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Estimated prevalence and risk factors of antenatal depression in the U.S. population: Behavioral Risk Factor Surveillance System, 2006

by

June Marie Ashley

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ESTIMATED PREVALENCE AND RISK FACTORS OF

ANTENATAL DEPRESSION IN THE U.S. POPULATION:

BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM, 2006

Except where reference is made to the work of others, the work described in this thesis is my own or was done in collaboration with my advisory committee. This thesis does not include propriety or classified information.

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Abstract

Prevalence of minor and major depressive episode during pregnancy was determined in a population-representative sample of pregnant women (*n* = 1,422) surveyed by the 2006 Behavioral Risk Factor Surveillance System. Scores from the Patient Health Questionnaire-8 Depression Scale show pregnant women have a higher prevalence of minor depressive episode and a lower prevalence of major depressive episode when compared to non-pregnant women (*n* = 32,622) whereas risk estimates reveal pregnant women have a higher risk for minor and major depressive episodes when controlling for possible factors related to both pregnancy and depression (i.e., marital status and emotional support). Race, health status, emotional support, and prior depressive disorder diagnosis were identified as factors involved in risk for depressive episodes during pregnancy.

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Review of Literature

Antenatal depression is the occurrence of depressive symptoms in a woman while she is pregnant. It is also commonly referred to as prenatal or perinatal depression. Multiple studies provide evidence for detrimental effects of antenatal depression on the mother, on the developing fetus, on the birthing process, and on the child's development after birth (Alder, Fink, Bitzer, Hosli, & Holzgreve, 2007; Blier, 2006; Cohen, Altshuler, Harlow, Nonacs, Newport, Viguera, et al., 2006; Correia & Linhares, 2007; Suri, Altshuler, Helleman, Burt, Aquino, & Mintz, 2007; Lindgren, 2001). Research regarding the prevalence of antenatal depression as well as its possible risk factors has been based on clinical samples of convenience (Dietz, Williams, Callaghan, Bachman, Whitlock, & Hornbrook, 2007; Marcus, Flynn, Blow, & Barry, 2003). Consequently, the generalizability of the results to the overall population of pregnant women is questionable. The current study uses a population-based sample to evaluate the prevalence of both minor and major depressive episodes in pregnant women in comparison to women who are not pregnant. The study also seeks to identify possible risk factors for the development of minor and major depressive episodes during pregnancy.

Depression is one of the predominant causes of disability worldwide. Data from the World Health Organization-sponsored Global Burden of Diseases

List of Abbreviations

APA	American Psychiatric Association
BDI	Beck Depression Inventory
BRFSS	Behavioral Risk Factor Surveillance System
CDC	Centers for Disease Control
CES-D	Center for Epidemiological Studies Depressed Mood Scale
DSM-IV	*Diagnostic and statistical manual of mental disorders* (4th ed., text revision)
EPDS	Edinburgh Postnatal Depression Scale
PHQ	Primary Care Evaluation of Patient Health Questionnaire
PHQ-8	Patient Health Questionnaire-8 Depression Scale
PHQ-9	Patient Health Questionnaire-9 Depression Scale

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predicts that major depression will become the second leading cause of disability in the world by the year 2020 (Murray & Lopez, 1997). The same data demonstrates that women are at a higher risk for developing depression than men (Ribeiro, Jacobsen, Mathers, & Garcia-Moreno, 2008). An argument has been made for more research into why women bear nearly twice as much risk for depression as men, with particular emphasis on the interaction between genetic and environmental vulnerability (Kessler, 2003). Identifying the burden of antenatal depressive episodes by determining its prevalence in a population-based sample will contribute to this search.

Symptoms and Diagnosis of Antenatal Depression

The symptoms of antenatal depression are not different from the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text-Revision (DSM-IV-TR) (American Psychiatric Association [APA], 2000) criteria for major depressive episode, with the only difference being that the woman must be pregnant. A diagnosis of major depressive episode requires the presence of five or more of the following symptoms occurring over a span of two weeks. At least one of the symptoms must be either depressed mood or loss of pleasure and/or interest in activities the individual used to enjoy.

(1) depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful).

(2) markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others)

(3) significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day.

(4) insomnia or hypersomnia nearly every day

(5) psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)

(6) fatigue or loss of energy nearly every day

(7) feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)

(8) diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others)

(9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide (p. 356).

A minor depressive episode is the presence during a two week period of two to four of the symptoms of a major depressive episode, one of which must be either depressed mood or loss of pleasure (APA, 2000).

The estimated prevalence of antenatal depression varies widely across studies. Still, the majority predict a prevalence at or near 20% of pregnant women, which is consistent with the estimated 10% to 25% lifetime risk for depression in women (APA, 2000).

Complicating the diagnosis of antenatal depression is the difficulty involved in identifying affected women. There is a tendency on the part of health care practitioners, the mother's support group, and even on the part of the expectant mother to attribute the symptoms of depression to the normal hormonal and physical changes associated with pregnancy (Bowen & Muhajarine, 2006a; Hatton et al., 2007). There is also a belief that pregnancy provides a natural defense against depression is not uncommon (Blier, 2006; Cohen et al., 2006). Furthermore, the physical symptoms of depression are similar to the expected physical discomforts brought about by the pregnancy and may be easily misconstrued as such (Kelly, Russo, & Katon, 2001). It has been suggested that as many as one-fifth of women considered to have high-risk pregnancies suffer from depressive symptoms that go unrecognized by their health care teams (Hatton et al., 2007).

Differences among Prevalence Studies

When reviewing studies on the prevalence of antenatal depression it is helpful to classify the findings into four categories: 1) prevalence of major depression, 2) prevalence of minor depression, 3) prevalence of depression as defined by either a self-report instrument (usually involving no distinction between major and minor depression) or a structured interview, and 4)

prevalence of depressive symptoms falling short of the diagnostic criteria for major or minor depressive episodes.

Finding agreement among prevalence studies involving antenatal depression is difficult because of a number of differences among the studies' designs. A prominent source for the differences lies in a tendency to focus on narrow population subsets rather than on a more representative sample of the general population. For instance, one study specifically makes documented evidence of depression diagnosis or treatment of depressive symptoms the criteria for subject selection (Dietz et al., 2007). Others focus on women in high-risk socioeconomic and/or minority groups (Bowen & Muhajarine, 2006b; Hatton et al., 2007). An additional source of disparity between prevalence studies on antenatal depression is the specific type of depression focused on in each study. Some studies concentrate on the prevalence of diagnosed (or diagnosable) depression during pregnancy (Alami et al., 2006; Bowen & Muhajarine, 2006b; Dietz et al., 2007; Faisal-Cury & Menezes, 2007; Gotlib et al.,1989), whereas other studies look at the prevalence of individual depressive symptoms without restriction to the diagnostic criteria for depressive episodes (Marcus et al., 2003; Records & Rice, 2007).

Another factor leading to inconsistency among the studies is the use of many different instruments to measure depressive symptoms. Among the instruments used are medical records (Dietz et al., 2007), clinical interviews (Hatton et al., 2007), and self-report measures. Commonly used self-report measures include the Beck Depression Inventory (BDI) (Faisal-Cury & Menezes,

2007; Gotlib, Whiffen, Mount, Milne, & Cordy, 1989), the Center for Epidemiological Studies Depressed Mood Scale (CES-D) (Marcus et al., 2003; Records & Rice, 2007), the Edinburgh Postnatal Depression Scale (EPDS) (Bowen & Muhajarine, 2006b; Alami, Kadri, & Berrada, 2006), and the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PHQ) (Kelly, Russo, & Katton, 2001).

Estimates of the prevalence of major depression during the antenatal period range between 20% (Hatton et al., 2007) and 27% (Bowen & Muhajarine, 2006b). Only one study specifically identifies the occurrence of minor depression, finding a prevalence of 45% in a pregnant, predominately low-income and minority sample (Bowen & Muhajarine, 2006b). Although it does not distinguish between major and minor depression, a study using women's medical records to determine whether they were depressed during pregnancy yielded a prevalence of 6.9% (Dietz et al., 2007).

The disagreement among the prevalence estimates of antenatal depression is also evident in research designed around both self-report instruments and brief structured interviews. These screening tools are not designed to differentiate between major and minor depression. The prevalence estimate found using the Beck Depression Inventory (BDI) cutoff criteria ranges between 10% in a study at a large urban hospital in Canada (Gotlib et al., 1989) to 19.6% in private clinics in Brazil (Faisal-Cury & Menezes, 2007). The Mini International Neuropsychiatric Interview yielded a prevalence of 19.2% during pregnancy in a study of Moroccan women in a maternal and infant health care

setting (Alami et al., 2006). The Center for Epidemiological Studies Depressed Mood Scale (CES-D) produced a 33% prevalence of depression in women specifically in the third trimester of pregnancy at primary care clinics in the U.S. Pacific Northwest (Records & Rice, 2007).

Research aimed at identifying the occurrence of subclinical depressive symptoms yielded similarly different prevalence estimates. Studies that follow women for the duration of pregnancy have resulted in prevalences of 20% (Marcus et al., 2003) and 25% (Gotlib et al., 1989). Other research focuses only on the third trimester and identified an affected proportion of 50% of pregnant women (Records & Rice, 2007). As evidenced by these studies, timing is another potential source of differences in the prevalence research on antenatal depression. One study follows subjects before, during, and after pregnancy (Dietz et al., 2007), whereas another focuses on a specific trimester of pregnancy (Records & Rice, 2007). Many studies involve periodic assessments of women throughout pregnancy (Alami et al., 2006; Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Gotlib et al., 1989; Hatton et al., 2007; Marcus et al., 2003).

