PREDICTORS OF DEPRESSION IN A HIGH-RISK HOSPITALIZED PREGNANCY POPULATION: A PROSPECTIVE LONGITUDINAL STUDY

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DEDICATION

To my husband

and

*all* our boys

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# PREDICTORS OF DEPRESSION IN A HIGH-RISK HOSPITALIZED PREGNANCY POPULATION: A PROSPECTIVE LONGITUDINAL STUDY

by

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Research is beginning to elucidate the prevalence and effects of antenatal depression on the mother and fetus. However, relatively little focus has been paid to the woman diagnosed with a high-risk pregnancy requiring hospitalization. The present study investigated the predictors and trajectory of depression in women hospitalized on an antepartum unit. The sample consisted of 129 who were hospitalized due to complications during pregnancy. At admission, the women completed self-report measures to assess depressive symptoms, life events as well as personality. Women who exceeded set thresholds on depressive measures were administered a structural clinical interview to assess for a formal diagnosis of

Major Depressive Disorder. Additionally, women's depressive symptoms were assessed weekly across hospitalization until discharge. Forty-four percent of the sample exceeded set threshold at admission, indicating they were experiencing high levels of depressive symptoms. Logistic regression was used to determine predictors of group status at admission, based on depressive measures. Results indicated that only life events were predictive of those women exceeding set thresholds. Furthermore, consideration of pregnancy termination and prior psychiatric diagnosis were predictive of Major Depressive Disorder. Growth curve modeling was used to identify trajectory and changes in depressive symptoms over the course of hospitalization. The results indicated that most women experienced a decrease in symptoms over time. In measuring personality, the Depressive Experiences Questionnaire (Blatt, D'Affliti, & Quinlan, 1976) was used to determine if women characterized as self-critical would report more depression during pregnancy than women characterized as dependent. No significant differences were found between the personality scales and depression severity. However, those women who were high on both self-criticism and dependency had the highest scores on the depressive measures. These results suggests that women who score high on both self-criticism and dependency scales appear to be the most vulnerable to depressive symptoms during the antepartum period

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**Antenatal** – Pertaining to the period before birth; "the prenatal period" or "antepartum period".

**Antepartum** – Pertaining to the period before delivery or birth; "the prenatal" or "antenatal period".

**Incidence** – The percentage of the population with an illness episode that begins within a given period of time (e.g. during pregnancy or within the first 3 months following delivery).

**Major depressive disorder** – The presence of depressed mood or loss of interest, for a period lasting two weeks. Additionally, four concurrent symptoms are required for a positive diagnosis of depression: weight or appetite change (either increase or decrease), change in sleep (either insomnia or hypersomnia), change in psychomotor activity (either agitation or retardation), fatigue, feelings of guilt or worthlessness, diminished ability to concentrate and recurring thoughts of death or suicidal ideation, and must be serious enough to cause significant impairment in social and/or academic functioning.

**Meta-analysis** – A quantitative approach for systematically combining evidence from multiple research studies on a particular parameter or association to arrive at a conclusion about the body of research on that parameter or association.

**Period prevalence** – The percentage of the population with a condition specified over a period of time (e.g., during pregnancy or within the first 3 months following delivery).

**Perinatal depression** – A condition encompassing major and minor depressive episodes that occur during pregnancy (prenatal) or within the first 12 months following delivery (postpartum).

**Prenatal** – The period of pregnancy from conception to parturition.

**Postnatal** – The period beginning immediately after the birth of a child

**Postpartum** – For the purposes of this review, the period from parturition to 12 months after delivery.

**Postpartum Depression** – According to DSM-IV, a specific type of major depressive disorder with onset of a major depressive episode within 4 weeks postpartum.

**Screen (also Screening)** – The use of a measure or a test, often a formal instrument or tool, to classify an individual with respect to her likelihood of having a particular disorder. A screen itself does not diagnose the illness – those screening positive require subsequent diagnostic confirmation to confirm the presence of the disease.

**Sensitivity** – The ability of a test or measure to correctly identify those with a syndrome, calculated as the percentage of true positives values compared to false negative values.

**Specificity** – The ability of a test or measure to correctly identify those who do not have a syndrome, calculated as the percentage as true negatives values as compared to true positive values.

# CHAPTER ONE
# Introduction

Major Depressive Disorder (MDD) is a devastating disabling disease, affecting 14.8 million Americans each year (NIMH, 2006). MDD is more common and aggressive in women, with lifetime prevalence rates ranging from 10 to 25% (APA, 2000). This range is 1.5 to 3 times higher than that in men, indicating a strong gender influence. Compared to men, women with a depressive disorder endure a longer period of illness, recurrences that are linked to reproductive events, atypical symptoms, more somatic symptoms and associated comorbitities (Burt & Stein, 2002). Recognizing that depression is a major public health concern, the World Health Organization (WHO) has declared MDD the leading disease-related disability globally among women today (Murray & Lopez, 1996) as it significantly reduces a woman's quality and functioning status in life.

Women experience the highest risk for depression during their childbearing years. Historically, the focus of health concern was on the postpartum period while the antepartum period was viewed as a time of emotional well-being, almost a protective period against mood disorders. Later research has revealed equivalent or higher depression prevalence rates in the antepartum (Demyttenaere, Lenaerts, Nijs, & Van Assche, 1995; O'Hara & Swain, 1996;

O'Hara, Zekoski, Philipps, & Wright, 1990), with the implications of antenatal depression just beginning to emerge.

Approximately 25-50% of all women will experience some depression symptoms during their pregnancy, and 10-12% of these will suffer a major depressive episode. The course of depression varies across a woman's pregnancy; a meta-analysis estimates the prevalence rates of depression to be 7.4%, 12.8 and 12.0% during the first, second and third trimesters, respectively (Gaynes et al., 2005). However, there was considerable overlap in the 95% confidence intervals, thereby no significant differences between the trimesters were able to be ascertained (Bennett, Einarson, Taddio, Koren, & Einarson, 2004).

Women experiencing antenatal depression are less likely to seek out or adhere to prenatal care guidelines. It is well established that poor prenatal care can have more adverse effects on the mother and her developing fetus. Specifically, in the U.S., a woman who lacks prenatal care is 2.8-fold more likely to experience a preterm birth (Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002), the leading cause of perinatal morbidity and mortality in the U.S. (Berkowitz & Papiernik, 1993). Moreover, women who suffer from antenatal depression are at increased risk for abusing substances that may harm the fetus, including tobacco, alcohol and cocaine (Zuckerman, Amaro, Bauchner, & Cabral, 1989). Substance abuse during pregnancy has been linked to an increased incidence of obstetric complications and perinatal morbidity. The risk for obstetric complications for

women who abuse substances include premature rupture of the membranes, preterm delivery and intrauterine growth restriction (Curry, Perrin, & Wall, 1998). Poor obstetric outcomes linked to substance abuse include low birth weight, respiratory distress, and increased risk for congenital deformities (Ludlow JP, 2004; MacGregor et al., 1987). Further studies on tobacco use during pregnancy are now implicating fetal vulnerability to certain diseases in childhood/adulthood such as asthma, cancer, obesity, type II diabetes and hypertension (Ng & Zelikoff, 2006).

Although studies to date are not definitive, there is mounting evidence that depression during pregnancy may impact the mode of delivery and predispose for poor obstetric outcomes. In two U.S. studies, no association between delivery mode and operative deliveries was found (Wu, Viguera, Riley, Cohen, & Ecker, 2002; Zuckerman et al., 1989). A recent study however, suggested that at the time of delivery, depression is believed to effect a woman's perception of pain, leading to higher rates of epidural analgesia and operative deliveries (Chung, Lau, Yip, Chiu, & Lee, 2001).

Studies have demonstrated that maternal depression increases the risk of spontaneous preterm delivery (Orr, James, & Blackmore Prince, 2002; Steer, Scholl, Hediger, & Fischer, 1992), intrauterine growth retardation (Hoffman & Hatch, 2000), and preeclampsia (Kurki, Hiilesmaa, Raitasalo, Mattila, & Ylikorkala, 2000). Research suggests that a depressive episode during pregnancy

can alter the uterine environment, causing direct physiological effects to the fetus. Salient molecular markers among depressed pregnant women include elevated cortisol and norepinephrine levels (Lundy et al., 1999), and reduced serotonin and dopamine levels (Field et al., 2004). As much as 40% of the elevated cortisol is estimated to cross the placental barrier (Glover, Teixeira, Gitau, & Fisk, 1999), affecting the fetus directly. At birth, the newborn's endocrine profile mimics that of the mother, exhibiting high cortisol and norepinephrine levels and reduced serotonin and dopamine levels. Depressed mothers are at an increased risk of delivering low birth weight babies and preterm infants (Neggars, Goldenberg, Cliver, & Hauth, 2006).

The consequences of maternal depression on the neonate and infant are well documented. Newborns of depressed mothers tend to have greater right frontal electroencephalogram (EEG) activation pattern (Jones et al., 1998), that mimics EEG profiles in depressed adults (Henriques & Davidson, 1990). Studies have documented that newborns of depressed mothers show disorganized sleep patterns and perform less than optimally on the Brazelton newborn assessment test (Lundy, Field, & Pickens, 1996).

The serious impact of a mother's postpartum depression on her infant's development and family relationships has been extensively studied, preceding the more recent interest in the antenatal period and a more inclusive perspective on a woman's emotional well-being throughout and after pregnancy. Depression may

impact both the amount and quality of a mother's interaction with her infant, ultimately impairing the mother-infant attachment and the infant's overall development, hindering the formation of the mother-infant bond necessary for secure attachment difficult (Teti, Gelfand, Messinger, & Russell, 1995). Studies indicate that depressed mothers present a flat affect and provide less stimulation to their infants compared to normal non-depressed mothers (Lundy, Fields, & Pickens, 1996). The initial mother-infant attachment relationship serves as a model for subsequent interpersonal relationships and is believed to be a strong predictor of a child's future adjustment. If children of depressed mothers fail to obtain a secure attachment at birth, they will likely lose the ability to form secure relationships later in life. Mothers who feel overwhelmed with parenting are less likely to guide their infants through crucial developmental stages. They may struggle with patience and confidence, diminishing their ability to engage in positive parenting behaviors, and raising the risk for exhibiting negative and a disengaging demeanor (Paulson, Dauber, & Leiferman, 2006). Depressed mothers may struggle with maintaining joint attention and providing feedback to their infant (Goldsmith & Rogoff, 1997). Although this skill does not fully develop until the first year of the infant's life, the parent begins to model joint attention when the infant reaches about six months of age. This skill of mutually observing an object by mother and child is critical for social development, language acquisition and cognitive development.

The consequences of maternal depression are not confined to the infancy years. Studies have shown that maternal depression can affect a child's cognitive and social/emotional development as well as lead to behavior problems that can extend into adolescence (Gelfand & Teti, 1990). In a study of 1 to 3 year olds, depressed mothers not only spent significantly less time reading to their children, but were also less likely to engage their children with questions about books (Bigatti, Cronan, & Anaya, 2001). By the age of 4, children whose mother had a history of maternal depression already exhibited significantly lower IQ scores than children with no family history of maternal depression (Cogill, Caplan, Alexandra, Robson, & Kumar, 1986). Behaviorally, children of depressed mothers are more likely to suffer from depression, attentional difficulties and conduct disorders (Beardslee, Bemporad, Keller, & Klerman, 1983).

Maternal depression often negatively impacts marital relationships. Depression in women is often associated with marital difficulties and divorce (Weissman and Olfson 1995; Coyne, Kahn & Gotlib, 1987). Specifically, during the postpartum period, marital discord and the lack of spousal support have been found to be significant risk factors for postpartum depression (O'Hara, 1986; Campbell, Cohn, Flanagan, Popper & Meyers, 1992). Furthermore, research suggests that maternal depression has a negative influence on the father's mental health (Goodman, 2004) suggesting that the suffering may not be just confined to the person diagnosed with MDD.

Beyond the effects on the immediate family, depression exacts a serious economic burden on society. Although no studies have examined the economic costs of perinatal depression, we do know that it is responsible for at least a portion of the 83 billion dollars spent on depression in the U.S. each year. Workplace costs are significant, accounting for 62% of the overall monies spent on depression in the U.S. Such expenditures result from excessive absenteeism, loss of productivity and disability. Employees that suffer from depression are more than four times likely to take disability days than those employees without depression (Greenberg, Leong, Birnbaum, & Robinson, 2003). Furthermore, significant costs are associated with increased healthcare utilization. Women who experience depression during pregnancy incur higher healthcare costs, associated with medical complications and poor neonatal outcomes, than non-depressed mothers. Children of depressed mothers have higher medical claims than do children of non-depressed mothers, largely due to more emergency room visits (Flynn, Davis, Marcus, Cunningham, & Blow, 2004).

Given the extensively documented negative impact of perinatal depression, originating with the focus on the postpartum period, and more recent evidence that the strongest predictor of postpartum depression is a prior occurrence of antenatal depression, investigating the predictors of antenatal depression has finally received more attention. Within the antenatal population less is understood about women who experience a high-risk pregnancy.

Approximately 10-20% of all pregnancies are labeled as high-risk, indicative of a possible suboptimal outcome for either mother or fetus. Once diagnosed with a high-risk pregnancy, a woman's sense of well-being is challenged as she faces a period of uncertainty about her pregnancy outcome. In 1982, Penticuff (1982) was the first to discuss the psychological implications of a high-risk pregnancy. She proposed that high-risk women might face difficulties navigating the normal developmental stages necessary to adapt to pregnancy and proceeded to outline the developmental task during each trimester. In a normal pregnancy, women face developmental tasks throughout each trimester. During the first trimester, there is an initial period of ambivalence resolved by the end of the first trimester. The second trimester is marked by a growing sense of affiliation with the fetus, while during the third trimester, the mother develops a sense of mastery as she cares for the growing fetus. Close to delivery, in the normal pregnancy, a nesting phase begins. However, in the high-risk pregnancy, failures in the adaptation process may lead to difficulties resolving ambivalent feelings, becoming attached to the fetus, or in taking the steps necessary to bring the baby home (Cohen, 1979). Plausibly, in a high-risk pregnancy, these failures to adapt to the physical and emotional changes can negatively affect the mood of the mother increasing her emotional difficulties. Although there are numerous descriptive case studies on the psychological impact of a high-risk pregnancy, there exists a paucity of empirical studies. The limited data indicates that a high-risk pregnancy has a

significant impact on a woman's mood, with significantly higher rates of anxiety and depression compared to women experiencing a low-risk pregnancy (Mercer and Ferketich, 1988). Often times, women with high-risk pregnancies require hospitalization on a specialized antepartum unit. These hospitalized women report the two most stressful events associated with their admission are separation from family and home and the onset of mood disturbances (White and Ritchie, 1984). Research by Maloni and colleagues (1993; 2002; 2005) has identified some key mood characteristics among the high-risk hospitalized patients. The limited number and scope of antenatal depression studies and the important need to improve upon our identification and treatment of women with perinatal depression provide the rationale to explore depression in this understudied population.

# CHAPTER TWO
# Literature Review

## DIAGNOSING DEPRESSION

Diagnosing depression during pregnancy is complex. There is considerable overlap in depression and normal pregnancy symptoms, such as fatigue and changes in appetite and sleep. As a result, a significant number of cases go unrecognized and untreated (Marcus, Flynn, Blow, & Barry, 2003).

Health care professionals use the Diagnostic and Statistical Manual of Mental Disorders (fourth edition, text revision; DSM-IV-TR; APA, 2000) currently to diagnosis mental disorders. The criteria for recognizing a major depressive episode (MDE) is the presence of depressed mood or loss of interest for a period lasting two weeks. Additionally, four concurrent symptoms are required for a positive diagnosis of depression: a change in weight or appetite (either increase or decrease), altered sleep patterns (either insomnia or hypersomnia), a change in psychomotor activity (either agitation or retardation), pronounced fatigue, feelings of guilt or worthlessness, diminished ability to concentrate and recurring thoughts of death or suicidal ideation. Moreover, these four symptoms must be serious enough to cause significant impairment in social and/or academic functioning.

**Prevalence**

Research indicates that lifetime prevalence rates of depression in women are twice that of men, peaking during the childbearing years (Weissman & Olfson, 1995). The calculated prevalence rates for depression during pregnancy range from 2 to 51% (Affonso, Lovett, Paul & Sheptak, 1990; McKee, Cunningham, Jamkowski & Zayas, 2001). These rate discrepancies appear to co-vary with different data collection methods, as lower rates are associated consistently with structured clinical interviews and higher rates with screening instrumentation.

The most accurate way to make a formal Axis I diagnosis, which assigns diagnostic codes for mental disorders, is to utilize a structured clinical interview. In the U.S., O'Hara and colleagues (1984) were the first to examine depression prevalence rates in pregnant women using an interview adapted from the Schedule of Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978). They followed 99 women from the second trimester into the postpartum period and found that 9% met the criteria for either major or minor depression during the second trimester. Gotlib and colleagues (1989) found similar cumulative rates (10.2%) of major and minor depression in Canadian women during the second and third trimesters. In a study comparing childbearing to non-childbearing women, O'Hara and colleagues did not find any significant distinction between major and minor depression rates (O'Hara et al., 1990). These

results suggested that pregnancy could no longer be viewed as a protective period against mood disorders.

In the most comprehensive meta-analysis to date, the Agency for Healthcare Research and Quality (AHRQ), in collaboration with the Safe Motherhood Group (SMG), reviewed the prevalence and incidence of perinatal depression (Gaynes et al., 2005). Sample studies were included in these analyses if the diagnosis was confirmed by a clinical assessment or structured interview. During the antenatal period, a point prevalence of 8.5 to 11.0% was found for major and minor depression and 3.1 to 4.9% for major depression alone. The study concluded that a paucity of quality studies exists for evaluating the incidence of depression. The limited data from Gaynes et al., suggest that 14.5% of women will experience a new major or minor depressive episode during pregnancy, while only 7.5% will experience a new episode of major depression.

**Ethnicity**

Overall, the prevalence rate studies in antenatal depression have focused primarily on Caucasian samples due to the fact that a majority of the research is conducted in Australia and in European countries. While there is limited research on different ethnicities, findings in antenatal depression suggest that the highest rates are among African-American and Hispanic women. In 2006, Orr and colleagues surveyed 1163 pregnant women to determine race-related differences.

They determined that African-American women scored significantly higher on the Center for Epidemiological Studies Depression Scale (CES-D) test compared to Caucasian women (49% and 33.5%, respectively). In 2004, Dole and colleagues surveyed 2029 African-American and Caucasian women and found that the African-American women had slightly higher rates of depressive symptoms. These findings are in contrast to statistics found in the general population as measured by National Centers for Health, which have found Caucasian women to exhibit significantly higher rates of MDD than African-American women (Riolo, Nguyen, Greden, & King, 2005).

