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Prenatal Exposure to Alcohol and Nicotine: Implications for Special Education

This is the full text of the following paper. One figure has been transposed into tabular format.

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IN THE PAST DECADE, a great deal of media attention has been focused on women who use illicit drugs during pregnancy; this has been particularly true of crack cocaine. However, research suggests that rates of alcohol and tobacco use during pregnancy are far higher than those of cocaine or other illegal drugs (e.g., see Brady, Posner, Lang, & Rosati, 1994; Mathias, 1995; Slotkin, 1998). The literature on maternal alcohol and tobacco use during pregnancy clearly delineates the harmful effects these substances may have on the developing fetus and on the child's subsequent academic, behavioral, social, and emotional development. Accordingly, this module will focus on the substantial body of research regarding prenatal exposure to alcohol and nicotine and on the implications of such exposure for special education.

Prenatal substance exposure has proven to be a complicated issue for researchers and educators alike. For a number of reasons, it is often difficult to determine whether a child has been prenatally exposed to alcohol, nicotine, illegal drugs, or a combination of these substances. For example, women may under-report their use of alcohol and other substances during pregnancy (Ventura, Martin, Curtin, & Mathews, 1997), and there is no single biological marker for fetal exposure to alcohol (Bagheri, Burd, Martsolf, & Klug, 1998; Wekselman, Spiering, Hetteberg, Kenner, & Flandermeyer, 1995). In addition, there is evidence that the effects of prenatal alcohol exposure on infants are under-recognized by physicians, even among infants born to women with a history of alcohol abuse. Stoler and Holmes (1999) note that this under-recognition may be due to doctors' reluctance to label women as substance users or to a lack of training in making such diagnoses. In many instances, it is also difficult to separate the effects of a single substance such as

alcohol from those of polydrug use, which may include tobacco and illegal drugs (Brady et al., 1994), or from other prenatal conditions that may increase the negative effects of prenatal exposure to alcohol, such as maternal under-nutrition (Abel, 1998) or lack of prenatal care (Day, Cottreau, & Richardson, 1993). Finally, it is difficult to separate the effects of prenatal exposure to a given substance from the effects of a child's postnatal environment (Brady et al., 1994; Roebuck, Mattson, & Riley, 1999; Weinberg, 1997).

PRENATAL EXPOSURE TO ALCOHOL

A report on a joint project of the U.S. Department of Health and Human Services and the U.S. Department of Education notes that "although prenatal (illicit) drug exposure has captured a great deal of public attention, prenatal exposure to alcohol is more widespread and has perhaps an even more serious impact" (Brady et al., 1994, p. 1). Research on the level of alcohol exposure needed to cause significant impairment has yielded varying results, but the U.S. Centers for Disease Control and Prevention (CDC) note that "even low to moderate alcohol use has been shown to negatively impact birth outcome, independent of other risk factors" (Ventura et al., 1997, p. 12). There is no known safe level of alcohol consumption during pregnancy (Bagheri et al., 1998; Bauer, 1999). It has been estimated that more than 2.6 million infants are prenatally exposed to alcohol each year in the United States (Gormby & Shiono, 1991). This section reviews a number of large studies that have attempted to estimate the national prevalence of alcohol exposure during pregnancy.

Prevalence of Alcohol Use During Pregnancy

Brady and her colleagues (1994) note that prevalence studies of maternal drinking during pregnancy are subject to a number of limitations. Most hospitals lack protocols for screening pregnant women for alcohol and drug use. Where protocols to exist, they tend to rely on pregnant women's self-reports regarding their alcohol and drug use. Such protocols are of limited use because women are reluctant to admit using alcohol or drugs during pregnancy. In addition to the problems posed by self-report, relatively few researchers have used population-based samples (Mayes, Bornstein, & Zuckerman, as cited in Brady et al., 1994). The studies reported here have generally been population-based and have relied on self-reported data.

