



Perinatal Substance Use Screening in California

Screening and Assessment with the *4P's Plus*® Screen for Substance Use in Pregnancy

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This publication is based on a consolidation of data and analysis that was funded by the Maternal, Child and Adolescent Health Program, California Department of Public Health. The data described in this report were provided by the participating California counties and were analyzed by the research staff of *NTI Upstream*. This report and its statements are products of *NTI Upstream*.

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Acknowledgements

The development and implementation of the screening, assessment, referral, and treatment (*SART*) systems, upon which the data in this report are based, were funded by the individual participating California counties. Funding for the analysis of the cumulative cross-county dataset was provided by the Maternal, Child and Adolescent Health Program, California Department of Public Health.

The authors express their gratitude to the following individuals who provided the leadership necessary at the county level to make the *SART* system a success and to broaden our understanding of the best approaches to identifying and intervening in pregnancies affected by alcohol, tobacco, and illicit drugs:

Alameda County	Dani Taylor Lynn Chung Janet Brown
Alpine County	Shelly Taplin
Butte County	Insu Hyams Alice Kienzle
El Dorado County	Phyllis Goldie
Fresno County	Connie Woodman Laurie Misaki Sandra Arakelian Judith Calvo-Gonzales
Humboldt County	Susan Buckley
Lassen County	Laura Roberts
Madera County	Anita Jensen
Mendocino County	Linda Nagel
Riverside County	Sue Spooner Diane Ewing
San Bernardino County	Bruce Smith Evelyn Trevino Andrea Rodriguez Disep Ojukwu
San Luis Obispo County	Jan Campbell

Santa Cruz County	Lynn McKibbin
Shasta County	Romi Uribe
Solano County	Nancy Calvo Jaylean Richards
Ventura County	Diane Viscencio Lois Manning

The authors also extend their thanks to the research assistants at *NTI Upstream*, who pored over data sheets, entered what seemed like endless streams of data, conducted analyses, and provided clerical support for the production of this report: Jeff Sieracki and Christine McCuen.

“Physicians have an ethical obligation to learn and use techniques for universal screening questions, brief intervention, and referral to treatment in order to provide patients and their families with medical care that is state-of-the-art, comprehensive, and effective.”

*American College of Obstetricians and Gynecologists
Committee on Ethics
American Journal of Obstetrics and Gynecology
May 2004*

Prologue

In *Working in Partnership, Needs and Opportunities for Improving Perinatal Substance Abuse Services in California, July 2002*, the California Conference of Local Directors of Maternal, Child and Adolescent Health, now Maternal, Child and Adolescent Health (MCAH) Action, indicated that at least 15 county MCAH programs had identified perinatal substance use as a top-ranked priority in developing their state-mandated five-year plans. The most recent 2005 Title V Block Grant Five-Year Needs Assessment by the state MCAH program showed that 29 county MCAH programs identified perinatal substance use as a priority. Based on the results from local health jurisdiction (LHJ) needs assessment reports, input from external stakeholders and program staff, assessment of capacity at the state level, review of published data, state-level surveillance data, and Healthy People 2010 objectives, the MCAH program has selected seven Title V priority goals for the five-year span of 2006-2010. One of these priority goals addresses improving mental health and decreasing substance abuse among children, adolescents, and pregnant and parenting women.

Numerous studies have shown that unfavorable birth outcomes result from alcohol exposure during pregnancy. Poor perinatal outcomes include preterm labor, low birthweight, prematurity, congenital anomalies, stillbirths and mental retardation. Fetal Alcohol Syndrome (FAS), characterized by facial dysmorphology, growth retardation, and central nervous system impairment, represents the severe end of a spectrum of effects that can occur in an individual whose mother consumed alcohol during pregnancy. Since 2004, the umbrella term, Fetal Alcohol Spectrum Disorders (FASD), has been used to describe this range of physical and neurodevelopmental effects. The desire for a healthy pregnancy outcome is a strong motivator for adopting healthy behaviors during pregnancy and the preconception period. Women are becoming increasingly aware of the importance of reproductive life planning and maintaining healthy lifestyles.

The MCAH Epidemiology, Assessment and Program Development Branch uses data sources such as the California Women's Health Survey (CWHS) and the California Maternal and Infant Health Assessment (MIHA) to estimate the prevalence of alcohol consumption and smoking among women of reproductive age. In October 2007, in the publication *Preconception Health: Selected Measures, California, 2005*, the MCAH program reported that, among non-pregnant California women 18-44 years of age included in an annual, population-based, telephone survey, 14% smoked, and 55% had at least one alcoholic drink in the past month (2005 CWHS data). The analysis of 2006 data from MIHA, a mailed survey conducted annually among a representative sample of women with a recent live birth, showed that approximately 15.8% of women reported drinking during the first or third trimester of their pregnancy.

In April to July 2006, the MCAH program conducted a survey of local MCAH directors to assess the availability and format of local MCAH data on prenatal substance use screening. The survey also inquired about local use of prenatal substance use screening tools, resources and public health activities. Findings from this survey showed that

forty-six percent (21/46) of LHJs that indicated that they promote prenatal substance use screening currently use the *4P's Plus*® *Screen for Substance Use in Pregnancy*, while 26% (12/46) use the Comprehensive Perinatal Services Program tool solely or in conjunction with other available prenatal screening tools. These other prenatal screening tools or questionnaires used by LHJ providers are those that were locally developed or provided by the Black Infant Health program, the American College of Obstetricians and Gynecologists, or Kaiser Permanente. Thirty-seven percent (16/46) reported that they do not promote a specific tool.

Substance use in the U.S. has historically been viewed as a problem specific to men, resulting in screening, intervention and treatment protocols that are not appropriate for addressing these problems in women. Moreover, available screening tools primarily target heavy drinkers and do not identify pregnant women who are engaging in lower levels of alcohol consumption. In an effort to better quantify perinatal substance exposure during pregnancy, and in the light of the growing number of LHJs that promote provider use of the *4P's Plus*® screening tool, the MCAH program believes that it is an opportune time to report the available data on perinatal substance use screening. In addition, a report on data from other screening tools that are being used by LHJs is included in Appendix B of this report.

The quantification of the problem of perinatal substance use is essential in the definition of its scope and in the evaluation of prevention and intervention programs. We hope that this report will serve as a useful resource for LHJs, public health professionals, and policy makers as they strive to determine effective ways to address perinatal substance use prevention.

*Maternal, Child and Adolescent Health Program
California Department of Public Health*

Executive Summary

Pregnant women's use of alcohol, tobacco, and illegal substances is a recognized factor in infant morbidity and mortality. The prevention of these problems relies on a system of care that evaluates every pregnant woman for risk of substance use. The purpose of this report is to present the outcome data from 16 California counties that have established a comprehensive system of screening, assessment, and brief intervention in pregnant women. Each of the counties engaged in an initial process of systems preparation, developing a plan that focuses on preventing and reducing the impact of prenatal substance exposure. The data presented in this report do not represent overall prevalence data for the counties or the state since each county screened women only in those practices and public health clinics that participated in the screening initiative.

Procedures

In each county, pregnant women were interviewed at the first prenatal care visit by a physician, nurse, medical assistant, or Comprehensive Perinatal Health Worker (CPHW) utilizing the *4P's Plus*® *Screen for Substance Use in Pregnancy*, a validated screening instrument developed specifically for assessing risk in pregnant women. Data were collected from 2001-2007, with different initiation years in each county. All clinicians in the participating counties followed the same protocols, policies, and procedures for screening and follow-up. Any woman who had a "positive" *4P's Plus*® screen (i.e., admitted use of any alcohol, any marijuana, or any tobacco in the month before she knew she was pregnant) underwent immediate assessment for substance use. This assessment was conducted in the primary prenatal care setting immediately following screening. Based on the assessment at the first prenatal visit, any woman who had evidence of any alcohol or illicit substance use during pregnancy, including the month prior to knowledge of pregnancy, was defined as a substance user. All women with a positive assessment were provided a brief intervention and education regarding substance use and its impact on pregnancy and child outcome and, if appropriate, were offered a referral to a perinatal treatment program in the community.

Data from the screening and assessment instrument, absent any identifying information, were entered into a county-specific database and were analyzed. Each local jurisdiction/county was responsible for assuring compliance with standards of confidentiality and

privacy, including appropriate management of protected health information.

Results

Frequency data

The counties collected a total of 78,951 screens on pregnant women at their first prenatal visit. In response to the *4P's Plus*[®] screening questions, 12.8% of the women admitted to tobacco use in the month prior to knowledge of the pregnancy, 16.1% admitted to alcohol use, and 6.6% admitted to marijuana use in the month prior to knowledge of pregnancy. Eliminating duplicative counts among women who used multiple substances, the rate of positive screens, i.e. women *at risk* for substance use during pregnancy due to alcohol, tobacco, or marijuana use in the month prior to knowledge of pregnancy, was 23.7%.

Substance use assessments were immediately conducted on all women with a positive screen. The assessment evaluated current use patterns at the time of the first prenatal visit and provided guidance as to which women require intervention at that point in pregnancy. Among women with a positive screen, approximately 40% of those who were drinking prior to knowledge of pregnancy admitted to continuing to drink after they learned of their pregnancy, giving an overall prevalence of 6.5% continuing alcohol use in the total population.

The rate of admitted marijuana use in the month prior to knowledge of pregnancy among the total population of women was 6.6%, and 2.5% of the total population continued to use marijuana after knowledge of pregnancy. The rate of use of cocaine, heroin, and/or methamphetamines with or without alcohol and/or marijuana in the month prior to knowledge of pregnancy was 1.8%. This rate dropped to 0.8% after the women learned of the pregnancy. Eliminating all duplicative counts and including women who used illicit substances prior to knowledge of pregnancy, the overall rate of illicit drug use in pregnancy (including marijuana) among the population of women in the participating prenatal care sites was 5%. Overall, the rate of alcohol and/or illicit drug use during pregnancy at the time of the first prenatal screen and assessment was 19.2%.

Special populations

Age

Among the 20,524 pregnant women on whom age data were collected, there was a statistically significant difference in rate of positive screens across age range, with

adolescents (<20 years old) having the highest rate of marijuana use and women aged 20 to 24 years having the highest rates of alcohol and tobacco use as well as the highest overall rate of positive screens. Women ages 25 – 29 years old were the least likely to cease drinking once they found out they were pregnant. There was no difference in cessation rates across age groups for marijuana or other illicit drugs.

Race/ethnicity

Complete data on race and ethnicity were collected on 35,709 pregnant women. Hispanic women consistently had the lowest rates of substance use, no matter what the specific substance. Caucasian women demonstrated the highest rates of alcohol and tobacco use, and African American women had the highest rates of marijuana use in the month prior to knowledge of pregnancy. Caucasian women continued after knowledge of pregnancy to drink at significantly higher rates than women in the other racial or ethnic groups. Cessation rates at the time of the first prenatal visit for marijuana and tobacco did not vary significantly across racial/ethnic lines.

Payment source

Complete data on form of payment were collected on 17,898 pregnant women. Private pay women had a significantly lower rate of tobacco use, but a significantly higher rate of alcohol use in pregnancy. Medi-Cal-funded women had a significantly higher rate of marijuana use, but overall had a significantly lower rate of positive screens at the first prenatal visit. Type of payment was significantly associated with cessation of alcohol use after knowledge of pregnancy. After realizing they were pregnant, by the time of the first prenatal visit, significantly more women with private insurance coverage were continuing to consume alcohol than were women with Medi-Cal or no coverage. These differences were not observed for illicit drug use.

Implications

Assuming that exposure rates remain constant over time, from the data collected in this sample of participating counties, among the 9,531,046 children under age 18 years in California,⁷⁷ approximately 19%, or a little over 1.8 million children, have been prenatally exposed to alcohol or illicit drugs. Providing intervention and treatment to even a small proportion of these children through the mental health, education, child welfare, and juvenile justice systems can be a driving force in the escalating costs for children's behavioral health services that are being documented across the state. In light of these costs, the need for prevention and earliest intervention becomes clear. California can take a major step forward in this direction by implementing statewide policies that support preconception prevention efforts and universal screening, assessment, brief intervention, and linkage to treatment for women *at risk* for substance use in pregnancy.