**Socioeconomic Status**

There appears to be an interaction between ethnicity and socioeconomic status that increases a women's vulnerability to depression. Prevalence rates are significantly higher in low-income women than in other economic populations. In 1995, Hobfoll and colleagues surveyed 192 inner city pregnant women using an adapted version of the SADS, and determined that 27.6% and 24.5% in the second and third trimesters, respectively, met the criteria for depression. Other studies measuring depressive symptoms have offered similar results. In a population of low-income minority women with low-risk pregnancies, 51% were categorized with significant depressive symptoms, as measured by the Beck Depression Inventory (BDI; McKee, Cunningham, Jankowski, & Zayas, 2001). Only one

study, comparing low-income African-American and Caucasian women, determined that there were no significant differences between these two groups (Jesse, Walcott-McQuigg, Mariella, & Swanson, 2005).

**Measurement of Depressive Symptoms**

As frequently reported in the literature, prevalence rates for depression are obtained from self-report measures due to the high cost of clinician-administered interviews. Several self-report measures have been utilized to assess depressive symptoms and were validated traditionally during pregnancy. The most frequently used of these measures are the Edinburgh Postnatal Depression Scale (EPDS), CES-D and the BDI. The EPDS, initially developed for testing during the postnatal period, is the most widely used self-report measure in the perinatal period. The EPDS is not a diagnostic measurement, but rather a screening instrument for depression (Cox, Holden, & Sagovsky, 1987). The EPDS has been validated for use during the antenatal period with empirically determined cut-off scores based on the most optimum properties of sensitivity and specificity (Matthey, Henshaw, Elliott, & Barnett, 2006). The recommended cut-off score for minor and major depression during the antenatal period is 12/13 (Murray & Cox, 1990). Women scoring 13 or greater are likely to be diagnosed with MDD.

Depression rates estimated by self-report questionnaires among pregnant women in the U.S. range from 11 to 51.4% (Dayan et al., 2002; McKee et al.,

2001). The large range is due to inconsistencies in cut-off scores between studies and consistently higher scores found in lower socioeconomic women. In a comprehensive review, Bennett and colleagues (2004) compared rates from a structured clinical interview with two screening measures, the EPDS and the BDI. They found no significant differences in the EPDS and the structured clinical interview. However, significantly higher rates of depression were reported by the BDI. This study raises concern about the higher rates that are routinely reported with the BDI and the lack of adequate specificity for this population.

**Course of Symptoms across Pregnancy**

To date, most of the research examining the stability of antenatal depressive symptoms has limited their focus from the end of pregnancy into the postpartum period. While no study has systematically measured the course of depression across pregnancy, several studies have examined a single time point in each trimester. Two separate meta-analyses have supported the findings that depression rates are highest among women progressing through their second trimesters (Bennett et al., 2004; Gavin et al., 2005). However, the AHRQ review found depression prevalence rates of 11.0 during the first trimester and dropping to 8.5% for the second and third trimesters, respectively, while indicating continued uncertainty in terms of when depression rates are highest during pregnancy (Gaynes, et al., 2005).

**Summary**

A number of factors contribute to the lack of consensus of reported prevalence of major and minor depression in pregnant women: the lack of clarity concerning the severity of symptoms measured, the confusing and interchangeable terms, and the difficulty diagnosing mental health during pregnancy. Additionally, depression prevalence among pregnant women maybe higher than reported, as studies often exclude women with psychiatric histories. Prevalence rates for minor and major depression among pregnant women, then, continue to be inconclusive.

## PREDICTORS OF ANTENATAL DEPRESSION

Numerous community studies have examined the risk factors for developing MDD. Findings indicate that often the causes of MDD are multi-determined including risk factors such as female gender, younger age, a previous history of depression, recent stressful life events, premature parental loss, lower levels of education, marital status (divorced, separated) or marital discord (Weissman, 1987). The most potent variables for depression in men are early childhood loss and low self-esteem (Kendler, Gardner, & Prescott, 2006). Specific to women, traditional social female roles and the associated chronic stressors have been suggested to contribute to the higher rates of depression found in women (Hammen & Brennan, 2002; Mirowsky, 1996). Childhood abuse is a significant risk factor for developing MDD during adulthood, and women are believed to suffer abuse at a 12:1 ratio compared to men (Weiss, Longhurst, & Mazure, 1999).

However, little is known about the predictors associated with antenatal depression. Previous studies are difficult to generalize due to the predominantly Caucasian samples and exclusion of women with medically complicated pregnancies or psychiatric histories. To date, Rich-Edwards and colleagues (2006) were the first to examine sociodemographic predictors of antenatal depressive symptoms in a large U.S. cohort study. This group found financial hardship and unwanted pregnancy to be associated with antenatal depressive symptoms, while

other studies have reported higher rates associated with factors such as age, parity, life events, social support, psychiatric history, employment status, previous miscarriage/stillbirth, personality factors and education.

**Age**

Age is clearly associated with depression in women, and research in antenatal depression mirrors these findings. Studies have consistently shown that younger women during pregnancy experience higher rates of depression (Gotlib et al., 1989). In 2006, Field, Hernandez-Reif and Diego found that women with a diagnosis of dsthymia or a major depressive disorder were significantly younger than non-depressed women. Similarly, in a U.S. cohort study, Rich-Edwards and colleagues (2006) found that pregnant women younger than 23 years of age were at two times the risk for depressive symptoms as compared with older pregnant women.

**Parity**

The data is inconsistent with regard to parity's influence on antenatal depression. Field et al. (2006) found no significant difference in the number of children between depressed and non-depressed pregnant women. However, several studies have reported an increase in depressive symptoms based on the number of children in the home. Pajulo and colleagues (2001) found the presence

of one child under school age was a protective factor while the highest depressive symptoms were among women with 2 to 3 children. Similar findings were reported by Gotlib and colleagues (1989), who found that the largest numbers of children were born to women with major depressive disorder or significant depressive symptoms.

**Employment**

The evidence supporting a relationship between employment and antenatal depression is inconclusive. Several studies have determined unemployment to be associated with depressive symptoms (Rubertsson, Wickberg, Gustavsson, & Radestad, 2005). Furthermore, Gotlib and colleagues (1989) found that depressed pregnant women were more likely to describe themselves as being housewives. These findings were supported in a national sample that found women between the ages of 15-54 were at a greater risk for MDD if they described their employment status as a homemaker (Kessler, Zhao, Blazer, & Swartz, 1997). In contrast, one study found no significant difference in the occupational status of women who met diagnostic criteria for depression and those who were deemed as not depressed (Kumar & Robson, 1984).

**Marital Status**

Oftentimes, prior research did not examine the relationship between marital status and antenatal depression. However, more recent studies (T. Field, Hernandez-Reif, & Diego, 2006) found women who were depressed were less likely to be married. Hobfoll and colleagues (1995) found that pregnant women were at increased risk for developing depression if they lacked a cohabitating partner. These studies suggest that it is not marital status but the presence or absence of a partner that places a women at risk, due to the fact that many women may experience single parenthood as an additional stressor (Feggetter, Cooper, & Gath, 1981).

**Education**

The information on education and antenatal depression is sparse. Only two studies have examined this sociodemographic factor (Field et al., 2006; Gotlib et al., 1989), and have found that women who were depressed during pregnancy had significantly lower levels of education than those women who were not depressed. The finding is consistent with the profile of a woman of lower socio-economic status who is less educated and particularly vulnerable to antenatal depression. Findings in a national sample indicate, for both men and women, the lack of a college education is a risk factor for MDD (Blazer, Kessler, McGonagle, & Swartz, 1994).

# PSYCHOSOCIAL VARIABLES

## Social Support

Overwhelming evidence confirms the link between supportive social relationships and mental health in the face of stressful life events (Cohen & Wills, 1985). Langford and colleagues (1997) examined the four most common attributes of social support: appraisal (affirmational support), instrumental (tangible goods and services), informational (problem-solving) and emotional (care, love and trust). Researchers have long recognized the positive relationships between social support and health (Langford, Bowsher, Maloney, & Lillis, 1997). Specifically, social support has been found to enhance mental health stability (Vandervoort, 1999). Several models of social support have been proposed to relate to mental well-being. One posits that society acts as a buffer from the adverse effects of stress, while the second implicates social support as a direct contributor to well-being, regardless of stressful events (Cohen & Wills, 1985).

Studies have consistently shown a relationship between a lack of social support and postpartum depression (O'Hara, 1986). More recently, the relationship has been examined in antenatal depression. According to Field et al. (2006), during the antenatal period, women were more likely to be depressed if they were unmarried (Field et al., 2006), or if they lacked the support or perceived support of a partner (Sequin, Potvin & St. Denis. 1995; Pajulo et al., 2001).

Most individuals define their primary support system as “family”. In some cases, friends may fill this role. However, one psycho-social effect of being referred away for treatment to an antepartum medical unit is the lack of proximity to social support. Husbands and partners are often unable to obtain extended leave from work, or they are needed to care for children at home. Plausibly, if a woman has been referred to care outside her demographic area, it is possible that social support is less available, causing increased maternal stress.

**Pregnancy Intendedness**

In 2001, approximately 49% of all pregnancies are unintended at the time of conception (Finer & Henshaw, 2006). Numerous behavioral correlates have been identified in unintended conceptions, including consumption of tobacco and alcohol (Kost, Landry, & Darroch, 1998). Furthermore, women are more likely to be battered by an abusive spouse while carrying an unintended pregnancy (Goodwin, Gazmararian, Johnson, Gilbert, & Saltzman, 2000). Recently, researchers have begun to explore the relationship between pregnancy intendedness and maternal mood during pregnancy**.** There is a clear relationship between an unintended pregnancy and antenatal depression (Messer, Dole, Kaufman, & Savitz, 2005; Rich-Edwards et al., 2006), with rates for depressive symptoms as high as two-fold compared to women with planned pregnancies (Rich-Edwards et al., 2006).

**Miscarriages and Stillbirth**

In 2000, 18 in every 1000 deliveries in North America ended in stillbirth. A stillbirth is defined as a loss of pregnancy after the 20th week (Stanton, Lawn, Rahman, Wilczynska-Ketende, & Hill, 2006). Most studies report that a mother experiencing a stillbirth will become pregnant subsequently in a relatively short period of time (Dyregrov & Matthiesen, 1987). Consistent with this, Forrest and colleagues (1982) found that more than half of the women in their samples had become pregnant within one to two years of their loss. Some bereavement literature indicates that pregnancy soon after the loss of a pregnancy may contribute to mental health problems (Forrest, Standish, & Baum, 1982).

Hughes and colleagues (1999) assessed depressive symptoms in sixty pregnant women whose previous pregnancies had ended in a stillbirth, compared to matched controls without a history of pregnancy loss. The women were followed from the third trimester through the end of the perinatal period. Depressive symptoms were measured by the EPDS, and the results suggested that women whose previous pregnancy had ended in stillbirth were significantly more depressed than the controls during the third trimester. Furthermore, depressive symptoms remained elevated for this group through the perinatal period. Interestingly, these studies determined a particular vulnerability for depression in women who conceived less than 12 months after giving birth to stillbirth infants,

suggesting that it may be advantageous for a woman to delay a subsequent pregnancy following a stillbirth to allow adequate time for grieving.

Less is known about the impact of miscarriage on the maternal mental health (Conway, 1995). Miscarriage is the spontaneous termination of a nonviable pregnancy, occurring within the first 20 weeks of gestation (Klier, Geller, & Neugebauer, 2000). Statistics estimate that 10-20% of all recognized pregnancies will end in miscarriage. Numerous factors increase a women's risk for miscarriage, including maternal age (Risch, Weiss, Clarke, & Miller, 1988), uterine and chromosomal abnormalities (Garcia-Enguidanos, Calle, Valero, Luna, & Dominguez-Rojas, 2002), environmental factors (Abel, 1997) and stressful life events (Neugebauer et al., 1996).

Reportedly, shortly after a miscarriage, most women suffer from depressive symptoms. Neugeberger and colleagues compared depressive symptoms in 232 women four weeks after miscarriage to a group of pregnant and non-pregnant women. Their findings suggested that women who experienced a recent miscarriage had significantly higher rates of experiencing depressive symptoms, with the highest rates observed in those women who were also childless.

Studies indicate women with a previous history of a miscarriage are at no greater risk for developing antenatal depression (Kumar & Robson, 1984); however, the research on the impact of miscarriage on the subsequent pregnancy

is mixed. There is a debate surrounding the best time for a woman to conceive following a miscarriage. Hughes and colleagues (1999) found that women at the greatest risk for depression during a subsequent pregnancy were those who became pregnant fewer than 12 months following miscarriage, while Swanson (2000) found that women who were least depressed had a child or were pregnant, suggesting that less time between these pregnancies is more favorable. Theut and colleagues (1988) found no significant difference in depressive symptoms in couples that experienced a perinatal loss (64% of the sample had miscarriage prior to 20 weeks) compared to pregnant couples with no history of such loss. Franche and Mikail (1999) research suggested it was not history of miscarriage or time but rather personality factors that contributed to depression in this population.

**Psychiatric History**

Research has shown a strong link in antenatal and postnatal depression in women with a previous history of psychopathology (Kumar & Robson, 1984; O'Hara, Neunaber, & Zekoski, 1984; O'Hara & Swain, 1996; Watson, Elliott, Rugg, & Brough, 1984). Studies suggest that a history of depression is the strongest predictor of antenatal depression (Rich-Edwards et al., 2006) while a previous personal history of depression and a family psychiatric history were found to be vulnerabilities for postnatal depression (O'Hara et al., 1984). Only one study in pregnant women found no association between depression and personal

and family history (Areias, Kumar, Barros & Figueiredo, 1996); however, it is important to note the limitations of the small sample size ($n$ = 54) used in this study.

**Personality**

A significant body of literature describes the relationship between certain personality structures and depression, to which Blatt's (1974) model of personality development and depression has contributed significantly. According to this model, two paths of psychological development occur during childhood, one of which is focused on interrelatedness and the other on self-identity. Blatt called these two personality styles anaclitic (dependency) and introjective (self-criticism), respectively. Dependency is associated with a focus on care, connectedness and relatedness, with a deep longing to be loved, and corresponding fears of abandonment and loss (Blatt & Zuroff, 1992). In contrast, self-criticism is defined by a sense of high expectations and a drive toward achievement to support one's self-worth. However, feelings of failure to meet expectations elicit feelings of guilt, inferiority and concerns about garnering approval and love. Blatt (1991) conceptualized the interplay between these two paths in a healthy individual as follows:

> "an increasingly differentiated, integrated, and mature sense of self is contingent upon establishing satisfying interpersonal experiences, and,

> conversely, the continued development of increasingly mature and satisfying interpersonal relationships is contingent upon the development of a more mature self-definition and identity" (p. 453).

In his work, Blatt theorized that an imbalance between the two paths may result in differing psychopathologies. There is significant evidence to support that both dependency and self-criticism are personality vulnerabilities to depression (Zuroff, Mongrain, & Santor, 2004). Subsequent to publishing this model, Blatt and colleagues (1976) developed the Depressive Experiences Questionnaire (DEQ) to measure dependency and self-criticism, which when used in the perinatal studies, has almost exclusively focused on the postpartum period (Priel & Besser, 1999).

In 1999, Priel and Besser investigated dependency and self-criticism in a sample of pregnant women with vulnerabilities to depression and examined the moderating effects of antenatal attachment. They found that women who scored high on self-criticism and low on dependency as measured by the DEQ were more likely to suffer from postpartum depression. According to Besser and Priel, self-critical women face significant challenges during pregnancy. The idea of a new role as parent may illicit self-criticizing thoughts that threaten a women's self-identity.

Using the DEQ, Franche and Mikail (1999) examined the psychological adjustment of pregnant women who experienced a perinatal loss in a previous pregnancy. They found that the depressive symptomatology was associated significantly with self-criticism, low levels of dependency, and a higher number of pregnancy losses. They posited that self-critical individuals may interpret the pregnancy loss as a personal failure, making them particularly vulnerable to developing depression.

In contrast to Blatt's developmental model, Hans Eysenck proposed a personality model based on genetics, focusing on an individual's temperament. Eysenk's model is composed of three broad dimensions including, introversion-extraversion, neuroticism and psychoticism. Research suggests that highly neurotic individuals are predisposed to negative cognitions causing a vulnerability to depression (Berlanga, Heinze, Torres, Apiquian, & Caballero, 1999). Kumar and Robson (1984) assessed personality factors in pregnant women using the Eysenck Personality Questionnaire (EPQ). They found that high scores on the neuroticism and psychoticism scales were significantly associated with antenatal depression but failed to predict postnatal depression prevalence.

In summary, the understanding of personality functioning has been identified as an important factor in the etiology and treatment of depression in women (Widiger & Anderson, 2003). To date, most of the literature describing the association between women and personality has focused on dependency, as

this variable has been shown to be a significant vulnerability factor for depression in women (Blatt & Zuroff, 1992; Nietzel & Harris, 1990). Consistently, studies have found that women of all ages obtain higher scores on measures of dependency compared to men (Bornstein, 1995). In contrast to the studies that support dependency as a risk factor in women across ages, the perinatal literature suggests that a self-critical woman is at a greater risk for developing depression, whereas women who are highly dependent may find the transition to motherhood less stressful.

**Life Events**

Stress is often measured by the number of adverse major life events experienced by a person (Holmes & Rahe, 1967). There is a substantial body of evidence citing the relationship among adverse life events, the degree to which they occur, and their negative impacts on a woman's psychological mental health. Paykel (1979) found an excess of major adverse life events in those patients who developed depression. He also determined a statistical association with life adversity and the relapse of depression (Paykel & Tanner, 1976). Other research has elucidated the same relationship with stressful life events and pregnancy. In a Swedish sample, Rubertsson and colleagues (2005) found antenatal depressive symptoms to be associated with experiencing two or more stressful life events in the year prior to pregnancy. Additionally, higher EPDS scores were correlated

positively with increasing numbers of stressful events. Da Costa and colleagues (2000) found that hassle scores, recorded during the first trimester, were the best predictors of depressed mood during pregnancy. Notably, Field and colleagues (2006) examined 810 pregnant women and found a significant difference in the number of hassle scores reported between the depressed and non-depressed groups. In a study examining minority women with uncomplicated pregnancies, Zayas and colleagues (2002) found a significant relationship between negative life events and depressive symptoms as measured by the BDI. Furthermore, research has found that chronic stressors were more impactful than time-limited events in a pregnant population (Sequin, Potvin & St. Denis, 1995). In contrast, Kumar and Robson (1984) found no relationship between life events and antenatal depression in a group of first-time mothers.

