

The Impact of Methamphetamine on Children

A Bibliography



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Introduction

Use of methamphetamine has increased rapidly throughout the United States. The ease of synthesis from inexpensive and readily obtainable chemicals has led to the rampant increase in abuse of this drug. Data from the National Clandestine Laboratory Seizure System, there were 1,660 children affected by or injured or killed at methamphetamine labs during calendar year 2005, down from more than 3,000 in the three previous years (U.S. White House Office of National Drug Control Policy, 2006). Children who live at or visit drug-production sites or are present during drug production face a variety of health and safety risks, including inhalation, absorption, or ingestion of toxic chemicals, drugs, or contaminated foods that may result in nausea, chest pain, eye and tissue irritation, chemical burns, and death; fires and explosions; abuse and neglect; and hazardous lifestyle (presence of booby traps, firearms, poor ventilation). In addition, there are many social issues involved that potentially put children from these environments at risk. The binge-and-crash pattern of using this drug makes it difficult for parents who are users to meet even the basic needs of their children. Children are often not properly supervised. Meals may be forgotten for days at a time while the user is on a binge or in a crash. School problems, criminal behavior, and social isolation can develop for these children. Users of methamphetamine often become paranoid, frustrated, or can be hallucinatory. These behaviors can lead to violence against anyone who happens to be nearby; unfortunately, this is often the child in the home. While on a binge, the user can feel a heightened sexual drive. This can lead to sexual abuse, and children in the home are easy and convenient targets.

Scope

This bibliography pertains to effects of exposure of fetuses, infants and young children to methamphetamine, alone or in combination with other substances, and to the risks that derive from caregiver use of methamphetamine.

Publications

The items listed here are books, chapters, journal articles and selected Internet documents published in English, 1987-2021. The bibliography does not include theses and dissertations, conference papers, audiovisual materials, or ephemera.

Organization

This bibliography is arranged in date descending order. When possible, abstracts that accompanied the original publications are provided. Links to full text are provided when available.

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A Bibliography

Oni-Orisan, O. O., Dansereau, L. M., Marsit, C. J., Smith, L. M., Neal, C. R., Della Grotta, S. A., ... & Lester, B. M. (2021). [DNA methylation in children with prenatal methamphetamine exposure and environmental adversity](https://doi.org/10.1038/s41390-020-1058-4). *Pediatric research*, 89(5), 1152-1156. <https://doi.org/10.1038/s41390-020-1058-4>

Methamphetamine (MA) use during pregnancy is a significant public health concern in the United States and affects long-term brain and behavioral development in children. We hypothesized that prenatal MA exposure would be related to greater DNA methylation of HSD11B2 and postnatal environmental stress. The Infant Development, Environment, and Lifestyle Study (IDEAL), a longitudinal study of prenatal MA exposure enrolled mother–infant dyads in California, Hawaii, Iowa, and Oklahoma. Prenatal exposure was defined by maternal self-report and/or meconium toxicology screening. At ages 10–11 years, 100 children were assessed for drug exposure and DNA methylation of HSD11B2. Hierarchical linear models were used to determine the association between prenatal MA exposure and methylation of HSD11B2 at four CpG sites. Prenatal MA exposure (1.4% vs 0.31%, $P < 0.01$) and early childhood adversity (3.0 vs 2.0, $P < 0.01$) were associated with greater DNA methylation of HSD11B2 at the CpG2 site. The statistically significant effects of early childhood adversity ($B = 0.11$, $P < 0.01$) and prenatal MA exposure ($B = 0.32$, $P = 0.03$) on DNA methylation remained after adjusting for covariates. Prenatal MA exposure is related to postnatal childhood adversity and epigenetic alterations in HSD11B2, an important gene along the stress response pathway suggesting prenatal and postnatal programming effects.

Saldana, L., Chapman, J. E., Campbell, M., Alley, Z., Schaper, H., & Padgett, C. (2021). [Meeting the needs of families involved in the child welfare system for parental substance abuse: Outcomes from an effectiveness trial of the Families Actively Improving Relationships Program](https://doi.org/10.3389/fpsyg.2021.689483). *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.689483>

Limited evidence-based practices exist to address the unique treatment needs of families involved in the child welfare system with parental substance abuse. Specifically, parental opioid and methamphetamine abuse have increased over the last decade, with associated increases of families reported to the child welfare system. The Families Actively Improving Relationships (FAIR)

program was developed to address the complexities of these families. Evidence-based strategies to address the interrelated needs of parents—including substance abuse and mental health treatment, parent skills training, and supportive case management to improve access to ancillary needs—are integrated in an intensive community outpatient program. This study examined the clinical effectiveness of FAIR when delivered in a Medicaid billable outpatient clinic. Parents (n = 99) were randomized either to the immediate FAIR condition or to the Waitlist (WL) condition, using a dynamic wait-listed design, with all parents provided the opportunity to eventually receive FAIR. Outcomes show statistically and clinically significant reductions in parental opioid and methamphetamine use, mental health symptoms, and parenting risk, and improvements in stability in parents receiving FAIR. Providing services to families who require travel in excess of 20 miles for sessions has challenging implications for program costs under a Medicaid structure. Study outcomes highlight the need for policies to support funding of intensive family-based programs.

Wright, J., Symons, B., Angell, J., Ross, K. E., & Walker, S. (2021). [Current practices underestimate environmental exposures to methamphetamine: Inhalation exposures are important](https://doi.org/10.1038/s41370-020-00260-x). *Journal of Exposure Science & Environmental Epidemiology*, 31(1), 45-52. <https://doi.org/10.1038/s41370-020-00260-x>

Current practice for determining the exposure to methamphetamine in contaminated homes relies on the analysis of surface wipe sample to address direct contact exposures. The movement of methamphetamine into the air phase, and the potential for inhalation exposures to occur within residential homes contaminated from former clandestine manufacture or smoking of methamphetamine has been generally poorly characterised and understood. All available risk-based guidelines for determining safe levels of methamphetamine in residential properties do not include any consideration of the inhalation pathway as an exposure route. This study showed that methamphetamine can readily move from contaminated materials in a home into the air phase. This movement of methamphetamine into the air phase provides both an exposure pathway and a mechanism for the transfer of methamphetamine throughout a property. The inhalation exposure pathway has the potential to result in significant intake of methamphetamine, adding to dermal absorption and ingestion exposure routes. Guidelines that are established for the assessment of methamphetamine contaminated properties that ignore inhalation exposures can significantly underestimate exposure and result in guidelines that are not adequately protective of health. This

study also demonstrates that sampling methamphetamine in air can be undertaken using commercially available sorption tubes and analytical methods.

Chen, T., Spiller, H. A., Badeti, J., Funk, A. R., Zhu, M., & Smith, G. A. (2020). Methamphetamine exposures reported to United States poison control centers, 2000–2019. *Clinical Toxicology*, 1-14. <https://doi.org/10.1080/15563650.2020.1861287>

The objective was to investigate characteristics and trends of methamphetamine exposures reported to United States (US) poison control centers. Data from the National Poison Data System were analyzed. From January 1, 2000 through December 31, 2019, US poison control centers managed 54,199 cases involving methamphetamine as the first-ranked substance. Adults 20–39 years old accounted for more than half (56.3%) of cases. There were 1,291 deaths, of which 43.0% involved multiple-substance exposures. Among multiple-substance exposures in which methamphetamine was the first-ranked substance, stimulants and street drugs (excluding methamphetamine) were most commonly also present (22.7%), followed by opioids (19.0%). The substance class associated with the most fatalities was opioids (n = 243, 26.6%). The rate of methamphetamine exposures per 100,000 US population increased from 0.6 to 1.1 from 2000–2005, then decreased from 1.1 to 0.4 from 2005–2007, followed by an increase from 0.4 to 2.6 from 2007–2019. From 2007–2019, the rate significantly increased in all US regions, and among all age groups, except among 6–12-year-olds. Also, the rates of single-substance and multiple-substance exposures each increased significantly (both $p < 0.0001$) from 2007–2019, as did the overall methamphetamine fatality rate per 100,000 US population (0.0036 to 0.022, $p < 0.0001$). From 2000–2019, the proportions of cases resulting in admission to a health care facility and serious medical outcome increased from 30.2% to 47.8% ($p < 0.0001$) and from 37.6% to 54.0% ($p < 0.0001$), respectively. The rate of exposure to methamphetamine in the US declined initially following passage of the Combat Methamphetamine Epidemic Act of 2005. However, since 2007, the rate and severity of exposures to methamphetamine have increased, primarily driven by individuals 20 years or older. Increased prevention efforts are needed, including prevention of methamphetamine initiation among adolescents and young adults, improved access to effective treatment for co-occurring mental health and substance use disorders, and prevention of unintentional exposures among children.

Chu, E. K., Smith, L. M., Derauf, C., Newman, E., Neal, C. R., Arria, A. M., ... & Lester, B. M. (2020). Behavior problems during early childhood in children with prenatal methamphetamine exposure. *Pediatrics*, *146*(6), e20190270.
<https://doi.org/10.1542/peds.2019-0270>

The effects of in utero methamphetamine exposure on behavioral problems in school-aged children are unclear. Our objective for this study was to evaluate behavior problems in children at aged 3, 5, and 7.5 years who were prenatally exposed to methamphetamine. Subjects were enrolled in the Infant Development, Environment, and Lifestyle study, a longitudinal prospective study of prenatal methamphetamine exposure and child outcomes. Exposed and comparison groups were matched on birth weight, race, education, and health insurance. At ages 3, 5, and 7.5 years, 339 children (171 exposed) were assessed for behavior problems by using the Child Behavior Checklist. Generalized estimating equations were used to determine the effects of prenatal methamphetamine exposure, age, and the interaction of exposure and age on behavior problems. Caregiver psychological symptoms were assessed by using the Brief Symptom Inventory. Analyses adjusted for covariates revealed that relative to age 3, children at 5 years had less externalizing and aggressive behavior and more internalizing behavior, somatic complaints, and withdrawn behavior. By age 7.5, aggressive behavior continued to decrease, attention problems increased and withdrawn behavior decreased. There were no main effects for methamphetamine exposure and no interactions of exposure and age. Caregiver psychological symptoms predicted all behavior problems and the quality of the home predicted externalizing problems and externalizing syndrome scores. Behavioral effects longitudinally from ages 3 to 7.5 years were not associated with prenatal methamphetamine exposure, whereas caregiver psychological symptoms and the quality of the home were predictors of behavior problems.