Table of Contents

I.	Introduction	1
II.	Impact of Substance Use on Pregnancy and Child Outcome	3
	Alcohol	3
	Fetal brain development	3
	Terminology	4
	Cocaine and methamphetamine	4
	Physiologic mechanism	4
	Impact on the neonate	5
	Marijuana	6
	Heroin and other opiates	6
	Signs of newborn withdrawal from opiates	6
	Methadone maintenance in pregnancy	7
	Long term outcome of the child	7
III.	Identifying Pregnant Women at Risk	11
	Screening instruments	12
	Review of screening instruments for pregnant women	12
	Development of the <i>4P's Plus</i> ®	13
	Assessment	14
	Brief intervention	14
	<i>SART</i> : A community-based system of screening, assessment, referral and treatment	16
IV.	Perinatal Substance Use in California	17
	Previous methodologies used to estimate prevalence of perinatal substance use in California	17
	The <i>SART</i> system in California counties	18
	Description of participating counties	20
	Research approach	21
	Data collection	21
	Data management and analysis	22
	Prevalence rates	22
	Cumulative rates of positive screens and assessments	22
	Special populations	25

Age	25
Race/ethnicity	26
Payment source	27
V. Discussion	29
Prevalence data	29
Results and consequences	31
Alcohol	31
Tobacco	32
Illicit drugs	32
Special populations	33
Implications	35
VI. Recommendations	37
VII. References	41
Appendices:	
A. The <i>4P's Plus</i> ® Screen and Field Assessment	47
B. Data From Other Perinatal Substance Use Screening Tools	49

Introduction

Pregnant women's use of alcohol, tobacco, and illegal substances is a recognized factor in infant morbidity and mortality. The prevention of these problems relies on a system of care that evaluates every pregnant woman for risk of substance use. In California, 20 local health jurisdictions in 19 counties are actively screening pregnant women for substance use with the *4P's Plus*,[®] a validated screening instrument that relies on six questions to identify those women at highest risk for substance use during pregnancy. The purpose of this document is to present the outcome data from 17 health jurisdictions in 16 counties (the City of Berkeley is included in Alameda County data) that have been able to establish a comprehensive system of screening, assessment, and brief intervention accompanied by data collection. In addition to summary rates of alcohol, tobacco and illicit drug use by the pregnant women in the targeted populations, we will address factors associated with risk of use and how knowledge of these factors can guide community- and state-based prevention programs.

Aristotle wrote of the harm done to the unborn child by alcohol use in pregnancy, and wood etchings from the 1700's depicting the scourge of the gin epidemic in England portray children with facial features characteristic of Fetal Alcohol Syndrome (FAS). In the mid-1940's, the *Journal of the American Medical Association* described the "defects" found in children born to alcoholic women, but attributed the children's difficulties to the "defective stock of the parents."¹ Studies over the last two decades have documented the implications of prenatal exposure to marijuana,² cocaine,³ and methamphetamine⁴ for pregnancy and the growing child over the long term. However, despite this recognition of the significant health and mental health problems substance use during pregnancy can cause, slow progress is being made in integrating routine screening for substance use into primary care for pregnant women. In fact, FAS remains the most common cause of diagnosable mental retardation in the United States as well as one of the leading causes of behavioral problems in children.⁵

In a 2000 technical bulletin based on 600 obstetric practices in the United States, the American College of Obstetricians and Gynecologists (ACOG) documented the advice that obstetricians gave their patients about substance use during pregnancy.⁶ On the one hand, 97% of obstetricians stated that they asked their patients about alcohol use; on the other hand, 80% confirmed that they advised their patients that "a little alcohol" does not pose a threat to the pregnancy or the developing fetus, and 4% of the obstetricians surveyed declared that 8 drinks or more per week was a "safe" level of alcohol consumption for pregnant women. This is in direct contrast to data which document that *any* alcohol use in pregnancy places the child at more than three times increased risk for delinquent behavior.⁷

Multiple legal, social, and attitudinal barriers often come together to restrain open communication between prenatal care provider and patient. Most pregnant women state that they simply will not talk to primary care providers about their substance use, the most common reason given being the fear of prosecution or loss of their baby to the child protection system.⁸ There is good reason for this fear. When screening for substance use is implemented in clinical practice, it often focuses on targeted populations rather than the general population entering prenatal care. Providers often state that they can “tell” who is a substance abuser by looking at the person.⁹

A 1990 study of substance use in pregnancy in Pinellas County, Florida,⁹ revealed that although the overall use of alcohol and illicit substances was approximately 15% in both African American women and in Caucasian women within the population, African American women were ten times more likely to have a urine toxicology performed and to have their infants removed from their custody by the child welfare system. This study demonstrated that physicians’ selection of pregnant women for risk of substance abuse was based on two factors: race and social class.

On a more positive note, much work is focusing on universal screening of pregnant women for risk of substance use. The American College of Obstetricians and Gynecologists¹⁰ emphasizes the importance of addressing risk for substance abuse, domestic violence, and mental health problems within the context of primary prenatal care, and one study of doctors’ willingness to intervene in patients’ drug and alcohol problems revealed overall positive attitudes toward the physician’s role in screening and working with families affected by alcohol or other drug use.¹¹

Impact of Substance Use on Pregnancy and Child Outcomes

Alcohol

F*etal Alcohol Syndrome (FAS)* is the original name given to a cluster of physical and mental defects present from birth that are the direct result of a woman's drinking alcoholic beverages while she is pregnant.¹² The prevalence of FAS is estimated to range from 0.2 to 2 cases per 1,000 live births, depending on ethnic, cultural and regional factors.¹³ In children with a confirmed or unconfirmed history of prenatal alcohol exposure, the diagnosis of FAS is based on three criteria: prenatal and/or postnatal growth retardation, central nervous system impairment, and characteristic facial dysmorphism.¹² Much more common, however, are the more subtle growth and neurodevelopmental deficits among alcohol-exposed children who do not meet diagnostic criteria for FAS. Alcohol-Related Birth Defects (ARBD) and Alcohol-Related Neurodevelopmental Disorders (ARND) are thought to occur three to four times more frequently than diagnosed cases of FAS.¹⁴

Fetal brain development

While some deficits seen in alcohol-exposed children may stem from the family environment, children with FAS and ARND suffer behavioral and mental health problems that clearly have a biological basis. Human studies have demonstrated that prenatal alcohol exposure can produce microcephaly and a broad spectrum of significant abnormalities of various brain structures, including the frontal lobes, hippocampus, amygdala, basal ganglia, and corpus callosum, and ventricular and cerebellar anomalies.¹⁵⁻²¹ Additional brain imaging studies have confirmed disproportionate size reductions in the cerebrum, cerebellum, basal ganglia, and corpus callosum in children with ARND as well as in children with FAS.^{22,23}

Those areas of the brain vital to executive function and behavioral regulation (i.e., higher cortical frontal systems, subcortical regions, and their neuronal connections) appear to be the most vulnerable, both functionally and structurally, to prenatal alcohol exposure. Due to the impairments of the attentional and executive function domains of working memory, inhibition, planning and organization, sustained attention, focus execution, and encoding information, the individual is not able to think ahead in order to self-direct behavior, to maintain and integrate multiple bits of information, to stay on task, to problem-solve in a cognitively fluent manner, or to place information into memory for later recall. Such problems occur not only in children with FAS, but also in children with ARND.^{22,23}



A child with FAS:
microcephaly and
lissencephaly*

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Terminology

The inability to rely on clearly defined dysmorphic features that can be attributed to alcohol use in pregnancy has resulted in a wide variation of diagnostic terminology related to alcohol-exposed children. A great deal of research has demonstrated that children with what in the past has been called Fetal Alcohol Effects (FAE) have significant structural and functional changes in the brain, even though there is little if any overt physical manifestation of the alcohol exposure. Currently, preferred terminology for children who have been exposed to alcohol but do not meet all of the three diagnostic criteria for FAS is Alcohol-Related Neurodevelopmental Disorder (ARND) or Alcohol-Related Birth Defects (ARBD). In April 2004, a group of U.S. agencies developed a consensus definition of a new term, *Fetal Alcohol Spectrum Disorders* (FASD) as “an umbrella term describing the range of effects that can occur in an individual whose mother drank during pregnancy.”¹²

It is important to understand that FASD is not meant to serve as a diagnostic term, but rather a unifying one to encompass the many ways in which prenatal alcohol exposure can manifest itself in the affected individual. Research is underway to determine the subtle differences in physical, neurological, behavioral, and executive functioning status that exist among children who fall within the spectrum.

Cocaine and Methamphetamine

Physiologic mechanism

Cocaine and methamphetamine can be discussed concurrently, because both drugs act directly on the catecholamine – or neurotransmitter – system, the intricate regulatory component of the nervous system. Cocaine and methamphetamine primarily act on dopamine, a neurotransmitter located in the prefrontal cortex, the regulatory center of the brain. Cocaine produces a “high” by blocking the reuptake of dopamine into the proximal nerve ending while methamphetamine stimulates excess release of dopamine; the result in both situations is that there is increased availability of dopamine at the distal nerve ending, increasing the excitability of the nerves. The excess neurotransmitter can interfere with transplacental blood flow from the mother to the fetus, resulting in poor fetal growth and can cause contractions of the uterus, producing premature labor.

The short-term toxic effects of cocaine and methamphetamine use are related to the high circulating levels of dopamine. Dopamine acts directly on smooth muscle of the heart and the vascular system, producing tachycardia and vasoconstriction with accompanying acute hypertension and possible myocardial and cerebrovascular infarction. In addition, the excess release of dopamine contributes to dangerous elevations of body temperature and convulsions that can occur during use.

The long-term effects of methamphetamine abuse are thought to be related to the damage that a single high dose of methamphetamine has been shown to produce in nerve terminals in the dopamine-containing regions of the brain. Volkow et al²⁴ found on positron emission test (PET) scans that dopamine transporters (DATs) are reduced in the striatum of methamphetamine users. The striatum is associated with control of movement, attention, motivation and reward. After two months of abstinence, the DATs were still reduced, and the damage appeared to be directly linked to slowed motor skills and weakened memory.

Chronic exposure to cocaine or methamphetamine can result in the “down regulation” of the neurotransmitter receptors. PET scans of adults with a long history of use of either of these substances have shown an absence of functioning *dopamine receptors* in the prefrontal cerebral cortex. The prefrontal cortex is the area of the brain that controls impulsive and aggressive behavior. Animal studies have shown that prenatal exposure to cocaine alters the brain metabolism of neurotransmitters in the motor, limbic, and sensory systems, which results in difficulties regulating different types of responses. All of this information suggests that prenatal exposure to cocaine or methamphetamine has long-term effects on the function of the central nervous system in general and on behavioral regulation specifically.

Impact on the neonate

Children who have been prenatally exposed to cocaine or methamphetamine may suffer a range of physical problems, often based on the interruption of adequate blood flow to developing organs.²⁵ Exposure during gestation can result in limb reduction deformities, renal agenesis, or bowel infarction. Cerebral or cardiac infarction also has been reported in babies whose mothers used cocaine or methamphetamine during pregnancy, especially during the third trimester.^{26,27}

Muscle tone in cocaine or methamphetamine-exposed infants can vary; it is not uncommon to see increased tone, resulting in tremulousness and arching behaviors.^{3,4,26-28} Such muscle tone problems also can cause feeding problems, with poor coordination of suck and swallow. Adding to these difficulties, prenatal exposure to cocaine or methamphetamine may interfere with the infant’s neurobehavior: the ability to interact with his environment, to respond to sound and visual stimulation, and to interact appropriately with his parents or other caretaker. While physical difficulties occur in only about 25% to 30% of infants exposed prenatally to cocaine or methamphetamine, neurobehavioral difficulties are far more common and are the basis of many of the more difficult challenges a parent may have while caring for the infant.^{26,28}

The cocaine- or methamphetamine-exposed newborn with neurobehavioral difficulties can easily become overloaded and has difficulty regulating behavior. Sleep is easily disrupted by sudden changes in light or sound, and the infant demonstrates frequent startle reactions and color changes as he becomes over-stimulated. The rapidity of the changes in state of responsiveness can significantly disrupt interactions between the infant and the parent, adding to long-term risk for the child.

