CHAPTER 11

Parental Substance Abuse

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Parental substance abuse is an important public health problem and a complex risk factor impacting infant development. In the United States, in 2013, almost 10% of neonates were exposed to alcohol, and about 5.4% of neonates were exposed to illicit drugs *in utero* (Substance Abuse and Mental Health Services Administration, 2014). The recent epidemic of opioid abuse, fueled by prescription painkillers, is a stark reminder that cyclical trends in substance abuse often differentially impact infants and their caregivers (Patrick et al., 2012; Volkow, 2016). Estimating the cost of parental substance abuse is challenging, particularly because the intangible costs are difficult to capture adequately (French, Rachal, & Hubbard, 1991). For instance, maternal substance abuse is often associated with malnutrition, and malnutrition may affect not only fetal growth and development but also have longer-term health effects, even into adulthood (Kajantie et al., 2005). As newer classification schemes evolve, it may be possible to better quantify the full costs of parental substance abuse to society (Drost, Paulus, Ruwaard, & Evers, 2013). Nevertheless, as Lester, Boukydis, and Twomey (2000) noted in the second edition of this volume, the *projected* costs of maternal substance abuse also need to be considered. For instance, extra educational expenditures multiply over time for those children who exhibit deficits in attention and cognitive processing due, in part, to prenatal substance exposure. Given that at least one in 10 pregnancies is impacted by alcohol and/or drug use, the absolute number of affected infants and children is large.

If effective and accessible interventions for pregnant women who abuse substances were available, some of the future costs associated with parental substance abuse could be mitigated. Unfortunately, based on meta-analytic findings, there is no evidence that outpatient treatment of pregnant women who abuse substances results in abstinence or improved pregnancy outcomes (Terplan & Liu, 2007; Terplan, Ramanadhan, Locke, Longinaker, & Liu, 2015). The lack of evidence for treatment impact during pregnancy reflects more than one problem, however. First, the number of well-designed treatment trials for pregnant women who abuse substances is limited. In particular, few studies evaluate pregnancy or neonatal outcomes, and of these, few do so in systematic ways, rendering it difficult to assess the impact of treatment on infant outcomes (Terplan et al., 2015). Second, the intensity of treatment reflected in the available trials is only moderate, and it would not be surprising if outcomes and intensity of treatment are linked. Finally, specialized outpatient treatment programs for pregnant women who abuse substances cannot meet demand, which makes access to care for pregnant women

a significant national problem. It is therefore not altogether surprising that at the peak of the current opioid epidemic, fewer than 40% of pregnant women who are opioid dependent receive medication-assisted therapy, the treatment of choice in pregnancy (Volkow et al., 2014). Evaluation of other types of programs (e.g., intensive residential treatment) also has not been adequate to draw broad conclusions about effectiveness (Greenfield et al., 2004; Haug, Duffy, & McCaul, 2014).

Certainly, access to substance abuse treatment in the United States is of serious concern for all adults, not just pregnant women. Infants and young children who are not exposed to drugs *in utero* still may be impacted adversely by parental substance abuse. It is discouraging that large-scale studies of individuals with both mental health and substance abuse conditions suggest that few receive appropriate treatment (Grella, Karno, Warda, Moore, & Niv, 2009; Wu, Hoven, & Fuller, 2003). Given that a vast majority of individuals identified as having a past-year substance dependence diagnosis perceived no need to receive help, initiatives to increase the recognition of difficulties related to substance abuse may improve help seeking (Grella et al., 2009). A significant proportion of adults with comorbid mental health and substance abuse conditions are parents of infants and young children. The limited treatment options for parents who abuse substances mean that infants and young children suffer (Bountress & Chassin, 2015; Calhoun, Conner, Miller, & Messina, 2015; Luthar, Suchman, & Altomare, 2007).

Beyond the issues with treatment we raised earlier, the adverse effects of parental substance abuse may be difficult for infant mental health clinicians to unpack. Recent research suggests that the ways in which parental substance abuse affects infants can be thought of along three basic dimensions. First, there are direct effects—exposure to substances *in utero* impacts the developing fetus and results in developmental consequences. Second, there are genetic effects—parents who abuse substances are more likely to have underlying traits that also may influence parenting behavior. Third, parental substance abuse is linked to a series of other risk conditions that impact the social environment of infants. When risk factors combine, negative developmental effects can be large and lasting. In individual cases, it is either impossible or impractical to separate direct effects, genetic effects, and the effects of cumulative risks on a given infant's development. For the infant mental health clinician, however, tracing the impact of substance abuse on a given infant's development requires consideration of the interplay among all three dimensions. Likewise, effective treatment often requires family-based strategies that target key developmental processes impacted by all three dimensions.

Given the importance of these dimensions, we have organized this chapter around them. First, we review evidence regarding the developmental effects tied to direct exposure to alcohol and/or drugs, using alcohol, cocaine, and opiates as examples. Next, we consider parental genetic effects associated with substance abuse and link these to the available data on the parenting behaviors of those who abuse substances. Finally, we underscore the importance of thinking about co-occurring risk factors as they impact the developing infant.

