

## CHAPTER 2

# Pregnancy and Infant Mental Health

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**P**regnancy is a “‘critical phase’ in the life of a woman” (Benedek, 1970, p. 137), a time of major transition, reorganization, and integration for the mother-to-be, greatly affected by her biology, life experience, and psychology. It is a period of enormous change in her relationships with those around her: her partner, her family, and her larger community. As such, it is a period at once vulnerable and full of the potential for transformation and change for the mother-to-be, as well as the child-to-be.\*

The literature on the biology and psychology of pregnancy has grown enormously in the last two decades. Advances in understanding the neurobiology of pregnancy, as well as the impact of trauma and disrupted attachments on prenatal maternal representations make abundantly clear the sensitivity and vulnerability of this period, and underscore the need to routinely assess risk factors and to intervene in a comprehensive, timely way before and immediately after the child is born so as to prevent the intergenerational transmission of adversity and disrupted relationships.

We begin this review with a discussion of what is variously called the “parental brain” (Feld-

man, 2015a; Toepfer et al., 2017), the “parental caregiving network” (Feldman, 2015a), and the “caregiving system” (Bowlby, 1969/1982). We then discuss (1) the impact of early adversity, prenatal stress, and other risk factors on development in the fetus and neonate; (2) prenatal attachment processes; (3) maternal representations of the child; and (4) prenatal reflective functioning. We close with a consideration of the relevance of both biological and psychological perspectives for prenatal assessment and intervention.

### A Brief Overview of Pregnancy

#### *The Contexts of Motherhood*

Pregnancy begins with conception, which, for the large majority of women, occurs as the result of sexual intercourse during the fertile period in the menstrual cycle. However, advances in reproductive technology over the past three decades—which include *in vitro* fertilization, egg donation, and artificial insemination—have vastly increased the likelihood that women who struggle with infertility, are at risk for passing along genetic disorders, or past childbearing age can bear children; they also make it possible for lesbian women and gay men to raise their own biological children (see Golombok, 2015). While most of these technologies are available

\*Although we do not have the space here to discuss the relevant and important changes men experience during the transition to parenthood, they too are transformed by the process of becoming a parent.

primarily to the privileged, each profoundly affects the psychology of pregnancy and—once the child is born—the parents' conscious and unconscious experience of the child, and him- or herself as a parent. In addition, in the case of donated sperm or eggs, the “absent” biological parent becomes another “ghost in the nursery,” who may—to quote Fraiberg's (1980) prescient words—“take up residence” in parents' minds and hearts, and—ultimately—in the minds and hearts of their children as well.

The biological aspects of conception are quite distinct from their psychological aspects. Women *become pregnant* in a vast array of different personal, relational, and social circumstances, all of which contribute in small and large ways to the psychological experience of pregnancy, and to a woman's acceptance of the pregnancy. These distinct circumstances establish the context for the beginning of a new and—for the mother—lifelong relationship.

### ***Affective Upheaval in Pregnancy***

John was in his mid-30s; Maggie, his wife of 5 years, also in her mid-30s, was in her seventh month of pregnancy. The pregnancy was planned and welcome; the couple had a good marriage, good jobs in their chosen careers, were about to move into a new home, and had no financial worries. John described waking up one morning to discover Maggie in floods of tears. Enraged at finding his work clothes from the night before abandoned on the living room floor, she had thrown them out their apartment window and into the (locked) communal garden five stories below. The car keys, which she needed to go to work, were in the pocket of the pants that lay in a heap in the garden. “I'm giving her everything she wants! A baby! A house! And this is what happens???”

The emotional complexity of the transition to parenthood has been well documented, beginning with the groundbreaking work of psychoanalysts Grete Bibring (Bibring, Dwyer, Huntington, & Valenstein, 1961) and Therese Benedek (1970), and carried forward by a number of dynamic clinicians and scholars (for reviews, see Leifer, 1980; Raphael-Leff, 1991). The essence of this complexity lies in the redefinition of self and of one's relationship to others that is at the heart of the transition to motherhood. In addition to being a woman, a daughter, a wife/partner, and—in many in-

stances—a working person, she is now also becoming a mother, or becoming a mother to a new child, shifting prior attachments to make room for the new. This process invariably reawakens her relationship with her own mother. Ideally, this leads to feeling identified with her mother and other female caregivers in a positive and organizing way; often, however, these experiences can be painful and profoundly disruptive. Every other significant relationship in her life will change as well, and “who she is” in the eyes of the world, her intimates, and herself will never be the same. It is a deep loss, a thrilling, hopeful gain, and everything in between. As one father put it prosaically, “Once we are three, we can never be one again.” It is thus unsurprising that emotional upheaval is the *sine qua non* of pregnancy (despite the fact that many cultures mark it as a period of bliss and quiescence). Bibring was the first to note that affective instability—characterized to varying degrees by mood swings, fear, anxiety, and affect dysregulation—often typifies even the most “normal” and stable women during pregnancy. For the bulk of women, even when they are consciously thrilled to be pregnant (as Maggie was), regression, conflict, anxiety, transient depression, emotional lability, and ambivalence are inevitable—and profoundly adaptive, as they prepare the mother in a variety of ways for the enormous task before her. Women defend against the emotions of pregnancy in a number of different ways. Some rely on higher-order, flexible defenses, whereas others resort to more primitive, rigid defenses; these variations will have a direct impact on their later behavior with the child, as well as the child's attachment organization (Porcerelli, Huth-Bocks, Huprich, & Richardson, 2015).

