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Early detection of prenatal substance exposure and the role of child welfare

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ABSTRACT

Substance use during pregnancy is a public health concern that has potential short- and long-term effects for infants and young children. Ongoing parental substance abuse and the home environment have significant consequences for infant and child development. Pregnancy may be an ideal time to address maternal substance abuse; however, early detection of prenatal substance use is complicated by a number of political/legal, economic, and social/attitudinal barriers. Addressing the needs of substance-exposed infants requires coordination of prevention (education and screening) and early intervention by multiple agencies, including child welfare. This article focuses on early detection of prenatal substance abuse, with attention to the role of the child welfare field. The article reviews the policy context for early detection and presents the results from a review of screening instruments for detecting substance use in pregnant women. The article concludes with a discussion of the implications of the findings for collaboration between programs and child welfare practice.

1. Introduction

The presence of parental substance abuse in many child welfare cases is well-documented (Child Welfare League of America, 2001; U.S. Department of Health and Human Services, 1999). Between 50 and 80% of child welfare cases are estimated to involve parental abuse of alcohol or other drugs (Osterling & Austin, 2008). Substance abuse and child maltreatment are highly correlated in research studies to the extent that initial screening and ongoing assessment for substance use disorders for child welfare involved families is indicated (Young, Nakashian, Yeh, & Amatetti, 2007).

While all parental substance abuse is a concern in promoting children's safety, permanency, and well-being, prenatal substance exposure is particularly concerning given the risk to the infant and negative outcomes potentially associated with maternal substance use. In addition to problems during pregnancy and shortly after birth (e.g., low birth weight and increased risk of infant mortality), maternal substance abuse is associated with future developmental problems for the child (Behnke & Eyler, 1993). Additional issues of concern stem from numerous social, financial, and psychological problems faced by women who abuse drugs during pregnancy, only one of which is inadequate prenatal health care (United States Governmental Accountability Office [GAO], 1990).

Young (2006) reports that most (75–90%) prenatally exposed infants return home undetected. Given a growing concern about the health, safety, and well-being of substance-exposed infants, early detection of drug and alcohol abuse in pregnant mothers is critical. However, disagreement about what should be done if drug or alcohol abuse is detected can lead to inconsistent responses to screening and assessment of pregnant women. Some research suggests that certain women, typically poor women from minority backgrounds, are targeted for screening or disproportionately reported and others argue that screening is ineffective if the response is punitive (criminal conviction) rather than rehabilitative (drug treatment) (Chasnoff, Landress, & Barrett, 1990; Drescher-Burke & Price, 2005; Hans, 1999).

In an effort to intervene early with substance-exposed infants, the 2003 amendments of the Child Abuse Prevention and Treatment Act (CAPTA) require states to have a response protocol when a newborn is identified as exposed to illegal substances. Ideally, early detection of substance exposure would occur well before the birth event, when the mother can make changes to impact the development of the fetus. Studies suggest that a woman may be more open to substance abuse treatment during pregnancy than at other times in her life (Morse, Gehshan, & Hutchins, 1997; Young et al., 2007). In addition to stopping use during pregnancy, early detection may help to focus service efforts and minimize long-term, negative consequences for children. Further, early efforts can reduce the need for substantial services in the future.

Given the need for a comprehensive approach to prevention and treatment, early detection of prenatal substance exposure is the responsibility of multiple agencies including child welfare (Young, 2006). Child welfare's current role in screening for prenatal substance exposure remains limited by a lack of education about screening activities and restricted interdisciplinary collaboration to address this complex public health problem. As Young et al. (2007) suggest, the role of the child welfare system is complex and involves case managers and supervisors understanding: "1) the basics of substance use and how use affects child development, 2) how to screen for substance use, 3) the local treatment system and how to help families remain in treatment, and 4) the implications of tensions between

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substance use recovery and the Adoption and Safe Families Act (ASFA) rules" (p.6).

In addition to the screening that occurs within medical settings, child welfare can play a role in screening as another crucial point of early intervention for substance abusing mothers. Currently, screening is inconsistently implemented in both medical and child welfare settings. Understanding how prenatal substance use is identified and reported has the potential to support interdisciplinary collaboration to address this public health problem. Consequently the purpose of this review is to analyze the research on screening practices for maternal drug using during pregnancy and the effects on newborn infants and children with attention to the role of the child welfare field.

