

ABSTRACT

Title of dissertation: TRAUMA, DEPRESSION, EARLY ATTACHMENT,
AND NEONATAL HEALTH OUTCOMES AMONG
AFRICAN AMERICAN MOTHERS AND THEIR
INFANTS

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Young children whose mothers are depressed are vulnerable to a range of negative developmental outcomes beginning during the prenatal period and persisting throughout childhood. There is a large and growing need for evidence-informed pre-and postnatal services for pregnant women, especially in high-risk populations. More research is needed to inform practices relative to identifying pregnant women at risk for depression, providing treatment of depression and its concomitants during pregnancy and the postpartum period, and promoting positive developmental outcomes in infants who have been exposed to perinatal depression.

The goal of this study was to enhance our knowledge of perinatal depression (i.e., depression that occurs during pregnancy or within the first 12 months following delivery) as well as its impact on maternal functioning in low-income, African American women and the health and developmental outcomes of their young infants.

Participants were low-income African American women (N = 70), recruited during their third trimester of pregnancy, and their newborns. Data collection took place over two time periods: during the third trimester of pregnancy and at one month postpartum. Prenatal data collected include information on a range of risk and protective factors, including prenatal depression, health behaviors, and maternal-fetal attachment (i.e., mother's feelings of attachment to her unborn child). Postnatal data collected include information on depression, neonatal outcomes (e.g., birth weight), and maternal feelings of attachment to her infant. Multiple regression, logistic regression, and measured variable path analysis were used to test the relationships between risk factors, maternal functioning, and neonatal outcomes.

Although his study relied on a small convenience sample of pregnant women, and is not generalizable to a broader population, there are still several findings of note. Marital status and trauma exposure significantly contributed to prenatal depressive symptoms. Also, maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices, but only for participants who were not married or cohabitating. Finally, maternal-fetal attachment significantly predicted maternal-infant attachment. Implications for policy and practice are presented.

RISK AND PROTECTIVE FACTORS DURING THE PERINATAL PERIOD AMONG
AFRICAN AMERICAN MOTHERS AND THEIR INFANTS

By

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Dedication

To Dustin, for always being there. I am forever grateful for your understanding, love, and support. To Calvin, for bringing so much joy into my world, and for reminding me why this work matters.

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I would first like to acknowledge my parents. Thank you for your continued love and support, and for instilling in me the value of hard work. No one is prouder of this accomplishment than you are.

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Chapter 1: Introduction

Despite cultural representations of motherhood as a joyous experience, pregnancy and childbirth, especially for mothers living in poverty, are increasingly identified as risk factors for depression and depressive symptoms (Sohr-Preston & Scaramella, 2006). Research suggests that the social context of a woman's life experience impacts her risk for developing depressive symptoms during the perinatal period, and that low-income African American women may be a particularly vulnerable group (Dailey & Humphreys, 2011). Ethnic minority women are disproportionately more likely to be poor, be single, experience adverse events throughout their pregnancies, have limited access to prenatal care, and be exposed to a range of chronic stressors associated with living in impoverished communities (Kramer, Séguin, Lydon, & Goulet, 2000; Williams & Jackson, 2005), which converge to increase their susceptibility to depression.

Depression can be defined as intense feelings of sadness and hopelessness that may affect many areas of individual functioning (American Psychiatric Association, 2013). Perinatal depression includes major and minor depressive episodes that occur either prenatally (during pregnancy) or within the first 12 months following delivery (Gaynes et al., 2005). For low-income minority women, perinatal depression rates have been found to be as high as 52% (Administration for Children and Families, 2006; Zayas et al., 2002). The high rate of perinatal depression among low-income mothers is of particular concern because perinatal depression has been found to have deleterious impacts on multiple child outcomes, beginning at birth. Researchers speculate that the long-term consequences of maternal perinatal depression on child development are linked

to its impact on maternal physiology, maternal psychological functioning, and maternal behavior during the pre-and-postnatal periods.

Research has documented that depression during the prenatal period negatively impacts mothers' health behaviors, putting children at risk for developmental delays even before birth (Orr, Blazer, James, & Reiter, 2007; Rahman, Iqbal, Bunn, Lovel, & Harrington, 2004). Furthermore, research suggests that depression during the first year following delivery negatively impacts the critical relationship between mothers and their infants (Albright & Tamis-Lemonda, 2002; Campbell et al., 2004; Field, 1998; Goodman & Gotlib, 1999; Murray & Cooper, 1997; NEECR, 1999), putting children's health and safety, as well as their social, emotional, language and cognitive development, at risk. In spite of these deleterious consequences, few studies have examined risk and protective factors related to prenatal and postnatal depression in women from low-income, minority, high-risk backgrounds.

Overview of the Relevant Literature

Depression is the leading cause of disease-related disability among women, and women of childbearing age are at high-risk for major depression (World Health Organization, 2012). Research has found that certain risk factors, including poverty and stressful life events, increase a woman's chance of experiencing perinatal depression. Further, perinatal depression negatively impacts maternal functioning during both the prenatal and postnatal periods, contributing to adverse neonatal outcomes.

Risk Factors

In the general population, perinatal depression is a complication for 8.5-11% of pregnant women and 6.5-12.9% of mothers in the first postpartum year (Gaynes et al.,

2005). However, certain risk factors have been found to increase a woman's chance of experiencing perinatal depression, including low socioeconomic status, race, unintended pregnancy, and the experience of stressful life events.

Poverty and race. Poverty is a major risk factor for perinatal depressive symptoms, with research reporting perinatal depression rates as high as 52% in low-income samples (U.S. Department of Health and Human Services Administration for Children and Families, 2006b; Zayas et al., 2002). Some research suggests that in the United States, poverty is a more powerful predictor than race, and that for poor women, rates of depression are high regardless of ethnicity (Yonkers et al., 2001). On the other hand, other evidence suggests that the prevalence of perinatal depression in the United States is higher among African American and Hispanic women compared to European American women (Gavin et al., 2011; Melville, Gavin, Guo, Fan, & Katon, 2010; Rich-Edwards et al., 2006; Segre, O'Hara, & Losch, 2006).

Stressful life events. Beyond demographic factors, risk factors for perinatal depression include stressful life events, such as exposure to trauma and environmental chaos (Calam, Jones, Sanders, Dempsey, & Sadhnani, 2012; Lopez, Konrath, & Seng, 2012; Morland et al., 2007). Research suggests that women entering pregnancy who have been exposed to trauma are at increased risk for engaging in high-risk health behaviors, such as smoking, alcohol consumption, substance use, poor prenatal care, and excessive weight gain (Lopez et al., 2012; Morland et al., 2007). For instance, in a sample of low-income, African American pregnant women, Dailey, Humphreys, Rankin, and Lee (2011) found that lifetime exposure to traumatic events (including incidents of family or friends being murdered or killed, robberies, home burglaries, attacks with weapons, and

muggings) was significantly associated with both depressive symptoms and adverse perinatal health behaviors, including tobacco use and fewer prenatal care visits. Beyond depression and health behaviors, limited research has examined how trauma exposure impacts a woman during the perinatal period. Research has demonstrated that exposure to intimate partner violence, one of the most common sources of reported trauma during pregnancy (Mendez-Figueroa, Dahlke, Vrees, & Rouse, 2013), is linked to adverse neonatal outcomes, even after controlling for depressive symptoms (Alhusen et al., 2014). But more research is needed to explore what variables might mediate this relationship, such as a mother's ability to bond with her unborn child.

There is a paucity of literature examining perinatal depression in relation to neighborhood and household chaos, however, evidence documenting higher levels of chaos among low-income families suggest that there may be a link between environmental chaos and perinatal depression. For example, relative to their more affluent counterparts, low-income families reside in more crowded, noisier, and poorer-quality housing (Evans, 2004). The construct of environmental chaos has been linked to parental insensitivity and parents' lower motivation to actively engage with their children (Corapci & Wachs, 2002; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005). However, limited research has examined how chaos might impact parenting behaviors in the perinatal period. One study has reported a positive link between household chaos and maternal depression in the postpartum period (Calam et al., 2012), but to my knowledge, no research has examined household chaos in a sample of pregnant women.

Taken together, these findings suggest that low-income African American women are at an increased risk for experiencing perinatal depression, and that more research is

needed to identify other risk factors, beyond poverty, that might increase a woman's chance of experiencing depression during the perinatal period. Relatedly, Duncan, Ziol-Guest, & Kalil (2010) emphasize addressing "omitted variable bias" when examining the effects of poverty on child and adult outcomes, in other words, considering the risk factors that are associated with poverty, such as demographic variables (e.g., race and ethnicity), prenatal factors (e.g., low birthweight, prematurity), and larger ecological factors (e.g., parental functioning, neighborhood characteristics). In this vein, in the current study, I will explore exposure to trauma and environmental chaos and their relation to perinatal depression and birth outcomes among impoverished women.

Maternal Functioning

Depression negatively impacts maternal functioning in both the prenatal and postnatal periods. During pregnancy, depression may impact a mother's ability to maintain a healthy pregnancy. Depression may drain mothers of the energy and motivation needed to schedule and attend prenatal visits, reducing their exposure to information on prenatal vitamins, adequate nutrition, healthy weight gain, and other elements of a healthy pregnancy (U.S. Department of Health and Human Services Office on Women's Health, 2009b). During the postpartum period, depression may impact a mother's ability to respond sensitively to her infant and interfere with the formation of the maternal-infant relationship.

Prenatal. Research indicates that maternal depression during pregnancy affects mothers' health-related behaviors. Women experiencing increases in depressive symptoms during pregnancy have been found to be less likely to seek prenatal care (Kelly et al., 1999; Lin, Lin, Hsiao, & Li, 2009), report being in poorer health (Orr, Blazer,

James, & Reiter, 2007), report more alcohol use (Marcus, Flynn, Blow, & Barry, 2003; O'Connor & Whaley, 2006; Pajulo, Savonlahti, Sourander, Helenius, & Piha, 2001), and report more tobacco use (Linares Scott, Heil, Higgins, Badger, & Bernstein, 2009; Marcus et al., 2003; Zhu & Valbø, 2002) than mothers experiencing little to no depression during pregnancy.

Depression during pregnancy may also impact a mother's ability to bond with her unborn child. The mother–infant relationship has long been recognized as important to infant development (Ainsworth 1979), but researchers have only recently begun to understand that this earliest relationship does not begin at birth. Psychological bonds between mother and child form fairly early in pregnancy and increase over gestation, culminating in the birth of an infant (Dipietro, 2010). Maternal–fetal attachment (MFA) is a term that has been used to describe the emotional connection a woman develops with her fetus during pregnancy, expressed in feelings, cognitions, and behaviors (Salisbury, Law, Lagasse, & Lester, 2003). Previous studies have demonstrated a negative effect of a mother's prenatal depression on MFA (Lindgren, 2003; Mcfarland, Salisbury, Battle, & Lester, 2011; Sedgmen, McMahon, Cairns, Benzie, & Woodfield, 2006), with higher depressive scores associated with lower MFA. In addition, low MFA has been linked to a lower likelihood of engaging in positive health practices (Alhusen, Gross, Hayat, Woods, & Sharps, 2012) and a greater stated probability of harming the fetus currently and in the future (Pollock & Percy, 1999). However, more research is needed to examine MFA in samples of high-risk pregnant women. Additionally, there is a need for studies that address the extension of these prenatal phenomena through birth and later in the postnatal period.

Postnatal. Mothers who are depressed in the postpartum period exhibit behaviors that compromise child development. Compared with women who do not suffer from depression, depressed women have been observed to be less positive, spontaneous, and responsive with their infants (Field et al., 2000; van Doesum, Hosman, Riksen-Walraven, & Hoefnagels, 2007). Depressed mothers have been found to be less likely to respond to their infants' cues (i.e., vocalizations and actions) or to engage with their infants and young children in positive, harmonious interactions. Such patterns are particularly worrisome because once negative parent-child interactions are established, they may persist even after a mother's depression has improved (National Scientific Council on the Developing Child, 2009a).

Neonatal Outcomes

Prenatal depression has been linked to poor birth outcomes such as preterm delivery (Grote, Bridge, et al., 2011; Li, Liu, & Odouli, 2009; Rahman et al., 2004) and low birthweight (Grote, Bridge, et al., 2011; Rahman et al., 2004). The association between prenatal depression and poor birth outcomes is concerning because preterm birth and low birthweight are the leading causes of neonatal, infant, and childhood morbidity, mortality, and neurodevelopmental impairments and disabilities worldwide (Swamy, Ostbye, & Skjaerven, 2008; Wilson-Costello, Friedman, Minich, Fanaroff, & Hack, 2005).

Conceptual Framework

This study uses two linked conceptual theories as frameworks within which to consider the mechanisms through which perinatal depression might impact child development. The first, the continuum of reproductive casualty (Pasamanick & Knobloch,

1966), hypothesizes that maternal depression during the prenatal period results in long-term deficits in child functioning, regardless of the postnatal environment into which the child is born and raised. This theory is supported by research that demonstrates the long-term consequences for preterm and low-birth-weight children (Swamy et al., 2008), as well as by findings that associate obstetric complications with later conditions such as poor cognitive functioning (Odd, Rasmussen, Gunnell, Lewis, & Whitelaw, 2008). As illustrated by *Figure 1*, the continuum of reproductive casualty hypothesizes that perinatal depression impacts neonatal outcomes through changes in the fetal environment. For instance, health practices during pregnancy, such as seeking prenatal care or using alcohol or tobacco, may account for the links between prenatal depression and poor neonatal outcomes, such as preterm delivery, low birthweight, and colic (Rahman et al., 2004).

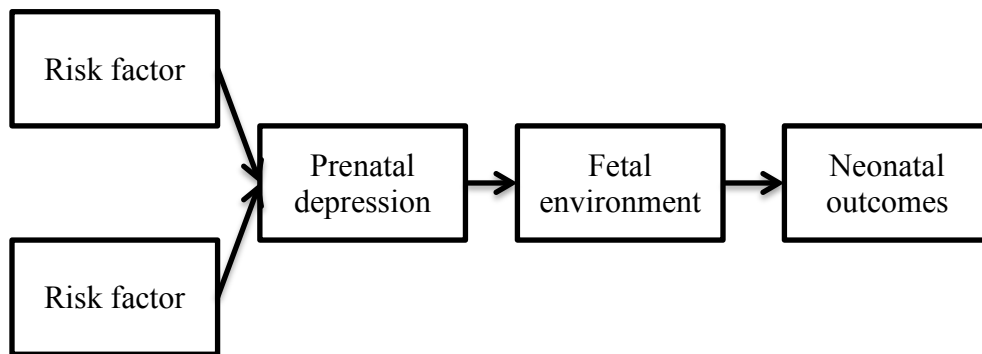


Figure 1. Continuum of Reproductive Casualty

Using this conceptual framework as a guide, it is important to first examine what risk factors may render women vulnerable to the experience of prenatal depression. Thus, a salient research question is whether there are specific environmental risk factors beyond

poverty, such as living in a chaotic household or experiencing trauma, that increase a woman's chances of experiencing prenatal depression. Further, it is important to examine if there are any protective factors that might mediate the relationship between prenatal depression and health behaviors during pregnancy. For instance, do depressed mothers who feel more attached to their unborn children engage in more positive health practices?

In contrast to the continuum of reproductive casualty, the continuum of caretaking casualty, developed by Sameroff and Chandler (1975), emphasizes the influence of the postnatal caregiving environment on child outcomes. As illustrated by *Figure 2*, the continuum of caretaking casualty hypothesizes that perinatal depression impacts child outcomes through changes in the postnatal caregiving environment. For instance, the early relationship between mother and child, negatively impacted by a mother's depressive symptoms, may contribute to deficits in child functioning. On the other hand, the continuum of caretaking casualty hypothesizes that although prenatal depression could render children vulnerable to later deficits in functioning, a healthy and nurturing postnatal environment could serve as a protective factor against the long-term consequences of perinatal depression. This hypothesis is supported by research that suggests that depressed mothers who frequently stroke the face, limbs, and body of their babies buffer their infants from some of the negative impacts of depression (Sharp et al., 2012).

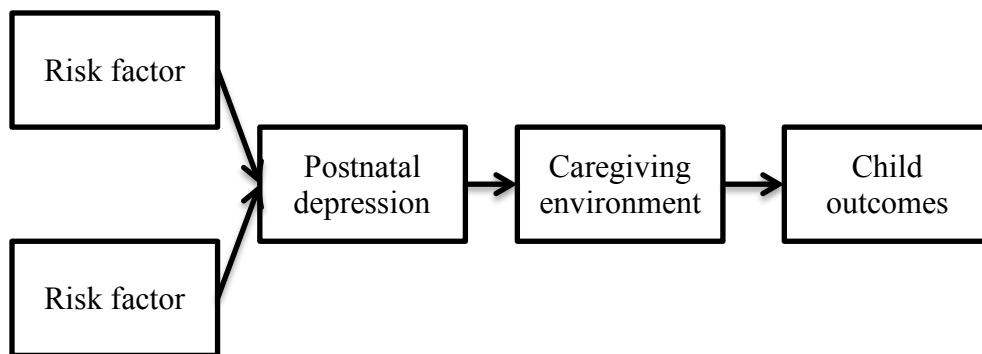


Figure 2. Continuum of Caretaking Casualty

Based on this conceptual framework, it is important to first examine what risk factors may render women vulnerable to the experience of postnatal depression. Research suggests that prenatal depression is a significant risk factor for postnatal depression. Compared to mothers who do not experience depression during pregnancy, mothers who experience prenatal depression are more likely to experience depression during the postpartum period (Edwards, Galletly, Semmler-Booth, & Dekker, 2008; Milgrom et al., 2008). However, little research has examined the impact of MFA on postnatal depression. Thus, a critical research question is whether strong feelings of attachment during pregnancy impact a mother’s postnatal experience?

Next, it is important to examine what risk factors may impact the postnatal caregiving environment. Some research suggests that prenatal depressive symptoms have a stronger impact on maternal postnatal responsiveness than postnatal depressive symptoms (Flykt, Kanninen, & Sinkkonen, 2010), suggesting that prenatal depression is especially harmful for the mother-infant relationship. Furthermore, a mother’s attachment to the fetus in the prenatal period may lay the groundwork for the mother-to-infant relationship in the postpartum period (Muller, 1993; Shin, Park, & Kim, 2006), suggesting that prenatal experiences may be important predictors of the postnatal context

and birth outcomes. However, more research is needed to examine the relationship between prenatal and postnatal experiences, especially in high-risk samples. Additionally, it is important to examine the influence of potential protective factors, such as maternal-fetal attachment, on neonatal outcomes.

Goals of Current Study

With perinatal depression rates among African American mothers in poverty reaching more than 50% (Administration for Children and Families, 2006; Zayas et al., 2002), it is essential to identify environmental factors that impact perinatal depression and to understand the mechanisms through which perinatal depression impacts child development. Limited research has examined how specific contextual influences, such as neighborhood and household chaos and trauma exposure, impact prenatal depression in high-risk populations, and even less research has examined the mediating roles of prenatal depression and maternal behaviors during pregnancy relative to the effect of contextual influences on neonatal outcomes. There is also a paucity of literature examining the correlates of maternal psychological functioning in the first few weeks following birth.

This study has two main goals. The first goal is to examine environmental risk factors, prenatal depression, maternal-fetal attachment, and maternal health practices during pregnancy in relation to neonatal outcomes in a sample of low-income, African American women. The second goal is to examine environmental risk factors, prenatal depression, and maternal-fetal attachment during pregnancy in relation to postnatal depression and maternal-infant in the early postpartum period in a sample of low-income, African American women.

Statement of Problem and Research Questions

More research is needed to examine the perinatal experiences of low-income, African American women, particularly in regard to their psychological functioning. Specifically, it is important to examine depression among this group of women, as well as the environmental factors that influence the development of depression in the prenatal period. Further, although there is abundant research that adverse pregnancy outcomes are more prevalent in minority and low-income populations (Patrick & Bryan, 2005), little research has examined the possible mediating factors between environmental risk factors and adverse neonatal outcomes in this population. Finally, further research is needed to disentangle the linkages between prenatal depression, postnatal depression, and the maternal-child relationship both during pregnancy and during the early postpartum period.

Research Question 1: Do environmental chaos and trauma exposure contribute to prenatal depressive symptoms in pregnant women?

- Hypothesis 1.1- Pregnant women who experience higher levels of environmental chaos will report a higher number of prenatal depressive symptoms.
- Hypothesis 1.2- Pregnant women who report higher levels of trauma exposure will report a higher number of prenatal depressive symptoms.

Research Question 2: Do environmental chaos, exposure to trauma, and prenatal depressive symptoms contribute to maternal-fetal attachment in pregnant women?

- Hypothesis 2.1- Pregnant women who experience higher levels of environmental chaos will report lower levels of maternal-fetal attachment.
- Hypothesis 2.2- Pregnant women who report higher levels of trauma exposure will report lower levels of maternal-fetal attachment.

- Hypothesis 2.3- Pregnant women who report a higher number of prenatal depressive symptoms will report lower levels of maternal-fetal attachment.
- Hypothesis 2.4- Prenatal depressive symptoms will mediate the relationship between environmental risk factors (i.e., environmental chaos and trauma exposure) and maternal-fetal attachment.

Research Question 3. Do prenatal depressive symptoms and maternal-fetal attachment contribute to maternal health practices during pregnancy?

- Hypothesis 3.1- Pregnant women who report a higher number of prenatal depressive symptoms will report lower quality health practices.
- Hypothesis 3.2- Pregnant women who report higher maternal-fetal attachment will report higher quality health practices.
- Hypothesis 3.3- Maternal-fetal attachment will mediate the relationship between prenatal depressive symptoms and maternal health practices.

Research Question 4- Do maternal-fetal attachment and maternal health practices during pregnancy predict neonatal outcomes?

- Hypothesis 4.1- Pregnant women who report lower levels of maternal-fetal attachment will have neonates with higher odds of adverse health outcomes.
- Hypothesis 4.2- Pregnant women who report lower quality health practices will have neonates with higher odds of adverse health outcomes.
- Hypothesis 4.3- Maternal health practices will mediate the effect of maternal-fetal attachment on neonatal outcomes.

Research Question 5- Do prenatal depressive symptoms and maternal-fetal attachment predict postnatal depression?

- Hypothesis 5.1- Women who experience higher levels of prenatal depressive symptoms will experience higher levels of postnatal depression.
- Hypothesis 5.2- Women who experience lower levels of maternal-fetal attachment will experience higher levels of postnatal depression.

Research Question 6- Do prenatal depressive symptoms, maternal-fetal attachment, and postnatal depression predict maternal-infant attachment?

- Hypothesis 6.1- Women who experience higher levels of prenatal depressive symptoms will experience lower levels of maternal-infant attachment.
- Hypothesis 6.2- Women who experience lower levels of maternal-fetal attachment will experience lower levels of maternal-infant attachment.
- Hypothesis 6.3- Women who experience higher levels of postnatal depression will experience lower levels of maternal-infant attachment.

Definition of Terms

Prenatal depression is defined as overwhelming feelings of sadness and/or hopelessness during the prenatal period. Characterized by low mood (e.g., feeling sad or empty) and loss of interest in usually enjoyable activities, prenatal depressive symptoms include difficulty sleeping and concentrating, loss of appetite, feelings of worthlessness or guilt, and low energy (American Psychiatric Association, 2013; National Scientific Council on the Developing Child, 2009b).

Postnatal depression is defined as overwhelming feelings of sadness and/or hopelessness during the postpartum period. Characterized by low mood (e.g., feeling sad or empty) and loss of interest in usually enjoyable activities, postnatal depressive symptoms include difficulty sleeping and concentrating, loss of appetite, feelings of

worthlessness or guilt, and low energy (American Psychiatric Association, 2013; National Scientific Council on the Developing Child, 2009b).

Perinatal depression is defined as major and minor depressive episodes that occur either prenatally (during pregnancy) or within the first 12 months following delivery (Gaynes et al., 2005).

Environmental chaos is defined as systems of frenetic activity, lack of structure, unpredictability in everyday activities, and high levels of ambient stimulation in an environment (Bronfenbrenner & Evans, 2000). For this study, the construct of environmental chaos includes observations of the safety of the environment surrounding the home and neighborhood.

Trauma exposure is defined as a lifetime history of exposure to traumatic events. Traumatic events include incidents of family or friends being murdered or killed, robberies, home burglaries, attacks with weapons, and muggings. For this study, the construct of trauma exposure includes the number of different types of traumatic events endorsed across the lifetime.

Maternal-fetal attachment is defined as behaviors and feelings that demonstrate a mother's affiliation and interaction with her unborn child (Condon, 1993; Cranley, 1981; Muller, 1993). Commonly measured components of maternal-fetal attachment include maternal preoccupation with thoughts about the fetus, maternal interaction with the fetus (i.e., talking to or palpating the abdomen to elicit a fetal response), maternal affective valence of feelings towards either the fetus or pregnancy, and the degree to which women report that they modulate their behavior or diet to foster fetal well-being (Dipietro, 2010).

Maternal-infant attachment is defined as behaviors and feelings that demonstrate affiliation and interaction with the infant (Condon & Corkindale, 1998). For this study, the construct includes a total score that captures three dimensions: maternal pleasure in interaction (desire for proximity and enjoyment of interaction with her infant); maternal acceptance (lack of resentment about the impact of the infant upon parent's lifestyle); and lack of hostility (absence of feelings of anger and hostility towards the infant).

Health practices include behaviors a woman engages in during pregnancy to optimize maternal and fetal health. This study will address the adequacy of health practices in six areas: balance of rest and exercise, safety measures, nutrition, avoiding use of harmful substances, obtaining health care, and obtaining information (Lindgren, 2005).

Neonatal outcomes include birth weight (weight of infant obtained at birth), gestational age (the number of weeks between the mother's last menstrual period and birth), and other birth complications such as amount of time a neonate spends in the hospital.

Contributions

This study contributes to the limited research examining perinatal depression in samples of low-income African American women in the United States. Although adverse pregnancy outcomes are more prevalent in minority and low-income populations (Patrick & Bryan, 2005), scant research has examined the relationship between environmental risk factors, maternal functioning during pregnancy, and neonatal outcomes in low-income populations. To my knowledge, this study is the first to examine the link between

environmental chaos and perinatal depression, and the first to examine the links between depression and the mother-child relationship in both the pre- and post-natal periods in a high-risk sample. This study also adds to the limited literature on experiences of trauma in a high-risk pregnant sample, and how trauma might affect other aspects of pregnancy-related functioning.

There is a paucity of research on maternal-fetal attachment in high-risk samples. Although some research has linked maternal-fetal attachment to health behaviors during pregnancy (Alhusen, Gross, Hayat, Woods, et al., 2012), no research has examined the link between maternal-fetal attachment, maternal-infant, and postnatal depression in a high-risk sample. Research in low-risk samples suggests that a mother's attachment to the fetus in the prenatal period may lay the groundwork for the mother-to-infant relationship in the postpartum period (Muller, 1993; Shin et al., 2006), suggesting that prenatal experiences may be important predictors of the postnatal caregiving environment. Thus, an important contribution of the current study is to examine whether maternal-fetal attachment serves as a protective factor for women at high-risk for depression during the perinatal period.

Conclusion

Perinatal depression is a serious public health concern that has significant implications for children and families, especially those living in poverty. More research is needed to examine the perinatal experiences of low-income, African American women, specifically the risk factors that may increase a woman's chance of experiencing depression during the perinatal period. Finally, it is important to identify the protective

factors that might buffer children from the deleterious impact of depression on their development.

Chapter 2: Literature Review

Contemporary scholars and advocates have underscored the pernicious consequences for children of early exposure to “toxic stress”, defined as early adverse experiences in the absence of stable caregiving (e.g., Shonkoff, 2011). Young children exposed to toxic stress are typically reared in impoverished circumstances; according to recent survey data, one in four children under age 3 live in poverty (Jiang, Ekono, & Skinner, 2016). Beyond poverty, such children experience a variety of compromised family contexts, including those in which there is family violence, substance abuse, or parental mental health difficulty, such as maternal depression (Shonkoff, 2011). Young children whose mothers are depressed are vulnerable to a range of negative developmental outcomes beginning during the prenatal period and persisting throughout childhood.

For mothers living in poverty, pregnancy and childbirth are increasingly identified as risk factors for depression and depressive symptoms (Sohr-Preston & Scaramella, 2006). Perinatal depression, defined as major and minor depressive episodes that occur during pregnancy or within the first 12 months following delivery (Gaynes et al., 2005), can have serious consequences for the mother and her developing child. Research has found that depression during the prenatal period negatively impacts mothers’ health behaviors, putting children at risk for developmental delays even before birth (Orr, Blazer, James, & Reiter, 2007; Rahman, Iqbal, Bunn, Lovel, & Harrington, 2004). Furthermore, research suggests that depression during the first year following delivery negatively impacts the critical relationship between mothers and their infants (Albright & Tamis-Lemonda, 2002; Campbell et al., 2004; Field, 1998; Goodman & Gotlib, 1999; Murray &

Cooper, 1997; NEECR, 1999), putting children's health and safety, as well as their social, emotional, language and cognitive development, at risk.

This review explores the phenomenon of perinatal depression and its impact on very young children. I first provide an overview of perinatal depression, which is followed by a discussion of several factors that place mothers at increased risk for depression during the perinatal period. Next, I examine different theoretical frameworks that help explain the various mechanisms by which perinatal depression might impact child development. This section is followed by a summary of the evidence on the impact of perinatal depression on parental functioning and the parenting displayed by mothers and fathers affected by depression. Then, I review the literature surrounding developmental consequences of perinatal depression. Additionally, I present various evidence-based interventions that aim to improve maternal depression symptoms during the perinatal period. I conclude with a discussion of future research directions.

Overview

Depression is a mental health disorder characterized by low mood (e.g., feeling sad or empty) and loss of interest in usually enjoyable activities, which also involves symptoms such as difficulty sleeping and concentrating, loss of appetite, feelings of worthlessness or guilt, and low energy (American Psychiatric Association, 2013; National Scientific Council on the Developing Child, 2009a). Perinatal depression includes major and minor depressive episodes that occur either prenatally (during pregnancy) or within the first 12 months following delivery (Gaynes et al., 2005). Depression is the leading cause of disease-related disability among women, with as many as 21% of women experiencing an episode of major depressive disorder in their lifetimes

(Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993). Across countries, women consistently have lifetime risk of major depression roughly twice that of men (Kessler & Bromet, 2013).

Although women can be affected by depression at any time during their lives, the stresses of pregnancy and motherhood make the childbearing years an especially vulnerable time period. In the general population, perinatal depression is a common complication for 8.5-11% of pregnant women and 6.5-12.9% of women in the first postpartum year (Gaynes et al., 2005). These rates vary across studies depending upon such factors as the definition of depression, the instrument used to measure depression, and the population studied. For instance, an increased prevalence of perinatal depression has been noted in certain subgroups of women, including African American women and women in poverty (Melville, Gavin, Guo, Fan, & Katon, 2011; U.S. Department of Health and Human Services Administration for Children and Families, 2006a; Zayas, Cunningham, McKee, & Jankowski, 2002). Some studies of low-income pregnant women and mothers of young children estimate rates of perinatal depression to be as high as 40-60% (Knitzer, Theberge, & Johnson, 2008).

Prenatal Depression

Although not as highly publicized as post-partum depression, prenatal depression is a serious disorder faced by many pregnant women. Using a nationally representative sample in the United States (N = 14,549), Le Strat, Dubertret, and Le Foll (2011) found that the prevalence of a Major Depressive Episode (MDE) during pregnancy was 12.4%, and that MDE was associated with high rates of other psychiatric disorders and high

levels of substance use (including alcohol, illicit drugs, and cigarettes). Furthermore, they found that more than three-quarters of depressed pregnant women did not seek help, suggesting that prenatal depression remains unrecognized and untreated in most women (Le Strat, Dubertret, & Le Foll, 2011). Pregnant women may be reluctant to seek treatment for prenatal depression due to confusion between symptoms of major depression and the more typical emotional swings experienced by many mothers during pregnancy (Sohr-Preston & Scaramella, 2006). For some women, prenatal depression can be debilitating, and can make it difficult to carry out caregiving tasks and responsibilities needed to maintain a healthy pregnancy.

Postnatal Depression

Following childbirth, many mothers either continue to experience depressive symptoms or experience their first bout of depression during the postpartum period. It is estimated that 20-80% of new mothers experience negative feelings or mood swings following childbirth, often called the “postpartum blues” (Payne, 2003). The symptoms of postpartum blues—including crying, anxiety, and depressed mood—are not severe and do not require treatment, and typically disappear within a week (U.S. Department of Health and Human Services Office on Women’s Health, 2009a). However, as many as 20% of women with postpartum blues develop the more serious condition of postpartum depression (Sohr-Preston & Scaramella, 2006). Like postpartum blues, postpartum depression seems to be related to the hormonal changes associated with childbirth (Payne, 2003). However, the symptoms of postpartum depression are more severe and long lasting, and can include a lack of interest in the baby, thoughts of self-harm, or

thoughts of hurting the baby (U.S. Department of Health and Human Services Office on Women's Health, 2009a). Compared to mothers who do not experience depression during pregnancy, mothers who experience prenatal depression are more likely to experience depression during the postpartum period (Edwards et al., 2008; Milgrom et al., 2008).

Risk Factors

In order to understand how to reduce the rates of perinatal depression, it is important to address the risk factors that might increase its prevalence among different populations of women. Specific risk factors have been found to increase a woman's chance of experiencing perinatal depression, including low socioeconomic status, race, unintended pregnancy, and the experience of stressful life events.

Poverty

Poverty is a major risk factor for perinatal depressive symptoms. Many low-income women experience stressful life events that have negative consequences for their own mental health and potential long-term effects for their children's health and development. For example, Zayas, Cunningham, McKee, and Jankowski (2002) examined depressive symptoms in a sample of low-income African American and Hispanic pregnant women in New York City (N = 148). They found that over half the women in the study (51%) had elevated levels of depressive symptoms, documented through a self-report questionnaire. In a study of low-income mothers at pediatric primary care sites in the greater Boston area (N = 559), an average of 40% of mothers screened positive for depressive symptoms using a self-report questionnaire, with site-specific rates ranging from 33% to 59% (Kahn et al., 1999). Because this study only screened mothers who brought their children to pediatric care, this rate of prevalence of

depression may underestimate that of the general population, especially considering how depressive symptoms may interfere with help-seeking behaviors (Flynn, Davis, Marcus, Cunningham, & Blow, 2004). More recently, data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) revealed that one-fourth of poor mothers with infants reported that they were moderately or severely depressed, more than twice the rate for non-poor mothers with infants (Knitzer et al., 2008; National Research Council, 2009; National Scientific Council on the Developing Child, 2009b). Findings from the Early Head Start Research and Evaluation Project portray a broader impact of perinatal depression (Administration for Children and Families, 2006). At enrollment, more than half (52%) of mothers with children age 1 year or younger reported having depressive symptoms. One-third of mothers of 1-year-olds and one-third of mothers of 3-year-olds were depressed, and for some women (12%), depression was chronic, meaning that these mothers were depressed when their children were both 1 and 3 years old.

