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UNIVERSITY OF SAN DIEGO
Hahn School of Nursing and Health Science
DOCTOR OF PHILOSOPHY IN NURSING

PERINATAL DEPRESSION AND PRETERM BIRTH

by

Elizabeth C. Light

A dissertation presented to the
FACULTY OF THE HAHN SCHOOL OF NURSING AND HEALTH SCIENCE
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requirements for the degree
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Dissertation Committee

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Abstract

Purpose/Aims: Despite the notable 15 year low in overall preterm birth (PTB), a 10% improvement since the 2006 peak with declines for each of the largest race and Hispanic origin groups, the United States has the highest rate of PTB of any industrialized country with estimates of 11.5% or approximately 500,000 infants annually. The Institute of Medicine (2006) recommends researchers focus on PTB causes including reasons for health disparities. The purpose of this study was to identify factors associated with PTB among a sample of racially and ethnically diverse women with depressive symptomatology (Edinburgh Postnatal Depression Scale [EPDS], score of ≥ 10).

Rationale/Conceptual Basis/Background. The conceptual framework, derived from the empirical literature, identifies variables shown to increase risk for PTB: age, race/ethnicity, primary language, marital status, partner presence, education, income, depression, alcohol abuse, drug abuse, tobacco use, intimate partner violence, gravida, and antenatal medical complications (AMC).

Methods: Descriptive, correlational design using secondary data analysis of perinatal and birth data obtained from a sample of mothers who participated in the Perinatal Maternal Health Study, a randomized clinical trial conducted by Connelly et al. (2010; 2013).

Descriptive and inferential statistics were used.

Results: Purposive sample ($N = 302$) was diverse although predominately Latina (80.5%), White (8.9%), Black (5.6%), Asian/Pacific Islander (3.6%), other (1.3%); EPDS mean 13.9 ± 3.67 ; 12.5% PTB. Statistically significant lower drug abuse scores $M=1.4 \pm .89$ and more AMC $M=2.72 \pm 1.75$ for PBT vs term mothers $M=3.56 \pm 2.03$, $t(35) = 2.32$, $p < .05$; $M=1.53 \pm 1.72$, $t(285) = -3.88$, $p < .01$ respectively. Multivariate

regression indicates the overall model (gravida, AMC, and unusual problems at birth) accounts for 16% of the variance in weeks gestation, $R^2 = .156$, $R^2_{adj} = .147$, $F(3, 275) = 16.912$, $p = .000$. Logistic regression indicates the overall model was successful in classifying 87% and significantly predicted the likelihood of PTB ($\chi^2(3) = 31.517$, $p = .000$).

Implications: The perinatal period provides unique opportunities to simultaneously assess maternal psychosocial and physical health care needs. Knowing health factor relationships among ethnically diverse women allows for informed advocacy for health policy targeting screening guidelines and management.

Dedication

This dissertation is dedicated to my family and for all of the premature infants and their families whom I cared for as a NICU nurse.

To my husband and best friend, Dion, your encouragement, support, and love is what made my educational journey possible. Thank you for the laughs, many hugs, and your unconditional love.

To my beautiful daughters, Zoë and Jillian, for always putting everything into perspective and understanding when mommy had to work hard to pursue an educational goal. I hope I have inspired both of you to always reach for the sky.

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To my grandmother Elvira “Grammie”, I know you would be so proud of me and I still feel your love all around me. You can tell everyone in heaven that your granddaughter has her PhD!

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Chapter 1

Problem and Background

Historically within the United States preterm birth rates have fluctuated, ranging from 12.5% in 2004 to 12.8% in 2006 to the most recent rate of 11.4% for 2013 (Martin et al. 2006, Centers for Disease Control, 2006-2010, Martin et al., 2015). Premature birth is defined as a birth occurring before 37 completed weeks' gestation (Behrman & Butler, 2007; National Institute of Child Health & Human Development, 2012) and is the leading cause of neonatal mortality (March of Dimes, 2012). The Institute of Medicine (IOM) (Behrman & Butler, 2007) reports the rate of premature births in the United States cost society an estimated \$26 billion dollars or roughly \$52,000 per infant born preterm.

Fowler et al. (2014) examined trends related to complicated newborn hospital stays and found in 2009 the top diagnosis for admission among a national sample (n=859,853) was preterm birth/low birth weight. The average length of stay was 14.2 days for preterm birth/low birth weight infants with 33% of the total costs associated with a preterm birth/low birth weight diagnosis (Fowler et al., 2014). Approximately 75% of neonatal intensive care unit (NICU) admissions are related to prematurity with daily costs

in the United States exceeding \$3,500 per infant (Muraskas & Parsi, 2008). For infants with a prolonged length of stay it is not uncommon for the costs to reach \$1 million (Muraskas & Parsi, 2008). With preterm births contributing to the rising numbers of newborn complicated hospital admissions and increased lengths of stay, improvements in the prenatal and maternal health are necessary (Fowler et al. 2014). In addition, children born prematurely often require long-term services and support for a wide range of long-term physical and developmental impairments (IOM, 2006).

Prematurity research remains not only a national health priority, but also a global health research initiative (March of Dimes, 2012). The Institute of Medicine (2006) recommends researchers focus on the causes of preterm birth including reasons for disparities among different racial, ethnic, and socioeconomic groups. Premature birth rates in the United States are astounding when compared to other industrialized nations (March of Dimes, 2012). For example, the United States is among the top 15 countries that contributes to the globally high preterm birth rate (March of Dimes, PMNCH, Save the Children, & WHO, 2012). Despite the resources, technology, and economic infrastructure within the United States, the rates of prematurity are comparable to the third world countries of Nigeria and Thailand (March of Dimes et al., 2012). Countries such as Canada, Spain, Italy, and Germany, demonstrate lower rates of preterm birth as compared to the United States (March of Dimes et al., 2012). Even though the premature birth rate has declined steadily over the past five years in the United States, there remains ample opportunity for improvement.

With the reduction of preterm birth rates on the minds of many organizations and government agencies, goals have been established to address this public health issue.

The March of Dimes 2020 goal is to reduce the incidence of preterm births to no more than 9.6% of live births (March of Dimes, 2014b). The Healthy People 2020 goal is to reduce the incidence of preterm births to no more than 11.4% of live births (U.S. Department of Health and Human Services, 2010). Current figures for California's preterm birth rate for 2013 are 8.8% (March of Dimes, 2014a). When considering race and ethnicity, current data reflects ethnically diverse women in California have higher percentages of premature births (March of Dimes, 2014a). Black women have the highest with 13.7%, Hispanic women 9.8%, Native American women 9.7%, and Asian women 9% compared to White women at 8.3% (March of Dimes, 2014a).

Maternal-child health status has been recognized and acknowledged worldwide as the indicator of the health of a nation (Bloom, 2011). If women are healthy it is highly likely their children will be healthy and so forth for future generations (Bloom, 2011). The well-documented maternal-child health outcomes of vulnerable groups in the United States demonstrate persistent disparities (Bloom, 2011); reviewing preterm birth statistics at a national and state level, racial disparities prevail (Culhane & Goldenberg, 2011). While interventions to address these disparities have been created and are currently under review and investigation there continues to be opportunity for further improvements. For example, Culhane and Goldenberg (2011) have explored promising areas of research to identify potential factors that may contribute to an increased risk of preterm birth among women who are ethnically and racially diverse. By recognizing the complexity of certain factors, further research is important to understand the causes of preterm birth among ethnically and racially diverse women.