1.1. Substance use among pregnant women

Rates of maternal substance use during pregnancy vary considerably and are impacted by national drug trends resulting from accessibility and cost. The National Institute on Drug Abuse conducted one of the first large-scale national surveys of drug use during pregnancy, finding that approximately 5.5% of women giving birth in 1992 used illicit drugs during pregnancy, with marijuana (2.9%) and cocaine (1.1%) being the most frequently used drugs (NIDA, 1992). The most recent National Survey on Drug Use and Health (NSDUH) found that 5.2% of pregnant women aged 15 to 44 reported using illicit drugs in the past month (Substance Abuse and Mental Health Services Administration [SAMHSA], 2008). Rates of illicit drug use in pregnant women differ by ethnicity; 1.7% of Hispanic women compared to 3.6% of white women and 6.2% of black women used illicit substances during pregnancy (SAMHSA, 2004).

Overall, 11.6% of pregnant women reported current alcohol use of any amount and 3.7% of pregnant women reported binge drinking while 0.7% reported heavy drinking. Finally, 11.6% of pregnant women aged 26 to 44, 23.3% of those aged 18 to 25, and 24.3% of those aged 15–17 reported smoking cigarettes during the prior month. Women who are pregnant maintain overall lower substance use rates than nonpregnant women, with the exception of cigarette smoking in women aged 15 to 17 (24.3% for pregnant women compared to 16% for nonpregnant women); however, substance use is a concern for the subset of women who use throughout pregnancy (SAMHSA, 2008).

Estimates of alcohol and drug use during pregnancy and the number of substance-exposed infants are likely to be substantially lower than actual rates due to underreporting by individuals who fear reprimand as well as the limited screening and testing done by hospitals. Even when tested, only recent drug or alcohol use can be confirmed by urine or blood tests and therefore only accounts for a limited amount of all drug or alcohol use. The number of infants exposed prenatally to substances is therefore difficult to estimate; however, data suggest approximately 500,000 pregnancies involved alcohol use, 420,000 tobacco use, and 160,370 pregnancies involved illicit drugs in 2004 (National Abandoned Infants Assistance Resource Center [AIA], 2008). Overall estimates suggest that 10–11% of all newborns, or 400,000–480,000 newborns, were exposed to alcohol or illicit drugs during pregnancy in 2005 (Young, 2006).

1.2. Impact of prenatal substance exposure on developmental outcomes

Prenatal substance exposure can have a range of negative impacts on infant and child development, depending on a number of factors such as amount, extent, and duration of use. Differences in how individuals respond physiologically and psychologically to substances also have an impact on prenatal substance exposure. Additional factors complicating a clear picture of exposure on developmental outcomes include polysubstance use, making it difficult to isolate the impact of any one substance along with overlapping environmental issues (AIA, 2008). As previously noted, poor maternal nutrition and prenatal care along with the personal, financial, and social difficulties associated with drug use often compromise parenting and complicate outcomes for drug-exposed newborns. Current research continues to reflect the ongoing search for long-term outcomes associated with the use of various substances during different stages of pregnancy.

The transfer of drugs from the mother to the fetus occurs through the placenta connecting the mother and child (typically through passive diffusion). The transport of drugs from the mother to the fetus is impacted by factors such as the rate of drug metabolism and excretion in the mother as well as her general nutrition and health status (Huestis & Choo, 2002). In addition to the impact on infants, drug-exposed women may experience a range of obstetric complications including gestational diabetes, placental insufficiency, post partum hemorrhage, spontaneous abortion, preterm birth, and lower gestational age (Huestis & Choo, 2002). In a study comparing mothers of drug-exposed infants with mothers not exposed to drugs, the GAO (1990) found among drug-exposed mothers a higher likelihood of little or no prenatal care and among infants outcomes related to lower birth weights, premature birth, and longer and more complicated hospital stays.

In general, major medical problems are apparent in a greater number of substance-exposed infants (75% of substance-exposed compared to 27% of unexposed infants) and substance-exposed infants are more likely than unexposed babies to be premature (Huestis & Choo, 2002). While the effects of each substance are not the same in all cases given the differences previously noted, a number of possible effects have been identified for different types of substances. Considerable attention is devoted in the literature to the effects of cocaine exposure during the cocaine epidemic of the 1980s. The results from studies on prenatal substance exposure are mixed regarding the amount of substance needed to produce effects and the severity of effects. Broad statements about the impact of prenatal substance exposure may, in fact, overstate the effects. However, there is a general consensus that children who are prenatally exposed to alcohol and other drugs experience more behavioral and physical/health problems than non-exposed children (Behnke & Eyler, 1993; Chasnoff, McGourty, Wells, & McCurties, 2008; Drescher-Burke, 2007; Huestis & Choo, 2002).

