



National Children's Advocacy Center  
Research Library

---

*professional bibliographies series, no. 3*

---

The Impact of Methamphetamine on Children  
A Selected, Annotated Bibliography

*prepared by*

David N. King, Ph.D.

2006

---

*digital knowledge resources for professional excellence*

This publication was supported in part by Grant No. SM 54259-01 from the U.S. Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the U.S. Department of Health and Human Services, Public Health Service, Substance Abuse and Mental Health Services Administration.

Copyright © 2006 National Children's Advocacy Center. All rights reserved.

The Professional Bibliographies Series is a publication of The National Children's Advocacy Center Research Library. Issues in the series are available on our web site at:

<http://www.nationalcac.org/professionals/library/biblio.html>

Recommendations for future bibliographies in the series, or for updates, additions or corrections to current issues, may be addressed to:

Research Library  
National Children's Advocacy Center  
210 Pratt Avenue  
Huntsville, AL 35801

or via e-mail to:

[library@nationalcac.org](mailto:library@nationalcac.org)

#### Recommended Citation

King, D.N. (2006). The impact of methamphetamine on children: A selected, annotated bibliography. (Professional bibliographies series, no. 3) Huntsville, AL: National Children's Advocacy Center.

#### Disclaimer

This bibliography was prepared by the Research Library of the National Children's Advocacy Center for the purpose of research and education, and for the convenience of our readers. NCAC Research Library is not responsible for the availability or content of cited resources. NCAC Research Library does not endorse, warrant or guarantee the information, products, or services described or offered by the authors or organizations whose publications are cited in this bibliography. The NCAC does not warrant or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed in documents cited here. Points of view presented in cited resources are those of the authors, and do not necessarily coincide with those of the National Children's Advocacy Center.

# The Impact of Methamphetamine Use on Children

## A Selected, Annotated Bibliography

### *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 parental use of methamphetamine.

### *Publications*

The items listed here are books, chapters, journal articles and selected Internet documents published in English, 1987-2006. The bibliography does not include theses and dissertations, conference papers, audiovisual materials, or ephemera.

### *Organization*

This bibliography is arranged chronologically, from most recent to oldest publication date. When possible, abstracts that accompanied the original publication are provided. These are designated as Author Abstract. When an original abstract was not available, abstracts were written by the staff of the National Children's Advocacy Center Research Library and are designated NCAC Abstract.

The author welcomes recommendations for publications that might be added to this bibliography.

**2006**

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)

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). *Maternal and Child Health Journal*. 5, 1-10.

Objectives: Methamphetamine use is a continuing problem in several regions of the United States and yet few studies have focused on prenatal 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 meconium 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)

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) [The full text of this publication is accessible via the Internet at the following URL:

[http://www.whitehousedrugpolicy.gov/enforce/drug\\_endangered\\_child.html](http://www.whitehousedrugpolicy.gov/enforce/drug_endangered_child.html) ]

## 2005

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) [This publication is accessible via the Internet at the following URL:

<http://otispregnancy.org/pdf/methamphetamines.pdf> ]

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 review the teratogenicity of the exposure and identify the spectrum of neurodevelopmental issues that can present in children exposed to this substance. Diagnosis of the spectrum of fetal alcohol outcomes is also discussed. When possible, we provide country-specific statistics on exposure risks for adopted children.

## 2004

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 subcorti-

cal 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., Watana-rungsan, 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,  $p < 0.001$ ) 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 ( $p < 0.001$ ). 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 effect 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) [The full text of this publication is accessible on the Internet at the following URL: <http://www.ncsl.org/programs/cj/meth.pdf> ]

## 2003

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., Zweben, 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 percentage 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 performed 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 benzoyllecognine. 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) [The full text of this publication is accessible via the Internet at the following URL: <http://www.ojp.gov/ovc/publications/bulletins/children/197590.pdf> ]

## 2002

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) [The full text of this publication is accessible via the Internet at the following URL: <http://www.usdoj.gov/ndic/pubs1/1466/1466p.pdf> ]

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 itself, 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 Health 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) [The full text of this publication is accessible via the Internet at the following URL: [http://www.ndaa-apri.org/publications/newsletters/update\\_volume\\_15\\_number\\_2\\_2002.html](http://www.ndaa-apri.org/publications/newsletters/update_volume_15_number_2_2002.html) ]

## 2001

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. *Neurology*. 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)

## 2000

Anglin, M. D., Burke, C., Perrochet, B., Stamper, E., & Dawud-Noursi, S. (2000). History of the methamphetamine problem. *Journal of Psychoactive Drugs*. 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 prescribed 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) [The full text of this publication is accessible via the Internet at the following URL:

[http://www.addictionrecov.org/paradigm/P\\_PR\\_S\\_P00/cont\\_shah.htm](http://www.addictionrecov.org/paradigm/P_PR_S_P00/cont_shah.htm) ]

**1997**

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 microgram/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 microgram/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)

**1995**

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) [The full text of this publication is accessible via the Internet at the following URL:

<http://www.pubmedcentral.gov/picrender.fcgi?artid=1022802&blobtype=pdf>

**1992**

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)

**1990**

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)

## 1989

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 present 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 begin-

ning 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) [The full text of this publication is accessible via the Internet at the following URL:

<http://www.pubmedcentral.gov/picrender.fcgi?artid=1026579&blobtype=pdf>

## 1988

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 outcome 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)

**1987**

Oro, A. S., & Dixon, S.D. (1987). Perinatal cocaine and methamphetamine exposure: maternal and neonatal correlates. *Journal of Pediatrics*. 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)