



What the Experts Say

Prenatal Exposure

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WHY IT IS IMPORTANT

The use of alcohol, tobacco, and illicit drugs (cocaine, methamphetamine, marijuana, heroin, opiates) during pregnancy is a risk factor for physiological and neurological problems for the developing fetus.¹ Research suggests that legal drugs (alcohol and tobacco) may cause more harm than illicit drugs.² Estimates from national surveys indicate estimates of alcohol and tobacco use are considerably higher than for illicit drugs.³ Studies have shown that a large percentage of child welfare cases involve parental substance abuse.⁴

WHAT THE EXPERTS SAY

Incidence

Maternal use of alcohol, tobacco, and illicit drugs during pregnancy can result in varying detrimental effects on children, including mild delays, attention or behavior problems, mental retardation (alcohol-related) and, in severe cases, death. Prenatal substance abuse affects a large number of children in the US. According to the *2004 National Survey on Drug Use and Health* (NSDUH), 4.6% of pregnant women aged 15 to 44 reported using illicit drugs. Of those women, 11.2% reported using alcohol and 18% cigarettes.⁵ African-American, pregnant women have a higher rate of substance use than Whites or Hispanics.⁶ An estimated 200 000 children are born annually who were prenatally exposed to drugs.⁷

Polysubstance Abuse

Research over the past 20 to 30 years found adverse developmental outcomes for children exposed to alcohol, drugs, and other toxins in utero; however, much remains unknown about the specific of type of drug, amount of drug, and intensity and duration of the effects to the fetus. This uncertainty is due to the difficulty conducting research into the effects of prenatal exposure.

- Polysubstance use (use of more than one type of drug) makes it difficult to determine exactly which substance or combination of substances causes a specific effect or effects.
- Alcohol and tobacco, both legal drugs with known teratogenic (harmful) on the developing fetus, are not always factored into studies of illegal drugs.

- Mother report on the amount and type of use during pregnancy may over- or underestimate use, polysubstance use, and postnatal risks.

Postnatal environmental risks (e.g. homelessness, single parenthood, maternal and paternal mental illness, poverty, etc.), shown to have serious consequences for children, are not always factored into studies.

Cumulative Risks

In spite of methodological issues in conducting research, the research repeatedly highlights the impact of the postnatal environment on outcomes of children prenatally exposed to alcohol and other drugs.⁸ Research has established the negative effects of multiple risk factors on child behavioral outcomes. The number of risks in early childhood predicts behavior problems in adolescence.⁹ The more risks that present in the lives of young children, the worse the child outcomes and every risk factor that can be reduced matters.

In a 57-month study designed to examine prenatal exposure and cumulative risks (number of risk factors present), Carta⁸ and colleagues found:

- Higher amounts of drug use as reported by the mother during pregnancy correlated with more severe developmental delays in infancy.
- The developmental gap between low exposure and high exposure widened as children got older.
- Higher amounts of drug use during pregnancy corresponded with an increased number of postnatal environmental risk factors.
- When both prenatal exposure and environmental risk factors were present, the effects of the environmental risk factors outweighed the effects of prenatal exposure.
- By 57 months, children with five environmental risk factors were developmentally delayed 8.1 months compared to less than one month for children with no environmental risk factors, indicating that as the cumulative risk increased, the developmental delay worsened.

Addiction

Addiction is a term that describes the compulsive behavior a person continues to do in spite of adverse consequences. By this definition, **babies cannot be addicted to a drug at birth**. Neonatal Narcotic Abstinence Syndrome (NNAS) is a physiological dependence on opiates (heroin, methadone) in utero. NNAS is a serious, but treatable condition – not an addiction. Symptoms of this condition have not been found from prenatal exposure to cocaine or methamphetamine.¹⁰

Reports by the media have misrepresented the issue of prenatal exposure, leading to misunderstanding by the public. In an open letter to the public, David Lewis, M.D., a professor of Medicine and Community Health at Brown University, took issue with radio, television, and newspaper for their use of terms such as “crack babies,” “meth babies,” or

“addicted babies,” emphasizing that children are not born addicted to drugs.¹⁰ Many of the media reports are not based on scientific or medical evidence and such labels stigmatize children. Dr. Lewis urges caution: 1) research on the prenatal effects of methamphetamine is in the early stages and results are often confounded (complicated) by polysubstance use and environmental risk factors; 2) although early studies on prenatal cocaine exposure that elicited the term “crack baby” were based on findings of the first few months of life, it is now known that the early neurological problems typically resolve themselves by the end of the first year and these early, neonatal effects do not paint the child’s lifetime course. Over 20 years of research has not yielded a diagnosis (condition, syndrome, or disorder) that applies to the pejorative term “crack baby.”