The range of possible effects of prenatal substance exposure on newborns and infants related to different substances is summarized in Table 1. As indicated, some effects of prenatal drug exposure resolve and do not negatively impact long-term development. Without minimizing the potentially damaging impact of prenatal substance exposure on newborns, it is important to note that research identifies the critical influence of the home environment and issues related to substance use on developmental outcomes and the in-utero drug effects cannot be separated from the context of the home environment (Kim & Krall, 2006; Ondersma, Simpson, Brestan, & Ward, 2000). While a certain percentage of prenatal substance use is minimal and can be prevented with education efforts, other situations involve more serious substance use issues. In these cases, environmental factors contributing to the substance abuse and consequences of the substance abuse are inextricably linked to the health and well-being of the newborn.

The various outcomes of prenatal substance exposure and disparate findings on the severity of outcomes (depending on the type, frequency, amount, and timing of use during pregnancy) contribute to perceptions about the consequences of prenatal substance use and the role of policymakers in legislating an appropriate response. The next section reviews major policies that impact the early detection of prenatal substance exposure from a child welfare perspective.

1.3. Policies impacting early detection

The policy response to substance abuse during pregnancy has been debated since the 1980s when the outcomes of prenatal substance exposure received heightened attention. Policymakers face the difficult task of balancing reproductive rights (autonomy for pregnant women and potential implications for abortion rights with an expansion of fetal rights) with the safety and health of children

Table 1
Possible effects of prenatal substance exposure by substance type.

Substance type	Possible effects on newborn/child development
Alcohol	Fetal alcohol syndrome (FAS) (and fetal alcohol effects resulting from a lesser degree of alcohol exposure and toxicity) characterized by growth retardation, lower birth weight (increased risk for perinatal brain injuries for low birth weight babies of less than 31 weeks gestation born to alcohol-abusing mothers), decreased length, small head circumference, facial dysmorphism, and central nervous system (CNS) dysfunction; greater likelihood (85% of FAS children) for mental retardation
Cocaine	Intrauterine growth retardation; microcephaly or reduced head circumference, prematurity, hypertension, CNS hemorrhage, stroke, genito-urinary abnormalities, increased risk for SIDS and HIV, necrotizing enterocolitis; increased degree of irritability, tremulousness, and state lability as compared to methadone-exposed babies interfering with the bonding of the mother and child after birth; long-term effects uncertain with some studies showing decreased head circumference, lower IQ scores, and increased behavior problems in 3 year olds exposed to prenatal cocaine use and other studies finding no evidence of long-term developmental effects
Nicotine	Low birth weight due to intrauterine growth retardation; prematurity; spontaneous abortions; perinatal mortality; SIDS; decreased mental task scores and decreased basic visuo-perceptual performance later in life; attention-deficit hyperactivity disorder
Marijuana	Increased tremors; exaggerated startle reflex; poorer habituation to visual stimuli; high-pitched cry; reduced quiet sleep; decreased memory and verbal functions in 3 and 4 years old; poor attention and impulsivity in children from 6 years of age; reduced head circumference, visual analysis and hypothesis testing at 9–12 years of age; impaired top down neurocognitive functioning (executive function) in 9–12 years old; negative effects on attentional processes (executive function)
Opiates	Fluctuating cycle of fetal intoxication and withdrawal; neonatal abstinence syndrome (NAS) experienced in varying degrees by 55–94% of opiate-exposed neonates; NAS characterized by increased startle reflex, tremors, inability to self-quiet, poor feeding, abnormal sleep patterns, diarrhea, fever and seizures, CNS hyperactivity, gastrointestinal dysfunction, respiratory distress, autonomic symptoms including yawning, sneezing, mottling and fever, tremors, high-pitched cry, increased muscle tone, irritability, seizures, exaggerated moro reflexes; typically, withdrawal appears in first 24 h however death can result from prolonged and untreated NAS; intrauterine growth retardation; conditions secondary to low birth weight and prematurity including asphyxia neonatorum, intracranial hemorrhage, nutritional deprivation, hypoglycemia, hypocalcemia, septicemia, and hyperbilirubinemia; longer hospital stays; increased risk for SIDS; most children born exposed to heroin appear to have normal mental and motor development by school entry
Amphetamines	Suspected that many of the effects of cocaine occur in amphetamine-exposed infants; low birth weight; premature delivery; congenital brain hemorrhage; infarction and cavitary lesions; increased risk of neonatal seizures and SIDS; disordered sleep patterns; tremors; poor feeding; hyperactive reflexes; abnormal cry and state disorganization; significant correlation between extent of amphetamines exposure and impaired psychometrics testing (aggressive behavioral and adjustment problems); poor state control, difficulty with habituation and impairment in reflexes in later development

Note: Adapted from Huestis and Choo (2002).