Latina Perinatal Population

Latinos are the fastest growing ethnic minority in the United States with high fertility rates and elevated preterm birth rates (Ruiz et al., 2012). According to the United States Census Bureau the Latino population grew 43% between the years of 2000 and 2010. In 2010, 41% of Latinos lived in the West and accounted for 29% of the population. Latinos living in California accounted for 14.0 million or 28% of the national Latino population (Ennis, Rios-Vargas, & Albert, 2011). The United States Census Bureau projects between 2010 and 2060 the proportion of Latino women of childbearing age is expected to increase 74% (March of Dimes [MOD] Perinatal Data Center, 2014). High fertility rates (74.4 births per 1,000 ages 15-44) among Latinos are a contributing factor to the increase in the U.S. Latino population (MOD Perinatal Data Center, 2014).

The most current national statistics reported in 2013 found Latinas accounted for 11.3% of preterm births with 3.2% considered early preterm or before 34 weeks' gestation and 8.1% considered late preterm between 34-36 weeks' gestation (Martin, Hamilton, Osterman, Curtin, & Mathews, 2015). Infant birth weight among Latinas was found to be 1.2% for very low birth weight and 7.1% for low birth weight (Martin et al., 2015). Cesarean section rates for Latinas in 2013 were 32.2% (Martin et al., 2015).

At a regional level, California had a total of 49.6% Latino live births between 2010 and 2012, with preterm birth rate at 9.9% (MOD Perinatal Data Center, 2014). Latest figures for 2013 demonstrate roughly the same percentage among Latinos at 9.8% for preterm birth. The premature birth rate for Latina women in California is higher compared to White women (March of Dimes, 2014a). Factors such as acculturation (Ruiz et al., 2012), issues related to access to health care, lack of health insurance, and

community resources (Baker-Ericzen et al., 2012) impact Latinas' ability to seek and benefit from quality health care.

Latinas are not immune from maternal behaviors related to poor birth outcomes that include but are not limited to tobacco and alcohol use, poor diet, lack of exercise, and failure to consume adequate folic acid through multivitamins or diet (CDC, 2013). For example, tobacco use contributes to the occurrence of preterm birth and low birth weights. Alcohol use during pregnancy is associated with birth defects and developmental disorders. Inadequate folic acid intake before pregnancy increases the risk of neural tube defects (NTDs) in the infant.

Certain maternal health conditions such as obesity, hypertension, and diabetes if uncontrolled, can lead to poor infant outcomes and have a long-term negative impact on a woman's health. Latinas of childbearing age report significantly higher rates of obesity, diabetes, pregnancy-related diabetes, and pregnancy-related hypertension than non-Hispanic White women (MOD Perinatal Data Center, 2014). In addition, mental health issues before, during, and after pregnancy can be associated with adverse perinatal outcomes (Smith, Shao, Howell, Lin, & Yonkers, 2011). Higher rates of depressive symptoms have been reported among ethnically and racially diverse mothers (Howell, Mora, Horowitz, & Leventhal, 2005). According to Perry, Ettinger, Mendelson, and Le (2011), the presence of depressive symptoms during the latter half of pregnancy for Latinas were an important risk factor for lower maternal attachment. Due to inadequate access to health care screenings, health education, and cultural influences, a large percentage of Latinas are at risk for poor health, mental health issues, and adverse maternal-child health outcomes.

Perinatal Depression

Among women of childbearing age depression is prevalent, with estimated ranges of 7% to 20% found before, during, and after pregnancy (Bansil et al., 2010; Gaynes et al., 2005). Depression has important clinical implications for the health status of the mother during pregnancy (Bansil et al., 2010). According to the literature, depression among pregnant women is associated with behaviors including cigarette use, alcohol and substance abuse, poor nutrition, and inadequate use of prenatal care (Bansil et al., 2010).

Limited studies have explored the relationship between pregnancy outcomes and maternal depression (Bansil et al., 2010). The association between perinatal depression and preterm birth has been supported in the literature (Dayan et al., 2006; Deave, Heron, Evans, & Emond, 2008; Li, Liu, & Odouli, 2009). However, the findings among these studies vary (Straub, Adams, Kim, & Silver, 2012) and the rate of depression during pregnancy and its effect on pregnancy outcomes are still largely unknown (Li et al., 2009). These studies found conflicting evidence regarding the presence or absence of an association with suboptimal birth outcomes such as preterm labor or delivery, low birth weight, fetal growth restriction, hypertension, and operative delivery, including cesarean sections (Bansil et al., 2010).

The inconsistency of results is attributed to the type of measurement utilized to assess for depression, problems with generalizability because of the different types of scales and screening tools to measure depression, cut-off points for depression symptoms, the time points in which depression is measured during a pregnancy, varied study populations, and small sample sizes (Bansil et al., 2010). Examining the association of perinatal depression and preterm birth with consideration for these methodological issues

can provide further clarity as to how this relationship truly impacts preterm birth rates (Straub et al., 2012).

The potential effect of perinatal depression on the risk of preterm delivery demonstrates the need for early diagnosis and prevention of perinatal depression due to the significant clinical and public health impact (Li, Liu, & Odouli, 2009). Women who are depressed are less inclined to care for themselves as adequately as those who are not (Behrman & Butler, 2007). Investigation into the specific pathways that contribute to preterm birth with respect to distinct stress, emotional, and affective factors are necessary to elucidate this complex relationship (Behrman & Butler, 2007).

Previous research has demonstrated maternal anxiety has been linked to early labor and delivery via hypothalamic pituitary axis (HPA) pathways, whereas depression has been associated with poor health behaviors and their consequences for fetal growth (Behrman & Butler, 2007). Anxiety and depression are distinct emotional states that require further theoretical analysis of their intensity and duration (Behrman & Butler, 2007). According to the Premature Birth Report Brief presented by the IOM (2006), each requires investigation as to their effect on pregnancy outcomes.

In a study by Wisner et al. (2013), 10,000 women who gave birth were screened for depression, making it the largest American population to undergo depression screening specifically with the Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987). The timing of depression onset was not only a predominating factor during the postpartum period (as defined as within four weeks after birth) at 40.1%, but also was found to be elevated at 33.4% during pregnancy and 26.5% before pregnancy. This study highlights the importance of screening for depression not

only in the postpartum period but also before and during pregnancy. Additionally, this recent study underscores vital evidence of the large percentage of depression findings in women during the perinatal and postpartum period.

Study Purpose and Aims

The purpose of this study was to identify factors associated with preterm birth among a sample of racially and ethnically diverse women with depressive symptomatology.

The specific aims of this study are to:

Aim 1.

Describe the characteristics of racially/ethnically diverse women with depressive symptomatology who deliver prematurely compared to women who delivered term infants.

Aim 2.

Examine the relationship between Demographic Characteristics (age at screening, race/ethnicity, primary language, marital status, presence of a partner, educational level, household income), Maternal Risk Factors (EPDS score, alcohol abuse, drug abuse, tobacco use, intimate partner violence, gravida rank, antenatal medical complications), Maternal Outcomes (type of labor, type of delivery), Infant Outcomes (weeks' gestation, baby birth weight in grams, low birth weight or normal birth weight of infant, unusual problems at birth, NICU admission, NICU days, hospitalized days, breastfeeding status at discharge) and the occurrence of premature birth among racially/ethnically diverse women with depressive symptomatology.