The 1988 National Maternal and Infant Health Survey (NMIHS) studied 9,953 women who had given birth to a live infant in 1988. Overall, 45.4 percent of respondents reported drinking alcohol during the three months prior to learning they were pregnant, and 20.7 percent reported continuing to drink after learning they were pregnant. In addition, 16.8 percent reported having three or fewer drinks per month during pregnancy, and 0.6 percent reported that they consumed six or more drinks per week during pregnancy (CDC, 1995).

Respondents who reported drinking at any time during pregnancy were categorized as "prenatal drinkers," while those who reported consuming six or more drinks per week during pregnancy were categorized as "frequent drinkers." The likelihood of drinking during pregnancy increased directly with age and was highest among white, non-Hispanic women. In addition, likelihood of prenatal drinking was higher among women with 16 or more years of education and those with annual household incomes of \$40,000 or more. Prenatal drinking was reported by 38.2 percent of women who smoked more than 10 cigarettes per day, compared with 17.2 percent of women who were nonsmokers. In contrast, "frequent drinking" was more likely among women age 35 or older, those who were members of racial/ethnic minority groups, and those whose household incomes were \$10,000 or less. The likelihood of frequent drinking increased as smoking increased and was more than three times higher

among women who received no prenatal care than among those who did receive prenatal care (CDC, 1995).

Floyd, Decoufle, and Hungerford (1999) used the 1988 NMIHS data set to study women's reported alcohol use during the three months prior to learning they were pregnant. Overall, 45 percent of participants reported drinking during that period, and 5 percent reported consuming six or more drinks per week. In addition, 60 percent of the women who drank reported that they did not learn they were pregnant until after the fourth week of gestation. Once participants realized they were pregnant, many of them stopped drinking altogether; those who continued to drink reported significant reductions in the amount of alcohol they consumed. For example, prior to pregnancy recognition, 56 percent of the women who used alcohol reported consuming less than one drink per week; after pregnancy recognition, 81 percent of drinkers fell into this category. Five percent of all women reported having six or more drinks per week prior to pregnancy recognition, but fewer than 1 percent continued to drink at this level after realizing they were pregnant. Overall, alcohol use dropped from a prevalence rate of 45 percent during the three months prior to pregnancy recognition to 21 percent following pregnancy recognition. Since half of all pregnancies in the United States are unplanned (Forrest, as cited in CDC, 1997), the NMIHS data raise questions about the number of women who consume moderate or even heavy amounts of alcohol during the early stages of an unrecognized pregnancy.

More recently, the National Institute on Drug Abuse (NIDA) studied 2,613 women who gave birth in 1992 (for the National Pregnancy and Health Survey) and found that 18.8 percent of participants consumed alcohol at some point during their pregnancy. Nearly 23 percent of white women reported drinking during pregnancy, compared with 15.8 percent of African American women and 8.7 percent of Hispanic women (Mathias, 1995).

The CDC compared 1991 and 1995 data from the Behavioral Risk Factor Surveillance System (BRFSS), an ongoing, State-based, random-dialed telephone survey of the U.S. population, to determine trends in the prevalence of alcohol use during pregnancy. In 1995, 33,585 women between the ages of 18 and 44 were interviewed by telephone about their alcohol consumption during the previous month; 1,053 respondents, or 4.7 percent, reported being pregnant at the time of the interview. Pregnant women who reported consuming at least one alcoholic drink during the preceding month were categorized as "any drinking," and those who reported consuming an average of seven or more drinks per week or five or more drinks on at least one occasion were classed as "frequent drinking" (CDC, 1997).

In 1995, 16.3 percent of pregnant women reported "any drinking" during the previous month, compared with 12.4 percent in 1991. "Frequent drinking" was approximately four times more common in 1995 than in 1991 (3.5 percent versus 0.8 percent). This difference in the rate of frequent drinking persisted after the researchers controlled for age, race, household income, marital status, employment status, education level, and smoking status (CDC, 1997).