## THE HIGH-RISK HOSPITALIZED PATIENT

According to the National Centers for Health Statistics, there are approximately 6 million pregnancies and 4 million births each year (NCHS, 2002). While a majority of these babies are born healthy, serious complications arise in some pregnancies. In fact, 10-20% of all pregnancies are considered high-risk (Knuppel & Drukker, 1993), indicating that a maternal or fetal complication threatens a healthy outcome. In general, there are two types of high-risk patients: the woman who begins pregnancy with a chronic maternal complication, thus

increasing her chances for incurring problems, or the woman who develops complications during her pregnancy, thus necessitating special care (Knuppel & Drukker, 1993). Chronic maternal complications include sickle cell anemia, diabetes mellitus, hypertension, cardiovascular abnormalities, autoimmune and neurologic disorders (Burrow, 1995). Pregnancy-induced complications include preterm labor, preeclampsia, intrauterine growth retardation, multiple pregnancy, premature rupture of membrane, placenta previa and fetal abnormalities (Queenan, 1999).

The most common prescription for high-risk pregnancy patients is bedrest. Approximately 700,000 women are advised to adhere to this prescription at some point during their pregnancy (Crowther, 2001; Goldenberg et al., 1994). These women often take their bedrest at home or in a hospital, depending on the type and severity of the pregnancy complication. Most often, the goal is to extend the pregnancy to prolong gestation, thus allowing the fetus to develop. Bedrest is often prescribed to treat conditions such as preeclampsia, fetal growth retardation, bleeding, preterm labor and multiple births. Women describe bedrest as a physically, emotionally and financially stressful experience (Schroeder, 1996).

Although the trend over the last decade has shifted towards outpatient care for pregnancy complications, there are a significant number of women hospitalized each year for close medical supervision. Using the statistics from the National Hospital Discharge Survey (NHDS), Bacak and colleagues (2005)

estimated pregnancy-associated hospitalization (non-delivery) to be 12.8 per 100 deliveries in the United States. Women were most often hospitalized for preterm labor, vomiting, genitourinary complications and hypertensive disorders. In 1999-2000, hospitalization rates were the highest among young women ages 20 to 24, African-American women and women without private insurance (Bacak, Callaghan, Dietz, & Crouse, 2005).

**High-Risk Pregnancy as a Source of Stress**

In *Stress and Emotion,* Lazarus identifies three types of psychological stress: harm/loss, threat and challenge. A woman hospitalized on an antepartum unit faces all three stressors. She is faced with the loss of a normal pregnancy, a threat to the fetus and her health, and the outcome of her pregnancy. Additionally, she is faced with the challenge to persevere through the mandated hospitalization period in hopes of taking home a healthy newborn. These three stressors are taxing on a woman's resources. If she begins to feel that the demands of the situation are too great, she becomes at risk of feeling anxious and depressed, which is a recurring theme for high-risk hospitalized women (Mercer et al., 1986).

Mercer et al. (1986) presented a theoretical model on the effects of antepartum stress on maternal health status. They hypothesized that the antepartum stress (i.e., pregnancy complication) affects the woman's sense of mastery (SOM) or control. Loss of control is a repeated theme for women who

experience a high-risk pregnancy (Evans & O'Brien, 2005). Mediating variables that affect antepartum stress are self-esteem and social support. Based on Dixon and Dixon's (1984) research, there is a direct relationship between SOM and emotions such as anxiety and depression.

**Psychological Effects**

The physical effects of bedrest on the mother have been well documented. The woman is at increased risk for thromboembolic disease, bone demineralization, muscle atrophy, weight loss and calcium depletion (Goldenberg et al., 1994; Maloni et al., 1993). Less understood and researched is the psychological impact of the dual stress of pregnancy complication and hospitalization. Research on the psychological aspects of hospitalization and immobilization can contribute to our understanding of what a woman experiences. According to Hyman (1972):

> "Loss of mobility leads to loss of independence, both financial and personal. Coupled with the loss of the patient's home, loss of loved ones … and the result is a pronounced deprivation of precious values."

A majority of the research conducted on high-risk hospitalized patients has been descriptive. Case studies and qualitative research have helped to deepen the

understanding of a woman's experience while hospitalized. In a phenomenological study, Leichtentritt and colleagues (2005) examined 57 Israeli women's experiences of being hospitalized as a result of high-risk pregnancies. From these case studies, five themes emerged:

1) The desire to nurture
2) Personal and social meaning of family
3) Loss of normal experiences of life and childbearing
4) The woman's need versus the well-being of the fetus
5) Sources of strength and stress

In a sample of 61 Canadian women, White and Ritchie (1984) examined the most common stressors encountered while hospitalized on an antepartum unit. They developed a new instrument, the Antepartum Hospital Stressors Inventory (AHSI; White & Ritchie, 1984) to measure forty-seven potential stressors on a Likert scale. Items were grouped into seven categories: separation, environment, health status, communication with health professionals, self-image, emotions and family status. Women reported that variables related to family, separation from home and disturbing emotions ranked the highest among stressors.

In an ethnographic study, Heaman and Gupton (1998) compared the perceptions of 12 women on bedrest at home versus 12 women who were hospitalized. Similarities in the two group experiences included the significant

impact on the emotional and social well-being of the woman and her family. Hospitalized women were most often concerned about being separated from their home and family. Often times, women are transferred to regional medical centers, leaving behind their geographic primary support system.

Although case reports suggested that women frequently experienced emotional disturbances during their hospitalizations, to date there has been limited research in this area. In one of the few relevant studies, Maloni et al. (2002) examined the stability of dysphoria across the antepartum to postpartum period. The sample included 63 women admitted to an antenatal unit, with the inclusion criteria including only the diagnosis of a) preterm birth, b) premature rupture of membranes, c) incompetent cervix, d) placenta previa, e) multiple gestation, and f) placenta abruption. Women were excluded if they were diagnosed with chronic conditions such as asthma or hypertension or had a psychiatric condition. Dysphoria was measured by the Multiple Affect Adjective Checklist Revised at admission and discharge or delivery. A composite dysphoria score was computed by combining the anxiety, depression and hostility subscales. Four time points were analyzed in the postpartum period: 2 days after delivery, at 2 weeks, at 4 weeks, and at 6 weeks. Results indicate that dysphoria significantly decreased from admission to discharge. These results were not surprising. Admission to the hospital is stressful with the outcome still uncertain; however, by discharge or delivery the outlook is most often optimistic. There was no relationship found

between dysphoria at admission and length of bedrest or estimated gestational age at admission.

In a subsequent study, Maloni and colleagues (2005) examined 89 women treated with bedrest, 37 women remained hospitalized for four weeks. Depressive symptoms were measured by the Multiple Affective Adjective Checklist Revised (MAACL-R), the Profile of Mood States (POMS) and the Center for Epidemiological Studies Depression Scale (CES-D). Women scored high on all three measures at admission and experienced a decrease across time on the MAACL-R and POMS. Interestingly, women's scores on the CES-D remained elevated across hospitalization. In contrast, White & Ritchie (1984) found the intensity of stress experienced during hospitalization increased over a two-week period, with disturbing emotions ranking in the highest category.

## PURPOSE OF THE PRESENT STUDY

Although society expects pregnancy to be time when a woman "blooms," we estimate 10 to 15% of women will suffer from a major depressive episode, with 25 to 50% experiencing significant depressive symptoms (Gaynes et al., 2005). The presence of depression during pregnancy has serious consequences for the mother and the developing fetus, with documented effects lasting into childhood. While there appears to be a relationship between antenatal depression and certain psychosocial factors, for several aforementioned reasons these

findings are not always consistent and require further investigation. Additionally, much focus has been on evaluating women with uncomplicated pregnancies, limiting the generalizability. Relatively little focus has been paid to the women diagnosed with a high-risk pregnancy and requiring hospitalization despite evidence suggesting that these women may experience increased anxiety and depression. Therefore, little is known about the risk factors associated with depression in these women or what occurs when a woman is hospitalized. Do her symptoms persist or remit across hospitalization?

Given the lack of research within this area, the current study aims to do the following:

1. The primary objectives of this study are to determine what risk factors predict MDD and depressive symptoms upon admission to a high-risk antepartum unit and to determine which of these risk factors continue to be predictive of depression across hospitalization.
2. Secondary objectives of this study are to examine the course of depression across hospitalization and to examine the relationship among personality, medical complications and depression for each patient.

# HYPOTHESES

## Hypothesis One

*Identifying predictors of risk*

Based on previous findings reported in the antenatal literature, it is hypothesized that certain factors will be associated with higher levels of depressive symptoms and MDD. Predictors to be examined are the following: family and psychiatric history, life events, pregnancy intendedness, distance from home, income and type of medical insurance. Further demographic variables, such as age, income, number of children in the home, ethnicity and marital status will predict depression and MDD as measured by the EPDS, CES-D and SCID. The identification of such variables might allow for more tailored intervention in future studies.

*Predictor Variables*

*Psychiatric History.* Women who report a positive psychiatric history will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS, and SCID, than women who report a negative psychiatric history.

*Family History.* Women with a positive family history for a psychiatric disorder will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS and SCID, than women who report a negative family psychiatric history.

*Life Events.* Women who report high levels of life event stress in the past year will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS, and SCID, than women who report lower levels of life event stress.

*Pregnancy Planning.* Women who report an unplanned pregnancy will endorse higher level of depressive symptoms, as measured by the CES-D, EPDS, and SCID, than women who report a planned pregnancy

*Distance from Home.* Women who live more than 60 miles from Baylor University Medical Center (BUMC) will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS, and SCID than women who live less than 60 miles from BUMC. The figure of 60 miles was selected indicating residence outside of the DFW area warranting a possible hardship.

*Age*. Women who are younger will endorse higher levels of depressive symptoms as measured by the CES-D, EPDS, and SCID, than women who are older.

*Marital Status*. Women who are single will endorse higher levels of depressive symptoms as measured by the CES-D, EPDS, and SCID, than women who are cohabitating, separated or married.

*Income.* Women with a lower income will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS, and SCID, than women with higher income.

*Insurance.* Women with Medicaid will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS, and SCID, than women with private insurance.

*Ethnicity.* Women who are African-American or Hispanic will endorse higher levels of depression as measured by the CES-D, EPDS and SCID, than Caucasian women.

*Parity.* Women with two or more children will endorse higher levels of depressive symptoms as measured by the CES-D, EPDS, and SCID, than women with only one child.

*Termination*. Women who considered termination during the pregnancy will endorse higher levels of depressive symptoms as measured by the CES-D, EPDS, and SCID, than women who did not consider termination.

**Hypothesis Two**

*Evaluating predictor strength*

The risk factors that are predictive of depression at the time of hospital admission will continue to be predictive of depression over the course of hospitalization.

**Hypothesis Three**

*Assessing predictor course*

It is hypothesized that women who are clinically depressed upon admission, as determined by the SCID, or who exceed thresholds on self-report measures (EPDS and CES-D), will remain depressed or continue to elevate on self-report measures until discharge.

**Hypothesis Four**

*Identifying within-group risk*

Based on the perinatal literature, it is hypothesized that women characterized as self-critical, by the DEQ, are more likely to experience depression during pregnancy than women characterized as dependent by the DEQ.

**Hypothesis Five**

*Evaluating the impact of personality on the course of depressive symptoms*

Based on prior research with women, it is hypothesized that women characterized as dependent by the DEQ at admission will experience a decrease in depressive symptoms over the course of hospitalization, while women characterized as self-critical at admission will experience either no improvement or an increase in depressive symptoms during hospitalization.

**Hypothesis Six**

*Evaluating the impact of within-group risk and potential complicating variables*

It is hypothesized that women who are characterized as being self-critical and experiencing one or more maternal complication will experience significantly greater depression as compared to self-critical women with a fetal complication and dependent women with either a fetal or maternal complication. For purposes of this hypothesis, a maternal or fetal complication will be determined by the location of the complication.

# CHAPTER THREE
# Methodology

## PARTICIPANTS

One hundred sixty pregnant women from Baylor University Medical Center's antepartum unit were recruited to participate in the study. Women over the age of eighteen who were admitted to the antepartum unit due to a pregnancy complication were asked to complete several surveys. Only women hospitalized for more than 72 hours were included in the study (since it takes at least 72 hours to administer all the measures). In addition, only women who could communicate and read in English or Spanish were included in the study. Pregnant women who were cognitively impaired, homicidal, or psychotic were excluded from the study.

## METHODS AND PROCEDURES

A research team member reviewed the purpose and the procedure of the study with prospective participants. Consenting, participants were asked to sign a consent form, and a duplicate copy was provided for the participant. Participants were then asked to complete a Time 1 packet that included three measures of depressive symptoms (i.e., the EPDS, the CES-D, and the DEQ). A research team member immediately scored the three measures of depressive symptoms to

determine if participants exceeded the set thresholds for depressive symptoms. The research team member then administered the SCID to determine the presence or absence of major depressive disorder.

After completing the initial evaluation, women who were hospitalized longer than one week completed a Time 2 packet (EPDS and CES-D depressive symptoms measures) thereafter on a weekly basis until discharge or delivery.

## MEASURES

The Center for Epidemiological Studies-Depression scale (CES-D) is a 20-item self-report scale developed to measure depressive symptoms in the general population (L. S. Radloff, 1977). Respondents are asked to rate the frequency of each event or behavior over a one-week period of time as rarely or none of the time, some or little of the time, occasionally or moderate amount of the time or most or all of the time. All items are equally weighted and scored 0-3 with total scores ranging from 0 to 60. Acceptable reliability and validity has been demonstrated across age, education, and racial groups (L. S. Radloff, 1991; L. S. Radloff, Ten L., 1986). Specifically, in a perinatal population, good internal consistency was found (Beeghly et al., 2002). A total score of 16 was the set threshold in this study, triggering the administration of the Structured Clinical Interview for DSM-IV, mood module.

The Depressive Experiences Questionnaire (DEQ) is a 66-item self-report measure developed to assess the personal experience of depression (Blatt SJ, 1976). Three primary factors scores are yielded; Dependency, Self-Criticism and Efficacy. Dependency is externally directed, with concerns about interpersonal relationships themes including feelings of abandonment, hopelessness and loneliness, while, self-criticism focuses on one's failure to live up to expectations, related to feelings of inferiority and guilt. Respondents were asked to rate each item on a 7-point likert-type scale [1 – Strongly Agree; 7 – Strongly Disagree]. The mean for each factor is 0, and the standard deviation is +/- 1. Minus scores indicate low involvement for that particular factor. The factors are internally consistent and show both short and long-term test-retest reliability (Zuroff, Quinlan, & Blatt, 1990). Further evidence for construct validity has been reported (Blatt & Zuroff, 1992).

The EPDS is a 10-item self-report measure designed to screen for depressive symptoms during the postnatal period (Cox et al., 1987). Items are measured on a 4-point likert-type scale based on their experience during the past seven days. Items are equally weighted and scored from 0 to 3, yielding a score range from 0 to 30. The EPDS measures symptoms of depression but excludes the somatic symptoms (i.e., fatigue) that are normal during the perinatal period. Although the EPDS was developed to measure depressive symptoms during the postpartum period, studies indicate moderate reliability and validity during the

antenatal period as well. The EPDS was shown to be positively correlated with the Hospital and Anxiety Depression Scale in a high-risk pregnancy population (r = .74) (Adouard, Glangeaud-Freudenthal, & Golse, 2005). To optimize the tests sensitivity and specificity, and in accordance with other studies, a cut-off score of 11 or higher was used to trigger the administration of the SCID mood module (D. Murray & Cox, 1990).

Life Events Scale for Obstetric Groups (LES) is a 42-item self-report measure that includes general life events and events specific to pregnancy (Barnett, Hanna, & Parker, 1983). Respondents are asked to indicate if the event occurred in the last 12 months. Previous research findings indicate a relationship between the number of significant life events and depression during the antepartum and postpartum periods (Barnett et al., 1983; Da Costa, Larouche, Dritsa, & Brender, 2000; T. Field et al., 2006). In addition, respondents were asked to provide a distress rating for each life event, regardless of whether they had experienced the event in the last 12 months. The Distress was rated on a 0 to 10 scale [0 – Not Distressing at All; 10 – As Distressing as it could be]. High internal consistency was demonstrated for distress scores in both primparous and multiparous samples (Barnett, et al., 1983).

Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version SCID-I (First et al., 1994) was administered to participants who exceeded any of the other instruments thresholds in order to determine the presence or

absence of MDD. The SCID is organized into modules. For the current study, only the mood disorder module was administered.

All research team members received training from an experienced SCID interviewer. In addition, research members viewed interviewer training videotapes throughout the study to assure inter-rater reliability. The test-retest reliability for diagnosing a major depressive disorder over a 7-10 day period is .61 (Williams, et al., 1992). In addition, study findings examining the validity of the SCID vis-à-vis standard clinical interviews indicate superiority of the SCID.

## DATA ANALYSIS

Several statistical procedures were used to test the hypotheses posited in this study. Specifically, multiple regression procedures, analysis of variance (ANOVA) procedures using multiple regression, and hierarchical linear modeling tests will be used to test the proposed hypotheses.

### Hypotheses One and Two: Multiple Regression

These hypotheses will be tested using multiple regression procedures. Two assumptions of multiple regression are that the outcome variables be measured on an interval or ratio scale and that the data should come from a normal distribution. The first assumption will be satisfied since the various measures of depression are all measured on an interval or ratio scale. In order to

check whether the second assumption has been met, tests of normality will be conducted on each of the variables prior to running multiple regression analyses.

**Hypothesis Three and Five: Hierarchical Linear Modeling**

These hypotheses will be tested using hierarchical linear modeling procedures (using the HLM 6 program). Change in depression scores across time will be modeled at two levels. The first level will consist of participants' depression scores across time (i.e., the unit of analysis will be within subjects). The second level will look at differences between the subjects and will include the various predictors of depression (i.e., demographic, biological, psychological and social factors). The mean change of depression scores (i.e., the intercept in the first level model) will then be regressed on these predictors and those across hospitalization.

**Hypotheses Four and Six: Analysis of Variance**

These hypotheses will be tested using analysis of variance (ANOVA). A 2 (depression) x 2 (personality) x 2 (complication) will be calculated. The main effect and as well as the interaction effect between the variables will be assessed. The effects of both variables will be tested at the .05 level.

# CHAPTER FOUR
# Results

One thousand, one hundred and twenty-eight women were admitted to the antepartum unit at Baylor University Medical Center between October 2005 and December 2006. Of these women admitted, 312 were approached about participating in the present study. Exclusion criteria included the following: (1) discharge less than 72 hours after admission, (2) admitted to the unit for a reason other than pregnancy complications, and (3) admitted during the postpartum period. The majority of the women approached for the study consented ($n$ = 166), from which 129 participants completed baseline measures. Reasons for not completing baseline measures after consenting ($n$ = 37) included early discharge/delivery, fetal demise, and withdrawal of consent. A total of 109 women declined to participate in the study, and while no formal data to exploring reasons for non-participation was collected, many of these women were observed to be in greater physical and/ or emotional distress than the participants.