Wright, J., Kenneally, M., Ross, K., & Walker, S. (2020). [Environmental methamphetamine exposures and health effects in 25 case studies](https://doi.org/10.3390/toxics8030061). *Toxics*, *8*(3), 61.
<https://doi.org/10.3390/toxics8030061>

The clandestine manufacture and use of methamphetamine can result in contamination of residential properties. It is understood that this contamination remains in homes for a significant period, however there are a lack of data available to understand the health effects of exposure to environmental methamphetamine contamination (third-hand exposure). Our study collected

information from 63 individuals in 25 separate case studies where the subjects had unwittingly suffered third-hand exposure to methamphetamine from former manufacture, use, or both. Data included environmental contamination data, information on subjects' health effects, and evidence of exposure using hair analysis. This study identified a range of health effects that occur from residing in these properties, including behavioural effects or issues, sleep issues, respiratory effects, skin and eye effects, and headaches. Methamphetamine was detected in hair samples from some individuals, including children. The exposures and concomitant reported health effects covered a wide range of environmental methamphetamine levels in the properties, including low levels close to the current Australian guideline of 0.5 µg methamphetamine/100 cm². There were no discernible differences between health effects from living in properties contaminated from former manufacture or use. This study demonstrates that residing in these properties can represent a serious public health risk.

Dyba, J., Moesgen, D., Klein, M., & Leyendecker, B. (2019). Mothers and fathers in treatment for methamphetamine addiction—Parenting, parental stress, and children at risk. *Child & Family Social Work, 24*(1), 106-114. <https://doi.org/10.1111/cfs.12587>

Parents addicted to methamphetamine (“crystal meth”) are likely to be impaired in meeting parental responsibilities, and the developmental settings can be highly disadvantageous for children. Therefore, parenting by methamphetamine-addicted mothers and fathers needs further exploration, while considering the impact on children affected by parental substance use. In our study, we analysed parenting practices and parental stress as well as children's behavioural problems using standardized assessments. The sample consisted of 87 methamphetamine-addicted parents in recovery. We obtained data on parents' current substance use and on their psychological distress. Multiple regression analysis was performed to identify predictors of children's overall problems. Parents reported high levels of parental and psychological distress, even after achieving abstinence. Especially depressive perceptions of parenthood appeared problematic. While recovering from methamphetamine addiction, parents exhibited a precarious psychosocial situation and problematic parenting behaviour. Dysfunctional parenting practices were evident in both indifferent and overreactive tendencies. Children were at risk of behavioural and emotional problems. Variables associated with parenting showed significant predictive value for children's overall problems, beyond current substance use, and psychological distress. These findings are

discussed in terms of a family-oriented perspective in order to promote parenting capabilities of methamphetamine-addicted parents and to prevent problematic development of their children.

Howell, S., Bailey, L., & Coffman, J. (2019). Evaluation of drug-endangered children: The yield of toxicology and skeletal survey screening. *Child Abuse & Neglect*, 96. <https://doi.org/10.1016/j.chiabu.2019.104081>

Drug endangerment is known to be associated with child maltreatment. However, even with the high association between physical abuse and drug endangerment there is no standard for screening in this population. Skeletal survey screening may facilitate the identification of children in this population who have also been physically abused. Our objective was to determine the characteristics of drug endangered children and specifically the yield of skeletal survey screening. The participants in this study were children referred by Child Protective Services (CPS) due to concerns of drug exposure. They were seen in a child abuse outpatient clinic by a child abuse pediatrician or pediatric nurse practitioner. This study is a retrospective chart review of the Child Advocacy Resource and Evaluation (C.A.R.E.) Team records between January 1, 2011 and December 31, 2017. We measured the yield of toxicology, additional abuse endured, and skeletal survey findings. Over the 6-year period, 1252 cases were referred to C.A.R.E. Team for drug endangerment. 1150 cases had hair toxicology performed with 595 cases (52%) testing positive for at least one illegal substance. The compound most frequently identified was methamphetamine followed by marijuana and cocaine. In addition to drug endangerment, other forms of abuse were identified in 162 cases including sexual, physical, and neglect. Using the American Academy of Pediatrics (AAP) and American College of Radiology (ACR) guidelines, 340 skeletal surveys were performed. Twelve cases (4%) had occult skeletal injuries none of which had cutaneous findings. Of those with skeletal injury, 11 cases out of 11 tested by hair toxicology were positive for at least one illegal substance. The application of the AAP and ACR guidelines for skeletal survey screening to those children referred for drug endangerment is useful in identifying children with physical abuse.

Lebel, C. A., McMorris, C. A., Kar, P., Ritter, C., Andre, Q., Tortorelli, C., & Gibbard, W. B. (2019). Characterizing adverse prenatal and postnatal experiences in children. *Birth Defects Research, 111*(12), 848-858. <https://doi.org/10.1002/bdr2.1464>

Prenatal and postnatal adversities, including prenatal alcohol exposure (PAE), prenatal exposure to other substances, toxic stress, lack of adequate resources, and postnatal abuse or neglect, often co-occur. These exposures can have cumulative effects, or interact with each other, leading to worse outcomes than single exposures. However, given their complexity and heterogeneity, exposures can be difficult to characterize. Clinical services and research often overlook additional exposures and attribute outcomes solely to one factor. We propose a framework for characterizing adverse prenatal and postnatal exposures and apply it to a cohort of 77 children. Our approach considers type, timing, and frequency to quantify PAE, other prenatal substance exposure, prenatal toxic stress, postnatal threat (harm or threat of harm), and postnatal deprivation (failure to meet basic needs) using a 4-point Likert-type scale. Postnatal deprivation and harm were separated into early (<24 months of age) and late (\geq 24 months) time periods, giving seven exposure variables. Exposures were ascertained via health records, child welfare records, interviews with birth parents, caregivers, and/or close family/friends. Nearly all children had co-occurring prenatal exposures, and two-thirds had both prenatal and postnatal adversities. Children with high PAE were more likely to experience late postnatal adversities, and children with other prenatal substance exposure were more likely to have early postnatal deprivation. Postnatal adversities were more likely to co-occur. This framework provides a comprehensive picture of a child's adverse exposures, which can inform assessment and intervention approaches and policy and will be useful for future research.

Meays, B. M., Simpson, J. L., Ramos, A. K., Bevins, R. A., Carlo, G., & Grant, K. M. (2019). Children exposed to methamphetamine in settings where the drug is being used. *Children and Youth Services Review, 104*. <https://doi.org/10.1016/j.chilyouth.2019.104393>

While children's exposure to methamphetamine is well described in settings where methamphetamine is manufactured, little is known about children's exposure to methamphetamine in settings where methamphetamine is used. Methamphetamine-dependent individuals (N = 124) enrolled from substance use disorder treatment sites completed questionnaires, which included queries about children's exposure to methamphetamine. This descriptive study found that nearly one-third of participants reported methamphetamine was stored in rooms where children may be

present, 30% reported children were present when methamphetamine was being used (26% when smoked), and approximately 25% reported children were present when methamphetamine was being sold and/or distributed. Findings from this study emphasize the need to evaluate children who are living in homes where methamphetamine is present such as through a family assessment at the point of initial contact with treatment, criminal justice, or family/child welfare system staff. Employing public health practices to educate adults about the risks that methamphetamine exposure poses to their children may be a useful motivator to promote substance abuse treatment.

Wright, J., Walker, G. S., & Ross, K. E. (2019). [Contamination of homes with methamphetamine: is wipe sampling adequate to determine risk?](https://doi.org/10.3390/ijerph16193568). *International Journal of Environmental Research and Public Health*, 16(19).
<https://doi.org/10.3390/ijerph16193568>

Contamination of domestic dwellings from methamphetamine cooking or smoking is an increasing public health problem in many countries. To evaluate the extent of contamination, sampling generally focusses on the collection of surface wipe samples from walls and other surfaces of a potentially contaminated home. Here, we report the contamination levels of many household materials and items sampled from a home that was suspected to be the premises used to cook methamphetamine, it was then sold, lived in for several years by the new owners and then left unattended for several more years. Although the time since the cooking had taken place was significant (over five years), the levels of contamination were extremely high in both household items that were part of the house when cooking was taking place (blinds, carpets, walls, etc.) and also in articles brought to the house post-cooking (rugs, toys, beds, etc.). Both wipe sampling and analysis of bulk samples indicate that the methamphetamine is not breaking down or being removed and is transferred from contaminated to non-contaminated objects. These results raise questions about the adequacy of characterising contamination and of making decisions about the extent of remediation required based solely on surface wipe samples. Without fully understanding the extent of contamination that is present, not only on surfaces but within the building materials, it is difficult to ensure that the correct and most effective remedial approaches are taken to appropriately determine and address the risks to inhabitants.

Henry, C., Liner-Jigamian, N., Carnochan, S., Taylor, S., & Austin, M. J. (2018). [Parental substance use: How child welfare workers make the case for court intervention](https://doi.org/10.1016/j.chilyouth.2018.07.003). *Children and Youth Services Review*, 93, 69-78. <https://doi.org/10.1016/j.chilyouth.2018.07.003>

Parental substance use (PSU) is a factor in many child welfare cases; however, little is known about how child welfare agencies and their workers make the case to juvenile or family courts that PSU-related acts and omissions are harmful to children. This qualitative data-mining study explores the ways in which child welfare workers draw on child maltreatment statutes, risk assessment tools, and practice guidelines to frame evidence and make the case that PSU is harmful or poses a substantial risk of harm to children. Narrative data were extracted from child welfare court reports located in electronic case records from two California counties. Analysis revealed that workers cited multiple sources and types of evidence to make the case that, due to substance use, parents had failed to protect their children from harm or risk of harm and/or had failed to provide for their children's basic needs. Moreover, workers noted that these failures constituted neglect under California law. In addition, similarities and differences emerged within and across counties in how workers made the case that children were in need of protection, which suggested that state and local policy-practice guidelines influenced the structure of court reports and arguments made for state intervention. Implications for policy and practice are discussed and recommendations for future research are identified.

