United States Sentencing Commission
Public Hearing on Cocaine Sentencing Policy
November 14, 2006

The 2005 National Survey of Drug Use and Health estimates that 3.9% of pregnant women, ages 15-44 years, used illicit drugs (marijuana/hashish, cocaine (including crack), heroin, hallucinogens, inhalants, prescribed-type psychotherapeutics used non-medically) in the past month prior to the survey, statistically the same rate as 2002-2003 data [1]. Marijuana was the most commonly used illicit drug, accounting for approximately 74.2% of current illicit drug use. Twelve percent of pregnant women reported current use of alcohol and 16.6% of pregnant women reported current cigarette (tobacco) use during the same period. These rates of fetal exposure accounted for approximately 159,000 infants with illicit drug exposure versus 496,100 alcohol and 680,600 tobacco-exposed infants.

The majority of individuals who acknowledge cocaine use, 2.4 million (1% of the United States population) used powered cocaine compared to 682,000 (0.3% of United States citizens) who admitted to crack use. These data suggest that the rate of powdered cocaine use is three times that of crack use. In Baltimore City, for instance, less than 5% of the cocaine related emergency department visits were attributable to "crack" [2].

Both forms of cocaine are metabolized into the same chemical compounds, including benzoylecgonine, ecgonine methylester, and norcocaine and are virtually indistinguishable by traditional drug detection methods. There are no scientific studies noted in PubMed, to date, that compare the immediate and long term effects of intrauterine powdered cocaine versus crack exposure on child development. As studies have become more prospective and sophisticated (e.g., adjusting for environmental risk factors), it is apparent that intrauterine cocaine (including "crack") exposure is associated with less risk of adverse health and neurodevelopmental outcomes in the child compared to fetal alcohol and cigarette (tobacco) exposure [3-7;7;8].

Children with intrauterine tobacco exposure have an increased risk of low birth weight (birth weight of less than 2500 grams) [9]. Tobacco exposed infants have a higher incidence of asthma [9]. Neuropsychological test results demonstrate a longitudinal adverse effect of gestational smoking on learning, memory, problem solving, and eye-hand coordination in exposed children [10]. The literature also suggests an association between increased risk of Conduct Disorder and Attention Deficit Hyperactivity Disorder in children with prenatal tobacco exposure [11;12].

Fetal alcohol syndrome (FAS) is one of the leading identifiable and preventable causes of mental retardation and birth defects, occurring in 0.2-1.5 infants per 1,000 live births in the United States [13]. FAS occurs in 30-40% of pregnancies in which women drink heavily (greater than one drink of 1.5 ounces of distilled spirits, 5 ounces of wine or 12 ounces of beer per day). Although there is evidence of a dose response effect of alcohol

on the developing fetus, no safe amount of alcohol consumption during pregnancy has been identified.

FAS is associated with physical characteristics including growth retardation, microcephaly, short palpebral fissures, flat midface, long philtrum, and thin upper lip[13]. Central nervous system anomalies may include agenesis of the corpus callosum and cerebellar hypoplasia[14]. Multiple studies have demonstrated alcohol's neurobehavioral teratogenic effects. Neuropsychological disorders associated with alcohol exposure include Attention Deficit Hyperactivity Disorder, Depression, Suicidal Ideation, Mental Retardation, and Learning Disabilities [5;6;15]. Children with intrauterine alcohol exposure are also at risk for poor motor coordination, social functioning and judgment that may place the child at further risk for poor school performance[5].

The annual U.S. cost of alcohol related disorders ranges from $75 million to $249.7 million [16]. Approximately 60-75% of the cost is attributable to care of individuals with FAS who have mental retardation. An additional estimated $75 million dollars per annum is spent for supervised environments for alcohol-exposed individuals with IQ's in the low average to borderline intellectual range [16].