Direct Effects of Substance Abuse: Alcohol, Cocaine, and Opiates

The direct effects of substance exposure on the developing fetus have been studied intensively, although such research is complicated by numerous factors (Shankaran et al., 2007). One factor that complicates research on direct effects is the variation in the degree to which different substances impact fetal organ systems. For instance, alcohol is a potent neurotoxin. Even though the mechanisms by which alcohol affects neuronal growth are complex (Bonthius, Winters, Karacay, & Bousquet, 2015), the end result of fetal alcohol exposure early in pregnancy can be the death of large numbers of neurons (Olney et al., 2000), and a series of neuroanatomic changes associated with alcohol exposure have been documented (Chen, Maier, Parnell, & West, 2003). Other drugs, such as cocaine, may injure neurons but not by directly killing them (Ren, Malanga, Tabit, & Kosofsky, 2004). Although cocaine can cause vascular constriction, thereby injuring fetal organs and the placenta, cocaine's direct effects on neurons appear to be less severe (Plessinger & Woods, 1993). Likewise, opioids are not considered a direct neurotoxin, although their effects on the fetus are not well studied, and studies linking opiate use in pregnancy to poor fetal growth and birth defects are concerning (Viteri et al., 2015; Yazdy, Desai, & Brogly, 2015).

A second factor complicating research on direct effects is that the timing, dose, and duration of exposure may be critical in determining how the fetus is impacted. Unfortunately, however, timing, dose, and duration of exposure are almost always difficult to pin down. So, for instance, even though alcohol is a direct neurotoxin, low-to-moderate alcohol use during all trimesters of pregnancy is not associated with increased risk of low birthweight, preterm delivery, or other perinatal outcomes (Lundsberg, Illuzzi, Belanger, Triche, & Bracken, 2015). Additionally, studies suggest that 5-year-olds exposed *in utero* to low-to-moderate quantities of alcohol show no differences in intelligence test scores (Falgreen Eriksen et al., 2012), executive functioning (Skogerbø et al., 2012), or sustained attention (Underbjerg et al., 2012) relative to unexposed children.

On the other hand, there is evidence that even sporadic use of alcohol in pregnancy is linked to fetal alcohol effects, with fetuses in the first trimester being particularly sensitive to the effects of alcohol (Nykjaer et al., 2014). Such sporadic use is not uncommon among women who drink during pregnancy (Martínez-Frías et al., 2004). The question of how much alcohol exposure is enough to directly affect a given infant may be unanswerable. Consequently, there can be no guidelines for acceptable alcohol usage during pregnancy, and it remains the standard to advise women to avoid alcohol consumption throughout pregnancy (Falgreen Eriksen et al., 2012).

Here, a third factor that complicates research on the direct effects of substance abuse comes into play, namely, that maternal substance exposure may be associated with other important factors in fetal development that can potentiate direct effects. For instance, maternal alcohol abuse during pregnancy is associated strongly with poor nutritional status. There also is good evidence that the combination of alcohol exposure and a poor nutritional environment greatly influences the developing brain (Guerrini, Thomson, & Gurling, 2007). Other factors such as maternal age, chronic alcohol use, higher parity (Niccols, 2007), and maternal body mass index (May et al., 2016) also may play a role in increasing the likelihood that a given fetus's exposure will lead to fetal alcohol syndrome.

The effects of cocaine and opiates also may be potentiated by poor maternal nutrition, and inadequate weight gain during pregnancy is particularly common among those who abuse cocaine (Smith et al., 2006). Here, again, the limits of research on direct effects are apparent (for a review, see Smith & Santos, 2016). Because cocaine and opiate use are associated with poor fetal growth, with the use of alcohol and/or other drugs, and with high-risk social environments, documenting the direct effects of each drug alone is quite difficult (Viteri et al., 2015). Clearly, there is much we do not know about the effects of alcohol, cocaine, and opiates on the developing fetus. Still, infant mental health clinicians should be familiar with diagnosing fetal alcohol syndrome and should be aware of limited, though important, longitudinal data on prenatal cocaine and opiate exposure.

Alcohol Effects

The best available data confirm that fetal alcohol exposure is among the most common preventable causes of developmental disorders in the United States and that public health interventions meant to influence alcohol intake by women of child-bearing age (and their partners) are a worthy investment (Floyd, O'Connor, Bertrand, & Sokol, 2006). In fact, global initiatives to reduce the harmful use of alcohol have been implemented recently (World Health Organization, 2014). Fetal alcohol syndrome (FAS), a neurodevelopmental syndrome characterized by physical stigmata, cognitive deficits, and impaired pre- and postnatal growth, has been described for decades (Calhoun & Warren, 2007). Nevertheless, only within the past 15 years or so have uniform diagnostic criteria for FAS been developed (Floyd, O'Connor, Sokol, Bertrand, & Cordero, 2005). Part of the struggle to characterize FAS has to do with the fact that individual infants may be more or less affected. Furthermore, various terms, including "fetal alcohol spectrum disorders" (FASD), are used to describe the large number of children who are affected but do not meet criteria for "classic" FAS (Niccols, 2007). In the most recent edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), however, a new category, neurobehavioral disorder associated with prenatal alcohol exposure (ND-PAE), was included, with the goal of advancing recognition of fetal alcohol effects (Olson, 2015). For infant mental health clinicians, recognizing the behavioral and developmental stigmata of alcohol exposure is a key to shaping treatment.