Relationship with Maternal Outcomes

Antenatal depression is related to adverse effects on the mother, on fetal development, on the birthing process, and on the child's later development. Multiple studies have investigated the relationship between depressive symptoms and their impact on pregnancy, often with an emphasis on the effects of antidepressant medications (Blier, 2006; Bonari et al., 2004; Kallen, 2004; Suri et al., 2007). Research regarding the use of antenatal depression as a predictor

for postpartum depression is also common (Bowen & Muhajarine, 2006a; Da Costa, Laurouche, Dritsa, & Brender, 2000).

Depression during pregnancy is associated with challenges to a woman's physical and mental wellbeing during a time when she is already trying to adapt to the normal changes associated with pregnancy. Pregnant women who are depressed and/or anxious experience more nausea and vomiting, a higher number of sick days, and more frequent doctor visits than their nondepressed peers (Andersson, Sundstrom-Poroma, Wulff, Astrom, & Bixo, 2004). Increased reports of back pain and leg pain have also been noted (Field et al., 2008). Although it is not known whether the relationship is causal, a high occurrence of sleeping problems is also observed among depressed pregnant women (Field et al., 2008; Jomeen & Martin, 2007; Ross, Murray, & Steiner, 2005; Wolfson, Crowley, Anwer, & Bassett, 2003).

Pregnant women who experience high levels of depressive symptoms have been shown to be nearly twice as likely to report poor health and functional limitations in comparison to pregnant women who have few or no depressive symptoms (Orr, Blazer, James, & Reiter, 2007). Regarding mental health, antenatal depression is associated with increased negative emotions, particularly anger and anxiety (Field et al., 2008). Depression has also been linked to fears regarding childbirth (Andersson et al., 2004). Women who discontinue antidepressant medication after discovering the pregnancy are at a high risk for relapsing into a depressive episode (Blier, 2006).

Relationship with Infant Outcomes

The relationship between antenatal depressive symptoms and fetal development has received a fair amount of attention. The developing fetus is most impacted by the secondary effects of depressive symptoms, including medication usage and risky maternal behavior. Antidepressant use during pregnancy has been associated with preterm births as well as with increased neonatal care admissions for infants (Kallen, 2004; Suri et al., 2007). The use of selective serotonin reuptake inhibitors (SSRIs) appears to minimize this association but a majority of pregnant women quit their medications during pregnancy. Even in the absence of medication usage, there is evidence for an increased likelihood of neonatal care admission for infants of women who were depressed during late pregnancy (Chung, Lau, Yip, Chiu, & Lee, 2001). Risky maternal behavior associated with depressive symptoms includes alcohol use (Bowen & Muhajarine, 2006a), smoking (Bowen & Muhajarine 2006b; Zhu & Valbo, 2002), and a tendency for the mother not to follow prenatal care advice (Bonari et al., 2004). Antenatal depression has also been proposed as a factor in fetal abuse, wherein the expectant mother attempts to harm the fetus in a variety of ways (e.g., hitting her stomach or ingesting harmful substances) (Kent, Laidlaw, & Brockington, 1997).

Relationship with Obstetric Problems

Another concern related to antenatal depression is its relationship to obstetric problems, including preterm labor, low birth weight, labor pain, prolonged labor, surgical deliveries, and postpartum hemorrhage. Similar to the

prevalence data on antenatal depression, research on obstetrical outcome is varied in terms of focus. Some studies use clinical diagnoses of depression whereas others use self-report measures of depressive symptoms. The timeframe of the studies also varies, including following the women throughout their pregnancies, specifically looking at the final trimester, or retroactively obtaining data either through women who are in their postpartum period or via medical records. The sheer variety of study designs makes comparison difficult and indicates a need for additional research on the effects of antenatal depression.

There is some evidence of an increased likelihood for women who are depressed during pregnancy to spontaneously abort or miscarry (Bonari et al., 2004). Chronic antenatal depression has also been linked to low gestational age at birth as well as to low birth weight (Field et al., 2008). Increased reports of labor pain have been noted among depressed women (Alder et al., 2007). The presence of depressive symptoms is linked with higher numbers of operative deliveries (both requested and necessitated) as well as with requests for epidural analgesia (Alder et al., 2007; Andersson et al., 2004; Chung et al., 2001). A possible relationship has been identified between antenatal depression or anxiety and both prolonged labor and an increased risk for postpartum hemorrhage (Mei & Huang, 2006).

The most frequently researched aspect of antenatal depression is its proposed connection with postpartum depression. Women who are depressed during pregnancy have an increased risk for developing postpartum depressive

symptoms (Da Costa et al., 2000; Dietz et al., 2007; Gotlib et al., 1989; Larsson, Sydsjo, & Josefsson, 2004; Alami et al., 2006). In a study based on indicators of depressive symptoms in medical records, 54.2% of postpartum depressed participants were also depressed either during or before pregnancy (Dietz et al., 2007). A study using the Mini International Neuropsychiatric Interview with a sample of pregnant women found that 19.2% of the women who later experienced postpartum depression originally became depressed during pregnancy (Alami et al., 2006). Research using the Beck Depression Inventory indicated half of the women who were depressed during pregnancy were also depressed in the postpartum period (Gotlib et al, 1989). In spite of the 50% overlap between depression during and after pregnancy found in this study, the same research also identified different risk factors for depression during pregnancy in comparison to the risk factors for postpartum depression. Younger age, lower educational level, higher number of children already in household, and being a stay-at-home parent were all factors associated with an increased likelihood for developing antenatal depression whereas they were unrelated to the risk for developing postpartum depression. The argument that antenatal depression and postpartum depression do not share the same risk factors may limit the predictive ability of antenatal depression for later postpartum depression. Regardless, the presence of depressive symptoms during pregnancy remains the best predictor of postpartum depressive symptoms (Da Costa et al., 2000).

Beyond fetal development, antenatal depressive symptoms may also have lasting effects on the long-term development of the child. It is possible that

depressive symptoms may interfere with maternal-fetal attachment, setting the infant up for a less than desired level of attachment during his or her early development (Lindgren, 2001). There is evidence that neonates of depressed mothers have slower adaptation times (Adler et al., 2007) and higher stress hormone levels (Bonari et al., 2004). This suggests the existence of a biological interaction between the mother's antenatal depressive symptoms and the infants' ability to cope with stress. A longitudinal study of youth in Finland identified a slight but significant increase in future criminality for the children of women who identified themselves as having depressive symptoms during pregnancy (Maki et al., 2003). Although this study used self-report of depressive symptoms rather than a more standardized assessment, the self-reports were obtained during the women's pregnancy and the results could not have been influenced by recall bias. The long-term effect of antenatal depression on children's development is an area of interest for additional research.

Risk Factors for Developing Antenatal Depression

Research has identified possible risk factors for the development of depression during pregnancy. These factors can be classified into three categories: 1) physical changes associated with pregnancy, 2) demographic factors such as marital status, socioeconomic status, ethnicity, and age, and 3) behavioral factors like prior mental illness, smoking, and availability of social support. Identification of risk factors can aid health professionals in identifying women who are either at risk for or who have already developed depressive symptoms.

Being pregnant is a significant life event for a woman (Holmes & Rahe, 1967). The physical changes associated with pregnancy as well as the anticipation of becoming a mother can be stressful. Anxiety and anger have been identified as comorbid problems with antenatal depression (Correia & Linhares, 2007; Field et al., 2008). Pregnant women who are experiencing increased life stress tend to have a higher occurrence of antenatal depression (Bowen & Muhajarine, 2006a). Similarly, women who report a higher number of daily hassles during the first trimester of pregnancy are more likely to develop a depressed mood (Da Costa et al., 2000). Changes in sleep patterns during pregnancy are another potential factor in antenatal depressive symptoms, with women who experience relatively more sleep disturbances having a higher incidence of depressive symptoms (Field et al., 2008; Jomeen & Martin, 2007; Ross, Murray, & Steiner, 2005).

The associations between a variety of demographic variables and antenatal depressive symptoms have been investigated in numerous studies. Marital status has received the most support as a risk factor for depression during pregnancy. Research has found that single pregnant women are at a higher risk for developing clinically significant antenatal depression than married or partnered women (Bowen & Muhajarine, 2006a; Faisal-Cury & Menezes, 2007; Reardon & Cougle, 2002). Further, a correlation has been found between marital status and subclinical depressive symptoms during pregnancy wherein single women are again at greater risk (Records & Rice, 2007). In addition to the increased likelihood for single pregnant women to be depressed, pregnant

women who are in difficult marriages or partnerships may also be more susceptible to becoming depressed (Alami et al., 2006).

Socioeconomic status has been proposed as a demographic factor that may contribute to the development of depressive symptoms during pregnancy. Pregnant women who have a low income and a low education level are at an increased risk for depression (Faisal-Cury & Menezes, 2007; Marcus et al., 2003). A link has also been identified between women living in poverty and the development of antenatal depression (Bowen & Muhajarine, 2006a). Minority status has also been associated with increased diagnoses of antenatal depression (Bowen & Muhajarine, 2006b).

Maternal age may be associated with the development of depression during pregnancy. Many studies agree that younger pregnant women (e.g., women in their teens or twenties) are more likely to become depressed (Deal & Holt, 1998; Gotlib et al., 1989; Reardon & Cougle, 2002). In contrast to these studies, research on older women's (i.e. 35 years and older) prevalence of postpartum depression in comparison to younger women (i.e. 20 to 29 years old) found no significant differences between the two groups (Windridge & Berryman, 1999). Although the study did not investigate antenatal depressive symptoms, it does highlight a need for affirming the existence of age-specific differences in antenatal depression. Further support will be generated for distinct risk factors between antenatal and postpartum depression if the existence of age differences in antenatal depression is confirmed (Gotlib et al, 1989).