The abundance of misinformation about the effects of prenatal exposure to legal and illegal drugs coupled with a lack of information about the effects of environmental risk factors makes it vital teachers are knowledgeable about prenatal exposure and risk factors. Table 1 is a summary of what is currently known regarding prenatal exposure to various drugs.

Table 1. Effects of Prenatal Exposure to Alcohol, Cocaine, Heroin, Marijuana, Methamphetamine (Meth), and Nicotine.

Effects	Alcohol	Cocaine	Heroin	Marijuana	Meth	Nicotine
Decreased birth weight	✓	✓	✓	✓	✓	
Small for gestational age	✓					✓
Mental retardation	✓					
Central nervous system (CNS) problems	✓	✓			✓	
Newborn CNS problems	✓	✓	✓	✓	✓	
Withdrawal	✓		✓			
Physical anomalies	✓	✓		✓	✓	
Respiratory Problems						✓

Alcohol

Alcohol is the leading preventable cause of mental retardation, birth defects, and developmental delays.^{5,11} There is no known safe ‘dose’ for alcohol consumption during pregnancy.⁵ As little as one-half ounce of alcohol per day has been found to have adverse effects on the developing fetus.¹² Alcohol is transported directly to the fetal organs and tissues. Because the fetal liver is under-developed, high concentrations of

alcohol stay in the fetus longer than in the mother, often up to 24 hours. Exposure during early pregnancy presents the greatest risk for serious physical defects in the fetus. Exposure later in the pregnancy increases the risk for neurological and growth deficiencies. Binge drinking (4 or more drinks on one occasion) by the mother is most problematic for the developing fetus. The effects of prenatal alcohol exposure are life-long and may include physical, mental, behavioral, and learning disabilities.

Fetal Alcohol Syndrome (FAS) was recognized in the late 1960s and diagnostic criteria established in 1973.¹¹ In 1981, the U.S. Surgeon General issued a statement regarding the use of alcohol during pregnancy and Congress mandated labels on all alcoholic products to warn of the possible effects to the fetus. Diagnosis of FAS requires documentation of findings in 3 areas: 1) specific facial abnormalities; 2) growth deficiency; and 3) central nervous system (CNS) abnormalities (see Table 2). Diagnosis may or may not include documentation that mother used alcohol.¹¹

Table 2: Fetal Alcohol Syndrome Diagnostic Criteria

Facial Abnormalities	Growth Deficits	CNS Abnormalities
Smooth area about top lip* Thin upper lip* Small eye opening* Flat nasal bridge & midface	Height & weight below 10 th percentile	Head circumference below 10 th percentile Brain abnormalities (seen through MRI) Neurologic (seizures, motor problems) Developmental functioning below expectations for age

*Required for diagnosis

Fetal Alcohol Spectrum Disorders (FASD), a term adopted in 2004 by the National Institutes of Health (NIH), CDC, and SAMHSA, describes a range of prenatal effects when a fetus is exposed to alcohol.¹¹ Although FASD is a permanent condition, it is treatable and manageable with appropriate intervention.⁵ The term Fetal Alcohol Effects (FAE) was discontinued in 1996 and replaced by Alcohol-Related Neurodevelopmental Disorders (ARND) and Alcohol-Related Birth Defects (ARBD) as shown in Table 3.¹¹

Table 3: Terms Used to Describe Prenatal Exposure to Alcohol

Fetal Alcohol Syndrome (FAS)	Most severe form of the disorder; death is the most extreme outcome Medical diagnosis identified by growth deficiencies, abnormal facial features, and central nervous system problems including mental retardation Complications include problems with hearing, vision, learning, memory, communication
Fetal Alcohol Effects (FAE)	Known prenatal exposure Behavioral and cognitive problems Lacks the diagnostic features of FAS