Aim 3.

Identify factors that increase the odds of premature birth among racially/ethnically diverse women with depressive symptomatology.

Conceptual Framework

Figure 1 illustrates the conceptual framework used in this study. The framework, derived from the empirical literature, identifies the variables that have been shown to increase maternal risk for preterm birth. Demographic factors can directly affect these outcomes, as well as exacerbate the effects of other risks. According to Grote et al. (2010) prior evidence has shown that key variables in addition to depression are strongly and consistently predictive of negative birth outcomes. Some of these key variables include substance use, abuse, and race/ethnicity (Grote et al., 2010). The recent report by Robbins et al. (2014) highlights core state preconception health indicators and provides recent evidence to support the use of these concepts and variables in the study. An explanation of each concept will be provided for further clarity and understanding.

Figure 1. Present Study Framework

Maternal Demographics

Age

Maternal age has an impact on maternal-child health outcomes. According to the recent report by Robbins et al. (2014), young women (18-24 years) frequently had a higher prevalence of risk factors or lower prevalence of protective factors in the domains of health care, reproductive health, tobacco and alcohol use, mental health, and emotional support when compared to older women (35-44 years). Older women tended to have poorer preconception health in the nutrition and physical activity and chronic conditions domains (Robbins et al., 2014). Maternal age, whether a woman is younger or older, has an impact on health behaviors and outcomes and is required in order to analyze the data appropriately.

Race/Ethnicity

The race/ethnicity of a woman plays an important role in maternal-child health outcomes. Health disparities are known to exist within particular race and ethnicities. The United States suffers from a persistent preterm birth rate disparity across race/ethnic subgroups (Culhane & Goldberg, 2011). Compared with women of other racial/ethnic groups, non-Hispanic Black women generally had poorer preconception health and Hispanic women reported less health-care access than women of other racial/ethnic groups (Robbins et al., 2014).

Educational level

The level of education of a woman can either increase or decrease her risk for adverse maternal-child health outcomes. Educational level can be an indicator of socioeconomic status, as well as vary among different race/ethnicities.

Health Insurance Status

Women who do not receive preventative health services often do not have health insurance (Robbins et al., 2014). The findings from the recent report by Robbins et al. (2014) indicate one in four women with a recent live birth did not have health-care coverage during the month before pregnancy. This equates to approximately 500,000 U.S. women of reproductive age (Robbins et al., 2014). For example, in California for 2009, only 66% of Hispanic women aged 18-44 had health care coverage and 82.4% of Black women had health care coverage compared to 89.3% of White women (Robbins et al., 2014). Health care coverage determines access to health care services. Health care services and encounters for women before, during, and after pregnancy can have positive consequences by allowing for assessments, screenings, and evaluations of potential physical and mental health issues.

Maternal Risk Factors

Tobacco/Drug/Alcohol Use During Pregnancy

Approximately one fourth of women of reproductive age reported pre-pregnancy smoking and approximately one fifth reported current smoking (Robbins et al., 2014). Tobacco use during pregnancy is associated with spontaneous abortions, preterm births, and other adverse birth outcomes. The use of alcohol during the three months before pregnancy in 2009 was higher than the 2004 estimate (Robbins et al., 2014). The use of alcohol during pregnancy is associated with spontaneous abortions, stillbirth, preterm delivery, and a host of lifelong disorders in children (Robbins et al., 2014).

Interpersonal Violence

Interpersonal violence has been shown to negatively impact maternal-child health outcomes and is associated with a higher prevalence of depression in women who screen positive for depression versus those who screen negative (Connelly, Hazen, Baker-Ericzen, Landsverk, & Horwitz, 2013).

Preconception Health

The health of the mother prior to pregnancy can impact the maternal and child health outcomes. In addition, the lack of prenatal care has been demonstrated to negatively impact birth outcomes. Preconception care optimizes women's health before pregnancy (Robbins et al., 2014). There are several medical conditions that have been demonstrated in the literature to result in adverse pregnancy outcomes for women such as diabetes mellitus, thyroid disease, and hypertension (Dunlop et al., 2008). Chronic medical conditions, for example, hypertension, place a woman at risk for adverse health outcomes during pregnancy. Medical complications acquired during pregnancy including gestational diabetes, have also been linked to adverse birth outcomes.

Maternal Mental Health

Women with a diagnosis of depression were consistently 1.2-2.8 times more likely to experience adverse maternal and fetal outcomes (Bansil et al., 2010).

Maternal Outcomes

Type of labor

Rates for cesarean section were steadily on the rise until recent efforts by many organizations such as the March of Dimes encouraged hospitals and health care professionals to collaborate and establish programs to reduce elective and non-medically

necessary cesarean sections before 39 weeks' gestation (March of Dimes, 2014b). Latest data indicate cesarean sections account for 32.7% of all U.S. births (Martin et al., 2013). Cesarean section rates for non-Hispanic Black women were 35.8% and for Hispanic women were 32.3%, which remained unchanged for 2013 (Martin et al., 2013).

Infant Outcomes

Preterm birth

Preterm births are associated with negative consequences for a neonate. The literature supports that preterm birth contributes to the infant mortality rate with more infants dying because they are born preterm than as a result of any other cause of death (Callaghan et al., 2006). Premature births are categorized into extremely premature (24-27 weeks), very premature (28-32 weeks), and moderate to late premature (32-36 weeks) (March of Dimes et al., 2012). The national rate for late preterm infants is 8.3% (March of Dimes, 2014b) and has been linked to rising rates of cesarean section and early induction (March of Dimes, 2014b).

Low birth weight

There is conflicting evidence surrounding depression and a relationship to birth weight. The literature has demonstrated depressed women exhibited a higher incidence of prematurity and low birth weight infants than non-depressed women (Diego et al., 2009). Identification and determination of low birth weight infants is important to describe this relationship further.

Breastfeeding initiation

The literature indicates women reporting prenatal depressive symptoms are nearly twice as likely to plan to formula feed prenatally (Fairlie, Gillman, & Edwards-Rich,

2009). In addition, women classified as having at least probable minor depression or with probable major depression in midpregnancy were approximately 21%-23% less likely to breastfeed compared to women without depression (Insaf et al., 2011). Women with persistent depressive symptoms over pregnancy were 24%-33% less likely to intend to breastfeed compared to women without depressive symptoms (Insaf et al., 2011).

NICU Admission rate

It is important to evaluate the NICU admission rate to determine the impact of adverse outcomes of preterm births. The NICU admission rate is an important factor to consider as it impacts the mother and infant interaction and postpartum processes.

NICU length of stay

The NICU length of stay is important to determine the health care associated costs and health care burdens placed on families of infants requiring specialized care during the newborn period.

Hospital length of stay

The length of stay of infants in the hospital depends on any complications found at birth that would require further treatment or intervention. Longer lengths of stay incur more health care associated costs and increase exposure of infants to the hospital environment leading to potential nosocomial infection and other potential safety concerns.