Marijuana

Marijuana does not have a direct health effect on pregnancy or the fetus; there is no increased rate of preterm labor, growth retardation, or other such complications.²⁹ However, a woman who uses marijuana is more likely to have used other substances including alcohol, tobacco, and other illegal drugs. More importantly, even though marijuana does not affect pregnancy outcome, it does have an impact on fetal brain development. Long term studies document that children whose mothers have used marijuana during pregnancy have a higher rate of executive functioning difficulties, which interfere with learning and behavior, especially as related to planning and following through with a task.²⁹

Heroin and Other Opiates

The use of heroin and other opiates has waxed and waned over the last several decades, but opiates once again are emerging as a major substance of abuse. No matter what form the opiate may take – whether it is heroin for intravenous injection, methadone used legally or illegally, or Vicodin® or Oxycontin® in the form of a prescription drug – abuse can result in the physical addiction of both the mother and the fetus. The newborn infant is born addicted and goes through withdrawal (abstinence) after birth, which mimics narcotic abstinence in an adult. The most significant features of the neonatal abstinence syndrome are a high pitched cry, sweating, tremulousness, scratching of the skin, vomiting, and diarrhea.

Signs of newborn withdrawal from opiates

Symptoms of neonatal withdrawal from opiates may be present at birth but they usually do not appear until three to four days of life.³⁰ However, withdrawal depends on many factors, and in some cases symptoms may not appear until ten to fourteen days after birth. The withdrawal symptoms peak around 6 weeks of age and can persist for four to six months or longer.³¹ The infants can also demonstrate many of the same problems as other prenatally exposed infants, including low birth weight, prematurity, muscle tone changes, and infant behavioral problems.

Neonatal Abstinence Syndrome^{30,31}

Neurologic signs	Hypertonia Tremors Hyperreflexia Irritability and restlessness	High-pitched cry Sleep disturbances Seizures
Autonomic system dysfunction	Yawning Nasal stuffiness Sweating	Sneezing Low-grade fever Skin mottling
Gastrointestinal abnormalities	Diarrhea Vomiting Poor feeding	Regurgitation Swallowing problems Failure to thrive
Respiratory signs	Tachypnea Apnea	
Neurobehavioral abnormalities	Irritability Poor response to auditory/visual stimulation	
Miscellaneous	Scratching of the skin	

Methadone maintenance in pregnancy

When discussing opiate use during pregnancy, it is important to at least mention methadone treatment for narcotic addiction. Methadone is a synthetic narcotic that is used to treat individuals, including pregnant women, who are addicted to heroin, opium, or other narcotics. The advantage of methadone treatment is that it usually requires only one oral dose each day to suppress the desire to use heroin. The risk of infection with the Human Immunodeficiency Virus (HIV) or with forms of Hepatitis is reduced when the pregnant woman is on methadone rather than continuing to use heroin or other narcotics. However, it is important to be aware that infants whose mothers are on methadone during pregnancy can undergo the same difficulties as infants whose mothers continue to use heroin through the pregnancy, especially if the mother is on more than 40 mg per day in the third trimester.^{30,31}

Long Term Outcome of the Child

IQ's in adolescents and adults with FAS have been reported to range from the 20's to 105 with a mean of 68.³² Alcohol-exposed children, with or without the characteristic FAS features, have consistently lower IQ scores than non-exposed children.³³ Importantly, even alcohol-exposed children with a “normal IQ” demonstrate difficulty with behavioral

Behavioral Patterns in Children Prenatally Exposed to Illicit Drugs

Anxiety or Depression:

- feels the need to be perfect
- feels unloved
- feels that others are out to get him
- feels worthless or inferior
- feels nervous, anxious, tense
- worries excessively

Social Problems:

- acts younger than chronological age
- is clingy
- doesn't get along with others
- gets teased a lot
- is not well liked by other children

Thought Problems:

- can't get his mind off of certain thoughts
- repeats particular acts over and over
- stares
- has strange ideas

Attention Problems:

- can't concentrate for long
- can't sit still and is restless
- daydreams more than usual
- has impulsive behavior
- has difficulty staying on task

Delinquent Behavior:

- exhibits little guilt after misbehaving
- lies, cheats or steals

Aggressive Behavior:

- argues a lot
- demands attention
- destroys his own things or those of others
- is disobedient and stubborn
- has sudden changes in mood
- talks too much and is unusually loud
- has temper tantrums

Poor Executive Functioning:

- gets lost in conversations with others
- cannot follow sequenced instructions
- difficulties making decisions

regulation, impulsivity, social deficits, and poor judgment, causing difficulties in day-to-day management in the classroom and home.³⁴ As the alcohol-exposed child progresses through school, these deficits in cognition and behavior become more evident.^{35,36} At the same time, as the child ages, the child's social environment continues to expand and increase in complexity. The child increasingly is susceptible to victimization, being led by peers, poor self-esteem, and depression. Social isolation, inappropriate peer group affiliation, drug and alcohol abuse, sexual promiscuity, and illegal activities are not uncommon as the child grows into adolescence.^{32,37}

Though there is no information regarding the long term impact of methamphetamine use in pregnancy, studies consistently report that prenatal exposure to cocaine, opiates, and other illicit drugs has minimal direct influence on intellectual development in children once they reach three years of age. It is becoming increasingly clear that the single most important predictor of cognitive development, other than genetics, is the environment in which the child is raised. This reiterates the principle of infant mental health: all aspects of a child's development occur within the context of a positive, secure parent-child relationship.

One study³⁸ of children prenatally exposed to cocaine, alcohol and other drugs found that by six years of age, 60% of the children's birth mothers were continuing to use drugs and alcohol. Those children living in homes where there was ongoing substance abuse also were more likely to have been exposed to domestic violence, to have a mother who had been sexually abused or raped, or to have a mother who had previously physically abused a child. Given these issues, it is not surprising that the most important factor predicting the child's IQ at six years of age was not the child's prenatal exposure but postnatal exposure to the mother's ongoing drug use patterns.³⁸ A home in which drugs were used was a home in which the child's needs for intellectual stimulation and developmental support were not met.

On the other hand, while prenatal drug exposure may not have a direct effect on the child's intellectual performance, studies do suggest that children exposed to cocaine, heroin, marijuana, and other illicit drugs are more likely to have behavioral, emotional, and learning problems in preschool and elementary school.^{2,3,38} A typical behavioral pattern that emerges often appears to be Attention Deficit Hyperactivity Disorder (ADHD). It is

understand that the behaviors these children demonstrate are based in part on damage to the child's neurological system rather than necessarily being due to willful disobedience. The accompanying chart provides an overview of the most common problems seen in children who have been prenatally exposed to illegal drugs. However, no one substance of abuse can be associated with any one particular problem, especially in the context of the polydrug use patterns of most women. Add to this that most women who use illegal drugs also smoke cigarettes and drink alcohol during pregnancy, and the picture becomes even more complex. The challenge for ongoing research efforts will be to untangle the specific influences of various substances while considering the impact of environment, especially related to early deprivation and neglect found in the histories of many substance-exposed children.

Identifying Pregnant Women at Risk

Problems related to substance use in pregnancy are preventable if women cease drinking, smoking, and using illicit drugs prior to becoming pregnant. However, it is never too late to intervene for those women who are using at the time of conception. Infants whose alcoholic mothers entered treatment and became alcohol-free by the third trimester have been shown to have substantially improved outcomes at birth.^{39,40} Women who were using cocaine heavily in early pregnancy but stopped use by the third trimester had a significantly reduced rate of preterm labor and delivery of low birth weight babies. In addition, there was a significant reduction in neonatal seizures and morbidity.⁴¹ A study of 6,774 pregnant women receiving prenatal care through the Kaiser Permanente Managed Care Plan demonstrated that pregnant women who screened positive for alcohol and other drug use and received brief interventions within the prenatal care setting had significantly improved outcomes as compared to women who screened positive but had no brief interventions provided. Women who received even a single brief intervention had a reduced rate of low birth weight infants, preterm infants, and infants who required ventilation.⁴² These data are similar to other studies that have documented the usefulness of screening and brief interventions within the primary care setting.⁴³

From the child's perspective, the benefits of early intervention for children with a history of prenatal exposure to alcohol or illicit drugs have repeatedly been demonstrated.^{5,38} Unfortunately, the very factors that protect children with prenatal substance exposure from developing secondary disabilities^{44,45} – being raised in a stable, nurturing home; no sexual or physical abuse; identification before the age of six years; receiving early intervention services – are the very factors that many substance-exposed children frequently lack because their mothers' alcohol or other drug use has gone undetected.

Given these compelling data, it becomes clear that the drive toward prevention and early intervention for alcohol- and illicit drug-exposed children can be approached through identification of the substance-using pregnant woman with implementation of treatment and intervention strategies that can address her substance use and can link her exposed child to early intervention services.

Screening Instruments

Substance use and abuse in this country historically have been viewed as problems specific to men. This has resulted in screening, intervention and treatment protocols being developed with language and approaches that are not necessarily appropriate for addressing these problems in women and most certainly do not work within a prenatal care setting.

Review of screening instruments for pregnant women

The CAGE (Cut down, Annoyed by criticism, Guilty about drinking, Eye-opener),⁴⁶ although easy to administer and with very good validity, sensitivity and specificity, primarily targets heavy, alcoholic drinking⁴⁷ and does not provide a method for identifying pregnant women who are participating in lower levels of risky drinking.

The NET (Normal drinker, Eye-opener, Tolerance),⁴⁸ is similar to the CAGE in that it targets only heavy alcohol use, so it may not identify early-stage risk drinkers. The T-ACE (Tolerance, Annoyed by criticism, Cut down, Eye-opener)⁴⁹ was designed specifically for office detection of risky drinking among obstetric patients and has been validated as a reliable screening instrument for obstetrical practice. Again, however, heavy drinkers are the primary targets of the T-ACE, and it may not identify more moderate drinkers in a prenatal care setting; nor will it identify women who are using tobacco or illicit substances.

The TWEAK (Tolerance, Worry about drinking, Eye-opener, Amnesia, K/Cut down)⁵⁰ was developed to screen for risky drinking during pregnancy and is an acronym that prompts five questions. The TWEAK has demonstrated moderately high sensitivity (79%) and specificity (83%) in a sample of pregnant women when detecting consumption of at least one ounce of absolute alcohol per day⁵¹ and had high sensitivity and relatively high specificity when used to identify Diagnostic and Statistical Manual (DSM)-III Alcohol Use Disorder among a population of pregnant women.⁵²

NTI Upstream (formerly the National Training Institute),^a a training partner of the Children's Research Triangle located in Chicago, Illinois, has been involved in developing and field-testing a screening methodology that identifies pregnant women at risk for alcohol, tobacco, and illicit drug use. The 4P's Plus^{®53} is a five-question screen specifically designed to quickly identify obstetrical patients in need of in-depth assessment or follow-up monitoring. Taking less than one minute, it easily can be integrated into the initial prenatal visit and used for follow-up screening through the pregnancy. The questions are broad-based and highly sensitive.

^a For more information about NTI Upstream, please visit the organization's web site at www.ntiupstream.com.

Development of the *4P's Plus*®

Through an initial three-year study of 2,002 Medicaid-eligible women, significant risk factors for substance use during pregnancy were identified.⁵⁴ To refine the analysis and identify a small set of risk factors that could serve as the basis for a screening protocol for risk of alcohol or other drug use during pregnancy, a Classification and Regression Table (CART) analysis was performed. The CART analysis generated three groups with increasing levels of risk for alcohol or illicit drug use during pregnancy: 1) *low risk* – those women who had never used alcohol; 2) *average risk* – those women who had used alcohol in the past but not in the month before pregnancy; 3) *high risk* – those women who used alcohol or cigarettes in the month before pregnancy.

We developed a series of questions that would identify those women who fell into the high risk category and, through field testing, integrated these questions into a new instrument, the *4P's Plus*®, that includes questions about the woman's social and family background (Appendix A).