The baby is largely an abstraction to the mother until she sees it and hears the heartbeat at 8–12 weeks, and feels the flutters of “quickening” 4–5 months after conception; as the pregnancy progresses, the baby slowly becomes more real to her. Throughout, the mother must grapple with the fact that the child is both a part of and separate from her, a reality she will negotiate throughout the rest of her life with the child. On the one hand, particularly during the latter stages of pregnancy and the early postnatal period, the woman must in some very real sense abandon herself to her child. Winnicott (1956) called this “primary maternal preoccupation,” referring to the mother's utter absorption in her baby, with its needs, its rhythms, its

very being. In this state, she and the baby are—profoundly—together as *one*. At the same time, the baby is a separate being, distinct from her fantasies, desires, projections, and attributions.

## Evolution, the Parental Brain, and the Caregiving System

### The Parental Brain

The manifest changes of pregnancy reflect an evolutionarily programmed transformation that *readies* the mother to ensure the literal survival of the infant, and guarantee its entry into the human, social world. Ruth Feldman, a pioneering researcher who has studied the neurobiology of parenting for well over 20 years, describes parenthood as “the process most critically implicated in the survival and continuity of life on Earth,” one that “contains more evolutionarily conserved components than all other social phenomena on the one hand and the greatest plasticity on the other” (2015a, p. 387). By this she means that while the common components of parenting (e.g., protection from danger, comfort, and nurture) have been retained over millions of years of evolution, these components are also enormously flexible and can be expressed in a variety of ways and contexts (e.g., by fathers, adoptive parents, and nonparental caregivers).

Particularly crucial to parental caregiving is the activation of mentalizing, empathy, and mirroring networks in the mother that together promote the development of like and crucial socioemotional networks in the baby (Feldman, 2015a). The activation of these networks in the parent depend on a delicate balance between neuroendocrine systems. These include the oxytocin [OT] system, which ensures attachment and bonding (Feldman, 2015b; Feldman, Weller, Zagoory-Sharon, & Levine, 2007; Gordon, Zagoory-Sharon, Leckman, & Feldman, 2010; Toepfer et al., 2017); the hypothalamic–pituitary–adrenal [HPA] axis, which regulates stress and ensures response to danger (Toepfer et al., 2017); and, finally, dopaminergic reward centers, which activate pleasure centers in the brain (Strathearn, Fonagy, Amico, & Montague, 2009). The mother’s brain also readies itself for social and emotional connection, as evidenced by widespread “pruning” and increased specificity of brain function in regions crucial for social exchange (Hoekzema et al., 2017). Following delivery, these areas show renewed

growth and development as they begin to support the infant’s emotional development (Kim et al., 2010).

### The Caregiving System

Bowlby (1969/1982) talked about the parental brain, too, but used a different language. He described the presence, at birth, of a flexible, adaptive, and evolutionarily privileged attachment system aimed at ensuring the child’s survival and ushering its entry into the human, social world. As he saw it, the functioning of this crucial biological system in the child is *completely dependent* on a reciprocal, evolutionarily privileged biological system in parents, which he termed the “caregiving system.” This unfortunately mechanistic and behavioral term refers to both the powerful urge to protect the child (of whatever age) from harm and the intense sense of connection and love a parent feels toward the child. Both allow the parent to provide a safe, secure, and loving base from which the child can discover the world, and to bear the competing demands and emotional complexity of parenting (also see Solomon & George, 1996). While the development of the parental brain begins with conception, women’s representations of their imagined child and of themselves as mothers begin to take shape when they are but children themselves (George & Solomon, 1996). Bowlby avoided using the term “attachment” to describe the parental side of the attachment system because for him attachment implied safety seeking and not safety providing. But in fact, “attachment,” used in a more colloquial sense, seems far more descriptive of the intense feelings parents experience toward their children than “caregiving system”; indeed, a number of researchers use the term “attachment” to describe a pregnant woman’s feelings of connection to her child.

## Risk Factors during Pregnancy

### Early Life Stress

It has been well established that early life stress (ELS) or adverse childhood experiences (ACEs) have a profound effect on the health and mental health of the exposed individual (Felitti, et al., 1998). It now seems increasingly clear that there is a “continuous intergenerational transmission of maternal ELS that likely occurs during both the prenatal and postnatal period via ELS as-

sociated alterations in stress sensitive biological systems, which may affect fetal development as well as the quality of postnatal dyadic mother–child interactions” (Toepfer et al., 2017, p. 293). In particular, Toepfer and his colleagues (2017) argue, ELS has a profound effect on “the central availability and functioning of the OT system,” which persists “into adulthood and may impact functional integrity of the ‘parental brain’” (p. 294). For example, OT concentrations are lower in adult women who have high levels of ELS (Heim et al., 2009). These effects of adversity on the OT system are intergenerationally transmitted to the fetus during pregnancy (see Thompson, Kiff, & McLaughlin, Chapter 5, this volume), with various downstream effects on the child’s social and emotional functioning. In addition, disruptions in the OT system are likely to affect the woman’s capacity to feel connected to her infant, and to behave in ways that will organize and regulate its social and emotional functioning.