Recent reviews suggest that even children who are at the more affected end of the FAS spectrum have developmental consequences

that are not captured simply by reductions in intellectual functioning. It is true that verbal and nonverbal intelligence often are affected in individuals who are alcohol exposed (Koditiwakku, 2007). Nevertheless, tests of intellectual functioning alone give an incomplete picture of alcohol-related deficits. Reductions in processing speed, deficits in working memory, and inattentiveness are common in children who are affected (Koditiwakku, 2007; Niccols, 2007), and such executive functioning deficits can be documented in children less than 6 years of age (Fuglestad et al., 2015). As task complexity increases, however, deficits in domains of functioning as disparate as visual processing and language use in early childhood (Koditiwakku, 2007) may lead to deficits in theory of mind by ages 9–11 years (Lindinger et al., 2016).

Not surprisingly, alcohol exposure also is linked to changes in social and emotional behavior in infancy. Infants who are exposed to alcohol prenatally show emotional withdrawal when they are 6½ months of age, irrespective of factors such as mother–infant interaction, infant temperament, and maternal depression, anxiety, or life stress. Subsequently, infants' emotional withdrawal predicted scores on measures indicative of risk for childhood depression and other mood disorders at a 5-year follow up (Molteno, Jacobson, Carter, Dodge, & Jacobson, 2014). Additionally, early impairments in state regulation give way to difficulty reading social cues, such that, as a group, preschoolers with FAS have difficulty differentiating familiar from unfamiliar caregivers and can appear excessively friendly or socially indiscriminant (Kelly, Day, & Streissguth, 2000). As time goes on, children who are affected may have severe problems with adaptive functioning. Many meet criteria for attention-deficit/hyperactivity disorder (ADHD) by the preschool years, and disruptive behavior often further complicates early learning deficits (Streissguth et al., 2004; Whaley, O'Connor, & Gunderson, 2001). By kindergarten, many children who were exposed to alcohol prenatally exhibit behavioral difficulties, including hyperactivity, inattention, and conduct problems (Alvik, Aalen, & Lindemann, 2013).

Cocaine Effects

Relative to data on alcohol exposure, data on cocaine exposure and developmental functioning over time are sparse (Lester & Lagasse, 2010). The strongest link in the literature is between maternal cocaine use during pregnancy and birth outcomes, such as preterm delivery, low birthweight, and transient neurobehavioral problems (Shankaran et al., 2007). The long-term implications of these birth outcomes are not well documented, however, and cocaine's role in more severe birth defects has not been established. Still, data from the few longitudinal, controlled studies following the upswing in cocaine use in the United States in the early 1990s converge to suggest that prenatal cocaine exposure is associated consistently with mild attentional deficits and decreased emotional expressiveness over time, even when researchers control for confounding factors (Frank, Augustyn, Knight, Pell, & Zuckerman, 2001). Prenatal cocaine exposure also is related to children being less sociable, exhibiting more internalizing behavior problems, and having smaller size at age 10 years (Richardson, Goldschmidt, Larkby, & Day, 2013; also see Lester & Lagasse, 2010, for a review).

Although mixed findings have been noted regarding the learning outcomes of children exposed to cocaine prenatally, Lester and colleagues (2000) note that the costs of addressing even small learning-related deficits in a large number of children exposed prenatally to cocaine are impressive. For example, children who have been cocaine-exposed have significantly lower scores on measures of intelligence, receptive language, and expressive language relative to children who have not been exposed. Although the findings for intelligence suggest a small effect size, and the findings for receptive and expressive language suggest medium effect sizes, such discrepancies in child performance translate into a significant need for special education services each year. The added cost of serving cocaine-exposed children in special education services is estimated to be from $4 million to $80 million each year depending on the degree of IQ deficits noted (Lester, Lagasse, & Seifer, 1998).

Nevertheless, the deficits associated with cocaine exposure are neither common enough nor severe enough to suggest that even a minority of infants who are exposed to cocaine will be affected predictably. Instead, longitudinal data suggest that the relative impact of factors affecting the infant's postnatal environment also must be considered, including the parenting that they receive (Neger & Prinz, 2015). Specifi-

cally, these children are likely to be affected by the socioeconomic and environmental factors impacting their substance-involved parents, creating a kind of "double jeopardy" and promoting further contact with a variety of social services (Lester et al., 1998). Although calls for considering prenatal drug exposure to be a reliable marker for social risk are long-standing (cf. Conners et al., 2003; Tronick & Beeghly, 1999), recent research suggests that addiction is a complex biosocial problem with genetic underpinnings. For infant mental health clinicians, emerging research on behavioral phenotypes associated with parental substance abuse can guide assessment and inform intervention.