Calhoun, S., Conner, E., Miller, M., & Messina, N. (2015). [Improving the outcomes of children affected by parental substance abuse: A review of randomized controlled trials](#). *Substance Abuse and Rehabilitation*, 6, 15-24.

Substance abuse is a major public health concern that impacts not just the user but also the user's family. The effect that parental substance abuse has on children has been given substantial attention over the years. Findings from the literature suggest that children of substance-abusing parents have a high risk of developing physical and mental health and behavioral problems. A number of intervention programs have been developed for parents who have a substance abuse problem. There have also been a number of interventions that have been developed for children who have at least one parent with a substance abuse problem. However, it remains unclear how we can best mitigate the negative effects that parental substance abuse has on children due to the scarcity of evaluations that utilize rigorous methodologies such as experimental designs. The

purpose of this study is to review randomized controlled trials of intervention programs targeting parents with substance abuse problems and/or children with at least one parent with a substance abuse problem in order to identify programs that show some promise in improving the behavioral and mental health outcomes of children affected by parental substance abuse. Four randomized controlled trials that met our eligibility criteria were identified using major literature search engines. The findings from this review suggest that interventions that focus on improving parenting practices and family functioning may be effective in reducing problems in children affected by parental substance abuse. However, further research utilizing rigorous methodologies are needed in order to identify other successful interventions that can improve the outcomes of these children long after the intervention has ended.

Lloyd, M. H., & Akin, B. A. (2014). The disparate impact of alcohol, methamphetamine, and other drugs on family reunification. *Children and Youth Services Review, 44*, 72-81.

Parental substance abuse is one of the most prominent reasons that children enter foster care. The relative role of substance type in delaying reunification has remained elusive. This study sought to understand the impact of parental use of alcohol, methamphetamine, other drugs, and poly-substances on reunification rates for children in foster care. The authors used administrative foster care data from a Midwestern state between years 2007 and 2012 to evaluate the unique contribution of each substance use domain. Results suggest that parental methamphetamine use has the most significant impact on the likelihood of reunification, followed by other drugs, and poly-substances. These findings further indicate that children removed due to any parental drug use stay in foster care for an average of 49–156 days longer than their peers. Implications for research and practice are addressed.

Wouldes, T. A., LaGasse, L. L., Huestis, M. A., DellaGrotta, S., Dansereau, L. M., & Lester, B. M. (2014). [Prenatal methamphetamine exposure and neurodevelopmental outcomes in children from 1 to 3 years.](#) *Neurotoxicology and Teratology, 42*, 77-84.

Despite the evidence that women world-wide are using methamphetamine (MA) during pregnancy little is known about the neurodevelopment of their children. The controlled, prospective longitudinal New Zealand (NZ) Infant Development, Environment and Lifestyle (IDEAL) study was carried out in Auckland, NZ. Participants were 103 children exposed to MA prenatally and

107 not exposed. The Mental Developmental Index (MDI) and the Psychomotor Developmental Index (PDI) of the Bayley Scales of Infant Development, Second Edition (BSID-II) measured cognitive and motor performance at ages 1, 2 and 3, and the Peabody Developmental Motor Scale, Second Edition (PDMS-II) measured gross and fine motor performance at 1 and 3. Measures of the child's environment included the Home Observation of Measurement of the Environment and the Maternal Lifestyle Interview. The Substance Use Inventory measured maternal drug use. After controlling for other drug use and contextual factors, prenatal MA exposure was associated with poorer motor performance at 1 and 2 years on the BSID-II. No differences were observed for cognitive development (MDI). Relative to non-MA exposed children, longitudinal scores on the PDI and the gross motor scale of the PDMS-2 were 4.3 and 3.2 points lower, respectively. Being male and of Maori descent predicted lower cognitive scores (MDI) and being male predicted lower fine motor scores (PDMS-2). Prenatal exposure to MA was associated with delayed gross motor development over the first 3 years, but not cognitive development. However, being male and of Maori descent were both associated with poorer cognitive outcomes. Males in general did more poorly on tasks related to fine motor development.

Castaneto, M. S., Barnes, A. J., Scheidweiler, K. B., Schaffer, M., Rogers, K. K., Stewart, D., & Huestis, M. A. (2013). [Identifying methamphetamine exposure in children](#). *Therapeutic drug monitoring*, 35(6).

Methamphetamine (MAMP) use, distribution and manufacture remain a serious public health and safety problem in the United States, and children environmentally exposed to MAMP face a myriad of developmental, social and health risks, including severe abuse and neglect necessitating child protection involvement. It is recommended that drug-endangered children receive medical evaluation and care with documentation of overall physical and mental conditions and have urine drug testing. The primary aim of this study was to determine the best biological matrix to detect MAMP, amphetamine (AMP), methylenedioxymethamphetamine (MDMA), methylenedioxyamphetamine (MDA) and methylenedioxyethylamphetamine (MDEA) in environmentally exposed children. 91 children, environmentally exposed to household MAMP intake, were medically evaluated at the Child and Adolescent Abuse Resource and Evaluation (CAARE) Diagnostic and Treatment Center at the University of California, Davis (UCD) Children's Hospital. MAMP, AMP, MDMA, MDA and MDEA were quantified in urine and oral

fluid (OF) by gas chromatography mass spectrometry (GCMS) and in hair by liquid chromatography tandem mass spectrometry (LCMSMS). Overall drug detection rates in OF, urine and hair were 6.9%, 22.1% and 77.8%, respectively. Seventy children (79%) tested positive for 1 or more drugs in 1 or more matrices. MAMP was the primary analyte detected in all 3 biological matrices. All positive OF (n=5) and 18 of 19 positive urine specimens also had a positive hair test. Hair analysis offered a more sensitive tool for identifying MAMP, AMP and MDMA environmental exposure in children than urine or OF testing. A negative urine, or hair test does not exclude the possibility of drug exposure, but hair testing provided the greatest sensitivity for identifying drug-exposed children.

Twomey, J., LaGasse, L., Derauf, C., Newman, E., Shah, R., Smith, L., ... & Dansereau, L. (2013). [Prenatal methamphetamine exposure, home environment, and primary caregiver risk factors predict child behavioral problems at 5 years.](#) *American Journal of Orthopsychiatry*, 83(1), 64-72.

This study investigated the prospective association between prenatal methamphetamine (MA) exposure and child behavioral problems at 5 years while also examining the home environment at 30 months and several primary caregiver (PC) risk factors. Participants were 97 MA-exposed and 117 comparison children and their PCs enrolled in the Infant Development, Environment and Lifestyle Study. Hypotheses were that child behaviors would be adversely impacted by (a) prenatal MA exposure, (b) home environments that provided less developmental stimulation and emotional responsiveness to the child, and (c) the presence of PC psychological symptoms and other risk factors. Prenatal MA exposure was associated with child externalizing behavioral problems at 5 years. Home environments that were more conducive to meeting children's developmental and emotional needs were associated with fewer internalizing and externalizing behavioral problems. Independent of prenatal MA exposure, PC parenting stress and psychological symptoms were associated with increased child behavioral problems. Findings suggest prenatal MA exposure may contribute to externalizing behavioral problems in early childhood and the importance of considering possible vulnerabilities related to prenatal MA exposure in the context of the child's caregiving environment.

Derauf, C., LaGasse, L. L., Smith, L. M., Newman, E., Shah, R., Neal, C. R., ... & Lester, B. M. (2012). [Prenatal methamphetamine exposure and inhibitory control among young school-age children](#). *The Journal of Pediatrics*, 161(3), 452-459.

To examine the association between prenatal methamphetamine exposure and inhibitory control in 66-month-old children followed since birth in the multicenter, longitudinal Infant Development, Environment, and Lifestyle study. The sample included 137 children with prenatal methamphetamine exposure and 130 comparison children matched for race, birth weight, maternal education, and type of insurance. Inhibitory control, an executive function related to emotional and cognitive control, was assessed using a computerized Stroop-like task developed for young children. Hierarchical linear modeling tested the relationship between the extent of prenatal methamphetamine exposure (heavy, some, or none) and accuracy and reaction time outcomes, adjusting for prenatal exposure to alcohol, tobacco, and marijuana; age; sex; socioeconomic status; caregiver IQ and psychological symptoms; Child Protective Services report of physical or sexual abuse; and site. In adjusted analyses, heavy prenatal methamphetamine exposure was related to reduced accuracy in both the incongruent and mixed conditions on the Stroop-like task. Caregiver psychological symptoms and Child Protective Services report of physical or sexual abuse were associated with reduced accuracy in the incongruent and mixed conditions and in the incongruent conditions, respectively. Heavy prenatal methamphetamine exposure, along with caregiver psychological distress and child maltreatment, are related to subtle deficits in inhibitory control during the early school-age years.

Farst, K., & Bolden, B. B. (2012). Substance-exposed infants and children: Forensic approach. *Clinical Pediatric Emergency Medicine*, 13(3), 221-228.

Infants and children exposed to illicit substances can be harmed directly by hazards in their home environment and indirectly by related issues of poor supervision and interpersonal violence among their caregivers. These children will present to health care providers with clinical symptoms that can be obvious or subtle. This article address the recognition and response to substance-exposed infants and children by reviewing the definition of a substance-exposed infant or child, differences in screening vs confirmatory drug testing modalities, and responses to consider once an infant or child is recognized as substance exposed.

Messina, N., & Jeter, K. (2012). [Parental methamphetamine use and manufacture: Child and familial outcomes.](#) *Journal of Public Child Welfare*, 6(3), 296-312.

The children of methamphetamine (MA) users and manufacturers are at high risk of neglect and abuse and physical harm from exposure to the drug and the chemicals used to produce it. This study is the first to document the epidemiology of children removed from home-based MA labs and their familial outcomes. Analyses are predominantly descriptive for 99 cases of drug-endangered children recorded from 2001–2003 in Los Angeles County. Neglect was substantiated in 93% of the cases; 97% of the cases resulted in child protective services detainment. Eighty percent had a documented medical diagnosis, most often related to exposure to MA manufacture.