The *4P's Plus*® has been evaluated across a variety of populations.⁵⁵⁻⁵⁷ One set of validity data in California was collected in a mainly African American population of 1,884 Medi-Cal eligible pregnant women enrolled in community health centers and maternal and child health programs in Alameda County, California.^c The instrument demonstrated moderately high sensitivity (83%) and specificity (80%) with excellent levels of positive and negative predictive validity (50% and 95%, respectively). In a recently published study,⁵⁵ the *4P's Plus*® demonstrated similar properties in a population of privately insured and Medicaid-funded Hispanic and African American pregnant women in Illinois (positive predictive validity 37%, negative predictive validity 97%). These levels of predictive validity demonstrate that we are able to identify not only those pregnant women who use alcohol or illicit drugs heavily or whose substance use is at a high enough level to impair daily functioning, but also identify those women whose pregnancies are at risk from relatively small amounts of alcohol or illicit drug use. In addition, a prenatal care provider can be assured that it is highly unlikely that a woman is using alcohol or illicit drugs if her *4P's Plus*® screen is negative. Further studies⁵⁶ have demonstrated that the *4P's Plus*® identifies significantly more women as at risk for alcohol and drug use than does universal urine toxicology testing.

In the field of chemical dependency treatment, the *DSM-IV* guidelines are the current gold standard for diagnosing substance abuse and chemical dependency in the general population. While these guidelines are useful, they do not capture substance use at levels

The *4P's Plus*®

Parents

- Did either of your parents ever have a problem with alcohol or drugs?

Partner

- Does your partner have a problem with alcohol or drugs?

Past

- Have you ever drunk beer, wine, or liquor?

Pregnancy

- In the month before you knew you were pregnant, how many cigarettes did you smoke?
- In the month before you knew you were pregnant, how many beers/how much wine/how much liquor did you drink?
- In the month before you knew you were pregnant, how much marijuana did you smoke?^b

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^b The question regarding marijuana is included in most California counties, but is not a standard screening question in other states.

^c Data collected and analyzed by Janet Brown, epidemiologist, Alameda County Department of Public Health.

that do not meet the full criteria for a diagnosis of substance abuse; however, these lower levels of use can pose substantial risk in pregnancy. The *4P's Plus*[®] is designed specifically to identify women whose substance use levels fall below the *DSM-IV* criteria but who still are at risk from any level of use of alcohol and illicit drugs. By identifying women early in pregnancy, treatment, brief intervention, and prevention services for this special population can be made available, reducing risk for the pregnancy and the child.³⁹⁻⁴²

Assessment

Screening instruments ask the question, “Who *might* be using?” An assessment asks, “Who *is* using?” Any woman with a positive screen requires immediate assessment. The women who have a “positive” *4P's Plus*[®] screen (i.e., admits use of any alcohol, any marijuana, or any tobacco in the month before she knew she was pregnant) undergo an immediate *field assessment* for substance use, so named because the assessment occurs in the prenatal care setting as an immediate response to a positive screen. The field assessment (see Appendix A for core questions on the field assessment) is a standardized, structured clinical interview that addresses frequency and pattern of use of alcohol, marijuana, heroin, cocaine, and methamphetamines during the pregnancy, commencing with the month prior to knowledge of the pregnancy through current point in gestation. Based on clinician discretion, follow-up field assessments can be conducted at subsequent prenatal visits to track compliance with abstinence from substance use.

Brief Intervention

To promote the healthiest outcomes for pregnancies, screening and assessment cannot stand alone; it is essential that identification of risk take place in the context of a much larger integrated system of screening, assessment, referral, and treatment. If there is no capability to educate the pregnant woman about the dangers of substance use, if there is no ability to provide direct interventions, or if there is no treatment available for the woman or her affected child, efforts to identify the *at-risk* woman can result in punitive policies that disrupt families and drive pregnant women out of prenatal care, further complicating medical risk for the pregnancy and the baby.⁹ Once a woman is identified as using alcohol, tobacco, or illicit drugs, the provider’s responsibility is to guide the woman to accept an appropriate level of treatment. The protocol to accomplish this is grounded in a brief intervention strategy.

Brief intervention is the generic name given to an array of educational and brief counseling efforts aimed at helping people make healthy choices. Brief interventions have been classified in the research literature into three levels of intensity:⁵⁷ 1) “very brief interventions” have one session up to five minutes long; 2) “brief interventions” have one session, up to 15 minutes long; and 3) “brief multicontact interventions” have an initial session up to 15 minutes long plus follow-up contacts. A meta-analytic study found that brief multicontact interventions have the greatest impact on reducing risk or harmful alcohol use in adults.⁵⁷

A further distinction also must be made between brief treatment interventions and brief *opportunistic* interventions. A brief *treatment* intervention is offered to people who are specifically seeking help for a drug problem; it is delivered in a drug treatment center by certified counselors. A brief *opportunistic* intervention represents an ‘opportunity’ to assist patients; it is conducted by those working in primary health care settings with patients who are not seeking specific help for a drug or alcohol problem.

I am concerned...[©] is a brief multicontact opportunistic intervention developed by Chasnoff and McGourty⁵⁸ and piloted in Fresno, California. The intervention makes use of educational materials (print, photo, and video) and follows a precise protocol^d in which the provider:

1. *Makes a bridging statement:* “I’m glad you told me about your use of alcohol. It’s important information.”
2. *States his or her medical concern:* “I am concerned because I know that alcohol use during pregnancy can cause a child to be born too early or too small or to have learning problems.” It is important that the “I” message is used and the woman does not feel threatened by the provider’s attitude or terminology. Also, the provider should stick to medical facts and not resort to threats about the woman’s losing custody of her child. The use of educational materials (key messages, scripts, photos, videos) to help convey the medical facts is encouraged.
3. *Advises to abstain or seek treatment:* “And I know that the best thing that you can do for your child is to stop drinking.” From a public health perspective, it is important to give pregnant women a clear message of abstinence and not one of “cutting back.”
4. *Discusses the patient’s reaction:* Allow the patient to express her feelings. Employ conversational methods such as motivational interviewing to foster a willingness to explore the issue. Do not argue with the patient, but continue to return to points 2 and 3: “I understand, but I am concerned...”
5. *Agrees upon the need for treatment:* Through this process, the patient will come to understand that she needs to cease use and perhaps accept treatment. It may not happen the first time the provider discusses these issues, but discussions at each visit will result in a change in attitudes and a movement away from denial.
6. *Refers to an appropriate treatment program:* In those cases in which the woman needs to enroll in treatment, it is vital that referral is made immediately while the pregnant woman is in the office and that there is an immediate response from the treatment program.

^d For purposes of illustrations in this report, the protocol uses alcohol as an example; however, any substance for which the woman screens and assesses as positive can be substituted into the conversation.

SART: A Community-Based System of Screening, Assessment, Referral and Treatment

S*SART*, an acronym that stands for screening, assessment, referral, and treatment, is the “core intervention” established through the Leadership Institute. The Leadership Institute is a 3½ day session in which selected members of the community, facilitated by the faculty of *NTI Upstream*, work together to create a two- to three-year plan. The goal of the plan is to achieve universal screening and intervention for substance use in pregnancy.

Screen	Screen all pregnant women for substance use. This is accomplished by making screening a fixed part of primary prenatal care.
Assess	Those women who screen positive are given an assessment to determine if they are in fact using alcohol or illicit drugs.
Refer	Those women who are determined to be using substances are provided a brief intervention and, if necessary, a referral to substance abuse treatment.
Treat	Those women who are referred to drug treatment receive quality, gender-specific drug treatment that is appropriate for their circumstances.

Specifically, the plan developed for each community through the Leadership Institute seeks to ensure that:

1. all pregnant women in the community are screened for substance use.
2. all pregnant women who *screen positive* immediately have a field assessment within the prenatal care setting to determine active tobacco, alcohol, or illicit drug use in pregnancy.
3. all pregnant women who *assess positive* receive a brief intervention at the initial and all ensuing prenatal visits.
4. all pregnant women receive appropriate referral to substance abuse counseling when indicated.
5. the rate of tobacco, alcohol, and illicit drug use decreases through professional and community education and outreach.

Participants work as a team to implement the plan developed during the Leadership Institute. Data are collected and analyzed throughout the process in order to determine substance use patterns in the community as well as to track successes and challenges that emerge through the start-up and implementation process. Ongoing technical assistance is provided on-site and via electronic and teleconference communication by *NTI Upstream's* staff.

Perinatal Substance Use in California

Previous Methodologies Used to Estimate Prevalence of Perinatal Substance Use in California

There have been several efforts to evaluate the prevalence of alcohol, tobacco, and illicit drug use among pregnant women in California. The most widely cited is a study by Vega, et al, published in 1993.⁵⁹ Utilizing universal urine toxicologies in hospitals across the state selected through a multistage probability sampling design, the authors found an overall rate of illicit drug or alcohol use of 11.35%. This was acknowledged by the authors to be a very conservative estimate because urine toxicologies detect only very recent substance use, especially in the case of alcohol. In 2003, Wolfe et al,⁶⁰ published prevalence data based on information gleaned from hospital discharge records. This group of investigators found an overall prevalence rate of 1.2%, with public hospitals having a significantly higher rate (2.9%) of substance abuse diagnoses among pregnant women than private hospitals (1%). Cocaine, heroin, and polydrug use patterns were the substance use patterns most commonly documented. Maternal and newborn mortality rates were two times higher for substance-using women compared to non-users, and infant death rates prior to one year of age were four times higher than the general population. Maternal hospital costs were estimated to be increased an average of \$414 for substance-using women, and infant costs in the newborn period were increased by approximately \$900. This study is problematic, however, in that it relied on provider selection of pregnant women based on clinical decision-making and entry of diagnostic codes by physicians at the time of discharge. Previous studies⁹ have demonstrated the racial and social class bias inherent in such an approach to diagnostic workup for substance abuse in pregnancy. The data from this study probably reflect a degree of that bias, in that women and infants with the worst clinical outcomes were those selected for substance use screening.

California's Maternal and Infant Health Assessment, a survey conducted annually among women who recently gave birth, found that approximately 15.8% of women in 2006 reported drinking during the first or third trimester of their pregnancy.⁶¹ This is higher than the documented rate in the federal National Survey on Drug Use and Health, the primary source of information regarding the prevalence of alcohol and other drug use in the United States population. In its most recent dataset,⁶² 4.6% of pregnant women report using illicit drugs in the previous month and 11.2% report alcohol use, with variation in rates by gestation. Each of these surveys employs a different methodology and targets different populations, which could account for the variance between the outcomes.

In a survey of local Maternal, Child and Adolescent Health (MCAH) directors conducted by the MCAH Program of the California Department of Public Health,⁶³ 46 jurisdictions reported that they promote a prenatal screening program. Most screening, however, occurs in the context of the state's Comprehensive Perinatal Services Program (CPSP), which provides guidelines for serving Medi-Cal eligible pregnant women.

The *SART* System in California Counties

Since 1998, *NTI Upstream* has been working with California counties to develop comprehensive *SART* systems of care for pregnant women who are using alcohol, tobacco, or illicit drugs. Each of the counties has engaged in an initial process of systems preparation, usually via a plan developed through the county's participation in a Leadership Institute, a 3½-day learning and planning initiative under the direction of Drs. Chasnoff and McGourty. The Leadership Institute process focuses on preventing and reducing the impact of prenatal substance exposure by working with perinatal health care personnel throughout the community to eliminate substance use among pregnant women. The final product of the institute is a plan that guides the county's efforts in this arena.

The team that participates in the Leadership Institute is composed of selected people in the community who have the ability to commit real resources toward the work of the team. If the team is composed of people who have little authority or little passion for the work, the process is seriously handicapped. Most commonly, the key members of the community team include representatives from the Maternal, Child, and Adolescent Health Agency; public and private prenatal care providers; Public Health; Child Protection Services; Mental Health; Substance Abuse Treatment; and the court system.

The Leadership Institute is intended to give the team a shared understanding of the key issues in substance use among pregnant women. It also is designed to produce an initial plan for the team to use as the members return to their community. This plan focuses on a specific model based within the primary prenatal care office or clinic and is grounded on the relationship developed between provider and patient.

California's experience with developing systems of care for pregnant women reflects the strong political and administrative oversight exercised at the county level as well as the breadth and diversity of the state's geographic and population characteristics. Twenty California local health jurisdictions in 19 counties are actively utilizing the *SART* system and screening pregnant women for substance use with the *4P's Plus*.[®] Of these, 17 jurisdictions in 16 counties (Table 1) have been able to establish a comprehensive *SART* system with data collection. Not included in this analysis are three counties that, as of the date of production of this report, had not yet implemented the full *SART* system: Kern County, Sacramento County, and San Diego County.