Body mass index and body image have been studied as potential behavioral risk factor for antenatal depression. The necessary weight gain associated with pregnancy may interact with women's existing body image. This may, in turn, influence the development of depressive symptoms. The research to date is mixed. One study investigated the relationship between eating attitudes, body mass index, and depressive symptoms during and after pregnancy. The study concluded that body mass index and eating attitudes are not a source of anxiety or depressive symptoms during pregnancy but can become problems in the postpartum period (Carter, Baker, & Brownell, 2000). Other research found a tendency for overweight and obese women to experience more stress during pregnancy as well as to report twice the amount of depressive symptoms as normal weight pregnant women (LaCoursiere, Baksh, Bloebaum, & Varner, 2006). Both studies argue for additional research into body mass index, body image, and depressive symptoms during the antenatal period.

Prior mental illness in women has received some attention as a behavioral risk factor for depression during pregnancy. An identified relationship between prior mental illness and antenatal depressive symptoms may in part be a result of the likelihood that pregnant women will quit their psychotropic medications in order to avoid possible harm to the fetus (Blier, 2006). In a study of pregnant women who had been diagnosed with major depression in the past but who had been euthymic for three or more months prior to their last menstrual period, 43% relapsed into major depression during the pregnancy (Cohen et al., 2006). When analyzed according to who did and who did not continue taking antidepressant

medication during pregnancy, the women on antidepressants had a 26% relapse rate whereas those who were not had a 68% relapse rate. A similar study was conducted to determine the prevalence of depressive symptoms during pregnancy in relation to women's prior depression diagnoses as well as to their depression status after pregnancy (Dietz et al. 2007). Fifty-six percent of the women who had been identified with either depression or depressive symptoms in the 39 weeks prior to pregnancy received a depression diagnosis at some point during pregnancy. Likewise, 54% of the women identified with depressive symptoms following pregnancy had been diagnosed with depression either prior to or during pregnancy.

Substance abuse, including smoking, alcoholism, and other drug use, is a behavioral risk factor that has been linked to antenatal depressive symptoms. Similar to the discussion on antidepressant use during pregnancy, many women stop smoking, drinking, or using drugs due to concerns about the effects on the pregnancy. Quitting these addictive behaviors without any gradual approach or treatment (such as nicotine gum or patches) may lead to depressive symptoms (Bowen & Muhajarine, 2006b; Zhu & Valbo, 2002). Women who either do not quit successfully or who never attempt to quit are also at a higher risk for depressive symptoms due to the conflict they feel over their behavior (Zhu & Valbo, 2002).

A final behavioral risk factor involves the pregnant woman's perception that she is receiving the support she needs. Pregnant women who do not perceive themselves as having strong social support through family and friends have been found to have a higher prevalence of antenatal depressive symptoms

(Bowen & Muhajarine, 2006a; Elsenbruch et al., 2007; Records & Rice, 2007). A parallel has been identified between women smoking during pregnancy and their perception of a low amount of social support, suggesting the possibility of an interaction between these factors and the development of antenatal depressive symptoms (Elsenbruch et al., 2007)

A wealth of research exists regarding antenatal depression, particularly regarding its effects on the mother, impact on the fetus and on the infant, links to postpartum depression, and possible risk factors. However, a population-representative sample on the prevalence of antenatal depression in the United States is lacking. Dietz et al. (2007) explored the occurrence of depressive symptoms in the medical records of 4,398 pregnant women but their sample was limited to women who were seen in Kaiser Permanente medical clinics in the United States Northwest. Marcus et al. (2003) measured the prevalence of antenatal depressive symptoms in 3,472 women recruited from obstetrical clinics, all of which were in Southeastern Michigan. These studies represent clinical samples rather than population-based samples.

Statement of the Problem

The goal of the current study is to determine the population-based prevalence of minor and major depressive episodes during pregnancy using a sample randomly selected from throughout the United States. A population-based design also affords an opportunity to differentiate the prevalence of depressive episodes in pregnant women and non-pregnant women. Prior research comparing childbearing women in their postpartum period to non-childbearing women found no difference in prevalence of depression between the two groups (O'Hara, Zekonski, Philipps, & Wright, 1990). No comparable research between pregnant women and their non-pregnant peers has been identified to date. The current study hypothesizes that pregnant women will be at a higher risk for developing minor or major depressive episodes than non-pregnant women due to the stress associated with pregnancy.

A second hypothesis involves the influence of demographic and behavioral risk factors on the development of both minor and major depressive episodes during pregnancy. The interplay between the following demographic variables and depressive symptoms will be examined: marital status (Bowen & Muhajarine, 2006a; Faisal-Cury & Menezes, 2007; Reardon & Cougle, 2002; Records & Rice, 2007), income level, employment, and education (Bowen & Muhajarine, 2006a; Faisal-Cury & Menezes, 2007; Marcus, et al.), ethnicity (Bowen & Muhajarine, 2006b), and maternal age (Deal & Holt, 1998; Gotlib et al.,

1989; Reardon & Cougle, 2002; Windridge & Berryman, 1999). The relationships between major and minor depressive episodes and the following behavioral risk factors will also be evaluated: general health status (Orr et al., 2007), availability of social support (Bowen & Muhajarine, 2006a; Elsenbruch et al., 2007; Records & Rice, 2007) and prior diagnoses of depressive or anxiety disorders (Bowen & Muhajarine, 2006a; Cohen et al., 2006; Correia & Linhares, 2007; Dietz et al., 2007). The current study proposes that each of these demographic and behavioral risk factors contributes to the development of minor and major depressive episodes in pregnant women.

Methods

Sample

The Behavioral Risk Factor Surveillance System (BRFSS) is a telephone survey conducted annually throughout the United States (Centers for Disease Control, CDC, 2006a). The BRFSS selects participants for telephone surveys based on random sampling of phone numbers in the United States, comprised of the 50 states, the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands. The intent of the BRFSS is to produce a sample that is representative of the entire population of adults in the nation. Weighted estimates are used for prevalence values and ratios to account for such factors as the number of telephones and adults in a household and the probability of a telephone number being randomly selected. The BRFSS data set is publicly available for download at the Centers for Disease Control web site (CDC, 2006b). The present study uses data from the responses of 2006 BRFSS survey participants who were administered the Depression and Anxiety survey module, which included questions based on the eight-item Patient Health Questionnaire depression scale (PHQ-8) (Kroenke & Spitzer, 2002). The Depression and Anxiety survey module was included in the BRFSS survey in 33 states, two U.S. territories, and the District of Columbia.

The data for the present study were limited to the BRFSS responses of women between the ages of 18 and 44, an age range selected to reflect the

women who were most likely capable of becoming pregnant. During the 2006 BRFSS, 1,422 pregnant women between the ages of 18 and 44 as well as 32,622 non-pregnant women between the ages of 18 and 44 were surveyed and given the PHQ-8 questions (CDC, 2006b). The average age of the sample was 34 (*SD* = 6.91). Table 1 outlines the demographic characteristics of the sample (race, employment status, income level, educational level, and marital status).

Measurement: Major and Minor Depressive Episode

The PHQ-8 questions were adapted for use in the Depression and Anxiety survey module administered as part of the BRFSS in 2006 to assess participants' depression symptoms over the 14 days prior to survey administration. For each question from this module, participants gave an answer of between 0-14 days to indicate the number of days they experienced the depressive symptom the question is designed to evaluate. The PHQ-8 is based on the Patient Health Questionnaire-9 depression scale (PHQ-9; Kroenke, Spitzer, & Williams, 2001; Kroenke & Spitzer, 2002). The PHQ-9 is a brief measure of depression severity designed to measure the nine DSM-IV criteria for depressive symptoms (APA, 2000). The only difference between the PHQ-8 and the PHQ-9 is the exclusion of the question about the ninth symptom of depression, which pertains to recurrent thoughts about death and suicide. Questions regarding this symptom are omitted in the PHQ-8 to allow the measurement to be used in situations where interviewers cannot intervene appropriately for individuals who are at risk of committing suicide, as is the case in the telephone-based BRFSS (Kroenke & Spitzer, 2002; Kroenke et al., 2009). Removing the ninth item does not

significantly threaten the validity of the PHQ-8 in comparison to the PHQ-9. Recurrent thoughts of death and suicidal ideation are infrequently endorsed when compared to the first eight symptoms of a depressive episode and do not contribute heavily to scores on the PHQ-9 (Kroenke et al., 2001).

The DSM-IV-TR (APA, 2000) criteria for a major depressive episode require the presence of five or more of the nine symptoms occurring over a span of two weeks. At least one of the symptoms must be either depressed mood or loss of pleasure and/or interest in activities the individual used to enjoy. A minor depressive episode is the presence during a two week period of two to four of the symptoms of a major depressive episode, one of which must be either depressed mood or loss of pleasure. In the case of both major and minor depressive episodes, the frequency of experiencing the symptoms is not specified; the guideline is that the symptoms be experienced approximately every day.

The current study based its calculation of depression scores on the PHQ-8 research by Fan et al. (2009). The number of days during which each individual symptom occurred was classified into four categories using a 0-3 scale (0-1 day = 0 *not at all*, 2-6 days = 1 *several days*, 7-11 days = 2 *more than half the days*, and 12-14 days = 3 *nearly every day*). The category score for each of the 8 symptoms was then summed to arrive at a total score for the PHQ-8. The total scores were then classified into depression categories using criteria from prior research (Fan et al., 2009; LoBello & Zachar, 2009). Scores of 4 or less were labeled no depression. Scores between 5 and 9 were labeled minor depressive episode and scores of 10 or higher were labeled major depressive episode.

Research by Kroenke et al. (2009) supports the sensitivity and the specificity of these depression categorizations based on the PHQ-8. Scores greater than or equal to 10 have sensitivity of 100% and a specificity of 95% for major depressive disorder. Similarly, the sensitivity and the specificity of the greater than or equal to 10 cut score for any depressive disorders is 70% and 98% (respectively).