It should be noted that many of the studies described above relied on self-reported data that may be subject to both recall and reporting bias. Despite these limitations, researchers have learned a great deal about alcohol consumption during pregnancy. Studies examining data collected over the past 12 years have suggested that anywhere from 16.3 percent to 45.4 percent of women drink alcohol during pregnancy (CDC, 1995, 1997). In the latter study, 20.7 percent of women reported that they continued to drink after learning that they were pregnant. Variation in reported rates of maternal drinking does not obscure the fact that a significant number of infants are prenatally exposed to alcohol each year. The next section of this module examines

the potential effects of alcohol on the developing fetus, with a particular focus on the implications of such exposure for the field of special education.

Effects of Alcohol Use During Pregnancy

It is well documented that alcohol is teratogenic, or toxic, to a developing fetus, and the effects of maternal alcohol consumption during pregnancy are "potentially devastating" (Wekselman et al., 1995, p. 296). Possible consequences of alcohol consumption during pregnancy include physical birth defects, cognitive or learning problems, attention deficits, behavioral and emotional problems, growth retardation, and the triad of anomalies that comprise fetal alcohol syndrome (FAS). Specific abnormalities are linked to alcohol use at particular times during pregnancy (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 1997). For example, physical birth defects are more likely when alcohol is used in the first trimester, while growth restriction is associated with alcohol use later in pregnancy (Bauer, 1999).

Fetal Alcohol Syndrome and Fetal Alcohol Effects. In 1973, two University of Washington researchers described a condition marked by the co-occurrence of three primary characteristics: growth deficiency, a distinctive pattern of abnormalities primarily observable in the face, and central nervous system (CNS) dysfunction. The researchers named this condition fetal alcohol syndrome (Streissguth et al., 1997). Children who manifest some but not all of the characteristics of FAS, and who were exposed prenatally to alcohol, may be referred to as exhibiting fetal alcohol effects (FAE). FAEs represent the "partial or incomplete expression of alcohol's teratogenic influence on the developing fetus" (Bauer, 1999, p. 97). The full spectrum of characteristics resulting from fetal alcohol exposure may also be referred to as alcohol-related neuro-developmental disorders (ARND) (Institute of Medicine, 1996). The characteristics associated with fetal alcohol exposure are most often observed along a continuum ranging from milder effects to full FAS (NIAAA, 1997).

A 1996 Institute of Medicine report estimates the incidence of full FAS at 0.5 to 3 births per 1,000, with higher rates in some populations. Among heavy drinkers, the rate of FAS occurrence has been placed at 4.3 percent (Abel, 1998). If FAEs are considered, the incidence is much greater. A recent study concluded that the incidence of FAS and other alcohol-related neurodevelopmental disabilities reached almost 1 in 100 live births (Sampson, et al., as cited in Streissguth, Barr, Bookstein, Sampson, & Olson, 1999). In the United States, the incidence of FAS is higher among African Americans and American Indians (CDC, 1996; NIAAA, 1994), in lower socioeconomic classes (NIAA, 1994), and among women who have previously given birth to a child with FAS (NIAAA, 1997).

Cognitive impairment is one characteristic of FAS. FAS is the leading known cause of mental retardation in the United States (Bagheri et al., 1998; Streissguth et al., 1999; Weinberg, 1997). Among all the major causes of mental retardation, FAS alone is completely preventable (Bauer, 1999). In addition to cognitive defects, FAS and FAE are associated with a number of secondary conditions that are related to fetal alcohol exposure. Streissguth and her colleagues (1997) sought to determine the prevalence and range of these conditions in persons diagnosed with FAS or FAE.** The researchers defined primary conditions as "functional deficits that reflect the central nervous system (CNS) dysfunctions inherent in the FAS or FAE diagnosis" (i.e., those that result directly from the teratogenic effects of alcohol on the developing fetus), while secondary conditions were defined as "those that arise after birth and presumably could be ameliorated through better understanding and appropriate interventions" (p. 27). Primary conditions were measured through the use of intelligence, achievement, and adaptive behavior tests; secondary conditions were assessed using a life history questionnaire.

Streissguth and her colleagues (1997) referred to these conditions as "primary and secondary disabilities." To avoid confusion with the term "disabilities" as defined under IDEA, the word "conditions" is used here instead.