The Opiate Epidemic and Neonatal Abstinence Syndrome

As with studies of cocaine use during pregnancy, the overall picture regarding opiate exposure and fetal development is unclear. The lack of hard data is of particular concern in the recent epidemic of opiate abuse impacting women of childbearing age in the United States. From 2000 to 2010, there was a 35% increase nationally in prescriptions for opioid painkillers, leading to sharp increases in morbidity and mortality associated with opiate abuse, including a sharp rise in heroin use nationally as individuals shift from use of prescription opiates to illicit opiates (Kenan, Mack, & Paulozzi, 2012). The effects of opiates on the developing fetus are not well studied. Based on a recent review, initial studies suggesting that opiates are not associated with congenital anomalies should be reconsidered in light of more recent data, although there are not enough data to firmly conclude that opiates are indeed teratogenic (Viteri et al., 2015). Furthermore, the largest multisite study of medication-assisted therapy (e.g., dispensing methadone or buprenorphine at controlled doses) reveals that methadone is differentially associated with poor fetal growth, including lagging head circumference, although previous studies regarding the link between opiate use in pregnancy and fetal growth have been mixed (Jones et al., 2010).

Although some of the direct effects of opiates remain unclear, what is clear is that opiate use in pregnancy causes neonatal abstinence syndrome and that a majority of neonates born to regular opiate users will go through some form of withdrawal (Hayes & Brown, 2012; Ko et al., 2016). Other substances, such as alcohol and cocaine, also may cause withdrawal symptoms, although these symptoms are far less prolonged and occur at much lower rates (American Academy of Pediatrics, 2012). Symptoms of neonatal abstinence syndrome (NAS) may include feeding and gastrointestinal disturbance, failure to thrive, sleep–wake difficulties, autonomic dysfunction, irritability, difficulties with calming, alterations in infant tone and movement, and impaired interactional capacity (American Academy of Pediatrics, 2012; Jansson & Velez, 2012). NAS symptoms generally start within days after birth, though individual differences in symptom expression are common (Jansson & Velez, 2012; Kocheriakota, 2014). The majority of infants with NAS are cared for in intensive care, and many have hospital stays of 20 or more days (Lind et al., 2015). Although controlled weaning with some form of opioid (morphine is the most commonly used drug; Tolia et al., 2015) is the treatment of choice for exposed newborns, there is considerable variability in treatment protocols. Furthermore, infant withdrawal is not infrequently compounded by comorbid exposure to other drugs including psychiatric medications, further complicating care (Hayes & Brown, 2012; Levinson-Castiel, Merlob, Linder, Sirota, & Klinger, 2006; Pritham, Paul, & Hayes, 2012). Environmental and interactive modifications, like infant swaddling and rooming in with mothers in darkened rooms, may impact a given child's course and help engage parents (Jansson & Velez, 2012; Salki, Lee, Hannam, & Greenough, 2010).

NAS is a challenging medical condition, and it is also costly (Patrick et al., 2012; Maguire et al., 2016). There is some evidence that better management of women during pregnancy can significantly shorten the length of stay for affected neonates (Jones et al., 2010), but medication-assisted therapy remains underutilized nationally (Volkow et al., 2014). The costs of managing neonatal abstinence are compounded by costs associated with child welfare involvement of affected infants, and both child welfare and court systems are strained (Wiltz, 2007). Rehabilitating drug-using parents is challenging, and part of the challenge reflects the fact that affected families face both social risk and biological propensities that can impact treatment. Understanding what predicts parental substance abuse is important in informing both prevention and intervention efforts.

Beyond Social Risk: Predictors of Parental Substance Abuse

Not surprisingly, substance involvement hinders parents' ability to provide safe and stable relationships and environments for their infants (Small & Kohl, 2012). Obviously, acute intoxication leads to impairments in parenting. It also is important to note, however, that underlying genetic traits predisposing individuals to substance abuse also place parents at a higher risk for engaging in unfavorable and unsafe parenting behaviors. Fortunately, predicting which parents will struggle with substance abuse (and, therefore, which infants will be affected) is becoming possible. Twin and other genetically informed studies are especially helpful in identifying traits associated with substance abuse and estimating the degree to which those traits are heritable (Kendler, Myers, & Prescott, 2007). In fact, recent findings indicate that the mean heritability rates of substance use disorders (SUDs) range between 40 and 70% (Kendler et al., 2012). Such findings suggest that substance use is an intergenerational problem, with heritability rates that are equal to or higher than those of many common chronic medical problems.

The links between early impulsivity, externalizing behavior problems, and emotion dysregulation and later substance abuse also have been demonstrated in longitudinal studies of at-risk groups, such as children of parents who abuse substances. For example, Verdejo-Garcia, Lawrence, and Clark (2008) summarize that children of parents with SUDs are likely to demonstrate elevated impulsivity before they are exposed to substances, and that this impulsivity can be a strong and reliable predictor of their later initiation of substance use and subsequent substance problems. In effect, impulsivity is a strong predictor of substance abuse and dependence, and the relationship between preexisting impulsivity and substance abuse holds for different substances, including alcohol and cocaine.