**Demographic Information**

The demographic composition of the sample is shown in Table 1, which consisted of 129 women, ranging in age from 17 to 44 years with a mean age of 27.63 (SD = 6.40). Fifty-four percent of the sample (*n* = 70) were Caucasian, 33% (*n* = 42) were African-American, 11% (*n* = 14) were Hispanic, 2% (*n* = 2) were Asian and less than 1% (*n* = 1) of the sample identified themselves as other. In the sample, 51% (*n* = 66) were married, 32% (*n* = 41) were single, 13% (*n* = 16) were cohabitating, and 11% (*n* = 4) were separated. The average number of children in the home was 1.13 (SD = 1.45) with a range from 0 to 7 children. In terms of education, 13% (*n* = 17) of the sample did not complete high school; however, 24% (*n* = 31) completed high school or received an equivalent degree, 34% (*n* = 44) completed some college and 28% completed their undergraduate degree (*n* = 35). Forty percent (*n* = 50) were unemployed, 29% (*n* = 36) were on leave, 25% were employed full-time (*n* = 32), and 6% (*n* = 8) were employed part-time. Eleven percent (*n* = 14) reported a household income of under $12,000, 24% (*n* = 30) reported an income of $12,000-25,000, 20% (*n* = 25) reported an income of $26,000-40,000, 26% (*n* = 20) reported an income of $41,000-65,000, and 29% (*n* = 37) reported an income > $66,000. Finally, 48% (*n* =61) reported that they possessed private insurance to cover their medical cost, 50% (*n* = 64) reported Medicaid (Government Assistance) coverage, and 2% (*n* = 2) reported having no insurance at admission.

**Obstetric History**

Data on obstetric history is illustrated in Table 2. Twenty-eight percent (*n* = 36) of the subjects had never been pregnant, 26% (*n* = 33) reported one prior pregnancy, 19% (*n* = 24) two prior pregnancies, 13% (*n* = 17) three prior pregnancies, 5% (*n* = 7) reported four prior pregnancies, and 9% (*n* = 11) reported five or more prior pregnancies. Forty-three percent (*n* = 55) of the subjects reported a history of obstetric complications. Thirty-two percent (*n* = 41) of the subjects reported having had a previous miscarriage, 6% (*n* = 8) stillbirth, 5% (*n* = 6) neonatal demise, and 8% (*n* = 10) reported a previous termination.

**Pregnancy Characteristics**

Approximately, 10% (*n* = 13) of the subjects reported needing help getting pregnant. Complications arose among 19% (*n* = 24) during the first trimester, 36% (*n* = 45) during the second trimester, and finally 45% (*n* = 57) during the third trimester (see Table 2). Based on admitting diagnoses, 66% (*n* = 85) were admitted due to a fetal risk, whereas only 27% (*n* = 35) were admitted with a maternal risk. Six percent (*n* = 8) of the women were hospitalized due to both a maternal and fetal risk. The most common admitting diagnoses were preterm labor (26%), premature rupture of membranes (16%) and incompetent cervix (18%). Fifty-nine percent (*n* = 75) of the subjects reported the pregnancy was not

planned, 44% (*n* = 57) reported doubts or concerns about the pregnancy, and 7% (*n* = 10) considered termination.

**Psychiatric Characteristics**

Data on psychiatric characteristics were available for 96.9% (*n* = 125) of the sample (see Table 3), of which 76% (*n* = 95) denied a previous psychiatric diagnosis, 11% (*n* = 14) reported a previous diagnosis of depression, 8% anxiety (*n* = 10). One participant (0.8%) endorsed a past diagnosis of bipolar disorder and 5% (*n* = 5) a comorbid mood and anxiety disorder. Twenty-seven percent (*n* = 35) of the participants had received past psychopharmacologic intervention, 26% (*n* = 34) of the participants reported a history of therapy, and 4% (*n* = 5) reported a prior psychiatric hospitalization. Thirty-percent (*n* = 38) reported a positive family history for a psychiatric illness, and 7% (*n* = 9) of the sample were receiving a psychopharmacologic intervention at admission.

When screened for depression, 44.2% (*n* = 57) endorsed depressive symptoms on the EPDS (scores at or above threshold of $\geq$11) and 45% (*n* = 50) endorsed depressed symptoms on the CES-D (scores at or above threshold of $\geq$16 (see Table 3). Over half of the women exceeding threshold, 65% (*n* = 40) did so on both depression measures. Of the 57 women, who exceeded on either measure and were scheduled for SCID administration to assess for a formal diagnosis of

MDD, 5% ($n$ = 6) met criteria for MDD. Twenty-four women did not undergo the SCID, generally due to early discharge from the hospital or delivery of the baby.

**Hypothesis One**

*It was hypothesized that specific factors would be associated with high levels of depressive symptoms and MDD. Predictors included family and psychiatric history, life events, pregnancy intendedness and distance from home. Further, it was hypothesized that demographic variables (e.g., age, household income, number of children in the home, ethnicity, and marital status) will predict depression and MDD as measured by the EPDS, CES-D and SCID.*

A series of chi-square analyses (see Table 4, 5, and 6) were conducted on categorical variables and Pearson bivariate correlations (see Table 7) as well as independent *t*-test (see Table 8, 9) on continuous variables to determine if any relationship existed between the independent variables outlined below and the dependent variables (EPDS, CES-D and SCID diagnosis). Both the EPDS and CES-D generated total scores that were subsequently separated into two groups: above the threshold (probable diagnosis of depression – EPDS $\geq$ 11 and CES-D $\geq$16) and below the threshold. A third group was analyzed with those participants who received a diagnosis of MDD (as determined by the SCID) compared to women in the sample with no diagnosis. Analyses excluded the aforementioned 24 women who did not complete the SCID.

**Predictor Variables**

*$H_{1.1}0$: Psychiatric History: Women with a psychiatric history will endorse higher levels of depressive symptoms (as measured by the CES-D, EPDS, & SCID) than women without a psychiatric history.* Non-parametric analyses examining the frequency between predictor variables and the primary dependent variables revealed a significant association between psychiatric history and depression as measured by SCID $\chi^2$ (1, $n$ = 104) = 40.07 $p$ = .03 one-tailed Fishers Exact Test). Sixty-six percent ($n$ = 4) of the women with MDD ($n$ = 6) reported a positive psychiatric history, whereas 33% ($n$ = 2) with a diagnosis of MDD denied a previous diagnosis. Of the women with no diagnosis of MDD in the current study, 78% ($n$ = 77) denied a previous psychiatric history, with 21% ($n$ = 21) endorsing a history. However, neither self-report measures of depression yielded significant differences between these sets of variables: EPDS $\chi^2$ (1, $n$ = 125) = 2.25, $p$ = .13 and CES-D $\chi^2$ (1, $n$ = 110) = .156, $p$ = .69.

*$H_{1.2}0$: Family History: Women with a family history of psychiatric illness will endorse higher levels of depressive symptoms (as measured by the CES-D, EPDS & SCID) than women without a family history of psychiatric illness.* Analyses did not reveal any significant difference between the levels of family history in terms of the primary dependent variables of the study: the EPDS $\chi^2$ (1, $n$ = 125) = .579,

$p$ = .44; CES-D $\chi^2$ (1, $n$ = 110) = .180, $p$ = .67 and the SCID $\chi^2$ (1, $n$ = 101) = .00, $p$ = .60 one-tailed Fishers Exact Test).

*$H_{1.3}$0: <u>Life Events:</u> Women who report two or more life events in the past year will endorse higher levels of depressive symptoms (as measured by the CES-D, EPDS, & SCID) than women who report fewer than two life events.* The life events scale for obstetric groups (LES) measures both general life events and those specific to pregnancy. The final analyses did not include 30 participants whose measures revealed a seemingly high number of unanswered questions. Four participants ($n$ = 4) reported less than 2 life events, whereas 96% ($n$ = 95) endorsed two or more life events. The results failed to find a significant difference between the endorsing and non-endorsing of life events on all measures for depression [EPDS $\chi^2$ (1, $n$ = 99) = .00, $p$ = .68 one-tailed Fishers Exact Test), CES-D $\chi^2$ (1, $n$ = 88) = .01, $p$ = .56 one-tailed Fishers Exact Test) and the SCID $\chi^2$ (1, $n$ = 81) = .06, $p$ = .79 one-tailed Fishers Exact Test)]. In light of the fact that descriptive statistics found only four women in the sample endorsed fewer than two life events, the variable of life events was dichotomized. Specifically, a median split ($Mdn$ = 7) was conducted based on the total score of the LES. Women were dichotomized into two categories: a) below the median of stressful life events [56.6 % ($n$ = 56) on life events]; or b) above the median of stressful life events [43.4% ($n$ = 43)]. Analyses revealed significant findings for the EPDS, $\chi^2$ (1, $n$ = 99) = 15.53, $p$ =

.000; CES-D $\chi^2$ (1, $n$ = 88) = 17.42, $p$ = .000; and SCID, $\chi^2$ (1, $n$ = 81) = 20.70, $p$ = .04. Approximately 63% ($n$ = 31) of the women who fell above the sample's median of stressful life events had elevated scores on the EPDS compared to 36.7% ($n$ = 18) who fell below the median on stressful life events but who still had elevated EPDS scores. In addition, 70.3% ($n$ = 26) of the women who fell above the median on stressful life events had elevated scores on the CES-D compared to 29.7% ($n$ = 11) of the women who fell below the median. Finally, 83.3% ($n$ = 5) of the women who fell above the sample's median for stressful life events met criteria for MDD (as measured by the SCID) compared to only 16.7% ($n$ = 1) of the women who fell below the median.

*$H_{1.4}0$: Pregnancy Planning: Women who report an unplanned pregnancy will endorse higher levels of depressive symptoms (CES-D, EPDS, & SCID) than women who report a planned pregnancy.* The results failed to yield a significant association between pregnancy planning and all measures for depression, the EPDS $\chi^2$ (1, $n$ = 126) = .685, $p$ = .40; CES-D $\chi^2$ (1, $n$ = 109) = .039, $p$ = .84 and the SCID $\chi^2$ (1, $n$ = 103) = 1.68, $p$ = .40; one-tailed Fishers Exact Test).

*$H_{1.5}0$: Distance from Home: Women who live more than 60 miles from Baylor University Medical Center (BUMC) will endorse higher levels of depressive symptoms, as measured by the CES-D, EPDS, and SCID than women who live*

*less than 60 miles from BUMC.* The results did not show any significant difference between the levels of distance from home and all measures for depression [EPDS $\chi^2$ (1, $n$ = 129) = .68, $p$ = .41, CES-D $\chi^2$ (1, $n$ = 112) = .522, $p$ = .47 and the SCID $\chi^2$ (1, $n$ = 107) = .02 $p$ = .51, one-tailed Fishers Exact Test)]. A secondary analysis examined the relationship between total miles as a continuous variable and the two self-report measures. A Pearson's bivariate correlation analysis did not find a significant association between the predictor and the EPDS, $r$(129) = .041, $p$ =.32 or with the CES-D $r$(110) = .128, $p$ = .09. An independent-samples $t$ test was performed to compare the mean miles from home in women with MDD compared to those with no diagnosis in the study. Scores of these groups were not significant, $t$(105) = -0.44, $p$ = .66 (see Table 8).

*H1.60: <u>Age:</u> Younger women will endorse higher levels of depressive symptoms as measured by the CES-D, EPDS, and SCID than older women.* The correlations show, for the EPDS $r$(129) = -.12, $p$ =.09; and CES-D $r$(112) = -.082, $p$ = .20 (see Table 7) the effect of age is not statically significant. An independent-samples $t$ test was performed to compare the mean age with those women with MDD compared to those with no diagnosis in the study. Scores of these groups was not significant, $t$(105) = 0.76, $p$ = .46 (see Table 9).

*$H_{1.7}0$: Income: Women with a lower household income will report more depression (CES-D, EPDS, & SCID) than women with higher household income.* Household income was defined as a categorical variable with the following four ranges: 0-$12,000, $26,000-$40,000, $41,000-$65,000, and over $66,000. The results did not yield a significant relationship between this predictor and all three measures of depression, the EPDS $\chi^2$ (4, $n$ = 126) = 6.81, $p$ = .15; CES-D $\chi^2$ (4, $n$ = 109) = .919, $p$ = .63 and the SCID $\chi^2$ (4, $n$ = 105) = 4.55, $p$ = .33. Due to insufficient cell sizes, household income was collapsed into three categories: 0-$25,999, $26,000-$65,000, and over $65,000. The analyses were repeated; however, no significant associations between this predictor and the measures of depressions were found [EPDS $\chi^2$ (2, $n$ = 126) = 3.46, $p$ = .17; CES-D $\chi^2$ (2, $n$ = 109) = .919, $p$ = .63 and SCID $\chi^2$ (2, $n$ = 105) = .515, $p$ = .77].

*$H_{1.8}0$: Insurance: Women with no insurance or Medicaid insurance will report greater depression (CES-D, EPDS, & SCID) than women with private insurance.* Only two women reported no insurance, therefore, only women with Medicaid were compared to women with private insurance. Whereas the CES-D [$\chi^2$ (1, $n$ = 108) = .3.29, $p$ = .06] and the SCID $\chi^2$ (1, $n$ = 105) = 3.67 $p$ = .18, one-tailed Fishers Exact Test) revealed no association with insurance, women covered by Medicaid (63%, $n$ = 31) reported significantly more depressive symptoms, as

measured by the EPDS [$\chi^2$ (1, $n$ = 81) = 5.26, $p$ = .02} compared to 37 % ($n$ = 20) of the women with private insurance.

*$H_{1.9}0$: Ethnicity: African-American or Hispanic women will endorse higher levels of depression (CES-D, EPDS & SCID) than Caucasian women.* Two groups were analyzed, African-American and Hispanic and those women who were Caucasian. The results show that across all measures for depression, the EPDS $\chi^2$ (1, $n$ = 126) = .131, $p$ = .71; CES-D $\chi^2$ (1, $n$ = 109) = .050, $p$ = .82 and the SCID $\chi^2$ (1, $n$ = 126) = .02 $p$ = .43; one-tailed Fishers Exact Test) ethnicity did not show significant differences. Additional analyses examined for differences among the three groups, Caucasian, African-American and Hispanic. No statistically significant differences were found among the three groups [EPDS $\chi^2$ (2, $n$ = 126) = .74, $p$ = .69; CES-D $\chi^2$ (2, $n$ = 109) = .837, $p$ = .66 and the SCID $\chi^2$ (2, $n$ = 105) = 1.13, $p$ = .57].

*$H_{1.10}0$: Parity: Women with two or more children will report greater depression than women with only one child.* The results did not yield any significant differences between these two groups on any of the depression measures [EPDS $\chi^2$ (1, $n$ = 129) = 1.12, $p$ = .29; CES-D $\chi^2$ (1, $n$ = 112) = 1.03, $p$ = 30; and the SCID $\chi^2$ (1, $n$ = 107) = .03, $p$ = .52, one-tailed Fishers Exact Test)].

*$H_{1,11}$0: <u>Marital Status:</u> Women who are single or separated will report greater depression than women who are married or cohabitating.* No significant difference between these two groups on any of the depression measures were found, [EPDS $\chi^2$ (1, $n$ = 127) = .187, $p$ = .67; CES-D $\chi^2$ (1, $n$ = 110) = .303, $p$ = .58, and the SCID $\chi^2$ (1, $n$ = 105) = .77, $p$ = .33 one-tailed Fishers Exact Test)].

*$H_{1.12}$0: <u>Termination:</u> Women who considered termination will report greater depression than women who did not consider termination.* Results revealed no significant difference between this predictor and the two self-report measures for depression [EPDS $\chi^2$ (1, $n$ = 126) = 3.06, $p$ = .08; and CES-D $\chi^2$ (1, $n$ = 109) = 1.13, $p$ = .28]. However, a statistically significant difference emerged between women considering and not considering termination and the presence of a MDD as measured by the SCID [$x^2$(1, $n$ =106) = 19.42, $p$ = .000]. For women who met criteria for MDD, 50% ($n$ = 3) considered termination compared to those women with no diagnosis ($n$ = 100) in which only 4% ($n$ = 4) considered termination.

A hypothetical model was developed for each measure (EPDS, CES-D, and SCID) based on the results of the above analyses. A binary logistic regression was conducted to empirically test each model. Variables with a $p < .15$ were entered as predictors (see tables 10, 11, 12). The entry criterion for these analyses was set at .10, and the removal was set at .15.

For the EPDS, at admission, analyses revealed the data had an adequate goodness-of-fit (-2 Log Likelihood = 114.341; Goodness of Fit = 9.227); the overall model appears reliable in distinguishing depression and no diagnosis at hospitalization ($\chi^2 = 20.908$, $p < .003$). The model correctly classified 73.2% of the cases (see Table 10 for the regression coefficients). *Wald* statistics indicated that only the presence of major life events predicted the presence of depression at admission. Odds ratios for this significant predictor indicated that participants with a presence of major life events are 4.597 times more likely to be classified as above threshold at admission as measured by the EPDS. Estimates of the proportion of variability in the dependent variable accounted for by all predictor variables were impressive (Cox & Snell R2 = .187; Nagelkerke R2 = .250).

For the CES-D, at admission, analyses revealed the data had an adequate goodness-of-fit (-2 Log Likelihood = 55.527; Goodness of Fit = 6.468); the overall model appears unreliable in distinguishing depression and no diagnosis at hospitalization ($\chi^2 = 3.343$, $p = .322$). The model correctly classified 68.1% of the cases (see Table 11 for the regression coefficients). *Wald* statistics only identified the presence of life events as a significant predictor of elevated CES-D scores at admission. Odds ratios for this significant predictor indicated that participants with a presence of life events are 7.081 times more likely to be classified above threshold at admission as measured by the CES-D. Estimates of the proportion of

variability in the dependent variable accounted for by the predictor was impressive (Cox & Snell R2 = .258; Nagelkerke R2 = .346).

For the SCID, at admission, a forward logistic regression was conducted to determine which independent variables (previous psychiatric history, decision to terminate, and life events) represent predictors of depression at hospitalization. Analyses revealed the overall model (previous psychiatric history and decision to terminate) had an excellent goodness-of-fit (-2 Log Likelihood = 30.309; Goodness of Fit = 1.13), and the overall model is accurate in distinguishing between depression and no diagnosis at hospitalization admission ($\chi^2 = 15.569$, $p < .000$). The model correctly classified 96.2% of the cases. Table 12 presents the regression coefficients. Decision to terminate and a previous psychiatric history predicted a greater number of cases of major depression than would be expected. However, the odds ratio for both significant variables indicated little change in the likelihood of being classified as depressed at admission. Estimates of the proportion of variability in the dependent variable accounted for by all predictor variables were impressive (Cox & Snell R2 = .139; Nagelkerke R2 = .390).

**Hypothesis Two**

The second hypothesis was addressed with a sequential logistic regression enabling the nesting of models on the initial set of variables which predicted diagnostic status at the initial hospitalization. The logistic regression model was

run against the dependent variable for the full model including significant and non-significant predictors, and then was repeated for each time-point. These analyses were conducted separately for both the EPDS and the CES-D.