Race

Although the literature is ambiguous, there is some evidence that the prevalence of perinatal depression in the United States is higher among African American and Hispanic women compared to European American women (Fellenzer & Cibula, 2014; Gavin et al., 2011; Melville et al., 2010; Rich-Edwards et al., 2006; Segre et al., 2006). For instance, in an ethnically diverse sample of pregnant women (N = 1,997) asked to report on their depressive symptomatology, the overall prevalence of prenatal depression was 5.1%; however, the prevalence of depression was significantly higher among African American women (15.3%) and Latinas (6.3%) compared to European American women who were non-Hispanic (3.6%). The increased risk of prenatal depression in these

subgroups remained after adjusting for a variety of factors, including socioeconomic status (Gavin et al., 2011). In contrast, Mora et al. (2009) examined the timing and persistence of maternal depressive symptoms in a sample of 1,735 low-income, multi-ethnic, inner-city women who reported on their depressive symptomatology. These researchers found that African American women were less likely than European American women to experience chronic (both pre-and-postnatal) depression.

Other research suggests that in the United States, poverty is a more powerful predictor than race, and that for poor women, rates of depression are high regardless of ethnicity (Yonkers et al., 2001). In one sample of low-income African American and European American women in the Midwestern United States (N = 192) reporting on depressive symptomatology, prevalence rates of depression were more than twice those reported for middle-class samples at three assessment points: two prenatal (prevalence estimates for the first and second pregnancy assessments were 27.6% and 24.5%, respectively); and one postnatal (a prevalence estimate of 23.4%) (Hobfoll, Ritter, Lavin, Hulsizer, & Cameron, 1995). At all three assessment points, African American and European American women did not differ in rates of depression (Hobfoll et al., 1995). The literature is even more mixed regarding ethnic disparities in perinatal depression between Hispanic and non-Hispanic European American women, with some studies finding lower perinatal depression prevalence among Hispanics reporting on depressive symptomatology (Mora et al., 2009; Segre et al., 2006), others finding higher depressive symptoms reported by Hispanics (Gavin et al., 2011; Melville et al., 2010; Rich-Edwards et al., 2006), and still other studies finding no differences by ethnicity (Yonkers et al., 2001).

Unintended Pregnancy

Unintended pregnancies are defined as pregnancies that, at the time of conception, are either mistimed, meaning the mother wanted the pregnancy to occur at a later time, or unwanted, meaning the mother did not want it to occur at that time or any time in the future (Santelli et al., 1999). In 2006, 49% of all pregnancies in the United States were unintended, with an increased prevalence noted in certain subgroups, including unmarried women, cohabiting women, lower income women, less educated women, and African American women (Finer & Zolna, 2011). Specifically, a woman living in poverty is four times as likely as a woman living at 200% of poverty or higher to have an unintended pregnancy. Further, Hispanic women are twice as likely as White women to have an unintended pregnancy, and African American women are three times as likely as White women to have an unintended pregnancy (Finer & Zolna, 2011).

Research indicates that compared to women intending their pregnancy, women who report not intending their pregnancy also report having increased levels of perceived stress and higher levels of depressive symptoms (Barber, Axinn, & Thornton, 1999; Messer, Dole, Kaufman, & Savitz, 2005; Orr & Miller, 1997). Using a cross-sectional sample that included all women with recorded births of live infants in a 13-county region in central New York State ($n = 19,219$), Fellenzer and Cibula (2014) found that women with unintended pregnancies were more likely to report severe or moderate prenatal depressive symptoms compared to women with intended pregnancies. In a sample of 215 high-risk Hispanic women in Washington, D.C., unintended pregnancy was not related to reports of depressive symptoms in the prenatal period, but was related to a significant increase in reported depressive symptoms in the postpartum period, when these women

were compared to women who reported intended pregnancies (Christensen, Stuart, Perry, & Le, 2011). These analyses lend support to the hypothesis that unintended pregnancy leads to perinatal depression, rather than depression preceding the unintended pregnancy.

Stressful Life Events

Perinatal depression often coincides with a multitude of other adversities that may further exacerbate depressive symptoms and undermine child development. Mothers experiencing depression are often young, socially isolated, educationally disadvantaged, and burdened by more family conflict and stressful life events than mothers who are not depressed (Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007; Lancaster et al., 2010; Lorant et al., 2003; Melville et al., 2010). For instance, in a study of 119 low-income African American pregnant women receiving care at prenatal clinics in Northern California, Dailey and Humphreys (2011) examined the relationship between self-reported depressive symptoms and social stressors such as discrimination, exposure to trauma, social conflict, and economic stress. They found that nearly half (42%) of their sample had scores indicative of possible depression, whereas nearly one quarter (23%) had scores indicative of probable depression. Analysis indicated significant and positive relations between social stress variables and depression scores, with discrimination and social conflict accounting for 36% of the variance in perinatal depressive symptoms. A recent population-based study of mothers who gave birth in Mississippi (n = 3,695) found a dose-response relationship between stressful life events and the prevalence of postpartum depression. Specifically, researchers found that the prevalence of postpartum depression was highest in mothers who reported trauma-related stressors, followed by relational, financial, and emotional stressors, respectively (Qobadi, Collier, & Zhang,

2016). These findings suggest that the social context of a woman's life experiences impacts her risk for developing depressive symptoms during pregnancy, and that low-income African American women may be a particularly vulnerable group.

Discrimination. One social stressor linked to perinatal depression is the experience of discrimination. Canady et al. (2008) examined the link between reports of experiences of discrimination and depressive symptoms in a sample of 2,731 pregnant African American and European American women in Michigan. Initial analyses showed that African-American women demonstrated a higher level of depressive symptoms than European American women at mid-pregnancy. After adjusting for maternal socio-demographic characteristics, however, the adjusted depression score for African American women was higher than that of European American only among employed women. This race difference disappeared when self-reported discrimination was added to the model. These findings suggest two things. First, African-American women do not benefit from employment in the same way as European American women, as depressive symptoms remained high among African Americans regardless of employment status, whereas employed European American women had lower depression scores than their unemployed counterparts. Second, self-reported discrimination mediates the relationship between race and depressive symptoms among pregnant women. In other words, discrimination may account for some of the racial disparity in the prevalence of perinatal depression (Canady, Bullen, Holzman, Broman, & Tian, 2008).

In an analysis of two prospective cohort studies in the Boston area, Ertel et al. (2012) found that self-reported racial discrimination was differentially associated with the risk of prenatal depressive symptoms in two cohorts of pregnant black women. Among

black women enrolled in the less affluent cohort, each increment on the racial discrimination scale conferred a 48% higher odds of prenatal depressive symptoms. In contrast, among black women enrolled in the more affluent cohort, they observed no increased risk of prenatal depressive symptoms associated with racial discrimination. These findings suggest that experiences of racial discrimination may be a particularly salient social stressor among disadvantaged black women (Ertel et al., 2012). Clearly, further research is needed to examine how specific social contexts impact a woman's risk for developing depressive symptoms during and after pregnancy.

Exposure to trauma. Another significant social stressor during pregnancy is lifetime exposure to trauma. Women entering pregnancy who have been exposed to trauma are at increased risk for engaging in high-risk health behaviors, such as smoking, alcohol consumption, substance use, poor prenatal care, and excessive weight gain (Lopez et al., 2012; Morland et al., 2007). In a recent study of urban, low-income, African American pregnant women (N = 116), 87% of the women reported exposure to at least one traumatic event in their lifetimes, with a mean report of 4.3 events (Dailey et al., 2011). Traumatic events included incidents of family or friends being murdered or killed, robberies, home burglaries, attacks with weapons, and muggings. Lifetime trauma exposure was significantly associated with depressive symptoms and adverse perinatal health behaviors, including tobacco use, fewer prenatal care visits, and longer maternal hospital stays. This study's 87% estimate with respect to trauma exposure is relatively higher than the 29-74% reported in other studies of pregnant women (Smith, Poschman, Cavaleri, Howell, & Yonkers, 2006). However, there is some evidence that African American women experience more traumatic life events than their non-African American

counterparts. For example, in a sample of pregnant women (N = 1,581) expecting their first child in the Midwestern United States, Seng, Kohn-Wood, McPherson, and Sperlich (2011) found that the prevalence of posttraumatic stress disorder (PTSD) was 4 times higher among African American women (13.4%) than non-African American women (3.5%), documented through a psychiatric interview and self-report questionnaires. This disparity was explained by greater trauma exposure. Specifically, the mean number of traumatic events, the rating of “strong past-year impact” of the index trauma, the likelihood that the index trauma occurred in childhood, and the likelihood of having experienced childhood abuse as the trauma all were higher among African American women. In addition, the rate of pre-pregnancy use of mental health treatment among African American women was lower. These results suggest that the disparity by race in risk for PTSD and depression during pregnancy may be explained by differential exposure to trauma as well as differential use or access to treatment prior to pregnancy.

One specific type of trauma is exposure to intimate partner violence (IPV). IPV exposure is one of the most common sources of reported trauma during pregnancy (Mendez-Figueroa et al., 2013). Research indicates that mothers who experience IPV are more likely to experience perinatal depression than mothers without such experiences (Gavin et al., 2011; Martin et al., 2006; Rodriguez, 2008; Valentine, Rodriguez, Lapeyrouse, & Zhang, 2011). In a study of 1,888 pregnant women receiving prenatal care in Seattle, Melville et al. (2010) found reports of intimate partner violence to be one of the strongest independent predictors of prenatal major depression, conferring an odds ratio of 3.45. Intimate partner violence has also been linked to adverse neonatal outcomes. In a sample of 194 pregnant women experiencing prenatal IPV, women experiencing

greater severities of intimate partner violence were more likely to deliver a neonate with an adverse outcome, even after controlling for depressive symptoms (Alhusen et al., 2014). Thus, physical injury as well as psychological stressors relative to IPV may influence biological pathways during pregnancy.

Similarly, a study of birth outcomes in a sample of low-income, inner-city pregnant women (N = 358) found that women with prenatal anxiety had significantly smaller babies than non-anxious women, and that this relationship was moderated by trauma history (Blackmore et al., 2016). Specifically, childhood trauma exposure increased vulnerability for low birthweight delivery associated with maternal anxiety and depression, suggesting that life experiences prior to pregnancy may have a psychological and biological influence on birth outcomes. Taken together, these findings have implications for screening and intervention during pregnancy, for example, prenatal care visits should incorporate questions about social stressors, such as discrimination, trauma, and intimate partner violence, with routine depression screening.

Environmental chaos. The living environments of many at-risk families can be characterized as chaotic, consisting of numerous intractable and unpredictable conditions. Relative to their more affluent counterparts, low-income families reside in more crowded, noisier, and poorer-quality housing (G. W. Evans, 2004). The construct of neighborhood and household chaos, according to Bronfenbrenner and Evans (2000), can be described as “systems of frenetic activity, lack of structure, unpredictability in everyday activities, and high levels of ambient stimulation” (p. 121). Researchers have hypothesized that household chaos might disrupt the important proximal processes between parent and child, especially in families who are under stress from poverty and other factors.

Researchers have found that this disruption in parenting is related to the tension that chaos creates in the home, leading to parental insensitivity and a lower motivation to actively engage with their children (Corapci & Wachs, 2002; G. W. Evans et al., 2005). This literature suggests that household chaos plays a key role in the etiology of poor parenting and environmental uncertainty and inconsistency, even after controlling for parental IQ and SES (Coldwell, Pike, & Dunn, 2006; Pike, Iervolino, Eley, Price, & Plomin, 2006). Limited evidence has suggested a positive link between household chaos and maternal depression in the postpartum period (Calam et al., 2012), but to my knowledge, no research has examined neighborhood and household chaos in a sample of pregnant women.

Conceptual Framework

The above overview of perinatal depression reveals many factors that may contribute to this phenomenon. Specific conceptual theories provide multiple perspectives on this complex issue, and offer explanatory frameworks within which to consider the various mechanisms through which maternal depression might impact child development. In this vein, I consider two linked conceptualizations: the continuum of reproductive casualty and the continuum of caretaking casualty.

Pasamanick and Knobloch (1966) first used the term “reproductive casualty continuum” to define a range of possible outcomes related to pregnancy and delivery complications. They hypothesized that complications on one end of the continuum resulted in death, whereas complications at the other end of the continuum were negligible. Specifically, profound prenatal insults, such as exposure to toxins, might result in death or severe congenital disorders, and milder insults might result in subtle

deficits in functioning evident only as the child grows older. This concept has been used to explain the long-term outcomes for preterm and low-birth-weight children (Swamy et al., 2008), and for findings that associate obstetric complications with conditions such as poor cognitive functioning (Odd et al., 2008) and disorders such as autism (Eaton, Mortensen, Thomsen, & Frydenberg, 2001). Using this framework, researchers would hypothesize that maternal depression during the prenatal period would result in long-term deficits in child functioning, regardless of the postnatal environment into which the child is born and raised.

Following the introduction of the continuum of reproductive casualty, emerging data indicated that in some cases, infants exposed to prenatal insults were no more likely to display poor developmental outcomes in childhood than infants who were not exposed to prenatal insult (Baum, 1977). As a result, researchers began to move away from the reproductive casualty hypothesis and to recognize that child outcomes are influenced by a myriad of complex factors separate from (and in addition to) prenatal complications (Simeonsson, 2006). Some scholars (e.g., Baum, 1977) recommended that researchers attend more carefully to the impact of postnatal environmental factors on child outcomes. In accordance with this idea, the continuum of caretaking casualty, developed by Sameroff and Chandler (1975), emphasizes the influence of the caregiving environment on child outcomes. Similar to the reproductive casualty continuum, the caretaking casualty continuum is used to explain how individual differences in caregiving environments contribute to children's developmental differences across a number of domains. When parental behaviors do not meet a minimal requirement for the child's normal, healthy development, the child is placed at risk for a variety of caretaking

casualties (Rickel, 1986). Using this framework, researchers would hypothesize that although maternal depression during the prenatal period could render children vulnerable to later deficits in functioning, a healthy and nurturing postnatal environment could serve as a protective factor against long-term consequences. On the other hand, a healthy child born to a mother who experiences depression during the postpartum period could become at risk for adverse outcomes.

Taken together, the continua of reproductive and caretaking casualties highlight the significance of the severity, timing, and persistence of maternal depression. When examining how perinatal depression impacts child outcomes, one must consider where on the continuum the mother falls (i.e., low, moderate, or high depressive symptomology) as well as when and for how long the depressive episode occurred (i.e., during the prenatal period, the postnatal period, or both). The two theories also suggest separate underlying mechanisms through which maternal depression might leave its mark, through prenatal biological processes and/or postnatal psychological processes.

Perinatal Depression and Parental Functioning

Using the previously delineated theoretical frameworks as a guide, perinatal depression can be examined across multiple domains. In the following paragraphs, I consider perinatal depression in terms of its impact on the developing fetus and infant through maternal physiology, and health-related behaviors during the pre-and-postnatal periods. Finally, I consider parenting, including the parent-child relationship, within the context of perinatal depression.

Prenatal Physiology

One proposed mechanism by which maternal depression may have lasting effects on child development is through exposure to high levels of maternal cortisol during gestation (Miller, 2010; National Scientific Council on the Developing Child, 2009a; Seckl & Meaney, 2004). Known as the stress hormone, cortisol is released by the hypothalamic pituitary adrenal (HPA) axis in response to stress (National Scientific Council on the Developing Child, 2009a). An underlying hypothesis, based on experimental animal work, is that the effect of prenatal stress or depression on child outcomes derives from an HPA-mediated pathway. More specifically, maternal depression during the prenatal period is thought to be related to an elevation in maternal prenatal cortisol, which crosses the placental barrier to influence fetal development (Miller, 2010; Seckl & Meaney, 2004). In support of this hypothesis, research has documented that experiencing depressive symptoms during pregnancy increases the quantity of cortisol released in the mother's bloodstream (Diego et al., 2004). In contrast, Voegtline et al. (2013) found that levels of maternal salivary cortisol were unrelated to self-reported anxiety and depressive symptoms. These results suggest that studies that measure psychological factors in pregnancy but do not measure maternal cortisol should exercise caution in assuming activation of the maternal HPA axis. A recent systematic review of the literature supports this conclusion, stating that "the most plausible interpretation of currently available literature is that there is not a significant association between cortisol and antenatal depression" (Seth, Lewis, & Galbally, 2016, p.15). However, given the significant discrepancies between study methodologies (e.g.

differences in how cortisol is measured, how depression is measured, etc.), it is difficult to draw strong conclusions for either position.

Whereas evidence regarding the link between maternal depressive symptoms and increased levels of cortisol remains mixed, research has consistently linked increased levels of maternal cortisol to reduced fetal growth and an increased risk for premature labor (Diego et al., 2009; de Weerth, van Hees, & Buitelaar, 2003)(INSET HOFFMAN CITATION), as well as altered immune functioning in the baby after birth (Mattes et al., 2009). Increased levels of maternal cortisol may also have long-term effects on the child's developing HPA axis. Researchers have found an association between maternal depression during the prenatal period and elevated cortisol levels in infants (Brennan et al., 2008; Diego et al., 2004; Feldman et al., 2009). These findings suggest that depression during pregnancy may program the developing fetal HPA axis to be more reactive to stress, resulting in infants becoming easily over-aroused across a variety of nonthreatening situations (Sohr-Preston & Scaramella, 2006). Additional research has found that chronic HPA activation in children may have long-term consequences on the development of self-regulation and executive function skills (Blair, Granger, & Peters Razza, 2005).

Currently, the mechanism by which maternal depression relates to abnormalities in cortisol function in the offspring is unknown. It may be that high levels of maternal cortisol during pregnancy interfere with the development of the child's stress response system. Another possibility, as some evidence suggests, is that cortisol reactivity is a heritable trait, and depressed mothers pass down a genetic vulnerability to high cortisol reactivity (Steptoe, van Jaarsveld, Semmler, Plomin, & Wardle, 2009). To begin to tease

apart these compounding variables, Brennan et al. (2008) examined the cortisol levels of infants whose mothers had been treated for depression during pregnancy. They found that prenatal exposure to maternal psychotropic medications (i.e., antidepressants) was associated with lower infant cortisol levels. This finding suggests that psychopharmacological treatment of depression during pregnancy helps to normalize infant cortisol levels (Brennan et al., 2008). In summary, mothers' emotional health during pregnancy may indirectly affect children's risk for later physical, cognitive, and social-emotional difficulties by affecting the mother's physiologic state and the fetus' physiological development. Specifically, sustained feelings of depression during pregnancy may compromise the developing HPA axis by making the axis more sensitive to environmental stressors. Although the exact biological impact of prenatal depression on the developing fetus is currently unknown, it is an important area of ongoing research (Meltzer-Brody, 2011). Investigations into both human and animal models of prenatal depression offer much promise for the future identification of the underlying mechanisms, and subsequent early identification and prevention for women at risk for depressive symptoms.

Maternal Health-Related Behaviors

Physiological explanations for the effects of perinatal depression on young children extend to maternal health behaviors. Specifically, multiple studies have yielded evidence that perinatal depression affects maternal health behaviors prenatally and postnatally, which have a profound impact on child outcomes across domains.

Prenatal. Research indicates that maternal depression during pregnancy affects mothers' health-related behaviors. Women experiencing increases in depressive

symptoms during pregnancy are less likely to seek prenatal care (Kelly et al., 1999; Lin et al., 2009) and report being in poorer health (Orr, Blazer, James, & Reiter, 2007) than mothers experiencing little to no depression during pregnancy. Depression may drain mothers of the energy and motivation needed to schedule and attend prenatal visits, reducing their exposure to information on prenatal vitamins, adequate nutrition, healthy weight gain, and other elements of a healthy pregnancy (Alhusen, Ayres, & Depriest, 2016; U.S. Department of Health and Human Services Office on Women's Health, 2009b).

Depression may also drive mothers to abuse substances as a means of coping with negative emotions, or may make it more difficult for women using substances to quit when they get pregnant (Hoffman & Hatch, 2000). However, there is ambiguity in the literature on maternal depression and the use of specific substances during the prenatal period. For example, some studies, which have included both low-risk samples (e.g., predominately married, Caucasian, college graduates) and high-risk samples (e.g., low-income women participating in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) from the United States), have documented a link between prenatal depressive symptoms and alcohol use (Marcus, Flynn, Blow, & Barry, 2003; O'Connor & Whaley, 2006; Pajulo, Savonlahti, Sourander, Helenius, & Piha, 2001). Other studies, including large, population-based samples from Norway (N = 1,749) and the United Kingdom (N = 12,834), have found no association between symptoms of depression and alcohol use during pregnancy (Alvik, Heyerdahl, Haldorsen, & Lindemann, 2006; Leis, Heron, Stuart, & Mendelson, 2012).

Similarly, the link between prenatal depression and smoking is inconsistent. Some studies, including a population-based sample from the Netherlands (N = 8,266) and a meta-analysis of 57 studies evaluating risk factors for prenatal depression, report no consistent relationship between prenatal depression and smoking (Goedhart, van der Wal, Cuijpers, & Bonsel, 2009; Lancaster et al., 2010). Other studies examining low-income women in the United States found that smoking during pregnancy predicts prenatal depressive symptoms (Vander Weg, Ward, Scarinci, Read, & Evans, 2004; Ward, Vander Weg, Sell, Scarinci, & Read, 2002). Still others, which have included low-risk samples from the United States and Norway, report results in the opposite direction, finding that depressive symptoms predict continued tobacco use during pregnancy (Linares Scott et al., 2009; Marcus et al., 2003; Zhu & Valbø, 2002). In a sample of 810 African American pregnant women in North Carolina, Orr, Blazer, and Orr (2012) found an association between elevated prenatal depressive symptoms and smoking during pregnancy, with 14.3% of those women with low depression scores and 29.1% of women with elevated depression scores classified as smokers. They also found that smokers differed from nonsmokers in knowledge, attitudes, and environmental factors relative to smoking. For instance, the women who smoked were significantly more likely to have lower levels of education, to be single, and to believe that smoking could not harm the baby or themselves “a lot.” These results suggest that interventions to reduce depression among women of childbearing ages might help to reduce smoking among pregnant women, which would have a positive impact on the developing fetus.

Unhealthy behaviors during pregnancy, such as inadequate prenatal care, smoking, and alcohol use, are associated with heightened risk of unfavorable birth outcomes

including preterm delivery, low and very low birthweight, and stillbirth (Aliyu et al., 2008; Cox, Zhang, Zotti, & Graham, 2011; Debiec, Paul, Mitchell, & Hitti, 2010). These unhealthy behaviors may also account for the links between prenatal depression and poor birth outcomes, such as preterm delivery, low birthweight, and colic (Rahman et al., 2004). Considering the possible links between prenatal depression and unhealthy behaviors, efforts to improve health behaviors during pregnancy should consider the impact of depression on these behaviors, and interventions should target symptoms of depression in addition to health behaviors.

Postnatal. Mothers who are depressed also exhibit behaviors following the births of their children that compromise child health. For example, they are less likely to engage in age-appropriate safety practices, such as following healthy sleep routines (Chung et al., 2004; Paulson et al., 2006) and using car seats and childproof latches on cabinets (McLearn, Minkovitz, Strobino, Marks, & Hou, 2006a, 2006b). Depressed mothers are also less likely to breastfeed, and when they do breastfeed, they do so for shorter periods of time than non-depressed mothers (Henderson, Evans, Straton, Priest, & Hagan, 2003; Paulson, Dauber, & Leiferman, 2006). Flynn, Davis, Marcus, Cunningham, and Blow (2004) examined the relationship between maternal depression and child healthcare service utilization in mothers with young children (N = 176) in Michigan. Mothers with depressive symptoms reported a higher frequency of child visits to the emergency room in the past six months, and were more likely to say that they had missed a doctor's appointment for their children in the past year. The most commonly stated reason for missing a doctor's appointment (37%) was forgetting the appointment. Taken together,

these findings demonstrate the deleterious impact of maternal depression on the health and safety of young children.

Parenting and Perinatal Depression

As with any group of children, parenting plays a pivotal role in the outcomes of children exposed to perinatal depression. In this section, I review the extant literature on various features of parenting exhibited in families in which there is perinatal depression. Although the bulk of this literature refers to maternal parenting, I also explore emerging evidence on paternal depression and parenting.

Maternal-fetal attachment. The attachment literature has underscored the critical contribution of the mother-infant relationship to infant development (Ainsworth, 1979). Contemporary research has capitalized on this knowledge to consider prenatal manifestations of this important relationship. For example, Dipietro (2010) has documented that the psychological bond between women and their unborn children emerges fairly early in pregnancy and increases throughout the prenatal period.

Maternal–fetal attachment (MFA) is a term that has been used to describe the emotional connection a woman develops with her fetus during pregnancy, expressed in feelings, cognitions, and behaviors (Salisbury et al., 2003). Only a few instruments have been developed to explicitly measure the construct (Condon, 1993; Cranley, 1981; Muller, 1993), although related items are often contained within other scales that focus on pregnancy stress or anxiety. Commonly measured components of MFA scales include preoccupation with thoughts about the fetus, maternal interaction with the fetus (i.e., talking to or palpating the abdomen to elicit a fetal response), affective valence of feelings towards either the fetus or pregnancy, and the degree to which women report that

they modulate their behavior or diet to foster fetal well-being (Dipietro, 2010). MFA is manifested in behaviors that demonstrate care and commitment to the fetus and include nurturance (eating well, abstaining from harmful substances, such as alcohol), comforting (stroking the belly), and physical preparation (buying baby clothes and equipment).

Although limited research has examined the risk or protective factors associated with MFA, previous studies have demonstrated a negative effect of prenatal depression on MFA (Lindgren, 2003; McFarland et al., 2011; Sedgmen et al., 2006). For instance, in a sample of urban, low-income African American mothers in Baltimore (N = 166), Alhusen, Gross, Hayat, Rose, and Sharps (2012) found that together with social support, depressive symptoms accounted for 65% of the variance in MFA, with higher depressive scores associated with lower MFA. The link between prenatal depression and MFA is of particular concern because low MFA has been linked to engaging in less positive health practices (Alhusen, Gross, Hayat, Woods, et al., 2012) and a greater stated probability of harming the fetus currently and in the future (Pollock & Percy, 1999). In addition, a mother's attachment to the fetus in the prenatal period may lay the groundwork for the mother-to-infant relationship in the postpartum period (Muller, 1993; Shin et al., 2006). For example, Siddiqui and Hagglof (2000) found that MFA during the third trimester of pregnancy predicted mother-infant interaction in the postpartum period. Specifically, they found that Swedish mothers (N= 100) who experienced greater affection during pregnancy and fantasized more about their unborn babies showed more overall involvement during a videotaped interaction at 12-weeks postpartum. More recently, in a sample of low-income, predominantly African American women (N = 81), Alhusen, Hayat, & Gross (2013) found that women reporting higher MFA during pregnancy had

more secure attachment styles, and their children had more optimal development between 14 and 26 months of age, compared to women reporting lower MFA. Taken together, these findings highlight the importance of increasing our understanding of MFA, factors that influence it, as well as its association with health practices during pregnancy and the mother-infant relationship in the postpartum period. These relationships are particularly important to explore in high-risk pregnant women who are at increased risk for adverse birth outcomes and compromised maternal-infant relationships.

Positive parenting. Parents' sensitivity and emotional support predict infant-parent attachment security and numerous other aspects of young children's cognitive, social, and emotional functioning (Belsky, 1999; Bornstein, 1995; De Wolff & van Ijzendoorn, 1997). Parental sensitivity refers to parents' accuracy in reading their infants' cues for food, comfort, and exploration of the environment, as well as to parents' contingent responsiveness to these cues (e.g., the provision of food, comfort, etc.) (Berlin, Brady-Smith, & Brooks-Gunn, 2002). Nurturing and supportive parenting have been identified as protective factors across multiple studies of cumulative risk. For instance, positive, involved, and responsive parenting has been found to mediate the relationship between social risk factors, such as poverty, and developmental outcomes such as cognitive development, academic achievement, and social skills (Brody, Murry, Kim, & Brown, 2002; Burchinal, Vernon-Feagans, & Cox, 2008; Klebanov, Brooks-Gunn, McCarton, & McCormick, 1998; Krishnakumar & Black, 2002; Linver, Brooks-Gunn, & Kohen, 2002).

Positive parenting behaviors can act as protective factors for children's developmental outcomes, even in the presence of depression. For instance, the National

Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (1999) examined the link between maternal depression, mother-child interaction, and child functioning at 36 months in a sample of women and children (N = 1,215). Results indicated that mothers with chronic symptoms of depression were rated as less sensitive when observed playing with their children, and that children of depressed mothers performed more poorly on measures of cognitive-linguistic functioning and were rated as less cooperative and more problematic at 36 months. However, maternal sensitivity moderated the relationship between maternal depression and child outcomes. Mothers who reported more symptoms of depression, but who were still highly sensitive, had children who were buffered from some of the potentially negative effects of their mothers' depressive symptomatology. More recently, Milan, Snow, and Belay (2009) used data from the NICHD Study of Early Child Care (N = 938) to examine whether attachment security at age 3 interacts with maternal depressive symptoms to predict children's depressive symptoms at age 11. Results indicated that preschool attachment quality moderated the influence of maternal depression on children. In particular, maternal depressive symptoms predicted offspring depressive symptoms only among those children with an insecure attachment history. These results suggest that maternal depression may place children at an increased risk of experiencing depressive symptoms, but that a secure attachment relationship can serve as a protective factor.

Germane to the current study, sensitive parenting may also serve as a protective factor against the negative impacts of exposure to prenatal depression. Sensitive caregiving environments- in the form of secure attachment relationships and exposure to tactile stimulation—have been found to be protective factors against the deleterious

impacts of prenatal depression. For instance, Sharp et al. (2012) asked a socioeconomically diverse sample of mothers in the United Kingdom (N = 271) how often they stroked the face, limbs and body of their babies over the first 9 weeks of their infants' lives. They found no evidence that maternal stroking was a function of a mother's level of depression, instead noting naturally occurring variations in stroking behavior. They did find, however, that the effect of prenatal depression on infant outcomes differed depending on postnatal exposure to maternal stroking. Specifically, prenatal maternal depression was associated with infants' decreased physiological adaptability and with infants' increased negative emotionality, but only in the presence of low maternal stroking. These results suggest that maternal depression during the prenatal period might place infants at risk for abnormal stress reactivity later in life, but that a nurturing postnatal environment could serve as a protective factor against long-term consequences.

Negative parenting. Negative parenting may be characterized as unresponsiveness (detachment), over-responsiveness (intrusiveness), or overt negative regard and hostility (Berlin et al., 2002). These types of insensitive parenting may contribute directly to children's difficulties as well as amplify the deleterious effects of poverty, low education, and single parenthood on children's development (Brooks-Gunn, Klebanov, Duncan, & Brooks-Gunn, 1996; Conger, Conger, & Elder, 1997). Multiple types of negative parenting behaviors have been documented among depressed women in both low- and high-risk samples in the United States. Research has shown through observational paradigms that depressed mothers demonstrate more negative parenting

behaviors, such as unresponsiveness (detachment) and over-responsiveness (intrusiveness) (Field, 1998; Field, 2011; Lovejoy et al., 2000).

Extant research suggests that depression may diminish a mother's ability to respond sensitively to her children. Various observational studies with diverse samples from the United States have found that maternal depression reduces mothers' sensitivity toward their infants' signals and needs (Albright & Tamis-LeMonda, 2002; Campbell et al., 2004; Field, 1998; Goodman & Gotlib, 1999; Murray & Cooper, 1997; NEECR, 1999). Compared with women not suffering from depression, depressed women have been observed to be less positive, spontaneous, and responsive with their infants in studies investigating both high- (e.g., adolescent mothers) and low-risk mothers (Field et al., 2000; van Doesum, Hosman, Riksen-Walraven, & Hoefnagels, 2007). Depressed mothers have been found to be less likely to respond to their infants' cues (i.e., vocalizations and actions) or to engage with their infants and young children in positive, harmonious interactions. Such patterns are particularly concerning given the research which suggests that once negative parent-child interactions are established, they may persist even after a mother's depression has improved (National Scientific Council on the Developing Child, 2009a).

Recent research is examining the link between depression and parenting at the level of the brain. For example, in a functional neuroimaging study in the United States, Laurent & Ablow (2012) investigated depression-related differences in mothers' (N = 22) neural responses to their 18-month-old infant's distress cues. They found that mothers who self-reported depression respond differently to their crying babies than do non-depressed mothers. Compared to non-depressed mothers, depressed mothers displayed

reduced brain activity when hearing their babies' cries. Furthermore, whereas the brains of non-depressed mothers activated to their own infants' cries greater than to a control cry, depressed mothers as a group showed no unique response to their own babies. These results suggest that disturbances in the neural networks involved in emotional response and regulation may contribute to parenting deficits in depressed mothers.

Moreover, maternal depression has been found to elevate the risk of coercive or hostile parenting and corporal punishment according to the reports of various groups of mothers, including low-income mothers in the United States (N = 774) and mothers of children with Attention-Deficit/Hyperactivity Disorder (ADHD) in South Korea (N = 585) (Chung et al., 2004; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Shin & Stein, 2008). Additionally, in the United States, maternal depression has been associated with a heightened risk of child maltreatment in samples ranging from socioeconomically diverse families (N = 7,103), families in the child welfare system (N = 4,895), and low-income families (N = 595) (Chaffin, Kelleher, & Hollenberg, 1996; Kohl, Jonson-Reid, & Drake, 2011; Windham et al., 2004). The mechanisms by which maternal depression lead to hostile parenting behaviors and maltreatment is an understudied area.