Primary Conditions. Of the 473 participants who were assessed for primary conditions, 178 had a diagnosis of FAS, and 295 had a diagnosis of FAE. The 178 participants with a FAS diagnosis had an average IQ of 79 and an average adaptive behavior score/standard score of 61.** On the achievement tests, the average reading score was 78, the average spelling score was 75, and the average mathematics score was 70. The 295 participants with a FAE diagnosis had an average IQ of 90, with a Vineland Adaptive Behavior Scale (VABS) score of 67. Their achievement test scores averaged 84 on reading, 81 on spelling, and 76 on mathematics.

Secondary Conditions. Secondary conditions related to fetal alcohol exposure were assessed in 415 participants with FAS or FAE who ranged in age from 6 to 51. Six main secondary conditions were studied. (See table 1.):

- *Mental health problems*, defined as having any one of a list of mental health problems or as ever having gone to a psychotherapist or counselor for a mental health problem.
- *Disrupted school experiences*, defined as having been suspended or expelled from school or having dropped out of school.
- *Trouble with the law*, defined as ever having been in trouble with the authorities, charged, or convicted of a crime.
- *Confinement*, including inpatient treatment for mental health, alcohol, drug problems, or ever having been incarcerated for a crime.
- *Inappropriate sexual behavior*, defined as having had repeated problems with one or more of ten inappropriate sexual behaviors or ever having been sentenced to a sexual offenders' treatment program.
- *Alcohol/drug problems*, defined as having ever been in treatment for an alcohol or drug problem or as having an alcohol or drug problem.

Male participants had higher rates of disrupted school experience, trouble with the law, and confinement than did female participants. Rates of other secondary conditions generally did not differ significantly by sex (Streissguth et al., 1997).

** Participants were given an age-appropriate IQ test and the Wide Range Achievement Test-Revised (WRAT-R). The Vineland Adaptive Behavior Scale (VABS) was administered to a caregiver or other person who knew the participant well. For both IQ and adaptive behavior, a score of 100 is normal.

Finally, to determine how many persons with FAS or FAE were living independent lives as adults, the researchers evaluated two additional secondary conditions for the 90 participants who were 21 or older. Eighty-three percent of those participants were in dependent living situations, and 79 percent reported problems with employment. Only 7 of the 90 participants aged 21 or older were living independently and did not have employment problems.

Table 1. Secondary Conditions Among Persons with FAS or FAE

<u>Secondary Conditions</u>	<u>Percent</u>
Mental health problems	90
Disrupted school experience	60
Trouble with the law	60
Confinement	50
Inappropriate sexual behavior	50
Alcohol/drug problems	30
Dependent living	80
Employment problems	80

Note: N = 415

Source: Streissguth et al., 1997

An important finding of this study was that, although participants with FAE had less cognitive impairment than those with FAS, they actually had more secondary conditions related to fetal alcohol exposure than did the FAS group. The authors suggest that this difference is partly due to the fact that the FAE group tended to be diagnosed later than the participants who had FAS; early diagnosis appeared to protect participants against the development of secondary conditions. Overall, the authors found that "people with FAS and FAE have an unacceptable level of secondary (conditions) that severely impairs their quality of life and is extremely costly to society" (Streissguth et al., 1997, p. 38).

Weinberg (1997) recommended systematic study of the prevalence of persons with FAS and FAE in specialized settings. The findings of Streissguth and her colleagues (1997) suggested that disproportionate numbers of alcohol-affected individuals have problems with the law. Accordingly, Fast, Conry, and Look (1999) studied the prevalence of FAS and FAE among youth between the ages of 12 and 18 who had pleaded guilty to or been found guilty of committing a criminal offense and had subsequently been remanded for a forensic psychiatric/psychological assessment. Of the 287 young people remanded for evaluation, 67 (23.3 percent) had an alcohol-related diagnosis. The majority (N = 64) were diagnosed with FAE, and three had a diagnosis of FAS. In this sample, the occurrence of FAS was 3 to 10 times the accepted worldwide rate, which the authors cite as 1 to 3 per 1,000 births; the occurrence of FAE was 10 to 40 times the accepted worldwide incidence. The researchers noted that only 3 of the 67 youth with an alcohol-related diagnosis had received such a diagnosis prior to this special assessment, which resulted from an encounter with the juvenile justice system (Fast et al., 1999).