For the EPDS, the goodness-of-fit was examined at each time-point. At admission, analyses revealed the data had an adequate goodness-of-fit (-2 Log Likelihood = 114.341; Goodness of Fit = 9.227); the overall model appears reliable in distinguishing depression and no diagnosis at hospitalization ($\chi^2$ = 20.908, $p < .003$). The model correctly classified 73.2% of the cases (see Table 10 for the regression coefficients). *Wald* statistics indicated that only the presence of major life events predicted the presence of depression at admission. Odds ratios for this significant predictor indicated participants with a presence of major life events are 4.597 times more likely to be classified as above threshold at admission as measured by the EPDS. Estimates of the proportion of variability in the dependent variable accounted for by all predictor variables were impressive (Cox & Snell R2 = .187; Nagelkerke R2 = .250).

At week 1, analyses revealed an improvement in the goodness-of-fit of data since the initial time-point at admission (-2 Log Likelihood = 55.404; Goodness of Fit = 5.770); however, the overall model appears may be less reliable in distinguishing depression and no diagnosis ($\chi^2$ = 9.938, $p = .127$). The model correctly classified 76.0% of the cases (see Table 13 for the regression coefficients). *Wald* statistics indicated that only the presence of psychiatric history

predicted the depression at week 1. Odds ratios for this significant predictor indicated that participants with a psychiatric history are 5.065 times more likely to be classified as above threshold at admission as measured by the EPDS. Estimates of the proportion of variability in the dependent variable accounted for by all predictor variables were impressive (Cox & Snell R2 = .180; Nagelkerke R2 = .247).

At week 2, analyses revealed an improvement in the goodness-of-fit of data since the initial time-point at admission and week 1 (-2 Log Likelihood = 27.322; Goodness of Fit = 6.379); however, the overall model may be less reliable in distinguishing depression and no diagnosis ($\chi^2 = 8.081$, $p = .232$). The model correctly classified 80.3% of the cases (see Table 14 for the regression coefficients). In spite of this high percentage, *Wald* statistics did not identify any significant predictors of depression at week 2.

At week 3, analyses revealed an improvement in the goodness-of-fit of data than the previous time-points (-2 Log Likelihood = 4.775; Goodness of Fit = .434); the overall model appears very reliable in distinguishing depression and no diagnosis ($\chi^2 = 17.719$, $p = .007$). The model correctly classified 95.0% of the cases (see Table 15 for the regression coefficients). However, *Wald* statistics did not identify any significant predictors of depression at week 3.

At week 4, indices of goodness-of-fit revealed strikingly contrasting results (-2 Log Likelihood = 4.169; Goodness of Fit = .000). These

inconsistencies are likely due to the few people classified as depressed on the EPDS. The third index of goodness-of-fit indicated that the overall model may be less reliable in distinguishing depression and no diagnosis ($\chi^2 = 7.314$, $p = .198$). The model correctly classified 92.9% of the cases (see Table 16 for the regression coefficients). However, *Wald* statistics did not identify any significant predictors of depression at week 4.

At week 5, indices of goodness-of-fit again revealed contrasting results (-2 Log Likelihood = .000; Goodness of Fit = .000). These inconsistencies are likely due to the few people classified as depressed on the EPDS. The third index of goodness-of-fit indicated that the overall model appears may be less reliable in distinguishing depression and no diagnosis ($\chi^2 = 6.684$, $p = .198$). The model correctly classified 100% of the cases (see Table 17 for the regression coefficients). However, *Wald* statistics did not identify any significant predictors of depression at week 4.

Overall, for the EPDS, the chi-square differences were found not to be significant. This finding suggests that the initial predictors were less reliable over time. Moreover, it might suggest that the non-significant variables had no control effect or that the few number of individuals classified as depressed offered enough variance for which to be accounted.

For the CES-D, the goodness-of-fit was examined at each time-point. At admission, analyses revealed the data had an adequate goodness-of-fit (-2 Log

Likelihood = 55.527; Goodness of Fit = 6.468); the overall model appears unreliable in distinguishing depression and no diagnosis at hospitalization ($\chi^2$ = 3.343, $p$ =.322). The model correctly classified 68.1% of the cases (see Table 11 for the regression coefficients). However, *Wald* statistics did not identify any significant predictor of elevated CES-D scores at admission.

At week 1, analyses revealed that indices of goodness-of-fit improved since admission (-2 Log Likelihood = 26.042; Goodness of Fit = 3.364); and the overall model appears very reliable in predicting depression as measured by the CES-D at week 2 ($\chi^2$ = 11.478, $p$ < .009). The model correctly classified 75.0% of the cases (see Table 18 for the regression coefficients). However, *Wald* statistics did not identify any significant predictor of elevated CES-D scores at week 1. It should be noted that insurance and life events both approached significance.

At week 2, analyses revealed that indices of goodness-of-fit improved since the prior time-points (-2 Log Likelihood = 16.326; Goodness of Fit = 6.657); however, the third index of goodness-of-fit suggests the overall model may be less reliable in predicting depression as measured by the CES-D at week 2 ($\chi^2$ = 11.478, $p$ < .009). The model correctly classified 83.3% of the cases (see Table 19 for the regression coefficients). However, *Wald* statistics did not identify any significant predictor of elevated CES-D scores at week 2.

At week 3, analyses revealed that indices of goodness-of-fit continued to improve since the previous time-points (-2 Log Likelihood = 9.527; Goodness of

Fit = 4.829); however, the third index of goodness-of-fit suggests the overall model may be less reliable in predicting depression as measured by the CES-D at week 3 ($\chi^2 = 6.522$, $p < .089$). The model correctly classified 69.2% of the cases (see Table 20 for the regression coefficients). However, *Wald* statistics did not identify any significant predictor of elevated CES-D scores at week 3.

At week 4, analyses revealed that indices of goodness-of-fit continued to improve since the previous time-points (-2 Log Likelihood = .000; Goodness of Fit = .000); however, the third index of goodness-of-fit suggests the overall model may be less reliable in predicting depression as measured by the CES-D at week 4 ($\chi^2 = 5.004$, $p < .082$). The model correctly classified 100% of the cases (see Table 21 for the regression coefficients). The model removed insurance as a predictor for at this time-point. However, *Wald* statistics did not identify any significant predictor of elevated CES-D scores at week 4.

Overall, for the CES-D, the chi-square differences were found not to be significant. This finding suggests that the initial predictors were less reliable over time. Moreover, it might suggest that the non-significant variables had no control effect or that the few number of individuals classified as depressed offered enough variance for which to be accounted.

**Hypothesis Three**

*Is group membership status (above or below threshold) at admission associated with rate of increase or stabilization in depressive symptoms (CES-D, EPDS or SCID) during the course of hospitalization?* Growth curve modeling was used to examine the stability of depressive symptoms across hospitalization based on group membership at admission with the CES-D, EPDS and SCID using depression at admission and time of assessment as our primary predictor.

For the EPDS, the two groups (above set threshold or below) scores at admission were compared across hospitalization. Analysis across time was conducted from admission to week 5, by week 6 only 6 participants remained hospitalized. A two-way interaction was added between time of assessment and EPDS was added. The orthogonal contrast for EPDS was modeled based on the expected change in symptoms over time. The mean score for the above threshold group at admission was 14.86. Women in the above threshold group at admission scored 9.22 higher compared to the below threshold group (see Table 22). The difference in the two group's scores at admission is statistically significant ($p <$ 0.0001). The slope estimate for week is -1.7261. This estimate would suggest that women in the depressed group experienced a 1.7261 decrease in total EPDS score each week, which is statistically significant ($p < 0.0001$). The interaction between week and EPDS group is 1.2475, was found to be significant ($p = .0087$), suggesting group differences in terms of the trajectory of depressive symptoms

over time. Specifically, this finding would suggest that women who scored above threshold at admission experience a faster rate of decrease in symptoms across time than women who were below threshold at admission. For women scoring below threshold at admission, the rate of decrease is .4789.

Women scoring above the set threshold (≥16) on the CES-D were compared to women scoring below the threshold at admission. Growth curve analysis was conducted to determine if there was a significant difference in course of depression based on group status at admission. A two-way interaction was added between the time of assessment and CES-D at admission was added. The orthogonal contrast for the CES-D was modeled based on the expected change in symptoms over time. Analysis was conducted from baseline to week 5, by week 6 only 6 women remained hospitalized. The mean score for the above threshold group at admission was 25.66 (see Table 23). Women in the above threshold group scored 16.55 higher compared to the below threshold group. The difference in the two group's scores at admission is statistically significant ($p < .001$). The slope estimate for week is -1.11, suggesting a group difference in terms of trajectory of CES-D scores over time. This finding would suggest that women in the above threshold group would experience a statistically significant 1.11 decrease in CES-D score each week ($p = .050$). However, the interaction between week category was not found to be significant ($p = .17$).

For the SCID, women with a diagnosis of MDD were compared to those women with no diagnosis at admission. Depressive symptoms were measured weekly with the EPDS, analysis across time was conducted from baseline to week 3, and at week 4 only one participant remained in the MDD group. The mean score for the MDD group at admission was 17.27 (see Table 24). Women in the MDD group scored 9.81 higher than women with no diagnosis on the EPDS at admission. The difference between these two groups is statistically significant ($p < 0.0001$). The slope estimate for week is –2.1483, this suggests that women in the MDD group at admission, weekly scores on the EPDS decreased by 2.1483. These findings were statistically significant ($p < .004$), suggesting a group difference in terms of trajectory. However, the interaction between week and total score on the EPDS is not significant, suggesting there was no significant difference in the way scores decreased over time.

**Hypothesis Four**

*It is hypothesized that women who are characterized as self-critical, as measured by the DEQ, are more likely to experience depression during pregnancy than women characterized as dependent by the DEQ.* Self-Critical and Dependent scores were obtained using Blatt's original scoring method of the DEQ (Blatt, 1976). Analyses included collecting basic descriptive statistics (e.g., means and standard deviations) for the DEQ (see Table 25). To address this hypothesis, a

median split procedure was used to determine group member ship for each factor: (1) those high on dependency and low on self-criticism = dependent, (2) those high on self-criticism and low on dependency = self-critical, (3) those high on both dependency and self-criticism = mixed, and (4) those low on both dependency and self-criticism = non-depressed. Two separate, One-way Analysis of Variance indicated no significant differences between those women who were classified as self-critical compared to those women classified as dependent on the total EPDS total score at $F(1,51) = .188$, $p = .66$) or CES-D total scores at admission $F(1,39) = .157$, $p = .69$). See table 26 and 27 for ANOVA summaries. A chi-square was conducted to determine if a relationship between SCID diagnosis and the variables dependency and self-criticism existed (see Table 28). The findings were not significant, $\chi^2$ (1, $n = 42$) = .359, $p = .55$. However, it should be noted that a third of the cells had less than five participants, which reduced the power and robustness of these analyses.

Secondary analyses were conducted using the four above mentioned groups. One-way Analysis of Variance indicated a significant influence of DEQ group on the total EPDS total score at admission $F( 3,123) = 10.38$, $p = .000$). Post-Hoc analyses using the LSD method with an alpha value of .05 found that the mixed group ($M = 12.61$) was significantly higher than dependent ($M = 9.15$), self-critical ($M = 9.78$) and non-depressed groups. Further, the dependent and

self-critical groups were significantly higher than the non-depressed ($M$ = 5.86). Table 29 provides a summary for this ANOVA.

One-way analysis of variance (ANOVA) indicated a significant influence of DEQ group on the total CES-D scores at admission, F(3,105) = 13.73, $p$ = .00). Games-Howell method was selected for Post-Hoc analyses due to unequal variance, with an alpha value of .05 that found the mixed group ($M$ = 23.14) to be significantly higher on the CES-D than the dependent group ($M$ = 13.32), self-critical group ($M$ = 14.36 ) and non-depressed group ($M$ = 10.13 ). Table 30 provides a summary for this ANOVA.

**Hypothesis Five**

*It is hypothesized that women characterized as dependent by the DEQ at admissions will report a decrease in depressive symptoms over the course of hospitalization, while women characterized as self-critical at admission will experience no improvement or an increase in depressive symptoms over the course of hospitalization.*

Growth curve modeling was used to examine EPDS total scores over hospitalization based on DEQ group at admission (see Table 31). Prior testing classified participants into 4 mutually exclusive groups based on DEQ scores: (1) those high on dependency and low on self-criticism = dependent, (2) those high on self-criticism and low on dependency = self-critical, (3) those high on both

dependency and self-criticism = mixed, and (4) those low on both dependency and self-criticism = non-depressed. At admission, women in the mixed group scored 6.92 points higher than those women in the non-depressed group ($p <$ .001); women in the dependent group scored 3.12 points higher than the non-depressed ($p = .02$); and women in the self-critical group scored 4.25 points higher than the non-depressed group ($p = .001$). The comparisons in groups were all statistically significant, in that all participants' depressive symptoms decreased over time. However, the interaction between DEQ classification and time indicated that the decrease in depressive symptoms were variable among the four groups. As hypothesized, the dependent group experienced the most rapid decline in depressive symptoms relative to other groups; however, the self-critical group experienced a decline in depressive symptoms over time as well. As a primary contrast, the trajectories of the other groups were compared to the non-depressed group, whose slope estimate for each week was -.8275 ($p = .0544$). The interaction between time and weeks was not significant for any of the groups.

**Hypothesis Six**

*It is hypothesized that women characterized as self-critical and experiencing a maternal complication will experience significantly greater depression compared to both self-critical women with a fetal complication and dependent women with either a fetal or maternal complication.* Based on

admitting diagnosis, complications were divided into the presence or absence of a fetal and/or maternal complication. Fetal complications were those admitting diagnoses of a fetal chromosome or fetal structural anomalies. All other diagnoses were considered to be maternal in nature, regardless of risk. Ninety-four percent were found to have a maternal complication ($n$ = 122); 2.3% ($n$ = 3) a fetal; and 3.1 % a maternal and fetal complication. Due to the small number of women that comprised the fetal and maternal-fetal complication groups, the variables were collapsed into the following: maternal complication, 94.6% ($n$ = 122), and presence of a fetal complication, 5.4% ($n$ = 7). However, the cell sizes still remained too small to address the hypothesis. Therefore, a series of exploratory analyses was performed to examine personality and risk. Chi-square analyses examined if a significant difference existed among the 4 DEQ groups and type of admitting complication (see table 32). Results indicated no significant difference between the two groups $\chi^2$ ($n$ = 127) = 1.34, $p$ = .72); however, it is important to note that 2/3 of the cells had less than the expected count of 5.

# CHAPTER FIVE
# Discussion

## Introduction

This primary aim of this study was to identify risk factors for depressive symptoms and for Major Depressive Disorder in pregnant women on a high-risk antepartum unit. Further, this study represents an effort to prospectively evaluate the robustness of these risk factors for depressive symptoms over time during hospitalization for a high-risk pregnancy. Additionally, this study represents an attempt to better understand the trajectory of depressive symptoms, based on the severity of depressive symptoms at admission as well as certain personality characteristics. Group membership was determined at admission by scores on the EPDS and CES-D; individuals were identified as being either above or below set thresholds. Those women who received a diagnosis of MDD at admission were compared to those women in the sample with no diagnosis. The current study is significantly distinct from previous research conducted with an antepartum unit in terms of ethnic diversity and inclusion/exclusion criteria. Historically, among studies examining an antepartum unit, the samples have been predominantly Caucasian (Maloni et al., 2002) and excluded women with a previous psychiatric history. The present study attempted to build upon previous work, to expand the

understanding of contributing variables to depression, and to better understand the psychological impact of hospitalization during a high-risk pregnancy.

**Characteristics of the Sample**

The 129 women who participated in the study embodied more ethnic diversity than most studies described in the perinatal literature. Many of the studies conducted in Europe and Australia have been Caucasian-influenced or ethnic-dominated. In general, most research conducted on antepartum units has been predominantly Caucasian (Gupton et al., 2001; Maloni et al., 2002; Maloni et al., 2005). A strength of the current study is its diverse ethnic representation, with 33% ($n$ = 42) African-American, 54% ($n$ = 70) Caucasian, 11% ($n$ =14) Hispanic, 2% ($n$ = 2) Asian, with one individual reporting "other" 1% ($n$ = 1). The participants ranged in age from 17 to 44 years ($M$ = 27.6; $SD$ = 6.4). Just over half of the sample reported being married, 51% ($n$ = 66) and 32% ($n$ = 41) were single. Eleven-percent reported being separated, and 13% were cohabitating. The income level of the women in the sample varied, with 11% reporting an income below $12,000, 24% reporting between $12,000-25,000, 20% reporting $26,000-40,000, 26% stating between $41,000-65,000, and 29% reporting an income of over $66,000. Over half of the sample (50.4%) indicated that Medicaid was covering their hospitalization and the remaining 48% was covered by private insurance. Education level was well represented in the sample. Twenty-four percent of the

sample graduate from high school or received a GED. Thirty-four percent attended some college, and 28% obtained an undergraduate degree.

In the current sample, only a quarter of the women endorsed a prior psychiatric disorder, with 30% reporting a positive family history for a psychiatric illness. The inclusion of women with a psychiatric history is strength of the current study. Often investigators exclude women with a psychiatric history from research in perinatal literature and studies on antepartum units (Maloni et al., 2002). Of note, in the current sample, women with a psychiatric history or current emotional difficulties may have been underrepresented since several women who appeared overwhelmed or angry with their current situation declined to participate in the study.

We used the EPDS and CES-D in the current study to screen women for depressive symptoms. Forty-four percent and 45% of the women exceeded the EPDS threshold and the CES-D thresholds, respectively. Thirty-five percent ($n$ = 46) of the women were administered the SCID to determine the presence or absence of Major Depressive Disorder. Six women met the criteria for MDD, with 40 receiving no diagnosis. Additionally, 24 women were missed due to early discharge/delivery.

**Pregnancy Characteristics**

Twenty-eight percent of the participants were experiencing a first pregnancy, 26% a second, 19% a third, 13% a fourth and 14% reported four or more previous pregnancies. Forty-three percent of the women reported histories of obstetric complications. Nineteen percent of the women reported the onset of complications in the current pregnancy during the first trimester, 36% during the second trimester and 45% reported complication began in the third trimester. Sixty-six percent of the sample were admitted due to a fetal risk, 27% due to maternal risk, and 6% were experiencing both a maternal and fetal risk. An additional strength of the current study was the inclusion of all admitting diagnoses on the unit. Previous work has often restricted inclusion to specific diagnosis or excluded chronic maternal conditions.

Fifty-nine percent of the current sample reported unplanned pregnancies. This figure exceeds that reported by Finer & Henshaw (49%; 2006) in a large U.S. study. Forty-four percent reported doubts or concerns about the pregnancy, and 7% considered termination.