Implications for Nursing

Nursing is at the forefront of care delivery with the ability to assess, implement, and develop interventions suited for patients according to their personalized care needs. Nurses have the ability to understand and recognize the intricate relationships of mental

health issues during the perinatal period and to enhance a woman's ability to account for variances in behaviors and physiological findings. With the future direction of the healthcare landscape changing due to health care reform, preventative care will be important more than ever. The ability for nurses to understand the unique needs of culturally diverse pregnant women allows for support and resources to be advocated for appropriately.

Caring for women who require early intervention and support requires therapeutic communication and interactions among medical professionals. Nurses, in particular, can recognize and identify factors that predispose women to perinatal depression, and create a beneficial relationship with their patients and multidisciplinary health care teams. By understanding the complicated process and deleterious effects of depression on mother and baby, nursing can provide a much-needed supportive network of care. By partnering with other clinicians, nursing is aligned to ensure patients are screened and treated, and completion of necessary follow-up is performed with high risk and at risk patient populations.

Education is paramount in the nursing profession. Nurses can impact patient outcomes by providing patients and families with educational materials regarding depression before, during, and after pregnancy that not only meet their cultural beliefs, but spiritual, economic needs, and are tailored to their individual health care needs. For example, a patient may present prior to becoming pregnant with a mental health issue and require guidance and education as how to manage their care in a way that is safe for a pregnancy. In addition, anticipatory guidance for care during the pregnancy for at risk clients and those who demonstrate signs for depression in the postpartum period, are

necessary to increase awareness of the devastating effects and potential adverse outcomes to the mother and her baby.

In summary, nurses are situated to design and implement with multidisciplinary teams, innovative interventions to address maternal-child health outcomes. Creating and generating new knowledge through research and conducting evidence-based practice initiatives, nurses can be at the forefront of presenting new ideas and visions for addressing maternal-child health disparities.

Chapter II

Review of the Literature

Premature infants, they are not for the faint of heart. They are not only immature in every organ system, they are fragile, and extremely vulnerable to every stimuli, and intervention in their environment. Their tiny fingers reach out for boundaries, comfort, and the warmth of the womb while struggling to maintain homeostasis. Everyday life for a premature infant involves adjusting to multiple stimuli in a given moment in a hostile extra-uterine environment. Some survive and others do not. They are in a daily fight to stay alive and health care professionals coupled with technology, keep them alive with moment-to-moment decisions that can either positively or negatively affect their daily care.

The implications for premature birth have been well documented in the literature. Yet, the research gathered to determine the causes of premature birth are not crystal clear. The link between premature birth and infant mortality is an unfortunate reality that has been examined in depth by a variety of researchers and has been called to attention by numerous federal and private agencies. Perinatal depression has also been extensively researched and linked to poor maternal and neonatal outcomes. With these two important

public health issues (premature birth and perinatal depression) exerting a heavy burden on our society, health system, and the future of the next generations, the impetus for further knowledge generation regarding this relationship is prudent and necessary. In this chapter, a critical review of the literature of the factors associated with premature birth, perinatal depression, and the current research demonstrating their link is provided.

Factors that Affect Premature Birth

Many factors are inherent in the mechanisms of premature birth outcomes. Some factors are behavioral while others are psychosocial. The Institute of Medicine's seminal report on premature birth provides a multitude of factors to elucidate the phenomenon of the causes and consequences of premature birth. A summary of specific factors is provided in order to highlight specific factors related to the proposed study (Behrman & Butler, 2007).

Behavioral factors

Attention to behavioral influences on preterm birth is well validated given that specific behaviors are subject to change and could reduce the frequency of preterm birth directly (Behrman & Butler, 2007).

Tobacco and Illicit drug use

Tobacco use among women has been found as one of the more prevalent, preventable causes of adverse pregnancy outcomes (Behrman & Butler, 2007). There have been modest associations reported between smoking and preterm birth in previous studies (Behrman & Butler, 2007). Alcohol use during pregnancy has adverse effects on fetal development (Behrman & Butler, 2007). Yet, the issue of whether a relationship exists between alcohol use and preterm birth remains unclear (Behrman & Butler, 2007).

The use of illicit drugs, particularly marijuana and cocaine, has been most commonly studied for the potential effects on preterm birth (Behrman & Butler, 2007). While the effects of marijuana use have not been highly indicated to influence preterm birth (Behrman & Butler, 2007) the use of cocaine has been in the literature as demonstrating an association with preterm birth (Behrman & Butler, 2007). For example, cocaine users experience an approximate twofold increase risk of preterm birth compared to non-users (Behrman & Butler, 2007).

Employment and physical activity

Studies that have examined employment and its association to premature birth have been inconsistent and are dependent on the socioeconomic conditions in the geographic location of the study (Behrman & Butler, 2007); particularly, the implications of employment for economic resources and medical care access including the type and characteristics of the work performed (Behrman & Butler, 2007). Physical exertion in the work place may be associated with an increased risk of preterm birth (Behrman & Butler, 2007). In contrast, more recent studies have found exercise to have protective effects against premature birth (Behrman & Butler, 2007).

Psychosocial Factors

There has been a high level of scientific interest and public health attention to the topic of psychosocial factors and preterm delivery (Behrman & Butler, 2007).

Stress

A focus particularly on the area of stress and its association to preterm delivery has generated an elevated level of scientific interest (Behrman & Butler, 2007). Recent research developments have strengthened the theoretical premises that causal pathways

link maternal and fetal environmental stress exposures (Behrman & Butler, 2007).

Associations between maternal emotional states through biological mediators to preterm delivery or low birth weight have also been enhanced by recent research (Behrman & Butler, 2007). The IOM committee on preterm birth found, through their overall review of the findings on the association of stress and preterm birth, there are more rigorous approaches yielding more definitive results. However, the exact nature and strength of these effects are not yet entirely clear (Behrman & Butler, 2007). A further in-depth review of life events, chronic, and catastrophic stress exposures, were examined to further understand the implications of stress and preterm birth outcomes (Behrman & Butler, 2007).

Emotional & Affective States

The psychosocial risk factors related to emotional responses and affective states have been examined extensively in the literature. Early research focused on maternal anxiety and preterm delivery and low birth weight (Behrman & Butler, 2007).

Determining whether depression or anxiety is a risk factor for preterm delivery has been difficult for many reasons (Behrman & Butler, 2007). One of the reasons for this difficulty is because depression and anxiety are often comorbid, even though they are distinguished clinically (Behrman & Butler, 2007). Additionally, questionnaire measures used in obstetric research to assess anxiety and depression are not well suited to their differentiation, and anxiety may be linked to different behavioral implications than depression (Behrman & Butler, 2007).

Anxiety

With a review of the literature regarding anxiety during pregnancy, the IOM committee considers anxiety to be a possible risk factor in premature birth. While the results of studies on general anxiety are mixed, studies on anxiety regarding the pregnancy itself are more consistent in predicting gestational age at birth or preterm birth (Behrman & Butler, 2007). The IOM committee recommends follow-up research on anxiety and its timing and mechanisms of effects on preterm labor and delivery (Behrman & Butler, 2007).

Depression

The IOM committee reviewed and evaluated 10 studies on depression and preterm birth or low birth weight. Of those ten, only four yielded significant effects (Behrman & Butler, 2007). Prenatal depression in the mother affected fetal growth and birth weight percentiles (Behrman & Butler, 2007). Two of the studies found associations with depression and preterm delivery (Behrman & Butler, 2007).