Pennar, A. L., Shapiro, A. F., & Krysik, J. (2012). Drug endangered children: Examining children removed from methamphetamine laboratories. *Children and Youth Services Review*, 34(9), 1777-1785.

Children removed from methamphetamine laboratories are a severely understudied population despite the widespread deprivation parental methamphetamine abuse has on children, particularly in homes where methamphetamine is produced. A sample of 144 children removed from their homes during the seizure of methamphetamine laboratories, as part of the Arizona Drug Endangered Children program, was investigated. Results indicate that younger children were more likely to be determined by Child Protective Services as high or moderate risk of further abuse, test positive for methamphetamine, and have maternal alleged perpetrators of abuse. Older children were more likely to be designated low risk for further abuse, test negative for methamphetamine, and have paternal alleged perpetrators of abuse. Results also show that children initially placed in foster care were more likely to remain in foster care at the final assessment than to be living with a parent or kin. These findings have implications for individuals working with children removed from homes with methamphetamine laboratories, and recommendations based on study findings are offered to child and family advocates and interventionists.

Farst, K., Reading Meyer, J. A., Mac Bird, T., James, L., & Robbins, J. M. (2011). Hair drug testing of children suspected of exposure to the manufacture of methamphetamine. *Journal of Forensic and Legal Medicine*, 18(3), 110-114.

This study compares hair color and age in children tested for methamphetamine by hair analysis due to suspicion of exposure to the manufacture of methamphetamine by their caregivers. A retrospective analysis evaluated differences in hair drug testing results of 107 children less than 12 years of age tested due to clinical suspicion of having been exposed to the manufacture of methamphetamine. Results (confirmed by gas chromatography–mass spectroscopy) were compared for differences in likelihood of testing positive in relation to the subject’s age and having light or dark colored hair and reported with crude and adjusted odds ratios with 95% confidence intervals. Of 107 children, 103 had a sufficient hair specimen for analysis. A third (36%) of the study population was less than 3 years of age. Almost half (45%) of the children tested positive for methamphetamine. 15% of the total study population tested positive for methamphetamine in combination with amphetamine indicating some degree of systemic exposure. No children were positive for amphetamine without also being positive for methamphetamine. Children less than 3 years of age were more likely to test positive. Positive hair drug tests for the combination of methamphetamine and amphetamine occurred in children with both light and dark colored hair. Children living in homes where methamphetamine is being manufactured can have drug identified in their hair regardless of hair color. This testing can aid in illuminating the child’s presence in an at-risk environment and a family in need of services.

Moller, M., Koren, G., Karaskov, T., & Garcia-Bournissen, F. (2011). Examining the health and drug exposures among Canadian children residing in drug-producing homes. *The Journal of Pediatrics*, 159(5), 766-770.

Starting in January 2006, children identified by police and the Children’s Aids Society in the York region of Ontario, Canada, were referred to the Motherisk Program at the Hospital for Sick Children for pediatric assessment of their general health and well-being, with specific focus on illicit-drug exposure. We used a standard protocol to collect all available medical and environmental history, conducted physical and neurologic examinations, and collected hair for analysis of illicit drugs. In total, 75 children, at the mean age of 6.5 years, were referred to us after being removed from homes where marijuana was grown (80%) or other operations linked to drug

production were occurring (20%). Overall, rates of health issues in this cohort fell below reference values for Canadian children. Of the hair tests, 32% were positive for illicit substances. In the majority there were no clinical symptoms related to these drugs. The majority of children removed from drug-producing homes were healthy and drug free. Comprehensive evaluations should be performed on a case-by-case basis in order to determine what is ultimately in the best interest of the child.

Roussotte, F. F., Bramen, J. E., Nunez, S. C., Quandt, L. C., Smith, L., O'Connor, M. J., ... & Sowell, E. R. (2011). Abnormal brain activation during working memory in children with prenatal exposure to drugs of abuse: The effects of methamphetamine, alcohol, and polydrug exposure. *Neuroimage*, 54(4), 3067-3075.

Structural and metabolic abnormalities in fronto-striatal structures have been reported in children with prenatal methamphetamine (MA) exposure. The current study was designed to quantify functional alterations to the fronto-striatal circuit in children with prenatal MA exposure using functional magnetic resonance imaging (fMRI). Because many women who use MA during pregnancy also use alcohol, a known teratogen, we examined 50 children (age range 7–15), 19 with prenatal MA exposure, 15 of whom had concomitant prenatal alcohol exposure (the MAA group), 13 with heavy prenatal alcohol but no MA exposure (ALC group), and 18 unexposed controls (CON group). We hypothesized that MA exposed children would demonstrate abnormal brain activation during a visuospatial working memory (WM) “N-Back” task. As predicted, the MAA group showed less activation than the CON group in many brain areas, including the striatum and frontal lobe in the left hemisphere. The ALC group showed less activation than the MAA group in several regions, including the right striatum. We found an inverse correlation between performance and activity in the striatum in both the CON and MAA groups. However, this relationship was significant in the caudate of the CON group but not the MAA group, and in the putamen of the MAA group but not the CON group. These findings suggest that structural damage in the fronto-striatal circuit after prenatal MA exposure leads to decreased recruitment of this circuit during a WM challenge, and raise the possibility that a rewiring of cortico-striatal networks may occur in children with prenatal MA exposure.

Haight, W., Black, J., & Sheridan, K. (2010). [A mental health intervention for rural, foster children from methamphetamine-involved families: Experimental assessment with qualitative elaboration](#). *Children and Youth Services Review*, 32(10), 1446-1457.

The misuse of methamphetamine, a powerful central nervous system stimulant and neurotoxin (Wermuth, 2000; Rawson, Gonzales, & Brethen, 2002; SAMHSA, 1999), is a sizeable and ongoing criminal justice and public health problem across the U.S. (Cretzmeyer, Sarrazin, Huber, Block, & Hall 2003; Hohman, Oliver, & Wright, 2004; National Drug Intelligence Center, 2009); especially in rural areas (Adrian, 2003; F.B.I., 2006; Hutchison & Blakely, 2003; Illinois Criminal Justice Information Authority, 2004; Muskie School of Public Service, 2007). Methamphetamine misuse affects not just individuals, but entire families. Rural law enforcement officers and health, mental health, and child welfare professionals encounter children living in homes where their parents produce and/or misuse methamphetamine (Shillington, Hohman, & Jones, 2002; Haight, Janssen, Black, Kingery, Sheridan & Mulder, 2005). These children are at risk for the development of substance abuse and other mental health disorders (e.g., Haight, Ostler, Black & Kingery, 2009). If untreated or undertreated, these problems could jeopardize children's future well-being and mental health, and perpetuate substance misuse into future generations. Although there are a variety of effective mental health interventions for children, there are challenges to implementing them with rural children from drug-involved families including limited access to services and cultural appropriateness. This paper describes the cultural-adaptation, implementation and impact of an evidence-informed mental health intervention for individual rural children aged 7-17 from methamphetamine-involved families who are in foster care. It also considers the feasibility of the intervention, and its merits for future study.

Haight, W., Marshall, J., Hans, S., Black, J., & Sheridan, K. (2010). [“They mess with me, I mess with them”](#): [Understanding physical aggression in rural girls and boys from methamphetamine-involved families](#). *Children and Youth Services Review*, 32(10), 1223-1234.

This paper examines the mental health, and experiences of physical aggression in school-aged girls and boys from rural families involved with methamphetamine and the child welfare system. The misuse of methamphetamine, a powerful central nervous system stimulant and neurotoxin (Wermuth, 2000; Rawson, Gonzales, & Brethen, 2002; SAMHSA, 2002), is a sizeable and ongoing criminal justice and public health problem across the U.S. (Cretzmeyer, Sarrazin, Huber,

Block, & Hall 2003; Hohman, Oliver, & Wright, 2004). In 2008, methamphetamine lab seizures nation-wide increased for the first time since 2003 (National Drug Intelligence Center, 2009). Methamphetamine misuse may be especially problematic in rural areas (Adrian, 2003; Illinois Criminal Justice Information Authority, 2004; F.B.I., 2006) where adolescents (Hutchison & Blakely, 2003) and young adults (Muskie School of Public Service, 2007) misuse this drug at approximately twice the rate of their urban counterparts.

Ostler, T., Bahar, O. S., & Jessee, A. (2010). Mentalization in children exposed to parental methamphetamine abuse: Relations to children's mental health and behavioral outcomes. *Attachment & Human Development, 12*(3), 193-207.

This study examined the mentalization capabilities of children exposed to parental methamphetamine abuse in relation to symptom underreporting, mental health, and behavioral outcomes. Twenty-six school-aged children in foster care participated in this study. Mentalization was assessed using the My Family Stories Interview (MFSI), a semi-structured interview in which children recalled family stories about a happy, sad or scary and fun time. An established scale of the Trauma Symptom Checklist for Children (TSCC), a self-report measure, provided information on children's symptom underreporting. The Child Behavior Checklist (CBCL), completed by the children's foster caregivers, assessed children's mental health and behavioral outcomes. Children with higher mentalization were significantly less prone to underreport symptoms. These children had fewer mental health problems and were rated by their foster caregivers as more socially competent. The findings underscore that mentalization could be an important protective factor for children who have experienced parental substance abuse.

Watanabe-Galloway, S., Ryan, S., Hansen, K., Hullsiek, B., Muli, V., & Malone, A. C. (2009). Effects of methamphetamine abuse beyond individual users. *Journal of Psychoactive Drugs, 41*(3), 241-248.

Since 1997, the use of methamphetamine as a drug of abuse has been widespread in the United States. While several forms of amphetamine are useful in some areas of medicine, methamphetamine as an abused substance is associated with severe and multifaceted consequences. Problems associated with the abuse of amphetamine and its derivatives such as methamphetamine have been well documented. As the manufacture and use of

methamphetamine across the United States has increased, the impact of methamphetamine abuse has been felt beyond individual users; families as well as communities can be seriously affected. An increase in child neglect and violence as well as a lack of resources for health care, social services, and law enforcement because of methamphetamine abuse have been reported by many communities. This study examines the historical spread of methamphetamine misuse in the United States and the resulting individual, social, and environmental consequences. A public health perspective on family, community, and social aspects is offered, and ideas for future research and policy changes are explored.