To determine the validity of their major and minor depressive episode categories based on the PHQ-8, LoBello and Zachar (2009) compared participants' depressive episode categorization to the participants' responses to another question on the 2006 BRFSS: *Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?* Participants in the no depression category averaged 2.4 poor mental health days in the 30 day period, participants in the minor depressive episode category averaged 6.7 days, and participants in the major depressive episode category averaged 17.7 days. Their model was significant (r^2 = .22, p <.0001) and Tukey's test indicated the differences among the group means were significant. These findings support the distinction between the categories of depression based on the PHQ-8 and indicate their diagnostic relevance.

Measurement: Risk Factor Variables

The risk factor variables used in this study have been found to be associated with antenatal depression in other studies (Bowen & Muhajarine, 2006a; Correia & Linhares, 2007; Faisal-Cury and Menezes, 2007; Field et al., 2008; Marcus et al., 2003; Records & Rice, 2007). The risk factors are classified into two areas: demographics and behavioral risk factors.

Demographics: The variables in this domain include age, race, employment status (9 categories), income level (8 categories), education status (5), and marital status (7 categories).

Behavioral Risk Factors: Variables include general health status, availability of emotional support, prior depressive disorder diagnosis, and prior anxiety disorder diagnosis. The BRFSS asked participants to rate their general health as *excellent*, *very good*, *good*, *fair*, or *poor* (CDC, 2006a). Participants were also asked "How often do you get the social and emotional support you need?" to which they responded, *always*, *usually*, *sometimes*, *rarely*, or *never.* With regard to prior depressive disorder diagnosis, participants were asked to indicate (*yes* or *no*) whether they have ever been told by a "doctor or other healthcare provider that [they] have a depressive disorder (including depression, major depression, dysthymia, or minor depression." Similarly, regarding prior anxiety disorder diagnosis, participants were asked to indicate (*yes* or *no*) whether a "doctor or other healthcare provider ever told [them] that [they] had an anxiety disorder (including acute stress disorder, anxiety, generalized anxiety

disorder, obsessive-compulsive disorder, panic disorder, phobia, posttraumatic stress disorder, or social anxiety disorder)."

Statistical Analyses

All analyses were adjusted by weighting to account for potential bias in BRFSS subject selection. Descriptive statistics were conducted to determine the prevalence of minor and major depressive episodes in both pregnant and non-pregnant women. Multivariate logistic regression was used to identify the associations between the variables of interest (i.e., pregnancy status and occurrence of depressive episodes, as well as the interaction between participant demographics or behavioral risk factors and pregnancy in the development of depressive episodes). Odds ratio estimates were used to determine risk estimates for minor and major depressive episodes based on pregnancy status alone. Similarly, comparison of pregnant women who were depressed to pregnant women who were not depressed was used for odds ratio estimates on demographic and behavioral risk factors. The resulting risk estimates indicate the risk of developing minor or major depressive episode during pregnancy based on individual demographic and behavioral risk factors.

Results

Prevalence of Major and Minor Depressive Episodes (Pregnant vs. Non-pregnant Women)

The initial goal of this study was to determine the prevalence of antenatal depressive episodes in a population-based sample of women between the ages of 18 and 44 years. The study hypothesized that differences would be revealed in the prevalence of depressive episodes in pregnant women when compared to their same-aged, non-pregnant peers. Use of data from pregnant women respondents interviewed for the 2006 Behavioral Risk Factor Surveillance System provides a prevalence based on 1,422 pregnant women selected from throughout the United States and 32,622 women who were not pregnant. In all subsequent analyses, these raw numbers were weighted as described in the Method Section. Of these women, 17.8% met the criteria for minor depressive episode. In comparison, 10.7% of the women met the criteria for major depressive episode.

Regarding minor depressive episode, 25.5% (95% CI: 25.3% to 25.6%) of pregnant women met the criteria (PHQ-8 score between 5 and 9) in comparison to the 17.4% (95% CI: 16.9% to 17.8%) of non-pregnant women who also met the criteria. Differences also existed between the two groups for major depressive episode. For pregnant women, 9.1% (95% CI: 9.06% to 9.16%) met the criteria for major depressive episode (PHQ-8 score ≥ 10) whereas 10.7%

(95% CI: 10.4% to 11.1%) of non-pregnant women also presented with these symptoms. The data for these findings are represented in Table 2. These results indicate that pregnant women have a higher prevalence of minor depressive episode and a lower prevalence of major depressive episode compared to women who are not pregnant.

The next step was to estimate risk of minor and major depressive episodes among pregnant women compared to women who are not pregnant while controlling for a variety of demographic characteristics and behavioral risk factors. Bivariate analyses of the relationship between pregnancy status and the potential demographic and behavioral risk factors for developing antenatal depression are presented in Table 3. This represents the comparison between the pregnant and non-pregnant women respondents to the 2006 Behavioral Risk Factor Surveillance System. Each of these demographic and behavioral risk factor variables was significantly related to pregnancy status. Research has indicated that these variables are also related to depressive episodes (Bowen & Muhajarine, 2006a; Correia & Linhares, 2007; Dietz et al., 2007; Faisal-Cury & Menezes, 2007; Field et al., 2008). These variables were then entered into the multivariate logistic regression models in order to control for their potentially confounding effects on the risk estimates for developing major and minor depressive episodes.

The odds ratios estimates for pregnancy status and the risk factors are represented in Table 4. Pregnant women were more likely to be younger, and married, and less likely to report "*very good*" health status and that they

"*sometimes*" receive adequate emotional support. They were also less likely to report prior diagnoses of depressive or anxiety disorders. There were no differences in race/ethnic background or income between pregnant and non-pregnant women. Controlling for this set of variables, pregnant women were 1.96 times more likely to experience a minor depressive episode and 1.75 times more likely to experience a major depressive episode.

Risk Factors for Depressive Episodes during Pregnancy (Pregnant with Depressive Episode vs. Pregnant without Depressive Episode)

The second set of hypotheses concerns the relationship between pregnancy and both demographic and behavioral risk factors in the development of antenatal depression. Pregnant women respondents to the 2006 Behavioral Risk Factor Surveillance System who were identified with depressive episodes were compared to the pregnant women who were identified as having no depressive episode (PHQ-8 score ≤ 4). Minor depressive episode and major depressive episode were evaluated independently, allowing for possible distinctions between their respective risk factors.

Minor Depressive Episode vs. No Depressive Episode

Bivariate analyses of the relationship between minor depressive episode (PHQ-8 score between 5 and 9) vs. no depressive episode (PHQ-8 score ≤ 4), in pregnant women and the potential demographic and behavioral risk factors for developing antenatal depression are presented in Table 5. Each of these demographic and behavioral risk factor variables was significantly related to depressive episode status. These variables were then entered into the

multivariate logistic regression models in order to control for their potentially confounding effects on the risk factor estimates for developing minor depressive episode during pregnancy.

The odds ratio estimates and the risk factors for minor depressive episode are presented in Table 6. Pregnant women who met the criteria for minor depressive episode were more likely to rate their general health status as either "*poor*" or "*good*" than "*excellent.*" They were also more likely to report that they "*sometimes*" receive adequate emotional support than that they "*always*" receive it. In contrast, pregnant women with minor depressive episode were less likely to be Hispanic than White. They were also less likely to report that they "*never*" receive adequate emotional support than that they "*always*" receive it. There were no associations between age, income level, marital status or prior diagnosis of depressive or anxiety disorders and current minor depressive episode.

Major Depressive Episode vs. No Depressive Episode

Bivariate analyses of the relationship between major depressive episode (PHQ-8 score ≥ 10) vs. no depressive episode (PHQ-8 score ≤ 4) in pregnant women and the potential demographic and behavioral risk factors for developing antenatal depression are presented in Table 7. Each of these demographic and behavioral risk factor variables was significantly related to depressive episode status. These variables were then entered into the multivariate logistic regression models in order to control for their potentially confounding effects on the risk factor estimates for developing major depressive episode during pregnancy.

The odds ratio estimates for current major depressive episode and the various risk factors presented in Table 8. Pregnant women who met the criteria for a major depressive episode were more likely to report "*poor*," "*fair*," or "*good*" general health status than "*excellent*" health. The relationship is linear, with pregnant women becoming increasingly more likely to experience major depressive episode the more poorly they rate their health. Compared to those who indicate they "*always*" receive the emotional support they need, the pregnant women who indicate they "*rarely*," "*sometimes*," or "*usually*" receive enough emotional support are more likely to experience a major depressive episode. The pregnant women experiencing major depressive episode were 6.4 times more likely to report that they had been previously diagnosed with a depressive disorder (95% CI, 2.9 - 14.3). Finally, pregnant women with major depressive episode were less likely to be multiracial than White. There were no associations between age, income level, marital status, or prior diagnosis of anxiety disorders and current major depressive episode status.

Discussion

This study provides a population-based estimate of the occurrence of minor and major depressive episode in a nonclinical sample of pregnant women between ages 18 and 44 in the United States. An additional purpose of the current study was to determine if pregnant women were at greater risk for experiencing minor and major depressive episodes than women who were not pregnant at the time of the survey. Further, pregnant women with depressive episodes were compared to pregnant women without depression to identify demographic and behavioral risk factors for minor and major depressive episodes.

Prevalence of Minor and Major Depressive Episodes

The results of the current study demonstrate that t pregnant women have a higher prevalence of minor depressive episode and a lower prevalence of major depressive episode than the non-pregnant age cohort. The findings are partially consistent with the hypothesis that the prevalence of both disorders would be greater among pregnant women. These prevalence estimates are lower than estimates based on clinic samples.

Research on minor depression during pregnancy is limited. One study used the Edinburgh Postnatal Depression Scale (EPDS) to determine the prevalence of minor depressive symptoms in addition to the prevalence of major depression in a sample of 39 pregnant women (Bowen & Muhajarine, 2006b).