(Dailard & Nash, 2000). States have developed a wide range of responses to the issue, ranging from punitive approaches to referrals for treatment (Figdor & Kaeser, 1998), including the following:

- 16 states consider substance abuse during pregnancy to be child abuse under civil child welfare statutes, and 3 consider it grounds for civil commitment;
- 14 states require health care professionals to report suspected prenatal drug abuse, and 4 states require them to test for prenatal drug exposure if they suspect abuse;
- 19 states have either created or funded drug treatment programs specifically targeted to pregnant women, and 7 provide pregnant women with priority access to state-funded drug treatment programs; and
- 4 states prohibit publicly funded drug treatment programs from discriminating against pregnant women (Guttmacher Institute, 2008).

Relatively recent federal legislation has drawn attention to the need for a coordinated response to prenatal substance exposure between child welfare, alcohol and drug, and the court systems (Young et al., 2007). First, provisions in the Federal Adoption and Safe Families Act (ASFA, 1997) emphasize the role of child welfare systems in identifying parental substance abuse along with implications for out-of-home placement decisions and child well-being. Second, the Child and Family Service Reviews (CFSRs) process calls for consistent assessment and referrals in child welfare agencies (ASFA, 1997). Finally, the 2003 amendments to the Child Abuse Prevention and Treatment Act (CAPTA) require protocols for responding to substance-exposed infants at the state level.

The CAPTA amendment encourages the development of an effective response to early detection rather than punitive measures (Drescher-Burke, 2007). To be eligible for CAPTA grants, states must provide:

Policies and procedures (including appropriate referrals to child protection service systems and for other appropriate services) to address the needs of infants born and identified as being affected by illegal substance abuse or withdrawal symptoms resulting from prenatal drug exposure, including a requirement that health care providers involved in the delivery or care of such infants notify the child protective services system of the occurrence of such condition of such infants, except that such notification shall not be construed to:

a) establish a definition under Federal law of what constitutes child abuse; or
b) require prosecution for any illegal action (Keeping Children and Families Safe Act, 2003, section 106(b)(A)(ii)).

CAPTA therefore provides some protection for mothers with prenatal exposure in an effort to ensure the provision of medical and social services. However, some states define substance abuse during pregnancy as child abuse and three of these states interpret it as grounds for civil commitment. Lastly, while CAPTA calls for a response when substance-exposed infants are identified, the legislation does not mandate testing or screening, nor does it directly address the role of alcohol exposure (Drescher-Burke, 2007).

The National Abandoned Infants Assistance Resource Center (AIA) recently investigated the impact of policy on practice in responding to substance-exposed infants (Drescher-Burke & Price, 2005). The exploratory study of testing and reporting of substance-exposed infants and the child welfare response in 8 large urban areas involved in-depth interviews with nurses, social workers, and child welfare administrators (39 interviews in 29 different hospitals). The results indicated that state law does not necessarily call for specific hospital and child welfare practices. Most newborns testing positive for illicit drugs were reported by hospital staff to child welfare agencies. However, who was tested for substances varied considerably as did the response from child welfare. Hospitals appear to lack systems for tracking and recording who gets tested, results of the test, and the referral response.

1.4. Barriers to early detection

As noted, barriers to early detection stem from multiple political/legal, economic, and social/attitudinal sources (Chasnoff, Neuman, Thornton, & Callaghan, 2001). The nature of the response to substance abuse among mothers from policymakers, the courts, and local practitioners is influenced by media attention to the drug epidemic at particular points in time and the effectiveness of certain advocacy groups. At different times, public opinion may reflect a rehabilitative/supportive approach to advocating for community treatment while at other times mothers who

abuse drugs receive a punitive response, including removal of a child and criminal prosecution.