Other Effects of Prenatal Alcohol Exposure

FAS represents the most extreme end of a spectrum of negative effects resulting from prenatal exposure to alcohol (Stoler & Holmes, 1999). The NIAAA reports that "outcome is a function of prenatal doses" (1997, p. 9). Carmichael Olson and her colleagues (1997) note that "effects of lower levels ('doses') of alcohol exposure most often emerge as problems in behavior and adaptive function" (p. 1187). For example, a team of researchers from San Diego State University found that children who were prenatally exposed to alcohol are likely to exhibit many psychosocial and behavioral problems, even if they do not meet criteria for a diagnosis of FAS (Roebuck et al., 1999).

Similarly, in their long-term follow-up study of a birth cohort of approximately 500 children through age 14, ** Streissguth and her colleagues (1999) found attention, memory, and information processing deficits in the alcohol-exposed children that persisted over time. In addition, the researchers reported antisocial and delinquent behaviors, as well as difficulties with classroom learning and behaviors, from school age through age 14. Using the same sample, Carmichael Olson et al. (1997) found a correlation between greater reported prenatal use and increased behavior and learning difficulties during early adolescence. In addition, two maternal drinking patterns -- "binge" drinking and alcohol exposure early in pregnancy -- were associated with greater risk of adolescent behavior and learning problems.

Over the past 25 years, a substantial body of multidisciplinary research has emerged to suggest that prenatal alcohol exposure can have significant physical, behavioral, intellectual, and emotional effects. Many of these effects, particularly mental retardation and behavioral and social deficits such as poor judgment, impulsivity, hyperactivity, and poor social skills, manifest themselves in the classroom and may involve the provision of special education and related services (Thompson & Thompson, 1998).

** The cohort was composed of children whose mothers reported a range of prenatal drinking patterns, including abstinence.

PRENATAL EXPOSURE TO NICOTINE

"The effect of cigarette exposure on the developing fetus may be the most under-rated, at least in public opinion" Eyler and Behnke (1999) note. Tobacco is used worldwide by people of all socioeconomic classes; it is perhaps for this reason that "tobacco use prenatally does not receive the press that crack smoking does" (p. 108). This section of the module discusses prevalence studies of maternal smoking during pregnancy and describes the effects of prenatal nicotine exposure.

Prevalence of Tobacco Use During Pregnancy

The same caveats that apply to prevalence studies of maternal drinking during pregnancy must also be considered in relation to studies of tobacco use. Relatively few studies have attempted to determine the prevalence of this behavior. NIDA's 1992 National Pregnancy and Health Survey reported that 20.4 percent of women smoked during pregnancy. Tobacco use was reported by 24.4 percent of white participants, compared with 19.8 percent of African American women and 5.8 percent of Hispanic women (Mathias, 1995).

A CDC analysis of data reported on the birth certificates of the 3.9 million births that occurred in 1995 found that smoking during pregnancy was reported by 13.9 percent of women giving birth that year.** Patterns of tobacco use during pregnancy differed by race and ethnicity, with non-Hispanic white women aged 18-19 having the highest rate (19 percent). Under the age of 30, smoking rates were considerably higher for non-Hispanic white women than for non-Hispanic black or Hispanic women. However, smoking rates for women aged 30 or older were highest for non-Hispanic black women. Hispanic women, regardless of age, had consistently low smoking rates of 3 percent to 5 percent (Ventura et al., 1997). Table 2 illustrates differences in smoking rates by race, Hispanic origin, and age.