Asanbe, C. B., Hall, C., & Bolden, C. D. (2008). The methamphetamine home: Psychological impact on preschoolers in rural Tennessee. *The Journal of Rural Health, 24*(3), 229-235.

A growing number of children reside with methamphetamine-abusing parents in homes where the illicit drug is produced. Yet, the effects of a methamphetamine environment on psychological child outcome are still unknown. To examine whether preschoolers who lived in methamphetamine-producing homes are at increased risk for developing psychological problems. The participants were 58 white children between the ages of 4 and 5 years; 31 with a history of living in methamphetamine-producing homes and 27 children who live in non-methamphetamine producing homes in rural Tennessee. The groups were similar in age, gender, and socioeconomic background. The groups were compared for behavioral and emotional adjustment using the behavior assessment system for children-parent rating scale-preschool (BASC-PRS-P) form. Biological or custodian parents completed a rating on their preschoolers that provided information about the children's pattern of behavior and feelings. Preschoolers from the methamphetamine-producing homes showed more externalizing problems than their peers, but were comparable on internalizing problems. On specific behaviors, the data indicate that preschoolers in the methamphetamine group showed higher aggression symptoms than their peers from non-methamphetamine-producing homes. These findings, if replicated, point to the need for mental health screening when a child is removed from a methamphetamine-producing home.

McGuinness, T. M., & Pollack, D. (2008). Parental methamphetamine abuse and children. *Journal of Pediatric Health Care*, 22(3), 152-158.

Methamphetamine has alluring properties, such as the ability to promote weight loss and wakefulness, and because of its low price and ease of synthesis, methamphetamine abuse is now a nationwide problem in the United States. Unfortunately, the scope of the problem extends beyond adult users to the children of parents who are users. As methamphetamine abuse increases, the consequences of the epidemic pose major health and child welfare concerns. This article describes methamphetamine abuse and the long-term consequences of use, as well as specific nursing interventions to mitigate its effects.

Sprang, G., Staton-Tindall, M., & Clark, J. (2008). Trauma exposure and the drug endangered child. *Journal of Traumatic Stress*, 21(3), 333-339.

This study examines the differences in trauma exposure and the response to those events between drug endangered children (DEC) and non-drug endangered children involved in the child welfare system. This data represents the experiences of 1,127 children randomly selected from the state's child protective service database and represents 20% of all open cases during 2005–2006. Archival data were analyzed to determine the presence of exposure using *DSM-IV-TR* posttraumatic stress disorder (PTSD) Criterion A1, and whether or not the child's response to exposure met PTSD Criterion A2. Results reveal high rates of trauma exposure in the DEC group and indicate that trauma exposure and trauma response did significantly vary across groups. Implications for the assessment and treatment of child welfare-involved children are drawn.

Connell-Carrick, K. (2007). Methamphetamine and the changing face of child welfare: Practice principles for child welfare workers. *Child Welfare*, 86(3), 125-144.

Methamphetamine use and production is changing child welfare practice. Methamphetamine is a significant public health threat (National Institute of Justice, 1999) reaching epidemic proportions (Anglin, Burke, Perrochet, Stamper, & Dawud-Nouris, 2000). The manufacturing of methamphetamine is a serious problem for the child welfare system, yet child welfare has not addressed the needs of children living in homes where methamphetamine is manufactured (U.S. Department of Justice, 2002; DOJ, 2003; Altshuler, 2005). This article presents key issues for child welfare workers related to the use, production, and effects of methamphetamine on children and

families, and identifies practice principles for child welfare workers in order to ensure safety for victims, parents, and workers themselves. (Author abstract.)

Farst, K., Duncan, J. M., Moss, M., Ray, R. M., Kokoska, E., & James, L. P. (2007). Methamphetamine exposure presenting as caustic ingestions in children. *Annals of Emergency Medicine*, 49(3), 341-343.

With the growing prevalence of methamphetamine use and production in home laboratories, children are at risk for injuries resulting from living in a drug-endangered environment. Although the ingestion of household cleaners is usually accidental and not a result of illicit drug use or production, medical providers must be aware of the chemicals associated with methamphetamine and illicit drug production to identify patients harmed in this environment. We present the first reported cases of children harmed by ingesting caustic substances used in the production of methamphetamine in the home.

Grant, P. (2007). Evaluation of children removed from a clandestine methamphetamine laboratory. *Journal of Emergency Nursing*, 33(1), 31-41.

The illicit manufacturing and use of methamphetamine continues to be a significant and growing problem in the United States. Children are often found in homes where this activity is occurring and are affected by it on many levels. This article will provide background information on the manufacturing of methamphetamine, including classes of chemicals involved; hazards inherent to the manufacturing process and its effects on those living in a clandestine laboratory; and the approach to children found in these homes and their medical care. The focus will be on care in the acute settings with the introduction of a protocol for evaluation and follow-up of these patients.

Haight, W., Ostler, T., Black, J., Sheridan, K., & Kingery, L. (2007). A child's-eye view of parent methamphetamine abuse: Implications for helping foster families to succeed. *Children and Youth Services Review*, 29(1), 1-15.

This report focuses on the experiences and perspectives of rural, Midwestern children aged 7–14 years who were involved with the public child welfare system because of their parents' methamphetamine abuse. Eighteen children participated in semi-structured, in-depth interviews focusing on their families of origin. Children reported exposure not only to their parents' and non-

kin adults' methamphetamine and other substance abuse, but to a constellation of activities related to drug use or drug seeking behavior including violence within their homes and other criminal behavior. Children responded to the contexts in which they were reared in a variety of ways including accepting or actively resisting socialization messages that normalized substance abuse. The majority of children described involvement with law enforcement and child welfare as a “sad” and “scary” time in their families. Far from embracing their placement within safe and stable families, many children continued to express sadness, distress and resistance to legal and child welfare interventions even after months in foster care. Implications for facilitating the adjustment of children to foster care and beyond are discussed including providing foster parents with support and information about the contexts in which children have been reared and children's understanding of those contexts in order that they may interpret and respond to challenges that may emerge.

Matteucci, M. J., Auten, J. D., Crowley, B., Combs, D., & Clark, R. F. (2007).

Methamphetamine exposures in young children. *Pediatric Emergency Care*, 23(9), 638-640.

Methamphetamine abuse is reaching epidemic proportions. As this occurs, the likelihood of accidental poisoning in children increases. We sought to evaluate the presentation, treatment, and outcome of pediatric methamphetamine exposures reported to the California Poison Control System. This is a retrospective review of California Poison Control System records for methamphetamine exposure from 2000 through 2004. All charts of patients identified as younger than 6 years were reviewed and abstracted. The charts of 47 children younger than 6 years were identified and reviewed. Three were coded as minor effects, 3 as major effects, and 16 as moderate effects. The remainder of the charts were not evaluated because of no effect (n = 6), unrelated or confirmed nonexposure (n = 3), or unable to follow (n = 16). The most common presenting symptom was agitation (82%), whereas seizures were documented in only 2 cases (9%). Tachycardia was common (mean heart rate, 171 beats/min; confidence interval [CI], 154-187), whereas blood pressure (BP) (mean systolic BP, 120 mm Hg; CI, 104-136; and mean diastolic BP, 70 mm Hg; CI, 51-88) and rectal temperature (mean, 37.4°C; CI, 36.9-37.9) were slightly elevated compared with normal values. Creatinine was documented in 6 cases and noted as normal in all (0.3IU/L; CI, 0.2-0.4), whereas creatine kinase was documented in 3 charts and elevated in all

(mean 1984 IU/L; range, 212-4942 IU/L). Most cases (55%) received benzodiazepines as treatment, although only 2 received activated charcoal. Symptoms persisted for an average of 22 hours (CI, 16.3-27.2). No deaths were reported. In this series of children, methamphetamine exposure was strongly associated with agitation that was successfully treated with benzodiazepines. Tachycardia was common, although hypertension and hyperthermia were not. Laboratory studies were not routinely recorded. The clinical significance of elevated creatine kinase concentrations recorded in 3 children is unclear.

Messina, N., Marinelli-Casey, P., West, K., & Rawson, R. (2007). [Children exposed to methamphetamine use and manufacture](#). *Child Abuse & Neglect*, 38(11), 1872–1883.

[Methamphetamine and child maltreatment](#) (2007). *Virginia Child Protection Newsletter*, 79, 1-6, 19-22.

As methamphetamine use escalates across the country, there are increasing effects on the child welfare system. Communities struggle with how to prevent use of the substance, how to protect children with addicted parents, and how to help parents complete treatment. This article will offer an overview of the challenges and highlight some of the promising practices that practitioners can consider.

Ostler, T., Haight, W., Black, J., Choi, G. Y., Kingery, L., & Sheridan, K. (2007). Case series: Mental health needs and perspectives of rural children reared by parents who abuse methamphetamine. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46(4), 500-507.

This case-based, mixed-methods study was undertaken to understand the perspectives and mental health needs of rural children exposed to parental methamphetamine abuse. Participants were 23 children involved with a state child protective agency because of parental methamphetamine abuse. A semistructured interview provided information on children's perspectives of their families. Information on children's mental health needs was obtained from the Child Behavior Checklist and Trauma Symptom Checklist. Case records and caseworker reports provided information on children's family experiences. Children described emotional pain; few social resources for coping with emotions, problem solving, or talking about their experiences; and

avoidant or passive coping skills. Sixty-five percent of children evidenced significant dissociative or posttraumatic symptoms on standardized assessments; 57% had other significant emotional and behavioral problems. Challenges to understanding children's perspectives included children's perceptions that talking about methamphetamine abuse was taboo and underreporting of significant symptoms on the Trauma Symptom Checklist. The high rate of mental health problems suggests the need for nontraditional strategies for services delivery in rural areas that are targeted toward these vulnerable children. Early identification and treatment of mental health problems should be a priority. Clinicians should be alert to the complexities in assessing children's mental health needs.