Alcohol-Related Neurodevelopmental Disorder (ARND)	Known prenatal exposure Behavioral or cognitive problems or a combination May have normal IQ May have learning and/or behavioral problems (memory, attention, poor impulse control, poor judgment and reasoning, hyperactivity)
Alcohol Related Birth Defects (ARBD)	Known prenatal exposure Problems with heart, kidneys, bones, and/or hearing

Most people affected by prenatal exposure to alcohol do not have mental retardation and are not diagnosed with FAS. Common interventions for FAS include medical management (reflux, gastrointestinal problems, nutrition, and/or small stature); behavior management and medication for atypical attention deficit-hyperactivity disorder (ADHD); therapy to address communication, motor, and sensory processing deficits.¹³ Table 4 indicates deficits and strengths found in individuals with FASD.⁵

Table 4: Other FASD Deficits and Strengths

Deficits	Strengths
Memory problems	Friendly
Difficulty storing/retrieving information	Likeable
Inconsistent performance (“on/off” days)	Helpful
Inability to predict outcomes or understand consequences	Caring
Impulsivity	Points of insight
Distractibility	Good with younger children
Disorganization	Good with animals
Ability to repeat instructions, but inability to put them into action	Not malicious
Difficulty generalizing rules	
Difficulty with abstractions (judgment, cause and effect, math, money management, time concepts)	
Cognitive processing deficits	
Developmental delays	
Slow auditory pace	

With the exception of FAS, children with FASD are not often identified; therefore, interventions are not initiated. This places children with FASD at higher risk for secondary conditions.¹⁴ By adulthood:

- 90% have mental health problems
- 60% have experienced disruptions in schooling
- 60% have trouble with the criminal justice system
- 58% have been incarcerated

- 50% have displayed inappropriate sexual behavior
- 45% have problems with alcohol and other drugs

Early intervention lessens the negative affects of secondary conditions associated with FASD and allow persons with FASD to lead productive lives. Children with FASD without the visible facial features of FAS and those with higher IQs may still have behavioral, cognitive, and psychological difficulties. Because they appear normal or capable, parents and teachers may assume the child is not trying, or that their unacceptable behavior is purposeful⁵ rather than a condition needing intervention. Special education and a stable home situation with consistent, nurturing parents are protective factors that help FASD children reach their full potential. Interventions should focus on establishing healthy parent-child relationships and enhancing parenting skills to improve parental support of children's physical and social-emotional development.

Cocaine

The brain functioning affected by cocaine in adults include judgment, attention, planning, and decision making. However, no known profile has been identified for prenatal exposure to cocaine. Children with prenatal exposure to cocaine are more likely to be born prematurely, have poor or late prenatal care, and experience fetal distress.¹⁵ At birth, infants exposed to cocaine, especially those with higher levels of cocaine exposure during pregnancy, may have poor ability to suck, have heightened sensitivity to stimuli, be irritable, and have higher risk of sudden infant death syndrome.¹⁶ Problems with self-regulation and difficulties being calmed in infancy are associated with prenatal exposure.¹⁷ In addition, researchers have found elevated levels of creatine (chemical in the brain related to storage and use of energy) in infants prenatally exposed to cocaine as well in adults who formerly used cocaine.¹⁸

In a rigorous review of the research literature, Frank, Augustyn, Knight, Pell, and Zuckerman concluded that, independent of exposure to alcohol, prenatal exposure to cocaine has not been found to be associated with physical growth retardation, language delays, and behavioral concerns that are detectable by standard measures as reported by parents and teachers.¹⁹ The only exception was decreased emotional expressiveness. Early studies did not control for polysubstance abuse and risk factors although most prenatally cocaine-exposed infants are also exposed tobacco, alcohol, and marijuana²⁰ with the heaviest prenatal cocaine users often the heaviest users of other substances.²¹ Recent research suggests that motor problems attributed in early studies to cocaine may reflect heavy prenatal tobacco exposure. Tone abnormalities have been documented in infants exposed to maternal cigarette smoking and cocaine use during pregnancy.²²