However, one potential pathway through which negative parenting behaviors of depressed mothers are exacerbated is through infant crying. Prenatal stress and depression have been linked to infants' unexplained and excessive crying during the postnatal period (Bolten, Fink, & Stadler, 2012; Radesky & Zuckerman, 2013; van der Wal, van Eijsden, & Bonsel, 2007). This association is likely mediated by disturbances in infants' stress response systems, as discussed previously in this review. Depression during pregnancy may program the developing fetal HPA axis to be more reactive to

stress, resulting in infants becoming easily over-aroused across a variety of nonthreatening situations (Sohr-Preston & Scaramella, 2006). Excessive and inconsolable crying, in turn, has been linked with maternal feelings of failure, diminished self-esteem, powerlessness, and depression (Kim, 2011). Thus, in addition to eliciting excessive crying in infants, depression during the perinatal period precipitates hostile responses from mothers. Maternal depressive symptoms have also been linked to infant sleeping problems (Armitage et al., 2009; Field et al., 2007; Petzoldt, Wittchen, Einsle, & Martini, 2015), which may further compromise the mother-infant relationship (Newland, Parade, Dickstein, & Seifer, 2016; Tikotzky, 2016). Taken together, these findings underscore factors that may jeopardize the early mother-infant relationship and in some cases, trigger child maltreatment. For instance, Shaken Baby Syndrome (SBS), a common form of infant physical abuse, has been linked with infant crying (Barr, 2012).

Fathering. Whereas there is a large body of literature examining the effects of maternal depression on parenting, few studies examine the impact of paternal depression on parenting and child outcomes. Research has found that during the first postpartum year, the incidence of paternal depression ranges from 1.2% to 25% in community samples. Maternal depression has been identified as the strongest predictor of paternal depression during the postpartum period, with prevalence rates of 24% to 50% among men whose partners were experiencing postpartum depression (Goodman, 2004). Paulson, Dauber, and Leiferman (2006) examined the effects of both maternal and paternal depression on parenting behaviors using data from the first wave of the ECLS-B. In a sample of two-parent families (N = 5,089), they found that 14% of mothers and 10% of fathers exhibited levels of depressive symptoms when children were 9-months-old.

Results indicated that both maternal and paternal depression had a strong association with decreased positive parenting behaviors such as reading, singing, and playing games with their children (Paulson, Dauber, & Leiferman, 2006). This finding supports existing literature linking maternal depression to impaired parent-child interactions and extends the findings to include fathers. Fortunately, fathers have also been found to serve as protective factors in families with depressed mothers. In a representative sample of families in the United States (N = 822), Kahn, Brandt, and Whitaker (2004) found that the adverse effects of a depressed mother on a child's behavioral and emotional problems were substantially reduced when a father reported better mental health. More recently, in a study of 730 Early Head Start families across the United States, researchers found that fathers' parenting-related stress had a harmful effect on their children's cognitive and language development when the children were 2 to 3 years old, even when the mothers' influences were taken into account (Harewood, Vallotton, & Brophy-Herb, 2016). In addition, they found that fathers' depressive symptoms when children were toddlers were more influential on children's later social skills than were mothers' depressive symptoms (Vallotton, Harewood, Froyen, Brophy-Herb, & Ayoub, 2016). These results suggest that fathers' mental health has significant and meaningful effects on their children's development.

In summary, depression can result in compromised parenting on the part of mothers and fathers. Various studies have found that maternal depression reduces mothers' sensitivity toward their infant's signals and needs (Albright & Tamis-Lemonda, 2002; Campbell et al., 2004; Field, 1998; Goodman & Gotlib, 1999; Murray & Cooper, 1997; NEECR, 1999), and increases negative responses, such as detachment and

intrusiveness (Field, 1998; Field, 2011; Lovejoy et al., 2000). In the extreme, maternal depression may result in child maltreatment. These impaired responses to infant signals may relate to disturbances in maternal brain activity (Laurent & Ablow, 2012). However, sensitive caregiving environments - in the forms of secure attachment relationships, exposure to tactile stimulation, or positive fathering - have been found to be protective factors against the deleterious impacts of perinatal depression (Milan et al., 2009; Sharp et al., 2012). Taken together, these findings suggest that interventions that work to increase sensitive caregiving may help improve the outcomes of children of mothers who have experienced perinatal depression.

Developmental Consequences

Perinatal depression has been found to have deleterious impacts on multiple child outcomes. This section reviews the literature surrounding the impact of perinatal depression on young children, such as birth outcomes, early health and development, brain development, stress response system, attachment, social emotional development, and cognitive development.

Birth Outcomes

Although the research is inconsistent, prenatal depression has been linked to poor birth outcomes such as preterm delivery (Grote, Bridge, et al., 2011; Li et al., 2009; Rahman et al., 2004) and low birthweight (Grote, Bridge, et al., 2011; Rahman et al., 2004). For instance, in one sample of mothers and infants (N = 2002), concurrent depression and anxiety during pregnancy were significantly associated with a two-fold increase in risk of spontaneous preterm birth, whereas women classified as “depressed only” or “anxious only” had no excess risk of preterm birth (Ibanez et al., 2012).

Furthermore, neither anxiety nor depression (nor both) was linked to birth weight. The association between prenatal depression and poor birth outcomes is concerning because preterm birth and low birthweight are the leading causes of neonatal, infant, and childhood morbidity, mortality, and neurodevelopmental impairments and disabilities worldwide (Swamy et al., 2008; Wilson-Costello et al., 2005). Premature babies are at risk for health and developmental problems throughout their lives, including intellectual disabilities, cerebral palsy, lung problems, and vision and hearing loss (March of Dimes, 2012b). Babies born with low birthweight may be more likely than babies born at a normal weight to have certain medical conditions later in life, including high blood pressure, diabetes, and heart disease (March of Dimes, 2012a).

Early Health and Development

Research indicates that perinatal depression is associated with poorer infant and child health and development (Chung et al., 2004; Gjerdingen & Yawn, 2007; Posmontier, 2008). Perinatal depression has been associated with increased rates of colic (Rahman et al., 2004) as well as childhood gastrointestinal infections and respiratory tract infections (Ban, Gibson, West, & Tata, 2010). Children of depressed mothers are also more likely to be underweight or demonstrate impaired growth (Surkan, Kennedy, Hurley, & Black, 2011). A recent examination of data from the ECLS-B cohort (N = 6,550) found that, compared to children of mothers without depression, children of mothers who were depressed during the first nine months of the child's life were 40% more likely to be at or below the 10th percentile for height at age 4, and 48% more likely to be at or below the 10th percentile for height at age 5 (Surkan, Ettinger, Ahmed, Minkovitz, & Strobino, 2012).

Darcy et al. (2011) examined the link between self-reported maternal depressive symptoms and infant health and development among a representative community-based sample of mothers in North Carolina (N = 217) who had returned to full-time employment by the time their infants were 4 months-old. They found that maternal depressive symptoms at 4 months postpartum predicted mothers' reports of infant health-related quality of life at 8, 12, and 16 months. Compared to women without significant depressive symptoms, women with significant depressive symptoms reported that their children had more pain or discomfort, and reported greater impairment because of their children's poor health. However, given the nature of these self-report data, it is unclear whether infants of mothers with significant depressive symptoms were, in fact, experiencing more pain and discomfort, or whether these mothers somaticized their infants' behavior (Darcy et al., 2011).

Brain Development

Studies of children of depressed mothers show patterns of brain activity (as observed on an electroencephalogram, or EEG) that are similar to those found in adults with depression. Specifically, whereas infants of non-depressed mothers show greater left (versus right) frontal EEG activity, infants of depressed mothers show greater right frontal EEG activity at rest (Dawson et al., 1999; Dawson, Frey, Panagiotides, Osterling, & Hessler, 1997; Dawson et al., 2001; Jones, Field, & Almeida, 2009). These patterns are most pervasive when the mother is both depressed and withdrawn from her infant (Diego, Field, Jones, & Hernandez-Reif, 2006). This finding is of concern because research suggests that greater right frontal activation reflects greater behavioral withdrawal and negative emotions (Fox, 1994; Henderson, Fox, & Rubin, 2001), which has been

associated with inhibited behavior, negative affect, and poor emotion regulation (Davidson, 1996; Fox, 1994).

Stress Response System

Research has linked maternal depression during the prenatal period to elevated cortisol levels in infants (Brennan et al., 2008; Diego et al., 2004; Feldman et al., 2009). Similarly, studies have found an association between maternal depression during the postnatal period and children's elevated cortisol levels during early childhood (Dougherty, Klein, & Rose, 2012; Essex et al., 2002), middle childhood (Ashman et al., 2002), and adolescence (Halligan, Herbert, Goodyer, & Murray, 2004). During infancy, elevated levels of cortisol among mothers have been linked to more difficult infant behavior such as crying, fussing, and negative facial expressions (Davis et al., 2007; de Weerth et al., 2003). In addition, early exposure to elevated maternal cortisol has been linked to impaired cognitive development during early childhood (Bergman, Sarkar, Glover, & O'Connor, 2010; Blair et al., 2005) and middle childhood (LeWinn et al., 2009).

Attachment

Many investigations have studied the quality of attachment relationships in the offspring of mothers with depressive symptoms. Overall, associations have been found between maternal depression and higher rates of insecure attachment in samples of both low- and high-risk families in the United States (Cicchetti et al., 1998; Cicchetti, Toth, & Rogosch, 1999; Coyl, Roggman, & Newland, 2002; Toth, Rogosch, Manly, & Cicchetti, 2006). Using the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development dataset, Campbell et al. (2004) examined the link between maternal depressive symptoms and children's attachment

security at 36 months in a sample of mother-child pairs (N = 1,077). Results indicated that maternal depressive symptoms, as well as their course and timing, predicted higher rates of insecure attachment. Maternal depressive symptoms limited to the first 15 months of the child's life were not associated with insecure attachment at age 3, whereas mothers who reported chronic or intermittent symptoms of depression over the first 3 years of their children's lives had children who were more likely to be insecurely attached. These results suggest that persistent depression in the first years of life has a negative impact on forming attachment bonds.

One mechanism through which maternal depression may impact the formation of attachment bonds is reduced sensitivity to infant signals. Research demonstrates that depression may diminish a mother's ability to respond sensitively to her infant (Albright & Tamis-LeMonda, 2002; Campbell et al., 2004; Field, 1998; Goodman & Gotlib, 1999; Murray & Cooper, 1997; NEECR, 1999), which in turn could lead to insecure attachment. Leerkes, Parade, and Gudmundson (2011) examined the link between mothers' affective responses to infant crying and infant attachment security in a socioeconomically diverse sample of pregnant women in North Carolina. Expectant mothers (N = 119) viewed video clips of infants crying and rated the extent to which they felt different emotions. At 16-months postpartum, infant attachment security was assessed using the Strange Situation procedure. Results indicated that mothers who had responded to the video clips with anger and anxiety were more likely to demonstrate insecure attachment with their infants. Maternal anxiety in response to infant crying (e.g., "All that crying made me feel nervous") was linked with greater attachment resistance. Maternal anger in response to infant crying (e.g., "I was irritated by the sound of the baby's cry") was linked with

greater avoidant behavior. These results suggest that negative emotional responses to infant signals can negatively impact the developing attachment relationship.

A study with a small, European sample suggests that depression during the prenatal period may have a more profound impact on the maternal-infant relationship than depression during the postnatal period. Flykt, Kanninen, and Sinkkonen (2010) examined Finnish mothers (N=59) during pregnancy, 4-5 months postpartum, and when their infants were 14-months old. They found that mothers with the combination of both prenatal and postpartum depressive symptoms were highly unresponsive in their dyadic interaction with their child at 14-months. Further, prenatal depressive symptoms had a stronger impact on maternal responsiveness than postnatal depressive symptoms, suggesting that prenatal depression is especially harmful for the mother-infant relationship.

Social Emotional Development

A review of the literature shows that beginning at birth, children of depressed mothers are at increased risk for a range of poor social and emotional outcomes. However, most of these studies focus on internalizing and externalizing symptoms and behavior problems as opposed to core social-emotional processes such as emotion expression and regulation (Chazan-Cohen et al., 2009; Essex, Klein, Meich, & Smider, 2001; Riley et al., 2009). For example, in a prospective study of low-risk mother-child pairs (N = 247) in Southern California, infants born to mothers with prenatal depressive symptoms had greater negative reactivity scores at 8 weeks of age when compared to those born to mothers without prenatal depressive symptoms, after controlling for maternal postnatal psychological state and prenatal cortisol levels (Davis et al., 2007). In a prospective study

of pregnant women in the United Kingdom (N = 7,144), maternal prenatal depressive symptoms at 18 and 32 weeks of pregnancy were associated with increased maternal report of child behavioral and emotional problems at age 4, independent of a number of covariates, including postpartum depression and markers of socioeconomic status (O'Connor, Heron, & Glover, 2002). It is important to note the methodological artifact that may explain such findings; mothers experiencing depression are more likely to endorse items reflecting behavior problems in their children (e.g., Richters, 1992).

Children of depressed mothers are also more likely than other children to develop depression. In a sample of infants representative of children born in the province of Quebec, Canada in 1997-1998 (N = 1,759), maternal reports of difficult child temperament and depression were found to be the two most important predictors of high levels of anxiety and depressive symptoms in children as young as age 5 (Côté et al., 2009). In a prospective longitudinal study of mothers and their offspring in the United Kingdom (N = 93), 41.5% of children of postnatally depressed mothers experienced depression by age 16 as compared to 12.5% of children of non-depressed mothers (Murray et al., 2011). Although there are many mechanisms through which children of depressed mothers experience higher levels of their own depressive symptoms, these findings could be attributable to the genetic vulnerability of children of depressed parents. In a recent study of a prospective population-based cohort (N = 10,569) in the United Kingdom, exposure to stressful life events at 18 weeks gestation was linearly associated with offspring's depressive symptoms at age 18, suggesting a dose-response relationship (Kingsbury et al., 2016). This increased risk persisted after adjusting for stress in the late

prenatal and early postnatal period, suggesting that exposure to stress in early pregnancy may be a specific risk factor for offspring depression during adolescence.

There is limited longitudinal data available to elucidate the association between perinatal depression and children's socio-emotional functioning. A notable exception is a longitudinal study begun in Finland in 1989, designed to examine whether high levels of maternal prenatal, postnatal (2 months post-delivery), or concurrent (both prenatal and postnatal) depressive symptoms are associated with a child's psycho-social functioning and emotional/behavioral problems later in life (Korhonen, Luoma, Salmelin, & Tamminen, 2012; Luoma et al., 2001). When the children were 8 to 9-years-old (N = 147), results indicated that prenatal as well as concurrent maternal depressive symptoms were associated with the least favorable child outcomes. Prenatal maternal depressive symptoms were a strong predictor of children's high externalizing and total problem levels, whereas concurrent maternal depressive symptoms were associated with children's low social competence and low adaptive functioning (Luoma et al., 2001). The follow-up to this study, when the subjects were 16 to 17-years-old (N = 191), found an association between maternal concurrent depressive symptoms and adolescents' psychosocial functioning and emotional/behavioral problems, especially for boys. Maternal pre-and postnatal depressive symptoms were associated with externalizing problems and lower social competence only in boys, suggesting that boys might be more sensitive than girls to maternal depressive symptoms early in life (Korhonen et al., 2012).

In a more recent study of 1,235 mothers in Norway, maternal depression at gestational week 32 and at 8 weeks postpartum were found to each bear an independent, adverse impact on children's social-emotional development at age 2 (Junge et al., 2016).

Children of mothers who were depressed either prenatally, postnatally, or at both time points faced approximately a three to fourfold increase in risk of developing social-emotional problems. The results from these longitudinal studies indicate that maternal depressive symptoms, especially during the prenatal period, are a risk factor for later child well-being.

In contrast, Bagner et al. (2010) found that maternal depression during the prenatal period did not significantly predict later child behavior problems, and reported no gender differences. In this low-risk sample of mothers and children (N = 175) in Oregon, maternal depression during the child's first year of life was a significant predictor of later internalizing and total behavior problems on the child behavior checklist (CBCL), whereas the predictive effect of maternal depression before and after the first postpartum year was non-significant. These results suggest that the first year of a child's life may be a sensitive period during which children are at an increased risk for adverse outcomes.

Perinatal depression may affect young children's social-emotional outcomes through a variety of different mechanisms. Increased negative reactivity shortly after birth in infants exposed to prenatal depression (e.g., Davis et al, 2007) is consistent with the hypothesis that the prenatal environment exerts programming effects on the fetus with consequences for infant behavior. In addition, the impacts of prenatal depression may then be exacerbated by depression within the postnatal environment, which increases the likelihood of mothers engaging in negative parenting behaviors (Field, 1998; Field, 2011; Lovejoy et al., 2000). Together, these factors may have a deleterious impact on the

mother-infant relationship, which has long-lasting implications for mother-infant attachment security and later social-emotional functioning.

Cognitive/Language Development

Several studies have linked maternal depression during the perinatal period to specific cognitive and language outcomes in children (Sohr-Preston & Scaramella, 2006). In studies utilizing direct assessments of children's cognition and other methodologies, compared to children of non-depressed mothers, it has been documented that children of depressed mothers process information more slowly (Diego et al., 2004), learn with greater difficulty (Kaplan, Danko, Diaz, & Kalinka, 2011), and score lower on various assessments of cognitive ability (Bornstein, Mash, Arterberry, & Manian, 2012; Deave, Heron, Evans, & Emond, 2008). For instance, (Cornish et al., 2005) examined the impact of maternal depression in a sample of low-risk mothers and their infants (N = 112). Infant language development was assessed at 12 months via parent report, and at 15 months the Bayley Scales of Infant Development-II were administered. They found that chronic maternal depression, lasting throughout the first 12 months postpartum, was associated with lower infant cognitive and psychomotor development. No effect of maternal depression on early language development was found. Although the literature has suggested adverse effects of perinatal depression on cognition and language, there is a need for more research in this particular developmental domain.

As discussed previously in this review, one plausible biological mechanism by which maternal depression during pregnancy may predict child cognitive performance is through the role of cortisol. However, evidence examining this hypothesis is inconsistent. LeWinn et al. (2009) examined the relationship between maternal cortisol levels in late

pregnancy and childhood IQ in a socioeconomically diverse birth cohort of mothers and sibling pairs in the New England Family Study (NEFS) (N = 832). Maternal blood cortisol levels were measured during the third trimester of pregnancy, and childhood IQ was measured at age 7 years using the Wechsler Intelligence Scale for Children (WISC). Results indicate a significant relationship between maternal cortisol and full-scale IQ in the final models (that adjusted for socio-demographic factors such as race, maternal work status, maternal education, and smoking during pregnancy, among others). Children with exposure to the highest cortisol levels had full-scale IQ scores 2.78 points lower than children with exposure to the lowest cortisol levels. This association was most pronounced for the verbal subscale, in which children with exposure to the highest cortisol levels had verbal IQ scores 3.83 points lower than children with exposure to the lowest cortisol levels. The researchers then looked at the effect of cortisol on IQ among siblings with different levels of cortisol exposure, and found similar results. These results suggest that even within sibling pairs, exposure to high levels of maternal cortisol during pregnancy may be negatively related to children's cognitive skills. In contrast, Bergman, Sarkar, Glover, and O'Connor (2010) examined the same relationship in a sample of mothers and infants in the United Kingdom (N = 125) recruited as part of a prospective study on fetal hormone exposure and child development. Amniotic fluid levels measured prenatal cortisol exposure at 17 weeks gestation, and the Bayley Scales of Infant Development-Second Edition (BSID-II) measured infant cognitive ability at 17 months. Results indicate that independent of socioeconomic (e.g., maternal education), prenatal (e.g., smoking during pregnancy), and obstetric (e.g., birth weight) factors, prenatal cortisol exposure negatively predicted infant cognitive ability. However, this association

was moderated by child-mother attachment. Prenatal cortisol exposure strongly predicted cognitive development in children with an insecure attachment history; in contrast, the association among children with a secure attachment history was essentially zero. This research does not support cortisol as the mediating mechanism for the effects of prenatal depression on child cognitive development. These results suggest that whereas cortisol levels in utero predict infant cognitive development, a sensitive early rearing environment may eliminate this effect (Bergman et al., 2010).

Another mechanism by which maternal depression may predict child cognitive performance is through the role of early caregiver-child relationships. Using data from the National Early Head Start (EHS) Research and Evaluation Project, Chapin and Altenhofen (2010) investigated the relationship between caregiver variables and early cognitive/language development, with a particular emphasis on language outcomes at age 3. Results indicate that maternal depression and language and cognitive stimulation were significant predictors of children's vocabulary. Analysis confirmed a mediation model, such that the relationship between maternal depression and child vocabulary was accounted for by language and cognitive stimulation. In other words, mothers with more depressive symptoms engaged in less cognitive and language stimulation with their children and had children with lower vocabulary scores. These results suggest that cognitive stimulation may be an important mechanism by which maternal depression is associated with children's language outcomes. Furthermore, the authors speculate that children in EHS may show greater results if maternal depression is addressed in a more direct and integral way by the EHS program (Chapin & Altenhofen, 2010).

In contrast, some literature suggests that the associations between prenatal maternal depressive symptoms and child cognitive outcomes are explained by sociodemographic characteristics of the family. For instance, Tse, Rich-Edwards, Rifas-Shimana, Gillman, and Oken (2010) examined the association between prenatal depressive symptoms at mid-pregnancy and child cognition at age 3 years in a pre-birth cohort study of 1030 low-risk mother-child pairs in Massachusetts. In their unadjusted model, children born to mothers who had prenatal depressive symptoms had Peabody Picture Vocabulary Test (PPVT) scores that were 3.8 points lower than those born to mothers who did not have prenatal depressive symptoms. However, with adjustment for sociodemographic factors such as maternal education, age, race, and household income, the association was substantially attenuated (with children born to depressed mothers just .7 points lower). These results suggest that maternal prenatal depression is not independently associated with early child cognition.

In summary, depression during the perinatal period has been linked with poor birth outcomes (Grote, Bridge, et al., 2011), poor health and development (Chung et al., 2004; Gjerdingen & Yawn, 2007; Posmontier, 2008), altered brain functioning (Diego, Field, Jones, & Hernandez-Reif, 2006), elevated cortisol levels (Brennan et al., 2008; Diego et al., 2004; Feldman et al., 2009), insecure attachment (Cicchetti et al., 1998; Cicchetti, Toth, & Rogosch, 1999; Coyl, Roggman, & Newland, 2002; Toth, Rogosch, Manly, & Cicchetti, 2006), and impaired social-emotional (Chazan-Cohen et al., 2009; Essex, Klein, Meich, & Smider, 2001; Riley et al., 2009) and cognitive/language development (Bornstein et al., 2012; Kaplan et al., 2011; Sohr-Preston & Scaramella, 2006). This set of profound and diverse consequences demonstrates the significant risk

that perinatal depression poses to young children and their families and highlights the need for intervention.

Implications for Practice

The literature on perinatal depression and its impacts on children has multiple implications for practice. This section explores various options to address depression in mothers during the perinatal period, ranging from psychopharmacological treatments to preventive interventions. Emphasis is placed on interventions that have been found effective with mothers experiencing perinatal depression who are from low-income backgrounds.

Antidepressant Medication

Women with depression face difficult decisions about treating or not treating their depressive symptoms with medication during pregnancy and while breastfeeding (Pearlstein, 2008). Whereas depression, anxiety, and maternal stress can lead to adverse effects on the fetus and offspring, research suggests that there are also risks to the fetus and infant with exposure to antidepressant medication. For example, research examining the effect of selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) has found that the fetus is exposed to these antidepressant medications through the placenta, as SSRIs and their metabolites have been detected in both umbilical cord blood and amniotic fluid (Hendrick et al., 2003). Prenatal exposure to SSRIs and SNRIs has been linked to an increased risk of many neonatal complications, including miscarriage (Rahimi, Nikfar, & Abdollahi, 2006), congenital malformations (Wogelius et al., 2006), neonatal behavioral syndrome (also called neonatal withdrawal syndrome; a syndrome of respiratory, motor, central nervous system and gastrointestinal

symptoms, including tachypnea, cyanosis, jitteriness/tremors, increased muscle tone, and feeding disturbance, linked to exposure to SSRIs) (Oberlander, Warburton, Misri, Aghajanian, & Hertzman, 2006), and pulmonary hypertension (Chambers et al., 2006). In a recent neuroimaging study of brain development following prenatal SSRI exposure, Jha et al., 2016 found that SSRI-exposed neonates exhibited widespread changes in the brain's white matter microstructure compared to matched controls. In contrast, children of mothers who received a diagnosis of depression prior to or during pregnancy but did not use SSRIs exhibited no differences in white microstructure compared to their matched controls. The authors speculate that these findings support one of two interpretations: 1) SSRIs alter white matter development, or 2) other factors which differentiate women treated with SSRIs from untreated women with a history of depression impact white matter development. It could be that the offspring in the SSRI-exposed group experienced a 'triple hit' consisting of exposure to pharmacotherapy, exposure to maternal depression, and high genetic vulnerability to depression, all of which contributed in some way to altered white matter.

On the other hand, Brennan et al. (2008) found that prenatal exposure to maternal psychotropic medications was associated with lower infant cortisol levels, suggesting that psychopharmacological treatment of depression during pregnancy may help to normalize infant cortisol levels. On the whole, more research is needed to examine the efficacy of antidepressants on perinatal depression, explore the long term impacts of antidepressant use during pregnancy on child development, and compare the risks of using antidepressant medication during pregnancy to the risks of not treating perinatal depression using psychopharmacologic agents (Pearlstein, 2008).

Psychotherapeutic and Psychoeducational Interventions

One alternative to treating depression with medication is to treat depression with a therapeutic intervention, and psychotherapy is often the preferred method of treatment for women who are pregnant or breastfeeding (Pearlstein, 2008). Although a limited number of studies has systematically evaluated psychotherapy in pregnant women with depression, a few promising randomized controlled studies have found that interventions can reduce the occurrence of major depressive disorder among financially disadvantaged women during the perinatal period.

In one sample of 37 pregnant women on public assistance in the Northeast United States who were assessed to be at risk for postpartum depression, those assigned to receive a brief interpersonal therapy-oriented intervention in addition to standard prenatal care were significantly less likely (4%) than those receiving standard prenatal care alone (20%) to develop postpartum depression within 3 months after delivery (Zlotnick, Johnson, Miller, Pearlstein, & Howard, 2001; Zlotnick, Miller, Pearlstein, Howard, & Sweeney, 2006). Although the results are favorable, these studies are limited in that they did not examine whether or not the intervention impacted depression during the prenatal period and did not follow-up with mothers beyond 3 months postpartum.

A more recent randomized controlled study of enhanced brief interpersonal psychotherapy (IPT-B) found that enhanced IPT-B improved depressive symptoms during pregnancy and at six months postpartum in a sample of low-income depressed women (N = 53) in Pittsburgh (Grote, Swartz, et al., 2011). Following eight weeks of weekly treatment sessions, 95% of pregnant women in the intervention group no longer met criteria for major depression, compared to 58% of pregnant women receiving usual

care. At six months postpartum, 100% of the women in the treatment group no longer met criteria for major depression, compared to 70% of women receiving usual care. This study is important because it suggests that psychotherapy is a promising intervention for this population, but also because the authors report high rates of engagement and retention (with 68% of the treatment group completing a full eight weeks of treatment), a feat that is somewhat uncommon in such a high-risk population. Grote et al. (2011) speculate that the addition of free bus passes, childcare, and the facilitation of access to needed social services (such as food, job training, housing, and free baby supplies) helped to increase engagement in treatment.

In 2011, researchers tested the efficacy of a 6-week cognitive-behavioral intervention in preventing the onset of perinatal depression and reducing depressive symptoms among low-income women African American mothers (N = 61) in home visitation programs (Tandon, Perry, Mendelson, Kemp, & Leis, 2011). Pregnant women and women with a child less than 6 months of age were randomized to a 6-week, group-based cognitive-behavioral intervention or usual home visiting services. They found that at 3 months post intervention, 33% of the women receiving usual care reported levels of depressive symptoms that met clinical cutoff for depression compared with 9% of women in the intervention condition. This study provides preliminary data on the efficacy of a cognitive-behavioral intervention to prevent perinatal depression among home visiting clients and suggests it is feasible to embed such an intervention in existing home visitation programs. Taken together, these studies suggest that socioeconomically disadvantaged pregnant women with depression can be engaged and retained in interventions that can obtain positive treatment outcomes during pregnancy and

postpartum. Unfortunately, these studies do not tell us if the positive outcomes extend to the children of these mothers.

In addition to prenatal interventions, research indicates that various combinations of psychotherapy and educational treatments focused on mothers during the postpartum period can be effective in reducing maternal depressive symptoms, but appear to have limited impacts on the development of their young children (Cooper, Murray, Wilson, Romaniuk, & Ay, 2003; Forman et al., 2007; Murray, Cooper, Wilson, Romaniuk, & Ay, 2003). For instance, Forman et al. (2007) tested whether psychotherapeutic treatment for mothers suffering from depression in the postpartum period would result in improved parenting and child outcomes for low-risk mothers in Iowa. They randomly assigned women to receive 12 weeks of interpersonal psychotherapy ($n = 60$) or to a waitlist ($n = 60$). They also had a non-depressed comparison group ($n = 56$). At the baseline assessment when children were 6-months-old, depressed mothers were less responsive to their infants, experienced more parenting stress, and viewed their infants more negatively than did non-depressed mothers. Eighteen months later, results indicated that although treatment had improved maternal depression, it had no significant impact on deficits in maternal responsiveness. Furthermore, treatment did not improve mothers' reports of their children's temperament, nor did it improve mothers' reports of child behavior problems or of the quality of the mother-child relationship. Finally, although treatment did significantly reduce reported levels of parenting stress, it did not bring parenting stress down to the level experienced by non-depressed mothers.

More recently, researchers in Ohio have worked to systematically adapt cognitive behavioral therapy to address the needs of depressed mothers enrolled in home visiting

programs. In this study, In-Home Cognitive Behavioral Therapy (IH-CBT) was implemented by therapists who provided treatment concurrent with ongoing home visiting. Results of a randomized controlled trial indicated that mothers receiving IH-CBT ($n = 47$) experienced significant benefits in terms of depression relative to controls ($n = 46$). Compared to those receiving home visiting alone, mothers in the IH-CBT condition were less likely to meet diagnostic criteria for major depressive disorder at post-treatment (70.7 vs. 30.2 %), reported fewer depressive symptoms, and obtained lower scores on clinician ratings of depression severity (Ammerman, Putnam, Altaye, Stevens, et al., 2013; Ammerman, Putnam, Altaye, Teeters, et al., 2013). Gains were maintained through 3 months follow-up. However, during a follow-up study to examine the impact of changes in depression on parenting and child adjustment, no significant differences were found between treatment and control groups, indicating that IH-CBT treatment by itself did not benefit parenting and child behavior (Ammerman et al., 2015), and depression was not associated with child social and emotional adjustment. The authors speculate that this finding was attributable to the young age of the children, who were an average of 5 months old at pretreatment, and that the emergence of a more clearly evident maladjustment in later toddlerhood may have revealed a stronger link between maternal depression and child functioning. Taken together, these results indicate that treating the mother's depression, even successfully, is not in itself sufficient to change the mother-child relationship, or the child's social and emotional development.

These findings have led several researchers to argue that therapies should not only treat the mother but should also focus on the mother-child relationship (Nylen & Moran, 2006), and several of these models have shown promise. For instance, Cicchetti, Rogosch,

& Toth (2000) found that weekly toddler-parent psychotherapy (which started when toddlers were 18-months-old and lasted approximately one year) improved cognitive development among 3-year-old children of low-risk depressed mothers (N = 158). The toddler-parent psychotherapy sessions focused on enhancing mother-child interactions and promoting a secure mother-child attachment relationship, and did not address maternal depression. Consequently, the intervention had no impact on maternal depressive symptoms. However, at age 3, children of depressed mothers who participated in the intervention were indistinguishable from the non-depressed comparison group on measures of IQ. Furthermore, the same intervention was found to increase rates of secure attachment when the children were 36-months old (Toth et al., 2006).

The results from the toddler-parent psychotherapeutic intervention demonstrate that an intensive, well-designed intervention for depressed mothers and their children can improve developmental outcomes in the children. Although these results are promising, this intervention suffers from a number of limitations. For one, the intervention did not impact maternal depressive symptoms, and thus may not have addressed the deleterious developmental consequences of maternal depression beyond cognitive and attachment outcomes. Secondly, and perhaps most importantly, the intervention excluded families of low socioeconomic status, limiting the generalizability of these results to higher-risk samples. As discussed previously in this review, poverty is a major risk factor for perinatal depression, and it is important to develop interventions that have the potential to positively impact children from the most vulnerable families. Future research should also explore whether or not interventions can improve the mother-child relationship before birth, by focusing on increasing maternal-fetal attachment.

Prevention Programs

One preventive intervention that could potentially address perinatal depression among women from low-income backgrounds is Early Head Start (EHS). Many EHS programs choose to serve families during pregnancy. The Early Head Start Research and Evaluation Project enrolled pregnant women, and provides valuable information on the type of women who enrolled in EHS during pregnancy, and the positive impacts the program had on their children and families. Researchers found that 60% of women enrolled in EHS were first time mothers, and home-based and mixed-approach programs enrolled more pregnant women than center-based programs (U.S. Department of Health and Human Services Administration for Children and Families, 2006b). They also found that pregnant women were at high-risk emotionally, medically, and socially, with 68% reporting sufficient numbers of depressive symptoms to be considered depressed. Chazan-Cohen, Mckelvey, Whiteside-Mansell, and Hart (2007) reported a delayed but significantly positive impact of the EHS program on maternal depression at follow-up when the children were about to enter kindergarten. At 3 years of age, 31.9% of mothers in the intervention group had elevated scores compared with 31.2% in the control condition. At kindergarten entry, this proportion shifted to 31.0% and 36.0% in the intervention and control groups, respectively. Further analyses revealed that reductions in maternal depression were primarily mediated by earlier improvements in child functioning. This finding suggests that over the long run, benefits to child functioning brought about by EHS eventually impact maternal mood. It is important to note that these studies did not isolate the women who reported depression during pregnancy. Future

research should examine how EHS impacted maternal depression in mothers who reported depression during pregnancy.