This report presents the outcome data from these 17 jurisdictions. In this vein, it is important to remember that the data do not represent prevalence data for the county or the state since each county screened women only in those practices and public health clinics within the county that agreed to participate in the *SART* system. Overall, in 2007, the percentage of prenatal care sites that participated in the project covered a wide range (Table 1). This wide variance is due to the differences in the length of time the *SART* system has been in place in the counties and the varying decisions among the counties as to the initial, secondary, etc. target populations to be screened. However, this is the largest dataset ever developed for evaluating substance use patterns within a prenatal population, and the results of the analysis can provide insight and guidance for policies and procedures that affect all counties in the state.

Table 1. California Counties and Number of Participating Prenatal Sites

County	Years of Data Collection	No. of participating prenatal sites / No. of total prenatal sites in county ⁱ	Participating sites	
			Private	Public
Alameda ⁱⁱ	2002 - 2007	15 / N/A ⁱⁱⁱ	3	12
Alpine	2006 - 2007	2 / 7	1	1
Butte	2004 - 2006	N/A ⁱⁱⁱ		
El Dorado	2006 - 2007	N/A ⁱⁱⁱ		
Fresno	2001 - 2005	50 / 95	50	0
Humboldt	2004 - 2007	7 / 8	5	2
Lassen	2007	1 / N/A ⁱⁱⁱ	1	0
Madera	2003 - 2007	5 / 10	5	0
Mendocino	2006 - 2007	6 / 11	4	2
Riverside	2003 - 2007	49 / 100	43	6
San Bernardino	2004 - 2007	14 / 61	13	1
San Luis Obispo	2003 - 2007	14 / 18	10	4
Santa Cruz	2007	7 / 15	2	5
Shasta	2006 - 2007	8 / 22	1	7
Solano	2006 - 2007	2 / 10	2	0
Ventura	2002 - 2007	13 / 197	0	13

ⁱ Data on number of prenatal care sites in each county are provided by MCAH Directors. In many instances, this number is unknown and the information presented here is the best estimate available.

ⁱⁱ All data for the Berkeley Health Jurisdiction are included in Alameda County dataset.

ⁱⁱⁱ Information not available.

Description of participating counties

The counties and health jurisdictions included in this report are a mix of frontier (≤ 6 persons per square mile), urbanized ($>1,000$ persons per square mile), and rural communities, as defined by the U.S. Bureau of the Census.⁶⁴ Births in the counties reflect the racial and ethnic diversity of the state as a whole (Table 2). The poverty rate in the participating counties⁶⁵ hovers around that of the United States at 12.5%,⁶⁴ although some of the counties demonstrate significant concentrations of impoverished populations, especially Fresno and Madera Counties.

Table 2. Demographic Descriptors of 2006 Births in the Participating Counties

County of Residence	Live Births	Race/Ethnicity of Mother					First Trimester Prenatal Care
		Hispanic	African-American	Asian/Pacific Islander	White	Other/Unknown	
Alameda	21,058	32.3%	12.0%	26.0%	25.5%	4.2%	89.0%
Alpine	13	7.7%	—	—	53.8%	38.5%	76.9%
Butte	2,622	20.0%	1.6%	6.5%	66.7%	5.2%	73.7%
El Dorado	2,036	21.4%	0.6%	4.1%	70.6%	3.3%	85.4%
Fresno	16,876	61.96%	5.3%	9.6%	21.3%	1.96%	85.9%
Humboldt	1,643	13.4%	0.7%	3.58%	69.4%	12.7%	82.9%
Lassen	259	13.5%	0.4%	1.5%	77.6%	6.9%	82.0%
Madera	2,622	73.9%	1.6%	1.6%	21.2%	1.7%	82.3%
Mendocino	1,106	35.6%	0.3%	1.4%	52.1%	10.7%	68.2%
Riverside	33,659	61.0%	4.8%	5.0%	26.7%	2.6%	86.4%
San Bernardino	34,675	59.1%	8.1%	5.3%	25.4%	2.1%	85.1%
San Luis Obispo	2,727	36.2%	1.0%	2.9%	56.0%	3.9%	85.9%
Santa Cruz	3,600	57.3%	0.4%	2.9%	35.9%	3.5%	88.5%
Shasta	2,191	10.8%	0.5%	4.0%	80.1%	4.7%	87.7%
Solano	5,801	34.9%	13.2%	14.4%	33.1%	4.4%	71.4%
Ventura	12,453	59.4%	1.2%	6.3%	29.9%	3.1%	81.4%
CALIFORNIA	562,157	52.2%	5.3%	11.6%	27.4%	3.4%	85.9%

Source: State of California, Department of Public Health, 2006 Birth Statistical Master File.

Research approach

Data collection

In each county, pregnant women were interviewed at the first prenatal care visit by a physician, nurse, medical assistant, or Comprehensive Perinatal Health Worker (CPHW) utilizing the questions from the *4P's Plus*.[®] All participating clinicians in the involved counties are following the same protocols, policies, and procedures for screening and implementing follow-up through the *SART* system as established through previous research studies. However, the majority of California counties have moved the question regarding marijuana use prior to knowledge of pregnancy into the screening protocol rather than the assessment component.

Any woman who had a “positive” *4P's Plus*[®] screen (i.e., admitted use of any alcohol, any marijuana, or any tobacco in the month before she knew she was pregnant) underwent immediate *assessment* for substance use. This assessment was conducted in the primary prenatal care setting immediately following screening. Although follow-up assessments were conducted at subsequent prenatal visits for many of the women, this practice was not consistent across counties. Results from these subsequent follow-up assessments thus are not included in this report. Based on the assessment at the first prenatal visit, any woman who had evidence of any alcohol or illicit substance use *during* pregnancy, including the month prior to knowledge of pregnancy, was defined as a substance user. All women with a positive assessment were provided a brief intervention and education regarding substance use and its impact on pregnancy and child outcome and, if appropriate, were offered a referral to a perinatal treatment program in the community. In no case was child protection services notified of a woman’s substance use during pregnancy.

The first and second sheets of the *4P's Plus*[®] form, which contain identifying information, were retained in the medical records, with one copy being sent to the delivering hospital at the time of admission to labor and delivery. The third sheet, a blinded copy with no identifying information, was sent to the data management team at *NTI Upstream* for entry into a county-specific database and analysis on a quarterly basis. Alameda and San Bernardino Counties managed their own database but sent the electronic dataset to *NTI Upstream* for analysis for purposes of this report. Fresno County, after consultation with the team from *NTI Upstream* to ensure that data were analyzed in the same way as the NTI analysis, elected to analyze its dataset and sent only results of the analysis to *NTI Upstream*. Each local jurisdiction/county was responsible for assuring compliance with standards of confidentiality and privacy, including appropriate management of protected health information. All members of the research team at *NTI Upstream* have been certified in human subjects protection policies and procedures through the U.S. Department of Health and Human Services, and *NTI Upstream* assures compliance with these standards in the management of data.

Definitions at First Prenatal Visit

Positive Screen:

- Any woman who admitted to any amount of alcohol, tobacco, or marijuana use in the month prior to knowledge of pregnancy.

Positive Assessment:

- Any woman who admitted to use of alcohol after knowledge of pregnancy or any illicit substance prior to or after knowledge of pregnancy.

Substance User:

- Any woman who admitted to use of alcohol or illicit substances during pregnancy, including the month prior to knowledge of pregnancy.

Data management and analysis

The standard practice at *NTI Upstream* is that *4P's Plus*® data sent by the counties for analysis are entered into an SPSS database by hand. Quarterly summaries for each county are constructed, and frequencies of all the variables are examined so that data entry errors can be rectified. For the cumulative dataset, frequency analyses were run to identify errant values. In preparation for statistical tests, skewness and kurtosis analyses were run on all interval level variables. We examined the data for outliers,⁶⁶ many of which were due to data entry mistakes that were subsequently corrected.

Data analysis was guided by the types of questions being asked of the dataset. Many issues of interest concerned nominal level variables. Chi-square analysis of independence was used for these analyses. The assumptions for the chi-square test are that the observations are independent, the categories are mutually exclusive and exhaustive, and that for joint probability tables with more than a single degree of freedom, the minimum expected frequency must be 5. In cases in which there is only one degree of freedom, then the minimum expected frequency must be 10. Analyses utilizing cells with values less than 20 may be unstable, so caution is warranted when evaluating data related to those cells.

Prevalence Rates

Cumulative rates of positive screens and assessments

The counties collected a total of 113,374 screens on 78,951 women. The analysis presented in this report includes only the first prenatal visit screens for the 78,951 women and excludes repeat screens on 34,423 of the women collected at subsequent prenatal visits.^e In response to the *4P's Plus*® screening instrument administered at the first prenatal visit, 12.8% of the women admitted to tobacco use in the month prior to knowledge of the pregnancy, 16.1% admitted to alcohol use, and 6.6% admitted to marijuana use in the month prior to knowledge of pregnancy (Table 3).

^e Repeat screens on women who had an initial negative screen were performed in only a few of the counties. The rate of positive screens on repeat administration was negligible.

Table 3. Percent of Women Reporting at First Prenatal Visit Use of Alcohol/Tobacco/Marijuana in the Month Prior to Pregnancy (N = 78,951)*

4P's Plus[®] Screen	N Positive	% Positive
Cigarettes <i>In the month before you knew you were pregnant, how many cigarettes did you smoke?</i>	10,073	12.8%
Alcohol <i>In the month before you knew you were pregnant, how many beers, how much wine or liquor did you drink?</i>	12,748	16.1%
Marijuana <i>In the month before you knew you were pregnant, how much marijuana did you smoke?</i>	5,210	6.6%
Positive screen for risk of substance use in pregnancy	18,738	23.7%

*Data collected at first prenatal visit using the 4P's Plus[®] screening tool. Respondents may answer in the affirmative to one or more substances.

A number of women with a positive screen exhibited polydrug use patterns, in that they used a combination of alcohol, tobacco, and/or marijuana in the month prior to knowledge of pregnancy (Table 4). Eliminating duplicative counts, the rate of positive screens, i.e. women *at risk* for substance use during pregnancy due to alcohol, tobacco, or marijuana use in the month prior to knowledge of pregnancy, was 23.7% within the total population of 78,951 women.

Table 4. Polydrug Use Patterns for Women at First Prenatal Visit With a Positive Screen for Alcohol/Tobacco/Marijuana Use in the Month Prior to Pregnancy (N = 18,738)

4P's Plus[®] Screen	N Positive	% Among Women With a Positive Screen
Alcohol and Cigarettes	2,744	14.6%
Alcohol and Marijuana	580	3.1%
Cigarettes and Marijuana	636	3.4%
Alcohol, Cigarettes, and Marijuana	1,195	6.4%

Substance use assessments (Table 5) were immediately conducted on all 18,738 women with a positive screen. The assessment evaluates current use patterns at the time of the first prenatal visit and provides guidance as to which women require intervention at that point in pregnancy. Among women with a positive screen, approximately 40% of those who were drinking prior to knowledge of pregnancy admitted to continuing to drink after they learned of their pregnancy, giving an overall prevalence of 6.5% continuing alcohol use in the total population.

Table 5. Assessment Results at First Prenatal Visit for Women with a Positive Screen (N = 18,738)

Assessment Questions	N Positive	% Positive Among Women With a Positive Screen	% of Total Population (N = 78,951)
Alcohol since known pregnancy	5,111	27.3%	6.5%
Marijuana since known pregnancy	2,006	10.7%	2.5%
Other illicit drug in month before known pregnancy	1,449	7.7%	1.8%
Other illicit drug since known pregnancy	642	3.4%	0.8%
Alcohol/illicit drug use before known pregnancy	15,183	81%	19.2%
Alcohol/illicit drug use since known pregnancy	6,761	36%	8.6%

The assessment data do not disclose the amount of alcohol or illicit substances used, but provide information regarding frequency of use. Of the 5,111 women who continued to drink alcohol after learning they were pregnant, approximately 15% at the first prenatal visit were frequent drinkers, drinking daily or 3 to 6 days per week (Table 6). The infants of these women are at high risk for severe effects consistent with FAS or ARND. Importantly, 85% of the women who at the first prenatal visit were continuing to drink alcohol fell into the less frequent rates of drinking that often are missed in routine prenatal care and through other forms of screening.