The sample was selected from a group of women attending a prenatal outreach program in Canada and was intended to estimate the prevalence of antenatal depression in a minority population. The resulting prevalence for minor depressive symptoms in the pregnant women was 45%. The current study's 25.5% prevalence of minor depressive episode during pregnancy is much lower than the prior study's estimate of minor depressive symptoms. However, the difference may be explained by the comparison of a population-based nonclinical sample to a small, ethnically homogeneous sample self-selected to attend an outreach program.

Studies of the prevalence of major depression designed around limited samples yield prevalence estimates between 20% (Hatton et al., 2007) and 27% (Bowen & Muhajarine, 2006b). The 20% estimate is based on a clinical sample of pregnant women in Oregon who were believed to be at a high risk for postpartum depression based on a personal or family history of depression and/or presence of premenstrual dysphoric disorder (Hatton et al., 2007). The Bowen & Muhajarine (2006b) estimate of 27% comes from a sample of minority women in a prenatal outreach program in Canada. The current study estimates the prevalence of major depressive episode during pregnancy at 9.1%, which is lower than the 20% to 27% range reported in other studies. As in the case of minor depressive episode, differences were anticipated between the results of current and prior studies because of differences in sample characteristics and methods of measuring depression.

Research on the prevalence of depression during pregnancy has usually been based on samples limited by specific subject characteristics (e.g., minority, low-income, prior mental illness). These samples typically come from clinic settings where seeking medical care may be driven by a variety of factors. Both the physical and psychological symptoms of depression may cause individuals to seek medical help (APA, 2000; Kroenke et al., 1994; Walker, Katon, & Jamelka, 1993). Therefore, a higher prevalence of depressive symptoms and episodes would be expected among clinic samples of pregnant women when compared to a population-based sample. The current study is not limited to specific participant demographic characteristics nor is it based on a clinical sample, thereby allowing prevalence estimates to reflect the general U.S. population of pregnant women.

Prevalence estimates from this study are higher than those found in one study based on medical diagnosis and treatment for depressive symptoms during pregnancy (Dietz et al., 2007). This study reviewed the medical records of 4,938 women in the Pacific Northwest who had given birth between 1998 and 2001. The medical information for each of the women was analyzed for the 10 months prior to her becoming pregnant, the duration of her pregnancy, and the 10 months after giving birth. The women were identified as depressed based on documentation in their record of a related diagnosis from The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM; United States Department of Health and Human Services, 2000) (including episodic mood disorders, anxiety, dissociative, and somatoform disorders, dysthymic disorders, adjustment reaction, and depressive disorder not otherwise specified).

Women were also classified as depressed if their records noted prescriptions for antidepressant medication following an ICD-9-CM diagnosis of "other current conditions in the mother classifiable elsewhere, but complicating pregnancy, childbirth, or the puerperium." The study found a 6.9% prevalence of depression during pregnancy as evidenced by the ICD-9-CM diagnosis and antidepressant treatment documentation from the medical records. The current study reveals a higher prevalence of antenatal depressive episodes based on self-reported answers to the PHQ-8 from pregnant women in a nonclinical sample. Retrospective review of medical records may underestimate cases in which medical providers fail to detect or note depression, or identified depressive symptoms in pregnant women but referred them elsewhere for assessment and treatment. However, the use of a broad range of ICD-9 diagnoses and prescription medication records are methods that might be expected to inflate prevalence estimates. All that may be said is that the difference between the prevalence estimates found in the two studies is sizeable.

The 6.9% prevalence estimate for antenatal depression based on medical records reported by Dietz et al. (2007) and this study's combined prevalence estimate of 35.5% for minor and major depressive episodes highlights the possibility that depression among pregnant women is underdiagnosed (Blier, 2006; Dietz et al., 2007; Hatton et al., 2007; Kelly et al., 2001). Blier (2006) hypothesizes that pregnancy protects against depression and may be one reason for the underdiagnosis of antenatal depression. A possible explanation of this protective effect is that some women experience a rejuvenation of their

emotional health during pregnancy. Another possibility is that concerns about potential adverse effects of antidepressant medication use during pregnancy may discourage medical treatment for depression. It is also possible that pregnant women and their support networks, including health care providers, fail to recognize or correctly identify the symptoms of depression. A study of pregnant women at high risk for depression determined that the majority did meet the criteria for a depressive disorder (Hatton et al., 2007). All of the women were receiving routine prenatal care but none had received depression diagnoses from their health care providers.

To some extent it is possible to understand why health care providers would underdiagnose depression in pregnant women. Many of the physical changes and discomforts associated with pregnancy may resemble depressive symptoms. Five of the symptoms of a depressive episode may be linked to physical aspects of pregnancy: significant weight change, changes in sleep pattern, appearing to others as more agitated or lethargic than usual, changes in energy level, and changes in concentration level (APA, 2000). As an example, a pregnant woman may tell her physician she is having a difficult time sleeping, lacks energy, and she is eating more (or less) than usual. The physician could easily attribute these symptoms to the pregnancy. If, in addition, the woman consistently feels "down" or lacks interest in normally enjoyable activities, she may have a minor depressive episode (APA, 2000). If the pregnant woman does not share her emotional symptoms with the physician and if the physician does

not provide a routine mental health screening then it is possible for cases of depression to be overlooked.

Risk of Major and Minor Depressive Episodes

Following the determination of prevalence of minor and major depressive episodes among pregnant women, an analysis was conducted to determine risk of these disorders while controlling for the effects of possible confounding variables. Odds ratios were calculated to determine the risk of developing depressive episodes during pregnancy while controlling for the effects of other variables that could also be related to depression, pregnancy status, or both. The covariates included in the multivariate models included age, marital status, health status, emotional support, and past history of depression or anxiety. The resulting risk estimates show an almost doubled likelihood for pregnant women to develop minor depressive episode and a 75% increase in the likelihood of developing major depressive episode when compared to women who are not pregnant.

Although pregnant women have a lower prevalence of major depressive episode compared to the non-pregnant women, the odds ratio indicates that pregnant women have a greater risk than non-pregnant women for developing major depressive episode. A lower prevalence, but higher risk, for major depressive episode may be attributable to a low likelihood of becoming pregnant while experiencing a major depressive episode. Women with major depressive episode may not desire sexual intercourse or pregnancy while she is experiencing the generalized lack of interest in pleasurable activities and other

symptoms of depression. These symptoms would seem inconsistent with at least intentionally planning to become pregnant and take on the responsibilities of rearing a child (APA, 2000). The subjective feelings of sadness and isolation common in depression may also disrupt the woman's relationships with others and consequently reduce the likelihood of pregnancy. For these reasons, it is reasonable to expect any sample of pregnant women to have a comparatively low prevalence of major depressive episode cases.

The prevalence and risk estimates in this study suggest that pregnancy is an independent risk factor for both minor and major depressive episodes. This finding is in line with pregnancy's classification as a life event that can increase stress levels and possibly lead to problems including depression (Holmes & Rahe, 1967). It is not possible, on the basis of these findings, to conclude that pregnancy causes depression. If pregnancy caused depression, then the prevalence of depressive episodes among pregnant woman would be higher than was found. Depression is not regarded as a normal part of pregnancy despite its association with physical changes that may also meet the criteria for depressive symptoms. Rather, the stress associated with pregnancy may increase risk of depressive episodes during pregnancy.

Risk Factors for Depressive Episodes during Pregnancy

In this study pregnant women who were depressed were compared to pregnant women who were not depressed to determine demographic and behavioral risk factors for minor and major depressive episodes. The demographic risk factors were maternal age, race, employment status, income

level, education status, and marital status. The behavioral risk factors included general health status, availability of emotional support, prior depression disorder diagnosis, and prior anxiety disorder diagnosis. It was hypothesized that certain risk factors, such as a low income level, would increase risk for developing a depressive episode during pregnancy. The results revealed a number of significant differences between pregnant women currently experiencing a depressive episode and pregnant women who are not depressed. The risk factors identified for minor depressive episode are related to general health status and emotional support. The risk factors associated with major depressive episode pertain to general health status, emotional support, and prior depressive disorder diagnosis. In contrast, factors related to race and perceived emotional support were protective factors against antenatal depressive episodes.

Pregnant women with minor depressive episode are 95 times more likely to rate their general health as "*poor*" than "*excellent*." This finding is consistent with prior research indicating pregnant women who are experiencing a high number of depressive symptoms are more likely to report poor health (Andersson et al. 2004; Orr et al., 2007). Pregnant women experiencing minor depressive episode are also twice as likely to report *good* general health in comparison to *excellent*. Although it may seem reasonable that any decrease in perceived general health would associated with an increased risk for depressive symptoms, pregnant women who rate their general health as *fair* do not have an increased risk of minor depressive episode.

Emotional support is another risk factor associated with the development of minor depressive episode. Compared to pregnant women who perceive themselves as *always* receiving enough emotional support, pregnant women with minor depressive episode are 3.5 times more likely to perceive themselves as only *sometimes* receiving enough emotional support. Inadequate emotional support has been recognized in prior studies as a risk factor for antenatal depression (Bowen & Muhajarine, 2006a; Elsenbruch et al., 2007; Records & Rice, 2007). On the other hand, pregnant women who report *rarely* or *never* receiving adequate emotional support do not have a higher risk for minor depressive episode.

Compared to pregnant women who rate their general health as *excellent*, pregnant women with major depressive episode are more likely to rate their heath as *poor*, *fair*, or *good*. Similar to the risk factors related to general health status for minor depressive episode, this finding coincides with prior research regarding the relationship between antenatal depression and poor health (Andersson et al. 2004; Orr et al., 2007). Unlike the somewhat inconsistent findings with minor depressive episode, the risk for major depressive episode increases as the health rating decreases, progressing from 9 times more likely to develop major depressive episode (*good*), to 13 times more likely (*fair*), to 42 times more likely (*poor*).