In summary, more research is needed to help pregnant women and practitioners make informed decisions regarding treatment of depression during the perinatal period. Whereas maternal depression, anxiety, and stress can lead to adverse effects on the fetus and infant, research suggests that there are also risks to the fetus and infant with exposure to antidepressant medication. Furthermore, although behavioral treatments have been successful at treating perinatal depression, these studies often do not indicate if the positive outcomes extend to the children of these mothers, or they demonstrate that treating depression alone is not sufficient to change the mother-child relationship. Future research should examine perinatal interventions in high-risk samples, such as pregnant women enrolled in EHS, and extend the research findings to include the impact of treatment on child outcomes. In addition, research should examine if interventions targeting maternal-fetal attachment during pregnancy might impact the mother-child relationship in the postpartum period.

Research Directions

The epidemiologic evidence and the literature surrounding biological and psychological mechanisms of perinatal depression and how they relate to child outcomes, help us to identify a number of factors important to consider for future research. Overall, more research needs to examine perinatal depression in large samples of low-income minority women in the United States. With perinatal depression rates among African American mothers in poverty reaching more than 50% (Administration for Children and Families, 2006; Zayas et al., 2002), identifying environmental factors that impact

perinatal depression and understanding the mechanisms through which perinatal depression impacts child development is essential. Limited research has examined how specific contextual influences, such as neighborhood and household chaos and trauma exposure, impact prenatal depression in high-risk populations, and even less research has examined the mediating roles of prenatal depression and maternal behaviors during pregnancy on the effect of contextual influences on neonatal outcomes.

Scant research has examined the relationship between perinatal depression, parenting, and child outcomes in this population. Future research should examine whether the relationship between perinatal depression and adverse child outcomes remains significant after accounting for other sociodemographic risk factors (e.g., Tse, Rich-Edwards, Rifas-Shimana, Gillman, & Oken, 2010). Although parenting, particularly sensitivity, has been examined to some extent with this population, limited attention has been devoted to the relation between perinatal depression and negative parenting behaviors such as detachment, anger/hostility and maltreatment. Also, given the paucity of research on fathering, future studies should address the roles of different types of fathers (e.g., legal, custodial, absent, social, etc.) in the parenting experienced by and outcomes of children exposed to perinatal depression. Longitudinal research should also examine the links between maternal depression during the prenatal period and later parent-child interactional outcomes. Additionally, longitudinal research could answer further questions about protective factors that attenuate the effects of perinatal depression on young child outcomes.

Turning to intervention research, examining the utility of psychopharmacological and behavioral treatments during pregnancy with women from low-income and minority

backgrounds is important. Limited research has begun to tease apart the confounding factors of prenatal and postnatal depression and their impact on the developing child, and even less research has examined these variables in a large, high-risk sample. Although some research suggests that pharmacological treatment of depression during the prenatal period may have positive impacts on the child (e.g., Brennan et al., 2008), this research has been conducted in low-risk samples (i.e., European American, college graduates). Grote et al. (2011) were successful in engaging and retaining socioeconomically disadvantaged pregnant women with depression in a behavioral intervention, and obtained positive treatment outcomes during the pregnancy and postpartum periods. Unfortunately, they did not examine if the positive outcomes extended to the children of these mothers. Future research should attempt to replicate these positive maternal treatment outcomes and extend the research to include infant and child outcomes.

Next, it is important to note that even if mothers do not receive treatment for prenatal depression, the window for improving child outcomes has not closed. Although there have been studies which have examined the impacts of interventions to improve parenting among women experiencing perinatal depression (e.g., Cicchetti, Rogosch, & Toth, 2000; Toth, Rogosch, Manly, & Cicchetti, 2006), these have often excluded families of low socioeconomic status, limiting the generalizability of these results to higher-risk samples. Thus, another direction for future research is to evaluate whether high-risk women and children who have experienced prenatal depression can benefit from an intervention that focuses on improving the caregiving environment. It would also be important to know if high-risk mothers with depression can be engaged and retained in behavioral interventions that work to improve the caregiving environment. Additionally,

comprehensive interventions that are designed to treat maternal depression and foster a more positive parent-child relationship should be evaluated to determine if they could impact parent and child outcomes. Finally, studies should be conducted to document the implementation and effects of treatments for perinatal depression that are integrated into preventive interventions serving high-risk young children and families, such as Early Head Start.

Conclusion

This review examined the phenomenon of perinatal depression and its impact on very young children. Research in this area underscores that perinatal depression is a major public health problem. Among poor mothers, estimates of perinatal depression are as high as 50% (Kahn et al., 1999; U.S. Department of Health and Human Services Administration for Children and Families, 2006a; Zayas et al., 2002), indicating that perinatal depression is a significant threat to high-risk children and families. There is a need for research that explores this phenomenon in African American women from low-income backgrounds. Empirical attention should be devoted to identifying the factors in these women's ecologies that may give rise to perinatal depression. In particular, few studies have examined the effect of environmental chaos and traumatic experiences on perinatal depression in this population. Further, an important question is how maternal health practices during pregnancy are affected by these environmental factors, and how such practices are related to birth outcomes in the context of perinatal depression. Although multiple studies have addressed maternal depression and infant development, there is limited evidence with respect to the early developmental outcomes of perinatal depression, and the parenting mechanisms through which these outcomes can be

attenuated. In particular, there is a paucity of evidence on mothers' attachment to their fetuses and their neonates in the context of perinatal depression.

The current study attempted to fill a gap in this literature by examining risk and protective factors during the perinatal period in a sample of low-income, African American mothers. Using the methods described in Chapter 3, I examined particular risk factors that may increase a woman's chance of experiencing depression during the perinatal period, and what protective factors might buffer children from the deleterious impact of depression on their development. Specifically, I examined the associations between environmental chaos, maternal trauma exposure, perinatal depression, prenatal health practices, maternal fetal/neonatal attachment, and birth outcomes.

Chapter 3: Methods

Overview

The overarching goal of this study was to explore the perinatal functioning of low-income, African American women, who have been exposed to a multitude of risk factors. Specifically, I examined the associations between maternal trauma exposure, perinatal psychological functioning, prenatal health practices, maternal fetal/neonatal attachment, and neonatal outcomes. In order to investigate the research questions, I employed a quantitative research design, collecting prospective, longitudinal, primarily self-report data from a sample of high-risk pregnant women. Specifically, a convenience sample of pregnant women, who were enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) programs in Prince George's County, Maryland, were recruited for this study. In this chapter, I describe my sample, data collection procedures, and measures.

Study Setting

Our initial plan was to recruit participants from two Early Head Start (EHS) centers that serve families during pregnancy: Rosemount Center and United Planning Organization, both located in Washington, D.C. Both of these programs have engaged in longstanding partnerships with the University of Maryland, and have participated in two prior Early Head Start-University research collaborations with my advisor. EHS home visitors who have responsibility for the prenatal caseloads were identified and agreed to assist with recruitment. Unfortunately, EHS prenatal caseload numbers were much lower than I had anticipated, and after enrolling just one EHS participant over the course of six months, I decided to identify a new recruitment strategy in order to meet our recruitment

goal. Due to the change in study setting, this first participant was dropped from the analyses.

In order to target a sample of low-income African American pregnant women, I decided to partner with the Maryland WIC Program, a supplemental nutrition program for women, infants and children under age 5. WIC provides nutritious foods, nutrition education, and access to health care to low-income pregnant women, new mothers, and infants and children. The monthly WIC food package is a combination of foods chosen to improve nutrition for pregnant women, new mothers, and their infants. To be eligible for Maryland WIC, an applicant must live in the state of Maryland, be pregnant or a new mother (delivered within the past 12 months), have an infant or child under age 5, and/or have a gross income at or below 185 percent of the U.S. Poverty Income Guidelines (Prince George's County, 2016). Participants were drawn from two WIC clinics in Prince George's County, Maryland. In 2014, Prince George's County's population was 63.8% African American, with a mean annual income of \$89,867, making it one of the most affluent counties in the United States with a majority African American population (Census Bureau, 2014). In spite of this affluence, 48.6% of births in the county were to unwed mothers, and 19.8% of female-headed households with children under age 5 were living at or below the poverty line (Census Bureau, 2014).

Participants

This study recruited a convenience sample of 70 pregnant women from two WIC clinics in Prince's George's County, Maryland. Inclusion criteria in this study included women who were: (a) at least 28 weeks gestation; (b) at least 18 years old; (c) able to speak English; and (d) self-identified as Black or African American. The time point of 28

weeks gestation was chosen for several reasons. First, 24 weeks gestation marks the beginning of fetal viability, and limiting the sample to include only mothers who have passed this significant time point ensured that adverse neonatal outcomes were recorded in a consistent manner (Ramsay & Santella, 2011). Secondly, research has found that maternal-fetal attachment increases both throughout the gestational period and once fetal movements are noted (Bloom, 1995; Zachariah, 1994). By limiting the sample to women in the third trimester, I limited the impact of gestational age and fetal movements on maternal-fetal attachment. In addition, studies conducted in early pregnancy have demonstrated a positive impact of ultrasound exposure on maternal feelings toward the fetus (Dykes & Stjernqvist, 2001), whereas studies later in pregnancy have generally failed to report significant findings (Baillie, Hewison, & Mason, 1999). These results suggest that ultrasound may hasten the development of maternal-fetal attachment, while not changing it substantially in the long term (Sedgmen et al., 2006). Restricting the sample to the third trimester of pregnancy limited the impact of ultrasound images on maternal-fetal attachment.

Adolescent mothers and non-English speaking mothers were excluded from this study because both groups experience a set of risk factors distinct from our target population of low-income, African American mothers (Chen et al., 2007; Mora et al., 2009; Segre et al., 2006). Other exclusion criteria for this study included: (a) history of fetal or infant death; (b) known chronic maternal medical conditions such as chronic hypertension, pre-eclampsia, clotting disorder, diabetes, or sickle cell; (c) abnormal diagnostic results including a known fetal abnormality on first or second trimester or genetic abnormality on screening tests; and (d) advanced maternal age (over 35-years).

These exclusion criteria were selected given their known contribution to adverse neonatal outcomes (Hamilton, Hoyert, Martin, Strobino, & Guyer, 2013). Research in this area has suggested that women are able to reliably report on these health conditions (Buka, Goldstein, Spartos, & Tsuang, 2004; Stuart et al., 2013).

Demographic variables. Participants' ages ranged from 18 to 35 ($M = 25.30$, $SD = 4.62$). Just over half the sample (52.9%) were first time mothers. The majority of participants graduated from high school (38.6%) or completed some college (37.1%) and reported their marital status to be single (61.4%). In addition to the demographic variables listed in Table 1, inclusion criteria for this study were that participants must identify as African American and must be eligible for the Maryland WIC program, which sets an income threshold of at or below 185% of the poverty line.

Table 1

<i>Sample Demographic Information</i>	
Variable	<i>M(SD)%</i>
Age	25.30(4.62)
Education	
Less than high school	4.3
High school graduate/GED	38.6
Some college	37.1
College graduate	20.0
Marital status	
Single	61.4
Single living with partner	20.0

Table 1

<i>Sample Demographic Information</i>	
Variable	<i>M(SD)%</i>
Married	15.7
Divorced	1.4
Widowed	1.4
Gravidity	
Primigravida	52.9
Multigravida	47.1

Statistical Power Analysis

To examine these hypotheses using path analysis, various rules of thumb exist for sample size determination. These rules of thumb include 4-5 subjects per parameter, 4-5 subjects per variable, and the often suggested 10 subjects per variable (Hatcher, 1994; Thorndike, 1978). For a model with 6 variables and 14 parameters, a total of 70 subjects will be necessary (using 5 subjects per parameter). Thus, a sample of 70 subjects should provide sufficient power.

Data Collection Procedure

This study employed a quantitative research design, collecting prospective, longitudinal, primarily self-report data from a sample of high-risk pregnant women. Specifically, women were recruited during the prenatal period and data collection took place at two points in time; once during the third trimester of pregnancy and once during the early postnatal period.

Recruitment

Pregnant women were recruited by a research assistant from the waiting area at two WIC clinics. The research assistant was a full-time, post-baccalaureate, African American woman trained in all recruitment and data collection procedures by my advisor, Dr. Jones Harden, and myself. The research assistant sat in the waiting area with recruitment flyers, participant incentives (baby soap and pairs of baby socks), and screening materials. Women who were interested in study participation were brought to a private room to complete a brief screen to determine eligibility. When a woman was determined to be eligible and if she decided to participate, informed consent was obtained (see consent form in Appendix). Participants were informed that participation is entirely voluntary. Written and verbal consent was obtained from all women agreeing to participate. A private setting was used to discuss the consent process, answer questions, and obtain voluntary informed consent. After informed consent was obtained, the participants' contact information was collected and a home visit was scheduled. The participant was asked to provide her home address as well as her home phone number and/or cell phone number. In addition, the participant was asked to provide the contact information for three close family members or friends whom I could contact in the event that I could not get back in touch with her (e.g., if her number had been disconnected, if her address had changed).

Home Visit

The home visit was scheduled based on the participant's availability and gestational age, to ensure that all data were collected after 28 weeks gestation. All home visits took place between 28 and 40 weeks, with an average time of 32 weeks. Prior to the

home visit, a reminder call was placed in order to confirm availability and continued interest in the study. Visits were cancelled or rescheduled if the participant requested such a change. Two research assistants conducted each home visit. They followed the safety protocol that has been developed for the EHS University partnership projects at the University of Maryland (e.g., not visiting after dark, carrying a cell phone, refraining from wearing headphones, not carrying valuables, etc.). One researcher administered the instruments while the other assisted as needed. At the beginning of each visit, informed consent was reviewed and the participants were reminded that they could refuse to answer any question and stop the visit at any time. Instruments were completed in whatever relatively private area could be identified in the home, where confidentiality could be maintained.

All instruments (described in Table 2) were administered verbally by the researcher to ensure understanding and completion of all items. This phase of the study lasted approximately 45 minutes. Participants were paid \$20 cash and a payment receipt was collected. At the end of the visit, the participant's due date was confirmed and a follow-up phone call was scheduled for four-weeks postpartum. Prior to departure, the researchers completed an observational assessment of the participant's household and neighborhood.

Table 2

Summary of Measurement Tools used in Home Visit

Variable	Theoretical/ Operational Definition	Name of Instrument	Instrument Description	Level of Measurement	Psycho- metrics	Time to complete
Socio-economic status	Income, employment status, education	Demographic and pregnancy background questionnaire	13-items created for use in this study	Individual items		10 min
Exposure to trauma	Lifetime history of exposure to traumatic events	Trauma History Questionnaire (THQ)	23-item inventory of traumatic events; participants indicate whether or not they have ever experienced a specific event.	Total score (0-23) with higher scores indicative of more types of lifetime traumatic experiences.	Kappa coefficients of .76-1.0 for inter-rater reliability and .36-.89 for test-retest reliability	10 min
Prenatal and postnatal depression	Overwhelming feelings of sadness and/or hopelessness	Edinburgh Postnatal Depression Scale (EDPS)	10-item scale with four-level likert items from the highest frequency (most of the time) to the lowest never)	Total score (0-30) with scores above 12 indicating high likelihood of depression	Internal consistency = .87-.92	5 min
Maternal-fetal attachment	Behaviors and feelings that demonstrate affiliation and interaction with unborn child	Maternal Antenatal Attachment Scale (MAAS)	19-item scale with five-level likert items from the highest frequency (almost all the time) to the lowest (not at all)	Total score (0-90) with higher scores indicative of more optimal attachment	Internal consistency = .80	10 min
Health practices	Behaviors a women engages in during pregnancy to optimize maternal and fetal health	Health Practices in Pregnancy Questionnaire (HPQ-II)	34-item scale with 5 responses ranging from 1 (never) to 5, a word indicating the highest frequency (always, daily, frequently)	Total score (34-170) with higher scores indicative of higher quality health practices	Internal consistency = .81-.90	10 min
Environmental chaos	Systems of frenetic activity, lack of structure, unpredictability in everyday activities, and	Windshield Survey	12-item observational scale of household and neighborhood disorganization with four-level	Total score (0-12) with higher scores indicative of more disorganization	Internal consistency = .67	5 min

	high levels of ambient stimulation		likert items ranging from 0 (cannot rate) to 4 (most extreme)			
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Phone Interview

Approximately three weeks after her expected due date, participants were contacted by the researcher or research assistant to confirm her actual due date and schedule a phone interview at four weeks postpartum. All phone interviews occurred between three and seven weeks postpartum, with an average time of 32 days postpartum. During this phone interview, I obtained information about birth outcomes, postnatal depression, and maternal feelings towards her infant. The time frame of four weeks postpartum was chosen for several reasons. First, it is estimated that 20-80% of new mothers experience negative feelings or mood swings following childbirth, often called the “postpartum blues,” which typically disappear within two weeks (Payne, 2003). Waiting four weeks before interviewing mothers helped to distinguish between normal postpartum feelings and more severe depressive symptoms. Secondly, I was interested in the early mother-to-infant bond, and the *Maternal Postnatal Attachment Scale* (MPAS; Condon & Corkindale, 1998) has been validated as early as four weeks postpartum.

When the participant was reached, all instruments (described in *Table 3*) were administered over the phone. Previous research suggests that a telephone interview can be an efficient, reliable, and valid mechanism for data collection, especially if researchers follow standardized procedures and maintain effective communication with participants (Musselwhite, Cuff, McGregor, & King, 2007). For instance, the *Edinburgh Postnatal Depression Scale* (EPDS; Cox et al., 1987) is commonly administered over the phone (e.g. Janssen, Heaman, Urquia, O’Campo, & Thiessen, 2012; Paul, Downs, Schaefer,

Beiler, & Weisman, 2013), and there is research to suggest that the use of instruments to measure the severity of depression over the telephone produces virtually identical results to face-to-face administration (M. Evans, Kessler, Lewis, Peters, & Sharp, 2004; Rohde, Lewinsohn, & Seeley, 1997).

Mothers were asked to report on several neonatal outcomes, including birth weight, gestational age, and birth complications. Previous research has demonstrated that maternal recall of infant characteristics and events that occurred during labor are sufficiently accurate for research purposes (Adegboye & Heitmann, 2008; Bat-Erdene, Metcalfe, McDonald, & Tough, 2013). For example, a study of low-income mothers in the Tennessee WIC program found that 89% of the 46,637 women sampled could recall their infant's birth weight within one ounce when compared to the weight recorded on the medical charts. Overall, only 1.1% of birth weights would have been incorrectly classified into low or normal birth weight categories based on maternal reporting. Even for women with the lowest reporting accuracy (single mothers who were African American, young, and less than high school education), the proportion of misclassified birth weights was still less than 4 % (Gayle, Yip, Frank, Nieburg, & Binkin, 1988). This phase of the study lasted approximately 20 minutes. Women who completed the phone interview received one package of diapers, dropped off by a research assistant to the address they requested following completion of the phone interview.

Table 3

Summary of Measurement Tools used in Phone Interview

Variable	Theoretical/ Operational Definition	Name of Instrument	Instrument Description	Level of Measurement	Psycho- metrics	Time to complete
Neonatal outcomes	Characteristics of the neonate such as gestational age and birth weight	Birth outcomes	10-items created for use in this study	Individual items		5 min
Prenatal and postnatal depression	Overwhelming feelings of sadness and/or hopelessness	Edinburgh Postnatal Depression Scale (EDPS)	10-item Likert scale with four-level likert items from the highest frequency (most of the time, quite a lot) to the lowest (not at all, never)	Total score (0-30) with scores above 12 indicating high likelihood of depression	Internal consistency = .87-.92	5 min
Maternal-infant attachment	Behaviors and feelings that demonstrate affiliation and interaction with infant	Maternal Postnatal Attachment Scale (MPAS)	19-item Likert scale with five-level likert items from the highest frequency/intensity (almost all the time/very strong) to the lowest (not at all/very weak)	Total score (19-95) with higher scores indicative of more optimal attachment	Internal consistency = .75	10 min

Protection of Human Subjects

This study examined associations between maternal risk exposure, perinatal psychological functioning, prenatal health practices, maternal fetal/neonatal attachment, and neonatal outcomes. In order to investigate the research questions, I employed a quantitative research design, collecting prospective longitudinal, primarily self-report data from a sample of high-risk pregnant women. This study was reviewed and approved

by the Institutional Review Boards (IRB) at the University of Maryland and the Maryland Department of Health and Mental Hygiene. The approved IRB protocol can be found in Appendix B.

Instruments¹

Instruments were selected to optimize information obtained while minimizing participant response burden. Further, selected instruments have been used with high-risk, low-income minority participants. In addition, instruments designed by the researcher were used to obtain demographic, pregnancy, and neonatal information. All instruments are included in Appendix A and Tables 2 and 3 provide a summary of the measurement tools.

Demographic and Pregnancy Background. A measure of demographic and pregnancy history data was created for use in this study. Demographic data collected included age, race, marital status, and measures of SES (e.g. educational information, household income, etc.). Pregnancy history collected was based on the Pregnancy Risk Assessment Monitoring System (PRAMS), a surveillance project of the Centers for Disease Control and Prevention (CDC) and state health departments that collects data on maternal attitudes and experiences before, during, and shortly after pregnancy (CDC, 2009). Pregnancy history included information related to past pregnancies (e.g., number

¹ **Additional Instruments**

This study is part of a larger study for which data collection is ongoing. The larger study includes variables that may be examined during future analysis, including exposure to discrimination, maternal infant attachment, breastfeeding, father involvement, maternal responsiveness, and infant development.

of previous pregnancies, number of live births) and current pregnancy (e.g. current weeks gestation, evidence re: wanted and/or planned pregnancy, etc.).

The Trauma History Questionnaire (THQ; Green, 1996) was used to assess lifetime history of exposure to traumatic events, including crime-related events, unwanted physical and sexual experiences, general disasters, and personal devastations. The THQ is an inventory of 23 potentially traumatic events based on the DSM-IV criteria for post-traumatic and acute stress disorders. Participants indicated whether or not they ever experienced a specific event. Endorsed items were summed for a total score that ranges from 0 to 23, with higher scores indicating more types of lifetime traumatic experiences. Internal consistency for the summed total was $\alpha = .73$. Adequate stability and validity of the THQ has been demonstrated in samples with severe mental illness and in samples with a history of abuse (Mueser et al., 2001; Spertus, Yehuda, Wong, Halligan, & Seremetis, 2003). The scale has also been used with women who are ethnically or racially diverse as well as women who are pregnant. For instance, in a study of urban, low-income, African American pregnant women (N = 116), 87% of the women reported exposure to at least one traumatic event in their lifetimes, with a mean report of 4.3 events (Dailey et al., 2011). Traumatic events included incidents of family or friends being murdered or killed, robberies, home burglaries, attacks with weapons, and muggings.

The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) is a well-validated and widely used 10-item screening tool to measure depressive symptoms during the perinatal period. The EDPS was used to assess prenatal and postnatal depression in this study. Currently, no screening tools have been specifically designed for assessing

prenatal depression, but the EPDS, which focuses less on the somatic symptoms associated with depression (which may overlap with symptoms of pregnancy), has been found to be particularly effective at identifying women with depressive symptoms during pregnancy (Ryan, Milis, & Misri, 2005). Several studies have supported its use during pregnancy and with women who are ethnically or racially diverse (Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Evans, Heron, Francomb, Oke, & Golding, 2001). Based on prior research demonstrating the reliability and validity of the EDPS when item 10 is excluded, item 10 was not asked (*The thought of harming myself has occurred to me*) (Meijer et al., 2014; Whooley, Avins, Miranda, & Browner, 1997). Internal consistency for the summed total was $\alpha = .81$.

Maternal Antenatal Attachment Scale (MAAS; Condon, 1993). The MAAS is a self-report measure used to assess maternal antenatal bonding to the unborn baby. It was developed in an attempt to create a questionnaire that adequately measured bonding to the fetus and did not contain questions to do with the ‘pregnancy state’ or the ‘motherhood role,’ which Condon (1993) described as a pitfall of previously constructed questionnaires aimed at measuring the same construct. Condon noted that as the pregnancy progresses, the expectant parent would, in normal circumstances, develop “increasingly elaborated internalised representation of the foetus” (Condon, 1993, pg. 163) through which the parental emotional bond grows. The scale consists of two factors, with the first representing the quality of the affective experiences such as closeness/distance, and positive/negative feelings which arise when thinking about the fetus. The second factor represents an intensity of preoccupation with the fetus, and assesses the amount of time women spend thinking about, talking to, dreaming about or

palpating the fetus. The scale consists of 19 items with responses recorded on a 5 point rating scale, with higher scores reflecting a positive quality of attachment and a high intensity of preoccupation with the fetus. The two factors are combined to yield a total score ranging from 18-90, with higher scores reflecting more optimal attachment. Internal consistency for the summed total was $\alpha = .66$.

The Health Practices in Pregnancy Questionnaire-II (HPQ-II; Lindgren, 2005) is a 34-item measure designed to address adequacy of health practices in six areas: balance of rest and exercise; safety measures; nutrition; avoiding use of harmful substances; obtaining health care; and obtaining information. In addition, 1 item addresses overall pregnancy health practices. Responses range from 1 (never) to 5 (always or daily) or a word or phrase that indicates the woman's level of engagement in a specific activity (e.g., 1- No alcoholic drinks while pregnant to 5- More than 3 alcoholic drinks at one sitting). The total score ranges from 34 to 170 with a high score indicating a higher quality of health practices. Content validity was established by clinical experts and pregnant women (Lindgren, 2001, 2005). The Cronbach's alpha coefficient reported by Lindgren (2003) was 0.81. For a sample of low-income, African American pregnant women (N = 166), Alhusen, Gross, Hayat, Woods, and Sharps (2012) reported a Cronbach's alpha coefficient of .90. Internal consistency for this sample was $\alpha = .66$.

Windshield Survey (U.S.D.H.H.S-A.C.F., 2013) is an observational measure used to measure environmental chaos. Adapting procedures used in the Family Life Project (Burchinal et al., 2008), I calculated a 2-item neighborhood safety scale ($\alpha = .94$), which consisted of mean ratings for items asking about the safety of the area outside of this building (rated from 1 = obviously dangerous to 4 = above average safety) and the safety

of the neighborhood (rated from 1 = very safe/crime free to 4 = very unsafe/high-risk; reverse scored). The subscale has a possible score from 2 to 8 with a higher score indicating a safer neighborhood safety.

Neonatal Outcomes. A measure of neonatal outcome data was created for use in this study, using variables that have been identified in other studies as important outcomes of maternal risk exposure and prenatal psychological functioning (Alhusen, Gross, Hayat, Woods, et al., 2012; Grote, Bridge, et al., 2011; Messer et al., 2005). Neonatal health outcomes included the neonate's gestational age and birth weight. Adverse neonatal outcomes included preterm birth (less than 37 completed weeks gestation), low birthweight (less than 2500 grams or five pounds, eight ounces) and small for gestational age. Small for gestational age will be calculated using comprehensive reference values of birth weight at 22-44 completed weeks of gestation that were established by Oken, Kleinman, Rich-Edwards, and Gillman (2003).

Maternal Postnatal Attachment Scale (MPAS; Condon & Corkindale, 1998). The MPAS is the postpartum counterpart of Condon's (1993) *Maternal Antenatal Attachment Scale (MAAS)*, developed as a self-report measure to assess maternal feelings toward her infant and perceptions of the mother-infant relationship. It includes 19 items scored on a five-point scale with total score ranges possible ranges from 19 to 95. The MPAS assesses four dimensions: pleasure in proximity (a desire for proximity, enjoyment of interaction); acceptance (lack of resentment about the impact of the infant upon parent's lifestyle); tolerance (absence of feelings of anger and hostility towards the infant); and (parental) competence. Higher scores on each subscale indicate more intense positive perceptions and feelings towards the infant. The MPAQ has demonstrated acceptable

levels of internal consistency (Cronbach's alpha coefficient of .75) and test-retest reliability (Condon & Corkindale, 1998; Van Bussel, Spitz, & Demyttenaere, 2010), is significantly associated with the Attachment Q-Set (an observer-rated scale of attachment; Feldstein, Hane, Morrison, & Huang, 2004), and has been used in urban, low-income samples (Mason, Briggs, & Silver, 2011). Internal consistency for this sample was $\alpha = .50$.

Chapter 4: Results

Data Analytic Approach

This section describes the data analytic approach used in this study to test the relations among risk and protective factors during pregnancy and adverse birth outcomes and maternal functioning during the postpartum period. First, the data were entered and cleaned, and assessed for outliers. Second, measures were scored, composites created, and the reliability of all measures was evaluated. Third, variables were assessed for multivariate normality using histograms and frequencies, and means and standard deviations were computed for each variable and composite. Fourth, correlations between all variables were assessed. Fifth, possible covariates were examined in relation to all variables and composites. Sixth, all research questions were examined using a combination of hierarchical linear regression, logistic regression, and measured variable path analysis.

Data Entry, Cleaning, and Examination for Outliers

The data for this study were double entered into SPSS to ensure accuracy, and then data cleaning was conducted. The data were also examined for outliers (+ or – 3 standard deviations) and other extreme patterns using frequency counts and data plots. All variables showed sufficient variability, and therefore, further analyses were conducted using all variables.

All independent variables were then assessed for multicollinearity, which occurs when independent variables are unacceptably highly intercorrelated, and the effects of the independent variables cannot be separated (Friedman & Wall, 2005; Wheeler & Tiefelsdorf, 2005). Multicollinearity exists when intercorrelation among independent

variables is above .80, the tolerance values are less than .10, and the VIF values are greater than 4.0. In the current study, none of the independent variables used in the regression equations or path analyses were correlated above .80, had tolerance values less than .10 or VIF values greater than 4.0.

Data Scoring and Reliability Analysis

All measures were scored using the appropriate techniques outlined in the scoring manuals. Initial analyses included performing internal reliability analyses (i.e. Cronbach’s alpha) for each measure, to examine its reliability with the sample (See Table 4). All measures showed acceptable to good levels of reliability with the exception of the Maternal Postnatal Attachment Scale. A more extensive discussion about how the low reliability estimates for this measure may have impacted study results can be found in Chapter 5.

Table 4

<i>Cronbach’s Alpha for Scales and Subscales</i>	
Variable	α
Neighborhood Safety (Windshield)	.94
Trauma (THQ)	.73
Prenatal Depressive Symptoms (EPDS)	.81
Health Practices (HPQ)	.66
Maternal-fetal attachment (MAAS)	.66
Postnatal Depressive Symptoms (EPDS)	.82
Maternal-infant attachment (MPAS)	.50

Descriptive Analyses

Eight sets of variables were examined in this study: 1) Neighborhood safety; 2) Trauma exposure; 3) Prenatal depressive symptoms; 4) Maternal-fetal attachment; 5) Health practices during pregnancy; 6) Neonatal outcomes; 7) Postnatal depressive symptoms; and 8) Maternal-infant attachment. Means and standard deviations, as well as frequency tables, were computed for each variable (see Tables 5 – 11).

Table 5

<i>Descriptive Statistics of Study Variables</i>			
Variable	Mean (SD)	Min	Max
Neighborhood safety (1-8)	5.98 (.21)	5.0	7.0
Trauma (0-24)	3.42 (3.00)	0	16
Prenatal depressive symptoms (0-27)	5.15 (4.56)	0	22
Maternal-fetal attachment (19-95)	86.91 (5.08)	70	94
Health practices (0-136)	95.04 (9.08)	71	113
Postnatal depressive symptoms (0-27)	4.66 (4.53)	0	23
Maternal-infant attachment (19-95)	86.40 (5.74)	63.5	94

Neighborhood Safety

The majority of participants (94.2%) lived in neighborhoods rated average for safety (see Table 6). It is important to note that all home visits took place during regular business hours and in the daylight, and the research assistant never conducted a home visit alone. These circumstances may have skewed the research assistants' perception of the neighborhood's safety. Adapting procedures used in the Family Life Project

(Burchinal et al., 2008), I calculated a 2-item neighborhood safety scale ($\alpha = .94$), which consisted of mean ratings for items asking about the safety of the area outside of this building (rated from 1 = obviously dangerous to 4 = above average safety) and the safety of the neighborhood (rated from 1 = very safe/crime free to 4 = very unsafe/high-risk; reverse scored). The subscale has a possible score from 2 to 8 with a higher score indicating a safer neighborhood safety. Scores ranged from 5 to 7 ($M = 5.98$, $SD = .21$).

Table 6

Windshield Survey Subscale Item Frequencies (n = 66)

Item	Frequency (n)	Percent (%)
How safe is the area outside of the home		
Missing	4	5.7
Slightly dangerous	2	2.9
Average	63	90.0
Above average safety	1	1.4
The safety of the neighborhood around this dwelling is		
Missing	4	5.8
Average for this city	66	94.2

Trauma Exposure

The *Trauma History Questionnaire* (THQ; Green, 1996) was used to assess lifetime history of exposure to traumatic events and measures a range of experiences including crime- related events, unwanted physical and sexual experiences, general disasters, and personal devastations. Two participants were not comfortable answering questions related to sexual abuse, and therefore data are missing for those participants. The majority of participants (88.6%) reported having experienced at least one traumatic event in her lifetime. The most common traumatic event endorsed was the serious injury, illness, or unexpected death of someone close (see Table 7). This study employed the most common scoring convention of the THQ, which is to count the number of types of

events endorsed (Hooper, Stockton, Krupnick, & Green, 2011). Out of the possible 24 traumatic events on the THQ, scores ranged from 0 to 16 ($M = 3.42$, $SD = 3.00$) with higher scores indicating a higher number of traumatic events experienced in a lifetime.

Table 7

Types of Traumatic Events Reported on the Trauma History Questionnaire (n = 68)

Type of Trauma	Frequency (n)	Percent (%)
Serious injury, illness, or unexpected death of someone close	44	62.9
Serious accident	25	35.7
Seen dead body	22	31.4
Seen someone killed/injured	20	28.6
Death of spouse, romantic partner, or child	12	17.1
Home break-in (not present)	11	15.7
Robbed	10	14.3
Forced intercourse, oral, or anal sex	9	12.9
Feared killing/injury	8	11.4
Touched under force or threat	8	11.4
Natural disaster	8	11.4
Family/friend murdered/killed	7	10.0
Serious injury	7	10.0
Mugged	7	10.0
Home break-in (present)	7	10.0
Serious illness (self)	7	10.0
Beaten	5	7.1
Attacked with weapon	4	5.7
Man-made disaster	4	5.7
Attacked without weapon	2	2.9
Toxic exposure	1	1.4
Other unwanted sexual contact	1	1.4
Military combat	0	0

Prenatal Depressive Symptoms

The *Edinburgh Postnatal Depression Scale* (EPDS; Cox et al., 1987) was used to measure depressive symptoms during the perinatal period. Prenatal scores on the EPDS ranged from 0 to 27 ($M = 5.15$, $SD = 4.56$). Only 8.6% of participants scored above the widely recommended cutoff score of > 12 as indicative of clinically depressive

symptoms during pregnancy. However, the majority of the sample (77.1%) reported at least one depressive symptom (see Table 8). A more extensive discussion about how the low levels of clinically depressive symptoms for this sample may have impacted study results can be found in Chapter 5.