The disagreement between the cost of universal screening and targeted screening illustrates economic barriers. The costs include the time it takes to complete instruments (waste of valuable resources), the limited accuracy of current instruments/tests (too many false positives and false negatives), and the presumed connection between a positive test and poor parenting (just because a parent tests positive does not necessarily mean the parent cannot provide adequate parenting) (Berger & Waldfogel, 2000). While universal screening is more costly and may over-identify mothers, some advocates suggest that universal screening provides more assurance that needs will be identified and services provided. Universal screening also has the advantage of addressing biased testing of certain disadvantaged groups. Some studies suggest that screening occurs inconsistently and that minority, poor women are overrepresented because of biases in reporting despite evidence suggesting similar rates across race and socio-economic groups (Chasnoff et al., 1990; Drescher-Burke & Price, 2005; McNamara, Orav, Wilkins-Haug, & Chang, 2005). Substance use among wealthy women, for example, may not trigger the same perceptions as those of low-income women despite documented high rates of substance use among private pay clients (Chasnoff et al., 2008). Biased reporting related to age, presentation, ethnicity, and culture may also influence the perceptions of women using substances.

Other barriers that prevent screening arise from the concerns of physicians about interfering with the confidentiality of the physician–patient relationship and the fear that the patient may not return or maintain appropriate prenatal care if the relationship is negatively impacted by assessment of substance exposure. While Chasnoff et al. (2001) have made considerable strides in educating physicians about early detection of prenatal substance exposure, they have also identified the following barriers: "1) concerns and misconceptions about the liability and risks associated with treating pregnant substance users, 2) a lack of knowledge about addiction and referral options, and 3) a lack of physician confidence in treatment programs" (p. 752).

Another potential barrier to screening for prenatal substance exposure is the availability of services once the substance abuse is detected. Although some substance use can be addressed through education and minimal services, long-standing substance use disorders require specialized treatment that may not be available. In fact, Drescher-Burke and Price (2005) found that hospital and CPS workers indicated a lack of sufficient drug treatment programs to be a major barrier to effective screening ("a positive toxicology test is useless if there is no help available," pg. 16). Other barriers include a lack of gender-specific treatment programs, accessible programs for low-income families, and access to related services such as housing and domestic violence that promote successful completion of programs. If practitioners know of (or even perceive) a lack of services in the community, the motivation to screen and refer may be reduced.

Finally, the following barriers to early detection are more practical than ideological: 1) limited time available from busy practitioners, 2) real (or perceived) cost of administering an additional questionnaire in an already complex assessment process, and 3) lack of clarity about which professionals are responsible for completing the screening tool/assessment instrument. For example, Chan, Pristach, Welte, and Russell (1993) found that doctors often fail to identify the majority of alcohol disorders due, in part, to lengthy administration time for some questionnaires. Other research, noted in the next section, found that most screening instruments do not require a great deal of time to complete.

In an effort to contextualize the screening process, the next section describes the assessment processes that may occur in medical and/or child welfare settings. The focus of this analysis is on the screening process because of the emphasis on early detection of prenatal substance exposure. Other processes such as case management to track and monitor substance use among parents involved in the child welfare system are separate processes that fall outside the scope of this article. Similarly, more involved assessment processes (review of medical records, drug testing, etc.) fall outside the role of child welfare and into the role of the medical profession. Screening, however, is an activity that can occur in the multiple settings in which pregnant women may be encountered.

2. Assessment of prenatal substance use

Prenatal substance use is most effectively assessed with the use of multiple methods, depending on the setting and resources available. A variety of strategies are employed in health care settings to detect prenatal substance exposure, including: 1) verbal screen with mother; 2) review of mother's history and medical records; 3) observation of mother and/or newborn; and 4) drug testing (urine, blood, hair, or meconium) (Young et al., 2007).

A verbal screen with the mother involves an informal line of questioning based on the practitioner's style or a standardized screening instrument designed to assess risk or potential of substance use. Both approaches typically involve questions about current and past alcohol and other drug use along with an assessment of signs and behavioral consequences of use. In a medical facility, access to the patient's medical history can further assist the practitioner in identifying factors related to prior use. Similarly, observation of the mother provides additional clues about substance use or attempts to disguise or deny substance use during pregnancy. Finally, clinical methods of drug testing through blood tests may also be used, such as liver function tests, urine toxicologies for illicit drug use, and blood or breath tests (Morse et al., 1997). While urinalysis is limited to detecting recent use (usually within the last few days), more recent methods of testing using meconium (newborn's first stool that may be present as early as the 13th week of gestation) or hair (may begin to develop after 6 months gestation) show some early signs of substance use (Chan, Caprara, Blanchette, Klein, & Koren, 2004).