Table 6. Alcohol Use Patterns at First Prenatal Visit Among Women Who Had Continued to Drink After Knowledge of Pregnancy (N = 5,111)

Frequency of Drinking Alcohol	N	%
Every day	368	7.2%
3-6 days per week	401	7.8%
1-2 days per week	1,025	20.1%
< 1 day per week	3,317	64.9%

The rate of admitted marijuana use in the month prior to knowledge of pregnancy among the total population of women was 6.6%, and 2.5% of the total population continued to use marijuana after knowledge of pregnancy (Table 5). The rate of use of cocaine, heroin, and/or methamphetamines with or without alcohol and/or marijuana in the month prior to knowledge of pregnancy was 1.8%. This rate dropped to 0.8% after the women learned of the pregnancy. Eliminating all duplicative counts and including women who used illicit substances prior to knowledge of pregnancy, the overall rate of illicit drug use

in pregnancy (including marijuana) among the population of women in the participating prenatal care sites was 5%. It is important to emphasize that these data were all collected at the first prenatal visit and do not include information from subsequent prenatal visits. We cannot assume that the women who had stopped use by the first prenatal visit continued to be abstinent for the rest of pregnancy; nor do we know if women who were found to be continuing use at the first prenatal visit had any subsequent use during the rest of pregnancy.

In sum, including women who used substances during early pregnancy when they were unaware of the pregnancy and excluding duplicate counts, the rate of alcohol and/or illicit drug use during pregnancy was 19.2%, dropping to 8.6% after women learned of their pregnancy. Thus, 55% of the women who used alcohol or illicit drugs in the month prior to knowledge of pregnancy ceased use once they learned of the pregnancy, but close to half (45%) continued to use. This proportion of women with continuing use is similar to cessation rates found in previous studies with the *4P's Plus*.^{55,56}

It should be noted that the data presented here provide prevalence rates among women who were screened and do not attempt to present community-wide prevalence rates. In addition, all summary prevalence rates of substance use in pregnancy exclude the women who admitted to only tobacco use in the month before they realized they were pregnant. If these women are included in the calculations, the overall rate of substance use in pregnancy would rise to 26.3%. Relatively few counties collected assessment data on women with a positive tobacco screen. However, in those counties that did collect assessment smoking data, of women who had a positive screen for tobacco use in the month prior to knowledge of pregnancy, 7.8% were continuing to smoke cigarettes after knowledge of the pregnancy.

Special populations

Prior to start-up of screening, the planning team in each county finalized the data points that would be collected in conjunction with administration of the *4P's Plus*[®] and assessment. Although many of the counties elected to focus on core information, several counties expanded their data collection efforts. The information available through these broader datasets provides an opportunity to explore issues related to age, race/ethnicity, and insurance coverage.

Age

Age data were collected on 20,524 of the pregnant women. In order to explore the influence of age on prevalence of substance use in pregnancy, we divided the women into five age ranges (Table 7). There was a statistically significant difference in rate of positive screens across age range, with adolescents (<20 years old) having the highest rate of marijuana use, and women aged 20 to 24 years having the highest rates of alcohol and tobacco use as well as the highest overall rate of positive screens.

Counties Collecting Data Regarding Age of Pregnant Women

Alameda
Humboldt
Lassen
Madera
Riverside
San Bernardino
Santa Cruz
Shasta
Solano

Table 7. Positive Screen at First Prenatal Visit by Age (N = 20,524)

4P's Plus® Screen	< 20 yrs N = 3,968		20 – 24 yrs N = 6,685		25 – 29 yrs N = 5,058		30 – 34 yrs N = 3,089		≥ 35 yrs N = 1,724	
	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.
Cigarettes*	485	12.2%	1050	15.7%	608	12.0%	280	9.1%	147	8.5%
Alcohol*	598	15.1%	1307	19.6%	873	17.3%	504	16.3%	282	16.4%
Marijuana*	307	7.7%	432	6.5%	230	4.5%	95	3.1%	49	2.8%
Positive Screen*	881	22.2%	1797	26.9%	1167	23.1%	635	20.6%	340	19.7%

* p = 0.000

In examining cessation patterns, i.e., women who stopped using a specific substance once they learned they were pregnant (Table 8), we found a significant difference in age groups for alcohol use patterns: women aged 25 – 29 years had the highest rates of continuing to drink alcohol after knowledge of pregnancy. There was no significant difference in cessation rates across age groups for marijuana or other illicit drugs.

Table 8. Reported Cessation After Knowledge of Pregnancy at First Prenatal Visit by Age Among Women With a Positive Screenⁱ (N=3,149)

4P's Plus® Screen		≤ 20 yrs		20 – 24		25 – 29		30 – 34		35 and over	
		N	%	N	%	N	%	N	%	N	%
Alcohol ⁱ	Stopped	432	72.2%	769	67.5%	453	60.7%	258	61.3%	161	68.5%
	Continued	166	27.8%	380	33.3%	293	39.3%	163	38.7%	74	31.5%
Marijuana	Stopped	146	49.5%	178	42.9%	80	36.2%	41	44.1%	19	39.6%
	Continued	149	50.5%	237	57.1%	141	63.8%	52	55.9%	29	60.4%
Other Drugs	Stopped	37	77.1%	48	60.8%	41	52.6%	30	65.2%	12	50.0%
	Continued	11	22.9%	31	39.2%	37	47.4%	16	34.8%	12	50.0%

ⁱ p=0.005

Race/ethnicity

Complete data on race and ethnicity were collected on 35,709 pregnant women (Table 9) from ten counties. Hispanic women consistently had the lowest rates of substance use, no matter what the specific substance. Caucasian women demonstrated the highest rates of alcohol and tobacco use, and African American women had the highest rates of marijuana use in the month prior to knowledge of pregnancy. Caucasian women continued after knowledge of pregnancy to drink at significantly higher rates than women in the other racial or ethnic groups (Table 10). Cessation rates at the time of the first prenatal visit for marijuana and tobacco did not vary significantly across racial/ethnic lines. Among women who continued to drink after learning of their pregnancy (Table 11), African American women demonstrated the most frequent patterns of drinking (at least 3 to 6 days/week).

Counties Collecting Data Regarding Race/Ethnicity of Pregnant Women
 Humboldt
 Lassen
 Madera
 Mendocino
 Riverside
 San Bernardino
 San Luis Obispo
 Santa Cruz
 Shasta
 Solano

Table 9. Positive Screen at First Prenatal Visit by Race/Ethnicity (N = 35,709)ⁱ

4P's Plus [®] Screen	Caucasian N = 8,073		Hispanic N = 22,976		African American N = 3,127		Asian/ Pacific Islander N = 764		Other N = 769	
	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.
Cigarettes ⁱⁱ	2,644	32.8%	1,320	5.7%	712	22.8%	80	10.5%	191	24.8%
Alcohol ⁱⁱ	2,961	36.7%	2,614	11.4%	718	23.0%	127	16.6%	208	27.0%
Marijuana ⁱⁱ	1,036	12.8%	484	2.1%	430	13.8%	13	1.7%	80	10.4%
Positive Screenⁱⁱ	4,279	53.0%	3,348	14.6%	1,185	37.9%	169	22.1%	313	40.7%

ⁱ Only ten counties collected race and ethnicity data.ⁱⁱ p = 0.000**Table 10. Reported Cessation After Knowledge of Pregnancy at First Prenatal Visit by Race/Ethnicity Among Women With a Positive Screenⁱ (N = 8,011)**

4P's Plus [®] Screen		Total		Caucasian		Hispanic		African American		Asian/ Pacific Islander		Other	
		N	%	N	%	N	%	N	%	N	%	N	%
Alcohol ⁱⁱ	Stopped	3,436	61%	1,472	57.0%	1,379	63.6%	412	68.0%	71	63.4%	102	65.5%
	Continued	2,186	39%	1,110	43.0%	788	36.4%	194	32.0%	41	36.6%	53	34.2%
Marijuana ⁱⁱⁱ	Stopped	840	44%	423	42.6%	201	46.2%	178	44.2%	7	58.3%	31	49.2%
	Continued	1,067	56%	571	57.4%	234	53.8%	225	55.8%	5	41.7%	32	50.8%
Other Drugs ^{iv}	Stopped	303	63%	159	65.4%	101	59.4%	26	55.3%	4	80.0%	13	76.5%
	Continued	179	37%	84	34.6%	69	40.6%	21	44.7%	1	20.0%	4	23.5%

ⁱ For reported cessation, women who did not answer both substance use questions in the month before and since known pregnancy were not included in this analysis.ⁱⁱ p = 0.000ⁱⁱⁱ p = 0.494^{iv} p = 0.322**Table 11. Frequency of Drinking Among Women Who Continued to Drink After Knowledge of Pregnancy at First Prenatal Visit by Race/Ethnicity (N = 2,434)***

Frequency of Drinking	Caucasian N = 1,216		Hispanic N = 891		African American N = 220		Asian/ Pacific Islander N = 48		Other N = 67	
	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.	N Pos.	% Pos.
Everyday	98	8.1%	118	13.2%	45	20.5%	3	6.3%	10	14.9%
3-6 days/week	129	10.6%	52	5.8%	29	13.2%	7	14.6%	8	11.9%
1-2 days/week	259	21.3%	156	17.5%	40	18.2%	10	20.8%	11	16.4%
< 1 day/week	730	60%	565	63.4%	106	48.2%	28	58.3%	38	56.7%

* p = 0.000

Payment source

Insurance and managed care companies have been particularly interested in the populations of women for whom they provide coverage. Although most counties have incorporated their outreach, training, and screening efforts into CPSP practices, a number of counties have made a concentrated effort to extend screening to include

pregnant women with private insurance. Complete data on form of payment were collected on 17,898 pregnant women (Table 12) from three counties: Riverside, San Bernardino, and Solano. Private pay women had a significantly lower rate of tobacco use, but a significantly higher rate of alcohol use in pregnancy. Medi-Cal-funded women had a significantly higher rate of marijuana use, but overall had a significantly lower rate of positive screens at the first prenatal visit.

Table 12. Positive Screen at First Prenatal Visit by Payment Source (N = 17,898)

4P's Plus® Screen	Private N = 1,950		Medi-Cal N = 15,123		None/Other N = 825	
	N Positive	% Positive	N Positive	% Positive	N Positive	% Positive
Cigarettes ⁱ	200	10.3%	2,431	16.1%	145	17.6%
Alcohol ⁱⁱ	484	24.8%	2,594	17.2%	154	18.7%
Marijuana ⁱⁱⁱ	60	3.1%	910	6.0%	35	4.0%
Positive Screen^{iv}	562	28.8%	3,756	24.8%	226	27.4%

ⁱ p = 0.000

ⁱⁱ p = 0.000

ⁱⁱⁱ p = 0.000

^{iv} p = 0.031

Type of payment was significantly associated with cessation of alcohol use after knowledge of pregnancy (Table 13). After realizing they were pregnant, by the time of the first prenatal visit, significantly fewer women with private insurance coverage had stopped drinking relative to women with Medi-Cal or no coverage. These differences were not observed for illicit drug use. Among women who reported continued drinking after knowledge of pregnancy, there was no difference in frequency of drinking between the payment source groups.

Table 13. Reported Cessation After Knowledge of Pregnancy at First Prenatal Visit by Payment Source Among Women With a Positive Screen (N = 3,906)

4P's Plus® Screen		Private		Medi-Cal		None		Other	
		N	%	N	%	N	%	N	%
Alcohol ⁱ	Stopped	202	56.3%	1,435	66.4%	32	60.4%	39	54.9%
	Continued	157	43.7%	727	33.6%	21	39.6%	32	45.1%
Marijuana ⁱⁱ	Stopped	23	50.0%	405	48.0%	6	31.6%	8	57.1%
	Continued	23	50.0%	438	52.0%	13	68.4%	6	42.9%
Other Drugs ⁱⁱⁱ	Stopped	6	66.7%	190	61.3%	9	81.8%	7	77.8%
	Continued	3	33.3%	120	38.7%	2	18.2%	2	22.2%

ⁱ p = 0.001

ⁱⁱ p = 0.458

ⁱⁱⁱ p = 0.406

Discussion

This report is not an attempt to provide a statewide or countywide estimate of the prevalence of alcohol, tobacco, and illicit drug use during pregnancy. Rather, it is an analysis of substance use rates and patterns among pregnant women who:

1. Live in health jurisdictions that are utilizing the *4P's Plus*® and
2. Receive prenatal care from providers who have elected to participate in the *SART* system of care for pregnant women.