One study found only significant effects among women who were underweight before the pregnancy and the other study examined African American women only (Behrman & Butler, 2007). As a result, the IOM committee determined based on the then current evidence, that studies on depression do not suggest a strong pattern for depression as a general risk for preterm delivery consistent with the results of earlier studies, with some exceptions (Behrman & Butler, 2007). According to the IOM Committee, depression in African American women seems to be an area worthy of further investigation. The inconsistency of results regarding the effects of depression on birth weight or fetal growth have also been debated, even though there are some indications

that depression may be a risk factor for fetal growth or low birth weight (Behrman & Butler, 2007). Further research is needed to elucidate this important topic. The IOM committee recommends that studies exploring these affective states must address their frequent confounding issues (Behrman & Butler, 2007).

Perinatal Depression

The rate of depression diagnosed in women hospitalized for a delivery, ages 15-44 within a nationwide sample, increased five-fold from 1998 to 2005 (Bansil et al., 2010). Bansil et al. (2010) note this increase could be because there may be an increase in awareness and diagnosis of depression during pregnancy or at the time of delivery. However, the estimates found by Bansil et al. (2010) are much lower than previously reported rates of depression at the time of delivery in obstetric populations. The researchers speculate whether or not the incomplete reporting or documentation of all comorbid conditions in the hospital record when the woman is hospitalized for a delivery or the coding of mental mood disorders are captured only when they interfere with management of the patient's condition contribute to the lower estimates found (Bansil et al., 2010). As a result, the estimated rate may reflect more severe depressive episodes rather than the prevalence of depression in pregnant women due to the nature of medical record abstraction (Bansil et al., 2010).

Despite the concerns regarding the nature of medical record abstraction, Bansil et al. (2010) found women with a diagnosis of depression were consistently 1.2-2.8 times more likely to experience adverse maternal and fetal outcomes, spend more time in the hospital, and incur higher hospital charges. Increasing age was associated with an increasing prevalence of depression, as well as those women who were uninsured (Bansil

et al., 2010). The results also showed a significant positive association of depression with preterm labor and fetal growth restriction, which has also been reported in previous studies (Bansil et al., 2010)

National studies have not focused on depression among mothers and as a result, there is a limited understanding of the national burden of this disorder among mothers caring for children (Ertel, Rich-Edwards, & Koenen, 2011). In a sample of 10,000 American women who gave birth, Wisner et al. (2013) found when screened with the EPDS approximately 40% (n = 331) of the women were found to have an onset of depression during the postpartum period, otherwise defined as within 4 weeks after birth. Indeed, the onset of depression during pregnancy was relatively high for 276 (33.4%) women and 219 (26.5%) before pregnancy. This study is the largest American sample to date to screen women with the EPDS. Of the 10,000 women screened, EPDS scores of greater or equal to 10 were found in 14% of the women, 7% had EPDS scores of 13 or higher (Wisner et al., 2013). This study provides the argument for the importance of addressing the currently high rates of women who are African American, younger, publicly insured, less well educated, and single, Wisner et al. (2013) found a higher likelihood of depression among women with these demographics. This study includes women with these sociologic factors however differs by having a primarily Latina population.

Perinatal Depression and Preterm Birth

A recent meta-analysis by Grote et al. (2010) evaluated 29 published studies that met inclusion criteria with respect to depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. Of the 29 published studies

evaluated, race/ethnicity varied from White to mixed and did not include a research study that solely examined Latinas (Grote et al., 2010). In addition, the depression measures utilized, varied widely among the 29 studies with only three studies citing the use of the EPDS depression measure; 10 of the 29 studies utilized the Center for Epidemiologic Studies Depression scale (CES-D) (Grote et al., 2010). Researchers have utilized the CES-D because it has been demonstrated to be a good indicator for clinical diagnosis for depression (Grote et al., 2010). Those studies that utilized the EPDS scale focused solely on a sample of white women (Grote et al., 2010). Overall the effect of antenatal depression on preterm birth rate was significant in nine of the studies analyzed utilizing a random-effects model (RR=1.13, 95% CI, 1.06-1.21) and non-significant in eleven of the studies evaluated (Grote et al., 2010). The association between low birth weight and antenatal depression resulted in significance for five studies (RR=1.18, 95% CI, 1.07-1.30) however six of the studies found no significant association. Only two of the twelve studies evaluated demonstrated a significant association between antenatal depression and intrauterine growth restriction.

Nonetheless, Grote et al. (2010) meta-analysis found despite the differences in measurement scales for depression, a pregnancy with depression is associated with modest but statistically significant risks for preterm birth and low birth weight. Findings also indicated women of lower socioeconomic status in the United States are twice as likely to experience antenatal major and minor depression as are women from middle or upper income strata (Grote et al., 2010). The evidence from this meta-analysis highlights the importance of the effects of antenatal depression on preterm birth and low birth

weight as a public health risk particularly among socioeconomically disadvantaged women in the United States (Grote et al. 2010).

In a more recent systematic review and meta-analysis about the impact of maternal depression during pregnancy on perinatal outcomes, Grigoriadis et al. (2013) sought to update the 2010 meta-analysis by Grote et al. (2010). Grigoriadis et al. (2013) examined maternal depression during pregnancy on perinatal outcomes in a systematic review and meta-analysis as part of a larger project that would serve as a reference guide for clinicians to use with their pregnant patients who are depressed and to assist in treatment decisions. Grigoriadis et al. (2013) updated the meta-analysis by Grote et al. (2010) including the examination of additional outcomes regarding the effects of maternal depression (Grigoriadis et al., 2013). Outcomes such as NICU admissions, APGAR scores, and breastfeeding initiation were considered (Grigoriadis et al., 2013).

Strengths of this recent meta-analysis demonstrate the importance of recognizing the methodological differences in studies conducted to infer relationships between depression and perinatal outcomes. Out of the diverse perinatal outcomes studied the most significant associations were for maternal depression and premature delivery and the lower likelihood of breastfeeding initiation (Grigoriadis et al., 2013). Out of the thirty articles that met inclusion criteria and were included in the quantitative analysis, seven (Dayan et al., 2006; Deave et al., 2008; Ertel et al., 2010; Evans et al., 2007; Fairlie et al., 2009; Imran & Haider, 2010; Larsson, Sydsjö, & Josefsson, 2004) utilized the EPDS for the depression classification. Only two (Ertel et al., 2010; Fairlie et al., 2009) of the six studies utilizing the EPDS were conducted in the United States.

Among the six studies with EPDS measurement, inconsistencies in cut-off scores for depression were noted: EPDS score of greater than 10 (Larsson et al., 2004), scores of greater than or equal to 13 (Ertel et al., 2010; Fairlie et al., 2009;), and scores of greater than 12 (Evans et al., 2007; Imran & Haider, 2010), and scores greater than or equal to 14 (Dayan et al., 2006; Deave et al., 2008). Sample populations and demographics varied widely from largely white, well educated, and married (Fairlie et al. 2009) to largely European (Dayan et al., 2006) to samples from developing countries with poor socioeconomic status (Imran & Haider, 2010). None of the studies examined included a large percentage of Latinas. In addition, findings among the thirty studies evaluated were conflicting with respect to the association of perinatal depression and preterm birth. More specifically the exposure to depression in utero and the odds ratio for premature delivery based on the meta-analysis results for fifteen studies demonstrated significance (Grigoriadis et al. 2013). There were no significant associations between exposure to maternal depression and gestational age, birth weight, a low birth weight, preeclampsia, Apgar scores, and neonatal intensive care admissions (Grigoriadis et al., 2013). However, the outcome measure of breastfeeding initiation was significant for four of the studies when pooled indicating maternal depression was associated with reduced rates of breastfeeding initiation (Grigoriadis et al., 2013).