Pregnant women who perceive themselves as *rarely*, *sometimes*, or *usually* receiving adequate emotional support are all at an increased risk for major depressive episode when compared to those who perceive themselves as

always having enough social support (8.9 times, 15 times, and 3 times more likely, respectively). This finding is once again similar to the finding for minor depressive episode and supports prior research on the relationship between emotional support and depression during pregnancy (Bowen & Muhajarine, 2006a; Elsenbruch et al., 2007; Records & Rice, 2007). However, it is interesting to note that pregnant women who report *never* receiving appropriate emotional support do not have an increased risk of major depressive episode.

The pregnant women experiencing major depressive episode are 6.5 times more likely to report that they had been diagnosed in the past with a depressive disorder (including depression, major depression, dysthymia, or minor depression). This finding is consistent with prior research demonstrating a high relapse rate during pregnancy for women who were previously diagnosed with a depressive disorder (Cohen et al, 2006; Dietz et al., 2007). However, recall that prior diagnosis of depression is not a risk factor for minor depression.

Two of the three significant findings for protective measures are related to race or ethnic background. Hispanic pregnant women have a 75.8% reduction in risk for developing minor depressive episode when compared to White pregnant women. Similarly, multiracial pregnant women have a 98% reduction in risk for developing major depressive episode when compared to white pregnant women. These findings are at odds with prior research findings that minority status women bear an increased risk for developing antenatal depression (Bowen & Muhajarine, 2006b). It is difficult to speculate on why Hispanic and multiracial pregnant women are less at risk for developing minor and major depressive

episode, respectively, than white pregnant women. Additional studies identifying culturally specific values, beliefs, practices, and experiences for ethnically diverse groups of pregnant women may help to explain why some are better protected against antenatal depressive symptoms.

The third finding on protective factors involves perception of emotional support. Pregnant women who perceive themselves as never receiving the emotional support they need have a 98% reduction in risk for developing minor depressive episode when compared to pregnant women who indicate they always receive the emotional support they need. This is contrary to prior research suggesting lack of emotional support is associated with the development of antenatal depression (Bowen & Muhajarine, 2006a; Elsenbruch et al., 2007; Records & Rice, 2007). One argument for why pregnant women who feel so unsupported may be less likely to become depressed is that they are forced into self-reliance and develop hardiness. It is also possible that women who are self-reliant and hardy create social networks that are different from those of women who are less self-reliant and hardy. The BRFSS measures perception emotional support, which is a subjective measure that may vary a great deal based on women's personality and expectations. Although the current study does not evaluate personality characteristics, future research into the relationship between personality and perceived emotional support may clarify our understanding of this unexpected and counterintuitive finding.

The demographic and behavioral risk found related to depressive episodes during pregnancy were race, perceived general heath status, perceived

emotional support, and prior depressive disorder diagnosis. With some exception, identified risk factors generally coincide with those identified in studies of risk factors for antenatal depression. However, the following demographic and behavioral risk factors were not related to current minor or major depressive episodes during pregnancy: maternal age, income level, employment status, education level, and marital status. These findings are not consistent with prior research findings on the relationship between antenatal depressive symptoms and these specific demographic and behavioral risk factors. The differences between prior research findings and those of the current study may be attributable to sampling differences. The findings indicate that pregnant women are not at increased risk of antenatal depressive episodes because of age, income, employment, education, and marital status.

The current study is limited in a few important areas. The predominant limitation has to do with being restricted to the data available through the PHQ-8 and the BRFSS. Although the PHQ-8 is an effective tool for identifying the symptoms of depressive episode, without a clinical interview or a more extensive list of questions it is not possible to separate, for example, cases of major depression from cases of bipolar disorder.

As discussed, some of the symptoms of depression may be attributable to the physical changes of pregnancy. When using the PHQ-8 it is possible that the pregnant woman's answers to questions based on the physically-oriented symptoms of depression will add up to a diagnosis of minor depressive episode ($5 \leq$ PHQ-8 ≤ 9) in the absence of one of the required emotional symptoms of

depression (i.e., sadness and loss of pleasure) (APA, 2000). In such cases, the physical discomforts of pregnancy that are captured, but absent to emotional tome associated with depressive episode. This limitation would suggest that the 25.5% prevalence of minor depressive episode found in the current study might be an overestimate. The limitation is less likely to apply to the 9.1% of cases where pregnant women met the PHQ-8 criteria for major depressive episode (PHQ-8 ≥ 10). The higher score required for a diagnosis of major depressive episode decreases the chances of a woman's score being based only on physical symptoms rather than on the two hallmark emotional symptoms of depression. Repeating this study, but classifying cases based on strict adherence to DSM-IV diagnostic criteria rather than a cut-score model would clarify this issue.

As mentioned above, using the PHQ-8 to classify depression cases does not provide a basis for identifying instances where depression is a component of a more complex mental disorder (e.g., bipolar disorder) or when it is occurring comborbidly with another mental disorder (e.g., schizophrenia, anxiety disorder). The PHQ-8 also does not distinguish between a depressive episode and a transient state of bereavement (LoBello & Zachar, 2009). Finally, the BRFSS does not ask if respondents are currently undergoing any form of treatment for depression (LoBello & Zachar, 2009). If treatment is ongoing at the time of the survey, women who may be currently diagnosed with a depressive disorder may present as symptom-free as the result of management through medication or other therapy.

Use of the BRFSS for the current study made impossible the study of some factors that may be of interest when researching antenatal depressive episodes. Prior studies indicate differences in prevalence of depression based on trimester of pregnancy, with the third trimester typically having a higher prevalence of depressive symptoms (Alami et al., 2006; Bennett et al., 2004; Records & Rice, 2007). The BRFSS does not question about the pregnancy trimester. Similarly, the BRFSS does not provide information on number of pregnancies, also known as parity. Number of pregnancies (first, second, and so on) has also been linked in one study to the development of depressive symptoms (Alami et al., 2006). The prevalence of depressive symptoms was lower first pregnancies compared to subsequent pregnancies. It is reasonable to assume the women in the current study represent a range of pregnancy trimesters in addition to varied parity, thus causing the results to average across these dimensions. However, a future study meant to investigate the possible effects of trimester and parity on depression would have to question for this information.

The research literature contains additional risk factors for antenatal depression that were not evaluated in the current study. One of the risk factors that may be related to the development of depression during pregnancy is the quality of the woman's relationship with her partner (Alami et al., 2006). Pregnant women who are experiencing difficulties in their partner relationships are believed to be at a higher risk for depression. Pre-pregnancy body mass index and body image are other factors of interest (Carter, Baker, & Brownell, 2000;

LaCoursiere, Basksh, Bloebaum, & Varner, 2006). Research results are mixed regarding whether obesity and body image problems are factors in the development of antenatal depression. Another area for future research is the relationship between substance abuse and depression during pregnancy (Bowen & Muhajarine, 2006b; Zhu & Valbo, 2002). Pregnant women may be at risk for depression based on stress related to either stopping their substance abuse during pregnancy or continuing their substance use throughout the pregnancy. Comparison of the prevalence estimates in the current study and estimates based on medical records provides support for the possibility that antenatal depressive episodes are often undiagnosed in medical settings. Future research could experimentally explore the potential role of biases in depression diagnoses based on pregnancy status. Physicians could be asked to watch videos of pregnant or non-pregnant women describing symptoms of depression and render diagnoses based on their reports. Differences in frequency of diagnoses of depressive disorders would be expected if pregnancy status influences this process.

Additional research is also recommended to identify any differences in the presentation of physical symptoms between pregnant women with depression and pregnant women without depression. The current study found a linear relationship between self-reports of general health status and an increased risk for major depressive episode. It has been suggested that, despite the overlap of physical symptoms of depression and pregnancy, pregnant women with depression are likely to report more intense physical symptoms in comparison to

pregnant women who are not depressed (Kelly et al., 2001). Future research into the relationship between health status during pregnancy and depressive episodes should focus on differentiating between health reports based on purely physical status and reports influenced by the symptoms of depression. The same research would help to clarify the prevalence of minor depressive episode separate from the physical symptoms of pregnancy.

In summary, the current study demonstrates that pregnant women are more at risk for developing either a minor or major depressive episode than women who are not pregnant. An estimated one-third of pregnant women in the general population meet the criteria for either minor or major depressive episode at a given point in time. Race, general health status, perception of emotional support, and prior depressive disorder diagnosis are all factors of concern when estimating a pregnant woman's risk for minor or major depressive episodes. Race appears to play a protective role against minor and major depressive episodes for Hispanic and Multiracial pregnant women, respectively. All other women are approximately equally at risk regardless of race. Perceived general health status is also related to her risk for antenatal minor or major depressive episodes. The relationship is linear and particularly strong for major depressive episode. Emotional support as perceived by the pregnant woman is also associated with her risk for depressive episodes. However, the relationship between emotional support and risk is complicated, with perceived lack of emotional support protecting against minor depressive episode, but increasing the risk for major depressive episode. Prior depressive disorder diagnosis is

linked to an increased risk for major depressive episode during pregnancy, some instances of antenatal major depressive episode are relapses of a pre-existing illness.

Considering the links between antenatal depression and related detrimental effects on the mother, on the developing fetus, on the birthing process, and on the child's development after birth, the potential burden of depressive episodes during pregnancy should not be dismissed. Misconceptions regarding pregnancy and depression may prevent the recognition of depressive symptoms and diagnoses of antenatal depression. Health care providers who interact with pregnant women are advised to routinely employ screening measures to identify women who may meet the criteria for depressive episode. These screening measures should incorporate questions regarding the woman's perception of her health, the amount of emotional support she's receiving, and her mental health history. Increased awareness of antenatal depression will hopefully encourage more help-seeking and lead to better pregnancy outcomes.