### ***Prenatal Stress***

“Prenatal stress” is a term that has been used to describe a range of different risk factors, among them acute environmental stressors such as socioeconomic adversity, intimate partner violence, or the prolonged stress of hunger and isolation in times of war or other emergencies, or internal stressors such as depression or anxiety (Monk, Spicer, & Champagne, 2012). While the literature on prenatal stress is quite diverse and complex, it is clear that any or all of these risk factors can impact a child’s capacities for stress and emotion regulation, cognitive functioning, motor development, and physiology (as measured by birthweight, gestational age, fetal heart rate, and fetal heart rate variability). It can also greatly increase risk for psychopathology in the child (for reviews, see Monk et al., 2012; O’Connor, Monk, & Fitelson, 2014).

ELS and prenatal stress are transmitted to the baby in a variety of complex ways, including gene methylation (Monk et al., 2016), or epigenetic changes in the OT, and dopaminergic and stress regulation systems that “can give rise to altered gene expression levels in multiple tissues, including the brain, with consequences for the functioning and connectivity of neural circuits, which can confer risk for physical and psychiatric disorders in later life” (Monk et al., 2012, p. 1361). In short, prenatal stress changes both the mother’s and the baby’s brain.

### ***Maternal Depression and Anxiety***

Maternal depression and anxiety are considered major sources of prenatal stress (O’Connor et al., 2014). According to a meta-analysis carried out over a decade ago, nearly one-fifth of pregnant women report depressive symptoms during the prenatal period, and 10–15% of women report postpartum depression (Gavin et al., 2005). In a more recent study of a large urban sample, Melville, Gavin, Guo, Fan, and Katon (2010) reported that nearly 10% of pregnant women seen in a university obstetric clinic met criteria for major or minor depressive disorder. Panic disorder and suicidal ideation were present to a lesser extent (between 2 and 3%). The odds of having a depressive disorder were increased significantly by psychosocial stress, chronic medical conditions, and race, with Asian, African American or Hispanic women being at higher risk.

The link between maternal depression and child outcomes have been comprehensively studied over the past 20 years, with both prenatal and postpartum symptoms associated with a range of negative child outcomes, including academic and behavioral/mental health difficulties and problems with emotion regulation (Goodman, Rouse, Connell, Broth, & Hall, 2011). Importantly, depression in the prenatal period has effects on the child that are independent of postnatal depression, however, including impaired intellectual functioning (Barker, Jaffee, Uher, & Maughan, 2011) and behavior problems (Hay, Pawlby, Waters, Perra, & Sharp, 2010). Most recently, Lebel and her colleagues (2016) have linked higher depressive symptoms during pregnancy and the postnatal period with preschoolers’ gray matter structure; prenatal depression was specifically linked to premature brain development, particularly cortical thickness. Interestingly, OT concentration in pregnancy has also been associated with the development of depression (Skrundz, Bolten, Nast, Hellhammer, & Meinschmidt, 2011), underscoring the complex relationship between psychiatric disorders and neuroendocrine systems.

### ***Maternal Posttraumatic Stress Disorder***

Trauma symptoms are also clearly a form of prenatal stress. As many as 3–7% of pregnant women meet diagnostic criteria for posttraumatic stress disorder (PTSD), and many of these

women are likely to have comorbid mood or anxiety disorders (Morland, Goebert, & Onoye, 2007; Smith, Poschman, Cavaleri, Howell, & Yonkers, 2006). They may also suffer from complex trauma disorder (Courtois, 2004; van der Kolk, 2014), which arises when traumata extend over a range of developmental periods and lead to posttraumatic adaptations that profoundly affect caregiving. Rates of PTSD are considerably higher (24%) for teen mothers, racial minorities, and mothers with less education or who live in poverty (Seng et al., 2001). Among the factors that lead to pregnancy-onset PTSD are childhood maltreatment, prenatal intimate partner violence (IPV), socioeconomic risk, and lifetime prevalence of PTSD (Muzik et al., 2016). Prenatal PTSD has been linked with pregnancy loss, early labor and delivery, and low birthweight (Seng, Low, Sperlich, Ronis, & Liberzon, 2011), with suicidality, substance use, and panic disorder, as well as major and minor depressive disorder (Rogal, Poschman, & Belanger, 2007; Smith et al., 2006). In a study of pregnant women with lifetime PTSD diagnoses, Muzik and her colleagues (2016) report that those with the greatest increase in PTSD symptoms during pregnancy were most likely to suffer from postpartum depression, and manifest disrupted attachment to their children at 6 months postbirth. And, like other forms of prenatal stress, PTSD impacts fetal brain functionality and development.

### *Teenage Pregnancy*

Adolescent women continue to bear children in large numbers in the United States. At present, just under 230,000 teenagers give birth every year, resulting in an annual birth rate of 22.3 live births per 1,000 women between ages 15 and 19 (Martin, Hamilton, Osterman, Driscoll, & Mathews, 2017). Adolescent birthrates in the United States have declined significantly since the peak of 61.8 births per 1,000 adolescent women in 1990 (Hamilton & Matthews, 2016), yet the United States continues to have much higher adolescent birth rates than other industrialized nations (<https://www.cdc.gov/teenpregnancy/about/index.htm>).