Similar research on novelty seeking (a trait that is related to impulsivity) describes more consistent findings; that is, novelty seeking is linked to conduct problems, including substance abuse (Hiroi & Agatsuma, 2005). Furthermore, externalizing symptoms (e.g., impulsivity, inattention, oppositionality, conduct problems) at ages 10–12 years and 16 years predicted SUDs at the age of 22 years for children of fathers who were diagnosed with a SUD (Kirisci et al., 2015). Emotion regulation also represents an additional underlying trait that may predispose individuals to substance use problems (Kober, 2014) as well as difficulties with parenting (Small & Kohl, 2012). In fact, boys who are rated high on difficult temperament characteristics and emotion dysregulation, and who have a father with an SUD diagnosis, are more likely to develop an SUD themselves, to have problems with multiple substances, and to experience more severe substance-related problems in adulthood (Kirisci et al., 2015). These findings suggest that impulsivity, other externalizing behavior problems, and emotion dysregulation can be examined collectively in terms of transmissible risk, particularly given that these psychological traits tend to demonstrate intergenerational continuity (Kirisci et al., 2015).

Research in this area has not stopped at identifying links between traits and later substance abuse. Instead, the search for genes and gene products that potentiate drug use is proceeding at a rapid pace (van den Bree, 2005). As yet, longitudinal studies that consistently identify gene products associated with substance abuse are lacking. Still, genetically informed research is illuminating. For instance, a longitudinal study looking at predictors of early alcohol use among children who are maltreated and a matched comparison group revealed a strong link between childhood maltreatment and early alcohol use (Kaufman et al., 2007). A clearer picture of early alcohol use is gained, however, when genetic and environmental factors are considered collectively from a diathesis–stress perspective. Children with a particular serotonin transporter gene (*5-HTTLPR*) are at increased risk for early alcohol use; there is an interaction between having the short-allele (s-allele) of this gene and childhood maltreatment. In other words, children who are maltreated and who also are born with the s-allele of *5-HTTLPR* are at greatest risk to initiate alcohol use early in life. The severity of childhood maltreatment experiences, the existence of early psychopathology, and a poor mother–child relationship also predict early alcohol use (Kaufman et al., 2007). This study, and others like it, emphasizes that genetic factors are important in determining how individuals respond to environmental triggers.

Identifying which neurotransmitters are key in the reward pathways that make individuals susceptible to substance abuse holds promise

for new and more effective interventions (Gass & Foster Olive, 2008). For infant mental health clinicians, the promise of substance abuse treatments is only one piece of a larger puzzle. What is to be done for impulsive and dysregulated caregivers whose unpredictability impacts their relationship with their infants? How can impulsivity and emotion dysregulation be assessed in the clinical setting, and what is the impact of these traits on a given parent–infant relationship? Finally, do parents who abuse substances demonstrate insight regarding the effect that their behaviors are having on their infants, and how can we improve their reflective capacity so that improvements can be made?

As yet, there are limited data to guide infant mental health clinicians in intervening with caregivers who are both impulsive and abuse substances. Nevertheless, data suggest that tracking caregiver impulsivity in interactions is important. For instance, Chen and Johnston (2007) indicated that mothers' inattention is associated with inconsistent discipline and less involvement with their 4- to 8-year-old children. Furthermore, this same study revealed that maternal impulsivity is associated negatively with reports of positive discipline. These relationships hold even when child behavior, maternal depressive symptoms, and sociodemographic factors are controlled. The findings from this study dovetail with others showing that fathers with ADHD are more critical and negative regarding their children's symptoms (Arnold, O'Leary, & Edwards, 1997) and that mothers with ADHD monitor their children with ADHD less and are less consistent with their children than are mothers who do not meet criteria for ADHD (Murray & Johnston, 2006).

Parents' emotion dysregulation also has been shown consistently to predict child maltreatment (Solomon, Morgan, Åsberg, & McCord, 2014). In fact, parents' emotion dysregulation is even more predictive of child maltreatment potential than their psychiatric diagnosis (Hien, Cohen, Caldeira, Flom, & Wasserman, 2010). Nevertheless, research findings agree consistently that emotion dysregulation serves as a pathway through which parents' experience of childhood adversity increases their likelihood of engaging in abusive parenting behaviors (Dixon, Browne, & Hamilton-Giachritsis, 2005; Lowell & Renk, 2017; Smith, Cross, Winkler, Jovanovic, & Bradley, 2014). As a result, parents' emotion dysregulation is another underlying trait worth assessing in those who present for infant mental health services. It is critical that mental health clinicians monitor over time parents' impulsivity and emotion dysregulation, issues of particular relevance for parents who abuse substances. For instance, there is evidence that mothers who abuse cocaine tend to be disruptive and intrusive in their interactions with their infants in the first year of life (Burns, Chethik, Burns, & Clark, 1997; Mayes et al., 1997).