Arria, A. M., Derauf, C., Lagasse, L. L., Grant, P., Shah, R., Smith, L., Haning, W., Huestis, M., Strauss, A., Grotta, S. D., Liu, J., & Lester, B. (2006). Methamphetamine and other substance use during pregnancy: Preliminary estimates from the infant development, environment, and lifestyle (IDEAL) study. *Maternal and Child Health Journal, 10*(3), 293-302.

Objectives: Methamphetamine use is a continuing problem in several regions of the United States and yet few studies have focused on pre-natal methamphetamine exposure. The purpose of this study was to estimate the prevalence and correlates of alcohol, tobacco, and other substance use including methamphetamine during pregnancy. **Methods:** The sample consisted of the first 1632 eligible mothers who consented to participate in a large-scale multisite study focused on prenatal methamphetamine exposure. This unselected screening sample included both users and nonusers of alcohol, tobacco, methamphetamine, and other drugs. Substance use was determined by maternal self-report and/or GC/MS confirmation of a positive me-conium screen. **Results:** Overall, 5.2% of women used methamphetamine at some point during their pregnancy. One quarter of the sample smoked tobacco, 22.8% drank alcohol, 6.0% used marijuana, and 1.3% used barbiturates prenatally. Less than 1% of the sample used heroin, benzodiazapenes, and hallucinogens. Multivariate modeling results showed that tobacco smokers and illicit drug users were more likely to be single and less educated, have attended less than 11 prenatal visits, and utilize public financial assistance. **Conclusions:** This is the first large-scale investigation to report the prevalence of methamphetamine use during pregnancy in areas of the United States where methamphetamine is a notable concern. Follow-up research is ongoing to investigate the outcomes associated with prenatal methamphetamine exposure. Given that this research extends and confirms previous findings

showing that high-risk groups of pregnant women can be identified on the basis of basic demographic characteristics, targeted interventions are greatly needed to reduce serious adverse outcomes associated with prenatal alcohol and tobacco use. (Author Abstract)

Lineberry, T. W., & Bostwick, J. M. (2006). Methamphetamine abuse: A perfect storm of complications. *Mayo Clinic Proceedings*, 81(1), 77-84.

Previously restricted primarily to Hawaii and California, methamphetamine abuse has reached epidemic proportions throughout the United States during the past decade, specifically in rural and semirural areas. Particular characteristics of methamphetamine production and use create conditions for a "perfect storm" of medical and social complications. Unlike imported recreational drugs such as heroin and cocaine, methamphetamine can be manufactured locally from commonly available household ingredients according to simple recipes readily available on the Internet. Methamphetamine users and producers are frequently one and the same, resulting in both physical and environmental consequences. Users experience emergent, acute, subacute, and chronic injuries to neurologic, cardiac, pulmonary, dental, and other systems. Producers can sustain life-threatening injuries in the frequent fires and explosions that result when volatile chemicals are combined. Partners and children of producers, as well as unsuspecting first responders to a crisis, are exposed to toxic by-products of methamphetamine manufacture that contaminate the places that serve simultaneously as "lab" and home. From the vantage point of a local emergency department, this article reviews the range of medical and social consequences that radiate from a single hypothetical methamphetamine associated incident. (Author Abstract)

U.S. White House Office of National Drug Control Policy. (2006). [Drug endangered children](#) (DEC).

Children who live at or visit drug-production sites or are present during drug production face a variety of health and safety risks, including inhalation, absorption, or ingestion of toxic chemicals, drugs, or contaminated foods that may result in nausea, chest pain, eye and tissue irritation, chemical burns, and death; fires and explosions; abuse and neglect; and hazardous lifestyle (presence of booby traps, firearms, code violations, poor ventilation). Around the country, Drug

Endangered Children (DEC) programs have been developed to coordinate the efforts of law enforcement, medical services, and child welfare workers to ensure that children found in these environments receive appropriate attention and care. (NCAC Abstract)

Altshuler, S. J. (2005). Drug-endangered children need a collaborative community response. *Child Welfare, 84*(2), 171-190.

The United States is facing an epidemic of the use of methamphetamine drugs. Child welfare has not yet addressed the needs of the children living in so-called "meth homes." These children are endangered not only from the chemicals involved, but also from parental abuse and neglect. Communities are recognizing the need for inter-agency collaboration to address the consequences of this epidemic. Spokane, Washington, has created a Drug-Endangered Children Project, whose mission is to implement a collaborative response among law enforcement, prosecutorial, medical, and social service professionals to the needs of drug-endangered children. This article presents the findings from the evaluation of the first year of the project, including a baseline assessment of the needs of drug-endangered children and the extent of community-based collaboration achieved. This article makes recommendations for future community-based partnerships to improve the well-being of drug-endangered children. (Author Abstract)

Organization of Teratology Information Services. (2005). [Dextroamphetamine/methamphetamine and pregnancy](#).

The best studied problem in babies prenatally exposed to methamphetamines is being born too early and too small. Babies that are born too early can have problems with many of the systems of their body because they have not finished developing. They are at risk for life-long breathing, hearing, vision, and learning problems. Babies that are born too early are more likely to die as infants. There is also some evidence to suggest methamphetamines can increase the chance for sudden infant death syndrome (SIDS), even in babies not born early. There is conflicting evidence on whether methamphetamines increase the chance of birth defects. It is not known whether prenatal exposure to methamphetamines can cause behavioral or intellectual abnormalities in older children. Some studies show children whose mothers used methamphetamines have more trouble in school, and more behavior problems. (NCAC Abstract)

Davies, J. K., & Bledsoe, J. M. (2005). Prenatal alcohol and drug exposures in adoption. *Pediatric Clinics of North America*, 52(5), 1369-1393, vii.

Prenatal alcohol and drug exposures are a significant concern in many domestic and international adoptions. This article addresses the following substance exposures for children: alcohol, opiates, tobacco, marijuana, cocaine, and methamphetamines. For each substance, we re-view the teratogenicity of the exposure and identify the spectrum of neurodevelopmental issues that can present in children exposed to this sub-stance. Diagnosis of the spectrum of fetal alcohol outcomes is also discussed. When possible, we provide country-specific statistics on exposure risks for adopted children.

Chang, L., Smith, L. M., LoPresti, C., Yonekura, M. L., Kuo, J., Walot, I., & Ernst, T. (2004). Smaller subcortical volumes and cognitive deficits in children with prenatal methamphetamine exposure. *Psychiatry Research*, 132(2), 95-106.

The purpose of this pilot study was to examine possible neurotoxic effects of prenatal methamphetamine (Meth) exposure on the developing brain and on cognition. Meth-exposed children (n=13) and unexposed control subjects (n=15) were evaluated with MRI. Global brain volumes and regional brain structures were quantified. Ten Meth-exposed and nine unexposed children also completed neurocognitive assessments. Meth-exposed children scored lower on measures of visual motor integration, attention, verbal memory and long-term spatial memory. There were no differences among the groups in motor skills, short delay spatial memory or measures of non-verbal intelligence. Despite comparable whole brain volumes in each group, the Meth-exposed children had smaller putamen bilaterally (-17.7%), smaller globus pallidus (left: -27%, right: 30%), smaller hippocampus volumes (left: -19%, right: -20%) and a trend for a smaller caudate bilaterally (-13%). The reduction in these brain structures correlated with poorer performance on sustained attention and delayed verbal memory. No group differences in volumes were noted in the thalamus, midbrain or the cerebellum. In summary, compared with the control group, children exposed to Meth prenatally exhibit smaller subcortical volumes and associated neurocognitive deficits. These preliminary findings suggest prenatal Meth exposure may be neurotoxic to the developing brain. (Author Abstract)

Hohman, M., Oliver, R., & Wright, W. (2004). Methamphetamine abuse and manufacture: The child welfare response. *Social Work, 49*(3), 373-381.

Methamphetamine abuse is on the rise, particularly by women of childbearing age. This article describes the history and effects of methamphetamine use. The authors examine the ways exposure to the manufacture of this drug affects clients and social workers in the course of their work. Because children are frequently found at the scene of a manufacturing laboratory, the child welfare system often becomes involved, and child protective services and other social work agencies need protocols to address the needs of the children and their parents, as well as those of the legal system. In 1997 California created and implemented drug-endangered children's units in seven counties to address the needs of children from families that manufacture methamphetamine; these units involve collaborative efforts among child protective workers, district attorneys, physicians, and police officers. A case example provides information about the role of social workers and their collaboration with these multiple systems. (Author Abstract)

Chomchai, C., Na Manorom, N., Watanarungsan, P., Yossuck, P., & Chomchai, S. (2004). Methamphetamine abuse during pregnancy and its health impact on neonates born at Siriraj Hospital, Bangkok, Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health, 35*(1), 228-231.

To ascertain the impact of intrauterine methamphetamine exposure on the overall health of newborn infants at Siriraj Hospital, Bangkok, Thailand, birth records of somatic growth parameters and neonatal withdrawal symptoms of 47 infants born to methamphetamine-abusing women during January 2001 to December 2001 were compared to 49 newborns whose mothers did not use methamphetamines during pregnancy. The data on somatic growth was analyzed using linear regression and multiple linear regression. The association between methamphetamine use and withdrawal symptoms was analyzed using the chi-square. Home visitation and maternal interview records were reviewed in order to assess for child-rearing attitude, and psychosocial parameters. Infants of methamphetamine-abusing mothers were found to have a significantly smaller gestational age-adjusted head circumference (regression coefficient = -1.458, $p < 0.001$) and birth weight (regression coefficient = -217.9, $p < \text{or} = 0.001$) measurements. Methamphetamine exposure was also associated with symptoms of agitation (5/47), vomiting (11/47) and tachypnea (12/47) when compared to the non-exposed group ($p < \text{or} = 0.001$). Maternal interviews were

conducted in 23 cases and showed that: 96% of the cases had inadequate prenatal care (<5 visits), 48% had at least one parent involved in prostitution, 39% of the mothers were unwilling to take their children home, and government or non-government support were provided in only 30% of the cases. In utero methamphetamine exposure has been shown to adversely affect somatic growth of newborns and cause a variety of withdrawal-like symptoms. These infants are also psychosocially disadvantaged and are at greater risk for abuse and neglect. (Author Abstract)

Sanchez, D. R., & Harrison, B. (2004). [The methamphetamine menace](#). National Conference of State Legislatures. *Legisbrief*, 12(1), 1-2.