Many, if not all, of the risks described earlier (ELS, prenatal stress, depression, anxiety, and PTSD) co-occur in pregnant teenagers. While there are some cultures in which having a baby during adolescence is the norm, in the United States, as well as many other West-

ern countries, adolescent pregnancy is usually part of a larger picture of socioeconomic risk: single parenthood, limited schooling, poverty, and ethnic/minority status (Dole & Shambley-Ebron, 2016; Ford & Browning, 2013). Many teenage parents have disrupted attachment histories, significant mental health issues, and academic failures that predate their pregnancies and stem from personal histories of abuse, depression, and PTSD. These often amplify their environmental stressors (Hodgkinson, Beers, Southammakosane, & Lewin, 2014). Add to this the fact that pregnant teens are still coping with the tremendous developmental demands of adolescence (Moriarty Daley, Sadler, & Reynolds, 2013). Recent descriptive studies of multicultural adolescent mothers demonstrate some of the unique challenges faced by these young women as they anticipate motherhood (Sadler, Novick & Meadows-Oliver, 2016) and search for parenting supports in their environments (Dole & Shambley-Ebron, 2016), often experiencing negative or judgmental health care encounters during their pregnancies and parenting health care visits (Harrison, Clarkin, Rohde, Worth, & Fleming, 2017).

These significant stressors leave pregnant teens more vulnerable to anxiety, depression, and PTSD, as well as the epigenetic effects of long-term elevations of the HPA axis and consequent disruptions in levels of circulating OT. They also contribute to difficulties becoming responsive nurturing parents, negotiating the critical family relationships needed to help raise their babies, remaining in school, and limiting rapid subsequent pregnancies (Sadler et al., 2007). Emotional difficulties, and/or conflicted relationships with key family members (e.g., partners or their own mothers, who themselves have mental health or substance abuse problems) can lead to outcomes such as incomplete schooling, child neglect or abuse, homelessness, rapid subsequent pregnancies, and further problems with depression or substance abuse (Hodgkinson et al., 2014; Oberlander, Black, & Starr, 2007).

It is important to note that youth is not always associated with poor outcomes, however. Outcomes can be positive in families or communities where there is an extended network of supportive relatives, adults, and “other mothers” who can rally the teen’s strengths and provide the structures that she will need to continue her schooling, take care of herself and the baby physically, and remain emotionally present for

this new and profound attachment relationship (Dole & Shambley-Ebron, 2016; Sadler et al., 2013).

### **Miscarriage/Pregnancy Loss**

Between 8 and 20% of pregnancies end in miscarriage; all but a small minority of women (3%) miscarry after the fetal heartbeat is detected, somewhere between 8 and 12 weeks. Most miscarriages occur as the result of chromosomal anomalies, although maternal age, history of prior miscarriage, medical illness in the mother or fetus, drug and alcohol abuse, smoking, and obesity also put pregnancies at risk. Prior pregnancy loss often creates stress in subsequent pregnancies; many studies (for a review, see Bennett, Litz, Lee, & Maguen, 2005) have confirmed that women experience much greater grief following pregnancy loss than is commonly recognized, even in the case of early miscarriage; however, fetal deaths beyond 20 weeks' gestation and through infant death 1-month postpartum are especially devastating. Bennett and her colleagues note that although a majority of women and their partners recover from this traumatic loss, some 15–25% will have ongoing mental health complications, including PTSD, depression, and anxiety. There is also an elevated risk (20%) for the development of PTSD in a subsequent pregnancy. Another long-term sequela of perinatal loss is traumatic grief, which is a syndrome that is likely distinct from grief, depression or PTSD (Bennett et al., 2005).

Stillbirth is a particularly devastating form of pregnancy loss. In a study of women pregnant following a stillbirth, over half were Unresolved with respect to loss and mourning on the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1996), and all but one of these were Unresolved about the stillbirth itself (Hughes, Turton, Hopper, McGauley, & Fonagy, 2004). While a history of maltreatment and the absence of family support were predictive of Unresolved status in relation to the stillbirth, and stillbirth was itself associated with postbirth PTSD, mothers who held the baby after a stillbirth or had a funeral for the infant were more likely to manifest depression, anxiety, and even PTSD. These common practices thus appear to be quite traumatizing. Prior stillbirth also increased the likelihood that a next-born child would be disorganized in relation to attachment, particularly if the mother was Unresolved, based on the

AAI, or (to a lesser extent) had held her stillborn infant after delivery (Hughes, Turton, Hopper, McGauley, & Fonagy, 2001).

Anecdotal clinical evidence has long supported the notion that the shadows of such losses can persist for generations. The woman has lost a part of herself, the part identified in a profound way with her baby, and has received a “traumatizing blow” to revived identifications with her mother and with herself as a baby (Leon, 1986, p. 315). She has also lost an attachment, not yet an actual child, but an attachment nevertheless. The severity of the trauma associated with prenatal loss depends on the breadth and depth of that attachment, and what it has meant to her—which brings us directly to an issue that has been implied in much of the literature reviewed thus far: the role of attachment processes in pregnancy.

### **Resilience Factors**

Often lost in the discussion of risk factors is the fact that resilience factors may counter their impact. In a recent study, Narayan, Rivera, Bernstein, Harris, and Lieberman (2017) examined the role of benevolent childhood experiences (BCEs) in mitigating against psychopathology and stress in an ethnically diverse group of pregnant women. Mothers-to-be were asked whether, for example, they had a caregiver with whom they felt safe, a good friend, other loving or supportive nonparental figures, and so on. Pregnant women with high BCEs had fewer PTSD symptoms and fewer stressful life events, above and beyond the effects of maternal ACEs. Thus, “angels in the nursery” (Lieberman, Padrón, Van Horn, & Harris, 2005), namely experiences of safety and support in childhood, served to protect pregnant women from some of the deleterious effects of early adverse experiences. These kinds of experiences are likely to have positive impacts on their children as well.