The participating counties recognized that they had a problem with substance use in pregnant women and made a financial commitment across multiple agencies in the county to address the issue. Although there are several other California counties that have initiated screening with the *4P's Plus*®, the counties included in this report are those counties who have developed a full *SART* system that provides screening, assessment, referral and treatment. There is oversampling of the Medi-Cal population in the counties; this oversampling likely is due to the fact that most counties, when initiating the *SART* system, focused on providers enrolled in California's Comprehensive Perinatal Services Program (CPSP). Overall, because all counties are utilizing the same approach to screening and have been trained from a common perspective, we have been able to develop the largest dataset, to date, of prenatal substance use screening and assessment.

Prevalence Data

Previous epidemiologic studies and routine surveys of substance use in pregnant women have resulted in a wide range of estimates of prevalence (Table 16). This most likely is due to the differing methodologies. As used in the Vega study,⁵⁹ urine toxicologies will identify only those women who have used an illicit drug in the previous 48 hours, although marijuana can be detected for up to two weeks after use in a heavy user. Alcohol disappears from the urine within a few hours of use so detection of alcohol use through urine toxicologies is highly unreliable. The high rate of alcohol use detected through California's Maternal and Infant Health Assessment (MIHA)⁶¹ may be due to the anonymity guaranteed through the mail survey among women who have already delivered, as opposed to the direct contact of the federal National Survey on Drug Use and Health (NSDUH).⁶⁷ In addition, the NSDUH is a summary of national data, with no specific data on pregnant women for the state of California. Meconium testing, as used in the Infant Development, Environment, and Lifestyle (IDEAL) study,⁶⁹ is highly reliable and will detect any substance a woman used in the last three months of the pregnancy. However, the IDEAL study focused on areas of the state that are known to have high rates of methamphetamine use, so this is a selected population.

Table 16. Summary Review of Substance Use Data in Pregnancy

Study/Year	Source of Data	Prevalence Rates			
		Tobacco	Alcohol	Illicit Drugs	Alcohol + Illicit Drugs
Vega et al/1992 ⁵⁹	Urine toxicology ⁱ	8.8%	6.7%	5.2%	11.35%
MIHA 2006 ¹	Self-report via mail ⁱⁱ		15.8%		
NSDUH/2004 ⁶⁷	Self-report national data ⁱⁱⁱ		11.2%	4.6%	
IDEAL/2005 ⁶⁹	Meconium toxicology or self-report ^{iv}			11.0%	
Orange County/2007 ⁷⁰	Urine toxicology and self-report ^v	4.9%	12.9%	3.5%	15.1% (with tobacco)
4P's Plus [®] /2007	Standardized instrument with personal screening interview ^{vi}	12.8%	16.1%	5.0%	19.2%

ⁱ Data collected at time of delivery

ⁱⁱ Reported drinking during the first or third trimester of pregnancy

ⁱⁱⁱ Reported use at random points during pregnancy

^{iv} Data collected at time of delivery

^v Data collected in two phases: self-report questionnaire at all stages of pregnancy and urine specimens at time of delivery

^{vi} Data collected at first prenatal visit

Orange County recently completed a study of substance use among pregnant women that combined data collected through urine toxicology, medical chart review, and self-report via a standardized questionnaire.⁷⁰ Their results are consistently lower than those found in this report. Several reasons could explain these differences, the most likely of which is that the survey completed by the pregnant women, as well as the survey completed by the practitioners, utilized close-ended questions; that is, questions that are answered “yes” or “no.” In the early research conducted in developing the 4P's Plus[®], we found a significant difference in positive response rates when asking open-ended vs. close-ended questions.^{55,56} In addition, all practitioners utilizing the 4P's Plus[®] were specifically trained in the administration and follow-up for the screening process, with an emphasis on utilizing screening as a “tool for engagement,”⁷¹ a non-threatening, non-confrontational approach which drives rates of denial very low (95% to 97% negative predictive validity).⁵⁵ Through an approach that incorporates community practitioners, word in the community spreads, and talking about substance use simply becomes a part of routine health care for pregnant women.

Results and Consequences

Alcohol

In examining the prevalence data produced for this study, it becomes clear that alcohol is the major substance used by pregnant women. The 16% of women drinking alcohol in the month prior to knowledge of pregnancy put their children at risk for significant learning and behavioral difficulties. Although more than half the women at the first prenatal visit reported cessation of alcohol consumption after knowledge of pregnancy, 40% continued to drink. Among those who are continuing to drink, 15% are drinking frequently, that is, 3 to 6 days per week or daily. The children born to these women will be at very high risk for the sequelae of prenatal alcohol exposure, and their behavioral and neurodevelopmental difficulties most likely are being recognized in early infancy or childhood. The children may receive early intervention services, but unless information regarding their alcohol exposure is available, important aspects of the services are missing. This calls attention to the importance of early childhood providers' awareness of the implications of prenatal alcohol exposure and ability to recognize those children at risk from exposure.

On the other hand, the great majority of pregnant women identified in the dataset as alcohol users are less frequent drinkers, consuming alcohol no more than one to two days per week. These women's children are at risk for the more subtle effects of prenatal alcohol exposure, and although they may show early distractibility, off-task behavior, and regulatory difficulties, they most often are passed off as "just busy children." Most often, the children do not receive any evaluation until they reach school age, when conduct in the classroom interferes with learning. At that point, the children frequently are misdiagnosed as having Attention Deficit Hyperactivity Disorder or other related behavioral or learning disorders and are placed on inappropriate medications. The lack of understanding of the child's difficulties from the perspective of his or her prenatal alcohol exposure results in the child's specific needs going unmet.

In point of fact, probably the children who are presenting the greatest challenges to school systems and behavioral health programs are these children born to less frequent drinkers. These children represent the great majority of substance-exposed children, but they do not receive the close observation and early intervention they need because their mothers' substance use was not recognized. In addition, many early childhood providers do not recognize early signs related to prenatal substance exposure as they screen and evaluate children in their programs. Once the children do begin to exhibit behavioral health difficulties that can be recognized, they frequently do not qualify for early intervention services through 0 to 3 programs or school-based services once they reach preschool age. Thus, by the time the children present to the school system, they have behavioral and learning difficulties that are taking their toll on the schools' resources and the children's academic success. Paradoxically, it is their mothers – the least frequent drinkers – that probably would have benefited most from early identification in pregnancy and associated brief intervention strategies, often requiring only an attentive educational intervention to stop their alcohol use early in pregnancy and prevent

escalating damage to the child. This also is the population that would be most amenable to community-based public health campaigns that would educate women about the need to abstain from alcohol use during pregnancy and about the need to plan pregnancy in order to avoid unintended use of alcohol prior to knowledge of conception. This message should be included in preconception health and family planning counseling.

The data demonstrate that the more affluent women with private insurance have the highest rates of alcohol use and are the least likely to stop drinking once they find out they are pregnant. Prevention campaigns pitched to this specific population would go far in reducing the alcohol-related complications of pregnancy and child outcome. Although there is much in the general media about “no known safe amount” of alcohol consumption during pregnancy, the general tenor supports the concept that small amounts are safe. In focus groups conducted by Chasnoff and Wells,⁷² testing of different phrasing of the need for alcohol abstinence during pregnancy revealed that the most successful message is “no amount of alcohol is safe.” This simple declarative statement removes the ambiguity that accompanies much of what the general public reads and hears.

Tobacco

The documented rate of tobacco use of 12.8% of pregnant women in the dataset is lower than that found in other states, most likely a result of California’s comprehensive approach to smoking prevention and cessation. However, more than half the women who were smoking cigarettes continued to smoke after learning they were pregnant. This is a significant rate of smoking among pregnant women, and specific information on tobacco’s effect on pregnancy and on the child’s long term outcome, including secondhand smoke, needs to be given a stronger role in public health efforts and clinical services.

Illicit Drugs

The prevalence of illicit drug use in this sample is similar to the rate documented in the Vega⁵⁹ study as well as in the NSDUH.⁶⁷ Similar to alcohol, there is a mixed message being communicated by prenatal care providers around the issue of marijuana use in pregnancy. The difficulty lies in the fact that there do not appear to be any immediate effects of marijuana directly on pregnancy outcome; however, there is clear evidence of harm to the child. The earliest studies of marijuana use in pregnancy demonstrated significant alterations in the ability of prenatally exposed neonates to regulate their state of arousal.^{2,37} Longer term studies documented the ongoing difficulties suffered by the exposed children, especially in the arena of executive functioning.³⁵ However, it is difficult to communicate delayed consequences, and many prenatal care providers elect to focus just on the immediate – pregnancy outcome. Consistent, clear information about the impact of prenatal marijuana exposure needs to be made available to professionals and the public.

Although methamphetamine use has attracted much attention in the political realm,

the rate of use is quite low among pregnant women, and the actual numbers of children affected by prenatal exposure to methamphetamine are similarly low, especially as compared to the rates of prenatal alcohol exposure documented in this report. However, it is important to note that the data do not account for methamphetamine users who do not seek prenatal care services. The effects of prenatal methamphetamine exposure are similar to what has been described for other illicit substances, with the long-term sequelae most likely to be associated with difficulties in executive functioning and self-regulation. What complicates the picture, however, is the violence and pornography associated with the methamphetamine lifestyle.⁷⁴⁻⁷⁵ This aspect has added to the impact methamphetamine has had on the child welfare system. In addition, methamphetamine production and use in the home can contaminate the environment in which children are living. Children breathe faster than adults, have a faster heart beat, are smaller and closer to the ground than adults, and their nervous system is still developing. Multiple reports have noted that children found in homes in which methamphetamine is being used often have a positive urine toxicology for the drug from the secondary inhalation of the smoke in the home.⁷³⁻⁷⁵ Thus, although the focus of this report is on the impact of prenatal exposure to substances, women found to be using methamphetamine must be instructed on the impact of environmental exposure to this drug.

Special populations

Analysis of data within special populations revealed some very interesting results. Although it is commonly assumed that adolescents pose the highest risk for alcohol and illicit drug use during pregnancy, women 20-24 years of age had a significantly higher rate of a positive screen. In addition, there were differences for patterns of specific substance use, with women 20-24 years having the highest rates of alcohol use and adolescents demonstrating the highest rates of marijuana use. Surprisingly, adolescents ceased using marijuana or illicit drugs once they found out they were pregnant at rates similar to the other age groups and had a higher rate of cessation of alcohol use than women aged 25 to 29 years, who demonstrated a significantly higher rate of continuing alcohol use after knowledge of pregnancy than the other age groups.

Examination of data by race and ethnicity demonstrated clear differences between groups. Overall, Hispanic women consistently have the lowest rates of substance use, no matter what the specific substance. Caucasian women have the highest rates of alcohol and tobacco use, and African American women have the highest rates of marijuana use. All groups stopped marijuana and tobacco use at similar rates upon learning of pregnancy, but Caucasian women had the lowest cessation rates of alcohol use. Rates of use among women of Asian and Pacific Islander background were low compared to Caucasian women; however, women in the “other” group, composed mainly of Native American women, had tobacco and alcohol use rates exceeded only by Caucasian women. Interestingly, women in the “other” group had the highest cessation rates for marijuana and illicit drugs once they found out they were pregnant. Among women who continued to drink after knowledge of pregnancy, Caucasian women tended to be the least frequent drinkers, and African American women drank most frequently. It should be noted that the data do not allow us to evaluate “heavy” drinking, that is, the amount of alcohol use

with each episode of drinking.

Substance use rates in Hispanic women were significantly lower than among Caucasian or African American women; however, these lower rates must be viewed within the context of the higher birth rates among the Latina population. Although Hispanics are about one-third of the state's population, of California's 562,157 births in 2006, 52% were to Hispanic women.⁷⁶ There are no previous large published studies of substance use in pregnancy among pregnant Latina women; this report signals the need for further study of this population, especially from the perspective of culturally appropriate public education and prevention efforts.