Other publications have noted higher smoking rates; for example, Slotkin (1998) reported that 25 percent of all pregnant women in the United States who smoke continue to smoke after they learn they are pregnant. National Center for Health Statistics data cited by Chomitz, Cheung, and Lieberman (1995) suggest that 20 to 25 percent of American women smoke during pregnancy. The U.S. Department of Health and Human Services (DHHS, 1990) reported that about one-quarter of women who smoke prior to pregnancy stop smoking when they learn they are pregnant; another third reduce their smoking level upon learning they are pregnant. However, as Eyler and Behnke (1999) note, "Most women who smoke have difficulty and rarely accomplish abstaining from tobacco use throughout pregnancy (p. 108).

** In 1995, tobacco use during pregnancy was reported on birth certificates in 46 States, the District of Columbia, and New York City, comprising 80 percent of U.S. births during that year.

Table 1
Percentage of Women Who Smoked During Pregnancy
By Race, Hispanic Origin, and Age

Race/Hispanic Origin	Mother's Age								Ages
	All <15	15-17	18-19	20-24	25-29	30-34	35-39	40-49	
Hispanic	3.3	4.5	4.8	4.5	3.8	4.2	5.0	4.0	4.3
White, Non Hispanic	21.5	27.3	28.6	23.9	14.8	12.0	12.4	10.6	17.1
Black, Non Hispanic	2.4	4.3	5.9	8.8	12.6	16.2	18.2	14.8	10.6

Note: Data collected from birth certificates in 46 States, the District of Columbia, and New York City in 1995, and analyzed by CDC/NCHS.

Source: Ventura et al., 1997

Effects of Tobacco Use During Pregnancy

A number of studies related to prenatal alcohol or illegal drug exposure have used maternal smoking as a covariate and reported significant results related to smoking. Animal studies have also demonstrated the teratogenic effects of nicotine (Slotkin, 1998). It is difficult to separate the effects of prenatal exposure from those of postnatal exposure to second-hand smoke, since, as Eyster and Behnke (1999) state, "It is likely that, when born to a smoking mother, a child will also be reared within a home filled with smoke" (p. 108). Nonetheless, research does suggest that a number of adverse effects are associated with prenatal exposure to nicotine.

Low birth weight, a condition that is responsible for approximately half of all infant deaths, is a characteristic of prenatal nicotine exposure (Bauer, 1999). Chomitz and her colleagues (1995) note that approximately one-fifth of all low birth weight cases could be prevented if women did not smoke during pregnancy. In 1995, 12.2 percent of infants born to women who smoked during pregnancy weighed less than 2,500 grams (5 lb. 8 oz.), compared with 6.8 percent of births to nonsmokers. The risk of low birth weight associated with maternal smoking increases with maternal age. Among women aged 30 and older, the low birth weight rate for births to women who smoked was at least 2.3 times that for births to nonsmokers. The risk of low birth weight also increases with the number of cigarettes smoked (Ventura et al., 1997). Other possible physical effects of maternal smoking during pregnancy include pre-term delivery (Kramer, 1991), perinatal mortality (Slotkin, 1998), increased risk of Sudden Infant Death Syndrome (Schoendorf & Kiely, 1992), and childhood asthma (Weitzman, Gortmaker, Walker, & Sobol, 1990).

Aside from these physical problems, children whose mothers smoke during pregnancy may also develop a number of learning and behavioral problems, many of which may not appear until childhood and adolescence (Slotkin, 1998). For example, Wakschlag and her colleagues (1997) conducted a six-year longitudinal study on the relationship between maternal smoking during pregnancy and conduct disorder. Participants included 177 boys who were aged 7 to 12 at the time of the first assessment. The researchers found that women who smoked were significantly more likely to have a child with a conduct disorder than women who did not smoke during pregnancy. Subsequent logistic regression analysis found that smoking more than half a pack of cigarettes daily during pregnancy remained a significant predictor of conduct disorder even after controlling for socioeconomic status, parental psychopathology, other pregnancy risk factors, and parenting risk factors.