Typically, verbal screening, review of history and medical records, observation, and drug testing will be used in combination to determine the extent of substance exposure, depending on the setting and resources available. Morse et al. (1997) suggest that screening tools are the most effective method for early detection due to the limitations of other strategies. For example, certain clinical methods such as blood tests are likely to only identify long-term use through damage to the liver, missing a whole range of earlier stage users. Similarly, urine toxicologies detect only recent use and cannot detect frequency or amount of substance use. Finally, screening tools are brief and easy to administer, making them useful for practitioners who do not have medical training or laboratory testing facilities.

2.1. Screening tools

Screening instruments are usually brief tools designed to identify the risk or probability of substance abuse and facilitate referral for more comprehensive assessments. Screening instruments are not full-length assessments and do not lead to a diagnosis. In contrast, assessment protocols are oriented toward determining whether or not an individual has a substance use disorder that meets the Diagnostic and Statistical Manual (DSM-IV-TR) criteria (APA, 2000). Most screening tools require no training or very minimal training, are free or low cost, and do not require specialized professional backgrounds for administration or scoring.

Ideally, the screening process would also make use of records and observations. As with any instrument, screening tools need to be incorporated into an ongoing and multi-faceted process of assessment that evolves out of the relationship between a practitioner and the individual (Young et al., 2007). In the case of prenatal exposure, the substance use does not need to reach the level of a diagnosable disorder to be damaging to a fetus. Further, the amount of the substance does not need to be damaging to the mother to be damaging to the fetus. Research is still identifying the exact amount of alcohol or other drugs that is

associated with harm to the fetus and individual differences in how the drugs are processed can impact this assessment. Currently, no amount of alcohol or drug use during pregnancy has been deemed safe.

The properties of any screening tool can be assessed in terms of measures of sensitivity and specificity. The sensitivity of the screening tool in this case indicates the probability that a woman who drinks or is at-risk for drinking during her pregnancy will test positive. In contrast, specificity refers to the screening tool's ability to screen out non-cases, in other words that a pregnant woman who does not drink or is not at risk for drinking tests negative (Chang, 2008). While the best tool would be both highly sensitive and highly specific, in reality all tools have some margin of error in correctly assessing risk (over- or under-assessment). Cutoff scores that are stringent or lenient are set to establish guidelines based on the purpose of the screening tool (Russell, 1994).

Most screening instruments were not developed specifically for pregnant women or tested with pregnant women. Traditional screening tools for alcohol are less effective with pregnant women for a variety of reasons (Chang, 2008). First, traditional alcohol-screening tools were tested on men, whose patterns of consumption and tolerance differ considerably from women. Second, most screening tools were designed to detect heavy use or dependence that may not be as common in pregnant women. Finally, cutoff scores for defining a positive result from the alcohol-screening instrument should be different for women due to differences in sensitivity to alcohol-related organ damage, even though most screening tools use a common cutoff score for men and women. Four instruments designed for use with pregnant women — TWEAK, T-ACE, 4P's Plus©, and Modified 5Ps—are summarized in Table 2 and described below.

2.1.1. TWEAK

TWEAK stands for *Tolerance* (number of drinks to feel high, number of drinks one can hold), *Worry* (about drinking), *Eye-opener* (morning drinking), *Amnesia* (blackouts), and *Cut* (*K*) down on drinking. The TWEAK is a variation of the T-ACE (Sokol, Martier, & Ager, 1989) and CAGE (Ewing, 1984), using some of the items from these two instruments. The TWEAK consists of the following questions:

1) T — Tolerance: "How many drinks can you hold?" (an alternative version to the Tolerance-hold question is the Tolerance-high question — "How many drinks does it take to make you feel high?" However, only one of the tolerance questions is used, not both).
2) W — Worried: "Have close friends or relatives worried or complained about your drinking in the past year?"
3) E — Eye-openers: "Do you sometimes take a drink in the morning when you first get up?"
4) A — Amnesia: stands for blackouts — "Has a friend or family member ever told you about things you said or did while you were drinking that you could not remember?"
5) K — K/Cut down: "Do you sometimes feel the need to cut down on your drinking?" (Russell, 1994).

Table 2
Prenatal substance use screening instruments.