The data reveal another important point. Unfortunately, most studies of substance use in pregnancy have focused on the Medicaid population. This stems mainly from the common perception that the risk of alcohol and illicit drug use is greatest among economically disadvantaged populations. However, within the current sample, women funded by Medi-Cal, as compared to those women with private/commercial insurance, had a significantly lower rate of positive screens for substance use. For individual substances, private pay women had a significantly higher rate of alcohol use and a lower rate of tobacco use. Medi-Cal-funded women had the highest rate of marijuana use. There was no difference in rates of use of other illicit drugs. Cessation patterns varied across payment source groups, with significantly more private pay women continuing to drink after learning of their pregnancy. There was no difference in cessation rates of alcohol, marijuana, or other illicit drug use across payment groups.

Previous studies have documented the high rate of substance use among the private pay population.⁹ However, the perception in the health care community persists that women at highest risk for substance use can be identified based on race/ethnicity and social class. In fact, in many of the participating communities, the most difficult aspect of implementing universal screening of pregnant women has been convincing prenatal care providers to include private pay patients in the initiative. The data in this report reinforce the importance of universal screening, given the fact that demographics may not accurately predict risk.

Implications

In sum, although the data in this report are from a selected population of counties in California, the participating counties do represent a wide spectrum of demographic, economic, and social strata that are found across the state. Assuming that exposure rates remain constant over time, it is possible to project that among the 9,531,046 children under age 18 years in California,⁷⁷ approximately 19%, or a little over 1.8 million children, have been exposed to alcohol or illicit drugs. Providing intervention and treatment to even a small proportion of these children through the mental health, education, child welfare, and juvenile justice systems can be a driving force in the escalating costs for children's behavioral health services that are being documented across the state. In light of these costs, the need for prevention and earliest intervention becomes clear.

The need for prevention and intervention during pregnancy is further substantiated through a recent review of qualitative information compiled from 17 California counties that have Fetal Infant Mortality Review (FIMR) programs.⁷⁸ When questioned about gaps in services and community resources, the FIMR counties mentioned substance use screening and referral as the most frequent deficit. Moreover, the most recent 2005 Title V Block Grant Needs Assessment by the state MCAH program showed that 29 county MCAH programs identified perinatal substance use as a priority.⁷⁹

Although the data available from the California sites do not provide insight into long term outcomes for the women enrolled in the *SART* system or their children, efforts currently underway in Solano County, California, and in the state of Louisiana, each of which has human subjects approval for longitudinal analysis, will allow us to look at long term outcome of the women and children in these jurisdictions, including ultimate involvement in the child welfare system.

Recommendations

The extraordinary efforts of the counties that have been most actively involved in prenatal substance use screening have borne fruit, as these findings make clear. Some local health jurisdictions may not yet be fully engaged, thus providing an opportunity for leadership. Currently, representatives of the California Department of Public Health Maternal, Child and Adolescent Health Program are members of the California Fetal Alcohol Spectrum Disorders Task Force and the State Interagency Team Alcohol and Other Drug Workgroup. MCAH Action, the organization of local MCAH directors, has a priority workgroup focused on perinatal substance use prevention.

California's state agencies may want to consider several statewide policies that have been put in place in other states, as well as the following recommendations:

I. Support defining and tracking the problem of substance use in pregnancy.

1. Form a council of state and local agencies affected by the problem of prenatal substance exposure and develop baseline data from a variety of agency perspectives, such as addressing issues relating to substance use in families in child welfare programs. Key agencies include the Departments of Public Health, Health Care Services, Social Services (child welfare), Developmental Services (developmental disabilities), Alcohol and Drug Programs, Education, and Mental Health.
2. Develop a centralized database and conduct periodic data compilation to track rates of positive screens for substance use in pregnant women.^f
3. Develop guidelines to support FIMR review committees in their efforts to assess, link, and track perinatal substance use and its impact on fetal and infant mortality in their respective counties.
4. Assess the feasibility of modifying the federally mandated reporting systems for child welfare and substance abuse treatment, known in California as the Child Welfare Services/Case Management System (CWS/CMS) and the California Outcomes Measurement System (CalOMS) to include information about substance use disorders affecting child welfare cases, pregnancy status and admission to treatment of prenatally screened clients.

^f Louisiana and New Jersey track all 4P's Plus data across the state, and Indiana⁸⁰ conducts double-blind meconium screenings at birth as a baseline for prevalence

II. Support prevention, identification, and intervention efforts.

5. Develop and implement statewide and local prevention campaigns to address substance use in pregnancy.
 - a. Focus separate messages on the particular populations that have been documented to be at highest risk for using alcohol, tobacco and illicit drugs in early pregnancy and continuing that use once they learn they are pregnant:
 - i. middle and upper socioeconomic class women with private insurance (alcohol).
 - ii. adolescents and younger women (alcohol and marijuana).
 - b. Provide prevention materials for clinicians in primary prenatal care and associated settings to support individual prevention/intervention approaches during preconception and pregnancy.
 - c. Link new steps to existing efforts regarding prevention of tobacco and methamphetamine use.
6. Support specific studies of substance use in pregnant Latina women.
 - a. Identify unique risk factors and patterns of use within this population of women.
 - b. Define intervention points across the social and health care spectrum.
 - c. Develop culturally appropriate community education and prevention campaigns.
7. Consider implementation of universal prenatal screening.
 - a. Encourage use of validated questions for substance use screening among CPSP providers.
 - b. Support existing efforts to make screening and intervention fully reimbursable by Medi-Cal, utilizing appropriate billing codes to take advantage of new federal Medicaid regulations that allow payment for screening and brief intervention in the primary care setting.
 - c. Work with private insurers to develop support for screening and brief intervention in the primary prenatal care setting.
8. Review current hospital practice and compliance with California Health and Safety Code Sections 123600 and 123605, which require hospital protocols for substance use screening.

9. In each county, promote the development of an integrated system of care that spans a continuum. This includes preconception prevention messages and support for both children and parents affected by perinatal substance exposure, including substance use prevention and family planning services for women.
10. Produce guidelines for offering pregnancy testing and contraceptive services to all women entering substance abuse treatment and for linking pregnant women in treatment programs to prenatal care.
11. Review state compliance with federal Child Abuse Prevention and Treatment Act (CAPTA) requirements for reporting substance-affected newborns to child welfare, linking children aged 0 to 3 years to early intervention services, and appropriate screening of those who are substance-affected and are in the child welfare system.
12. Develop and provide cross-training programs for personnel working in agencies and programs that have access to pregnant women and their children.
 - a. Prenatal care providers.
 - b. Pediatricians and other child health care providers.
 - c. Substance abuse treatment providers.
 - d. Child welfare professionals.
 - e. Educators.
 - f. Judges and other court personnel.

III. Build and sustain support for integrated systems of care for pregnant women and their children affected by prenatal substance use.

13. Develop relationships with and obtain endorsement from local and statewide associations of medical personnel to support universal screening of pregnant women.
14. Determine and assess the perinatal substance use prevention efforts funded by public and private entities (e.g., First Five and Kaiser Permanente) and the resulting models for evidence-based practices for perinatal substance use screening.

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Appendix A

The 4P's Plus[®] Screen and Field Assessment

4 P's Plus[®] Screen for Perinatal Substance Use

Provider Office: _____ Date: _____

First Name: _____ Last Name: _____

Address: _____ City: _____ Zip: _____

Date of Birth: _____ Primary Language: Engl. Span. Other (specify) _____

Race/Ethnicity: White African Amer. Latino Amer. Indian Asian/Pac. Island. Other (specify) _____

Insurance: Alameda Alliance Blue Cross Medi-Cal Medi-Cal/PE Other: _____
 Self-pay (specify)

Screening Episode: Initial 2nd Trimester 3rd Trimester Postpartum

			Provide substance abuse education	Provide tobacco intervention and/or substance abuse assessment
Parents	Did either of your parents ever have any problem with drugs or alcohol?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Partner	Does your partner			
	• have any problem with drugs or alcohol?	No		
Past	Have you ever			
	• drunk any beer/wine/liquor?	No		
Pregnancy	In the month before you knew you were pregnant,			
	• how many cigarettes did you smoke?	None		Any
	• how much beer/wine/liquor did you drink?	None		Any
	• how much marijuana did you smoke?	None		Any

If "ANY," complete the follow up questions ↓

Field Assessment: Follow-up Questions to the 4 P's Plus®

1. Sometimes a woman feels depressed or anxious or may need pain relief. How often do you use prescription medicines like Xanax®, Valium®, Oxycontin®, Vicodin® or similar drugs to make you feel better or to relax?

- Did not use any drug Every day 3 to 6 days a week
 1 or 2 days a week Less than 1 day a week

2. And last month, about how many days a week did you usually drink beer, wine or liquor?

- Did not drink Every day 3 to 6 days a week
 1 or 2 days a week Less than 1 day a week

3. And last month, about how many cigarettes did you smoke per day?

- Did not smoke Less than 1 per day 1 to 10 per day
 1 to 2 packs per day More than 2 packs

4. During the month before you knew you were pregnant, about how many days a week did you usually use marijuana?

- Did not use any drug Every day 3 to 6 days a week
 1 or 2 days a week Less than 1 day a week

5. During the month before you knew you were pregnant, about how many days a week did you usually use any drug such as cocaine heroin meth ecstasy, or other (specify drug): _____?

- Did not use any drug Every day 3 to 6 days a week
 1 or 2 days a week Less than 1 day a week

6. And last month, about how many days a week did you usually use marijuana?

- Did not use marijuana Every day 3 to 6 days a week
 1 or 2 days a week Less than 1 day a week

7. And last month, about how many days a week did you usually use any drug such as cocaine heroin meth ecstasy, or other (specify drug): _____?

- Did not use any drug Every day 3 to 6 days a week
 1 or 2 days a week Less than 1 day a week

Appendix B

Data from Other Perinatal Substance Use Screening Tools: Sonoma County

Drug Free Babies Program, Sonoma County 2007 Data

The Sonoma County Perinatal Alcohol and Other Drug (AOD) Action Team is a group of health care and treatment professionals dedicated to helping babies achieve the healthiest start in life. Beginning in March 2004 with pilot funding from First Five of Sonoma County and continuing with three years of expansion funding from The California Endowment, progress is being made to reduce the negative impact of prenatal tobacco, alcohol and other drug exposure.

Eighteen sites, including both private obstetrical practices and community health clinics, are using an oral interview tool to screen all pregnant patients, report screening data and refer patients at risk to the Perinatal Placement Specialist. The oral interview tool is a five-point questionnaire that inquires about the pregnant woman's use of cigarettes, marijuana, and alcohol, her parents' and partner's substance use, and any concerns about other drugs that she was exposed to before knowledge of pregnancy.

Total Screened in 2007 (of data submitted)	Number	Percent of Total ¹	Percent of at risk
Total Number Screened with Risk Status Indicated ¹	1,566	100%	
Total Number Screened Indicating "At Risk" ²	302	19%	100%
Tobacco Use (any)	204	13%	68%
Alcohol Use (any)	93	6%	31%
Marijuana Use (any)	89	6%	29%
Other Drug Use (any)	75	5%	25%

¹ Percentages use Total Number Screened with Risk Status Indicated (N = 1,566) in all calculations. The total number of screening forms submitted = 1,603.
² Sonoma County prenatal care providers indicate a woman is *at risk* if she discloses any use during her current pregnancy.

Women Identified "at risk" = 302	Number
Total Number of Women who met with the Perinatal Placement Specialist	50
Women who entered into treatment	34
Women who declined to enter into treatment	15
Women not meeting criteria to enter into treatment	1

For 2007, Sonoma County reported 5861 births.

- Drug Free Babies captured data on almost 40% of pregnancies outside the Kaiser system. Kaiser delivers approximately 30% of the births in the county and has an internal screening/referral system.
- All CPSP providers and the majority of prenatal care providers participate in the Drug Free Babies program.
- Women identified *at risk* are encouraged to meet with the Perinatal Placement Specialist (PPS). The PPS is a specially trained alcohol and other drug counselor available by cell phone to meet the women at the prenatal facility to conduct an Addiction Severity Index (ASI) assessment and place the client in treatment. The PPS also provides individual technical assistance and consultation. A Spanish-speaking Public Health Nurse is also available to assess monolingual patients.
- The program assists hospitals with adoption of the countywide newborn assessment protocol when there is possible perinatal alcohol and drug exposure. Any woman found to be *at risk* is referred to the PPS.
- The Perinatal AOD Action Team released the *Helping Mothers, Saving Babies* report in September 2007 to document the need for and effectiveness of prenatal substance abuse treatment in Sonoma County.