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## SUMMARY

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Prenatal exposure to drugs, including cocaine, is a significant and preventable cause of developmental disability. Almost two decades after the nation first heard stories of “crack babies,” new research has shown that children exposed to cocaine before birth are at risk of learning and behavioral problems. Such problems have broad implications for education, social welfare, and criminal justice in the United States.

This report presents an overview of the current state of knowledge regarding the effects of cocaine on the developing brain and offers policy considerations for addressing the issues that arise from cocaine use by pregnant women. Most of the scientific research discussed in the report is derived from a 1997 New York Academy of Sciences conference on “Cocaine: Effects on the Developing Brain,” the proceedings of which have been published as Volume 846 of the *Annals of the New York Academy of Sciences* (Harvey and Kosofsky, 1998). The policy implications discussed here are based on material presented at this conference and on investigations conducted by researchers at RAND.

The report discusses three preventive strategies: primary prevention (preventing substance use before and during pregnancy); secondary prevention (identifying pregnant women who use drugs and minimizing their drug use); and tertiary prevention (reducing the adverse consequences of substance exposure in children who were exposed *in utero*). In addition, a number of areas where more research is needed are discussed and a rationale is offered for making more resources available for women and children affected by cocaine.

## **PRIMARY PREVENTION**

Although the problems of children exposed to cocaine *in utero* are not as severe as was once feared, some cocaine-exposed infants do suffer subtle neurological damage and later have learning and behavioral problems. A number of research studies have reported that children prenatally exposed to cocaine experience reduced fetal growth (e.g., small head size), lower IQ levels, and neurobehavioral symptoms (e.g., attention difficulties). On entering school, many cocaine-exposed children have difficulty in regulating behaviors (e.g., they exhibit inattentiveness and impulsiveness), and this has an adverse effect on academic success and on adaptability and functioning later in life.

Primary prevention—avoiding cocaine and other drug use before and during pregnancy—remains the best approach to preventing exposure. It is important that women who are pregnant or who are at risk for pregnancy be educated about the potential dangers to the fetus from all forms and levels of prenatal exposure to harmful substances, including alcohol, cigarettes, and marijuana, as well as cocaine.

## **SECONDARY PREVENTION**

Many pregnant women receive inadequate prenatal care or none at all, and many physicians are ill prepared to identify substance abuse in pregnant women or to refer the women to treatment. Consequently, most cases of substance abuse among pregnant women come to light at the time of childbirth. Secondary prevention strategies refer to the identification by health-care providers of cocaine use by pregnant women and steps taken to safeguard the health and welfare of the mother as well as to minimize effects of the drug on the fetus. Secondary prevention can have an important impact during pregnancy.

When physicians are trained in exposure-detection techniques and are confident in their ability to manage maternal and prenatal substance exposure, the potential for minimizing drug use and subsequent damage to the fetus is increased. A RAND survey of obstetricians and pediatricians revealed that training had a significant

impact on a physician's ability to detect and follow up on signs and symptoms of substance use.

Although many states have enacted legislation requiring physicians to report cases of drug abuse during pregnancy, one-fifth of the physicians surveyed in the RAND study were not aware of their state's or their hospital's policies regarding reporting and follow-up procedures. Physicians' awareness of institutional and legal requirements was found to be associated with a greater propensity on the part of physicians to report drug abuse.

Most state-mandated policies and hospital protocols rely on the physician to take specific actions. Therefore, physicians should be involved in the design and implementation of such policies, and the protocols should be responsive to physicians' ethical and personal concerns. Additionally, direct incentives should be provided to hospitals to design protocols for substance-abuse reporting by health-care providers. Finally, substance-abuse information should be used only for helping the woman and the fetus; it should not be used for prosecution of the woman. The goal of detection and reporting policies should be to provide counseling, education, and treatment, not to punish or stigmatize.

Secondary prevention strategies aimed at health-care providers should include (1) education and training in substance-abuse detection techniques, (2) education about state and institutional protocols for reporting prenatal substance exposure, and (3) involvement of physicians in designing and implementing the protocols.