### **Attachment, Representation, and Reflective Functioning**

Each woman begins the journey to motherhood with a set of internalized representations of attachment, representations that reflect her “state of mind in relation to attachment” (Main, Kaplan, & Cassidy, 1985), namely, how she has organized and made meaning of her childhood experiences with her parents. Pregnancy invari-

ably “activates” representations of attachment in a number of ways; Thoughts, feelings, and memories of her relationship with her mother and/or other maternal caregivers that may have been quiescent for years are awakened at both conscious and unconscious levels. Becoming a parent invariably awakens “ghosts” (Fraiberg, 1980) and/or “angels” in the nursery (Lieberman et al., 2005). Thus, whatever her attachment history, and whatever the nature of her attachment organization, the attachment system is buffeted during pregnancy in a way that can be overwhelming, terrifying, or—under the best of circumstances—soothing and organizing.

Women with more secure attachment organizations will be able to process and regulate the onslaught of emotions, regression, ambivalence, and hope of pregnancy, whereas others, dismissing of attachment, will shut down and try to control these experiences by keeping them at bay. Even the most intense avoidance can be overwhelmed by the power of pregnancy, however, with frightening fantasies intruding in dreams and ruminations. For women preoccupied in relation to attachment, pregnancy can be an overwhelming time emotionally, bringing to mind the sense of “inchoate negativity” that Main saw as typical of this attachment organization (Slade & Cohen, 1996). For women who are unresolved or disorganized in relation to attachment, pregnancy can be retraumatizing in the ways it summons past memories of abuse and trauma, of frightening or terrified caregivers, especially when the circumstances of conception have themselves been traumatic (as in the case of rape, incest, etc.). The pregnant woman’s “state of mind in relation to attachment” predicts in powerful ways the child’s attachment organization at 1 year (Fonagy, Steele, & Steele, 1991).

In the sections below, we describe three different approaches to assessing prenatal attachment processes: the study of (1) prenatal feelings of connection to the child, (2) prenatal representations of the child, and (3) prenatal reflective functioning.

### ***The Study of Prenatal Attachment***

Rubin (1967), whose work inspired the study of prenatal attachment, delineated four crucial aspects of becoming a mother: (1) ensuring safe passage for the self and the baby, (2) making sure the baby is accepted by her fam-

ily, (3) developing a sense of “we-ness,” and (4) giving oneself to one’s baby. A number of researchers, beginning with Mecca Cranley in 1981, built on these ideas in developing brief self-report questionnaires to evaluate the strength of mothers’ “attachment” to their child during pregnancy (for reviews, see Alhusen, 2008; Brandon, Pitts, Denton, Stringer, & Evans, 2009). Cranley (1981) focused primarily on behavioral manifestations of preparedness for the baby, such as whether a woman is making room for the baby in her life, or taking care of herself and her baby physically. The limitations of this behavioral definition of attachment led later researchers to focus more directly on the woman’s emotional investment in the fetus, or “the unique, affectionate relationship that develops between a woman and her fetus” (Muller, 1993, p. 201). Condon similarly focused on “the emotional tie or bond which normally develops between the pregnant woman and her unborn child” (Condon & Corkindale, 1997, p. 359).

The two most widely used measures of prenatal attachment are Cranley’s Maternal–Fetal Attachment Scale (MFAS; Cranley, 1981) and Condon’s Maternal Antenatal Attachment Scale (MAAS; Condon, 1993). To date, upwards of 100 studies have used one or the other of these measures, as they are easy to administer and score. While a review of these findings is beyond the scope of this chapter (but see Alhusen, 2008; Brandon et al., 2009), these studies generally confirm what we might expect, namely, that the stronger the prenatal attachment, the greater the likelihood of a range of positive prenatal and postnatal outcomes in the mother, and of positive developments in the child and in the mother–child relationships. Prenatal attachment also tends to be negatively associated with symptoms of depression and anxiety, and is not associated with prior perinatal loss.

The most striking limitation of this literature is that subjects of most studies have been low-risk, partnered, privileged women who have received consistent and good-quality prenatal care (Alhusen, 2008), and therefore fail to shed light on the nature of prenatal attachment in more vulnerable populations. Brandon and her colleagues (2009, p. 208) also raise the question of whether these instruments actually measure attachment quality or are simply attitudinal measures “confounded by social desirability and adjustment (Waters, personal communication, 2005).”

### ***Parental Representations of the Child***

A number of researchers have studied the development of a mother's emotional bond with the child by examining prenatal representations of the child. Prenatal representations are, essentially, fantasies, as the baby is—at this point—imagined rather than known. Thus, they are truly creations, based less on reality than on an amalgam of the mother's projections, hopes, dreams, attributions, and unconscious fantasies. The quality of prenatal representations of the child have most often been assessed using Zeanah's Working Model of the Child Interview (WMCI; Zeanah, Benoit, Barton, & Hirshberg, 1996). Ammaniti, Tambelli, and Odorisio (2013) have also studied prenatal representations using an adaptation of Slade's Pregnancy Interview (PI; 2003), called the IRMAG (Ammaniti, 1991).