Children with intrauterine cocaine/polydrug exposure have similar cognitive outcomes as their socio-economically matched peers [4;17]. Subtle effects of cocaine exposure have been noted in language development at 6 and 7 years [18;19]. These effects were not noted at 9 1/2 years of age [18]. Some researchers have reported increased risk of developing externalizing behaviors among boys with intrauterine cocaine exposure [20], while other researchers have failed to find adverse behavioral outcomes [4;21]. Visual attention deficits reported in several studies may place children with cocaine exposure at increased risk of Attention Deficit Hyperactivity Disorder [22;23].

In summary, children with a history of intrauterine illicit drug exposure constitute approximately 3.9% of the populations of infants born each year; the majority of these infants are exposed to marijuana. Of the individuals who report cocaine use, three times as many persons use powdered cocaine compared to crack. Many of the children with intrauterine cocaine exposure have exposure to other drugs including marijuana, alcohol and cigarettes. No studies, to date, have documented the health and neurodevelopmental impact of intrauterine powdered cocaine versus crack exposure. Biologically, the rate of drug distribution based on method of administration varies, however the fetal effects of crack and powdered cocaine, once they pass through the placenta, should be identical. The physical and neurotoxic effects of alcohol exposure are significantly more devastating to the developing fetus than cocaine. The documented intrauterine effects of tobacco exposure are similar to cocaine with regard to deficits in attention, however in addition to the adverse attention effects, children with tobacco exposure are also at increased risk for conduct disorders and decreased intellectual test scores [7;24].

Importantly, children with intrauterine cocaine exposure benefit from interventions that provide support, education, and medical surveillance and treatment services [25;26]. Intrauterine cocaine exposure may be a marker to alert the medical, social services, and

child welfare systems of the increased need for family treatment and intervention. The child with intrauterine cocaine exposure may suffer adverse physical, emotional, and developmental effects more from the lack of a stable consistent nurturing (if the caregiver has ongoing drug dependence issues) caregiving environment than from the actual drug exposure.

There is no evidence of differential effects on the fetus and child up to 9 1/2 years of age from intrauterine crack cocaine exposure versus powdered cocaine exposure. There is no evidence that one form of cocaine is biologically more harmful than the other to the fetus and developing child. Current sentencing invites disparities in the implementation of justice.

Respectfully submitted,

Harolyn M.E. Belcher, M.D., M.H.S.
Associate Professor of Pediatrics
Johns Hopkins School of Medicine
(joint appt). Johns Hopkins Bloomberg School of Public Health
Department of Mental Health
Director of Research
The Kennedy Krieger Institute Family Center

Reference List

1. Substance Abuse and Mental Health Services Administration. Results from the 2005 National Survey on Drug Use and Health: National Finding. DHHS Publication No. SMA 06-4194 ed. Rockville: Office of Applied Studies, Department of Health and Human Services; 2006.

2. Substance Abuse and Mental Health Services Administration. The Drug Abuse Warning Network (DAWN) Report: Highlights from DAWN Baltimore, 2002. Rockville.

3. Frank DA, Augustyn M, Knight WG, et al. Growth, development, and behavior in early childhood following prenatal cocaine exposure: a systematic review. *JAMA* 2001;285:1613-1625.

4. Messinger DS, Bauer CR, Das A, et al. The maternal lifestyle study: cognitive, motor, and behavioral outcomes of cocaine-exposed and opiate-exposed infants through three years of age. *Pediatrics* 2004;113:1677-1685.

5. Streissguth AP, Barr HM, Kogan J, et al. Understanding the Occurrence of Secondary Disabilities in Clients with Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effects (FAE). Seattle: Fetal Alcohol and Drug Unit: University of Washington School of Medicine, Department of Psychiatry and Behavioral Sciences; 1996.

6. Day NL, Leech SL, Richardson GA, et al. Prenatal alcohol exposure predicts continued deficits in offspring size at 14 years of age. *Alcohol Clin Exp Res* 2002;26:1584-1591.

7. Fried PA, Watkinson B, Gray R. Differential effects on cognitive functioning in 13- to 16-year-olds prenatally exposed to cigarettes and marihuana. *Neurotoxicol Teratol* 2003;25:427-436.