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Table 1

Demographics of 2006 BRFSS Anxiety and Depression Survey Module Respondents: Weighted Percents, Women Ages 18-44

Variable	2006 BRFSS Depression Module Respondents (Women Ages 18-44) (*n* = 34,044)
Age	
18 - 26	28.4%
27- 35	35.3%
36 - 44	36.3%
Mean Age	34 (*SD* = 6.91)
Race	
White	61.2%
Black	10.9%
Hispanic	21.4%
Other Race (Non-Hispanic)	4.7%
Multiracial (Non-Hispanic)	1.8%
Employment Status	
Employed for Wages	57.6%
Self-employed	6.4%
Out of Work for More than 1 Year	2.2%
Out of Work for Less than 1 Year	4.0%
A Homemaker	18.2%
A Student	8.6%
Retired	0.1%
Unable to Work	2.8%
Refused	0.1%

Table 1(Cont)

Demographics of 2006 BRFSS Anxiety and Depression Survey Module Respondents: Weighted Percents, Women Ages 18-44

Variable	2006 BRFSS Depression Module Respondents (Women Ages 18-44) (*n* = 34,044)
Income Level (Annual)	
$75,000 or more	25.5%
Less than $75,000	17.6%
Less than $50,000	15.6%
Less than $35,000	11.9%
Less than $35,000	9.9%
Less than $25,000	7.6%
Less than $15,000	5.1%
Less than $10,000	6.9%
Education Status	
Did Not Graduate High School	10.6%
Graduated High School	25.8%
Attended College or Technical School	29.6%
Graduated from College or Technical School	33.9%
Don't Know/Not Sure/ Missing	0.1%

Table 1(Cont)

Demographics of 2006 BRFSS Anxiety and Depression Survey Module Respondents: Weighted Percents, Women Ages 18-44

Variable	2006 BRFSS Depression Module Respondents (Women Ages 18-44) (n = 34,044)
Marital Status	
Married	57.6%
Divorced	7.3%
Widowed	0.7%
Separated	3.1%
Never Married	24.5%
Member of an Unmarried Couple	6.7%
Refused	0.1%

Table 2

Weighted Prevalence Estimates and 95% Confidence Intervals for Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9), Major Depressive Episode (PHQ-8 ≥ 10), and No Depressive Episode (PHQ-8 ≤ 4) in Pregnant Women Respondents vs. Women Respondents Who Are Not Pregnant

Variable	Pregnant (n = 1,422)	Not Pregnant (n = 32,622)	x^2, p
Minor Depressive Episode	25.5% (25.3% - 25.6%)	17.4% (16.9% - 17.8%)	x^2 = 67,717 df = 2 p < .0001
Major Depressive Episode	9.11% (9.06% - 9.16%)	10.74% (10.4% - 11.1%)	
No Depressive Episode	65.4% (65.3% - 65.6%)	71.9% (71.2% - 72.6%)	

Table 3

Weighted Demographic and Risk Factor Comparison of Pregnant and Not Pregnant Woman Respondents.

Variables	Pregnant (n = 1,422)	Not Pregnant (n = 32,622)	x^2, p
Age	29.6 (SD = 5.72)	34.3 (SD = 6.93)[a]	-
Race			
White	57.9%	61.5%	x^2 = 15,473
Black	10.6%	10.9%	df = 4
Hispanic	25.0%	21.1%	p < .0001
Other Race (Non-Hispanic)	5.1%	4.7%	
Multiracial (Non-Hispanic	1.5%	1.8%	
Employment Status			
Employed for Wages	53.6%	57.9%	x^2 = 116,077
Self-employed	5.9%	6.5%	df = 8
Out of Work for More than 1 Year	2.1%	2.2%	p < .0001
Out of Work for Less than 1 Year	5.7%	3.9%	
A Homemaker	25.8%	17.8%	
A Student	3.9%	8.9%	
Retired	0.02%	0.13%	
Unable to Work	3.1%	2.8%	
Refused	0.02%	0.09%	

Table 3 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant and Not Pregnant Woman Respondents

Variables	Pregnant (n = 1,422)	Not Pregnant (n = 32,622)	x^2, p
Income Level (Annual)			
$75,000 or more	6.0%	6.9%	x^2 = 49,126
Less than $75,000	6.9%	5.0%	df = 7
Less than $50,000	9.7%	7.5%	p < .0001
Less than $35,000	13.0%	9.7%	
Less than $25,000	10.5%	12.0%	
Less than $20,000	15.2%	15.6%	
Less than $15,000	16.5%	17.7%	
Less than $10,000	22.3%	25.7%	
Education Status			
Did Not Graduate High School	13.1%	10.4%	x^2 = 47,309
Graduated High School	28.2%	25.6%	df = 4
Attended College or Technical School	22.4%	30.0%	p < .0001
Graduated from College or Technical School	36.4%	33.9%	
Don't Know/Not Sure/Missing	0.00%	0.05%	

Table 3 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant and Not Pregnant Woman Respondents.

Variables	Pregnant (n = 1,422)	Not Pregnant (n = 32,622)	x^2, p
Marital Status			
Married	69.0%	57.1%	x^2 = 181,503
Divorced	2.8%	7.6%	df = 6
Widowed	0.04%	0.7%	p < .0001
Separated	1.6%	3.2%	
Never Married	16.3%	24.9%	
A Member of an Unmarried Couple	10.2%	6.5%	
Refused	0.02%	0.14%	
General Health Status			
Excellent	31.4%	24.2%	x^2 = 46,278
Very Good	31.5%	36.3%	df = 4
Good	28.7%	29.2%	p < .0001
Fair	7.2%	8.4%	
Poor	1.3%	1.9%	
Availability of Emotional Support			
Always	54.7%	46.7%	x^2 = 43,518
Usually	28.7%	33.4%	df = 4
Sometimes	10.2%	13.3%	p < .0001
Rarely	2.9%	3.7%	
Never	3.5%	2.9%	

Table 3 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant and Not Pregnant Woman Respondents.

Variables	Pregnant (n = 1,422)	Not Pregnant (n = 32,622)	x^2, p
Prior Depression Disorder Diagnosis			
Yes	11.5%	20.8%	x^2 = 72,499
No	88.6%	79.2%	df = 1
			p < .0001
Prior Anxiety Disorder Diagnosis			
Yes	7.3%	15.6%	x^2 = 71,558
No	92.7%	84.5%	df = 1
			p < .0001

[a] t-test: t (2,004) = -36.26, p < .0001

Table 4

Adjusted Odds Ratio Estimates for Pregnancy Status, Comparing Pregnant Women Respondents to Women Respondents Who Are Not Pregnant (Weighted)

Variables	Adjusted Odds Ratios	95% Confidence Interval
Age	**0.90**	**0.88 - 0.91**
Race		
White	-	-
Black	0.78	0.37 - 1.64
Hispanic	1.04	0.65 - 1.67
Other Race (Non-Hispanic)	1.04	0.72 - 1.51
Multiracial (Non-Hispanic)	1.08	0.80 - 1.46
Income Level (Annual)		
$75,000 or more	-	-
Less than $75,000	0.98	0.73 - 1.33
Less than $50,000	0.98	0.65 - 1.48
Less than $35,000	0.84	0.59 - 1.21
Less than $25,000	1.41	0.96 - 2.08
Less than $20,000	1.51	0.97 - 2.36
Less than $15,000	1.64	0.94 - 2.85
Less than $10,000	0.99	0.58 - 1.72
Marital Status		
Married	-	-
Not Married	**0.30**	**0.22 - 0.41**

Table 4 (Cont)

Adjusted Odds Ratio Estimates for Pregnancy Status, Comparing Pregnant Women Respondents to Women Respondents Who Are Not Pregnant (Weighted)

Variables	Adjusted Odds Ratios	95% Confidence Interval
General Health Status		
Excellent	-	-
Poor	0.82	0.37 - 1.85
Fair	0.65	0.37 - 1.13
Good	0.75	0.55 - 1.02
Very Good	**0.69**	**0.51 - 0.92**
Availability of Emotional Support		
Always	-	-
Never	1.33	0.63 - 2.82
Rarely	0.76	0.38 - 1.51
Sometimes	**0.67**	**0.47 - 0.98**
Usually	0.76	0.58 - 1.01
Prior Depressive Disorder Diagnosis		
No	-	-
Yes	**0.63**	**0.48 - 0.83**
Prior Anxiety Disorder Diagnosis		
No	-	-
Yes	**0.52**	**0.39 - 0.71**
Depression		
No Depression	-	-
Minor Depressive Episode	**1.96**	**1.5 - 2.6**
Major Depressive Episode	**1.75**	**1.2 - 2.5**

Table 5

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Minor Depressive Episode (n = 388)	No Depressive Episode (n = 876)	x^2, p
Age			
18-26	48.6%	43.8%	x^2 = 2,618
27-35	41.4%	45.2%	df = 2
36-44	10.1%	11.0%	p < .0001
Race			
White	66.0%	55.2%	x^2 = 33,996
Black	13.1%	9.2%	df = 4
Hispanic	15.0%	28.9%	p < .0001
Other Race (Non-Hispanic)	5.0%	4.8%	
Multiracial (Non-Hispanic	1.0%	1.9%	
Employment Status			
Employed for Wages	53.8%	55.6%	x^2 = 16,483
Self-employed	6.2%	5.8%	df = 8
Out of Work for More than 1 Year	0.3%	2.3%	p < .0001
Out of Work for Less than 1 Year	5.7%	5.4%	
A Homemaker	27.5%	24.9%	
A Student	2.5%	4.2%	
Retired	0.00%	0.03%	
Unable to Work	4.0%	1.7%	
Refused	0.00%	0.02%	

Table 5 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Minor Depressive Episode (n = 388)	No Depressive Episode (n = 876)	x^2, p
Income Level (Annual)			
$75,000 or more	17.0%	26.2%	x^2 = 30,323
Less than $75,000	17.0%	16.9%	df = 7
Less than $50,000	16.2%	15.6%	p < .0001
Less than $35,000	14.3%	8.6%	
Less than $25,000	15.0%	10.8%	
Less than $20,000	6.3%	10.2%	
Less than $15,000	7.5%	6.7%	
Less than $10,000	6.8%	5.1%	
Education Status			
Did Not Graduate High School	12.8%	11.7%	x^2 = 18,096
Graduated High School	35.4%	25.3%	df = 3
Attended College or Technical School	21.1%	22.7%	p < .0001
Graduated from College or Technical School	30.7%	40.4%	

Table 5 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Minor Depressive Episode (n = 388)	No Depressive Episode (n = 876)	x^2, p
Marital Status			
Married	65.5%	73.6%	x^2 = 11,370
Divorced	3.1%	2.5%	df = 6
Widowed	0.00%	0.04%	p < .0001
Separated	0.7%	1.0%	
Never Married	18.7%	14.9%	
A Member of an Unmarried Couple	12.0%	7.9%	
Refused	0.00%	0.03%	
General Health Status			
Excellent	23.2%	37.9%	x^2 = 48,243
Very Good	33.6%	32.7%	df = 4
Good	33.5%	23.7%	p < .0001
Fair	7.6%	5.6%	
Poor	2.2%	0.12%	
Availability of Emotional Support			
Always	50.1%	61.5%	x^2 = 61,364
Usually	31.8%	27.2%	df = 4
Sometimes	13.9%	5.0%	p < .0001
Rarely	4.1%	1.7%	
Never	0.13%	4.6%	

Table 5 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4.

