.6 (10.4) | 56.7 (10.8) | 52.6 (12.8) | 56.3 (10.2) | 61.0 (13.6) | 57.8 (12.1) | n. s. |
| VABS Total Composite | 92.2 (13.3) | 90.9 (12.6) | 86.9 (15.3) | 87.4 (15.4) | 84.3 (16.8) | 83.2 (15.0) | 1 vs. 4, 6 2 vs. 6 |
| Communication | 100.3 (13.3) | 99.5 (12.5) | 96.5 (13.1) | 95.2 (15.6) | 90.0 (13.9) | 92.0 (15.7) | 1 vs. 4,6 2 vs. 6 |
| Daily living | 95.9 (12.9) | 94.1 (12.4) | 91.2 (15.2) | 92.1 (13.9) | 81.0 (7.2) | 83.6 (13.9) | 1,2, 4 vs. 6 |
| Social | 92.3 (11.3) | 91.1 (11.0) | 91.6 (15.2) | 88.7 (13.5) | 90.7 (18.0) | 88.3 (13.7) | n. s. |
| Motor | 88.5 (14.8) | 88.3 (14.8) | 79.3 (19.4) | 85.7 (17.0) | 87.7 (28.2) | 82.6 (15.8) | n. s. |

Table is based on 983 subjects who had either CBCL or VABS assessment at 36 months.

Exposed refers to opiate and or cocaine exposure; Non-exposed – no cocaine or opiate exposure.

* Significance adjusted by Tukey-Kramer method for multiple comparisons.

Table 6

Factors that influenced behavior problems from the regression analysis. Parameter estimates, p values and adjusted means (T-Scores) are shown for all who came for follow-up at 36-month visit.[‡]

| Factors | Total Behavior Problem | | | Externalizing Behavior Problem | | | Internalizing Behavior Problem | | |
|--------------------------------|------------------------|---------|---------------|--------------------------------|---------|-------------------|--------------------------------|---------|---------------|
| | Parameter Estimate | P value | Adjusted mean | Parameter Estimate | P value | Adjusted mean | Parameter Estimate | p value | Adjusted mean |
| Birth Head Circumference | -0.11 | 0.316 | 0.11 pt/cm | -0.09 | 0.39 | 0.09 pt/cm | -0.05 | 0.65 | 0.05 pt/cm |
| Race: Black | -1.44 | 0.176 | 53.8 | -0.92 | 0.38 | 53.7 | -1.96 | 0.07 | 53.6 |
| Hispanic | -0.60 | 0.71 | 54.7 | -0.77 | 0.63 | 53.9 | -2.28 | 0.16 | 53.3 |
| White/other [§] | | | 55.3 | | | 54.7 | | | 55.6 |
| Non-relative care | 0.42 | 0.810 | 55.8 | 0.08 | 0.64 | 55.5 [#] | -0.68 | 0.69 | 54.5 |
| Relative care | -2.90 | 0.019 | 52.5 | -2.77 | <0.022 | 52.0 | -2.26 | 0.067 | 52.9 |
| Biological parent [§] | | | 55.4 | | | 54.7 | | | 55.1 |
| Caretaker education <12 y | 3.08 | 0.001 | 56.1 | 2.50 | <0.004 | 55.3 | 4.60 | <0.001 | 56.3 |
| 12 y | 1.67 | 0.046 | 54.7 | 1.23 | 0.130 | 54.1 | 2.68 | <0.002 | 54.4 |
| >12 y [§] | | | 53.0 | | | 52.8 | | | 51.7 |
| Number moves/yr | 2.3 | 0.004 | 2.3 pts/move | 1.97 | <0.010 | 2.0 pts/move | 2.36 | <0.003 | 2.4 pts/move |
| Duration of CPS/mo | 0.11 | 0.003 | 1.3 pts/yr | 0.11 | <0.003 | 1.3 pts/yr | 0.12 | <0.002 | 1.4 pts/yr |
| Father sees child: No | 1.41 | 0.057 | 55.3 | 1.54 | <0.04 | 54.9 | 1.28 | 0.09 | 54.8 |
| Yes [§] | | | 53.9 | | | 53.3 | | | 53.5 |

[‡] CBCL not administered in 62

[§] reference

[#] p<0.05 relative vs. non-relative care

Table 7

Factors associated with behavioral and adaptive skills (VBAS). Parameter estimates and adjusted means are presented for all children who came for follow-up assessment at the 36-month visit.

| Variables | Total Composite | | Communication | | Daily Living | | Social | | Motor | |
|--------------------------------------|-----------------|---------------|---------------|---------------|--------------|---------------|----------|---------------|----------|---------------|
| | Estimate | Adjusted Mean | Estimate | Adjusted Mean | Estimate | Adjusted Mean | Estimate | Adjusted Mean | Estimate | Adjusted Mean |
| Head circumference (Pis/cm) | 0.74** | | 0.68*** | | 0.49*** | | 0.51*** | | 0.65*** | |
| Race: Black | -0.94 | 89.9 | -1.23 | 97.8 | 3.92 | 92.9 | -2.27* | 91.5 | -3.28* | 86.9 |
| Hispanic | 1.68 | 92.5 | -2.36 | 96.7 | 7.59 | 96.5 | -2.58 | 91.2 | 3.64# | 93.8 |
| White§ | | 90.9 | | 99.0 | | 89.0 | | 93.8 | | 90.2 |
| Non-relative care | -4.65# | 88.5 | -4.24* | 95.2 | -7.64*** | 88.1 | -1.74# | 91.4 | -2.75 | 88.9 |
| Relative care | -1.36‡ | 91.7 | -0.58 | 98.9 | -1.15‡‡ | 94.6 | -1.23 | 91.9 | -1.21 | 90.4 |
| Biological parent§ | | 93.1 | | 99.4 | | 95.7 | | 93.1 | | 91.6 |
| Caretaker education: <12 years | -5.21*** | 88.5 | -3.77*** | 95.9 | -1.08 | 92.3 | -4.43*** | 90.2 | -6.16*** | 87.1 |
| = 12 years | -2.78** | 91.0 | -1.70 | 97.9 | -0.66 | 92.7 | -2.94** | 91.7 | -2.69* | 90.6 |
| >12 years§ | | 93.8 | | 99.7 | | 93.4 | | 94.6 | | 93.3 |
| Father sees child: No | -3.02*** | 89.6 | -3.44*** | 96.1 | -2.15* | 91.7 | -1.54# | 91.4 | -2.70** | 89.0 |
| Yes | | 92.6 | | 99.5 | | 93.9 | | 92.9 | | 91.7 |
| Gender: male | -4.65*** | 88.8 | -4.83*** | 95.4 | -4.50*** | 90.5 | -2.33** | 91.0 | -2.88** | 88.9 |
| Female§ | | 93.4 | | 100.2 | | 95 | | 93.3 | | 91.7 |
| Number change caretaker (Pis/change) | -2.26 | | -2.65*** | | -2.19** | | -1.38* | | -1.20 | |

‡ VBAS not administered in 110

§ reference

p<0.10

* p<0.05

** p<0.01

*** p<0.001 compared to reference group

† p<0.10

‡ p<0.05

†† p<0.01

††† p<0.001, relative care compared to non-relative care