**Predictor Variables**

The initial focus of the study involved evaluating various quantitative demographic variables, as well as qualitative personality and life events, to determine a relationship among these variables and group membership. The

EPDS and CES-D cut-off scores determined group membership status if we assumed that normal (non-depressed) women scored below this cut-off and that women scoring above this cut-off had more depressive symptoms. In turn, the latter group would be more prone to clinical depression. Multiple parametric and nonparametric tests were conducted to identify whether a relationship existed among the hypothesized variables and group membership. For the EPDS and CES-D groups, the reporting of life events predicted group membership. Women who reported fewer life events were more likely to be in the non-depressed group; alternatively, in spite of the small number of cases of MDD, the reporting of life events predicted MDD. For the EPDS, the final model in the forward logistic regression correctly classified 73.2% of the cases at admission. For the CES-D group, the final model correctly classified 68.1% of the cases at admission. Based on the few cases of MDD, we could expect the percentage of accurate classification to fall in this moderate range.

These findings are consistent with more than two decades of research in the general population that reports a relationship between depression and negative life events (Kessler, 1997). Research in the general population has shown that events such as economic hardship and poor physical health represent common psychosocial stressors that adults experience during their lifetimes (Holmes & Rahe, 1967; Lazurus & Folkman, 1984). Further, women, African-Americans,

and individuals with lower socioeconomic status are at increased risk to experience negative life events (Miranda & Green, 1999).

However, findings from the antenatal literature appear inconsistent, a characterization that likely stems from the different methodological approaches and measurements employed. Several studies have shown a relationship between negative life events and depressive symptoms during the antepartum period (Zayas et al., 2002; Da Costa et al., 2000). Rubertsson and colleagues (2005) found a correlation between life events and mean EPDS scores in early pregnancy. Specifically, those women who reported experiencing two or more stressful life events in the year prior to pregnancy appeared most vulnerable to depressive symptoms. In contrast, Kumar and Robson (1984) found no association between life events and antepartum depression. However, these studies used different instruments to measure their data and different patient inclusion criteria. Kumar and Robson's sample may be the first time that married mothers and life events were analyzed individually. Zaya's study involved only African-American and Hispanic women, all experiencing normal, uncomplicated pregnancies.

In this sample, only 3.3 % ($n$ = 4) endorsed fewer than two life events as measured by the Life Events Scale for Obstetric Groups (LES). The LES is used to study pregnant and postpartum women as it includes stressors typically found on traditional life event scales (e.g., death of a loved one or financial difficulty).

In addition, the LES includes everyday occurrences during a pregnancy, as well as those commonly observed in high-risk pregnancies. (e.g. “I had a sonogram and experienced morning sickness”). Chapman and colleagues (1997) used the LES with a sample of low-income women recruited from obstetric clinics in the Midwestern United States. They found that many women who reported a greater number of stressful life events also experienced higher depressed moods than those reported by pregnant non-depressed women ($M$ = 5.07, $SD$ = 3.26). The mean score in our sample ($M$ = 8.52, $SD$ = 6.25) was slightly greater than that reported by Chapman and colleagues. However, this difference may be due in part to the nature of the samples, as women experiencing high-risk pregnancies are more likely to endorse more pregnancy symptoms and complications than are inquired on the LES.

Based on recent literature, this study represents one of the few systematic investigations of life events in a high-risk hospitalized population. The women represented herein described being hospitalized with a high-risk pregnancy as emotionally, physically, and financially stressful (Schroeder, 1996). Additional stressors may accumulate due to the hospitalization. For example, being separated from older children is likely stressful, particularly when finding adequate childcare is difficult. If employed, the loss of income could exact an economic hardship on her family. Additional unforeseen expenditures with hospitalization can occur, such as childcare and travel for family members. Seventy-six percent

($n$ = 48) of our sample included women with one or more children at home, while 27.9% ($n$ = 36) lived greater than 60 miles from the BUMC. Thirty-four percent ($n$ = 41) endorsed a major financial crisis in the past year, while almost half indicated they had stopped working in the last 12 months. Therefore, being hospitalized in and of itself is a stressful event, compounded by the stress of the condition for which they are hospitalized.

Research implicates stressful life events as a contributor in increasing the risk of the depressive onset and subsequent episodes of major depression (Kendler, Karkowski & Prescott, 1999). Of the 6 women diagnosed with MDD in our sample, 83.3% ($n$ = 5) fell into the high stressful life events group. Further, our study found a relationship between life events and women who reported higher depressive symptoms. Sixty-three percent ($n$ = 31) of the women with high LES scores also scored above threshold on the EPDS, compared to only 36.7% of the women with low scores.

For the SCID, consideration of termination and psychiatric history predicted membership into the MDD group compared to women with no diagnosis in the sample. However, it is important to note that due to the limited number of women who completed the SCID ($n$ = 48), with only six women being diagnosed with MDD, these findings must be interpreted with caution. The model correctly classified 96% of the cases. Based on the aforementioned number of

women with MDD diagnosis, the high percentage of accurate classification is not surprising.

Despite the low number of MDD cases, the findings are consistent with previous research in the general population and with the antenatal literature in relationship to psychiatric history. In the largest U.S. Cohort study, Rich-Edwards and colleagues (2005) determined that a history of depression was the strongest predictor of antenatal depressive symptoms as measured by the EPDS. Our study found similar results for the SCID but not for the EPDS. In our sample, 67% of thee women diagnosed with MDD reported a positive psychiatric history. One explanation for the divergent findings may stem from the question format. For example, Rich-Edwards et al. measured a patients' history of depression with the question, "Before this pregnancy was there ever a period of time when you were feeling down or when you lost interest in pleasurable activities?" The lack of specificity of their question likely resulted in over-reporting of a diagnosis of MDD, which is inaccurate as only one symptom was assessed. In contrast, the question "Any previous psychiatric diagnoses" assumed that the participant received a formal diagnosis made by a physician or mental health professional. Further, their study used a cut-off score of $\geq 12$ on the EPDS to determine positive antenatal depressive symptoms, whereas a cut off of $\geq 11$ was used here.

A second variable, consideration of termination of the pregnancy, predicted membership into the MDD group. Of those with a MDD diagnosis, 50%

($n$ = 3) considered termination. In contrast, these results showed that only 4% ($n$ = 4) of women without a MDD diagnosis considered terminating their pregnancies. Although preliminary, current results are intriguing and warrant further exploration. Most studies seek to understand a woman's view of the pregnancy by examining whether one planned/intended to have a child. However, few studies query whether a woman seriously considers termination. Considering termination can be a painful process for women, and likely suggests that the pregnancy was unplanned. Numerous studies have found a relationship between unintended pregnancy and antenatal depression (Messer, Dole, Kauffman, & Savitz, 2005; Rich-Edwards et al., 2006); however, this study did not support those results. For all three measurements, an unplanned pregnancy was not related to either depressive symptoms or a diagnosis of MDD. Again, this may be due in part to differences in the measurement criteria across studies. Rich-Edwards and colleagues measured pregnancy intention with three questions to determine whether a woman was:

1) Trying to become pregnant
2) Not trying, but happy about the pregnancy
3) Experiencing an unwanted pregnancy

In this study the participant was simply asked "was this pregnancy planned" with no further exploration.

In previous studies, questions regarding the validity of measuring pregnancy intent have emerged (Trussell, Vaughan & Standford, 1999). These questions warrant further exploration in relationship to this study and future research. Recall bias, a common flaw of ad hoc case-controlled research studies, is a problem inherent to questioning a woman who knows she is pregnant. Further, hospitalized women have already made a critical choice to receive medical care to try and sustain their pregnancy toward the successful outcome of producing a baby. Social desirability may play a role in response to case-controlled questioning while one is hospitalized in an antepartum unit. Additionally, an unintended pregnancy does not necessarily presuppose a woman's view of the pregnancy as unwanted. Rather, the unintended pregnancy may be wanted but not timely; therefore, our question of termination may serve as a better measure of an unwanted pregnancy, which would be consistent with previous research.

**Predictors Over Time**

Hypothesis two predicted the risk factors that are predictive of depression at the time of hospital admission will continue to be predictive of depression over the course of hospitalization. For the EPDS and CES-D, the only variable found to be predictive of group status at admission was life events. However, life events were no longer predictive after admission, which may be due to the interaction of

several factors. A decreasing sample size each week may have impacted the study's ability to find significance. At admission, the sample included 129 women. After one, two, three and four weeks, the sample had reduced to 60, 37, 25, and 18. Further, the possibility existed that a woman's depressive symptoms as measured at admission were artificially inflated due to the stress associated with hospitalization and the uncertainty of the pregnancy outcome. The current study found that women who exceeded threshold at admission, also experienced a significant decrease in their EPDS and CES-D scores after only one week following admission.

Interestingly, at week one, a patient's psychiatric history predicted group status. Psychiatric history has long been established in the literature as a predictor of antenatal depression (Rich-Edwards et al., 2006); however current results did not find this to be true at admission. The possibility exists that women who exceeded threshold primarily due to distress at admission may have obscured the significance, or alternatively, women who have a psychiatric history may experience more difficulty one week after admission.

**The Trajectory of Depressive Symptoms During Hospitalization**

Hypothesis Three predicted that women who were clinically depressed upon admission, as assessed by the SCID, or exceeded threshold scores on self-report measures (EPDS and CES-D), will remain depressed or continue to

demonstrate elevations on self-report measures until discharge. For the EPDS, it was observed that women who scored above and below the threshold at admission experience a decrease in depression over time. Further, depressive symptoms of women who scored above threshold at admission declined at a significantly faster rate across time than those women who scored below threshold at admission. One statistical explanation to account for this finding is regression to the mean. Psychologically, more significant levels of depression are more likely to change than scores falling in the mild to moderate range.

For the CES-D, there was a significant difference in the above and below threshold group at admission. Both groups experienced a decrease in symptoms at approximately the same rate over time. Similarly, the SCID data revealed that women with a diagnosis of MDD and women with no diagnosis at admission experienced a decrease in symptoms over time; there was no significant difference in the rate at which the two groups decreased. One potential explanation for the observation of a faster rate of decline in symptoms with the EPDS compared to the CES-D may again reside in the psychometric properties of each instrument. Specifically, research suggests that the EPDS measures depression but also contains a subscale that measures anxiety (Eberhard-Gran, Tambs, Opjordsmoen, & Samuelson, 2001).

In this study, the highest rate of depressive symptoms was found to be at the time of admission, a finding consistent with previous studies (Maloni et al.,

2002; Maloni et al., 2005; Mercer & Ferketich, 1988). Women often experience an emotional crisis at the time of hospitalization, fearing a negative outcome with the pregnancy and numerous psychosocial losses from being hospitalized such as a decrease in social support, being separated from family and job interruption (Maloni & Kutil, 2000).

Across time, a decrease in depressive symptoms occurred as measured by the EPDS and CES-D, a finding inconsistent with previous work by Maloni and colleagues (2005), who reported no significant decline from admission through four weeks. In their study, the mean CES-D score measured at admission was significantly higher ($M$ = 18.49) compared to the current study ($M$ = 15.93). However, they did report a decline on the Profile Moods States and Multiple Affect Adjective Checklist Revised. Although both studies used the CES-D to measure depressive symptoms, small sample sizes and differences in the sociodemographic characteristics of the two samples would render comparison difficult. The sample obtained by Maloni and colleagues (2005) consisted of 89 women at admission, but by week four, the sample had been reduced to 37 women. In the current study, 129 women were assessed at admission and by week four 18 women remained hospitalized. The ethnic composition of Maloni's study was 82% Caucasian, 66.3% of whom were married. In the current study, 54% of the women were Caucasian, of whom 51% were married.

Although the hypothesis was not supported for this study, several factors may have contributed to the unpredicted decrease of symptoms over time. First, all women hospitalized on the antepartum unit at BUMC received a private room that allowed for a family member or friend to remain with the patient overnight. Arguably, this accommodation may have decreased feelings of isolation that women have reported experiencing on an antepartum unit. Second, BUMC also has an established system to address the psychosocial needs of women, which includes a bi-weekly, recreational therapy group conducting a variety of activities (e.g., knitting, manicures and pedicures as well as games). Such resources may facilitate the social interaction among the women, which in turn, would result in decreased isolation, and improve adjustment to hospitalization (Maloni & Kutil, 2000). Furthermore, women may receive additional interventions such as occupational and individual therapy, as ordered by their physicians. Ideally, the study would have a control group with no interventions to determine the extent to which the resource influence outcomes related to depressed mood. Finally, some women feel a sense of reassurance being hospitalized. Often women are placed on bedrest at home prior to hospitalization. Gupton & Heaman (1998) examined women's perception of bedrest by comparing women at home and in the hospital. While both groups reported the experience as stressful, some women felt hospitalization was the easier place for bedrest.

**Dependency, Self-Criticism and Depression**

We predicted that women characterized as self-critical by the DEQ analysis would report more depression during pregnancy than women characterized as dependent. To address this hypothesis, a median split procedure was used to determine group membership for each factor: (1) those high on dependency and low on self-criticism = dependent, (2) those high on self-criticism and low on dependency = self-critical, (3) those high on both dependency and self-criticism = mixed, and (4) those low on both dependency and self-criticism = non-depressed. Twenty-one percent ($n$ = 26) scored high on the self-criticism factor, while 21% ($n$ = 27) scored high on dependency. Of the self-critical and dependent women, 44% and 39% were categorized in the high depressive symptoms group, respectively. The hypothesis that self-critical women would experience greater depressive symptoms was not supported as we found no significant differences between the two groups. These findings contradict previous work by Priel and Besser (1999), in which self-criticism was positively correlated and dependency was negatively correlated with scores on the CES-D during the antepartum and postpartum periods. Varying results may stem from population differences. Notably, Priel and Besser's sample was comprised of first-time Israeli mothers with no psychiatric history or pregnancy complications. In sum, we did not find that women who score high on dependency or high on self-criticism were vulnerable to depressive symptoms during the antenatal period.

When the four DEQ groups were included in the analysis, a significant difference was identified among the groups. Those women deemed as belonging to the mixed group had the highest scores on the EPDS ($M$ = 12.61), which was significantly higher than those determined for the self-critical, dependent and non-depressed groups. This finding is consistent with previous work, in which the mixed group experienced more intense episodes of depression than self-critical or dependent groups (Blatt et al., 1982). Women who score high on both self-criticism and dependency scales appear the most vulnerable to depressive symptoms during the antepartum period.

**DEQ Group and Depression Over Time**

Hypothesis Five predicted that women who were characterized as dependent by the DEQ at admission would experience a decrease in depressive symptoms over the course of hospitalization, while women who are characterized as self-critical at admission would experience no improvement or an increase in depressive symptoms. Results suggest that women who were characterized as dependent by the DEQ at admission experienced a decrease in depressive symptoms over the course of hospitalization. Further, these women as a group did not appear to be significantly vulnerable to depression as the mean results for the EPDS at admission and across hospitalization were consistently subthreshold. These findings appear to be consistent with the work of Priel & Besser (1999)

who suggested that dependency during the postpartum period could act as a protective factor from depressive symptoms.

The results failed to provide support for the hypothesis regarding the relationship between self-criticism and depressive symptoms over time. Women who were found to be self-critical also experienced a decrease in depressive symptoms over time. Additionally, these women were found to score below threshold on the EPDS at admission and across hospitalization as a group. These findings are inconsistent with Priel and Besser (1999) research that implicated self-criticism as a vulnerability for depression during the postpartum period. However, Priel and Besser's study (2000) on the attitudes of social support in dependency and self-criticism first-time mothers may help explain our divergent findings. They found that dependent women focused on the self as generating the support of others while self-critical women focused on the lack of support which increased depressive symptoms. Therefore, the setting of an antepartum unit may afford the self-critical woman the support she normally rejects on a day to day basis. Alternatively, the individual attention provided by the hospital setting was most likely gratifying for the dependent woman

Interestingly, the women who were mixed, high on dependency and self-criticism were the only group to score above threshold on the EPDS at admission. However, after admission they experienced a decrease of depressive symptoms, scoring below the threshold by week one. In a critical review of the DEQ

(Viglione, Clemmey & Camenzuli, 1990), it was suggested that the mixed individual may experience a co-existing sense of failure and guilt with unmet dependency longings. Blatt and colleagues (1982) found that the most severely depressed group in a sample of clinical and nonclinical subjects were those individuals scoring high on both dependency and self-criticism. It would appear that in this sample the mixed group was the most vulnerable to depressive symptoms at admission, raising the possibility that these women experience more difficulty dealing with emotional upheaval and uncertainty that surround a high-risk pregnancy.

**Limitations**

The present study has a number of limitations that warrant discussion. First, problems with statistical power occurred by dividing the women by depression status at admission. In many instances the subgroups were comprised of few participants. Yet, this division was necessary to the design of the study as predictors of group membership were examined. Second, the study relied heavily on self-report measures for determining severity of depressive symptoms in the majority of participants. Specifically for the EPDS, research suggests that sensitivity in the perinatal population is quite imprecise; however specificity appears to be high (Gaynes et al., 2005). The ability to administer the SCID to all participants in this study would have exceeded the resources of the current study.

Including a control group of high-risk women being managed at home or a group that had not experienced any milieu interventions while hospitalized would have been highly informative. However, the lack of control group does not limit the findings that can be drawn about a woman hospitalized with a high-risk pregnancy.

Finally, this study has several strengths that are important to note. First, this is one of the few prospective research studies conducted on an antepartum unit. Secondly, this is only the third study to assess depressive symptoms over the course of hospitalization during pregnancy. The study adds to the paucity of literature on antepartum units; it is a research topic that is only in the infancy stage.

**Conclusion**

Although the present study is limited by the above mentioned methodological issues, it contributes valuable information to the limited body of literature on women hospitalized with high-risk pregnancies. The study identified that as many as 44% of the women admitted on the antepartum unit were experiencing significant depressive symptoms at admission, and 4.7% were diagnosed with MDD. Further, analysis of risk factors of group status at admission found life events as well as personality to be predictive of women's depressive symptoms at admission. For the SCID, a psychiatric history as well as

considering termination was predictive of MDD group status This study establishes the groundwork for hospitals to begin screening women at admission and to develop and implement a multidisciplinary program to treat women during their hospitalization. Given previous research findings that antenatal depression is the strongest predictor of postpartum depression and that children of postpartum depressed mothers are at greater risk for developing psychopathology (Hammen et al., 1987), choosing to ignore the psychological issues of pregnant women during their hospitalization, ostensibly, will have far reaching effects. The setting of an antepartum unit offers a unique opportunity to identify and treat depression, possibly interrupting a cascade of deleterious outcomes.