Although there is some inconsistency in studies of mothers who abuse substances and their children, most researchers find that maternal substance abuse is a good marker for problematic interactive behavior, with the majority examining dyadic interactions in the preschool years (Johnson, 2001; Mayes & Truman, 2002). Although few longitudinal, controlled studies exist, one study suggests that mothers who abuse cocaine and who have 3-year-olds exhibit higher levels of hostility and intrusiveness relative to matched mothers who are not abusing drugs (Johnson et al., 2002). Furthermore, caregiver intrusiveness has been linked to disorganized attachment in toddlers who are exposed to substances prenatally (Swanson, Beckwith, & Howard, 2000). Similarly, research suggests that infants tend to demonstrate insecure attachment relationships to both their father and mother when both parents are abusing alcohol (Eiden, Edwards, & Leonard, 2002).

Combined evidence from neuroimaging and neurobiological studies has demonstrated how substances disrupt the neuroregulatory systems that are important in driving parent responsiveness (Rutherford, Potenza, & Mayes, 2013; Swain, Lorberbaum, Kose, & Strathearn, 2007). Overall, neural circuits that have been associated with parenting behaviors appear to be the same as those involved in addiction (i.e., those in the frontal, striatal, and limbic systems). Consequently, if these circuits are being co-opted for the craving–reward cycle involved with substance abuse, they may be less available for parenting (Landi et al., 2011). Specifically, mothers who abuse substances exhibit significantly less brain activity than comparison mothers when exposed to infant cries and images of infant faces. Such findings suggest that reward circuits are disrupted in the brains of mothers who abuse substances, with this disruption being related to decreased caregiving responsiveness and lower motivation to engage in dyadic interaction (Rutherford et al., 2013). In addition, disruptions in stress circuits in the brains of mothers who abuse substances

prompt these mothers to become distressed and dysregulated when they are exposed to infant cues (e.g., cries, faces) and may contribute to increases in these mothers' drug craving (Rutherford et al., 2013). In other words, an infant cue may act as a stress cue rather than an affiliation cue for parents who abuse substances. Such findings are noteworthy given that these neurobiological patterns and subsequent parenting difficulties often may lead to insecure attachment patterns in children of parents who abuse substances (Lander, Howsare, & Byrne, 2013).

The first important contribution of studies examining genetic traits and the neurobiological underpinnings of substance abuse is to provide an impetus for infant mental health clinicians to think differently about their clients who are abusing substances, and who have been labeled as "impossible." In particular, infant mental health clinicians can reframe these clients as individuals who have inherited a set of behavioral traits (e.g., impulsivity) that make substance abuse far more likely. For instance, recent epigenetic research using animal models shows that substance abuse in offspring can be attributed to alterations in the expression of genetic material provided by parents who experienced early adversity but who do not abuse substances themselves (Cadet, 2016; Montalvo-Ortiz, Gelernter, Hudziak, & Kaufman, 2015; Philibert & Erwin, 2015). Obviously, the inheritance of altered genetic material due to early maternal adversity is not a choice. Similarly, the inheritance of a short allele of a transporter gene is not a choice. Nevertheless, treatments for parents who abuse substances too often have emphasized confrontation and blaming (Miller & Rollnick, 2002). Although viewing parents who abuse substances as helpless victims is equally unhelpful, blaming these parents does not fit with the evolving science of how individuals likely come to abuse substances.

The second important contribution of studies examining genetic traits and the neurobiological underpinnings of substance abuse is to identify traits likely to be more common in parents who abuse substances and that also affect the interactive dance between parents and their infants. For instance, here is where parent impulsivity has its own direct effects on the infant. Even subtle shifts in interactive behavior, shifts known to be associated with alcohol, cocaine, and opiate abuse, can have significant developmental consequences over time (Tronick et al., 2005). Fortunately, brain imaging studies continue to shed light on the underlying neurobiological traits that affect parenting behaviors and parent–child interactions (Maupin, Hayes, Mayes, & Rutherford, 2015). In addition, using observational measures such as the Still-Face Procedure for infants and structured interactive procedures for toddlers and preschoolers is essential in clinical work when assessing parents and infants who have been affected by substance abuse (see Larrieu, Middleton, Kelley, & Zeanah, Chapter 16, this volume). Learning to recognize when parents fail to read their infants' cues is particularly critical. Tracking inconsistency and intrusiveness, hallmarks of parents who abuse substances and who are impulsive, must be a focus of assessment when parental substance abuse is part of the differential diagnosis.

For parents who abuse substances, guilt and shame often influence parenting behaviors. It is not unusual for parents who abuse substances to report "making up" for neglecting their infants during periods of active substance use by overstimulating their infants when they are not using substances as actively. Such "on again, off again" patterns may become evident through narrative interview. With parents who abuse substances, narrative interviews are an essential complement to direct observation of parent–infant interaction.

Furthermore, both observation of parent–infant interaction and parent narrative interview may reveal parents' capacity for reflective functioning, a trait that often is impaired in addicted individuals (Pajulo et al., 2012). "Reflective functioning" refers to the psychological process of individuals' understanding their own and others' behaviors and the mental states that drive those behaviors (Fonagy, Gergely, Jurist, & Target, 2002). Reflective functioning is similar to insight, in that both involve individuals examining their own behavior, thinking about how their behavior affects others, and using that knowledge to interact with others more effectively. Not surprisingly, impaired reflective functioning can contribute to relationship conflicts. These relationship conflicts then promote distress that in turn may contribute to substance abuse (Söderström & Skårderud, 2009). As a result, it is particularly important to assess initally the reflective functioning of parents who abuse substances, then to monitor it over time. Of greatest concern, mothers who have poorer reflective abilities relapse more frequently and have infants who are more likely

to be removed from their care and experience foster placements (Pajulo et al., 2012).