Instrument	Source	Brief description	Administration time
4P's Plus	Chasnoff & Hung (1999)	5 items; used to begin a discussion about drug and alcohol use; items ask about use prior to pregnancy; lifetime use; use by parents and use by partner; yes response to any question indicates need for further assessment	<1 min
Modified 5 Ps	Kennedy et al. (2004)	5 items; screens for alcohol or drug use during pregnancy; items ask about use during current and previous pregnancies, use by parents and use by partner	Not specified
T-ACE	Sokol et al. (1989)	4 items; first validated sensitive screen for risk-drinking in obstetric-gynecologic practices; retains three items from the CAGE and one from the MAST	~1 min
TWEAK	Russell (1994)	5 items; screens for high-risk drinking during pregnancy; includes questions from the MAST, CAGE, and T-ACE; administration by professional (no training required); no cost	2 min

The TWEAK can be administered in approximately 2 min and does not require training for administration. The specificity and sensitivity of the TWEAK have been examined in several studies. Russell et al. (1991) examined the psychometrics of the TWEAK with pregnant women and found a sensitivity of 68–69% and a specificity of 83–93%. Chan et al. (1993) tested the TWEAK with three specific populations (alcoholics in treatment, patients from two outpatient clinics in a county hospital, and the general population) and compared the TWEAK with the CAGE and the 10-item brief MAST (B-MAST; Pokorny, Miller, & Kaplan, 1972). They oversampled Black individuals and women to ensure a sufficient comparison of ethnic and gender differences (a major limitation noted in prior research). Their results confirm the clinical validity of the TWEAK, which was found to be more effective at identifying heavy drinking (higher sensitivity and specificity) than the CAGE and B-MAST. With further replication, they recommend different versions of the TWEAK for clinical outpatient males; males in the general population; and women.

2.1.2. T-ACE

The T-ACE is the first validated, sensitive screen for risk-drinking in pregnant women. Sokol et al. (1989) developed the T-ACE to detect the amount of alcohol intake that may damage the fetus by testing items from the MAST (Selzer, 1971) and the CAGE (Ewing, 1984) with 971 pregnant women. The T-ACE was specifically developed to screen for tolerance to the effects of alcohol since this particular question does not trigger psychological denial (Sokol et al., 1989). The resulting T-ACE includes the following questions:

1 T — TOLERANCE: How many drinks does it take to make you feel high?
2 A — Have people ANNOYED you by criticizing your drinking?
3 C — Have you ever felt you ought to CUT DOWN on your drinking?
4 E — EYE-OPENER: Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?

The T-ACE is considered positive for risk-drinking with a total of 2 or more points (i.e., more than 2 drinks in response to the tolerance question, 1 point for an affirmative response to the annoyed, cut down, or eye-opener questions) (McNamara et al., 2005). Sokol et al., (1989) found that the final four items reliably differentiated risk drinkers from non-risk drinkers (sensitivity, 69%; specificity, 89%).

Further evaluation of the T-ACE with a sample of 278 pregnant women (all at-risk for prenatal alcohol abuse — T-ACE positive) revealed that the T-ACE was more effective than traditional physician assessment of risk-drinking in medical practice (McNamara et al., 2005). Specifically, the study found that, while physicians identified medical risk factors, screening for risk-drinking was low (i.e., physicians identified 10.8% of patients as at-risk when 100% of the sample reported consuming alcohol). Additional results indicated that there was a bias among physicians toward identifying potential risk-drinking in non-white women, even after controlling for other factors such as income, prior alcohol use, and education (McNamara et al., 2005). Russell (1994) reports a sensitivity of 76% and specificity of 79% for the T-ACE. Subsequent comparisons with the TWEAK, CAGE, and MAST resulted in a sensitivity/specificity of 88%/79% for the T-ACE (when using a cut point of 2). Both the TWEAK and the T-ACE were more effective in screening for risk-drinking during pregnancy than the CAGE or MAST (Russell et al., 1996).

2.1.3. 4P's Plus©

The 4P's Plus© Screen for Substance Use In Pregnancy (Chasnoff & Hung, 1999) consists of questions in four areas designed to screen for high-risk use (use of alcohol or cigarettes in the month before pregnancy). The 4P's Plus© builds on Ewing's 4P's that screens for past and current use and partner and parent use (Morse et al., 1997). The instrument is easy to administer and score; as with all tools, the 4P's Plus© attempts to determine if further assessment is required in order to determine if there is a substance abuse disorder.