Milberger and her colleagues have published two studies examining a hypothesized link between maternal smoking and attention deficit hyperactivity disorder (ADHD). The first study compared 140 children with a diagnosis of ADHD to 120 children without an attention deficit diagnosis. All participants were white, non-Hispanic boys between the ages of 6 and 17. Twenty-two percent of the boys with ADHD had a history of maternal smoking during pregnancy, compared with 8 percent of the control group. The correlation remained statistically significant after controlling for socioeconomic status, maternal IQ, maternal ADHD, paternal IQ, and paternal ADHD (Milberger, Biederman, Faraone, Chen, & Jones, 1996).

In the second study, Milberger and her colleagues sought to determine whether the association between ADHD and maternal smoking in pregnancy previously seen in boys with ADHD would hold true for their high-risk siblings.** The researchers compared high-risk siblings with siblings of a non-ADHD control group. Fifty-one percent of the siblings in this

study were boys (N=158), 57 percent were siblings of children with ADHD (N=171), and 13 percent had ADHD themselves (N=38). The researchers found that 47 percent of the high-risk siblings with ADHD had a history of maternal smoking during pregnancy (N=15), compared with 24 percent of the siblings without ADHD (N=33). This relationship remained significant after controlling for socioeconomic status, parental IQ, and parental ADHD (Milberger, Biederman, Faraone, & Jones, 1998).

The effects of prenatal nicotine exposure on long-term cognitive development are still unclear. Lassen and Oei (1998) reviewed 16 longitudinal studies that looked at the cognitive effects of prenatal exposure. Twelve of those studies reported significant cognitive deficiencies in children whose mothers smoked during pregnancy. Of the four studies that found no significant cognitive deficits, the pattern of results "reflected subtle deficits in the intellectual function of children associated with maternal smoking during pregnancy" (p. 650). The authors concluded that the long-term effects of prenatal smoking on children's intellectual functioning are difficult to isolate because the majority of studies to date have not controlled for the postnatal effects of passive smoking.

The studies summarized above describe a number of physical and behavioral effects that result from tobacco use during pregnancy. These effects, together with those related to maternal alcohol use during pregnancy, may pose challenges for regular and special educators alike. The next section of this module describes some of the research on service delivery for prenatally exposed children and discusses barriers to effective service provision.

EFFECTIVE SERVICE DELIVERY FOR PRENATALLY EXPOSED CHILDREN

Sinclair (1998) notes that "each (exposed) child must be assessed and educated with particular attention to his or her individual strengths and vulnerabilities" (p. 125). Individualized assessment is one of the practices that practitioners have found helpful in working with exposed children.

Although there is no "typical profile" of a prenatally exposed child, researchers have described several specific behaviors and psychosocial impairments frequently exhibited by these children in the classroom, including:

- Difficulty forming attachments
- Impulsivity
- Impaired social skills
- Extremes of classroom aggression or introversion
- Inability to handle multiple stimuli, and
- Inability to recognize verbal cues (Sinclair, 1998; Sluder, Kinnison, & Cates, 1996/1997)

These special needs and behaviors suggest a number of particular classroom practices that may be useful. For example, researchers have determined that these children need a small, individual workspace that remains unchanged from day to day (Meyer & Morris, 1994; Sluder et al., 1996/1997). Adherence to a routine is also important for many children (Thompson & Thompson, 1998). Smooth transitions between activities allow children to stay focused and reduce the likelihood of extreme mood and behavior swings; thus, practitioners suggest announcing that an activity will end in a specific amount of time so that the children are prepared for change (Sluder et al., 1996/1997; Thompson & Thompson, 1998).

OSEP RESEARCH FINDINGS

In response to the challenges of providing effective special education services to prenatally exposed children, the Office of Special Education Programs (OSEP) currently funds several research and personnel preparation projects intended to improve results for this population. Researchers at the University of Kansas, the University of Minnesota, and the University of South Dakota are collaborating on a longitudinal study of the early elementary school experiences and developmental outcomes of children prenatally exposed to alcohol and drugs. The researchers hypothesized that the effects of prenatal exposure are compounded by environmental risk factors. Accordingly, the study has focused on five such factors: poverty, limited parental education, large family size, minority status, and single parent status. Initial analyses have confirmed that exposure to a greater number of environmental risk factors has increasingly negative effects on development and growth rate. Results from the study will be incorporated into preservice training in graduate coursework and disseminated through publications and conference presentations.