In a recent study by Straub et al. (2012), which was not included in the meta-analysis and systematic review by Grigoriadis et al. (2013) due to publication timing, significance of the likelihood of preterm births among a large cohort of prenatally screened women was examined. The relationship between antenatal depressive symptoms and preterm birth was evaluated utilizing the EPDS with a score of greater

than or equal to 12 indicating an at-risk woman (Straub et al., 2012). Of the 14,175 women screened prenatally with the EPDS, 9.1% (1298) women screened positive with symptomatic patients on average older, overrepresented by minorities (African American and Hispanic), more likely to be receiving public assistance, and less often nulliparous (Straub et al., 2012). Prior preterm birth was more common among symptomatic women compared to risk-negative cases (Straub et al., 2012). Significance was found for gestational age and risk for depression with 13.9% at risk versus 10.3% not at risk for depression for gestational age at delivery of less than 37 weeks (Straub et al., 2012). Among the 1,019 women who had a prior preterm birth, the women who screened positively were more likely to deliver prematurely than who screened negative (Straub et al., 2012). The mean birth weight for women with depressive symptoms was found to be lower than for women not screening at risk (Straub et al., 2012). When maternal age, race/ethnicity, prior preterm delivery, and insurance status were controlled for the relationship between depressive symptoms and preterm birth remained significant (Straub et al., 2012). This study highlights the need to conduct further research to examine the association of perinatal depression and preterm birth among an ethnically diverse, low-income sample of women. In addition, Straub et al. (2012) provided insight into considerations for study variables and methods due to its similarity of utilization of the EPDS, a sample consisting of a large American population with diversity with respect to race/ethnicity, and consideration confounding variables.

Perinatal Depression & Breastfeeding

Only a few studies have examined the association between perinatal mood disorders and breastfeeding (Fairlie et al., 2009). These studies have been cross-sectional

and included postpartum depression rates among breastfeeding and non-breastfeeding women with results demonstrating a lower rate of depression or better mood among women who breastfeed (Fairlie et al., 2009). Fairlie et al. (2009) found women reporting prenatal depressive symptoms were nearly twice as likely to plan to formula feed prenatally. However, prenatal symptoms of depression nor high pregnancy-related anxiety were a strong predictor of actual initiation of breastfeeding in the hospital (Fairlie et al., 2009). This could be related to breastfeeding promotion services that were provided toward the end of pregnancy regarding breastfeeding and could have influenced breastfeeding outcomes in the women (Fairlie et al., 2009). The limited amount of research regarding breastfeeding initiation among ethnically diverse women with depression symptomatology and conflicting results necessitate further research and investigation.

In Summary

Based on the review of the literature the findings among studies conducted to date remain conflicting regarding the association of perinatal depression and preterm birth. As previously discussed the reasons for these inconsistencies among the findings are most likely related to the issues surrounding the variety of methods utilized. For example, the use of depression screening instruments varies widely among studies. Despite the fact that the EPDS remains valid for use during pregnancy and after delivery and its availability in multiple languages, it is not always utilized to screen women for depression. Also the sample size and race/ethnicity studied are varied and these findings are not always generalizable to specific minority populations such as Latinas.

The gaps in the literature with respect to examining outcomes related to maternal-child health among ethnically diverse women is apparent after a thorough review of the literature. This review demonstrates the need for research to be conducted in order to elucidate further understanding of the complex relationship between perinatal depression and health outcomes in ethnically/racially diverse mothers and their babies. To reduce health disparities among minorities and low-income women, further research such as this study is necessary and prudent to provide new knowledge regarding these associations among vulnerable populations.

By linking together the maternal demographics, maternal health behaviors, and risk factors we can begin to paint a better picture of the potential relationship of these concepts and variables. These linkages can potentially aid in identifying the necessary variables for outcome analysis. The conceptual framework will guide the study and substantiate the rationale for the basis of this study.

Figure 1. Present Study Framework

Chapter III

Methods

The purpose of this study was to identify factors associated with preterm birth among a sample of racially and ethnically diverse women with depressive symptomatology. In this chapter, the research design, sample and sample characteristics, procedures for data collection, measurement, as well as proposed data analysis techniques are described. In addition, the protection of human subjects is also discussed.

The specific aims of this study are to:

Aim 1.

Describe the characteristics of racially/ethnically diverse women with depression symptomatology who deliver prematurely compared to women who delivered term infants.

Aim 2.

Examine the relationship between Demographic Characteristics (age at screening, race/ethnicity, primary language, marital status, presence of a partner, educational level, household income), Maternal Risk Factors (EPDS score, alcohol abuse,

drug abuse, tobacco use, intimate partner violence, gravida rank, antenatal medical complications), Maternal Outcomes (type of labor, type of delivery), Infant Outcomes (weeks' gestation, baby birth weight in grams, low birth weight or normal birth weight of infant, unusual problems at birth, NICU admission, NICU days, hospitalized days, breastfeeding status at discharge), and the occurrence of premature birth among racially/ethnically diverse women with depression symptomatology.

Aim 3.

Identify factors that increase the odds of premature birth among racially/ethnically diverse women with depression symptomatology.

Design

A cross-sectional, descriptive design was used for this study. Cross-sectional designs involve collecting data once the phenomena under study are captured during a single period of data collection (Polit & Beck, 2012). Even though cross-sectional studies can be designed to allow for inferences about particular processes evolving over time, such designs are typically less persuasive than longitudinal designs (Polit & Beck, 2012). While there are disadvantages in a cross-sectional design versus a longitudinal design, there are many reasons researchers will opt for cross-sectional designs for examining a particular phenomena. For example, cross-sectional studies are economical; however caution is recommended with respect to inferring changes over time (Polit & Beck, 2012).

Secondary data analysis was employed as an additional method for this research study. Secondary data analysis involves utilizing existing data from a previous study to

test new hypotheses or to answer new questions (Polit & Beck, 2012). The efficiency of secondary data analysis is attractive to many researchers. This is due in part to the time-intensive and expensive process of data collection (Polit & Beck, 2012). It is possible to examine new variables within a data set that have not been previously analyzed or a subgroup of the full original sample (Polit & Beck, 2012). Potential disadvantages include a lack of control over the data collection process, dependency on the original researcher's decisions about the population studied, sampling design, and the specific measures used in the data collection process (Mainous & Hueston, 1997). The resource savings and cost-effectiveness tend to outweigh some of these disadvantages (Castle, 2003).

The Perinatal Maternal Health (PMH) research database provided the data for this study and was accessed under the direction of the primary investigator, Dr. Cynthia D. Connelly. For this research study, analyses were conducted on a subsample of mothers who had both screening and delivery data available.

Parent Study

Collaborative model addressing mental health in the perinatal period.