Similar to the effects of prenatal alcohol exposure, the short-term neurobehavioral vulnerability in infants exposed prenatally to cocaine may be exacerbated by less than optimal home environments which lead to further deficits.¹⁶ Low birth weight, prematurity, and placement in kinship care (as opposed to staying with mother or placed in supervised foster care) have been found to worsen the effects of prenatal exposure to

cocaine while early intervention was found to mitigate the effects of prenatal exposure, particularly in infants with highest rates of exposure.²³ **The quality of the caregiving environment is the strongest predictor of cognitive performance among 4-year old cocaine-exposed children.** This suggests the importance of parenting/caregiver education in early life.²⁴

Methamphetamine

Methamphetamine is associated with prematurity and placental abruption,²⁵ birth defects such as cardiac defects, cleft lip, and biliary atresia (compromised liver function; may lead to jaundice and cirrhosis)²⁶ and smaller babies, particularly when the mother smokes cigarettes.²⁷ Studying effects of methamphetamine is difficult because 80% of women who report using methamphetamine also report using tobacco and alcohol. When polysubstance use and environmental risks were controlled for, infants exposed to methamphetamine were 3.5 times more likely to be small for gestational age while infants prenatally exposed to tobacco were nearly 2 times more likely to be small-for-gestational age.²⁸

Meth-exposed children have similar abnormalities in creatine levels in frontal white matter as cocaine exposed children, but meth-exposed also have evidence of increased creatine in the basal ganglia.¹⁸ The basal ganglia is the region of the brain responsible for body movement and coordination. Creatine is a compound the body synthesizes (makes) and uses to store energy. Researchers speculate that this chemical alteration may cause abnormal energy metabolism in the brain and affect executive functioning of the brain which may be manifested in aggressive behavior and hyperactivity.¹⁸

Marijuana

Marijuana is the most commonly used illicit drug. Research summarized in the a National Institute on Drug Abuse reports that some children prenatally exposed to marijuana display altered responses to visual stimuli, increased tremulousness, and a high-pitched cry at birth.²⁹ Preschool-aged, marijuana-exposed children perform more poorly on tasks involving sustained attention and memory than non-exposed children do. School-aged children were more likely to exhibit deficits in problem-solving skills, memory, and the ability to remain attentive. However, differences between children of marijuana-using and non-using mothers often disappear when demographic characteristics and other factors are controlled for. At 4 years of age, marijuana-exposure is associated with lower verbal and memory scores. One long-term study³⁰ found increased risk for birth defects associated with marijuana use, including gastrointestinal birth defects. When looking at birth defects that were occurring at higher than the normal rate, researchers found 35% of those with birth defects had been exposed to marijuana, compared to 22% for methamphetamine, and 20% for cocaine. However, this study did not control for prenatal use of the legal drugs tobacco and alcohol. Nonetheless, the results have troubling implications.

Tobacco

Tobacco dependence is common among users of other drugs. Among smokers, 20% use illicit drugs compared to 4% of non-smokers. Among drinkers, 60% of binge drinkers smoke, 20% of moderate drinkers smoke, and 17% of non-drinkers smoke. Among youth, 47% who smoke also use illicit drugs compared to 6% of non-smoking youth and 71% of youth who both drink and smoke also use illicit drugs compared to 3.5% of peers who neither smoked nor drank.³

Recent statistics indicate that 17% of pregnant women are smokers.³ According to the Surgeon General's Report on Health Consequences of Smoking (2004), full-term babies of smokers may look healthy, but they have been found to be born with a range of problems.³¹ Infants of women who smoke are at risk for smaller birth weight and smaller head circumference, premature delivery, sudden infant death (SIDS), narrowed airways and curtailed lung function, oral cleft defects, urinary tract anomalies, respiratory problems, and cognitive delays. Some studies have reported a link between prenatal smoking and early childhood conduct problems but a recent study found those differences disappear when they controlled for parental antisocial behavior, mother's depression, family disadvantage, and genetic influences.^{32,33} This study found mothers who smoked were different from mothers who do not smoke: smokers were more antisocial, had children with fathers who were more antisocial, were more likely to live in poverty, and more likely to be depressed.