The WMCI was originally developed by Zeanah and colleagues (1996) to study postnatal maternal representations of the child. However, they adapted the WMCI to evaluate prenatal representations by simply changing the wording of WMCI questions to the future tense (Benoit, Parker, & Zeanah, 1997); since then, it has been used by a number of researchers to assess maternal representations in pregnancy. The WMCI and the IRMAG have most commonly been scored using a system developed by Zeanah and colleagues, which classifies maternal narratives about the unborn child as balanced (analogous to Main and colleagues' (1985) Free-Autonomous classification), disengaged (analogous to the Dismissing classification) or Distorted (analogous to the Preoccupied classifications). Differences in the quality of prenatal representations have been linked to the quality of the child's attachment at 1 year (Benoit et al., 1997; Huth-Bocks, Levendosky, Bogat, & von Eye, 2004; Madigan, Hawkins, Plamondon, Moran, & Benoit, 2015), and to the quality of the mother–infant interaction postbirth (Ammaniti, 1991; Flykt et al., 2012; Tambelli, Odorisio, & Lucarelli, 2014; Theran, Levendosky, Bogat, & Huth-Bocks, 2005). Generally speaking, more flexible, balanced, and positive representations were linked to secure maternal attachment, secure infant attachment, and more positive, regulated mother–child interactions. In addition, women who were balanced in pregnancy but nonbalanced postbirth had more positive interactions with their infants than those women who were non-balanced in pregnancy

(Theran et al., 2005). By contrast, women who had non-balanced representations in pregnancy had more negative interactions with the infant, even if their classification had changed to balanced. These results suggest that positive prenatal representations serve as a buffer once the baby is born.

In early studies of the WMCI, Benoit and colleagues (1997) demonstrated a high rate of stability in WMCI categories from the third trimester of pregnancy to the child's first birthday, with the balanced and distorted categories being particularly stable. Huth-Bocks and her colleagues (2004) later found that women exposed to domestic violence during pregnancy were more likely to have non-balanced representations. In work with the same sample, Theran and her colleagues (2005) found that risk status—specifically low income, low socioeconomic status (SES), single parenthood, and exposure to domestic violence—predicted non-balanced prenatal representations. Malone, Levendosky, Dayton, and Bogat (2010) also reported that distorted prenatal representations were associated with higher rates of self-reported childhood physical neglect in women exposed to domestic violence. In a paper published nearly a decade later, Ammaniti, Tambelli, and Odorisio (2013) found a prevalence of Integrated/Balanced representations in nonrisk women, and a higher frequency of Not Integrated/Ambivalent representations in at-risk women. These studies illuminate the critical impact of risk factors on maternal representations of the unborn child.

Recently, in an effort to identify a category of representations analogous to the disorganized category in infancy, Benoit and her colleagues developed a fourth—"disrupted" classification (WMCI-D), wherein caregivers "convey frightened or frightening discourse characteristics similar to the frightened or frightening behaviors" mothers of disorganized infants display in relation to their children (Crawford & Benoit, 2009, p. 132). They found that a prenatal Disrupted classification on the WMCI was linked to unresolved maternal attachment on the AAI, disrupted affective communication with the infant, and disorganized attachment in the infant. In related work, Terry (2018) adapted Lyons-Ruth's Hostile/Helpless scale (Lyons-Ruth, Yellin, Melnick, & Atwood, 2005) for use with the PI (Slade, 2003) and discovered strong links between helpless/hostile representations of the caregiver/self/fetus and infant removal by child protective services within the first year of life.

### ***Prenatal Reflective Functioning***

The PI (Slade, 2003) invites the expectant mother to reflect on her emotional experience of pregnancy, the nature of her relationship with her unborn child, her sense of self, and the effect her pregnancy has had on her relationship with the father of the baby and her family. Recently, the PI has been adapted for use with fathers during pregnancy (FaPI; Slade, 2017). It is most commonly scored for reflective functioning (RF), which is broadly defined as the capacity to envision the mental, or subjective, psychological states of the self and other (Slade, 2005). An adult woman's capacity to reflect on her childhood experience with her parents has been assessed using the AAI, whereas a parent's capacity to reflect on her child's internal experience and on her own experience as a parent has been assessed using the Parent Development Interview (PDI; Slade, Aber, Berger, Bresgi, & Kaplan, 2003). RF in pregnancy involves the mother's capacity to reflect on her own internal states, and on those of the people closest to her, and to imagine that the child will have a mind and feelings of his or her own, and in that sense be separate from her. Prenatal RF is scored using a system developed by Slade, Patterson, and Miller (2004), in which lower scores indicate less reflectiveness and higher scores indicate more.

To date, there have been fewer studies of the PI than of the WMCI, as training for scoring RF on the PI has only recently become available. The first study to examine prenatal RF was conducted by Pajulo and her colleagues (2012). The sample comprised women in residential treatment for substance abuse, and both prenatal RF and change in RF over the course of a mentalization-based intervention were assessed. Overall RF scores in pregnancy were quite low, and while postnatal scores were slightly higher, prenatal and postnatal RF were correlated. When change over the course of the intervention was evaluated, there was less positive change in RF in mothers who had suffered from physical and emotional abuse, and in whose families there were long-held secrets. In addition, lower pre- and postnatal RF was linked to a higher risk of losing the child to foster care.

In two recent studies, Smaling and her colleagues linked prenatal RF to a range of variables. In the first (Smaling et al., 2015), links between prenatal RF and a range of risk factors were studied in a sample of 162 women, half of

whom were at high risk (based on the presence—absence of psychiatric diagnosis, substance use, as well as a range of socioeconomic risks, including low maternal age, low social support, lack of education, single status, unemployment, and poverty). Prenatal RF in the low-risk group was significantly higher than RF in the high-risk group; in addition, the more risk factors a woman had, the lower her RF. Maternal education, social support, and prenatal substance use were most predictive of prenatal RF.