Another OSEP-funded project will provide master's-level preparation to 48 students to serve infants and toddlers with low-incidence disabilities, including FAS, in rural Alaska. The 36-credit, competency-based program will include a two-course distance learning sequence; a summer intensive clinical course and practicum; a six-week clinical study in autism, FAS/FAE, and severe disabilities; and leadership activities in areas of care coordination, consultation, and inservice training.

The Alaska Early Childhood High Incidence Master's Training Program will prepare rural special educators and related services personnel to serve children aged 3 through 6 with disabilities and their families. The program will recruit rural under-represented Alaskan natives and train 48 students, plus an additional 16 who will graduate after the grant period ends, with the skills necessary to provide effective early childhood services. An intensive clinical study and practicum in FAS and FAE is a major component.

In addition to these efforts, OSEP funded the National Early Childhood Technical Assistance System (NECTAS) through a cooperative agreement to produce and distribute a publication entitled *Resources Related to Children and Their Families Affected by Alcohol and Other Drugs* (3rd Edition). This publication includes national training and information resources, state programs and agencies, and Federal and private funding sources, and is available from NECTAS: <http://www.nectas.unc.edu/pubs/publist2.html#resor>

DEPARTMENT OF EDUCATION PARTICIPATION IN OTHER FEDERAL INITIATIVES

A representative of the Office of Special Education and Rehabilitative Services (OSERS) serves as the chairperson of the Fetal Alcohol Syndrome/ Alcohol-Related Neurodevelopmental Disorders (FAS/ARND) Work Group. The purpose of this group is to improve educational interventions and services for children aged birth through 8 with FAS/ARND and their families. The work group reports to the Federal Interagency Coordinating Council and the Interagency Coordinating Committee on Fetal Alcohol Syndrome (ICCFAS) of the NIAAA and the National Institutes of Health (NIH). The goals of the FAS/ARND Work Group include the following:

- Develop methods for the early screening, referral and diagnosis of children with FAS/ARND;

- Clarify the ethical and confidentiality issues involved with screening and assessment in schools and early intervention settings;
- Identify and refine appropriate intervention strategies to effectively serve children with FAS/ARND and their families and to prevent secondary conditions related to fetal alcohol exposure; and
- Collaborate to provide intensive, effective, and ongoing training and technical assistance.

The work group comprises representatives from a number of Federal agencies, including NIAAA, the Department of Education, the CDC, the Substance Abuse and Mental Health Services Administration, Head Start, the Bureau of Indian Affairs, the Indian Health Service, and the Office of Juvenile Justice and Delinquency Prevention. It also includes parents, educational practitioners from the field, and representatives of different advocacy and health groups. Medical and research personnel from the University of Washington, Emory University School of Medicine, and UCLA Neuropsychiatric Institute and Hospital are also members of the work group.

In addition to chairing the FAS/ARND Work Group, OSERS has appointed a representative to the ICFAS. This committee coordinates the efforts of government agencies to address FAS, FAE, ARND, and alcohol-related birth defects. Its mission is to facilitate communication and cooperation among the different disciplines and organizations that address the health, education, developmental disabilities, and social service issues related to these disorders.

SUMMARY

Although the deleterious effects of both alcohol and nicotine on developing fetuses have long been recognized and documented, high numbers of children continue to be prenatally exposed to alcohol and nicotine -- often before their mothers realize they are pregnant. Prenatal exposure to both of these legal substances can result in significant and far-reaching intellectual, behavioral, and emotional effects and thus have particular implications for special education. A 1996 Institute of Medicine report on FAS pointed out the need for research related to early identification and concomitant early intervention services and to the provision of special education and related services. Although it is unclear how many children are prenatally exposed to alcohol and nicotine each year, it is apparent that significant numbers of these children will continue to require special education and related services. Further efforts are necessary in order to better understand the prevalence and scope of the problem, to develop improved assessment and identification methods, and to determine the most effective academic and behavioral interventions for this population of students.

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