Items assess lifetime parental use, current partner use, lifetime personal use, and use of cigarettes and beer/wine/liquor in the month before finding out about the pregnancy.

Responses to all items include "yes," "no," or "no answer." The 4P's Plus© screens for risk of prenatal substance use rather than extent of current use to target early intervention efforts. The 4P's Plus© demonstrated good psychometric properties (83% sensitivity; 80% specificity; 37–50% positive predictive validity; 95–97% negative predictive validity) in two studies (Chasnoff et al., 2008).

2.1.4. Modified 5Ps

The 5Ps is an expansion of the original 4Ps by adding a question regarding peer use, making it appropriate for screening pregnant teenagers. Similar to the 4Ps, the 5Ps screens for past and current use as well as the use of others in close relationship to the individual (parents, partner, etc.). The 5Ps includes the following items:

1 Did any of your parents have a problem with using alcohol or drugs? (Yes, No, No answer).
2 Do any of your friends (peers) have a problem with drug or alcohol use? (Yes, No, No answer).
3 Does your partner have a problem with drug or alcohol use? (Yes, No, No answer).
4 Before you knew you were pregnant (past), how often did you drink beer, wine, wine coolers or liquor? (Not at all, rarely, sometimes, frequently).
5 In the past month (present), how often did you drink beer, wine, wine coolers or liquor? (Not at all, rarely, sometimes, frequently) (Kennedy, Finkelstein, Hutchins, & Mahoney, 2004).

The sensitivity and specificity of the 5Ps has not been studied, although the modified 5Ps was used in a study implementing routine screening procedures in community health centers, private practices, and a teaching hospital (Kennedy et al., 2004). Results from this investigation suggest that a brief tool such as the modified 5Ps can be effectively implemented into routine practice and provide valuable information regarding current use or risk for use.

3. Discussion

Prenatal substance exposure represents a public health concern that impacts a number of agencies, including child welfare. As this review suggests, the negative impact of substance exposure on infant and child development can be substantially minimized by early detection and prevention efforts. In some cases, education programs about substance use (amount, timing, and type) can be effective at reducing or eliminating use during pregnancy. Studies suggest that pregnancy may be an optimal time to intervene in cases of substance use disorders due to a heightened maternal motivation for the well-being of the infant. Results of this review suggest that attention be shifted away from early detection of prenatal substance exposure as a policing effort and movement toward early detection as an opportunity for prevention of future consequences resulting from long-term parental substance abuse and related factors.

Reliable and valid screening instruments have been developed to assess substance abuse and several promising screening tools have been developed specifically for detecting substance use during pregnancy. These instruments can be administered in a short period of time and do not require specialized training or education for administration. Despite advancements in substance abuse screening, pregnancy specific instruments remain limited in several important ways. First, screening instruments specific for pregnant women have not been extensively tested in diverse practice settings. For example, the 5Ps has not been tested and the TWEAK and the T-ACE were developed in the early 1990s but have not been sufficiently tested or utilized in subsequent studies. In addition to the limited psychometric information, this suggests that screening instruments, even the 4P's Plus© which improves on limitations of other screening instruments, are not widely utilized in practice (Young, 2006). Second, many instruments such as the T-ACE and the TWEAK focus exclusively on screening for the use of alcohol. Screening instruments assessing for a broad range of substances are necessary to address the impact of illicit drugs on infants and mothers.

Once advancements in pregnancy specific instruments have been achieved, efforts to promote implementation of screening practices must occur. Such a goal is arguably more challenging to achieve given the social and political context of screening for prenatal substance use. As Barth (2001) suggests, barriers to screening primarily stem not from limitations in the instruments but rather from a range of other factors related to the results of screening. Barriers to screening among medical professionals including concerns regarding protecting the doctor/patient relationship and a lack of information about early detection are substantial and impact the extent to which referrals are made to child welfare. Further, the response of child protective services to referrals of substance-exposed newborns is inconsistent and varies considerably among states. Efforts are currently underway to address some of these barriers via education and training for physicians and other professionals (Chasnoff et al., 2001).

Clearly the tension between protection of a mother's privacy and trust with professionals and the need to protect the safety of a child presents a formidable barrier to screening for prenatal substance exposure. However, the opportunity for early intervention that can bring positive and lasting benefits to both the infant and the mother serves as a strong motivator for movement toward education and support to screen and provide appropriate referrals in multiple settings.

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