In a second study, Smaling and her colleagues (2016) examined the impact of prenatal RF and accumulated risk on mother–child interactions at 6 months postpartum in a sample of 133 women and their babies. They found that accumulated risk negatively and significantly correlated with prenatal RF. High prenatal RF was correlated with maternal behavior in a number of ways, specifically, more positive engagement during free-play and teaching tasks. Prenatal RF was negatively correlated with intrusiveness during the teaching task and internalizing–helplessness during more challenging tasks. Using regression and mediational analyses, they found that while prenatal RF and accumulated risk uniquely predicted maternal sensitivity, the indirect effect of accumulated risk on maternal sensitivity was mediated through prenatal RF.

In our *Minding the Baby*<sup>®</sup> project (MTB; Sadler et al., 2013), we found similar links between risk and RF; very few women in our large sample of high-risk pregnant women living in an underresourced community were truly capable of stable, ongoing RF. A qualitative analysis of the PIs of 30 pregnant adolescents participating in the MTB randomized clinical trial revealed great variation in their ability to think about and describe the many emotions experienced during pregnancy and how they envisioned caring for their soon-to-be-born infants (Sadler et al., 2016). Differences in level of RF appeared to be linked to a number of factors, among them variations in cognitive and brain development. The teens also described complex and often disappointing relationships with partners, and vitally important relationships with family members.

To conclude, although a number of writers have suggested that prenatal attachment processes and representations of the infant develop slowly and over time, coalescing only toward the end of the second or beginning of the third trimester, there is great variation in when these processes are assessed in research. Thus, mea-

surements taken during the second trimester may not be comparable to those taken toward the end of the third trimester. Clearly, there is a need for researchers to systematically track these processes across the three trimesters of pregnancy. It is also the case that little is known about how attachment processes in a woman's first pregnancy differ from those in second and subsequent pregnancies, as many studies tend to lump primiparas with multiparas.

### Intervention

In this chapter, we have provided an overview of the biological and psychological processes of pregnancy, namely, the development of the "parental brain," as well as the unfolding of prenatal attachment, representations of the child, and RF. The evidence from this diverse literature makes clear the importance of the development of (1) parental affiliative processes (aided by the functioning of the OT and dopaminergic reward systems, and the regulation of stress) for the subsequent development of the infant's social and relational brain, (2) a strong positive emotional connection to the fetus, (3) balanced, positive representations of the unborn child, and (4) emerging capacities to imagine the subjective experience of the baby and appreciate the complexity of one's own inner experience and changing relationships to others. Equally compelling is the evidence that a number of risk factors—among them maternal psychopathology, attachment disorganization, prenatal stress, poverty, early childhood adversity, substance use, single and/or teenage parenthood, lack of education, domestic violence—interrupt these developments in a number of ways. This makes apparent and even urgent the importance of ameliorating risks during the prenatal period, as well as enhancing the experiences that lead to regulation, balanced representations, and RF.

From a public health standpoint, this is a daunting challenge. The vast majority of women in the world will become pregnant and bear a child or children sometime between menarche and menopause. Although there are some cultures in which pregnancy is treated as a time of retreat from the world, in today's world, most women work hard, raise other children, take care of their families, and continue a range of normal activities. And in the grand scheme of life, it is a *brief* and nearly ubiquitous stage in female development and not, in any sense, an

illness. Therefore, "intervention" beyond what is offered within the framework of a woman's culture and community is rare (unless the fetus is at risk). The vast majority of women living in the United States and other Western countries receive routine prenatal care beginning with a positive pregnancy test, which typically includes regular checkups and monitoring of vital signs, sonograms as necessary, and childbirth education. They are also advised to exercise, eat properly, and supplement their nutritional intake, as well as to stop smoking, drinking alcohol, and using substances.

But even this absolutely crucial level of care is often lacking for women living in urban or rural poverty, resulting in a national maternal mortality rate on par with India's (18.5 deaths/1,000 births). There are a number of causes, among them lack of access to prenatal care, inadequate care during childbirth and the postpartum period, as well as diabetes and obesity. The United States also has one of the highest rates of infant mortality among industrialized nations (5.3 deaths/1,000 births), with double the rate of morality for non-Hispanic blacks (11.1 deaths/1,000 births) (*cdc.org*).

In the United States at least, much more must be done to assess and intervene in situations that risk both the mother's and the child's safety and emotional development. While some of the risks we have outlined are directly tied to poverty and other socioeconomic risks, others are tied to psychological vulnerability that can transcend even the most robust protections of privilege. Virtually all obstetricians or midwives have a number of women in their practices whose anxiety about the pregnancy—despite daily calls to the office—cannot be assuaged. They have patients who do not take care of themselves, and patients who cannot get out of bed. And those professionals who work in high-risk communities see in innumerable and stark ways the intergenerational transmission of adversity beginning with a positive pregnancy test; these realities often leave providers feeling numb and helpless as they observe the impact on multiple generations of trauma and fractured family life.

We believe strongly that the frontline health professionals who interact with pregnant women need the time and the resources to address these risks—to at least some extent—within the framework of routine practice and/or to link women with services as they are needed. There are few resources and little training in the biol-

ogy and psychology of pregnancy available to these overworked professionals, and deeper layers of supportive services for pregnant women (including those who endure miscarriages and stillbirths) are largely lacking in the vast majority of communities (and, at least in the United States, likely to be lacking for some time). And yet, if we are to take seriously the science of the last decade, and apply it to the everyday reality of women of childbearing age, we cannot overstate the importance of more comprehensive care for women in this vulnerable yet wonderful “crisis” (Benedek, 1970) in their lives, a crisis that in truth includes not only the prenatal period but also the 6- to 12-month period after birth. Given that the aim of infant mental health practice is to promote secure, resilient, robust, and smooth development in infants and toddlers, who, of course, will be the parents of the generations to come, the developmental significance of this period for our work simply cannot be underestimated.