# APPENDIX A

**Table 1:** Socio-Demographic Characteristics of Sample (*N* = 129)

| **Variable** | ***N*** | **%** |
|---|---|---|
| **Ethnicity** | | |
| African American | 42 | 32.6 |
| Caucasian | 70 | 54.3 |
| Hispanic | 14 | 10.9 |
| Asian | 2 | 1.6 |
| Other | 1 | .8 |
| **Marital Status** *(N=127)* | | |
| Single | 41 | 32.3 |
| Married | 66 | 51.0 |
| Separated | 4 | 10.9 |
| Cohabitating | 16 | 12.6 |

Table 1 (continued)

| **Variable** | ***N*** | ***%*** |
|---|---|---|
| **Education** *(N=127)* | | |
| Under 9 | 1 | 0.8 |
| 9-12 | 16 | 12.6 |
| High School or Equivalent | 31 | 24.4 |
| Some College | 44 | 34.1 |
| Undergraduate Degree | 35 | 27.6 |
| **Occupational Status** *(N=126)* | | |
| Unemployed | 50 | 39.7 |
| On Leave | 36 | 28.6 |
| Employed Part-Time | 8 | 6.2 |
| Employed Full-Time | 32 | 25.4 |
| **Average Household Income** *(N=126)* | | |
| Under $12,000 | 14 | 11.1 |
| $12,000 – $25,000 | 30 | 23.8 |
| $26,000 – $40,000 | 25 | 19.8 |
| $41,000 – $65,000 | 20 | 25.9 |
| Over $66,000 | 37 | 29.4 |

Table 1 (continued)

| **Variable** | ***N*** | ***%*** |
|---|---|---|
| **Medical Cost Coverage** *(N=127)* | | |
| No Insurance | 2 | 1.6 |
| Private Insurance | 61 | 48.0 |
| Medicaid | 64 | 50.4 |

**Table 2:** Pregnancy Characteristics of the Sample

| **Variable** | ***N*** | ***%*** |
|---|---|---|
| **Total Prior Pregnancies** | | |
| 0 | 36 | 28.1 |
| 1 | 33 | 25.8 |
| 2 | 24 | 18.8 |
| 3 | 17 | 13.3 |
| 4 | 7 | 5.5 |
| 5 or more | 11 | 8.7 |
| **Previous Neonatal Demise** | 6 | 4.7 |
| **Previous Stillborn *n*=127** | 8 | 6.2 |
| **Previous Miscarriage *n*=127** | 41 | 32.3 |
| **Previous Pregnancy Termination** | 10 | 7.8 |
| **Onset of Complications *n*=126** | | |
| First Trimester | 24 | 19.0 |
| Second Trimester | 45 | 35.7 |
| Third Trimester | 57 | 45.2 |
| **Complications with Previous Pregnancies** | 55 | 43.3 |

**Table 3:** Psychiatric Characteristics of Sample ($N = 125$)

| Variable | *N* | % |
|---|---|---|
| **Previous Psychiatric History** | | |
| Depression | 14 | 11.2 |
| Anxiety | 10 | 8.0 |
| Comorbid Mood and Anxiety Disorders | 5 | 4.8 |
| Bipolar Disorder | 1 | 0.8 |
| None | 95 | 76.0 |
| **Positive Screening for Depression at Admission** | | |
| CES-D (score > 16) *n*=110 | 50 | 44.6 |
| EPDS (score ≥ 11) *n*=129 | 57 | 44.2 |
| **Previous Psychiatric Medication** | 35 | 27.1 |
| **Previous Psychiatric Hospitalization** | 5 | 3.9 |
| **Previous Counseling** | 34 | 26.4 |
| **Current Psychiatric Medication** | 9 | 7.2 |
| **Family History of Psychiatric Illness** | 38 | 30.4 |

Note: EPDS = Edinburgh Postnatal Depression Scale
CES-D = Center for Epidemiological Studies Depression Scale

**Table 4:** Chi-Square Comparison of EPDS Groups and Predictor Variables

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | EPDS Below Threshold | EPDS Above Threshold | | |
| | % (*N*) | % (*N*) | $\underline{\chi^2}$ | $\underline{p}$ |
| Psychiatric History | | | 2.25 | .13 |
| Yes | 18.8 (13) | 30.4 (17) | | |
| No | 81.2 (56) | 69.6 (39) | | |
| Family Psychiatric History | | | .597 | .44 |
| Yes | 27.5 (19) | 33.9 (19) | | |
| No | 72.5 (50) | 66.1 (37) | | |
| Life Events | | | 15.53 | .00 |
| High | 24.0 (12) | 63.3 (31) | | |
| Low | 76.0 (38) | 36.7 (18) | | |
| Planned Pregnancy | | | .68 | .40 |
| Yes | 43.7 (31) | 36.4 (20) | | |
| No | 56.3 (40) | 63.6 (35) | | |
| Distance from Home | | | .68 | .41 |
| Less than 60 miles | 75.0 (54) | 68.4 (39) | | |
| More than 60 miles | 25.0 (18) | 31.6 (18) | | |

Table 4 (continued)

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | EPDS Below Threshold | EPDS Above Threshold | | |
| | % (*N*) | % (*N*) | $x^2$ | *p* |
| Household Income | | | 6.81 | .15 |
| Under $12,000 | 8.5 (6) | 14.5 (8) | | |
| $12,000-$25,000 | 19.7 (14) | 29.1 (16) | | |
| $26,000-$40,000 | 16.9 (12) | 23.6 (13) | | |
| $41,000-65,000 | 21.1 (15) | 9.1 (5) | | |
| Over $66,000 | 33.8 (24) | 23.6 (13) | | |
| Ethnicity | | | .74 | .69 |
| Caucasian | 56.9 (41) | 53.7 (29) | | |
| African–American | 30.6 (22) | 37.0 (20) | | |
| Hispanic | 12.5(9) | 9.3 (5) | | |
| Children In The Home | | | 1.12 | .29 |
| 0-1 | 87.5 (63) | 80.7 (46) | | |
| 2 or more | 12.5 (9) | 19.3 (11) | | |
| Consider Termination | | | 3.06 | .08 |
| Yes | 4.2 (3) | 12.7 (7) | | |
| No | 95.8 (68) | 87.3 (48) | | |

Table 4 (continued)

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | EPDS Below Threshold | EPDS Above Threshold | | |
| | % (*N*) | % (*N*) | $\underline{x^2}$ | $\underline{p}$ |
| Coverage of Medical Cost | | | 5.26 | .02 |
| Private Insurance | 57.7 (41) | 37.0 (20) | | |
| Medicaid | 42.3 (30) | 63.0 (34) | | |
| Marital Status | | | 3.37 | .34 |
| Single | 31.0 (22) | 33.9 (19) | | |
| Married | 57.7 (41) | 44.6 (25) | | |
| Cohabitating | 8.5 (6) | 7.9 (10) | | |
| Separated | 2.8 (2) | 3.6 (2) | | |

**Table 5:** Chi-Square Comparison of CES-D Groups and Predictor Variables

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | CES-D Below Threshold | CES-D Above Threshold | | |
| | % (*N*) | % (*N*) | $\underline{X^2}$ | *p* |
| Psychiatric History | | | .15 | .69 |
| Yes | 10.4 (13) | 13.6 (17) | | |
| No | 44.8 (56) | 31.2 (39) | | |
| Family Psychiatric History | | | .18 | .67 |
| Yes | 15.2 (19) | 15.2 (19) | | |
| No | 40.0 (50) | 29.6 (37) | | |
| Life Events | | | 17.42 | .00 |
| High | 25.5 (13) | 70.3 (26) | | |
| Low | 74.5 (38) | 29.7 (11) | | |
| Planned Pregnancy | | | .039 | .844 |
| Yes | 24.6 (31) | 15.9 (20) | | |
| No | 31.7 (40) | 27.8 (35) | | |
| Distance from Home | | | .52 | .47 |
| Less than 60 miles | 41.9 (54) | 30.2 (39) | | |
| More than 60 miles | 14.0 (18) | 14.0 (18) | | |

Table 5 (continued)

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | CES-D Below Threshold | CES-D Above Threshold | | |
| | % (*N*) | % (*N*) | $x^2$ | *p* |
| Household Income | | | .919 | .63 |
| Under $12,000 | 9.8 (6) | 12.5 (6) | | |
| $12,000-$25,000 | 23.0 (14) | 29.2 (14) | | |
| $26,000-$40,000 | 18.0 (11) | 22.9 (11) | | |
| $41,000-65,000 | 19.7 (12) | 10.4 (5) | | |
| Over $66,000 | 29.5 (18) | 25.0 (18) | | |
| Ethnicity | | | .837 | .658 |
| Caucasian | 31.8 (41) | 22.5 (29) | | |
| African–American | 17.1 (22) | 15.5 (20) | | |
| Hispanic | 7.0 (9) | 3.9 (5) | | |
| Children In The Home | | | 1.03 | .30 |
| 0-1 | 48.8 (63) | 35.7 (46) | | |
| 2 or more | 7.0 (9) | 8.5 (11) | | |
| Consider Termination | | | 1.13 | .28 |
| Yes | 2.4 (3) | 5.6 (7) | | |
| No | 54.0 (68) | 38.1 (48) | | |

Table 5 (continued)

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | CES-D Below Threshold | CES-D Above Threshold | | |
| | % (*N*) | % (*N*) | $\underline{x^2}$ | *p* |
| Coverage of Medical Cost | | | 3.29 | .06 |
| Private Insurance | 54.2 (32) | 36.7 (18) | | |
| Medicaid | 45.8 (27) | 63.3 (31) | | |
| Marital Status | | | .202 | .653 |
| Single | 17.3 (22) | 15.0 (19) | | |
| Married | 32.3 (41) | 19.7 (25) | | |

**Table 6:** Chi-Square Comparison of SCID Groups and Predictor Variables

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | No Diagnosis | MDD | | |
| | % (*N*) | % (*N*) | $\underline{x^2}$ | *p* |
| Psychiatric History | | | 40.07 | .03 |
| Yes | 21.4 (21) | 66.7 (4) | | |
| No | 78.6 (77) | 33.3 (2) | | |
| Family Psychiatric History | | | .00 | .60 |
| Yes | 30.6 (30) | 33.6 (2) | | |
| No | 69.4 (68) | 66.7 (4) | | |
| Life Events | | | 20.70 | .04 |
| High | 38.7 (29) | 83.3 (5) | | |
| Low | 61.3 (46) | 16.7 (1) | | |
| Planned Pregnancy | | | 1.68 | .40 |
| Yes | 40.0 (40) | 83.5 (5) | | |
| No | 60.0 (60) | 16.7 (1) | | |
| Distance from Home | | | .02 | .51 |
| Less than 60 miles | 73.3 (74) | 66.7 (4) | | |
| More than 60 miles | 26.7 (27) | 33.2 (2) | | |

Table 6 (continued)

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | No Diagnosis | MDD | | |
| | % (*N*) | % (*N*) | $\underline{x^2}$ | $\underline{p}$ |
| Household Income | | | 4.55 | .33 |
| Under $12,000 | 11.1 (11) | 16.7 (1) | | |
| $12,000-$25,000 | 23.2 (23) | 16.7 (1) | | |
| $26,000-$40,000 | 18.2 (18) | 50.0 (3) | | |
| $41,000-65,000 | 19.2 (19) | 0 (0) | | |
| Over $66,000 | 28.3 (28) | 16.7 (1) | | |
| Ethnicity | | | 1.13 | .57 |
| Caucasian | 55.6 (55) | 50.0 (3) | | |
| African–American | 33.3 (33) | 33.3 (2) | | |
| Hispanic | 11.1 (11) | 16.7 (1) | | |
| Children In The Home | | | .03 | .52 |
| 0-1 | 89.1 (90) | 83.3 (5) | | |
| 2 or more | 10.9 (11) | 16.7 (1) | | |
| Consider Termination | | | 19.42 | .00 |
| Yes | 4.0 (4) | 50.0 (3) | | |
| No | 96.0 (96) | 50.0 (3) | | |

Table 6 (continued)

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | No Diagnosis | MDD | | |
| | % (*N*) | % (*N*) | $\underline{X^2}$ | $\underline{p}$ |
| Coverage of Medical Cost | | | 3.67 | .18 |
| Private Insurance | 51.5 (51) | 20.0 (1) | | |
| Medicaid | 48.5 (48) | 80.0 (4) | | |
| Marital Status | | | 2.24 | .52 |
| Single | 32.3 (32) | 16.7 (1) | | |
| Married | 51.5 (51) | 50.0 (3) | | |
| Separated | 3.0 (3) | 0.0 (0) | | |
| Cohabitating | 13.1 (13) | 33.3 (2) | | |

**Table 7:** Pearson Correlation Coefficients for Continuous Predictors and Depression Measures

| | **EPDS** | **CES-D** |
|---|---|---|
| Age | $r(129) = -.12$, $p = .09$ | $r(112) = -.08$, $p = .20$ |
| Miles from Home | $r(129) = .12$, $p = .09$ | $r(112) = .04$, $p = .33$ |

**Table 8:** Comparison of Miles from Home for Women by SCID Diagnosis at Admission and Results of Independent-Samples *t* test ($N = 107$)

| | **No Diagnosis** | **MDD** | ***t* value** |
|---|---|---|---|
| Miles | 60.50 (65.92)<br>$n = 6$ (5.61) | 47.79 (68.30)<br>$n = 101$ (94.40) | -.44<br>$p = .65$<br>(2-tailed) |

**Table 9:** Comparison of Age for Women in the MDD group and No Diagnosis Group Results of Independent-Samples *t* Test ($N = 107$).

| | **No Diagnosis** | **MDD** | ***t* value** |
|---|---|---|---|
| Age | 25.50 (5.43)<br>$n = 6$ (5.61) | 27.50 (6.67)<br>$n = 101$ (94.40) | .76<br>$p = .46$<br>(1-tailed) |

**Table 10:** Predictors Entering Logistic Regression for EPDS at Admission

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | -.075 | .017 | 1 | .896 | .928 | .302 – 2.849 |
| Psychiatric History | -.564 | 1.034 | 1 | .309 | .569 | .192 – 1.687 |
| Household Income | -.144 | .360 | 1 | .549 | .866 | .541 – 1.385 |
| Age | -.023 | .294 | 1 | .588 | .977 | .899 – 1.062 |
| Decision to Terminate | -.933 | 1.071 | 1 | .301 | .393 | .067 – 2.303 |
| Life Events | 1.525 | 10.174 | 1 | .001 | 4.597 | 1.801 – 11.737 |

**Table 11:** Predictors Entering Logistic Regression for CES-D at Admission

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | .984 | 3.353 | 1 | .067 | 2.674 | .933 – 7.666 |
| Miles From Home | .004 | 2.410 | 1 | .121 | 1.004 | .999 – 1.008 |
| Life Events | 1.957 | 14.040 | 1 | .000 | 7.081 | 2.544 – 19.713 |

**Table 12:** Predictors Entering Logistic Regression for SCID Diagnosis at Admission

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Life Events | 2.146 | 2.227 | 1 | .113 | 8.54 | 7.817-12.268 |
| Psychiatric History | 2.550 | 4.664 | 1 | .031 | 12.81 | 8.337-14.915 |
| Termination | 3.728 | 8.943 | 1 | .003 | 41.61 | 24.815-62.322 |

**Table 13:** Predictors Entering Logistic Regression for EPDS at Week One

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | .729 | .968 | 1 | .325 | 2.073 | .485 – 8.849 |
| Psychiatric History | 1.622 | 4.446 | 1 | .035 | 5.065 | 3.636-9.005 |
| Household Income | .081 | .054 | 1 | .816 | 1.084 | .819-2.991 |
| Age | -.039 | .315 | 1 | .574 | .962 | .840 – 1.101 |
| Decision to Terminate | .092 | .006 | 1 | .936 | 1.096 | .114 – 10.517 |
| Life Events | 1.091 | 2.528 | 1 | .112 | 2.979 | .776 – 11.439 |

**Table 14:** Predictors Entering Logistic Regression for EPDS at Week Two

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | .155 | .015 | 1 | .902 | 1.167 | .100 – 13.686 |
| Psychiatric History | -.521 | .214 | 1 | .644 | .594 | .065 – 5.399 |
| Household Income | -.473 | .517 | 1 | .472 | .623 | .172 – 2.260 |
| Age | -.037 | .097 | 1 | .756 | .964 | .764 – 1.216 |
| Decision to Terminate | 22.002 | .000 | 1 | 1.000 | .009 | .000 – |
| Life Events | 1.532 | 2.109 | 1 | .146 | 4.630 | .585 – 36.620 |

**Table 15:** Predictors Entering Logistic Regression for EPDS at Week Three

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | 128.934 | .000 | 1 | .995 | .056 | .000 – |
| Psychiatric History | -116.828 | .000 | 1 | .995 | .000 | .000 – |
| Household Income | 48.897 | .000 | 1 | .995 | .021 | .000 – |
| Age | -.341 | .261 | 1 | .609 | .711 | .192 – 2.632 |
| Decision to Terminate | -309.026 | .000 | 1 | .996 | .000 | .000 – |
| Life Events | -131.192 | .000 | 1 | .999 | .000 | .000 – |

**Table 16:** Predictors Entering Logistic Regression for EPDS at Week Four

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | 93.458 | .000 | 1 | .997 | .000 | .000 – |
| Psychiatric History | 34.342 | .000 | 1 | .997 | .004 | .000 – |
| Household Income | 37.363 | .000 | 1 | .997 | .006 | .000 – |
| Age | -.311 | .216 | 1 | .642 | .733 | .198 – 2.718 |
| Decision to Terminate | | | | | | |
| Life Events | 16.784 | .000 | 1 | 1.000 | .005 | .000 – |

**Table 17:** Predictors Entering Logistic Regression for EPDS at Week Five

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | 108.586 | .000 | 1 | .999 | .047 | .000 – |
| Psychiatric History | 33.405 | .000 | 1 | 1.000 | .014 | .000 – |
| Household Income | 33.757 | .000 | 1 | 1.000 | .014 | .000 – |
| Age | .537 | .000 | 1 | 1.000 | 1.711 | .000 – |
| Decision to Terminate | | | | | | |
| Life Events | 33.079 | .000 | 1 | 1.000 | .014 | .000 – |

**Table 18:** Predictors Entering Logistic Regression for CES-D at Week One

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | 1.770 | 3.012 | 1 | .083 | 5.872 | .748 – 10.067 |
| Miles From Home | -.021 | 1.972 | 1 | .160 | .979 | .985 – 1.014 |
| Life Events | 1.874 | 3.517 | 1 | .061 | 6.516 | .473 – 6.190 |

**Table 19:** Predictors Entering Logistic Regression for CES-D at Week Two

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | 2.124 | 2.269 | 1 | .132 | 8.364 | .795 – 43.348 |
| Miles From Home | -.002 | .021 | 1 | .886 | .998 | .951 – 1.008 |
| Life Events | 1.095 | .659 | 1 | .417 | 2.990 | .919 – 46.214 |

**Table 20:** Predictors Entering Logistic Regression for CES-D at Week Three

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | -3.947 | .996 | 1 | .318 | .019 | .527 – 132.633 |
| Miles From Home | .061 | 1.358 | 1 | .244 | 1.062 | .965 – 1.031 |
| Life Events | -26.600 | .000 | 1 | .999 | .000 | .213 – 42.044 |