Variables	Minor Depressive Episode (n = 388)	No Depressive Episode (n = 876)	x^2, p
Prior Depression Disorder Diagnosis			
Yes	12.4%	5.2%	x^2 = 20,700
No	87.6%	94.8%	df = 1
			p < .0001
Prior Anxiety Disorder Diagnosis			
Yes	8.9%	3.3%	x^2 = 18,083
No	91.1%	96.7%	df = 1
			p < .0001

Table 6

Adjusted Odds Ratio Estimates for Pregnant Women with Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9) Compared to Pregnant Women without Depressive Episode (PHQ-8 ≤ 4) (Weighted)

Variables	Adjusted Odds Ratios	95% Confidence Interval
Age	1.003	0.96 - 1.05
Race		
White	-	-
Black	0.72	0.33 - 1.6
Hispanic	**0.24**	**0.11 - 0.53**
Other Race (Non-Hispanic)	0.68	0.26 - 1.7
Multiracial (Non-Hispanic)	0.37	0.9 - 1.6
Income Level (Annual)		
$75,000 or more	-	-
Less than $75,000	1.5	0.73 - 3.0
Less than $50,000	1.6	0.78 - 3.3
Less than $35,000	2.0	0.88 - 4.6
Less than $25,000	2.5	0.84 - 7.6
Less than $20,000	0.92	0.35 - 2.5
Less than $15,000	1.8	0.59 - 5.3
Less than $10,000	1.2	0.33 - 4.4
Marital Status		
Married	-	-
Not Married	1.6	0.83 - 3.2

Table 6 (Cont)

Adjusted Odds Ratio Estimates for Pregnant Women with Minor Depressive Episode (5 ≤ PHQ-8 ≤ 9) Compared to Pregnant Women without Depressive Episode (PHQ-8 ≤ 4) (Weighted).

Variables	Adjusted Odds Ratios	95% Confidence Interval
General Health Status		
Excellent	-	-
Poor	**95.1**	**14.8 - 612.8**
Fair	1.7	0.46 - 6.5
Good	**2.3**	**1.3 - 4.2**
Very Good	1.5	0.82 - 2.6
Emotional Support		
Always	-	-
Never	**0.020**	**0.003 - 0.14**
Rarely	3.1	0.79 - 12.3
Sometimes	3.5	1.5 - 8.1
Usually	1.3	0.8 - 2.1
Prior Depressive Disorder Diagnosis		
No	-	-
Yes	1.6	0.86 - 2.9
Prior Anxiety Disorder Diagnosis		
No	-	-
Yes	1.9	0.96 - 3.8

Table 7

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Major Depressive Episode (PHQ-8 ≥ 10) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Major Depressive Episode (n = 158)	No Depressive Episode (n = 876)	x^2, p
Age			
18-26	57.0%	43.8%	x^2 = 9,187
27-35	36.3%	45.2%	df = 2
36-44	6.7%	11.0%	p < .0001
Race			
White	54.4%	55.2%	x^2 = 7,112
Black	13.6%	9.2%	df = 4
Hispanic	24.8%	28.9%	p < .0001
Other Race (Non-Hispanic)	7.2%	4.8%	
Multiracial (Non-Hispanic	0.04%	1.9%	
Employment Status			
Employed for Wages	38.0%	55.6%	x^2 = 45,501
Self-employed	5.6%	5.8%	df = 8
Out of Work for More than 1 Year	5.5%	2.3%	p < .0001
Out of Work for Less than 1 Year	7.7%	5.4%	
A Homemaker	27.5%	24.9%	
A Student	5.8%	4.2%	
Retired	0.00%	0.03%	
Unable to Work	10.0%	1.7%	
Refused	0.00%	0.02%	

Table 7 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Major Depressive Episode (PHQ-8 ≥ 10) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Major Depressive Episode (n = 158)	No Depressive Episode (n = 876)	x^2, p
Income Level (Annual)			
$75,000 or more	9.2%	26.2%	x^2 = 48,326
Less than $75,000	12.4%	16.9%	df = 7
Less than $50,000	9.2%	15.6%	p < .0001
Less than $35,000	14.0%	8.6%	
Less than $25,000	23.6%	10.8%	
Less than $20,000	15.5%	10.2%	
Less than $15,000	6.4%	6.7%	
Less than $10,000	9.7%	5.1%	
Education Status			
Did Not Graduate High School	24.3%	11.7%	x^2 = 24,719
Graduated High School	28.4%	25.3%	df = 3
Attended College or Technical School	23.7%	22.7%	p < .0001
Graduated from College or Technical School	23.6%	40.4%	

Table 7 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Major Depressive Episode (PHQ-8 ≥ 10) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Major Depressive Episode (n = 158)	No Depressive Episode (n = 876)	x^2, p
Marital Status			
Married	45.1%	73.6%	x^2 = 79,187
Divorced	4.5%	2.5%	df = 6
Widowed	0.12%	0.04%	p < .0001
Separated	8.3%	1.0%	
Never Married	20.1%	14.9%	
A Member of an Unmarried Couple	22.0%	7.9%	
Refused	0.00%	0.03%	
General Health Status			
Excellent	7.1%	37.9%	x^2 = 166,754
Very Good	17.1%	32.7%	df = 4
Good	51.3%	23.7%	p < .0001
Fair	17.6%	5.6%	
Poor	6.9%	0.12%	
Availability of Emotional Support			
Always	21.2%	61.5%	x^2 = 185,268
Usually	30.5%	27.2%	df = 4
Sometimes	35.5%	5.0%	p < .0001
Rarely	7.91%	1.71%	
Never	5.0%	4.6%	

Table 7 (Cont)

Weighted Demographic and Risk Factor Comparison of Pregnant Women with Major Depressive Episode (PHQ-8 ≥ 10) and Pregnant Women without Depressive Episode (PHQ-8 ≤ 4).

Variables	Major Depressive Episode (n = 158)	No Depressive Episode (n = 876)	x^2, p
Prior Depression Disorder Diagnosis			
Yes	47.0%	5.2%	x^2 = 218,047
No	53.0%	94.8%	df = 1
			p < .0001
Prior Anxiety Disorder Diagnosis			
Yes	26.8%	3.3%	x^2 = 110,118
No	73.2%	96.7%	df = 1
			p < .0001

Table 8

Adjusted Odds Ratio Estimates for Pregnant Women with Major Depressive Episode (PHQ-8 ≥ 10) Compared to Pregnant Women without Depressive Episode (PHQ-8 ≤ 4) (Weighted)

Variables	Adjusted Odds Ratios	95% Confidence Interval
Age	0.98	0.93 - 1.03
Race		
White	-	-
Black	0.62	0.18 - 2.1
Hispanic	0.81	0.26 - 2.5
Other Race (Non-Hispanic)	1.3	0.30 - 5.8
Multiracial (Non-Hispanic)	**0.02**	**0.001 - 0.36**
Income Level (Annual)		
$75,000 or more	-	-
Less than $75,000	1.8	0.55 - 5.8
Less than $50,000	1.2	0.36 - 4.2
Less than $35,000	1.2	0.31 - 4.9
Less than $25,000	1.6	0.43 - 6.0
Less than $20,000	1.5	0.31 - 6.9
Less than $15,000	0.971	0.17 - 5.5
Less than $10,000	1.326	0.24 - 7.4
Marital Status		
Married	-	-
Not Married	1.4	0.62 - 3.2

Table 8 (Cont)

Adjusted Odds Ratio Estimates for Pregnant Women with Major Depressive Episode (PHQ-8 ≥ 10) Compared to Pregnant Women without Depressive Episode (PHQ-8 ≤ 4) (Weighted)

Variables	Adjusted Odds Ratios	95% Confidence Interval
General Health Status		
Excellent	-	-
Poor	**41.6**	**9.03 - 191.4**
Fair	**13.3**	**3.02 - 58.7**
Good	**8.9**	**3.05 - 26.2**
Very Good	2.3	0.77 - 6.6
Emotional Support		
Always	-	-
Never	1.5	0.34 - 7.1
Rarely	**8.9**	**2.6 - 30.9**
Sometimes	**14.9**	**5.3 - 42.0**
Usually	**2.9**	**1.3 - 6.9**
Prior Depressive Disorder Diagnosis		
No	-	-
Yes	**6.4**	**2.9 - 14.3**
Prior Anxiety Disorder Diagnosis		
No	-	-
Yes	1.97	0.89 - 4.3