8. Fried PA, O'Connell CM, Watkinson B. 60- and 72-month follow-up of children prenatally exposed to marijuana, cigarettes, and alcohol: cognitive and language assessment. *J Dev Behav Pediatr* 1992;13:383-391.

9. Jaakkola JJ, Gissler M. Maternal smoking in pregnancy, fetal development, and childhood asthma. *Am J Public Health* 2004;94:136-140.

10. Cornelius MD, Ryan CM, Day NL, et al. Prenatal tobacco effects on neuropsychological outcomes among preadolescents. *J Dev Behav Pediatr* 2001;22:217-225.

11. Weissman MM, Warner V, Wickramaratne PJ, et al. Maternal smoking during pregnancy and psychopathology in offspring followed to adulthood. *J Am Acad Child Adolesc Psychiatry* 1999;38:892-899.

12. Thapar A, Fowler T, Rice F, et al. Maternal smoking during pregnancy and attention deficit hyperactivity disorder symptoms in offspring. *Am J Psychiatry* 2003;160:1985-1989.

13. Bertrand J, Weber MK, O'Connor M, et al. Fetal Alcohol Syndrome: Guidelines for Referral and Diagnosis. Atlanta: Centers for Disease Control and Prevention; 2004.

14. Riley EP, Mattson SN, Li TK, et al. Neurobehavioral consequences of prenatal alcohol exposure: an international perspective. *Alcohol Clin Exp Res* 2003;27:362-373.

15. Willford JA, Richardson GA, Leech SL, et al. Verbal and visuospatial learning and memory function in children with moderate prenatal alcohol exposure. *Alcohol Clin Exp Res* 2004;28:497-507.

16. Abel EL, Sokol RJ. A revised conservative estimate of the incidence of FAS and its economic impact. *Alcohol Clin Exp Res* 1991;15:514-524.

17. Chasnoff IJ, Anson A, Hatcher R, et al. Prenatal exposure to cocaine and other drugs. Outcome at four to six years. *Ann N Y Acad Sci* 1998;846:314-328.

18. Beeghly M, Frank DA, Rose-Jacobs R, et al. Level of prenatal cocaine exposure and infant-caregiver attachment behavior. *Neurotoxicol Teratol* 2003;25:23-38.

19. Bandstra ES, Vogel AL, Morrow CE, et al. Severity of prenatal cocaine exposure and child language functioning through age seven years: a longitudinal latent growth curve analysis. 39 ed. 2004:25-59.

20. Delaney-Black V, Covington C, Nordstrom B, et al. Prenatal cocaine: quantity of exposure and gender moderation. *J Dev Behav Pediatr* 2004;25:254-263.

21. Accornero VH, Anthony JC, Morrow CE, et al. Prenatal cocaine exposure: an examination of childhood externalizing and internalizing behavior problems at age 7 years. *Epidemiol Psychiatr Soc* 2006;15:20-29.

22. Pulsifer M, Radonovich K., Belcher HME, et al. Intelligence and school readiness in preschool children with prenatal drug exposure. *Clinical Psychology* 2004;10:89-101.

23. Bandstra ES, Morrow CE, Anthony JC, et al. Longitudinal investigation of task persistence and sustained attention in children with prenatal cocaine exposure. *Neurotoxicol Teratol* 2001;23:545-559.

24. Fried PA, Watkinson B, Gray R. Differential effects on cognitive functioning in 9- to 12-year olds prenatally exposed to cigarettes and marihuana. *Neurotoxicol Teratol* 1998;20:293-306.

25. Butz AM, Pulsifer M, Marano N, et al. Effectiveness of a home intervention for perceived child behavioral problems and parenting stress in children with in utero drug exposure. *Arch Pediatr Adolesc Med* 2001;155:1029-1037.

26. Belcher HME, Butz AM, Wallace P, et al. Spectrum of early intervention services for children with intrauterine drug exposure. *Infants and Young Children* 2005;18:2-15.