### **TERTIARY PREVENTION**

Although research has shown that *in utero* cocaine exposure leads to subtle neurological changes and is associated with learning and behavioral problems that manifest in childhood, cocaine exposure does not affect all children equally, and a number of environmental (e.g., home environment), biological (e.g., adaptability), and other factors (e.g., malnutrition) also have an impact on the children's outcomes. In addition, very little is known about the long-term effects of prenatal cocaine exposure. More research is required to enable health-care providers to identify at-risk children, to understand the nature of their deficits, and to intervene on their behalf.

## **RESEARCH ON THE EFFECTS OF COCAINE ON THE DEVELOPING BRAIN**

This report discusses three major areas where more research is needed: (1) the specific action of cocaine on the developing brain and its manifestations in infants and children; (2) the role of environmental and other factors; and (3) community and educational interventions.

### **Specific Action of Cocaine on the Developing Brain and Subsequent Manifestations**

Animal and human studies indicate that gestational exposure to cocaine interferes with the growth and development of the brain, but the precise way in which these structural changes cause cognitive or behavioral deficits is not yet clear. Moreover, not all children exposed to cocaine *in utero* suffer neurobehavioral injuries, and those who are affected exhibit a range of neurobehavioral effects. It appears that the brain has compensatory mechanisms to provide relief from the effects of prenatal exposure to cocaine, but these mechanisms have their limits and may break down under stress in some children.

The general IQ and neurobehavioral tests now used to assess children who were prenatally exposed to cocaine may not be appropriate. The identification of specific clinical markers for neural injury from prenatal cocaine exposure would help to determine which populations of children are at risk and would aid in the development of appropriate interventions.

More research is needed on (1) the neurobiologic specificity of cocaine's action in the developing human brain; (2) the identification of compensatory mechanisms in the developing brain that may overcome effects of cocaine-induced changes; (3) the relationship between cocaine exposure and limits of adaptability in response to stress; (4) the identification of clinical markers for prenatal cocaine exposure that can be used in early infancy; and (5) the development, refinement, and validation of tests that are specific for the neurological, behavioral, and cognitive impacts of cocaine in children.

### **The Role of the Environment and Other Factors**

The range of outcomes reported in cocaine-exposed children may result partly from factors other than, or interactive with, cocaine exposure *in utero*. These factors include multiple drug abuse, smoking, malnutrition, and unstable and stressful family life. Several studies are currently attempting to tease out the relative contribution of the various factors, but much more work needs to be done.

### **Community and Educational Interventions for At-Risk Children**

There is relatively little information on community-based interventions directed at children prenatally exposed to cocaine. Because the effects of prenatal cocaine exposure go beyond cognitive and medical needs and children prenatally exposed to cocaine very often have a host of other difficulties, it is critical that health-care providers work in tandem with other service providers. Community-based research should be undertaken to determine the best treatment and education interventions for dealing with the effects of prenatal cocaine exposure, and providers who work with children who have been prenatally exposed to cocaine should be educated about and aware of all community resources and services.

### **RESOURCES FOR WOMEN AND CHILDREN: AN URGENT NEED**

The effects of cocaine on the developing fetus are actively being investigated, but the results of such research are not likely to be available for some time. In the interim, sufficient warning signs exist to warrant immediate interventions at multiple levels to help cocaine-using women and their children. Such interventions are needed to reduce both the adverse health outcomes and the social costs of prenatal substance exposure.

Helping children requires a community response that involves not only health-care professionals but also a broad array of interconnected service providers who can offer the necessary diversity of expertise.

Substance-abusing women of childbearing age need every opportunity to receive treatment and other services that will help them make reasonable decisions related to their pregnancy and to caring for their children. These services should be comprehensive, also addressing problems such as poverty, homelessness, and psychiatric disorders, which often accompany cocaine use.

Resources for women and children are urgently needed. It is recommended that (1) comprehensive substance-abuse treatment services be made available to women of childbearing age; (2) treatment programs for children prenatally exposed to cocaine be implemented and operated within a framework that considers the children's home environments and offers a community response in which all service providers work together; and (3) training in serving mothers and their cocaine-exposed children be mandated for all relevant health-care providers in the community.