It also is important to remember that substance abuse is known to be a marker for broader social risk conditions (Hans, 1999; Liu, Roberts, Burgdorf, & Herrell, 2003). Infant mental health clinicians must look for specific traits that are linked to parenting difficulties in parents who abuse substances, while also assessing the broader social context of the infant.

Substance Abuse as a Marker for Social Risk

Indeed, the infants and children of parents who abuse substances often must cope with constellations of risk factors rather than with isolated adverse circumstances (Evans, Li, & Whipple, 2013). Thus, the transaction between individuals and their environment has been accepted as a driving force in determining developmental outcomes (Sameroff & Mackenzie, 2003). Put another way, infants both act upon their social environment and are acted upon by that environment. For instance, in the context of maternal substance abuse, the data already reviewed in this chapter suggest that infants may be affected directly by alcohol, cocaine, or opiates, while also having a primary caregiver who is at-risk for interactive difficulties. As the infant develops, the impulsiveness of his or her parent may pervade the infant's social experience and lead to difficulties in early emotion regulation. Furthermore, the infant also may have been affected directly by prenatal alcohol exposure and inherited the tendency to be impulsive. It is when such early risk is compounded by postnatal environmental factors known to be associated with substance abuse that infant development is affected most severely.

A birth cohort study from the United States illustrates how risk conditions aggregate, and how they may affect infant development (Whitaker, Orzol, & Kahn, 2006). In a study following the majority of more than 4,200 mothers of infants from 18 U.S. cities over the course of 3 years, the relationships among child behavior (as reported by mothers) and maternal mental health, substance use, and domestic violence were explored. Reports of child aggression, anxiety–depression, and inattention–hyperactivity when the children in this study were 3 years of age were related in a stepwise fashion to the number of risk conditions (i.e., maternal mental health, substance use, and/or domestic violence) that had been reported when the children were 1 year of age, even after the researchers controlled for both a variety of sociodemographic factors (e.g., income, ethnicity, maternal age, maternal education, birthweight) and paternal mental health and substance use. As with other studies (Buehler & Gerard, 2013; Meunier, Boyle, O'Connor, & Jenkins, 2013; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987), particular maternal risk conditions early in life, including maternal substance abuse, are no more predictive of child behavior at later ages than other singular risk conditions. Rather, it is the cumulative occurrence of risk factors that is most predictive of early behavior difficulties. A study comparing infants who have been exposed prenatally to cocaine and infants who have not been exposed suggests that cumulative risk predicts internalizing behavior problems in kindergarten for both groups, regardless of drug exposure (Eiden, Godleski, Colder, & Schuetze, 2014). Such findings highlight the power of cumulative risk, regardless of whether this risk occurs in the context of parental substance abuse.

The clustering of risk conditions is common when maternal substance abuse is present. For instance, maternal substance abuse during pregnancy and depression often co-occur (Chandler & McCaul, 2003). In turn, depressive symptoms increase child maltreatment potential for parents who abuse substances (Kelley, Lawrence, Milletich, Hollis, & Henson, 2015). Furthermore, there are associations between maternal substance abuse and family and neighborhood violence (Ondersma, Delaney-Black, Covington, Nordstrom, & Sokol, 2006). For instance, individuals in methadone treatment for heroin addiction experience a disproportionate degree of stress compared to the general population and generally are marginalized and disadvantaged (Taplin & Mattick, 2015). The severe stress experienced by parents who abuse substances is particularly concerning given that both environmental stress and parenting stress play a role in addictive behaviors, damage the parent–child relationship, affect children's development, increase the likelihood of maltreatment, and increase the likelihood of relapse (Chaplin & Sinha, 2013).

With the possible exception of direct toxic effects from alcohol, available data suggest that it is the co-occurrence of family risk in the presence of maternal substance abuse that accounts for most of the negative developmen-

tal effects associated with maternal substance abuse (Shankaran et al., 2007). For infant mental health clinicians, it is essential to understand what co-occurring risk conditions are impacting families when parental substance abuse is an issue. Unfortunately, longitudinal studies suggest that maternal substance abuse at birth is a potent predictor of child protective services involvement in the preschool years (Child Welfare Information Gateway, 2014; National Association for Children of Alcoholics, 2015; Street, Whitlingum, Gibson, Cairns, & Ellis, 2008). Parents who abuse substances also are significantly more likely to have their parental rights terminated than those who do not use substances (Murphy et al., 1991). These figures may be due, in part, to the cumulative risk experienced by families with parents who abuse substances. Specifically, in a sample of parents whose rights had been terminated by the state, parents who abused substances presented with significantly higher cumulative risk (i.e., single parenthood, trauma history, criminal history, mental health problems) compared to parents who did not use substances (Ben-David, 2016). Such findings underscore the need to engage with parents who abuse substances and mitigate risks when possible.