Such “comprehensive care” would ideally include much more screening of pregnant women for mental health difficulties, ACEs, and ongoing prenatal stress. And ideally, there would be a menu of services available to address the needs identified in screening, ranging from less intensive services for routine pregnancies to more intensive services for those with diagnosable mental health disorders, or those coping with massive “toxic stress” (Shonkoff, 2012) and early or current trauma (who may or may not also be dealing with significant mental health issues). Group interventions that involve psychoeducation, stress reduction, and activities to enhance women’s feelings of connection to the unborn child are likely to be sufficient for women with low levels of risk, and indeed, programs such as this exist in some (though not nearly enough) communities in the United States and Europe (e.g., see Duncan & Barnacke, 2010; Puckering, 2011). Recently, practitioners of group parenting interventions that typically begin postnatally (e.g., the Circle of Security intervention; Powell, Cooper, Hoffman, & Marvin, 2013) have begun experimenting with engaging women before the birth of the baby. The depth, breadth, and accessibility of these programs desperately need expansion.

Women who manifest significant depression, anxiety, or PTSD (or worse, psychosis) during pregnancy are often referred by their prenatal care providers to mental health professionals,

many of whom do not have special training in the prenatal period. Because both untreated depression and selective serotonin reuptake inhibitor (SSRI) use put pregnant women and their infants at risk (Yonkers et al., 2009), short-term behavioral or dynamic treatments are preferred, although, again, targeted treatments for the prenatal and perinatal periods are in short supply and desperately needed, as are trained professionals with the competencies necessary to address the particular concerns of pregnancy. Another “midlevel” of care is provided for pregnant teens through specialized teen parent support programs (Harrison et al., 2017; Thompson, 2016), typically offered in partnership with school districts.

Home visiting is the treatment of choice for pregnant women coping with multiple layers of adversity. In the United States, only a handful of the government-sanctioned home visiting programs begin before the baby is born. The most widely disseminated of these programs is the Nurse–Family Partnership (NFP). In this model, first-time pregnant women are enrolled toward the end of the second or beginning of the third trimester, and followed with their baby until the child’s second birthday. NFP has been tested in three randomized controlled trials (RCTs) (see Olds, 2002; P. Zeanah & Korfmacher, Chapter 38, this volume) and the children have been followed longitudinally well into their late teens (Olds et al., 1997, 2004). At present, there are NFP programs in 41 states in the United States, and in Canada, Australia, and six countries in Western Europe as well.

MTB, the home visiting program we developed in collaboration with colleagues at the Yale Child Study Center, Yale School of Nursing, and a number of community partners, likewise begins in pregnancy (see Sadler et al., 2013, 2016; Slade et al., 2018b), and continues until the child is 2 years old. MTB is aimed specifically at addressing both the health and mental health needs of those whose risks in both domains are amplified by the multiple stressors of poverty, youth, and multiple generations of adversity. As such, we combine what van der Kolk (2014) has described as “top-down approaches (to activate social engagement) with bottom-up methods (to calm physical tensions in the body)” (p. 86). We believe that an atmosphere of safety, made possible through relationships with both clinicians, *and* quieting the body (incorporating practices such as mindfulness, to develop stress regulation capacities), are crucial to the emergence of

an attachment to the baby, positive representations of the child, and reflective capacities. Results of our RCT indicate a range of positive health and attachment outcomes, notably, higher levels of secure attachment in infants, lower levels of disorganized attachment, greater increases in RF in the most vulnerable mothers, lower levels of obesity in toddlers, and lower levels of externalizing behaviors postgraduation (Ordway et al., 2014, 2018; Sadler et al., 2013; Slade et al., 2018a). Unfortunately, neither NFP nor MTB provide services to women with multiple children (known to be at even higher risk for parenting difficulties) or those who come to the attention of the health care system after the birth of the baby.

Individual, local home visiting programs in a number of communities in the United States have recently begun to recruit families before birth; these efforts are not systematic, but they are noteworthy nonetheless. Interestingly, home health visiting during pregnancy has been in place in Western Europe (i.e., the United Kingdom, Denmark) for decades. While these efforts typically result in earlier referral of women at risk, they are—for the most part—not aimed at intervention, as most health visitors have a large caseload and no particular training in the multiple impacts of trauma and early adversity on maternal and child health.

Pajulo and her colleagues (2012) have described an intensive residential intervention for substance-abusing pregnant women, focusing on both abstinence and intensive support of the mother–baby relationship. This program, like MTB, is relationship and mentalization based. Describing this intervention, they note:

From a neurobiological perspective, the underlying idea has been to “reset” the focus of the maternal brain reward system by encouraging the mother to become intensively interested in her future baby *during* pregnancy, increasing her interest and curiosity about her unborn child’s personality and developmental achievements, and experiencing satisfaction from positive interaction experiences once the baby is born. (p. 73, original emphasis)

These concise words capture beautifully what we believe should be the goal of all prenatal interventions, from those for the most low-risk mothers-to-be to those for women needing intensive and ongoing support. For infant mental health professionals, supporting the mother

in her transition to parenthood is crucial to giving her child the very best start possible.

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