Table 8

Prenatal Depressive Symptoms (N = 70)

Score	Frequency (n)	Percent (%)
0	10	14.3
1-12	54	77.1
>12	6	8.6

Maternal-Fetal Attachment

The *Maternal Antenatal Attachment Scale* (MAAS; Condon, 1993) was used to assess maternal antenatal bonding to the unborn baby. The scale consists of two subscales, with the first representing the quality of the affective experiences such as closeness/distance, and positive/negative feelings which arise when thinking about the fetus. The second factor represents an intensity of preoccupation with the fetus, and assesses the amount of time women spend thinking about, talking to, dreaming about or palpating the fetus. Due to low reliability on the Quality and Intensity subscales ($\alpha = .60$ and $\alpha = .48$, respectively), the scale's total score was used in subsequent analyses ($\alpha = .66$). MAAS total scores ranged from 70 to 94 ($M = 86.91$, $SD = 5.08$), with higher scores reflecting more optimal maternal-fetal attachment.

Health Practices During Pregnancy

The *Health Practices in Pregnancy Questionnaire-II* (HPQ-II; Lindgren, 2005) was used to assess adequacy of health practices in six areas: balance of rest and exercise;

safety measures; nutrition; avoiding use of harmful substances; obtaining health care; and obtaining information. Only 7.1% percent of the sample reported smoking during pregnancy and 14.3% of the sample reported drinking alcohol during pregnancy (see Table 9). This study used the total score across all 34 items. Scores ranged from 71 to 113 ($M = 95.04$ $SD = 9.08$), with higher scores indicating a higher quality of health practices.

Table 9

Adverse Health Behaviors Reported on the Health Practices Questionnaire (N = 70)

Health Behavior	Frequency (n)	Percent (%)
Since becoming pregnant, I have smoked cigarettes:		
Never smoked	55	78.6
Quit since finding out I was pregnant	10	14.3
Less than 10 cigarettes per day	4	5.7
11 to 20 cigarettes per day	1	1.4
Since becoming pregnant, I have had alcoholic beverages:		
Never drank alcohol	31	44.3
Quit since finding out I was pregnant	29	41.4
Less than 3 times per month	9	12.9
1 time per week	1	1.4
Since becoming pregnant, at one sitting I usually drink:		
No drinks	61	87.1
1 drink	6	8.6
2 drinks	2	2.9
3 drinks	1	1.4

Neonatal Outcomes

Neonatal outcomes included the neonate's gestational age and birth weight. Health outcomes were considered adverse if the newborn was born preterm (less than 37 completed weeks gestation), low birthweight (less than 2500 grams or five pounds, eight ounces), or classified as small for gestational age. Small for gestational age was calculated using comprehensive reference values of birth weight at 22-44 completed

weeks of gestation that were established by Oken, Kleinman, Rich-Edwards, and Gillman (2003). Overall 16.4% of the sample had an adverse neonatal outcome (see Table 10).

Table 10

Classification of Adverse Neonatal Outcomes (n = 10/62)

Outcome	n	%
Preterm	3	4.8
Preterm and low birthweight	2	3.2
Preterm, low birthweight, small for gestational age	2	3.2
Small for gestational age	3	4.8
Total adverse birth outcomes	10	16.1

Postnatal Depressive Symptoms

The *Edinburgh Postnatal Depression Scale* (EPDS; Cox et al., 1987) was used to measure depressive symptoms during the perinatal period. Postnatal scores on the EPDS ranged from 0 to 23 ($M = 4.66$, $SD = 4.53$). Only 6.5% of participants scored above the widely recommended cutoff score of > 12 as indicative of clinically depressive symptoms during pregnancy. However, the majority of the sample (77.4%) reported at least one depressive symptom (see Table 11). A more extensive discussion about how the low levels of clinically depressive symptoms for this sample may have impacted study results can be found in Chapter 5.

Table 11

Postnatal Depressive Symptoms (n = 62)

Score	Frequency (n)	Percent (%)
0	10	16.1
1-12	48	77.4
>12	4	6.5

Maternal-Infant Attachment

The *Maternal Postnatal Attachment Scale* (MPAS; Condon & Corkindale, 1998) was used to assess maternal feelings toward her infant and perceptions of the mother–infant relationship. Responses were provided on 2-, 3-, 4- or 5-point scales. To ensure equal weighting of questions, all response options were recoded to represent a score of 1 (low bonding) to 5 (high bonding) (Mason et al., 2011). The MPAS assesses three dimensions: quality of attachment, pleasure in interaction, and absence of hostility. Due to low reliability on the three subscales ($\alpha = .30$, $\alpha = .30$, $\alpha = .17$ respectively), the scale’s total score was used in subsequent analyses ($\alpha = .50$). The sum of the 19 items forms the MPAS total, with higher scores indicating the most adaptive mother-infant bonding style. MPAS total scores ranged from 63.5 to 94.0 ($M = 86.4$, $SD = 5.74$), with higher scores reflecting more optimal maternal-infant attachment.

Bivariate Correlations

Pearson correlations were performed to examine the relations among all continuous variables (see Table 12). There were no significant correlations between neighborhood safety and any other variables. All other variables were correlated in the expected directions. Trauma exposure was positively correlated with prenatal depressive symptoms. Prenatal depressive symptoms were negatively correlated with maternal-fetal

attachment and health practices during pregnancy and positively correlated with postnatal depressive symptoms. Maternal-fetal attachment was positively correlated with health practices and maternal-infant attachment.

Table 12

Correlations Between Variables

Variable	1	2	3	4	5	6	7
1) Neighborhood safety	--						
2) Trauma exposure	.058	--					
3) Prenatal depressive symptoms	.016	.277*	--				
4) Maternal-fetal attachment	-.026	-.223	-.386**	--			
5) Health practices	-.151	-.195	-.279*	.508**	--		
6) Postnatal depressive symptoms	-.050	.167	.596**	-.087	-.087	--	
7) Maternal-infant attachment	-.040	-.177	-.243	.374**	.230	-.109	--

* $p < .05$, ** $p < .01$

Analysis of Covariates

Correlations and t-tests were performed to determine if there were group differences in factors based on demographic variables. Specifically, maternal age, education, parity, and marital status were examined in relation to all variables. Maternal age was significantly correlated in the expected direction with trauma exposure ($r = .36, p < .01$). Maternal education and parity were not significantly correlated with any variables.

Marital status was dichotomized to represent two groups 1) single (64.3% = participants who reported being single, divorced, or widowed), and 2) partnered (35.7% = participants who reported being married or single and living with a partner). T-tests

revealed significant differences between the single and the partnered groups (see Table 13). There was a significant difference in prenatal depressive symptoms ($t(68) = -2.87, p < .01$) with single participants exhibiting more depressive symptoms. There was a significant difference in maternal-fetal attachment ($t(68) = 1.75, p < .05$) with single participants exhibiting less optimal attachment. There was a significant difference in health practices ($t(68) = .36, p < .05$) with single participants exhibiting a lower quality of health practices. Due to these significant relationships, marital status will be controlled for in subsequent analyses involving these variables.

Table 13

Independent Group T-Tests between Prenatal Depressive Symptoms, Maternal-Fetal Attachment, Health Practices, and Marital Status

	No Partner		Partner		T-test
	M	SD	M	SD	
Prenatal depressive symptoms	6.27	5.05	3.16	2.58	-2.87**
Maternal-fetal attachment	86.13	5.63	88.32	3.58	1.75*
Health practices	94.74	10.17	95.56	6.96	.36*

* $p < .05$, ** $p < .01$

Note. Marital status is a dichotomous variable: 0 = Single, widowed, or divorced; 1 = Married or cohabitating

Missing Data

The missing data for the variables was minimal. Data were missing for a variety of reasons, including items being missed or refused. However, all other variables of interest displayed missing rates of less than 6 percent. Since Full Information Maximum Likelihood estimation (FIML) was used in the analyses of the research questions in

MPlus, a small amount of missing data is acceptable. FIML appropriately handles the existence of missing data by fitting the estimates to nonmissing variables for each case instead of deleting or replacing missing values which can misestimate the results (McCartney, et al., 2006).

Analysis of Research Questions

In this section, all research questions are examined using a combination of hierarchical linear regression, logistic regression, and measured variable path analysis. Hierarchical linear regression is a statistical method that examines the relationship between two continuous variables, and measures how prediction by certain variables improves on prediction by others. Logistic regression, like linear regression, is used to predict a dependent variable from a set of predictor variables, but is more appropriate when the dependent variable is categorical. Path analysis is a form of structural equation modeling which can posit a causal relationship between variables. It is an extension of regression analysis, but in contrast to regression, there are fewer assumptions and causal statements can be tested (Muller & Hancock, 2010).

All analyses were conducted using SPSS 20 (SPSS Statistics for Windows, Version 23) and MPlus 7.0 (Muthen & Muthen, 2010). For all of the measured variable path analyses, the recommendations for model fit indices outlined by Hu and Bentler (1999) were followed. That is, ideal fit indices included a root mean square error of approximation (RMSEA) less than 0.06; a comparative fit index (CFI) greater than 0.95 and a standardized root mean square residual (SRMR) less than 0.08.

Table 14		
<i>Research Question, Analytic Plan, and Variables</i>		
Research Question	Analytic Technique	Construct/Variables
RQ1	Hierarchical linear regression	Neighborhood Safety, Trauma Exposure, Prenatal Depressive Symptoms
RQ2	Hierarchical linear regression; Path analysis	Neighborhood Safety, Exposure to Trauma, Prenatal Depressive Symptoms, Maternal-Fetal Attachment
RQ3	Hierarchical linear regression; Path analysis	Prenatal Depressive Symptoms, Maternal-Fetal Attachment, Health Practices
RQ4	Logistic regression	Maternal-Fetal Attachment, Health Practices, Neonatal Outcomes
RQ5	Hierarchical linear regression	Prenatal Depressive Symptoms, Maternal-Fetal Attachment, Postnatal Depression
RQ6	Hierarchical linear regression	Prenatal Depressive Symptoms, Maternal-Fetal Attachment, Postnatal Depression, Maternal-Infant Attachment

Research Question 1: Do Neighborhood Safety and Trauma Exposure Contribute to Prenatal Depressive Symptoms in Pregnant Women?

- Hypothesis 1.1- Pregnant women who experience higher levels of neighborhood safety will report a lower number of prenatal depressive symptoms.
- Hypothesis 1.2- Pregnant women who report higher levels of trauma exposure will report a higher number of prenatal depressive symptoms.

The extent that the level of prenatal depressive symptoms could be a function of neighborhood safety and trauma exposure was assessed through hierarchical multiple linear regression, controlling for marital status. This combination of variables significantly predicted prenatal depressive symptoms, $F(3,60) = 8.74, R^2 = .22, p = .002$. However, only marital status and trauma exposure significantly contributed to the model (see Table 15). Thus I can reject hypothesis 1.1 and fail to reject hypothesis 1.2. These results suggest that participants who were married or cohabitating were less likely to report depressive symptoms during pregnancy, whereas participants who experienced a higher number of traumatic events in her lifetime were more likely to report depressive symptoms during pregnancy.

Table 15

Hierarchical Multiple Regression Analysis for Neighborhood Safety and Trauma Exposure Predicting Prenatal Depressive Symptoms

Variable	B	SEB	β	R ²
Step 1				.12
Marital status	-3.07	.62	-.35**	
Step 2				.22
Marital status	-3.40	1.02	-.39**	
Neighborhood safety	1.54	2.27	.08	
Trauma exposure	.45	.17	.29*	

* $p < .05$, ** $p < .01$

Note. Marital status is a dichotomous variable: 0 = Single, widowed, or divorced; 1 = Married or cohabitating.

Research Question 2: Do Neighborhood Safety, Exposure to Trauma, and Prenatal Depressive Symptoms Contribute to Maternal-Fetal Attachment in Pregnant Women?

- Hypothesis 2.1- Pregnant women who experience higher levels of neighborhood safety will report higher levels of maternal-fetal attachment.
- Hypothesis 2.2- Pregnant women who report higher levels of trauma exposure will report lower levels of maternal-fetal attachment.
- Hypothesis 2.3- Pregnant women who report a higher number of prenatal depressive symptoms will report lower levels of maternal-fetal attachment.
- Hypothesis 2.4- Prenatal depressive symptoms will mediate the relationship between environmental risk factors (i.e., neighborhood safety and trauma exposure) and maternal-fetal attachment.

First, the extent that the level of maternal-fetal attachment could be a function of neighborhood safety, trauma exposure, and prenatal depressive symptoms was assessed through hierarchical multiple linear regression, controlling for marital status. This combination of variables significantly predicted maternal-fetal attachment, $F(4,59) = 5.40$, $R^2 = .27$, $p < .01$. However, after controlling for marital status, only prenatal depressive symptoms significantly contributed to the model (see Table 16). Thus I can reject hypotheses 2.1 and 2.2 and fail to reject hypothesis 2.3. These results suggest that participants who reported more depressive symptoms during pregnancy reported lower maternal-fetal attachment.

Table 16

Hierarchical Multiple Regression Analysis for Prenatal Depressive Symptoms, Neighborhood safety, and Trauma Exposure Predicting Maternal-Fetal Attachment

Variable	B	SEB	β	R ²
Step 1				.07
Marital status	2.52	1.20	.09	
Step 2				.27
Marital status	.89	1.20	.09	
Neighborhood safety	-.86	2.47	-.04	
Trauma exposure	.11	.20	.06	
Prenatal depressive symptoms	-.54	.14	-.49***	

*p < .05, **p < .01, *** p < .001

Next, I examined the direct and indirect effects of marital status and trauma exposure on maternal-fetal attachment via prenatal depressive symptoms using measured variable path analysis. The model had good data-model fit ($\chi^2 = 0.13$, $df = 1$, $p = .72$, CFI = 1.00, RMSEA = 0.00, SRMR = 0.01). As expected, the direct path from prenatal depressive symptoms to maternal-fetal attachment was significant ($\beta = -.49$, $p < 0.001$), whereas the direct paths from marital status and trauma exposure to maternal-fetal attachment were not significant. The indirect path from marital status to maternal-fetal attachment, via prenatal depressive symptoms, was significant ($\beta = 1.86$, $p < 0.01$). The indirect path from trauma exposure to maternal-fetal attachment, via prenatal depressive symptoms, was also significant ($\beta = -0.24$, $p < 0.05$). These results indicate that prenatal depressive symptoms mediate both the relationship between marital status and maternal-

fetal attachment and the relationship between trauma exposure and maternal-fetal attachment, therefore I can fail to reject hypothesis 2.4 (see *Figure 3*). In summary, participants who were married or cohabitating experienced fewer depressive symptoms during pregnancy, which in turn increased levels of maternal-fetal attachment. Participants who experienced a higher number of traumatic events in her lifetime experienced more depressive symptoms during pregnancy, which in turn decreased levels of maternal-fetal attachment.

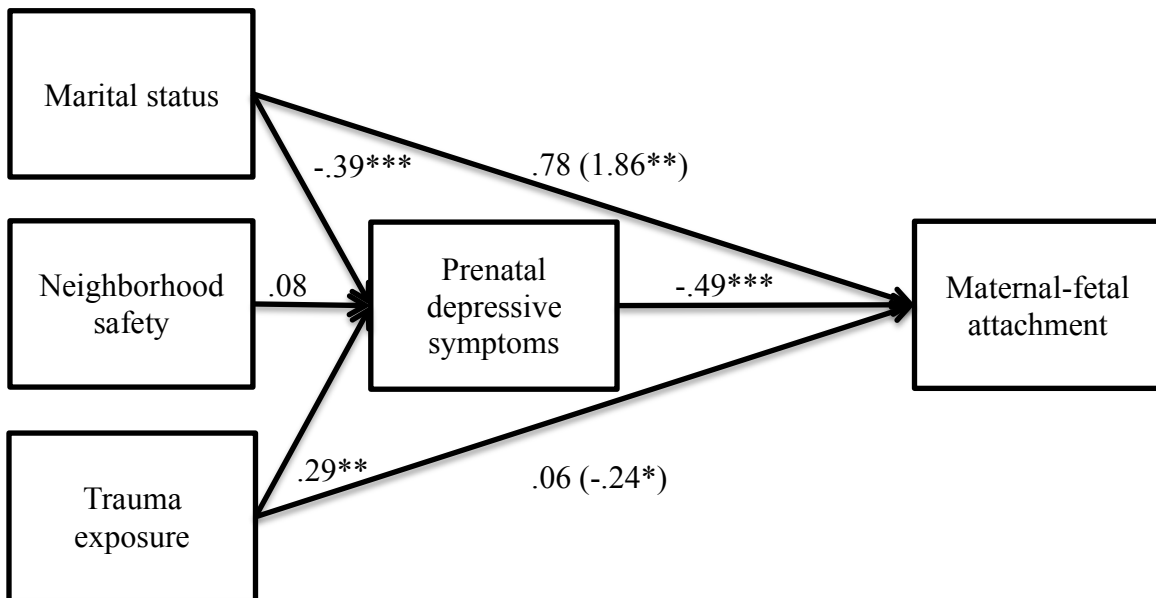


Figure 3. Standardized regression coefficients for the relationship between marital status, trauma exposure, and maternal-fetal attachment as mediated by prenatal depressive symptoms.

Note: The standardized regression coefficients between marital status and maternal-fetal attachment, and between trauma exposure and maternal-fetal attachment, controlling for prenatal depressive symptoms, are in parentheses.

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question 3: Do Prenatal Depressive Symptoms and Maternal-Fetal Attachment Contribute to Maternal Health Practices during Pregnancy?

- Hypothesis 3.1- Pregnant women who report a higher number of prenatal depressive symptoms will report lower quality health practices.
- Hypothesis 3.2- Pregnant women who report higher maternal-fetal attachment will report higher quality health practices.
- Hypothesis 3.3- Maternal-fetal attachment will mediate the relationship between prenatal depressive symptoms and maternal health practices.

First, the extent that the level of health practices could be a function of prenatal depressive symptoms and maternal-fetal attachment was assessed through hierarchical multiple linear regression, controlling for marital status. This combination of variables significantly predicted health practices, $F(3,64) = 8.16$, $R^2 = .28$, $p < .001$. However, after controlling for marital status, only maternal-fetal attachment significantly contributed to the model (see Table 17). Thus I can fail to reject hypothesis 3.2. These results suggest that participants who reported higher levels of maternal-fetal attachment engaged in a higher quality of health practices compared to participants who reported lower levels of maternal-fetal attachment.

Table 17

Hierarchical Multiple Regression Analysis for Prenatal Depressive Symptoms and Maternal-Fetal Attachment Predicting Health Practices

Variable	B	SEB	β	R ²
Step 1				.00
Marital status	.82	2.30	.04	
Step 2				.28
Marital status	-2.04	2.13	-.11	
Prenatal depressive symptoms	-.27	.24	-.14	
Maternal-fetal attachment	.85	.20	.48***	

*p < .05, **p < .01, *** p < .001

Next, I tested whether or not maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices using a multistage regression approach as outlined by Baron and Kenny (1986) in which three regression equations are estimated. In the first regression, the independent variable, prenatal depressive symptoms, and the mediator, maternal-fetal attachment, were found to be significantly associated (see Table 18), suggesting that participants who experienced a higher number of depressive symptoms during pregnancy reported lower levels of maternal-fetal attachment.

Table 18

Multiple Regression Analysis for Prenatal Depressive Symptoms Predicting Maternal-Fetal Attachment

Variable	B	SEB	β	R ²
Step 1				.15
Prenatal depressive symptoms	-.43	.13	-.39**	

*p < .05, **p < .01, *** p < .001

In the second equation, the independent variable, prenatal depressive symptoms, and the outcome variable, health practices, were found to be significantly associated (see Table 19). Thus I can fail to reject hypothesis 3.1. These results suggest that participants who experienced a higher number of depressive symptoms during pregnancy reported lower quality health practices.

Table 19

Multiple Regression Analysis for Prenatal Depressive Symptoms Predicting Health Practices During Pregnancy

Variable	B	SEB	β	R ²
Step 1				.08
Prenatal depressive symptoms	-.55	.23	-.38*	

*p < .05, **p < .01, *** p < .001

Finally, the third regression equation found a significant association between the maternal-fetal attachment and health practices, controlling for prenatal depressive symptoms $F(2,65) = 12.51, p < .001, R^2 = .27$, with the association between the prenatal depressive symptoms and health practices becoming non-significant, which demonstrates perfect mediation (see Table 20). Therefore I can fail to reject hypothesis 3.3. These

results suggest that participants who experienced a higher number of depressive symptoms during pregnancy experienced lower levels of maternal-fetal attachment, which in turn led to engaging in lower quality health practices.

Table 20

Multiple Regression Analysis for Prenatal Depressive Symptoms and Maternal-Fetal Attachment Predicting Health Practices

Variable	B	SEB	β	R ²
Step 1				.27
Prenatal depressive symptoms	-.20	.22	-.10	
Maternal-fetal attachment	.83	.20	.47***	

*p < .05, **p < .01, *** p < .001

I also examined the direct and indirect effects of marital status and trauma exposure on health practices via prenatal depressive symptoms and maternal-fetal attachment using measured variable path analysis (see *Figure 4*). The model had good data-model fit ($\chi^2 = 2.63$, $df = 2$, $p = .27$, CFI = .99, RMSEA = 0.06, SRMR = 0.04). As expected, the direct paths from marital status, trauma exposure, and prenatal depressive symptoms to health practices were not significant. The indirect path from marital status to health practices via prenatal depressive symptoms and maternal-fetal attachment was significant ($\beta = .07$, $p < 0.05$). The indirect path from trauma exposure to health practices, via prenatal depressive symptoms and maternal-fetal attachment, was also significant ($\beta = -0.06$, $p < 0.05$). These results indicate that prenatal depressive symptoms and maternal-fetal attachment mediate both the relationship between marital status and health practices and the relationship between trauma exposure and health practices. In other words, participants who were neither married nor cohabitating and participants who experienced

a higher number of traumatic events experienced a higher number of depressive symptoms and lower levels of maternal-fetal attachment, which in turn decreased their quality of health practices during pregnancy.

Finally, the indirect path from prenatal depressive symptoms to health practices, via maternal-fetal attachment, was significant ($\beta = -0.19, p < 0.01$). This result indicates that maternal-fetal attachment mediates the relationship between prenatal depressive symptoms and health practices, therefore I can fail to reject hypothesis 3.3. These results suggest that participants who experienced a higher number of depressive symptoms during pregnancy experienced lower levels of maternal-fetal attachment, which in turn decreased their quality of health practices during pregnancy.

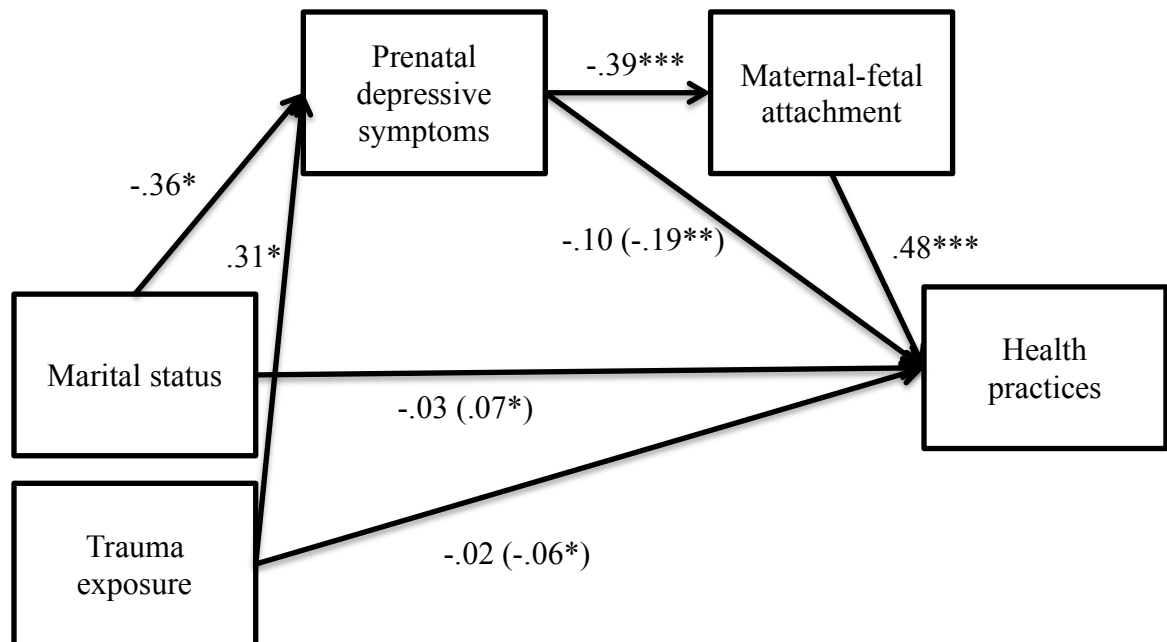


Figure 4. Standardized regression coefficients for the direct and indirect effects of marital status, trauma exposure, prenatal depressive symptoms, maternal-fetal attachment, and health practices.

Note: The standardized regression coefficients for the indirect pathways are in parentheses.

* $p < .05$, ** $p < .01$, *** $p < .001$

Although examining the influence of marital status (i.e., married/cohabiting) was not a research goal of the current study, the data revealed that this construct had important implications for study results. Thus, I examined the impact of marital status on the relationship between prenatal depressive symptoms, maternal-fetal attachment, and health practices. I ran a multi-group model with marital status as the grouping variable. The model demonstrated perfect fit ($\chi^2 = 0.00$, $df = 0$, $p < 0.05$, CFI = 1.00, RMSEA = 0.00, SRMR = 0.00), which was expected since the model is fully identified. For the single group (see *Figure 5*), maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices ($\beta = -0.18$, $p < 0.05$). These results suggest that for participants who were neither married nor cohabiting (i.e., those who were single, widowed, or divorced), depressive symptoms during pregnancy led to lower levels of maternal-fetal attachment, which in turn led to engagement in lower quality health practices.

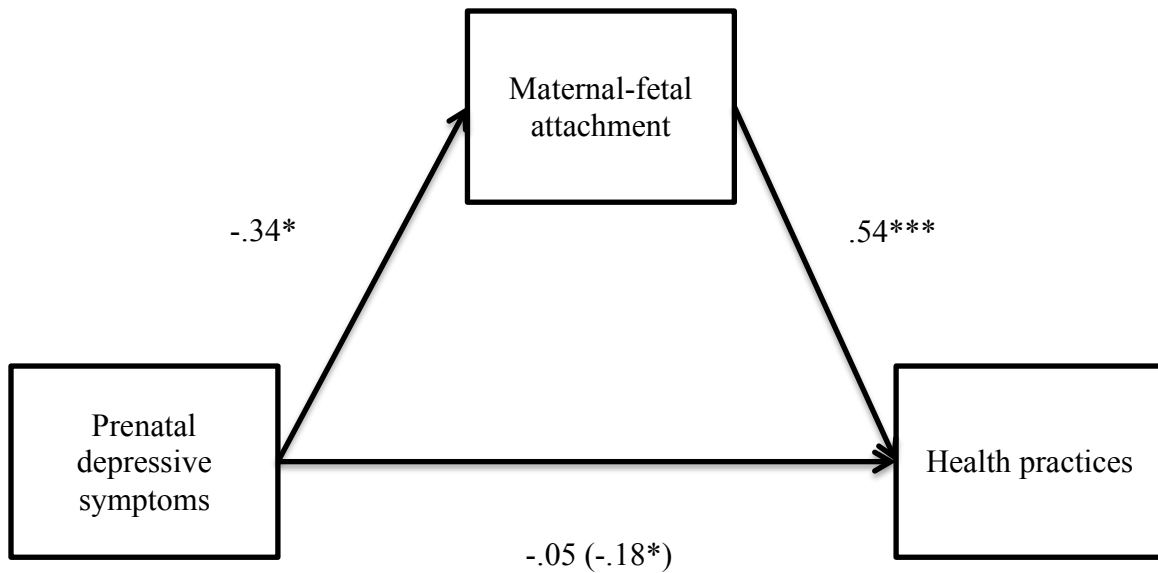


Figure 5. Standardized regression coefficients for the relationship between prenatal depressive symptoms and health practices as mediated by maternal-fetal attachment in the single group.

Note: The standardized regression coefficient between prenatal depressive symptoms and health practices, controlling for maternal-fetal attachment, is in parentheses.

* $p < .05$, ** $p < .01$, *** $p < .00$

In contrast, this mediation was not significant for participants who were married or cohabitating (see Figure 6). Instead, there was a significant direct effect from prenatal depressive symptoms to health practices ($\beta = -0.39, p < 0.05$). These results suggest that for participants who were married or cohabitating, a higher number of depressive symptoms during pregnancy led to lower quality health practices, irrespective of maternal-fetal attachment.

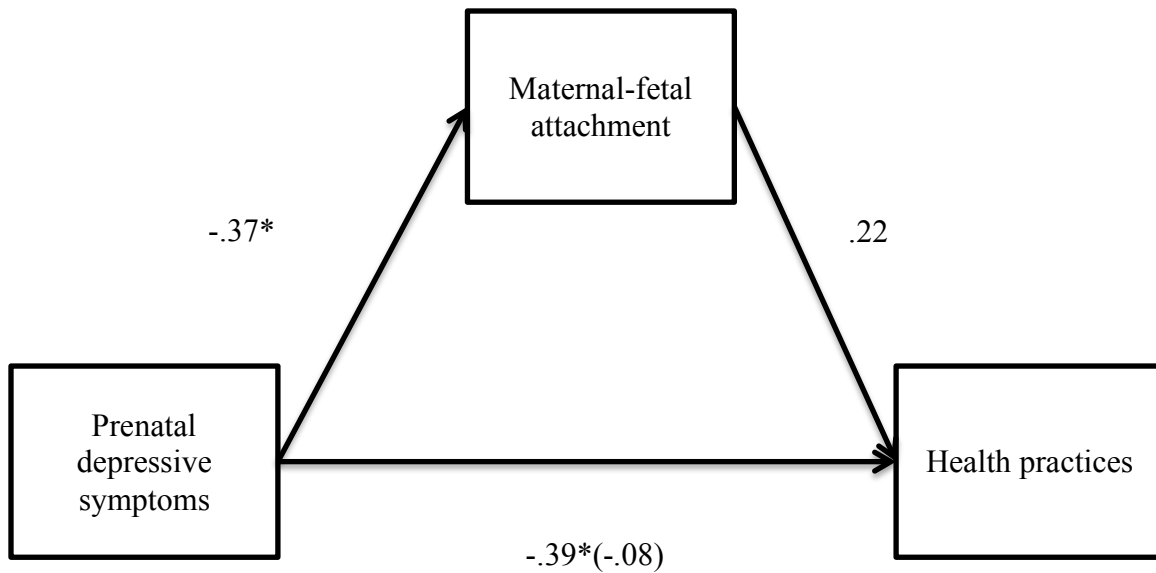


Figure 6. Standardized regression coefficients for the relationship between prenatal depressive symptoms and health practices as mediated by maternal-fetal attachment in the married group.

Note: The standardized regression coefficient between prenatal depressive symptoms and health practices, controlling for maternal-fetal attachment, is in parentheses.

* $p < .05$, ** $p < .01$, *** $p < .001$

Finally, I examined the impact of prenatal depressive symptoms and maternal-fetal attachment on specific health practices during pregnancy. Specifically, I looked at cigarette use and alcohol use. Logistic regression was conducted to assess whether prenatal depressive symptoms and maternal-fetal attachment significantly predicted whether or not a participant smoked cigarettes or drank alcohol during pregnancy.

Considered together, prenatal depressive symptoms and maternal-fetal attachment do not significantly predict cigarette use during pregnancy, however, the result is trending towards significance ($\chi^2 = 5.50$, $df = 2$, $p = .064$). Table 21 presents the odds ratios, which suggest that the odds of smoking cigarettes during pregnancy are increasingly greater as maternal-fetal attachment scores decrease OR = .84, 95% CI (.71-1.0).

Table 21

Logistic Regression Analysis for Prenatal Depressive Symptoms and Maternal-Fetal Attachment Predicting Cigarette Use During Pregnancy

Variable	<i>B</i>	<i>SE</i>	<i>Odds ratio</i>	<i>p</i>
Prenatal depressive symptoms	.04	.11	1.04	.714
Maternal-fetal attachment	-.17	.09	.84	.057

Similarly, considered together, prenatal depressive symptoms and maternal-fetal attachment do not significantly predict alcohol use during pregnancy, however the result is trending towards significance ($\chi^2 = 4.90$, $df = 2$, $p = .086$). Table 22 presents the odds ratios, which suggest that in contrast to cigarette use, the odds of drinking alcohol during pregnancy are increasingly greater as prenatal depressive symptoms increase, OR = 1.16, 95% CI (1.0-1.3).

Table 22

Logistic Regression Analysis for Prenatal Depressive Symptoms and Maternal-Fetal Attachment Predicting Alcohol Use During Pregnancy

Variable	<i>B</i>	<i>SE</i>	<i>Odds ratio</i>	<i>p</i>
Prenatal depressive symptoms	.15	.07	1.16	.047
Maternal-fetal attachment	-.01	.07	.99	.878

Research Question 4: Do Maternal-Fetal Attachment and Maternal Health

Practices during Pregnancy Predict Neonatal Outcomes?

- Hypothesis 4.1- Pregnant women who report lower levels of maternal-fetal attachment will have neonates with higher odds of adverse health outcomes.
- Hypothesis 4.2- Pregnant women who report lower quality health practices will have neonates with higher odds of adverse health outcomes.
- Hypothesis 4.3- Maternal health practices will mediate the effect of maternal-fetal attachment on neonatal outcomes.