Methamphetamine is highly explosive during the manufacturing process. Exposure to the drug and the toxic substances used to make it also pose serious health risks to children. Parental addiction can be devastating for children. Ten percent of users indicated that they were introduced to meth by their parents or other family members. A growing number of states have enacted legislation to address these problems. (NCAC Abstract)

Smith, L., Yonekura, M. L., Wallace, T., Berman, N., Kuo, J., & Berkowitz, C. (2003). Effects of prenatal methamphetamine exposure on fetal growth and drug withdrawal symptoms in infants born at term. *Journal of Developmental & Behavioral Pediatrics*, 24(1), 17-23.

To determine fetal growth and the incidence of withdrawal symptoms in term infants exposed to methamphetamine in utero, we retrospectively identified neonates whose mothers used methamphetamine during pregnancy and matched them to unexposed newborns. Exclusion criteria included multiple and term gestations. Although there were no differences in infant growth parameters between the methamphetamine-exposed and methamphetamine-unexposed neonates, methamphetamine exposure through gestation was associated with decreased growth relative to infants exposed only for the first 2 trimesters. In addition, there were significantly more small for gestational age infants in the methamphetamine group compared with the unexposed group. Methamphetamine-exposed infants whose mothers smoked had significantly decreased growth relative to infants exposed to methamphetamine alone. Withdrawal symptoms (as determined by a previously reported scoring system) requiring pharmacologic intervention were observed in 4% of methamphetamine-exposed infants. These preliminary findings indicate that methamphetamine use is associated with growth restriction in infants born at term. (Author Abstract)

Cohen, J. B., Dickow, A., Horner, K., Zwe-ben, J. E., Balabis, J., Vandersloot, D., & Reiber, C. (2003). Abuse and violence history of men and women in treatment for methamphetamine dependence. *American Journal of Addictions, 12*(5), 377-385.

The Methamphetamine Treatment Project offers the opportunity to examine the history of abuse and violence in a sample of 1016 methamphetamine users participating in a multi-site study between 1999-2001. Reporting of abuse and violence was extensive, with 80% of women reporting abuse or violence from a partner. Men were more likely to report experiencing violence from friends and others. A high percent-age of study participants reported a variety of threatening or coercive experiences with their partners. Past and current interpersonal violence is a characteristic of the lifestyles of the majority entering treatment for methamphetamine dependence. (Author Abstract)

Buchi, K. F., Zone, S., Langheinrich, K., & Varner, M. W. (2003). Changing prevalence of prenatal substance abuse in Utah. *Obstetrics & Gynecology, 102*(1), 27-30.

OBJECTIVE: To estimate the current prevalence of prenatal exposure to methamphetamines and other drugs of abuse among infants born in Utah and compare the results with those of a maternal substance abuse prevalence study per-formed in 1991 in the same geographic area. **METHODS:** Thirteen well baby nurseries in calendar year 2000 and six neonatal intensive care units (NICUs) in 2001-2002 collected anonymous meconium samples and associated, but nonidentifiable, demographic data on consecutively born infants. Samples were screened by enzyme immunoassay and confirmed by gas chromatography/mass spectroscopy for methamphetamines, cannabinoids, and benzoylcoagnine. **RESULTS:** Meconium samples were collected from 1202 well baby nursery infants and 317 NICU infants. There were no significant differences in the rates of positivity for methamphetamines (0.6% versus 0.4%) or marijuana (2.9% versus 1.8%) between the 1991 and 2000/2001 studies. Cocaine prevalence declined from 1.1% in 1991 to 0.3% in 2000/2001 ($P = .04$). The prevalence of positivity for any of these three drugs declined over the 10-year period from 4.4% to 2.4% ($P = .02$). The prevalence for positivity for any of these three drugs was higher in the NICUs (4.7%) than in the well baby nurseries (1.9%, $P = .008$). **CONCLUSION:** The rate of drug-positive infants declined during the decade of the 1990s in a geographic area that is experiencing a sharp rise in the use of methamphetamine among women of childbearing age. Further studies

that focus on women of childbearing age who use methamphetamine may help determine factors that impact their drug use during pregnancy and after the infant is born. (Author Abstract)

Swetlow, K. (2003). [Children at clandestine methamphetamine labs: Helping meth's youngest victims](#). *OVC Bulletin*, NCJ 197590, 1-11.

Children who exposed to the chemicals used for making methamphetamine face acute health and safety risks, including physical, emotional, and sexual abuse and medical neglect. The normal activities of young children increase the likelihood that they will inhale, absorb, or ingest toxic chemicals, drugs, or contaminated food. Their physiological characteristics leave them particularly vulnerable to the effects of toxic chemical exposures. Exposure places infants at increased risk for neurological abnormalities and respiratory problems. Personnel involved in laboratory seizures should include or have ready access to qualified professionals who can respond to the immediate and potential health needs of the children present at these sites. (NCAC Abstract)

U.S. National Drug Intelligence Center (2002). [Children at Risk](#). *U.S. Department of Justice Information Bulletin*, 2002-L0424-001, 1-7.

An increasing number of children in the United States are exposed to toxic chemicals because methamphetamine laboratories are being operated in or near their homes. In addition, these children often are abused or neglected by the parents, guardians, or others who operate these laboratories. The number of children found at seized methamphetamine laboratory sites in the United States more than doubled from 1999 through 2001. Methamphetamine laboratory sites typically contain toxic chemicals and waste as well as finished product and drug paraphernalia. Children who inhabit homes where laboratories are present often inhale dangerous chemical fumes or gases or ingest toxic chemicals or illicit drugs. Exposure to these substances can cause serious short- and long-term health problems, including damage to the brain, liver, kidneys, lungs, eyes, and skin. Children whose parents or guardians produce or abuse methamphetamine also are likely to develop emotional and behavioral problems stemming from abuse or neglect. In addition, inhaling or ingesting toxic substances, such as those present at methamphetamine laboratories may cause cancer or death. This bulletin provides an overview of the problem, rates of exposure, effects

of exposure, information on related abuse and neglect, and strategies to assist children at risk.
(Author Abstract)

Mecham, N., & Melini, J. (2002). Unintentional victims: development of a protocol for the care of children exposed to chemicals at methamphetamine laboratories. *Pediatric Emergency Care, 18*(4), 327-332.

Clinical toxicologic symptoms of methamphetamine exposure in children range from subtle agitation to seizure activity. In addition to the toxic concerns with methamphetamine production it-self, there are many social issues involved that potentially put children from these environments at risk. The binge-and-crash pattern of using this drug makes it difficult for parents who are users to meet even the basic needs of their children. Children are often not properly supervised. Meals may be forgotten for days at a time while the user is on a binge or in a crash. School problems, criminal behavior, and social isolation can develop for these children. Users of methamphetamine often become paranoid, frustrated, or can be hallucinatory. These behaviors can lead to violence against anyone who happens to be nearby; unfortunately, this is often the child in the home. While on a binge, the user can feel a heightened sexual drive. This can lead to sexual abuse, and children in the home are easy and convenient targets. This article describes the protocol developed by the Salt Lake City Police Department Methamphetamine Initiative in collaboration with the Center for Safe and Healthy Families and the State District Attorney's Office. (NCAC Abstract)

Ells, M., Sturgis, B., & Wright, G. (2002). [Behind the drug: The child victims of meth labs.](#) National Center for Prosecution of Child Abuse. *APRI Update, 15*(2), 1-4.

Use of methamphetamine during pregnancy presents stark risks. The effects of methamphetamine on the developing fetus can be severe and life threatening. In addition to direct drug effects, prenatal nutrition and prenatal care may be seriously neglected and the fetus may be exposed to alcohol and other damaging substances. Premature delivery, with all of its complications, is more common with prenatal meth use. After delivery, the infant may show abnormal reflexes and extreme irritability. Meth use has an impact on the user's ability to care for children and increases the possibility of abusive behavior. (NCAC Abstract)

Smith, L. M., Chang, L., Yonekura, M. L., Grob, C., Osborn, D., & Ernst, T. (2001). Brain proton magnetic resonance spectroscopy in children exposed to methamphetamine in utero. *Neurolog.*, 57(2), 255-260.

OBJECTIVE: To examine the possible neurotoxic effects of prenatal methamphetamine exposure on the developing brain using 1H-MRS. **METHODS:** Methamphetamine-exposed children (n = 12) and age-matched unexposed control subjects (n = 14) were evaluated with MRI, localized 1H-MRS, and a Child Behavior Checklist. Metabolite concentrations of N-acetyl-containing compounds (NA), total creatine (Cr), choline-containing compounds, myoinositol, and glutamate + glutamine were measured in the frontal white matter and striatum. **RESULTS:** Despite an absence of visible structural abnormalities in either group, children exposed to methamphetamine in utero had higher [Cr] (+10%, p = 0.02) in the striatum. [NA], primarily a measure of N-acetylaspartate, was normal in both regions, which suggests no significant neuronal loss or damage in the two brain regions examined. There were no differences in reported behavior problems among the methamphetamine-exposed children relative to the unexposed group. **CONCLUSIONS:** The authors found increased [Cr] in the striatum with relatively normal [NA] in children exposed to methamphetamine. These findings suggest an abnormality in energy metabolism in the brains of children exposed to methamphetamine in utero. (Author Abstract)

Anglin, M. D., Burke, C., Perrochet, B., Stamper, E., & DawudNoursi, S. (2000). History of the methamphetamine problem. *Journal of Psychoactive Drug*, 32(2), 137-141.