Recent research also sheds light on mitigating factors that may increase or decrease the negative effects of this cumulative risk. For instance, Zhang and Slesnick (2016) confirm that cumulative risk (e.g., maternal depression, childhood trauma history, runaway experiences, family history of substance use) in families with parents who abuse substances predicts children's behavior problems significantly. Mothers' emotion-oriented coping mediates the relationship between cumulative risk and children's behavior, however. In fact, parental emotion-oriented coping may have a more consistently negative impact on children, possibly because this type of coping includes distraction or palliative efforts to reduce stress (e.g., emotional withdrawal, alcohol or drug use; Zhang & Slesnick, 2016). In effect, when parents who abuse substances withdraw emotionally or use distraction, their relationship with their children may suffer, and their risk of relapse may increase. Such findings underscore the need to understand how parents' coping impacts their relationship with their children, particularly when cumulative risk is high, but specific risk factors are not addressed easily. It seems likely that keeping highly stressed parents engaged in moment-to-moment interactions with their children and helping them reflect on their children's emotional experience are critical both for their recovery and for their children's development.

Despite the challenges that parental substance abuse presents to infant mental health clinicians, treatments hold great promise. Having an infant to care for can be a great motivator for parents who abuse substances. In fact, mothers who abuse substances often enter treatment due to concerns for the physical safety of their fetus during pregnancy, as well as intentions to improve their caregiving abilities (Taplin & Mattick, 2015). Following the passage of the Adoption and Safe Families Act (i.e., a federal law calling for timely permanency planning for children in the child welfare system), mothers who abuse substances have been entering substance use treatment sooner and remaining in treatment longer in an effort to prevent their parental rights from being terminated (Green, Rockhill, & Furrer, 2006). Additionally, being pregnant or having a dependent child is associated with retention in residential substance treatment programs, particularly when the program has high percentages of other pregnant or parenting women enrolled (Grella, Joshi, & Hser, 2000). Retention in residential programs, in turn, is associated with higher rates of treatment success, with more than two-thirds of women who spend 6 months or more in residential treatment in a large, cross-site study reporting abstinence 6–12 months after discharge (Greenfield et al., 2004). Nevertheless, research has suggested that 60–75% of mothers who enter drug treatment leave before they complete treatment (Comfort, Sockloff, Loverro, & Kaltenbach, 2003).

When parents who abuse substances present for treatment, engaging them in parenting intervention is critical (Renk et al., 2016). Unfortunately, typical treatment provided to these parents more often focuses on substance abuse alone, however (Suchman, DeCoste, Castiglioni, Legow, & Mayes, 2008). Nevertheless, addressing parenting issues is particularly important given links between substance abuse and a history of childhood maltreatment and trauma (Kunitz, Levy, McCloskey, & Gabriel, 1998), high levels of parenting stress (Nair, Schuler, Black, Kettinger, & Harrington, 2003), decreased engagement with children (Mayes et al., 1997), and the use of more dysfunctional or harsh discipline (Fals-Stewart, Kelley, Fincham, Golden, & Logsdon, 2004). Parents who

abuse substances often feel tremendous guilt about the impact of their substance use on their children, and addressing this issue directly may prevent relapse.

Although there is not consensus on which parenting interventions are most effective for parents who abuse substances, a recent review grouped available studies of intervention programs into skills-based interventions (i.e., those that incorporate cognitive-behavioral components focused on improving parents' perceptions of their children and on changing parents' actual parenting behaviors) and attachment-based parenting interventions (i.e., those that focus on reflective functioning, emotional connection, and helping parents view child behavior through the lens of attachment theory; see Renk et al., 2016). There is evidence that both parenting approaches can be effective. Nevertheless, attachment-based parenting interventions may target the components of parenting that are related most closely to the neurobiological deficits known to be related to parents' substance abuse. These neurobiological deficits and parents' substance abuse also impact parent–child attachment (Suchman et al., 2008).

As model attachment-based interventions such as the Circle of Security Parenting Program (Horton & Murray, 2015; Powell, Cooper, Hoffman, & Marvin, 2014) and the Mothers and Toddlers Program (Suchman et al., 2008), are disseminated, parent–infant interactions can be addressed effectively while parents are engaging in treatment for their substance abuse. Such parenting interventions are capable of promoting early attachment security, which is a strong protective factor in infant development (Edwards, Eiden, & Leonard, 2006).

Clearly, the information provided here suggests that parental substance abuse is a potent risk condition. Furthermore, infant development can be affected through interrelated mechanisms, with direct prenatal effects, genetic effects (which influence parents and infants separately and together), neurobiological correlates, and cumulative social risks each being clinically important. Only intensive treatment is likely to be effective, although existing intervention models hold great promise for mitigating risk. The rewards of working with parents who abuse substances are great, and it is with such high-risk families that infant mental health clinicians can have the greatest impact in bettering the lives of infants and young children.

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