First, the extent that the level of neonatal outcomes could be a function of maternal-fetal attachment and maternal health practices was assessed through a logistic regression model. This combination of variables did not significantly predict adverse birth outcomes ($\chi^2 = 2.29, df = 2, p = .319$). Neither maternal-fetal attachment nor health practices significantly contributed to the model (see Table 23). Thus I can reject hypotheses 4.1-4.3.

Table 23

*Logistic Regression Analysis for Maternal-Fetal Attachment and Health Practices
Predicting Adverse Birth Outcomes*

Variable	<i>B</i>	<i>SE</i>	<i>Odds ratio</i>	<i>p</i>
Maternal-fetal attachment	.11	.10	1.12	.244
Health practices	.01	.05	1.01	.868

Next, I explored the extent to which neonatal outcomes could be a function of specific health practices during pregnancy through logistic regression models. Neither alcohol use during pregnancy nor cigarette use during pregnancy was significantly predictive of adverse neonatal outcomes. However, having ever smoked cigarettes (dichotomized as 1

= Quit since finding out I was pregnant, Less than 10 cigarettes per day, or 11 to 20 cigarettes per day; 0 = Never smoked) was predictive of adverse birth outcomes ($\chi^2 = 5.17, df = 1, p = .023$). Table 24 presents the odds ratios, which suggest that the odds of an adverse birth outcome are 5.50 times higher for participants who ever smoked cigarettes compared to participants who never smoked OR =5.50, 95% CI (1.3-22.9).

Table 24

Logistic Regression Analysis for Cigarette Use Predicting Adverse Birth Outcomes

Variable	<i>B</i>	<i>SE</i>	<i>Odds ratio</i>	<i>p</i>
Smoked cigarettes	1.71	.74	5.50	.021

Research Question 5: Do Prenatal Depressive Symptoms and Maternal-Fetal Attachment Predict Postnatal Depression?

- Hypothesis 5.1- Women who experience higher levels of prenatal depressive symptoms will experience higher levels of postnatal depression.
- Hypothesis 5.2- Women who experience lower levels of maternal-fetal attachment will experience higher levels of postnatal depression.

First, the extent that the level of postnatal depressive symptoms could be a function of prenatal depressive symptoms and maternal-fetal attachment was assessed through hierarchical multiple linear regression. This combination of variables significantly predicted postnatal depression, $F(2,59) = 18.15, R^2 = .38, p < .001$. However, only prenatal depressive symptoms significantly contributed to the model (see Table 25). These results suggest that participants who experienced a higher number of prenatal depressive symptoms experienced a higher number of postnatal depressive symptoms. Thus I can fail to reject hypothesis 5.1 and reject hypothesis 5.2.

Table 25

Hierarchical Multiple Regression Analysis for Prenatal Depressive Symptoms and Maternal-Fetal Attachment Predicting Postnatal Depressive Symptoms

Variable	B	SEB	β	R^2
Step 1				.38
Prenatal depressive symptoms	.65	.11	.67***	
Maternal-fetal attachment	.15	.10	.17	

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question 6: Do Prenatal Depressive Symptoms, Maternal-Fetal Attachment, and Postnatal Depression Predict Maternal-Infant Attachment?

- Hypothesis 6.1- Women who experience higher levels of prenatal depressive symptoms will experience lower levels of maternal-infant attachment.
- Hypothesis 6.2- Women who experience lower levels of maternal-fetal attachment will experience lower levels of maternal-infant attachment.
- Hypothesis 6.3- Women who experience higher levels of postnatal depression will experience lower levels of maternal-infant attachment.

First, the extent that the level of maternal-infant attachment could be a function of prenatal depressive symptoms, maternal-fetal attachment, and postnatal depressive symptoms was assessed through hierarchical multiple linear regression. This combination of variables significantly predicted maternal-infant attachment, $F(3,58) = 3.43$, $R^2 = .15$, $p < .05$. However, only maternal-fetal attachment significantly contributed to the model (see Table 26). Thus I can fail to reject hypothesis 6.2 and reject hypothesis 6.1 and 6.3. These results suggest that participants who experienced higher levels of maternal-fetal attachment during pregnancy experience higher levels of maternal-infant attachment at one month postpartum.

Table 26

Hierarchical Multiple Regression Analysis for Prenatal Depressive Symptoms, Maternal-Fetal Attachment, and Postnatal Depressive Symptoms Predicting Maternal-Infant Attachment

Variable	B	SEB	β	R ²
Step 1				.15
Prenatal depressive symptoms	-.13	.21	-.10	
Maternal-fetal attachment	.37	.15	.33*	
Postnatal depressive symptoms	-.03	.20	-.02	

*p < .05, **p < .01, *** p < .001

Summary of Results

This study had several findings related to marital status, trauma exposure, prenatal depressive symptoms, maternal-fetal attachment, health practices, neonatal outcomes, postnatal depressive symptoms, and maternal-infant attachment. I first examined predictors of prenatal depressive symptoms, and found that participants who were married or cohabitating were less likely to report depressive symptoms during pregnancy, whereas participants who experienced a higher number of traumatic events in her lifetime were more likely to report depressive symptoms during pregnancy. Contrary to our hypothesis, neighborhood safety did not significantly predict prenatal depressive symptoms. Next, I examined predictors of maternal-fetal attachment, and found that participants who were married or cohabitating experienced fewer depressive symptoms during pregnancy, which in turn increased levels of maternal-fetal attachment. I also found that participants who experienced a higher number of traumatic events in her lifetime experienced more depressive symptoms during pregnancy, which in turn decreased levels of maternal-fetal attachment. Then, I examined predictors of health practices during pregnancy, and found that participants who experienced a higher number of depressive symptoms during pregnancy experienced lower levels of maternal-fetal attachment, which in turn led to engaging in lower quality health practices. Taking this analysis a step further, I found that this mediation only held true for participants who were neither married nor cohabitating. Next, I examined predictors of adverse birth outcomes, and found that neither maternal-fetal attachment nor health practices during pregnancy significantly predicted adverse birth outcomes, but that maternal cigarette use increased the odds of an adverse birth outcome. Subsequently, I examined predictors of

postnatal depressive symptoms, and found that participants who experienced a higher number of prenatal depressive symptoms experienced a higher number of postnatal depressive symptoms. Finally, I examined predictors of maternal-infant attachment, and found that participants who experienced higher levels of maternal-fetal attachment during pregnancy experienced higher levels of maternal-infant attachment at one month postpartum.

Chapter 5: Discussion

The current study explored the associations among environmental risk factors, depression, attachment, and neonatal outcomes in a sample of low-income, African American women during the perinatal period. This research adds to existing literature by examining factors that mediate the complex relationship between poverty and adverse birth outcomes in African American mothers. First, this chapter summarizes the key findings of the study, considering each finding in the context of current literature. Next, policy and practice implications are explored. Finally, limitations of the study and future research directions are addressed.

Summary

This study had two main goals. The first goal was to examine environmental risk factors, prenatal depression, maternal-fetal attachment, and maternal health practices during pregnancy in relation to neonatal outcomes in a sample of low-income, African American women. The second goal was to examine environmental risk factors, prenatal depression, and maternal-fetal attachment in relation to postnatal depression and maternal-infant attachment in the early postpartum period in a sample of low-income, African American women.

To summarize my findings, marital status and trauma exposure were significant predictors of prenatal depressive symptoms, and prenatal depressive symptoms had a significant adverse effect on maternal-fetal attachment. I also found that maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices, but only for participants who were not married or cohabitating. Neither

maternal-fetal attachment nor health practices during pregnancy had a significant impact on adverse birth outcomes, but maternal cigarette use significantly increased the odds of an adverse birth outcome. Finally, I found that prenatal depressive symptoms were a significant predictor of postnatal depressive symptoms, and that maternal-fetal attachment significantly contributed to maternal-infant attachment.

Consideration of Key Findings

The following section summarizes the key findings of this study. I begin by addressing adverse birth outcomes, followed by discussions of maternal psychological functioning, maternal attachment, and maternal health behaviors. Finally, I consider the influence of maternal proximal and distal environments. Each finding is considered in the context of current literature.

Adverse Birth Outcomes

In the United States, African American infants are more than twice as likely to die within the first year of life as a White infant, and a significant portion of that disparity is attributable to the near two-fold increased rates of adverse birth outcomes, including low birthweight and preterm births, among African American neonates (Mathews, Macdorman, & Thoma, 2015). A goal of this study was to examine the relationship between risk factors, maternal functioning during pregnancy, and adverse birth outcomes among low-income, African American women.

In this study, 16% of the sample experienced an adverse birth outcome, defined as premature birth, low birthweight, or small for gestational age. This percentage is relatively low compared to other studies of neonatal health outcomes in high-risk populations. For instance, Alhusen et al. (2012), using the same adverse birth outcome

criteria as this study, reported an adverse birth outcome rate of 41% in a sample of low-income, African American pregnant women in Baltimore. The relatively low rate of adverse birth outcomes in this sample could be attributable to participants' enrollment in WIC, a supplemental nutrition program that provides nutritious foods and nutrition education during pregnancy. The low rate of adverse birth outcomes could be related to mothers' better psychological functioning during pregnancy, compared to other high-risk samples, an idea that will be expanded upon in the next section. In spite of the low number of adverse births, consistent with the literature (Centers for Disease Control and Prevention, 2016) this study did find that cigarette use was predictive of adverse birth outcomes, and that the odds of an adverse birth outcome were five times higher for women who reported ever smoking (even if they quit when they found out they were pregnant) compared to those who never smoked.

Maternal Psychological Functioning

In order to better understand how to reduce the morbidity rate among African American infants, it is important to examine what risk factors may render mothers vulnerable to impaired psychological functioning during the perinatal period. This study aimed to discover whether there are specific psychological risk factors, such as trauma, that increase a woman's chances of experiencing perinatal depression. The following section discusses key findings related to trauma exposure, prenatal depressive symptoms, and postnatal depressive symptoms.

Trauma exposure. The majority of participants (88.6%) in this study reported having experienced at least one traumatic event in her lifetime, with a mean report of 3.4 events. Common traumatic events included incidents of family or friends being murdered

or killed, robberies, home burglaries, and rape. This estimate is comparable to another study of urban, low-income, African American pregnant women in which 87% of the women reported exposure to at least one traumatic event, with a mean report of 4.3 events (Dailey et al., 2011). Consistent with the literature (e.g. Dailey et al., 2011; Melville, Gavin, Guo, Fan, & Katon, 2010), participants who experienced a higher number of traumatic events in their lifetimes experienced more depressive symptoms during pregnancy. Building on this literature, I found that prenatal depressive symptoms mediated the relationship between trauma exposure and maternal-fetal attachment. This finding is important considering the adverse impact of diminished maternal-fetal attachment on health practices during pregnancy. Taken together, these results suggest that trauma exposure is a prevalent issue among low-income, African American mothers, and that trauma exposure may negatively impact birth outcomes by impairing maternal psychological functioning during pregnancy.

Prenatal depressive symptoms. This study found that the majority of participants (77.1%) reported at least one depressive symptom during pregnancy. However, only 8.6% of participants scored above the widely recommended Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) cutoff score of >12 as indicative of clinically depressive symptoms during pregnancy. This finding is inconsistent with much of the literature on perinatal depression in high-risk populations, which typically reports much higher rates of rates of depressive symptoms. For instance, in a sample of low-income, African American pregnant women in Baltimore (N = 166), 59% of the total sample exceeded the cutoff score of >12 on the EPDS (Alhusen, Gross, Hayat, Rose, et

al., 2012). The lower rates of prenatal depressive symptoms in this study could be due to a few possible reasons.

First, the relatively low rate of prenatal depression in this sample could be a result of participants' enrollment in WIC. Although it is a common practice to recruit participants from health care clinics, early intervention programs, and other supportive services, this recruitment method could have biased the sample towards a more high functioning population. Pregnant women experiencing clinically depressive symptoms may lack the motivation and capacity to navigate a social service system. In addition, I recruited participants from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinics in Prince George's County, Maryland, where the income eligibility is at or below 185% of the U.S. poverty income guidelines. In contrast, programs such as Head Start have an income eligibility at or below 100% of the U.S. poverty guidelines (U.S. Department of Health and Human Services Administration for Children and Families, 2016). It is possible that due to differences in income thresholds, my sample had more financial resources compared to other studies of low-income women.

Further, my examination of other markers of socioeconomic status, such as maternal education, revealed that this sample has fewer risk factors compared to participants in similar studies. For instance, the Alhusen et al. (2012) study of pregnant women in Baltimore reported that the majority of the sample (67%) did not graduate from high school, whereas in this study only 4.3% of participants did not graduate from high school. Finally, this study excluded participants with known medical conditions, including chronic hypertension and preeclampsia, given their known contribution to adverse neonatal outcomes (Hamilton et al., 2013). Research has found a link between

preeclampsia and depressive symptoms during pregnancy (Thombre, Talge, & Holzman, 2015; Zhang et al., 2013). By excluding women with preeclampsia, I may have screened out women whose health issues led to a greater likelihood of experiencing prenatal depressive symptoms.

In spite of the small percentage of participants meeting the criteria for clinical depressive symptoms, this study still yielded several important findings related to prenatal depressive symptoms. Consistent with previous research (e.g. Lindgren, 2003; McFarland et al, 2011; Sedgmen, McMahon, Cairns, Benzie, & Woodfield, 2006), participants who reported more depressive symptoms during pregnancy reported lower maternal-fetal-attachment. Building on that research, this study found that prenatal depressive symptoms mediated the relationship between risk factors, including marital status and trauma exposure, and maternal-fetal attachment. These results indicate that risk factors, such as exposure to trauma, increase the likelihood of compromised maternal psychological functioning during pregnancy, which in turn increases the likelihood of a weakened relationship between mother and child.

In addition, I found that prenatal depressive symptoms increased the odds of drinking alcohol during pregnancy, a finding that supports previous research in high-risk samples (e.g. Leis, Heron, Stuart, & Mendelson, 2012). Finally, consistent with previous research (e.g. Leigh & Milgrom, 2008; Rich-Edwards et al., 2006; Toohey, 2012) , I found that prenatal depressive symptoms were the strongest predictor of postnatal depressive symptoms. Taken together, these results indicate that prenatal depressive symptoms have a detrimental impact on maternal functioning during both the pre- and post-natal periods.

Postnatal depressive symptoms. In this study, I found that the majority of participants (77.4%) reported at least one depressive symptom at one month postpartum, and that consistent with previous research (e.g. Leigh & Milgrom, 2008; Rich-Edwards et al., 2006; Toohey, 2012), prenatal depressive symptoms strongly predicted postnatal depressive symptoms. However, only 6.5% of participants scored above the widely recommended Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) cutoff score of >12 as indicative of clinically depressive symptoms during the postpartum period. As discussed in relation to prenatal depressive symptoms, it is possible that this sample was less likely to experience perinatal depressive symptoms, compared to other studies of low-income pregnant women, due to fewer demographic risk factors.

The low incidence of postpartum depression (PPD) could also be attributable to the timing of my phone interview. On average, the interview was completed at four weeks postpartum. A meta-analysis by Gaynes et al. (2005) of 28 studies that included about 15,000 women reported the prevalence of PPD diagnosis based on assessment by clinical interviews was 3.8% at 4 weeks, increasing to 4.7% at 12 weeks, and 5.6% at 26 weeks. The increasing prevalence of PPD up to 6 months' postpartum suggests the possibility of later-onset PPD that may have been missed by my follow-up at 4 weeks postpartum.

Maternal Attachment to Her Child

The attachment literature has underscored the critical contribution of the mother-infant relationship to infant development (Ainsworth, 1979), and contemporary research is beginning to recognize that this important relationship emerges fairly early in pregnancy and increases throughout the prenatal period (e.g. Dipietro, 2010; Salisbury,

Law, Lagasse, & Lester, 2003). This study aimed to examine whether maternal attachment might serve as a protective factor during the perinatal period, buffering infants from the deleterious impact of depression during the pre-and-post natal periods. In the following section, I discuss key findings related to maternal-fetal attachment, followed by an examination of maternal attachment to their neonates.

Maternal-fetal attachment. Participants who experienced a higher number of depressive symptoms during pregnancy experienced lower levels of maternal-fetal attachment, which in turn led to their engaging in lower quality health practices. This finding is consistent with the limited literature on maternal-fetal attachment in low-income minority women (Alhusen, Gross, Hayat, Rose, et al., 2012; Alhusen, Gross, Hayat, Woods, et al., 2012). However, this study found that the mediating role of maternal-fetal attachment in the relation between prenatal depression and health practices was significant for participants who were single (the majority of my sample), but not for those who were married. These results suggest that maternal-fetal attachment may be a protective factor particularly for women who are not married or living with a partner. Research on single African American mothers has pointed to the resilience in this family structure among African Americans (e.g. Murry, Bynum, Brody, Willert, & Stephens, 2001) which may be promoted by such protective factors as early emotional connections to their children.

I also found that the odds of smoking cigarettes during pregnancy are increasingly greater as maternal-fetal attachment scores decrease. Although this finding was not statistically significant, it was trending towards significance and likely would reach significance given a larger sample size and more statistical power. This finding is

important given that smoking during pregnancy is related to a heightened risk of unfavorable birth outcomes including preterm delivery, low and very low birthweight, and stillbirth (Aliyu et al., 2008; Cox et al., 2011; Debiec et al., 2010). Thus, cigarette use may reflect mothers' inability to connect with their unborn children such that they can engage in the protective behaviors that are typically found in pregnant women (Dipietro, 2010). Finally, maternal-fetal attachment was predictive of maternal-infant attachment, which supports the limited research relating maternal-fetal attachment to maternal attachment postpartum (Alhusen et al., 2013).

Maternal-infant attachment. This study documented that maternal-fetal attachment during the third trimester of pregnancy was predictive of maternal-infant attachment at one month postpartum. This finding is consistent with the limited literature that has found a positive relationship between maternal-fetal attachment and secure mother-child attachments (Alhusen et al., 2013). It may be that mothers who develop an emotional connection to their offspring during pregnancy are more likely to maintain this connection, despite the typical challenges in caring for a neonate (e.g., unique and inconsistent sleeping patterns, crying, and general dysregulation).

Nevertheless, this finding needs to be interpreted cautiously given the low Cranbach's alpha ($\alpha = .50$) on the Maternal Postnatal Attachment Scale (MPAS; Condon & Corkindale, 1998). To date, the MPAS has not been widely used as a research tool as the psychometric properties are still being explored. Although there is evidence of adequate test-retest reliability and construct validity (Condon & Corkindale, 1998; Feldstein et al., 2004; van Bussel et al., 2010), the MPAS still needs further examination to ensure it is a fully valid and reliable measurement of maternal feelings of attachment in

low-income and minority populations. One study that used the MPAS in a low-income, majority Hispanic sample also used only the total score (vs. subscales) but did not report their alphas (Mason et al., 2011).

To my knowledge, this is the first study that used the MPAS in a low-income, African American sample. This measure may not be a reliable or valid measure in my study population for a number of reasons. For one, it could be a measurement issue. The two dichotomous items on the MPAS (*I try to involve myself as much as possible in child care and looking after my baby*; *When I am with the baby I usually try to prolong the time that I spent with him/her*) had zero response variability, with all participants endorsing these items as true. It is possible that the forced choice between true or false did not capture the full range of feelings that new mothers have towards their infants. Secondly, it could be a cultural issue. While the measure's 3-, 4-, or 5-point scale items provided respondents with a wider range of options, participants may have felt a level of social desirability in responding to questions about their relationship with their young infant. For example, in an examination of the response process validity of the Child Behavior Checklist (CBCL; Achenbach, 1991), a commonly used measure of behavioral adjustment for young children, Perry et al. (2013) found that low-income, minority parents were "not comfortable" responding to 29 items. When asked to consider why they were "not comfortable," the two reasons most frequently given by parents were that they found the questions offensive or threatening.

This finding is of particular importance when implementing measures with poor, minority populations. It could be that participants in this study did not feel comfortable admitting to the research assistant that they felt anything but the most positive of feelings

towards their 4-week-old infants. Finally, the MPAS was administered over the phone. While previous research suggests that a telephone interview can be an efficient, reliable, and valid mechanism for data collection (Musselwhite et al., 2007), administration over the phone could have impacted this measure's reliability and validity.

Maternal Health Practices

A goal of this study was to understand how maternal health practices during pregnancy impact adverse birth outcomes. Although the current study did not find a significant relationship between health practices during pregnancy and adverse birth outcomes, cigarette use in general (having ever smoked vs. smoking during pregnancy) was significantly predictive of adverse birth outcomes. It is possible that there was not a significant relationship between smoking during pregnancy and adverse birth outcomes because some participants did not admit to smoking during pregnancy due to the stigma, and instead endorsed that they quit since finding out they were pregnant. This explanation is consistent with a recent study of late pregnancy nicotine exposures that found that compared with 8.6% of women self-reporting cigarette use, urine analysis detected high-level nicotine exposures for 16.5% of women (Hall, Wexelblatt, & Greenberg, 2016). The discrepancy between self-reported cigarette use and laboratory results was even greater for low-income women (15.8% vs. 45.4%) and black, non-Hispanic women (7.9% vs. 35.9%). This finding suggests that my study's sample of low-income, African American women may underreport cigarette use during pregnancy. Hall, Wexelblatt, and Greenberg (2016) also speculate that black, non-Hispanic women may experience different types of nicotine exposures than white, non-Hispanic women, including secondhand exposures or exposures originating from nicotine products other

than tobacco cigarettes. Thus, women in my study may have been exposed to second-hand smoke, smokeless tobacco, or e-cigarettes, none of which were measured by my Health Practices in Pregnancy Questionnaire.

Maternal Proximal and Distal Environments

This study aimed to understand what specific risk factors, beyond poverty, contribute to perinatal depression, maternal functioning, and adverse birth outcomes in low-income, African American women. In the following section, I examine the impact of one element of the maternal proximal environment—marital status—and one element of the distal environment—neighborhood safety.

Marital status. Although this was not a key question in the current study, I did find that participants who were married or cohabitating experienced significantly fewer depressive symptoms during pregnancy compared to participants who were single, widowed, or divorced. This finding is consistent with the literature (e.g. Fellenzer & Cibula, 2014; Lancaster et al., 2010) that states that being unmarried is a risk factor for prenatal depressive symptoms. There are several possible explanations for this correlation. It could be that mothers who are married or cohabitating experience more social support, a construct that I did not examine in this study but one that has been consistently linked to prenatal depression (Lancaster et al., 2010; Nylén, O’Hara, & Engeldinger, 2013). Interestingly, the relationship between marital status and depressive symptoms was only significant during the prenatal period. This finding suggests that there is something particularly salient about having a partner during pregnancy versus the postpartum period. Partner support during pregnancy has been found to be particularly important to the well-being of mothers (Blanchard, Hodgson, Gunn, Jesse, & White, 2009).

Also of note is the finding that maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices during pregnancy, but only for participants who were single. Participants who were married or cohabitating exhibited a direct relationship between prenatal depressive symptoms and health practices, irrespective of maternal-fetal attachment. These results suggest that maternal-fetal attachment serves as a protective factor for women who are not living with a partner. In a comparison of maternal-fetal attachment in primarily single, African American mothers and primarily married, Hispanic-American mothers, Ahern & Ruland, 2003 found that although there was not a significant difference in total attachment scores for the two groups, Hispanic-American mothers scored significantly higher on the subscale “Giving of Self,” which measures the degree to which a mother is willing to adopt a healthier lifestyle during pregnancy. The authors speculate that this finding might be attributed to cultural influences, including marital status. If single, African American mothers are less likely to adopt a healthier lifestyle during pregnancy than their married counterparts, perhaps feeling a stronger connection to their unborn child provides the motivation needed to make these lifestyle changes.

Neighborhood safety. To my knowledge, this was the first study to examine neighborhood and household chaos in a sample of pregnant women. Contrary to my expectations, there were no significant associations between neighborhood safety and any other study variable. I suspect the lack of findings with this measure is due to limited variability in neighborhood ratings. The majority of participants (94.2%) lived in neighborhoods rated average for safety. It is important to note that all home visits took place during regular business hours and in the daylight, and the research assistant never

conducted a home visit alone. These circumstances may have skewed the research assistants' perception of the neighborhood's safety.

Theoretical Framework

This study used two linked conceptual theories as frameworks within which to consider the mechanisms through which perinatal depression might impact child development. The first, the continuum of reproductive casualty (Pasamanick & Knobloch, 1966), hypothesizes that maternal depression during the prenatal period results in long-term deficits in child functioning, regardless of the postnatal environment into which the child is born and raised. In contrast, the continuum of caretaking casualty, developed by Sameroff and Chandler (1975), emphasizes the influence of the postnatal caregiving environment on child outcomes.

Consistent with the literature (Centers for Disease Control and Prevention, 2016) this study found that cigarette use was predictive of adverse birth outcomes, and that the odds of an adverse birth outcome were five times higher for women who reported ever smoking (even if they quit when they found out they were pregnant) compared to those who never smoked. This finding supports the continuum of reproductive casualty, as it suggests that neonatal outcomes are impacted through changes in the fetal environment. Participants who experienced a higher number of depressive symptoms during pregnancy experienced lower levels of maternal-fetal attachment, which in turn led to their engaging in lower quality health practices, including cigarette use.

Given that this study did not follow the infants beyond one month of age, this study is unable to determine the long-term impact of the postnatal environment. However, since this study is part of a larger study that does follow infants beyond one month of age,

future research will be able to shed light on how the postnatal caregiving environment impacts child outcomes. The continuum of caretaking casualty hypothesizes that although prenatal depression could render children vulnerable to later deficits in functioning, a healthy and nurturing postnatal environment could serve as a protective factor against the long-term consequences of prenatal depression. In the future, I plan to examine the differential impact of maternal functioning during the prenatal and postnatal periods on the infant outcomes at 4-6 months postpartum.

Policy and Practice Implications

Findings from this study, especially those related to trauma exposure, prenatal depressive symptoms, and maternal-fetal attachment, can be used to inform policy and practice. The following section presents policy and practice implications aimed at improving perinatal care and intervention for low-income mothers.

Policy

In 2016, the federal government took three significant steps towards facilitating new routes to finance, expand, and systematize maternal depression identification and treatment, as well as to generally support the well-being of high-risk women during the perinatal period. First, in January 2016, the United States Preventive Services Task Force (USPSTF) determined that screening for depression in all adults, including pregnant and postpartum mothers, is a preventive service that is well-supported by evidence (U.S. Preventive Services Task Force, 2016). This decision is important because the Affordable Care Act requires that all insurers cover, at no cost to the beneficiary, preventive services that are identified by USPSTF, and state Medicaid programs may have the opportunity to obtain an incentive payment if they cover the screening and other preventive services

with no cost-sharing to the beneficiary (U.S. Centers for Medicare & Medicaid Services, 2011).

This federal recommendation is long overdue and offers the opportunity to increase the number of mothers who are screened and receive treatment for depression. However, some critics argue that the guidance is not specific enough, as it does not specify when patients should be screened, how often screening should occur, whether or not specific risk factors (sex, race, socioeconomic status) should impact screening intervals, or when a doctor should follow-up with a patient who has screened positive for depression (Reynolds & Frank, 2016). Similarly, the American College of Obstetricians and Gynecologists (ACOG) recommends screening for depression and anxiety at least once during the perinatal period (The American College of Obstetricians and Gynecologists, 2015), but it does not specify when the screening should occur, or for which groups of women screening would be particularly beneficial.

The findings from the current study may shed light on the timing and target of screenings. First, I found that during the third trimester of pregnancy (average gestational age = 32 weeks), the majority of participants (77.1%) reported at least one depressive symptom, and that participants who experienced a higher number of depressive symptoms during pregnancy experienced lower levels of maternal-fetal attachment, which in turn led to engaging in lower quality health practices. Thus, in order to prevent the deleterious impact of depressive symptoms on the developing maternal-fetal relationship, and the subsequent impact on maternal health practices, screening for and treatment of depression should take place prior to the third trimester of pregnancy.

In addition, this study documented that marital status, specifically being single, widowed, or divorced, and lifetime exposure to traumatic events were both predictive of depressive symptoms during pregnancy. These findings suggest that screening for depressive symptoms is especially important for these subgroups of women. Many social policies include increased attention to and funding for participants who are at high-risk of presenting a particular physical or mental health challenge. For example, the high rates of intimate partner violence among pregnant women (Mendez-Figueroa et al., 2013) argues for more funding for mental health support for women during the perinatal period.

Finally, this study found that prenatal depressive symptoms were significantly predictive of postnatal depressive symptoms, suggesting a patient who has screened positive for depression during the prenatal period should not only be monitored to ensure mental health treatment during the prenatal period, but also during the postpartum period. Thus, reimbursement for these screenings during pediatric visits is vital. Additionally, policy-makers should advocate for formalized collaboration between obstetric and pediatric care, particularly in reference to sustained monitoring of perinatal depression.

The second federal step forward came in March 2016, when the U.S. Centers for Medicare and Medicaid Services (CMS) and the Health Resources and Services Administration (HRSA) issued a joint Informational Bulletin to help states understand how to appropriately draw on Medicaid funding to support home visiting (U.S. Centers for Medicare & Medicaid Services & U.S. Department of Health and Human Services Health Resources and Services Administration, 2016). This guidance could be helpful for maternal depression initiatives, as many include home visiting components. Prenatal home visiting programs for first-time low-income mothers have been documented as a

beneficial intervention for improving maternal and child outcomes (e.g. Olds et al., 2010). Given that the current study did not find any significant differences between first-time mothers and mothers experiencing subsequent pregnancies, my findings support an expansion of home visiting programs to include mothers experiencing subsequent pregnancies.

Lastly, in May 2016, CMS released an Informational Bulletin clarifying that states can allow maternal depression screenings to be claimed as a service for the child under Medicaid's Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) benefit. Because the scientific evidence indicates that maternal depression is a risk factor for the child, screening for maternal depression in a well-child visit is now considered a best practice (U.S. Centers for Medicare & Medicaid Services, 2016). Once a state makes that choice, providers such as pediatricians can be reimbursed for conducting the screening. After diagnosis, the guidance also clarifies that treatment services provided to the mother and child together—for example, family or dyadic therapy (but not separate treatment for the mother alone)—can also be claimed as direct services for the child. This guidance could offer an excellent opportunity for bringing child care and early education, mental health, health, and other stakeholders together to address maternal depression policies more broadly.

While these federal recommendations offer important new routes to support families affected by perinatal depression and other risk factors, major efforts to take advantage of these policy changes are still very rare. A recent report highlights some of the reasons for this lack of effort, including historical barriers between the health, mental health, and child care and early education systems; the difficulty of understanding and

influencing complex policies—particularly in Medicaid; and the lack of national strategy or targeted technical assistance that could help cut through this complexity (Schmit & Walker, 2016). Findings from the current study highlight the need for more coordinated, comprehensive, and streamlined services for women during the perinatal period.

All participants in this study were receiving WIC, a supplemental nutrition program providing nutritious foods and nutrition education, and all participants were seeing a doctor for prenatal care. Although these two services share the same goal—improving the health of pregnant women and infants—the systems are not coordinated, requiring pregnant women to navigate two separate bureaucracies, and neither system provides mental health or social services. If a participant from my study had been screened for exposure to trauma or prenatal depressive symptoms, either by a WIC staff member or by her obstetrician, she likely would have been referred to a third organization for mental health and/or social services. Considering the overlap and interplay between variables such as marital status, lifetime exposure to trauma, prenatal depressive symptoms, maternal-fetal attachment, health practices during pregnancy, and postnatal depressive symptoms, it is both inefficient and ineffective to have separate systems for each fundamental element of a healthy pregnancy. In summary, findings from this study highlight the need for a federally supported infrastructure to support service-integration, comprehensive women’s health care over the life course, and in particular, coordinated services for all women during the perinatal period, particularly in regard to mental health.

Practice

As with policy, findings from this study have several important practice implications. The following section situates current findings in the context of family

engagement in services emanating from medical homes, trauma-informed care, and relationship-based therapies.

Medical homes. Building on the idea of comprehensive perinatal services, some experts posit that every woman in America should have a patient-centered medical home (Lu, 2010). A medical home would provide preconception and interconception care, mental health services, genetic counseling, childbirth and parenting education classes, breastfeeding support, and other social services to make these centers truly a one-stop shop for perinatal services. Findings from this study support the development of such an integrated system. During pregnancy, a woman could visit her medical home to receive prenatal care, learn about health practices during pregnancy, and to sign up for a supplemental nutrition program. If she needed help with a substance use disorder, such as smoking cessation, her healthcare provider could refer her to an onsite substance abuse counselor. If she screened positive for trauma exposure and/or prenatal depression, she could be referred to an onsite mental health counselor. And if she needed more than one service—such as substance abuse and mental health—providers would collaborate to design the best course of treatment to optimize maternal and neonatal outcomes. All pregnant women could participate in childbirth and parenting education classes, which would include components on the developing maternal-fetal relationship, and afford them the opportunity to develop social support networks with other pregnant women.

Trauma informed perinatal care. In recent years, the term “trauma-informed care” (TIC) has been used to describe ways in which providers in varied settings (i.e., social service, education, health care, and corrections) can better serve people who have experienced traumatic life events (Raja, Hasnain, Hoersch, Gove-Yin, & Rajagopalan,

2013). The basic definition of TIC is when every part of service is assessed and potentially modified to include a basic understanding of how trauma impacts the life of an individual seeking services (The National Center for Trauma-Informed Care, Substance Abuse and Mental Health Services Administration, 2016). Given that the majority of participants (88.6%) in this study reported having experienced at least one traumatic event in her lifetime, TIC should be incorporated into existing services for low-income pregnant and postpartum mothers. Furthermore, this study's link between trauma exposure and prenatal depressive symptoms indicates that trauma screening should be a regular part of a woman's first prenatal care visit, and prenatal care providers should be prepared to offer services to women who screen positive. The integration of trauma treatment and prenatal services has the potential to contribute to a decrease in IPV and other experiences of trauma that could harm women and their unborn children.