Methamphetamine, called meth, crystal, or speed, is a central nervous system stimulant that can be injected, smoked, snorted, or ingested orally; prolonged use at high levels results in dependence. Methamphetamine (MA) is a derivative of amphetamine, which was widely pre-scribed in the 1950s and 1960s as a medication for depression and obesity, reaching a peak of 31 million prescriptions in the United States in 1967. Until the late 1980s, illicit use and manufacture of MA was endemic to California, but the MA user population has recently broadened in nature and in regional distribution, with increased use occurring in midwestern states. An estimated 4.7 million Americans (2.1% of the U.S. population) have tried MA at some time in their lives. Short- and long-term health effects of MA use include stroke, cardiac arrhythmia, stomach cramps, shaking, anxiety, insomnia, paranoia, hallucinations, and structural changes to the brain. Children of MA abusers are at risk of neglect and abuse, and the use of MA by pregnant women can cause growth

retardation, premature birth, and developmental disorders in neonates and enduring cognitive deficits in children. MA-related deaths and admissions to hospital emergency rooms are increasing. Although inpatient hospitalization may be indicated to treat severe cases of long-term MA dependence, optimum treatment for MA abusers relies on an intensive outpatient setting with three to five visits per week of comprehensive counseling for at least the first three months. The burgeoning problems of increased MA use must be addressed by adequate treatment programs suitable for a variety of user types. (Author Abstract)

Shah, R. Z. (2000). [Second-chance kids: Providing development focused care for drug-exposed infants.](#)

For pregnant women abusing cocaine or other drugs, early and regular prenatal care can provide protection against known complications of pregnancy such as premature birth, abruption of placenta, high blood pressure and fetal death. Both crack cocaine and methamphetamine are stimulants with the potential to cause blood vessel spasms resulting in compromising oxygen and blood supply to fetal brain and other organs vital for future functioning of the child. Treatment plans based upon systematic behavior observations of drug-exposed infants provide effective and developmentally appropriate intervention with successful outcome potential. A team approach of health professionals, parents, early childhood educators and local support network is essential for achieving this goal. (NCAC Abstract)

Stewart, J. L., & Meeker, J. E. (1997). Fetal and infant deaths associated with maternal methamphetamine abuse. *Journal of Analytical Toxicology*, 21(6), 515-517.

Eight cases of fetal and infant death related to maternal methamphetamine abuse are presented. The mean fetal blood concentration of methamphetamine was 0.36 microgram/mL (range, 0.03-1.20 micrograms/mL), and the mean concentration of amphetamine was 0.05 micro-gram/mL (range, 0-0.08 microgram/mL). Both maternal and fetal blood methamphetamine concentrations were obtained in two cases. The maternal and fetal methamphetamine concentrations for these two cases were 0.21 and 0.40 micro-gram/mL and 0.18 and 1.20 micrograms/mL, respectively. The cause of death for each case, as listed by the pathologist, is also discussed. (Author Abstract)

Gospe, S. M., Jr. (1995). Transient cortical blindness in an infant exposed to methamphetamine. *Annals of Emergency Medicine*, 26(3), 380-382.

An 11-month-old boy was brought to the pediatric emergency department for evaluation of acute onset of irritability and involuntary side-to-side turning of the head. Neurologic examination revealed cortical blindness. Toxicologic studies of blood and urine were positive for methamphetamine. The infant's vision and activity returned to normal within 12 hours. The possible mechanisms of this unusual form of amphetamine toxicity are discussed. (Author Abstract)

Catanzarite V. A., & Stein, D. A. (1995). ['Crystal' and pregnancy--methamphetamine-associated maternal deaths](#). *Western Journal of Medicine*, 162(5), 454-457.

The deaths of two pregnant women admitted to hospital were determined to be caused by the effects of methamphetamine abuse. Although the primary discussion concerns the issues surrounding the death of these two women, the effects on the fetus/newborn are also discussed. (NCAC Abstract)

Struthers, J. M., & Hansen, R. L. (1992). Visual recognition memory in drug-exposed infants. *Journal of Developmental and Behavioral Pediatrics*, 13(2), 108-111.

Visual recognition memory testing in high-risk infants has been shown to have significant predictive ability for later cognitive deficits. This study evaluated cognition in infants exposed prenatally to illicit stimulant drugs compared with nonexposed controls with a standardized test of visual recognition, the Fagan Test of Infant Intelligence (FTII). Thirty-six healthy, full-term infants with prenatal exposure to cocaine and/or amphetamines and 26 infants with no drug exposures, matched for race and socioeconomic status, were tested. Average FTII scores were significantly lower and the percentage testing at risk significantly higher in the drug-exposed group (p less than .01). Differences between groups were also noted in behaviors dealing with attention, distractibility, and activity level. These data support recent evidence from longitudinal studies showing that infants exposed to drugs prenatally may be at risk for later subtle neurological abnormalities and suggest these difficulties may be identifiable long before the children reach school age. (Author Abstract)

Little, B. B., Snell, L. M., Gilstrap, L. D., 3rd, & Johnston, W. L. (1990). Patterns of multiple substance abuse during pregnancy: Implications for mother and fetus. *Southern Medical Journal*, 83(5), 507-509, 518.

This paper describes patterns of drug use such as choice of drug, other substances abused, and route of administration in 174 women who reported methamphetamine, cocaine, heroin, or "Ts and blues" abuse during pregnancy. Seventy-five percent (130/174) reported using more than one drug. Other than tobacco, alcohol and cocaine were the drugs most frequently used in combination with other drugs (7% to 53% and 12% to 54% of the time, respectively). The extent of polydrug use observed in this study emphasizes (1) the difficulty in ascribing adverse maternal or fetal health effects to single substances, and (2) the potential for interaction effects due to multiple substance abuse. (Author Abstract)

Dixon, S. D., & Bejar, R. (1989). Echoencephalographic findings in neonates associated with maternal cocaine and methamphetamine use: incidence and clinical correlates. *Journal of Pediatrics*, 115(5 Pt 1), 770-778.

Term neonates (n = 74) exposed antenatally to cocaine, methamphetamine, or cocaine and a narcotic but without any other known perinatal complications were prospectively examined with cranial ultrasonography to detect the presence of central nervous system injury. These studies were compared with those of a drug-free but clinically ill group of infants (n = 87) at risk for hypoxic-ischemic encephalopathy, and with those of infants who were well. Cranial abnormalities were detected by ultrasonography in 35.1% of the drug-exposed infants, similar to the incidence in the infants at risk for hypoxic-ischemic injury (p = 0.7) but significantly greater than the 5.3% incidence of abnormalities in normal infants (p less than 0.001). The lesions in the drug-exposed infants were intraventricular hemorrhage, echodensities known to be associated with necrosis, and cavitory lesions; they were focused in the basal ganglion, frontal lobes, and posterior fossa. The presence of ultrasonographic abnormalities was not predicted by standard neonatal clinical assessment or by other perinatal risk factors pre-sent in the drug-using population. The types of cerebral injury are consistent with those seen in adult cocaine and methamphetamine abusers and are probably related to the vasoconstrictive properties of these drugs. Antenatal exposure to stimulant drugs is associated with significant risk for cerebral injury, even among seemingly normal term neonates. (Author Abstract)

Bost, R. O., Kemp, P., & Hnilica, V. (1989). Tissue distribution of methamphetamine and amphetamine in premature infants. *Journal of Analytical Toxicology*, 13(5), 300-302.

An amphetamine-abusing mother who had taken methamphetamine 5 hours before beginning labor gave birth to twins who died 1 to 2 hours after birth; an autopsy and toxicological examination were performed. The results are consistent with previous findings of premature delivery and retarded intrauterine development. Tissue distribution shows a similar pattern to an earlier reported case, though drug concentrations are about 10 times higher. (Author Abstract)

Dixon, S. D. (1989). [Effects of transplacental exposure to cocaine and methamphetamine on the neonate](#). *Western Journal of Medicine*, 150(4), 436-442.

This article discusses the increasing problem of cocaine and methamphetamine use by pregnant women. Of those exposed to methamphetamine, the author reports that infants with continued exposure were smaller and had feeding difficulty, drowsiness and lassitude lasting several months, and “very slow” development for the six months following release to foster homes. Foster mothers often suspected hearing loss, but none was found, suggesting they were instead observing decreased quality of alertness in those children. (NCAC Abstract)

Little, B. B., Snell, L. M., & Gilstrap, L. C., 3rd. (1988). Methamphetamine abuse during pregnancy: Outcome and fetal effects. *Obstetrics and Gynecology*, 72(4), 541-544.

Methamphetamines are a popular class of recreational drugs sometimes abused by women of childbearing age. The effects of methamphetamine abuse on pregnancy outcome and embryofetal development are not known. In this study, we compared pregnancy and fetal out-come in 52 women who abused methamphetamines with a randomly selected control group of 52 non-drug-abusing women. Body weight, length, and head circumference were significantly decreased in neonates born to mothers who abused methamphetamines during pregnancy. However, the frequency of congenital anomalies was not significantly increased in this group. (Author Abstract)

Oro, A. S., & Dixon, S.D. (1987). Perinatal cocaine and methamphetamine exposure: maternal and neonatal correlates. *Journal of Pediatric*, 111(4), 571-578.

Maternal and neonatal growth, behavior, and physiologic organization were evaluated in 104 mother-infant pairs with positive results of urine toxicology screens. ANOVA comparison of cocaine, methamphetamine, and cocaine plus methamphetamine groups revealed no significant differences in perinatal variables. The Finnegan withdrawal scoring scheme demonstrated that all three groups of infants had altered neonatal behavioral patterns, characterized by abnormal sleep patterns, poor feeding, tremors, and hypertonia. Infants exposed to cocaine or methamphetamine or both were combined and compared with both narcotic-exposed and drug-free mother-infant pairs matched for known maternal risk factors. All drug-exposed groups had significantly higher rates of prematurity and intrauterine growth retardation and smaller head circumferences than did the drug-free comparison group. A significantly higher rate of placental hemorrhage occurred in the cocaine plus methamphetamine group. Stepwise multiple regression analysis assessed the independent contribution of maternal factors; cocaine or methamphetamine was adversely, negatively associated with gestational age, birth weight, length, and occipitofrontal circumference. The increased rate of prematurity, intrauterine growth retardation, and perinatal complications associated with perinatal exposure to cocaine or methamphetamine was greater than that predicted by coexisting risk factors and was consistent with the pharmacologic properties of these drugs. (Author Abstract)