Study Overview:

The Perinatal Maternal Health Project is a randomized controlled trial designed to investigate the effectiveness of a collaborative care model compared to enhanced usual care to improve identification, referral, and treatment of perinatal depression within community obstetric clinics serving racially, ethnically diverse, low income pregnant or postpartum women (Connelly, Baker-Ericzen, Hazen, Landsverk, & Horwitz, 2010).

Procedures

“Women receiving obstetrical services any time throughout the perinatal period at routinely scheduled visits, including the 6-week postpartum visit, were recruited from 10 community obstetric/gynecologic clinics serving greater San Diego, California, from March 2009 through January 2012. Women were referred by clinic staff to bilingual, bicultural research assistants (RAs) who described the study while the mother was waiting to see the health care provider. Women were eligible to participate if they were pregnant, English or Spanish speaking, and reachable by phone. Exclusion criteria include being a surrogate mother or having a cognitive impairment precluding ability to give informed consent and respond to psychosocial questionnaires. Minors who were receiving reproductive health services were considered to be emancipated and thus able to provide legal consent to participate. Upon providing written informed consent, a screening interview was conducted in either English or Spanish (mother’s preference), with items read verbatim and responses recorded by the RAs.

A total of 2,250 women were referred by the clinic staff; 298 (13.2%) declined participation, 37 (1.6%) were not eligible, and 47 (2.1%) were unavailable to initiate and/or complete the measures during the health care visit (e.g., health care provider ready to see mom, busy with children, or parking about to expire). One thousand, eight hundred and sixty eight women (83%) completed the screening interviews, with 1,099 interviewed in Spanish (58.8%) and 769 interviewed in English (41.2%). Participants received \$10 for their time. All procedures were approved by participating clinics and university institutional review boards for the protection of human subjects.

Standardized screens in a technology supported assessment battery were used for the screening of depression and other psychosocial issues, IPV, substance use (alcohol, tobacco including environment exposure, other drugs), and the collection of patient sociodemographic characteristics during antenatal and 6-week postpartum visits. The battery included: (1) the EPDS (Cox et al, 1987) for maternal depressive symptoms, (2) the Abuse Assessment Screen (AAS) (Soeken, McFarlane, Parker, & Lominack, 1998), for IPV, (3) the Tolerance, Worried, Eye-opener, Amnesia, and K/Cut down on consumption (TWEAK) (Russel et al., 1994) screen for alcohol use, (4) the Short Drug Abuse Screening Test (DAST-10,) (Bohn, Babor, & Kranzler, 1991) for drug use, and (5) the Partnership for Smoke Free Families (PSF) Health Survey for New Moms–Tobacco Use Questionnaire for smoking patterns and environmental exposure (Rohweder, DiBiase, & Schell, 2007). Women were randomized at the clinic level to enhanced usual care (control) or PMH model (intervention). There were three innovative features of the Partnership for Women’s Health (PWH) program including incorporating a culturally competent intervention, integration of depression care within the primary care setting, and the use of a Maternal Health Advisor to support patients and providers in navigating clinical systems and community services (Connelly et al., 2010).” The cohort was followed from the time of study entry through the first year of birth of the participant’s child (Connelly et al., 2013). A complete description of procedures can be found in Connelly et al., 2010; Connelly et al., 2013).

Sample: Mothers' ages ranged from 14-48 years, 68% of the participants had a high school education or less, and 40.5% were married or living with a partner (Connelly et al., 2013). Twenty-seven percent of the women were screened in the first trimester, 36.8% in the second trimester, 33.3% in the third trimester, and 2.6% post-partum. Three hundred and eighty one or 20.4% of the 1868 women screened positive for depressive symptoms based on an EPDS score of 10 or above (Connelly et al., 2013).

Present Study

Based on an extensive review of literature, the variables chosen for this research study related to findings in the literature and are associated with the gaps and methodological inconsistencies in current research findings with respect to perinatal depression and premature birth rates.

Sample size

In order to determine the sample size for a moderate effect size a power analysis was performed. The most common effect sizes range from .20 to .40 for nursing studies (Polit & Beck, 2012). The effect size determines the magnitude of the relationship between the research variables and when effects are strong they can be detected at significant levels even with small samples (Polit & Beck, 2012). Large sample sizes are required to avoid Type II errors when relationships are found to be modest in nature (Polit & Beck, 2012). Due to the nature of secondary data analysis, the approximate sample size is known ahead of time. However, in order to interpret findings accurately the level of significance, power, and determination of effect size must be determined. A moderate effect size was determined at .30 with a significance level set at $p = .05$ and a power of .80. Based on an effect size of .30, power of .80 and significance level of $p=.05$

the sample size was determined to equal $n=176$ to test the difference of two means (Polit & Beck, 2012). For determining the effect size for Pearson correlations the estimated effect size (r) was set at .20 for medium effect size with an alpha of $p=.05$, and power of .80. Based on these parameters the sample size required to reduce Type II error would be $n=194$ (Polit & Beck, 2012).

The research questions required correlational and multiple regression analysis to explore the effects of the predictor variables on maternal delivery outcome. According to Tabachnick and Fidell (2007), a minimum of 20 cases is recommended for each predictor in the model. With approximately 10 independent variables and 1 dependent variable, the sample size for this study should be 400 to obtain statistical significance. On the other hand, Polit and Beck (2008) suggest a better way to estimate sample size is to perform a power analysis. For 10 variables with a moderate effect size ($R^2 + .13$) and a power of .80 and $\alpha = .05$, a sample of 136 mothers is needed to detect a moderate population effect size with a 5% chance of Type 1 error and 20% chance of Type 2 error.

The examination of a specific population of ethnically diverse women within a certain diverse geographical region such as San Diego, add to the importance of the rationale for the examination of vulnerable populations with health disparities in this proposed research study. Chart abstraction was utilized to gather and sort the data necessary for this research study.

The sample for this study was a purposive sample of pregnant ethnically diverse women with depressive symptomatology obtained from the original database. Purposive sampling is a nonprobability sampling method that utilizes the researcher's knowledge about the population to select sample members (Polit & Beck, 2012). Since the parent

study predominately consisted of Latinas (82%), the health disparities surrounding the Latina population, and review of the literature, a focus on this population for this study was prudent and necessary. The focus of this study was to examine mothers with depressive symptoms during the perinatal period and preterm birth.

Preterm birth was defined per IOM (Behrman & Butler, 2007) standards of less than 37 weeks' gestation. Weeks' gestation (continuous variable) was recoded "0" or "No" for term birth, "1" or "Yes" for premature birth, < 37 weeks' gestation.

The statistical analyses chosen for this study were multivariate regression, (least squares and logistic regression). Sample size requirements were approached with careful consideration. It is necessary to have a sufficient number of cases for each predictor in the model and recommendations range from 10 to 20 cases per predictor per outcome (Polit, 2010). According to Polit (2010), at least 15 cases per predictor or 20 or more is preferred and recommended. When the sample size is inadequate in relation to the number of predictors, the stability of the estimates decline (Polit, 2010).

Measurement

Maternal Demographic Variables included depressive symptom level, age at screening, race/ethnicity, primary language, marital status, presence of a partner, educational level, household income, Maternal Risk Factors (EPDS score, alcohol abuse, drug abuse, tobacco use, intimate partner violence, gravida rank, antenatal and perinatal medical complications), Maternal Outcomes (type of labor, type of delivery), and Infant Outcomes (preterm birth, weeks' gestation, baby birth weight in grams, low birth weight or normal birth weight of infant, unusual problems at birth, NICU admission, NICU days, hospitalized days, breastfeeding status at discharge).