Relationship-based therapies and interventions. Although several treatment models have shown promise in treating perinatal depressive symptoms in low-income mothers (e.g. Ammerman et al., 2013; Tandon, Perry, Mendelson, Kemp, & Leis, 2011), these interventions appear to have had a limited impact on the development of young children (Ammerman et al., 2015). These findings have led several researchers to argue that therapies should not only treat maternal depressive symptoms, but should also focus on the mother-child relationship (Nylen & Moran, 2006). Child Parent Psychotherapy (CPP), for instance, is a relationship-based treatment designed to break the intergenerational transmission of trauma and psychopathology in families with children under the age of 5 (Lieberman & Van Horn, 2005, 2008). Recently adapted for the perinatal period, CPP beginning in the third trimester of pregnancy and continuing

through 6 months postpartum was found to improve symptoms of depression and post-traumatic stress and enhance child-rearing attitudes in a sample of mothers who had experienced intimate partner violence (Lavi, Gard, Hagan, Van Horn, & Lieberman, 2015). Women with low levels of maternal-fetal attachment prior to treatment were found to benefit the most from this intervention, suggesting that improving the maternal-fetal relationship is a promising way to promote mental health and maternal functioning during pregnancy.

Findings from the current study support this assertion. Maternal-fetal attachment during the third trimester of pregnancy was predictive of health practices during pregnancy, and for mothers who were not married or cohabitating, maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices. These results indicate that single women who experience depressive symptoms, but who feel more attached to their unborn child, are less likely to engage in lower quality health practices (such as cigarette use) compared to single women who experience depressive symptoms but who do not feel as attached to their unborn child. This important finding implies that maternal-fetal attachment could serve as an important protective factor for single mothers, and that single mothers could show the most benefit from interventions that focus on strengthening the relationship between the mother and her unborn child.

Research Limitations and Directions

The current study adds to the limited research on perinatal risk and protective factors in African American women, but it also has several limitations and brings to light several important directions for future research.

Limitations

This study relied on a small convenience sample of pregnant women recruited through WIC clinics, and is not generalizable to a broader population, including non-English speaking samples. The WIC program in Maryland has an income threshold of 185% of the federal poverty level, and as such my sample may not be representative of the poorest, highest risk women. In addition, the small sample size may have made it more difficult to detect significant relationships in the data. Based on the program G*Power (Faul, Erdfelder, Buchner, & Lang, 2009), post hoc power analyses determined that the research questions employing linear multiple regression with two predictor variables, a sample size of 70 yielded a power of .82, which falls within the recommended range of .80-.90. However for the research questions employing logistic regression analyses, post hoc power analyses determined that power fell between .20-.90 (depending on the research question). Power below .80 increases the chances of making a Type II error, or concluding that there is no effect when in fact there is an effect.

The current study also relied heavily on maternal self-report as a data collection method. Study participants were asked to report their household incomes, however I was not confident that their reports were accurate based on inconsistencies within and across SES questions, and therefore household income was excluded from my analyses. Although the parent-child development field is relying increasingly on physiological measures of psychological functioning, this study did not examine the physiologic correlates of depression and trauma (e.g., cortisol) in relation to neonatal outcomes. Additionally, given the low Cronbach's alpha on the Maternal Postnatal Attachment

Scale (MPAS), I may not have had a reliable nor valid measure of attachment during the postpartum period.

Finally, although this study contributed to a gap in the literature regarding two specific risk factors that may increase women's potential for perinatal depression: trauma exposure and neighborhood safety, it did not address other psychological and ecological risk and protective factors, such as perception of discrimination, self-efficacy, family conflict, and social support (including male partners).

Research Directions

This study found that marital status was predictive of prenatal depressive symptoms, but I was unable to examine whether marital status served as a proxy for another variable, such as household income or social support. Future research could shed light on the relationship between marital status and prenatal depressive symptoms by including a more precise measure of household income and a measure of social support during pregnancy. A key question would be whether it is the presence of a romantic partner that buffers women from prenatal depression, or is it the additional financial resources, social support, or both?

More research is needed to examine the validity and reliability of the MPAS in low-income African American women. Future studies should employ observational measures to assess the maternal-infant relationship in the early postnatal period. In addition, longitudinal studies should be conducted to examine the links between maternal-fetal attachment, maternal-infant attachment in the early postnatal period, and the maternal-infant relationship in the later postnatal period. Furthermore, these constructs should be studied in conjunction with perinatal depression, as additional

research is needed to tease apart the distinct impact of prenatal depression and postnatal depression on the maternal-infant relationship.

Given the significant findings connecting maternal-fetal attachment to health practices during pregnancy and to postnatal attachment, future researchers should test culturally relevant interventions aimed at improving the maternal-fetal relationship. Technological advances now allow women to detect their pregnancies earlier, and they are able to view ultrasound images of their fetus at earlier dates. Incorporating technology, with an appropriate educational component, into an intervention may serve as the impetus for adopting positive health practices at an earlier time period in pregnancy. As research on the implications of poor maternal-fetal attachment grows, there is a critical need for early identification and appropriate intervention. In addition, research should investigate the integration of maternal-fetal attachment into existing interventions for depression and trauma, such as maternal home visiting programs.

Considering that this study did not find a significant link between health practices during pregnancy and neonatal outcomes, future research should more carefully examine links between maternal health during pregnancy and neonatal health outcomes by using physiological and biological markers of health, such as cortisol or cellular aging. DNA structures called telomeres, located at the end of chromosomes, function to protect against chromosomal recombination and degradation. Shorter telomere length is associated with advancing chronological age, disease morbidity, and mortality (Shalev, 2013). Such research would build on the limited knowledge base on the physiological consequences of risk factors, such as poverty and trauma exposure, in low-income

African American mothers and their young infants, and help to explain how society gets under the skin.

As this study is part of a larger, ongoing study, there are several additional variables that I plan to examine in the future. First, I plan to explore experiences of discrimination, and in particular investigate how experiences of discrimination relate to trauma, depression, and adverse birth outcomes. An examination of discrimination may provide additional cultural contexts to this work, and help to shed light on what these findings mean for low income, African American women.

I also plan to do a more thorough examination of trauma. First, I plan to sort traumatic events by the age at which the event occurred in order to study the impact of adverse childhood experiences on both maternal functioning during pregnancy and adverse birth outcomes. Next, I plan to sort traumatic events by the type of event that occurred, in order to study the specific impact of events such as sexual abuse and intimate partner violence.

Conclusion

Perinatal depression is a serious public health concern that has significant implications for children and families, especially those living in poverty. This study contributes to the limited research examining perinatal depression in low-income African American women in the United States. Although adverse pregnancy outcomes are more prevalent in minority and low-income populations (Patrick & Bryan, 2005), scant research has examined the relationship between environmental risk factors, maternal functioning during pregnancy, and neonatal outcomes in low-income populations. To my knowledge, this study is the first to examine the link between perinatal depression and

maternal-fetal attachment, and adds to the limited literature on experiences of trauma in a high-risk pregnant sample.

Among the findings of this study were that marital status and trauma exposure significantly contributed to prenatal depressive symptoms. Also, maternal-fetal attachment mediated the relationship between prenatal depressive symptoms and health practices, but only for participants who were not married or cohabitating. In addition, maternal cigarette use significantly increased the odds of an adverse birth outcome. Finally, maternal-fetal attachment significantly predicted maternal-infant attachment.

These findings suggest that depression screenings should be a regular part of prenatal care visits, especially for single women and for women who have experienced trauma. Further, strengthening the maternal-fetal relationship could potentially alleviate the impact of maternal depression on maternal health practices during pregnancy and increase mothers' connection to their infants during the postpartum period. Overall, the findings from the current study reinforce the need to address depression and associated risk factors during pregnancy, in order to promote the well-being of low-income African American women and positive outcomes for their infants.

Appendix A: Study Instruments

Screening Measure

Date: _____

Participant #: _____

Thank you for your interest in our study. In order to see if you are eligible to participate, I am going to start by asking you some questions about yourself.

1. Are you currently pregnant? *(If no, discontinue with screen)*
 - a. Yes _____ No _____
2. How old are you? _____
3. What is your date of birth? _____
4. What language do you speak at home? _____
5. Has a doctor, nurse, or other health care professional ever told you that you have any of the following medical conditions?
 - Chronic high blood pressure Yes No
 - Pre-eclampsia Yes No
 - Clotting disorder Yes No
 - Diabetes Yes No
 - Sickle cell Yes No

Now I am going ask you some questions about your current pregnancy.

6. How many weeks pregnant are you? _____
7. When is your (approximate) due date? _____
8. During a first or second trimester checkup, has a doctor, nurse, or other health care professional talked with you about any abnormal test results, such as a known fetal abnormality? *(For example, down syndrome or cardiac defect)*
 - a. Yes _____ No _____
 - b. If yes, what were the results? _____

Now I am going ask you some questions about your past pregnancies.

9. Before this pregnancy, how many times had you been pregnant? _____
10. How many children do you have? _____

11. (*If number of children and number of pregnancies are inconsistent*) How many abortions or miscarriages have you had?

a. Abortions: _____

b. Miscarriages: _____

Other (please explain): _____

Demographic and Pregnancy Background

Date: _____

Participant #: _____

I am going to start by asking you some questions about yourself.

1. What is your ethnicity?
 - Hispanic
 - Not Hispanic

2. What is your race?
 - American Indian or Alaska Native
 - Asian
 - Black or African American
 - Native Hawaiian or other Pacific Islander
 - White
 - Biracial

3. What is your current marital status?
 - Never married
 - Married
 - Divorced
 - Widowed
 - Living with partner

4. What is the highest year of school that you have completed (including GED)?

Elementary School	High School	College	Graduate School
01 _____	09 _____	13 _____	17 _____
02 _____	10 _____	14 _____	18 _____
03 _____	11 _____	15 _____	19 _____
04 _____	12 _____	16 _____	20+ _____
05 _____			
06 _____			
07 _____			
08 _____			

5. What is your family's total monthly income?
- Wages _____
 - TANF _____
 - Total monthly income _____
6. Do you receive The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)? Yes _____ No _____

Now I am going to ask you some questions about your current pregnancy.

7. When you got pregnant, were you trying to get pregnant?
- Yes _____
 - No _____
8. When you got pregnant, were you or your husband or partner doing anything to keep from getting pregnant? (Some things people do to keep from getting pregnant include not having sex at certain times [natural family planning or rhythm] or withdrawal, and using birth control methods such as the pill, condoms, vaginal ring, IUD, having their tubes tied, or their partner having a vasectomy.)
- Yes _____
 - No _____
9. Right before you became pregnant, did you want to have a(nother) baby at any time in the future?
- Yes _____
 - No _____
 - Not sure _____
 - Didn't care _____
10. Would you say that you became pregnant too soon, at about the right time, or later than you wanted?
- Too soon _____
 - Right time _____
 - Later _____
 - Didn't care _____
11. How many weeks or months pregnant were you when you were *sure* you were pregnant? (For example, you had a pregnancy test or a doctor or nurse said you were pregnant.)
- _____ weeks
 - _____ months
 - I don't remember

12. How many weeks or months pregnant were you when you had your first visit for prenatal care? (Do not count a visit that was only for a pregnancy test or only for WIC)

- a. _____ weeks
- b. _____ months
- c. I didn't go for prenatal care

13. Did any of these things keep you from getting prenatal care at all or as early as you wanted? (Yes/No)

- | | | |
|---|---|---|
| a. I couldn't get an appointment when I wanted one | Y | N |
| b. I didn't have enough money or insurance to pay for my visits | Y | N |
| c. I had no transportation to get to the clinic or doctor's office | Y | N |
| d. The doctor or my health plan would not start care as early as I wanted | Y | N |
| e. I had too many other things going on | Y | N |
| f. I couldn't take time off from work or school | Y | N |
| g. I didn't have my Medicaid card | Y | N |
| h. I had no one to take care of my children | Y | N |
| i. I didn't know that I was pregnant | Y | N |
| j. I didn't want anyone else to know I was pregnant | Y | N |
| k. I didn't want prenatal care | Y | N |

The Trauma History Questionnaire

The following is a series of questions about serious or traumatic life events. These types of events actually occur with some regularity, although we would like to believe they are rare, and they affect how people feel about, react to, and/or think about things subsequently. Knowing about the occurrence of such events, and reactions to them, will help us to develop programs for prevention, education, and other services. The questionnaire is divided into questions covering crime experiences, general disaster and trauma questions, and questions about physical and sexual experiences.

For each event, please indicate (circle) whether it happened and, if it did, the number of times and your approximate age when it happened (give your best guess if you are not sure). Also note the nature of your relationship to the person involved and the specific nature of the event, if appropriate.

Crime-Related Events		Circle one		<i>If you circled yes, please indicate</i>	
				Number of times	Approximate age(s)
1	Has anyone ever tried to take something directly from you by using force or the threat of force, such as a stick-up or mugging?	No	Yes		
2	Has anyone ever attempted to rob you or actually robbed you (i.e., stolen your personal belongings)?	No	Yes		
3	Has anyone ever attempted to or succeeded in breaking into your home when you were <u>not</u> there?	No	Yes		
4	Has anyone ever attempted to or succeed in breaking into your home while you <u>were</u> there?	No	Yes		
General Disaster and Trauma		Circle one		<i>If you circled yes, please indicate</i>	
				Number of times	Approximate age(s)
5	Have you ever had a serious accident at work, in a car, or somewhere else? (if yes , please specify below) _____	No	Yes		
6	Have you ever experienced a natural disaster such as a tornado, hurricane, flood or major earthquake, etc., where you felt you or your loved ones were in danger of death or injury? (if yes , please specify below) _____	No	Yes		
7	Have you ever experienced a "man-made" disaster such as a train crash, building collapse, bank robbery, fire, etc., where you felt you or your loved ones were in danger of death or injury? (if yes , please specify below) _____	No	Yes		

8	Have you ever been exposed to dangerous chemicals or radioactivity that might threaten your health?	No	Yes		
9	Have you ever been in any other situation in which you were seriously injured? (<u>If yes</u> , please specify below) _____	No	Yes		
10	Have you ever been in any other situation in which you feared you <u>might</u> be killed or seriously injured? (<u>If yes</u> , please specify below) _____	No	Yes		
11	Have you ever seen someone seriously injured or killed? (<u>If yes</u> , please specify who below) _____	No	Yes		
12	Have you ever seen dead bodies (other than at a funeral) or had to handle dead bodies for any reason? (<u>If yes</u> , please specify below) _____	No	Yes		
13	Have you ever had a close friend or family member murdered, or killed by a drunk driver? (<u>If yes</u> , please specify relationship [e.g., mother, grandson, etc.] below) _____	No	Yes		
14	Have you ever had a spouse, romantic partner, or child die? (<u>If yes</u> , please specify relationship below) _____	No	Yes		
15	Have you ever had a serious or life-threatening illness? (<u>If yes</u> , please specify below) _____	No	Yes		
16	Have you ever received news of a serious injury, life-threatening illness, or unexpected death of someone close to you? (<u>If yes</u> , please indicate below) _____	No	Yes		
17	Have you ever had to engage in combat while in military service in an official or unofficial war zone? (<u>If yes</u> , please indicate where below) _____	No	Yes		

Physical and Sexual Experiences		Circle one		If you circled yes, please indicate	
				Repeated?	Approximate age(s) and frequency
18	Has anyone ever made you have intercourse or oral or anal sex against your will? (If yes , please indicate nature of relationship with person [e.g., stranger, friend, relative, parent, sibling] below) _____	No	Yes		
19	Has anyone ever touched private parts of your body, or made you touch theirs, under force or threat? (If yes , please indicate nature of relationship with person [e.g., stranger, friend, relative, parent, sibling] below) _____	No	Yes		
20	Other than incidents mentioned in Questions 18 and 19, have there been any other situations in which another person tried to force you to have an unwanted sexual contact?	No	Yes		
21	Has anyone, including family members or friends, ever attacked you with a gun, knife, or some other weapon?	No	Yes		
22	Has anyone, including family members or friends, ever attacked you <u>without</u> a weapon and seriously injured you?	No	Yes		
23	Has anyone in your family ever beaten, spanked, or pushed you hard enough to cause injury?	No	Yes		
24	Have you experienced any other extraordinarily stressful situation or event that is not covered above? (If yes , please specify below) _____	No	Yes		

The Edinburgh Postnatal Depression Scale

Edinburgh Postnatal Depression Scale (EPDS) Form*

Name _____ Address: _____

Your Date of Birth _____

Baby's Date of Birth: _____ Phone: _____

SAMPLE QUESTION:

As you are pregnant or have recently had a baby, we would like to know how you are feeling. Please check the answer that comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

Here is an example, already completed.

I have felt happy:

Yes, all the time

Yes, most of the time This would mean: "I have felt happy most of the time" during the past week.

No, not very often Please complete the other questions in the same way.

No, not at all

In the past 7 days:

1. I have been able to laugh and see the funny side of things

- As much as I always could
- Not quite so much now
- Definitely not so much now
- Not at all

2. I have looked forward with enjoyment to things

- As much as I ever did
- Rather less than I used to
- Definitely less than I used to
- Hardly at all

*3. I have blamed myself unnecessarily when things went wrong

- Yes, most of the time
- Yes, some of the time
- Not very often
- No, never

4. I have been anxious or worried for no good reason

- No, not at all
- Hardly ever
- Yes, sometimes
- Yes, very often

*5. I have felt scared or panicky for no very good reason

- Yes, quite a lot
- Yes, sometimes
- No, not much
- No, not at all

*6. Things have been getting on top of me

- Yes, most of the time I haven't been able to cope at all
- Yes, sometimes I haven't been coping as well as usual
- No, most of the time I have coped quite well
- No, I have been coping as well as ever

*7. I have been so unhappy that I have had difficulty sleeping

- Yes, most of the time
- Yes, sometimes
- Not very often
- No, not at all

*8. I have felt sad or miserable

- Yes, most of the time
- Yes, quite often
- Not very often
- No, not at all

*9. I have been so unhappy that I have been crying

- Yes, most of the time
- Yes, quite often
- Only occasionally
- No, never

*10. The thought of harming myself has occurred to me

- Yes, quite often
- Sometimes
- Hardly ever

Administered/Reviewed by _____ Date _____

*Source: Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1987;150:782-786.

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Maternal Antenatal Attachment Scale

Please select the response that is closest to your own feelings.

1. Over the past two weeks I have thought about, or been preoccupied with the baby inside me:

1. almost all the time
2. very frequently
3. frequently
4. occasionally
5. not at all

2. Over the past two weeks when I have spoken about, or thought about the baby inside me I got emotional feelings which were:

1. very weak or non-existent
2. fairly weak
3. in between weak and strong
4. fairly strong
5. very strong

3. Over the past two weeks my feelings about the baby inside me have been:

1. very positive
2. mainly positive
3. mixed positive and negative
4. mainly negative
5. very negative

4. Over the past two weeks I have had the desire to read about or get information

about the developing baby. The desire is:

1. very weak or non-existent
2. fairly weak
3. in between weak and strong
4. fairly strong
5. very strong

5. Over the past two weeks I have been trying to picture in my head what the developing baby actually looks like in my womb:

1. almost all the time
2. very frequently
3. frequently
4. occasionally
5. not at all

6. Over the past two weeks I think about the developing baby mostly as:

1. a real little person inside me with special characteristics
2. a baby like any other baby
3. a human being
4. a living thing
5. a thing not yet really alive

7. Over the past two weeks I have felt the baby inside me is dependent on me for its well-being:

1. totally
2. a great deal

3. moderately

4. slightly

5. not at all

8. Over the past two weeks I have found myself talking to my baby when I am alone:

1. not at all

2. occasionally

3. frequently

4. very frequently

5. almost all the time I am alone

9. Over the past two weeks when I think about (or talk to) my baby inside me, my thoughts:

1. are always tender and loving

2. are mostly tender and loving

3. are a mixture of both tenderness and irritation

4. contain a fair bit of irritation

5. contain a lot of irritation

10. The picture in my mind of what the baby at this stage actually looks like inside the womb is:

1. very clear

2. fairly clear

3. fairly vague

4. very vague

5. I have no idea at all

11. Over the past two weeks when I think about the baby inside me I get feelings which are:

1. very sad
2. moderately sad
3. a mixture of happiness and sadness
4. moderately happy
5. very happy

12. Some pregnant women sometimes get so irritated by the baby inside them that they feel like they want to hurt it or punish it:

1. I couldn't imagine I would ever feel like this
2. I could imagine I might sometimes feel like this, but I never actually have
3. I have felt like this once or twice myself
4. I have occasionally felt like this myself
5. I have often felt like this myself

13. Over the past two weeks I have felt:

1. very emotionally distant from my baby
2. moderately emotionally distant from my baby
3. not particularly close to my baby
4. moderately close emotionally to my baby
5. very close emotionally to my baby

14. Over the past two weeks I have taken care with what I eat to make sure the baby gets a good diet:

1. not at all

2. once or twice when I ate
3. occasionally when I ate
4. quite often when I ate
5. every time I ate anything

15. When I first see my baby after the birth I expect I will feel:

1. intense affection
2. mostly affection
3. dislike about one or two aspects of the baby
4. dislike about quite a few aspects of the baby
5. mostly dislike

16. When my baby is born I would like to hold the baby:

1. immediately
2. after it has been wrapped in a blanket
3. after it has been washed
4. after I have had a rest for an hour or so
5. the next day

17. Over the past two weeks I have had dreams about the pregnancy or baby:

1. not at all
2. occasionally
3. frequently
4. very frequently
5. almost every night

18. Over the past two weeks I have found myself feeling or rubbing with my hand, the

outside of the stomach where the baby is:

1. a lot of times each day
2. at least once per day
3. occasionally
4. once only
5. not at all

19.If the pregnancy was lost at this time (due to miscarriage or other accidental event) without any pain or injury to myself, I expect I would feel:

1. very pleased
2. moderately pleased
3. neutral (ie: neither sad nor pleased; or mixed feelings)
4. moderately sad
5. very sad

The Health Practices in Pregnancy Questionnaire-II

On this questionnaire, we will be asking you about illicit drug use during pregnancy. The District of Columbia government requires us to make a report to Child Protective Services when women report using illegal substances (e.g. cocaine) while pregnant. If you prefer not to talk about this topic, you can choose not to answer this question.

Pick the ONE answer that best describes your actions since you found out you were pregnant. I know that sometimes you are prevented from doing things the way you planned because of, for example, illness, nausea, or medical history. If these special circumstances apply to you, answer questions by thinking about what you did before the problem occurred that required you to change your actions.

	Never	Rarely	Sometimes	Often	Always
1. Since becoming pregnant, I think I am practicing a healthy lifestyle					
2. Since becoming pregnant, I have gotten at least 7 to 8 hours of sleep a night					
3. Since becoming pregnant, I have exercised for at least 20 minutes a day, at least 3 times per week					
4. Since becoming pregnant, I have used seatbelts, when available, when driving in a car, truck, or van					
5. Since becoming pregnant, I drink more than 2 caffeinated beverages (e.g. coffee, tea, or soda) in a day					
6. Since becoming pregnant, I have used marijuana					
7. *Since becoming pregnant, I have used cocaine, crack cocaine, speed, LSD, heroine, or inhalants					
8. Since becoming pregnant, my partner and/or I have had sex with other people					
9. Since becoming pregnant, I take actions that reduce my risk for getting sexually transmitted diseases (e.g. I have used condoms or avoided intercourse)					

10. When I have concerns about my health or the health of my baby, I report them to my doctor or midwife					
11. When I have questions about my pregnancy or there is something I don't understand, I ask my doctor or midwife					
12. Since becoming pregnant, I have taken herbal remedies other than those recommended to me by my doctor or midwife					
13. Since becoming pregnant, I have read food labels to be sure I am buying an item that will be good for me and my baby (e.g. not too high in salt or fat, avoiding artificial sweeteners, and good sources of vitamins)					
14. Since becoming pregnant, I have douched					
15. Since becoming pregnant, I have avoided bathing or sitting in water that exceeds 100 degrees F					
16. Since becoming pregnant, I have limited or avoided exposure to toxic chemicals and other substances (e.g. second-hand smoke, pesticides, insecticides, or drinking lead in water)					
17. Since becoming pregnant, I talk to my doctor or midwife before taking any medication or supplement					
18. Since becoming pregnant, I have taken my multivitamins or prenatal vitamins (if recommended by your doctor or midwife)					
19. Since becoming pregnant, I take in adequate calcium (1200mg/d) by eating dairy products or other calcium-rich foods, or taking supplements					
20. Since becoming pregnant, I have eaten 5 servings of fruit and/or					

vegetables in a day					
21. Since becoming pregnant, I have eaten enough fiber or roughage in my diet (whole grain breads, high fiber cereals, fruits and vegetables)					

22. Since becoming pregnant, I have smoked cigarettes:

- A. Never smoked
- B. Quit since finding out I was pregnant
- C. Less than 10 cigarettes a day
- D. 11 to 20 cigarettes a day
- E. More than a pack a day

23. Since becoming pregnant, I have had alcoholic beverages (wine, beer, liquor):

- A. Never drank alcoholic drinks
- B. Quite since finding out I was pregnant
- C. Less than 3 times a month
- D. 1 time a week
- E. More than 1 time a week

24. Since becoming pregnant, at one sitting I usually drink (one drink is equal to one 12 ounce can of beer, 4 ounces of wine, or a one ounce shot of liquor):

- A. No drinks while pregnant
- B. 1 drink
- C. 2 drinks
- D. 3 drinks
- E. More than 3 drinks

25. I began seeing my doctor or midwife for prenatal care:

- A. To plan a pregnancy before conception
- B. In the first 3 months of pregnancy
- C. Before 5 months of pregnancy
- D. Before 7 months of pregnancy
- E. Before 9 months of pregnancy

26. Since becoming pregnant, I have (missed appointment means forgot to schedule or didn't show up for an appointment with my doctor or midwife):
- A. Never missed an appointment
 - B. Missed 1 appointment
 - C. Missed 2 to 3 appointments
 - D. Missed 4 to 5 appointments
 - E. Missed more than 5 appointments
27. Since becoming pregnant, I have gotten regular dental care (professional cleaning every 6 months or dental work):
- A. I do not get regular dental care
 - B. I have not been to the dentist even though I am due for dental care
 - C. I do not know if I need dental care at this time
 - D. I have visited a dentist and had some care but not everything I need
 - E. I have visited a dentist and had all dental care done
28. Since becoming pregnant, I have looked at books, pamphlets, videos, or the Internet to learn more about pregnancy and childbirth:
- A. Never
 - B. Less than one time a month
 - C. 2 to 3 times a month
 - D. 4 times a month (weekly)
 - E. More than 4 times a month
29. Since becoming pregnant, I have talked to family members more about pregnancy and childbirth:
- A. Never
 - B. Less than one time a week
 - C. 1 to 2 times a week
 - D. 3 to 5 times a week
 - E. More than 5 times a week
30. Since becoming pregnant, I have taken time to do something relaxing for myself:
- A. Never
 - B. Less than one time a month
 - C. 2 to 3 times a month
 - D. 4 times a month (weekly)
 - E. More than 4 times a month

31. Since becoming pregnant, I have gained the amount of weight recommended by my doctor or midwife for this time in pregnancy:
- A. I have lost weight
 - B. I have gained too much weight
 - C. I have not gained or lost weight
 - D. I do not know
 - E. I have gained the right amount of weight
32. Since becoming pregnant, I drink water, fruit or vegetables juices, or other fluids without caffeine daily:
- A. Less than 3 (8 oz) glasses of fluid per day
 - B. 3-4 glasses per day
 - C. 5-6 glasses per day
 - D. 7-8 glasses per day
 - E. More than 8 glasses of fluid per day
33. Since becoming pregnant, I have minimized my chances of getting toxoplasmosis by avoiding cat feces and not eating raw or undercooked meat and by using gloves when working in the garden:
- A. Always
 - B. 5 days a week
 - C. 3 days a week
 - D. Sometimes
 - E. Never
34. I have attended or plan to attend childbirth classes:
- A. No, I have taken them before
 - B. Definitely yes
 - C. Not sure
 - D. Probably not
 - E. Definitely no

Windshield Survey

Windshield Survey

The Windshield Survey consists of 12 questions about how the interview went and about the home and surrounding area.

S01. Family's preparation for session and organization of session.

- 0 Can't rate
- 1 Surprise/Difficulty
- 2 Aware but unprepared
- 3 Aware/ready
- 4 Good hosts

S02. Primary respondent's receptivity toward visitors.

- 0 Can't rate
- 1 Very uncomfortable
- 2 Distant but polite
- 3 Average friendliness
- 4 Very warm

S03. Secondary respondent's receptivity toward visitors.

- 0 Can't rate
- 1 Very uncomfortable
- 2 Distant but polite
- 3 Average friendliness
- 4 Very warm
- 5 Not applicable (no secondary respondent)

S04. How much difficulty did you have in completing the interview?

- 0 Can't rate
- 1 Very smooth
- 2 Slight difficulty
- 3 Some difficulty
- 4 Great difficulty

S05. Do you have any reason to doubt the validity of this interview and home visit?

- 0 Can't rate
- 1 Probably valid
- 2 Respondent responses possibly invalid
- 3 Definitely reasons to doubt validity

S06. How clean is the dwelling?

- 0 Can't rate
- 1 Very dirty
- 2 slightly dirty

- 3 Messy
- 4 Clean

S07. How safe is the interior of the building?

- 0 Can't rate
- 1 Obviously dangerous
- 2 Slightly dangerous
- 3 Average
- 4 Above average safety

S08. How many rooms are in the dwelling?

- 0 Can't rate
- 1 1 or 2
- 2 3 or 4
- 3 5 or 6
- 4 > 6

S09. How safe is the area outside of the home/building?

- 0 Can't rate
- 1 Obviously dangerous
- 2 Slightly dangerous
- 3 Average
- 4 Above average safety

S10. The street on which this dwelling is located is?

- 0 Can't rate
- 1 Mainly residential
- 2 Mixed residential and commercial
- 3 Mostly commercial
- 4 Rural or agricultural

S11. The noise level in this neighborhood around this dwelling is?

- 0 Can't rate
- 1 Very quiet
- 2 Average
- 3 Noisy
- 4 Very noisy

S12. The safety of the neighborhood around this dwelling is?

- 0 Can't rate
- 1 Very safe/crime free
- 2 Average for this city
- 3 Unsafe
- 4 Very unsafe/high-risk

Neonatal Outcomes

Date: _____

Participant #: _____

1. On what date was your baby due? _____
2. On what date was your baby born? _____
3. How many weeks pregnant were you when you have birth? _____
4. Was your baby born premature?
 - a. Yes
 - b. No
5. How much did your baby weigh when he or she was born?
 - a. _____ pounds
 - b. _____ ounces
6. The Apgar test is a test given to newborns immediately after and five minutes after birth. The test is evaluates a newborn's physical condition after delivery and determines if any extra care, such as CPR, is needed. Do you remember your baby's Apgar scores?
 - a. Yes:
 - i. Immediate score _____
 - ii. Five minute score _____
 - b. No, I don't remember
7. After your baby was born, was he or she put in an intensive care unit?
 - a. Yes _____
 - b. No _____
 - c. I don't know _____
8. After your baby was born, how long did he or she stay in the hospital?
 - a. _____ days
9. Did you ever breastfeed or pump breast milk to feed your baby?
 - a. Yes _____
 - b. No _____
 - c. I don't know _____
10. Are you currently breastfeeding or feeding pumped milk to your baby?
 - a. Yes _____
 - b. No _____

Maternal Postnatal Attachment Scale

These statements concern the different sorts of emotional reactions parents have when caring for young babies. Please select the response which is closest to your own feelings.

1. When I am caring for the baby, I get the feeling of annoyance or irritation:

1. very frequently
2. frequently
3. occasionally
4. very rarely
5. never

2. When I am caring for the baby I get the feeling that the child is deliberately being difficult or trying to upset me:

1. very frequently
2. frequently
3. occasionally
4. very rarely
5. never

3. Over the last two weeks I would describe my feelings for the baby as:

1. dislike
2. no strong feelings towards the baby
3. slight affection
4. moderate affection
5. intense affection

4. I can understand what my baby needs or wants:

1. almost always

2. usually
 3. sometimes
 4. rarely
 5. almost never
5. Regarding my overall level of interaction with the baby, I believe I am:
1. much more involved than most parents in my position
 2. somewhat more involved than most parents in my position
 3. involved to the same extent as most parents in my position
 4. somewhat less involved than most parents in my position
 5. much less involved than most parents in my position
6. When I am with the baby I feel bored:
1. very frequently
 2. frequently
 3. occasionally
 4. very rarely
 5. never
7. When I am with the baby and other people are present I feel proud of the baby:
1. very frequently
 2. frequently
 3. occasionally
 4. very rarely
 5. never
8. I try to involve myself as much as possible in child care and looking after the baby:

1. this is true

2. this is untrue

9. I find myself talking to people (other than my partner) about the baby:

1. many times each day

2. a few times each day

3. once or twice a day

4. rarely on any one day

10. When I have to leave the baby:

1. I usually feel rather sad (or it's difficult to leave)

2. I often feel rather sad (or it's difficult to leave)

3. I have mixed feelings of both sadness and relief

4. I usually feel rather relieved

11. When I am with the baby:

1. I always get a lot of enjoyment/satisfaction

2. I frequently get a lot of enjoyment/satisfaction

3. I occasionally get a lot of enjoyment/satisfaction

4. I rarely get a lot of enjoyment/satisfaction

12. When I am not with the baby, I find myself thinking about the baby:

1. almost all the time

2. very frequently

3. frequently

4. occasionally

5. not at all

13. When I am with the baby:

1. I usually try to prolong the time I spend with him/her
2. I usually try to shorten the time I spend with him/her

14. When I have been away from the baby for a while and I am about to be with him/her again, I usually feel:

1. intense pleasure at the idea
2. moderate pleasure at the idea
3. mild pleasure at the idea
4. no feelings at all about the idea
5. negative feelings about the idea

15. Over the past two weeks I have found myself just sitting looking at the sleeping baby for periods of five minutes or more:

1. very frequently
2. frequently
3. a few times
4. not at all

16. I now think of the baby as:

1. very much my own baby
2. a bit like my own baby
3. not yet really my own baby

17. Regarding the things that I/we have had to give up because of this baby:

1. I find that I resent it quite a lot
2. I find that I resent it a moderate amount

3. I find that I resent it a bit

4. I don't resent it at all

18. Over the past two weeks, I have felt that I do not have enough time for myself to pursue my own interests:

1. almost all the time

2. frequently

3. a few times

4. not at all

19. Usually when I am with the baby:

1. I am very impatient

2. I am a bit impatient

3. I am moderately patient

4. I am extremely patient

Appendix B: Approved IRB Application

Abstract Summary

Young children whose mothers are depressed are vulnerable to a range of negative developmental outcomes beginning during the prenatal period and persisting throughout childhood. There is a large and growing need for evidence-informed pre-and postnatal services for pregnant and post-partum women whose are experiencing depressive symptomatology, especially in high-risk populations. More research is needed to help identify pregnant women at-risk for depression and to help pregnant women and the practitioners who work with them make informed decisions regarding treatment of depression during pregnancy and the postpartum period. Additionally, more empirical attention should be devoted to how to promote positive developmental outcomes in infants who have been exposed to perinatal depression.