**Table 21:** Predictors Entering Logistic Regression for CES-D at Week Four

| | ***B*** | ***Wald*** | **d*f*** | ***p*** | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| Insurance | | | | | | |
| Miles From Home | 15.122 | .000 | 1 | .991 | 1.062 | .960 – 1.176 |
| Life Events | -1728.628 | .000 | 1 | .991 | .000 | .000 – .000 |

**Table 22:** Descriptive Statistics for the Total Score of the EPDS by Week

| **EPDS Total Score** | **Group** | ***N*** | **Mean** | ***SD*** |
|---|---|---|---|---|
| Admission | Low | 72 | 5.22 | 3.23 |
| | High | 57 | 14.86 | |
| Week 1 | Low | 31 | 4.00 | 3.50 |
| | High | 29 | 11.26 | |
| Week 2 | Low | 20 | 3.60 | 2.84 |
| | High | 18 | 8.78 | |
| Week 3 | Low | 14 | 3.96 | 4.33 |
| | High | 10 | 9.60 | |
| Week 4 | Low | 10 | 4.30 | 5.64 |
| | High | 7 | 8.71 | |
| Week 5 | Low | 10 | 2.60 | 3.53 |
| | High | 5 | 7.80 | |

**Table 23:** Descriptive Statistics for the Total Score of the CES-D by Week

| **CES-D Total Score** | **Group** | ***N*** | **Mean** | ***SD*** |
|---|---|---|---|---|
| Admission | Low | 62 | 8.39 | 4.27 |
| | High | 48 | 25.66 | 6.66 |
| Week 1 | Low | 34 | 8.24 | 5.25 |
| | High | 25 | 22.04 | 12.76 |
| Week 2 | Low | 23 | 7.43 | 5.71 |
| | High | 14 | 16.21 | 4.49 |
| Week 3 | Low | 15 | 6.80 | 5.73 |
| | High | 9 | 19.00 | 9.99 |
| Week 4 | Low | 11 | 9.73 | 8.05 |
| | High | 6 | 22.00 | 13.81 |
| Week 5 | Low | 11 | 6.00 | 4.75 |
| | High | 4 | 17.75 | 12.84 |

**Table 24:** Descriptive Statistics for the Total Score of the EPDS by Week by SCID Diagnosis at Admission

| **EPDS Total Score** | **Group** | ***N*** | **Mean** | ***SD*** |
|---|---|---|---|---|
| Admission | No Diagnosis | 101 | 8.1 | 5.36 |
| | MDD | 6 | 17.27 | 3.60 |
| Week 1 | No Diagnosis | 50 | 6.30 | 5.23 |
| | MDD | 6 | 16.33 | 3.77 |
| Week 2 | No Diagnosis | 34 | 5.71 | 4.62 |
| | MDD | 3 | 12.00 | 2.65 |
| Week 3 | No Diagnosis | 21 | 5.67 | 4.82 |
| | MDD | 3 | 11.00 | 3.61 |
| Week 4 | No Diagnosis | 17 | 6.12 | 5.84 |
| | MDD | 1 | 17.00 | - |

**Table 25:** Means and Standard Deviations of EPDS by DEQ Groups

| **DEQ** | ***N*** | ***M*** | ***SD*** | **Range** |
|---|---|---|---|---|
| Mixed | 38 | 12.61 | 5.25 | 2-23 |
| Dependent | 26 | 9.15 | 4.83 | 1-19 |
| Self-Critical | 27 | 9.78 | 5.60 | 0-22 |
| Non-Depressed | 26 | 5.86 | 5.13 | |

**Table 26:** ANOVA Summary Table for EPDS and DEQ groups

| **Source** | **SS** | **d*f*** | **MS** | **F** | ***p*** | **η2** |
|---|---|---|---|---|---|---|
| Dependency*<br>• Self-Critical | 5.16 | 1 | 5.15 | .188 | ns | .20 |
| Error | 1402.50 | 51 | 27.50 | | | |
| Total | 6162.00 | 53 | | | | |

**Table 27:** ANOVA Summary Table for CES-D and DEQ Groups

| **Source** | **SS** | **d*f*** | **MS** | **F** | ***p*** | **η2** |
|---|---|---|---|---|---|---|
| Dependency*<br>• Self-Critical | 11.20 | 1 | 11.20 | .157 | ns | .004 |
| Error | 2783.19 | 39 | 71.36 | | | |
| Total | 10691.00 | 41 | | | | |

**Table 28:** Chi-Square Comparison of DEQ Groups and SCID Diagnosis at Admission

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | No Diagnosis | MDD | | |
| | % (*N*) | % (*N*) | $\underline{X^2}$ | $\underline{p}$ |
| DEQ Group | | | .359 | .55 |
| Dependent | 51.3 (20) | 33.3 (1) | | |
| Self-Critical | 48.7 (19) | 66.7 (2) | | |

**Table 29:** ANOVA Summary Table for EPDS and DEQ Groups

| **Source** | **SS** | **d*f*** | **MS** | **F** | ***p*** | **η2** |
|---|---|---|---|---|---|---|
| DEQ Groups<br>• Mixed<br>• Dependency<br>• Self-Critical<br>• Non-Depressed | 846.66 | 3 | 282.22 | 10.38 | .00 | .20 |
| Error | 3345.44 | 123 | 27.20 | | | |
| Total | 15380.00 | 127 | | | | |

**Table 30:** ANOVA Summary Table for CES-D and DEQ Groups

| **Source** | **SS** | **d*f*** | **MS** | **F** | ***p*** | **η2** |
|---|---|---|---|---|---|---|
| DEQ Groups<br>• Mixed<br>• Dependency<br>• Self-Critical<br>• Non-Depressed | 3132.03 | 3 | 1044.00 | 13.73 | .000 | .28 |
| Error | 7987.00 | 105 | 76.07 | | | |
| Total | 38450.00 | 109 | | | | |

**Table 31:** Descriptive Statistics for the Total Score of the EPDS by Week for DEQ Groups

| **EPDS Total Score** | **Group** | ***N*** | **Mean** | ***SD*** |
|---|---|---|---|---|
| Admission | Mixed | 38 | 12.61 | 5.35 |
| | Self-Critical | 27 | 9.78 | 5.60 |
| | Dependent | 26 | 9.15 | 4.84 |
| | Non-Depressed | 36 | 5.96 | 5.13 |
| Week 1 | Mixed | 22 | 10.50 | 6.13 |
| | Self-Critical | 10 | 8.20 | 6.53 |
| | Dependent | 12 | 5.58 | 4.60 |
| | Non-Depressed | 16 | 4.44 | 4.78 |
| Week 2 | Mixed | 12 | 7.83 | 4.65 |
| | Self-Critical | 5 | 9.00 | 6.63 |
| | Dependent | 9 | 5.22 | 4.11 |
| | Non-Depressed | 12 | 3.66 | 3.97 |
| Week 3 | Mixed | 6 | 10.00 | 6.84 |
| | Self-Critical | 4 | 5.75 | 4.03 |
| | Dependent | 7 | 4.39 | 2.11 |
| | Non-Depressed | 7 | 5.39 | 4.96 |
| Week 4 | Mixed | 4 | 10.50 | 9.88 |
| | Self-Critical | 3 | 5.00 | 3.64 |
| | Dependent | 5 | 3.60 | 2.41 |
| | Non-Depressed | 5 | 5.80 | 4.82 |
| Week 5 | Mixed | 4 | 6.75 | 8.16 |
| | Self-Critical | 3 | 2.75 | 3.11 |
| | Dependent | 4 | 2.50 | 2.65 |
| | Non-Depressed | 3 | 5.66 | 3.51 |

**Table 32:** Chi-Square Comparison of DEQ Groups and Complication

| **Variable** | **Group** | | | |
|---|---|---|---|---|
| | Maternal Complication | Presence of Fetal Complication | | |
| | % (*N*) | % (*N*) | $\underline{x^2}$ | $\underline{p}$ |
| DEQ Group | | | 1.34 | .720 |
| Mixed | 29.2 (35) | 42.9 (3) | | |
| Dependent | 20.0 (24) | 28.6 (2) | | |
| Self-Critical | 21.7 (26) | 14.3 (1) | | |
| Non-Depressed | 29.2 (35) | 14.3 (1) | | |

# APPENDIX B

**Figure 1:** Weekly Change in EPDS Sum by Admission Group

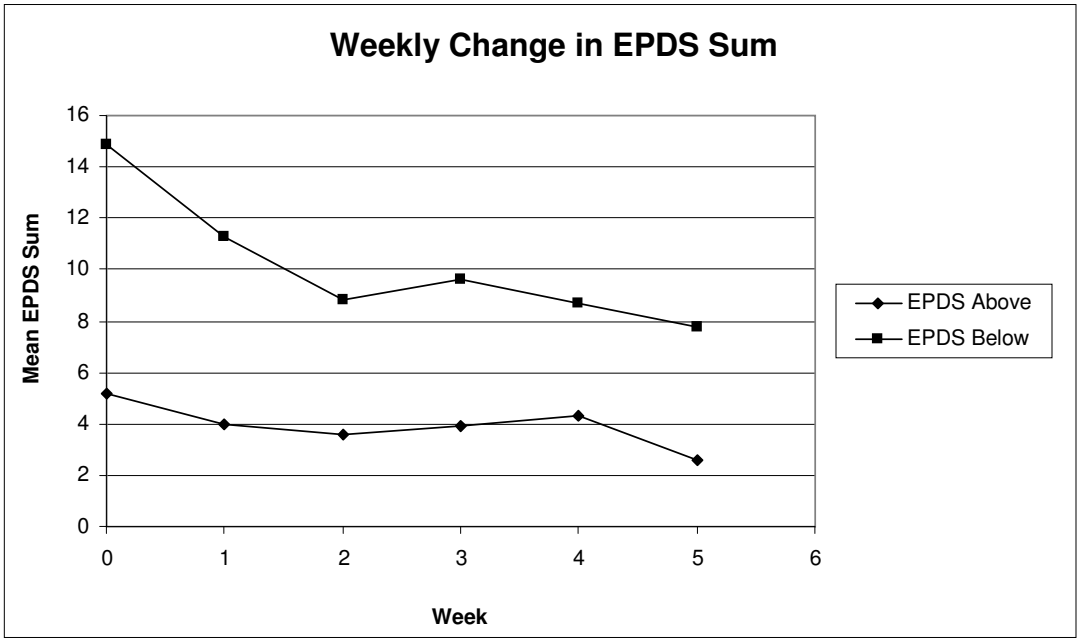


**Figure 2:** Weekly Change in CES-D Sum by Admission Group

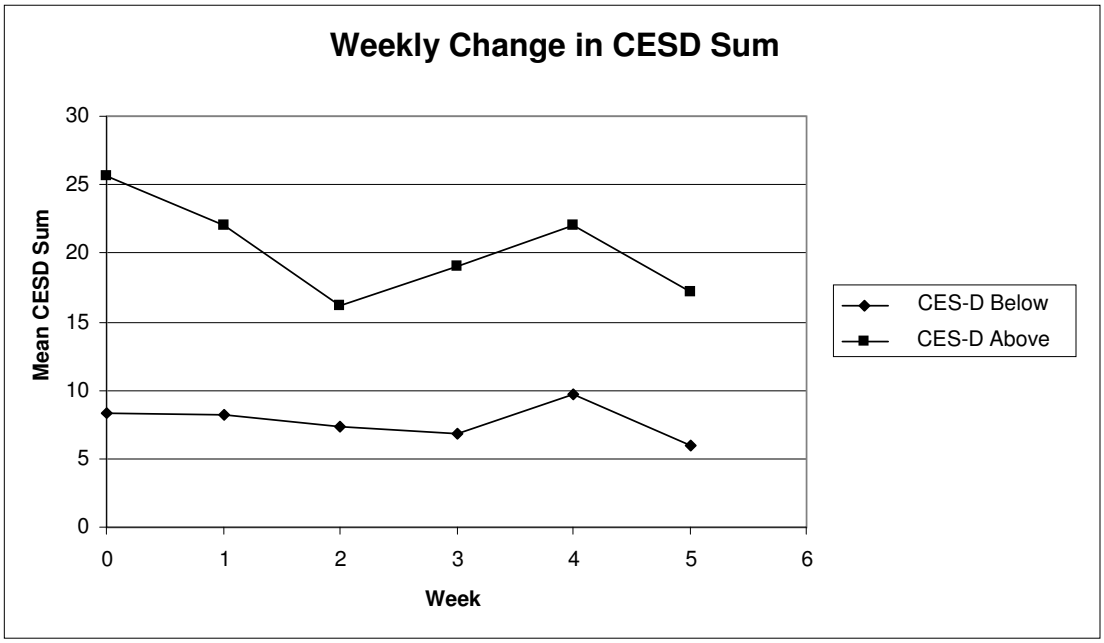


**Figure 3:** Weekly Change in EPDS Sum by Admission Group

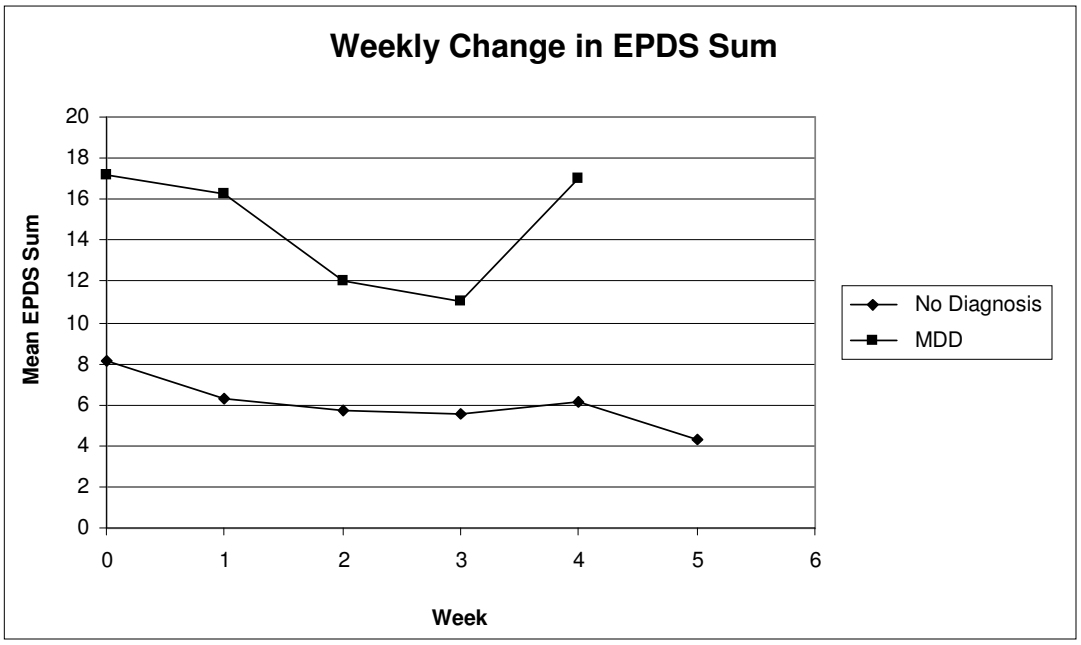
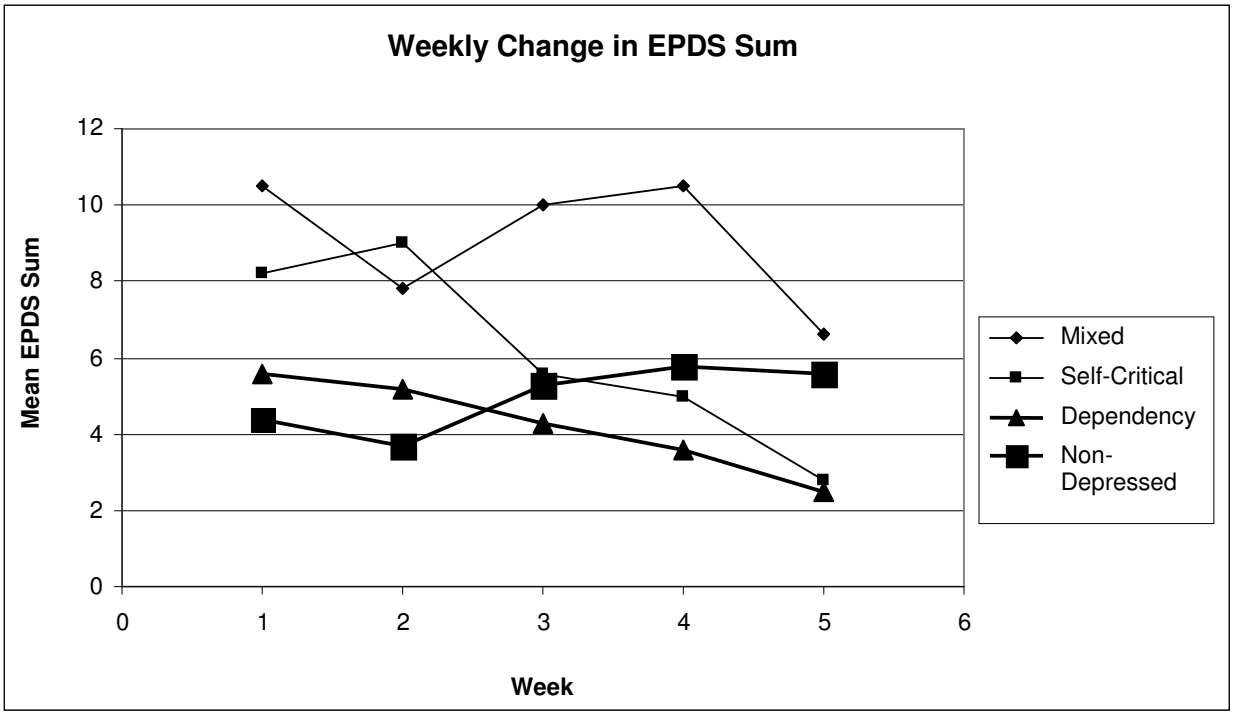


**Figure 4:** Weekly Change in EPDS Sum by DEQ Group



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# VITAE

Paula Dianne Bosler Miltenberger was born in Bossier, Louisiana, on March 20, 1969, the daughter of Patricia Dianne Bosler and James Leonard Bosler. After completing her work at The Hockaday School, Dallas, Texas in 1987, she entered Southern Methodist University at Dallas, Texas. She received the degree of Bachelor of Arts with a major in foreign service December, 1991 from Baylor University, Waco, Texas. During the following eleven years she was employed by a real estate development company. She received the degree of Bachelor of Science with a major in psychology August, 2002 from University of North Texas, Denton, Texas. In September 2003, she entered the Clinical Psychology doctoral program at the University of Texas at Southwestern Medical School in Dallas. She was awarded the degree of Doctorate in Philosophy in August, 2007. Currently, she lives in Dallas with her husband and three sons.