After birth, exposure to environmental tobacco smoke (ETS) is associated with exacerbation of asthma, increased frequency of colds and ear infections, and increased risk of sudden infant death syndrome.³⁴ As with other drugs, it is difficult to study children whose only risk factor is prenatal maternal smoking. In most cases, there are confounding factors such as postnatal parental smoking, alcohol and other drugs, and a host of other environmental risk factors.

Opiates and Non-Opiate CNS Depressants

The earliest studies of prenatal exposure to substances of abuse focused on maternal use of opiates. Opiate-exposed infants have a high rate of mortality and prematurity. Prenatal exposure to opiates and CNS depressants results in Neonatal Narcotic Abstinence Syndrome (NNAS). Characteristics of NNAS include hyperirritability, gastrointestinal dysfunction, respiratory distress, fever, sneezing, yawning, tremors, seizures, diarrhea, irritability, decreased birth weight, increased weight loss during early neonatal period, and increased length of stay in the hospital. Symptoms may vary with drug, quantity, frequency, duration of intrauterine exposure, and the timing of the withdrawal (last dose prior to delivery). Infants appear normal behaviorally and physically at birth. Symptoms begin to appear during the first 24 to 48 hours of life but may not appear until days 5 to 10. It may take as long as 4 to 6 months for the infant to fully withdraw after prenatal opiate exposure.⁷ Withdrawal of methadone tends to appear later than heroin. While up to 90% of newborns exposed to narcotics during pregnancy have some symptoms, only 50% to 75% will require treatment for withdrawal. Methadone exposed infants are more likely to need treatment. Treatment of NNAS includes swaddling, frequent small feedings, high calorie formula, observation of sleeping habits, temperature stability, weight gain/loss and change in symptoms.

Intervention

While policy issues have focused primarily on illicit drugs, research provides clear evidence that prenatal exposure to alcohol and tobacco poses the greatest risk to children. Further, it is the postnatal environment that poses the greatest threat to children. This suggests the need to provide early intervention services to address the host of environmental issues affecting children from substance abusing families, including poverty, health, education, literacy, and employment, and substance use.

Studies of interventions with families with parental substance abuse provide guidance for working with children and families.³⁵

- Respect the parents perception of their parenting abilities (“meet them where they are”) while providing opportunities to expand their repertoire of effective parenting skills shown to improve child outcomes.
- Observe parent-child interaction to determine possible areas for parenting education
- Model appropriate interactions and teaching of children
- Facilitate positive parent-child interactions

WHAT YOU CAN DO

Recommendations for working with children and families^{1,13}:

- Have a nonjudgmental discussion to provide parents with accurate information that normalizes expectations for children.
- Discuss possible effects of the various substances.
- Let mothers who are pregnant or planning to be know that there is no safe amount of alcohol for the developing fetus.
- Let fathers know they can help by not drinking around their pregnant partner.
- Share knowledge that many of the effects can be lessened by a nurturing, stable home, consistent care giving, screening, and intervention services.
- Make appropriate referrals for early intervention services to address medical needs (growth, nutrition, medication), clinical issues (motor, language, sensory, and behavior), and educational needs.
- Be aware that parents may be overwhelmed by their child’s special needs.
- Be optimistic about the child’s future.
- Develop a positive and trusting relationship with parents.
- Provide parenting education to establish stable, structured, nurturing environments that supports the child’s development.
- Establish a consistent, predictable routine every day.
- Maintain a calm, quiet environment to avoid overstimulation.

- Plan in advance to avoid rushing; defiance is more likely when under pressure.
- Teach children to recognize their own feelings and feelings of others.
- Teach children social skills.
- Set limits.
- Praise frequently for appropriate behavior.
- Allow sufficient wait time to avoid triggering defiance.
- Avoid settings that may over stimulate a child (too many people, too much noise)
- Limit transitions and provide structure for transitions
- Repeat directions and request
- Use calm colors on walls
- Have a few simple rules
- Have child repeat your requests or directions
- Read aloud and use books with simple pictures
- Teach self care skills
- Encourage positive self-talk
- Break activities into small steps.
- Be aware of self-esteem; redirect or teach without demeaning

Select appropriate tips to give parents information on enhancing child's social-emotional skills and using age appropriate positive discipline techniques (e.g. Calming Down, Feeling Words, Nurturing Family Routines, Redirect).

RESOURCES

US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration:

www.samhsa.gov/

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