The goal of the proposed study is to enhance our knowledge of perinatal depression (i.e., depression that occurs during pregnancy or within the first 12 months following delivery) and its impact on maternal functioning in low-income, African American women, as well as the health and developmental outcomes of their young infants. The study proposes to partner with the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) programs in Prince George's County that provide prenatal services to women in high-risk neighborhoods. Recruiting from WIC clinic waiting rooms, we propose to enroll 120 pregnant mothers to participate in this study. Beyond allowing us to use WIC clinic waiting areas and offices to recruit participants, WIC staff will not be involved with this project and WIC records will not be viewed or requested by project staff.

Data collection will take place over three time periods. The first home visit will take place during the mother's third trimester of pregnancy. During this visit, we will collect information on a range of risk and protective factors, including prenatal depression, health behaviors, and mother's feelings of attachment to her unborn child. We will follow-up with participants at one-month post-partum. At this time, we will interview mothers over the phone, collecting information on depression, neonatal outcomes (e.g., birth weight), and feelings of attachment to her infant. Finally, we will conduct a second home visit between three and six months postpartum, using observational assessments to collect information on infant outcomes and the maternal-infant relationship.

Findings from the proposed study will be disseminated to partnering WIC agencies and nationally through research networks and publication outlets. It is anticipated that knowledge gained from this study will facilitate the design of effective interventions for pregnant women, particularly those at risk for perinatal depression, and the design of interventions for high-risk families during pregnancy and early infancy. The Institutional Review Board (IRB) at the University of Maryland, College Park, has approved this study.

Background Information

Despite cultural representations of motherhood as a joyous experience, pregnancy and childbirth, especially for mothers living in poverty, are increasingly identified as risk factors for depression and depressive symptoms (Sohr-Preston & Scaramella, 2006). Generally, depression can be defined as intense feelings of sadness and hopelessness that may affect many areas of individual functioning (American Psychiatric Association, 2000). It is the leading cause of disease-related disability among women, with as many as 21% of women experiencing an episode of major depressive disorder in their lifetimes (R. Kessler et al., 1993). Specific to pregnancy and motherhood, perinatal depression includes major and minor depressive episodes that occur either prenatally (during pregnancy) or within the first 12 months following delivery (Gaynes et al., 2005). Although women can be affected by depression at any time during their lives, the stresses of pregnancy and motherhood make the childbearing years an especially vulnerable time period for women's psychological well-being. As such, perinatal depression is a complication for 8.5-11% of pregnant women and 6.5-12.9% of women in the first postpartum year (Gaynes et al., 2005).

Research suggests that the social context of a woman's life experience impacts her risk for developing depressive symptoms during the perinatal period, and that low-income African American women may be a particularly susceptible group (Dailey & Humphreys, 2011). Ethnic minority women are disproportionately more likely to be poor, be single, experience adverse events throughout their pregnancies, have limited access to prenatal care, and be exposed to a range of chronic stressors associated with living in impoverished communities (Kramer et al., 2000; Williams & Jackson, 2005). Thus, for low-income minority women, perinatal depression rates have been found to be as high as 52% (U.S. Department of Health and Human Services Administration for Children and Families, 2006a; Zayas et al., 2002). The high rate of perinatal depression among low-income mothers is of particular concern because perinatal depression has been found to have deleterious impacts on multiple child outcomes, beginning at birth, thus potentially exacerbating the adverse outcomes that result from a childhood of poverty.

Research has documented that depression during the prenatal period negatively impacts mothers' health behaviors, including utilization of prenatal care and substance abuse, which puts children at risk for developmental delays even before birth (S.T. Orr et al., 2012; Rahman et al., 2004). Furthermore, depression during the first year following delivery may negatively impact the critical relationship between mothers and their infants (Albright & Tamis-LeMonda, 2002; Campbell et al., 2004; S. H. Goodman & Gotlib, 1999; Murray et al., 2011), putting children's health and safety, as well as their social, emotional, language and cognitive development, at risk.

In spite of this evidence, few studies have examined risk and protective factors related to prenatal and postnatal depression in women from low-income, minority, high-risk backgrounds that may mediate child outcomes. There is a particular dearth of information about these processes during pregnancy. Identifying environmental factors, beyond poverty, that impact perinatal depression and understanding the mechanisms through which perinatal depression impacts child development is essential, especially in populations at risk-for poor pregnancy outcomes.

More research is needed to help identify women at-risk for perinatal depression and to help practitioners make informed decisions regarding interventions during the perinatal period. Moreover, research is needed to provide additional evidence regarding the risk and protective factors that may mediate the impact of perinatal depression on young children's outcomes.

Protocol

Participant Description. Inclusion criteria for this study are: (1) 18-35-years-old; (2) able to speak English; and (3) at least 24 weeks pregnant. Adolescent mothers and non-English speaking mothers will be excluded from this study because both groups experience a set of risk factors distinct from our target population of low-income, African American mothers (Chen et al., 2007; Mora et al., 2009; Segre et al., 2006). Other exclusion criteria for this study include: (a) history of fetal or infant death; (b) known chronic maternal medical conditions such as chronic hypertension, pre-eclampsia, clotting disorder, diabetes, or sickle cell; (c) abnormal diagnostic results including a known fetal abnormality on first or second trimester or genetic abnormality on screening tests; and (d) advanced maternal age (over 35-years). These exclusion criteria were selected given their known contribution to adverse neonatal outcomes (Hamilton et al., 2013). Research in this area has suggested that women are able to reliably report on these health conditions (Buka et al., 2004; Stuart et al., 2013). 120 women will be recruited for this study.

Recruitment. Potential subjects will also be recruited from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinics in Prince George's County. The researcher will periodically visit these clinics and staff an information table in the clinic waiting area, providing information on the study. The researcher will emphasize that participation in the research study is voluntary, not related to WIC, and has no impact on WIC services for the mother or baby. Women who are interested in study participation will respond to a brief 5-10 minute screening questionnaire (either while waiting for the appointments or after completion of their appointments) to determine eligibility. We will request the use of a private room to complete the brief screening. If a woman is eligible and decides to participate, informed consent will be obtained and a home visit will be scheduled. If a woman is ineligible for participation based on gestational age, we will ask if she would like to be contacted during the third trimester of her pregnancy to assess continued interest in the study. If so, necessary contact information will be collected. If a woman is ineligible for participation based on other criteria (e.g. under age 18), she will be informed that she is not eligible to participate. All screened pregnant women will be thanked for their interest and willingness to participate, and will be provided a small gift (e.g. lotion) for their time. Screening information for all ineligible participants and refusing participants will be shredded.

Home Visit One. The first home visit will be scheduled based on the participant's

availability and gestational age, to ensure that all data are collected after 28 weeks gestation. Prior to the home visit, a reminder call and/or text message will be placed in order to confirm availability and continued interest in the study. Two researchers (the graduate student researcher and an undergraduate research assistant) will conduct each home visit. One researcher will administer the instruments while the other assists as needed (e.g., entertaining other children in the home). Informed consent will be reviewed and the participants will be reminded that they can refuse to answer any question and stop the visit at any time. Instruments will be completed in whatever relatively private area can be identified in the home, where confidentiality will be maintained. All instruments (see *Table 1*) will be administered verbally by the researcher to ensure understanding and completion of all items. We will explain technical words or difficult to understand terminology, such as “toxoplasmosis” (on the HPQ-II). This session will last approximately 60 minutes. Participants will be paid \$20 cash and a payment receipt will be collected. At the end of the visit, the participant’s due date will be confirmed and a follow-up phone call will be scheduled for four-weeks postpartum. Prior to departure, the researchers will complete an observational assessment of the participant’s household and neighborhood.

As noted in Table 1, we will be asking study participants about depression. Based on prior research demonstrating the reliability and validity of the *Edinburgh Postnatal Depression Scale* (EDPS) when item 10 is excluded, we will not be asking item 10 (*The thought of harming myself has occurred to me*). However, we will follow procedures used in past studies regarding a total score indicative of increased depression symptomatology. Specifically, if participants’ score on the EDPS measure is above 12 (based on research on high levels of depression on this measure), we will provide them with a list of mental health clinics in their neighborhoods. If participants spontaneously reveal thoughts about harming self and/or others, we will also follow up with them by asking questions that are in our “safety protocol” developed for other projects to address harm to self. If study participants reveal thoughts or actions that pertain to harm to self or other, the graduate student and RAs will immediately contact their supervisors via cell phone. The supervisor of the project is Dr. Brenda Jones Harden, a clinical social worker and clinical psychologist, who has worked as a practitioner and researcher with individuals with mental health issues for many years. With the graduate student and RAs, Dr. Jones Harden will devise a plan for addressing these participants’ needs, including calling 911 or Child Protective Services if the participant expresses the potential to harm or demonstrates harm to self or others, particularly children.

Table 1- Summary of Measurement Tools in Home Visit One

Variable	Theoretical/ Operational Definition	Name of Instrument	Instrument Description	Time to complete
Socio-economic status	Income, employment status, education	Demographic and pregnancy background questionnaire	13-items created for use in this study	5 min

Exposure to trauma	Lifetime history of exposure to traumatic events	Trauma History Questionnaire (THQ)	23-item inventory of traumatic events; participants indicate whether or not they have ever experienced a specific event.	10 min
Exposure to discrimination	Self-reported experiences of discrimination	Everyday Discrimination Original Scale (EDS)	9-items with six-level likert items from highest frequency (almost everyday) to the lowest (never)	5 min
Prenatal and postnatal depression	Overwhelming feelings of sadness and/or hopelessness	Edinburgh Postnatal Depression Scale (EDPS)	10-item scale with four-level likert items from the highest frequency (most of the time) to the lowest never)	5 min
Maternal-fetal attachment	Behaviors and feelings that demonstrate affiliation and interaction with unborn child	Maternal Antenatal Attachment Scale (MAAS)	19-item scale with five-level likert items from the highest frequency(almost all the time) to the lowest (not at all)	10 min
Pregnancy Experiences	Maternal appraisal of positive and negative stressors during pregnancy	Pregnancy Experience Scale (PES)	10 uplift-items and 10 hassle-items, each rated from 0 (not at all) to 3 (a great deal).	10 min
Health practices	Behaviors a women engages in during pregnancy to optimize maternal and fetal health	Health Practices in Pregnancy Questionnaire (HPQ-II)	34-item scale with 5 responses ranging from 1 (never) to 5, a word indicating the highest frequency (always, daily, frequently)	10 min
Environmental chaos	Systems of frenetic activity, lack of structure, unpredictability in everyday activities, and high levels of	Windshield Survey	12-item observational scale of household and neighborhood disorganization with four-level likert items	5 min

	ambient stimulation		ranging from 0 (cannot rate) to 4 (most extreme)	
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Phone Interview. Four weeks post-partum (based on mothers’ report of her due date at home visit 1), mothers will be contacted by the researcher to participate in a phone interview in order to obtain information about birth outcomes, postnatal depression, and maternal feelings towards her infant. The time frame of four weeks post-partum was chosen for several reasons. For one, it is estimated that 20-80% of new mothers experience negative feelings or mood swings following childbirth, often called the “postpartum blues,” which typically disappear within two weeks (Payne, 2003). Waiting four weeks before contacting mothers will help to distinguish between normal postpartum feelings and more severe depressive symptoms. The researcher will call each participant on the date and time scheduled during the home visit. However, it is possible that mothers may deliver before or after their projected due dates, and calls will be rescheduled as needed to ensure data is collected after four weeks post-partum. If the researcher reaches an automated voice messaging system, the researcher will A) leave a message asking the participant to return the call, and B) call the participant again later that day. This process will be repeated on a daily basis, as needed, until the researcher is able to get in touch with the participant. If the participant cannot be reached within seven days of the initial phone call, or if the participant’s phone number is no longer in service, the researcher will begin to contact the additional points of contact (e.g. family and/or friends) provided by the participant during the home visit. Confidentiality will be maintained throughout this process; participant information will not be shared over the phone at any point. When the participant is reached, all instruments (see Table 2) will be administered over the phone. Previous research suggests that a telephone interview can be an efficient, reliable, and valid mechanism for data collection, especially if researchers follow standardized procedures and maintain effective communication with participants (Musselwhite, Cuff, McGregor, & King, 2007). As in other projects that we have conducted, if the mother has no access to a phone, we will send her a prepaid phone through her home visitor to allow us to complete this phone interview. This phone call will last approximately 20 minutes. If mothers report clinical levels of depressive symptomatology during the phone interview, we will refer them to appropriate treatment facilities. Women who complete the phone interview will receive a gift card of one pack of diapers, mailed to the address they request following completion of the phone interview. At the end of the phone interview, a second home visit will be scheduled for 3-6 months postpartum. We will update our contact information for the mothers at this time (e.g., obtain mothers’ current phone number and three other means of contact).

Table 2- *Summary of Measurement Tools in Phone Interview*

Variable	Theoretical/Operational Definition	Name of Instrument	Instrument Description	Time to complete
Neonatal outcomes	Characteristics of the neonate such as	Birth outcomes	10-items created for use in this study	5 min

	gestational age and birth weight			
Prenatal and postnatal depression	Overwhelming feelings of sadness and/or hopelessness	Edinburgh Postnatal Depression Scale (EDPS)	10-item Likert scale with four-level likert items from the highest frequency (most of the time, quite a lot) to the lowest (not at all, never)	5 min
Maternal-infant	Behaviors and feelings that demonstrate affiliation and interaction with infant	Maternal Postnatal Attachment Scale (MPAS)	19-item Likert scale with five-level likert items from the highest frequency/intensity (almost all the time/very strong) to the lowest (not at all/very weak)	10 min

Home Visit Two. The second home visit will be scheduled based on the participant’s availability and her infant’s age, to ensure that all data are collected between three and six months postpartum. This home visit will follow the protocol described for home visit one. One researcher will administer the instruments while the other assists as needed (e.g., caring for siblings). Informed consent will be reviewed and the participants will be reminded that they can refuse to answer any question and stop the visit at any time. Assessments and instruments (see Table 3) will be completed in whatever relatively private area can be identified in the home, where confidentiality will be maintained. To ensure understanding and completion of all items the researcher will administer all instruments verbally. This visit will include an assessment of infant development, administered by the graduate researcher who will be trained on this assessment tool by the PI, who has extensive experience administering developmental assessments to infants. This visit also includes a parent-child interaction session, which will be videotaped by for later coding. Undergraduate research assistants (who have no knowledge of study hypotheses) will be trained to code the videotapes. As indicated on the consent form, mothers can opt out of being videotaped and opting out will not impact participation in this study. If mothers do not want to be videotaped, this interaction session will be skipped. This home visit will last approximately 60 minutes. Participants will be paid \$40 cash and a payment receipt will be collected.

Variable	Name of Instrument	Instrument Description	Time to complete
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Prenatal and postnatal depression	Edinburgh Postnatal Depression Scale (EDPS)	10-item Likert scale with four-level likert items from the highest frequency (most of the time, quite a lot) to the lowest (not at all, never)	5 min
Maternal-infant	Maternal Postnatal Attachment Scale (MPAS)	19-item Likert scale with five-level likert items from the highest frequency/intensity (almost all the time/very strong) to the lowest (not at all/very weak)	10 min
Chaos	CHAOS scale	15-item likert scale	5 min
Breastfeeding	Breastfeeding questionnaire (created for this study)	8-items with both likert and open-ended questions	10 min
Father involvement	Father involvement questionnaire	10-items with both likert and yes/no questions	5 min
Mother-infant relationship	Videotaped still-face	Videotaped interaction	5 min
Maternal responsiveness	Videotaped mother-child Interaction	Videotaped interaction	10 min
Infant development	Bayley-III Screening Test	Cognitive, language, and motor domains tested	15 min

Possible Risks

Potential risks for this study include a psychological risk from the self-report of experiences of stressful life events such as trauma and depression. Participants will be asked about past experiences with child abuse, including sexual abuse, and will be asked to identify the perpetrator. The researcher will facilitate appropriate referrals (community resources, health care provider, etc.) if a participant becomes distressed and needs to end the interview. Other risks concern the disclosure of certain information (e.g., history of trauma, use of substances during pregnancy) that may lead to a breach of confidentiality.

Study participants will be advised of these risks in the consent process, and will be informed of their right to refrain from study participation or from responding to specific items on the questionnaires.

Benefits

There are no direct benefits to participants, but some possible benefits include: 1) the enhancement of services to pregnant women through increased knowledge about this client population; and 2) an increased understanding of the influences on and consequences of perinatal depression in African American women from low-income neighborhoods in Washington, DC, which can lead to improved services for depressed pregnant women in this area.

Confidentiality

All information for the larger study will be confidential. Screening information for all ineligible participants and refusing participants will be shredded. Data and videotapes will be stored in a locked cabinet on the campus of the University of Maryland. We will transport the raw data from the WIC clinics to the University in a locked accordion file. Only the Principal Investigator will have access to the raw data. Each participant will be provided with a number as an identifying marker. Names of the participants and the consent forms will be kept separate from the data. A master list of these names and identification numbers will be kept in a locked cabinet that only the Principal Investigator will have access to. Once the study is complete and the data have been analyzed, all records will be destroyed using a paper shredder. Because of the sensitive nature of some of the questions in this study, special procedures relative to the maintenance of confidentiality are necessary. Specifically, we will advise study participants that a breach of confidentiality could potentially occur if a parent reports that she is using substances during her pregnancy. However, we will obtain a Certificate of Confidentiality to avoid the use of our research data in subsequent prosecution. Additionally, although in the state of MD, there is no statute of limitations on reports of sexual abuse to state authorities, to our knowledge, there is no mandate in the District of Columbia (where this project will be conducted) that childhood sexual abuse be reported when the victim is an adult. However, we will inform research participants that in some jurisdictions, disclosing childhood sexual abuse may lead to a breach of confidentiality. We will also inform them that we are mandated reporters, and if we suspect child abuse or neglect, we have to call Child Protection Services.

Informed Consent

Project Title	<i>Risk and Protective Factors during the Perinatal Period</i>
Purpose of the Study	<i>This research is being conducted by Colleen Morrison at the University of Maryland, College Park. We are inviting you to participate in this research project because you are currently pregnant. The purpose of this research project is to learn more about mothers' experiences during pregnancy and after childbirth. We will be examining several risk and protective factors such as depression, health behaviors, and your attachment to your child.</i>
Procedures	<p><i>If you agree to participate and sign this consent form, here's what will happen:</i></p> <ol style="list-style-type: none"> <i>1. You will have a home-based research visit that will take approximately 60 minutes. During the research visit we will ask you some questions about yourself, your unborn baby, and your family. We will be asking you questions about your feelings about yourself and your baby, how you take care of your health, past traumatic experiences, and your attachment to your unborn child. For instance, we may ask questions such as, "Since becoming pregnant, how often have you exercised?" and "In the past two weeks, how often have you thought about the baby inside you?" We will also conduct an observation of your home and your neighborhood. You will be paid \$20 at the end of this visit.</i> <i>2. At the end of your research visit, we will schedule a follow-up phone call for approximately four weeks after your due date. During this phone call we will ask you some questions about yourself (e.g., your feelings about yourself and your baby) and your newborn baby, particularly their characteristics at birth. For instance, we may ask you questions such as, "How much did your baby weigh when he or she was born?" and "In the last two weeks, how often have you felt sad or miserable?" You will receive a gift of one pack of 30 diapers..</i> <i>3. At the end of your phone call, we will schedule a follow-up home-based visit for approximately three-to-six months after your due date. This visit will take approximately 60 minutes. During this visit we will ask you some questions about yourself and your baby. For instance, we may ask questions such as, "Over the last two weeks how would you describe your feelings for the baby?" We will also video record you and your baby interacting with each other. You will be paid \$40 at the end of this visit.</i> <p><i>Participants will be asked to provide the names and phone numbers of three individuals whom we can contact (family members, friends, etc.) in case we cannot get in touch with you.</i></p>

	<p><i>Do we have permission to contact the numbers provided?</i> Yes: _____ No: _____</p> <p><i>Participants will be asked to interact with their infants while being video recorded.</i></p> <p><i>Do we have permission to video record you and your child?</i> Yes: _____ No: _____</p> <p><i>Do we have permission to share these videos with our project staff for training purposes?</i> Yes: _____ No: _____</p>
<p>Potential Risks and Discomforts</p>	<p><i>The potential risks of your participation in this study are minimal or unlikely. There are no physical risks to you being involved in this research. We may ask you about sensitive topics such as experiences of violence and other traumatic events, substance use during pregnancy, and depression. You will be asked about past experiences of child sexual abuse and the perpetrator. If you prefer not to talk about these topics, you don't have to. In accordance with legal requirements, we will disclose any risks to yourself or to your child's safety, including illegal substance use during pregnancy and your past experience of child sexual abuse, to the appropriate authorities. You can choose not to answer certain questions or stop your participation at any time. Your participation in this study will not affect your and your baby's receipt of services in any way.</i></p>
<p>Potential Benefits</p>	<p><i>There are no direct benefits from participating in this research. We hope that, in the future, other people might benefit from this study through improved understanding of the needs and services provided to pregnant women participating in prenatal programs.</i></p>
<p>Confidentiality</p>	<p><i>Any potential loss of confidentiality will be minimized in the following ways. Your information will not be identified with your name, only with a number. Your information and video will be secured where only authorized project staff can access it. We will not share any of your information with anyone outside of this project unless required by law.</i></p> <p><i>If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law.</i></p> <p><i>In accordance with legal requirements, we will disclose any risks to yourself or to your child's safety to the appropriate authorities. Specifically, the District of Columbia government requires us to make a report to Child Protective Services when women report using illegal substances (e.g. cocaine) while pregnant. We are also required by the</i></p>

	<p><i>University of Maryland to report past child sexual abuse. In these cases we will have to release information about you without your consent. We will make every effort to talk to you about it first, however. Additionally, if we are concerned about your health and safety, we may want to talk to your service provider so that you can get the supports you need. We will ask your permission to do so prior to contacting the prenatal program.</i></p>
Compensation	<p><i>You will receive \$20 at home visit 1 and \$40 at home visit 2, for a total of \$60. You will be responsible for any taxes assessed on the compensation.</i></p> <p><input type="checkbox"/> <i>Check here if you expect to earn \$600 or more as a research participant in UMCP studies in this calendar year. You must provide your name, address and SSN to receive compensation.</i></p> <p><input type="checkbox"/> <i>Check here if you do not expect to earn \$600 or more as a research participant in UMCP studies in this calendar year. Your name, address, and SSN will not be collected to receive compensation.</i></p>
Right to Withdraw and Questions	<p><i>Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify and your and your baby's receipt of services will not be impacted in any way.</i></p> <p><i>If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigator:</i></p> <p>Colleen Morrison 3304 Benjamin Building, College Park, MD 20740 301-405-5210.</p>
Participant Rights	<p><i>If you have questions about your rights as a research participant or wish to report a research-related injury, please contact:</i></p> <p style="text-align: center;">University of Maryland College Park Institutional Review Board Office 1204 Marie Mount Hall College Park, Maryland, 20742 E-mail: irb@umd.edu Telephone: 301-405-0678</p> <p style="text-align: center;">Gay Hutchen DHMH IRB Administrator 201 W. Preston St., Baltimore, MD 21201 Telephone: 410-767-8448</p> <p><i>This research has been reviewed according to the University of Maryland, College Park IRB and the Maryland Department of Health and Mental Hygiene IRB procedures for research involving human subjects.</i></p>
Statement of Consent	<p><i>Your signature indicates that you are at least 18 years of age; you have</i></p>

	<p><i>read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. You will receive a copy of this signed consent form.</i></p> <p><i>If you agree to participate, please sign your name below.</i></p>	
Signature and Date	NAME OF PARTICIPANT [Please Print]	
	SIGNATURE OF PARTICIPANT	
	DATE	
	Investigator or Designee Obtaining Consent Signature	
	DATE	

Confidentiality Agreement

I understand that I will be exposed to privileged participant information. Examples of such information are medical conditions, patient names, and addresses. The participant's right to privacy is not only a policy of the University of Maryland but is specifically guaranteed by statute and by various governmental regulations. I understand that intentional or involuntary violation of the confidentiality policies is subject to appropriate disciplinary action(s) that could include being discharged from my position and/or being subject to other penalties. By initialing the following statements, I further agree that:

 I will never discuss participant information.

 I will handle confidential data as discretely as possible, and I will never leave confidential information in view of others unrelated to the specific activity. I will keep all confidential information in a locked room when not in use.

 I will maintain my computer protected by power on and screen saver passwords. I will not disclose my computer passwords to unauthorized persons.

 I will shred any document to be disposed of that contains personal identifiers at the completion of the study.

 I understand that I am bound by these policies, even upon resignation, termination, or completion of my activities.

 I have received, read, understand, and agree to comply with these guidelines.

Signature

Date

Printed Name

University of Maryland IRB Approval Letter



1204 Marie Mount Hall
College Park, MD 20742-5125
TEL. 301.405.4212
FAX 301.314.1475
irb@umd.edu
www.umresearch.umd.edu/IRB

DATE: August 30, 2013

TO: Colleen Morrison
FROM: University of Maryland College Park (UMCP) IRB

PROJECT TITLE: [428976-2] Risk and Protective Factors during the Perinatal Period
REFERENCE #: [428976-2]
SUBMISSION TYPE: Revision

ACTION: APPROVED
APPROVAL DATE: August 30, 2013
EXPIRATION DATE: August 14, 2014
REVIEW TYPE: Full Committee Review

Thank you for your submission of Revision materials for this project. The University of Maryland College Park (UMCP) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Full Committee Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure which are found on the IRBNet Forms and Templates Page.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of August 14, 2014.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

Administration for Children and Families Funding Letter



ADMINISTRATION FOR CHILDREN & FAMILIES

Administration for
Children & Families

370 L'Enfant Promenade, S.W.
Washington, D.C. 20447

www.acf.hhs.gov

September 26, 2013

Katie McKeon
Contract Manager
University of Maryland
3112 Lee Building
College Park, MD 20742-5141

Reference Grant No: 90YR0070-01-00

Dear Ms. Katie McKeon:

I am pleased to inform you that the application submitted on behalf of Dr. Brenda Jones Harden and Ms. Colleen Morrison, for the project titled "**Risk and Protective Factors during the Perinatal Period**" has been approved for funding. Please use the above referenced grant number for all related correspondence. The enclosed Financial Assistance Award (FAA) specifies the amount and duration of this award, as well as other pertinent information concerning this grant

During the duration of your grant, you will be working with Mr. David Kadan, the Grants Management Officer, who will be responsible for receiving all reports and for assisting you in the administration and financial aspects of the grant. Additionally, Dr. Amanda Clincy, your Program Specialist, and Ms. Anne Bergan, your Federal Project Officer, will be responsible for assisting with programmatic issues. Their contact information is listed below:

Program Specialist:

Amanda Clincy, Ph.D.
Office of Planning, Research and Evaluation
Administration for Children and Families
370 L'Enfant Promenade, SW, 7th Floor
Washington, DC 20447
Telephone: 202-690-5976
Fax: 202-205-3598
Email: amanda.clincy@acf.hhs.gov

Grants Management Officer:

David Kadan
Office of Grants Management
Administration for Children and Families
370 L'Enfant Promenade, SW, 6th Floor
Washington, DC 20447
Telephone: 202-205-8562
Fax: 202-205-9086
Email: david.kadan@acf.hhs.gov

Safety Protocol

Research participant reveals thoughts of self-harm

If a participant reveals thoughts of self-harm, the participant asked which of the following best describes their current thoughts:

1. I don't have any thought of killing myself
2. I have thoughts of killing myself, but I would not carry them out
3. I would like to kill myself
4. I would kill myself if I had the chance

If the participant responds with option 1 or 2, the researcher will provide the participant with a list of mental health clinics in her neighborhood and will be encouraged to talk with her prenatal/postnatal care provider about depression.

If the participant responds with option 3 or 4, the researcher will stop data collection and participant will be withdrawn from study. The researcher will express concern by stating, "I am very concerned that you're feeling troubled enough now to want to harm yourself. I need to share this with others so we can keep you safe until you no longer feel this way." The research will then contact her supervisor via cell phone. The supervisor of the project is Dr. Brenda Jones Harden, a clinical social worker and clinical psychologist, who has worked as a practitioner and researcher with individuals with mental health issues for many years. With the graduate student and RAs, Dr. Jones Harden will devise a plan for addressing these participants' needs, including calling 911. We may also seek the participants' permission to contact their prenatal service provider to access other support services they may need (e.g., mental health treatment).

List of Referral Resources

Organization	Services
<p>Whitman-Walker Clinic of Suburban Maryland, Max Robinson Center</p> <p>2301 Martin Luther King Jr. Avenue SE Washington, DC 20020</p> <p>Phone: (202) 745-7000/(202) 745-6116</p> <p>Email: info@whitman-walker.org</p> <p>Website: http://www.whitman-walker.org/</p>	<p>Medical Services:</p> <ul style="list-style-type: none"> • Primary Medical Care • HIV/AIDS Medical Care • LGBT Medical Care <p>Mental Health Services:</p> <ul style="list-style-type: none"> • Addictions Treatment Services • Psychotherapy Groups • Peer Support Groups <p>Payment- Sliding Scale, Medicare, Private Insurance</p>
<p>Integrated Behavioral Health Solutions, LLC</p> <p>3611 Branch Avenue, Suite 404 Temple Hills, MD 20748</p> <p>Phone: (301) 278-5997</p> <p>Website: www.ibhs-online.com</p>	<ul style="list-style-type: none"> • Substance Abuse Treatment • Mental Health and Wellness Counseling • Employment Assistance <p>Payment- Sliding Scale, Medicaid, Medicare, Private Insurance</p>
<p>Family Crisis Center of Prince George's County</p> <p>3601 Taylor Street Brentwood, MD 20722</p> <p>Phone: (301) 779-2100 24-Hour Hotline: (301) 731-1203</p> <p>Email: execdirfcc@gmail.com</p> <p>Website: http://www.familycrisiscenter-pgco.org/</p>	<ul style="list-style-type: none"> • Family violence intervention clinic • Safe passage emergency safe house • Legal advocacy • Court companionship
<p>Community Advocates for Family & Youth (CAFY)</p> <p>P.O. Box 4419</p>	<p>Support Groups:</p> <ul style="list-style-type: none"> • Survivors of Sexual Assault: This therapy group provides an opportunity for victims of sexual assault to come together

<p>Capitol Heights, MD 20791</p> <p>Phone: 301-390-4092</p> <p>Email: info@cafyonline.org</p> <p>Website: http://www.cafyonline.org/</p>	<p>in a safe environment and address the impact sexual violence has had on their life.</p> <ul style="list-style-type: none"> • Non-Offending Parent Support Group: Provides support and resources for parents or guardians whose child has been sexually or physically abused.
<p>East River Family Strengthening Collaborative, Inc (ERFSC)</p> <p>3917 Minnesota Avenue, NE Washington, DC 20019</p> <p>Phone: (202)-397-7300</p> <p>Website: http://www.erfsc.org/index.html</p>	<p>Family Services:</p> <ul style="list-style-type: none"> • Crisis intervention, case management, housing relocation, family team meetings, emergency assistance (flex funds, food certificates, and tokens) including crisis intervention, fatherhood support <p>Community Services:</p> <ul style="list-style-type: none"> • Youth programs, parenting programs
<p>Community Outreach and Development (CDC)</p> <p>4719 Marlboro Pike, Suite 104 Capitol Heights, MD 20743</p> <p>Phone: 301-404-1551</p> <p>Website: http://www.communityoutreachcdc.org/</p>	<ul style="list-style-type: none"> • Computer Lab: Our lab is free and open to the public for assistance with cover letter and resume development, conducting job searches, and maintaining communication with potential employers. • Food Pantry: Emergency food is available to residents, by providing 3-day supply of staples and meats. • Clothing Closet: Our closet provides both casual and professional wear for men, women, and children. • Financial Assistance: Based upon a client intake process, persons may be eligible to receive assistance with rent/mortgage, utilities, prescriptions, and other emergency care needs. • Advocacy and Referrals: We partner with other agencies to refer clients who may be best served by another organization. • Employment Assistance: Staff are available to meet with clients regarding their resumes, and to contact potential

	<p>employers about available positions</p> <ul style="list-style-type: none"> • Educational programming for infants and toddlers, and before and after-school care for children up to the age of 12.
<p>Forestville Pregnancy Center 3611 Branch Avenue, Suite 102 Marlow Heights, MD 20748 Phone: (301) 423-0063 24-Hour hotline: 1-800-395-4357 Email: pc@forestvillepregnancycenter.org Website: http://www.freepregnancytest.org/</p>	<ul style="list-style-type: none"> • Pregnancy tests • Pregnancy counseling • Post abortion counseling • Pregnancy education classes • Maternity & baby clothing, formula, furniture, diapers • Referrals for prenatal care, social services, adoption agencies, & other community resources
<p>The Keys to Canaan 3036 Nash Place, SE Washington, DC 20020 Phone: (202) 253-9780 Website: www.thekeystocanaan.org</p>	<ul style="list-style-type: none"> • Adult Basic Education program • Parenting Classes

Flyer for Information Table

Are you **Pregnant?** Congratulations!



The University of Maryland is conducting a study on African American pregnant women in the Washington, D.C. area.

Participation involves:

1. A one-hour home visit in your third trimester of pregnancy. During the research visit we will ask you some questions about yourself, your unborn baby, and your family.

You will be paid \$20 at the end of this visit.

2. A 20-minute phone call when your baby is one month old. During this phone call we will ask you some questions about yourself and your newborn baby.

You will receive a gift of one pack of diapers following completion of this phone call.

3. A one-hour home visit when your baby is between three and six months old. During this visit we will ask you some questions about yourself and your baby. We will also video record you and your baby interacting with each other.

You will be paid \$40 at the end of this visit.

If you are interested in participating please call
Colleen Morrison at 301-405-5210.

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