All standardized measures utilized in the PMH Study have established reliability and validity.

Depressive Symptom Level

Perinatal depressive symptomology was measured utilizing the EPDS. Developed by Cox, Holden, and Sagovsky (1987), this 10-item self-report scale is a valid and reliable screening measure for postnatal depression and more recently for perinatal depressive symptomatology (Connelly et al., 2010, 2013). The EPDS is one of the most widely used screening tools for women and has been translated in over 50 languages (Bergink et al., 2011). Bergink et al. (2011) conducted the first study to test the EPDS in a large unselected sample of pregnant women against a Composite International Dialogue Interview (CIDI) based syndromal diagnosis of depression with respect to specific trimesters. The EPDS was found to be a valid measure for detecting depression in a pregnant population and showed a high test-retest reliability and relatively high concurrent validity confirmed overall good psychometric properties (Bergink et al., 2011).

The cut-off for a positive screen for the EPDS for the parent study was ≥ 10 . The cut-off was based upon recommendations of the American Academy of Pediatrics (AAP). According to the AAP, women should be referred for follow-up immediately if they score greater than 9 on the EPDS. The internal consistency reliability for the EPDS was 0.85 for the parent sample.

Maternal risk factors

Alcohol abuse was measured using the TWEAK, a short five-question screen originally designed to screen pregnant women for harmful drinking habits (Russell et al.,

1994). Indication of harmful drinking is associated with a score of two or more, as well as further evaluation (Connelly et al., 2013).

Drug abuse was measured utilizing the DAST-10 (*Short Drug Abuse Screening Test*) a 10-item version of the original DAST that was designed to identify involvement with drugs, which does not include alcoholic beverages or tobacco (Bohn et al., 1991). The DAST-10 is internally consistent with an alpha equal to 0.86 and is temporally stable with an interclass correlation coefficient equal to 0.71 (Bohn et al., 1991). Scores at or above the cut point of 3 for participants screened, were considered positive for drug abuse (Connelly et al., 2013).

The *use of tobacco* was measured with The PSF Health Survey for New Moms-Tobacco Use Questionnaire from The National Partnership for Smoke Free Families. This questionnaire assesses smoking risk during the perinatal period consisting of 5 items that inquire about smoking and smoke exposure (Rohweder et al., 2007; Connelly et al., 2013).

Intimate Partner Violence (IPV) was measured by the AAS (Soehren et al., 1998), designed to assess the presence of abuse in pregnant women (CDC, 2007). The AAS identifies the presence of IPV which is defined as actual or threatened physical, sexual, psychological, emotional, or stalking abuse by an intimate partner (CDC, 2007). The AAS consists of a 5-item screening and participants who indicated they had been physically or sexually abused in the last year or during their pregnancy by a current or former intimate partner were considered to have experienced intimate partner violence (Connelly et al., 2013).

Gravida was determined by asking women “Which of mother’s pregnancies was this?” with mothers specifying 1st, 2nd, 3rd, etc.

Antenatal and perinatal medical complications were identified through chart abstraction. Medical complications were categorized into conditions and diseases found prior to pregnancy and related to pregnancy. This allowed for further grouping of more frequent complications and for the creation of a new variable that captured the number of medical complications among women in this sample for statistical analyses.

Maternal Outcomes

The *type of labor* was identified through chart abstraction and defined as spontaneous, induced, or cesarean birth.

Delivery type was coded “0 = No” for having a non-cesarean section or vaginal birth, “1= Yes” for having a cesarean birth.

Infant Outcomes

The infant outcomes included gestation weeks, birth weight, problems at birth, admitted to NICU, days in NICU, number of days hospitalized, and breastfeeding status at discharge. Based on recommendations from the IOM Report on Preterm birth (2007), the outcome variable of premature birth was derived from recoding weeks of gestation (continuous variable) to examine the percentage of preterm births less than 37 weeks’ gestation, “0 = term, 1 = preterm <37 weeks’ gestation. Many current studies have examined premature birth by using low birth weight as a study measure, however as stated in the IOM report on prematurity, this condition can be caused by preterm birth and fetal growth restrictions and while they may have some overlap, the reasons may be completely different for the occurrence (Behrman & Butler, 2007). The IOM report on

prematurity recommends future research to define preterm birth as a specific study outcome and not use low birth weight as a proxy for preterm birth (Behrman & Butler, 2007). Subcategories were created based on gestational age according to the World Health Organization (2014) categorical groupings for prematurity. These categories identified infants born extremely preterm (24 to 27 weeks' gestation), very preterm (28 to 32 weeks' gestation), and moderate to late preterm (32 to 36 weeks' gestation) (World Health Organization, 2014).

Birth weight was further narrowed to two categories: low birth weight (less than 2,500 grams) and normal birth weight (greater than 2,500 grams). Birth weight categories were created based on WHO guidelines for birth weight measurement.

Unusual problems at birth were identified through chart abstraction. The type of unusual problems at birth varied among the infants delivered to women in this sample. Examples of unusual problems at birth were bradycardia and respiratory distress. Additional infant outcomes included whether or not an infant was admitted to the NICU, the NICU length of stay measured by NICU days, and days an infant spent in the hospital. Breastfeeding was measured and categorized infants who were fed breast milk exclusively at discharge, those who received a combination of formula and breast milk at discharge, and those infants who did not receive any breast milk at discharge.

Statistical Analysis

Statistical analyses included descriptive and inferential statistics. Data were reviewed and inspected for normality, missing values, and outliers. After missing values were accounted for, 302 mothers' data were included for analyses.

The variables for age, race/ethnicity, marital status, primary language, educational level, presence of a partner, household income; study variables for maternal risk factors including EPDS score; and maternal and infant outcome variables were described by calculating the means, standard deviations, and percentages with Statistical Package for the Social Sciences (SPSS) version 22.

Statistical correlations examined the following relationship between demographic characteristics among racially/ethnically diverse women with depression symptomatology: age at screening, race/ethnicity, primary language, marital status, presence of a partner, educational level, household income; maternal risk factors including EPDS score, alcohol abuse, drug abuse, tobacco use, intimate partner violence, gravida rank, antenatal and perinatal medical complications; maternal outcomes including type of labor and type of delivery; infant outcomes including preterm birth, weeks gestation, baby birth weight in grams, low birth weight or normal birth weight of infant, unusual problems at birth, NICU admission, NICU days, and hospitalized days, breastfeeding status at discharge.

Correlations were performed with continuous and categorical variables to identify significant or non-significant relationships. When no relationship exists between two variables, the correlation is zero (Polit, 2010). For interval and ratio level variables Pearson's r was measured to determine a linear relationship between the study variables (Polit, 2010). The nature and magnitude of the relationship between variables was determined by recognizing a negative sign for an inverse relationship or positive sign for positive relationship (Polit, 2010). A higher absolute value for the correlation coefficient meant a stronger relationship between the two variables (Polit, 2010).

Nonparametric tests were performed utilizing the chi-square test to examine the relationship between the categorical variables. Chi-square tests are used when both the independent and dependent variables are measured on a nominal scale (Polit, 2010). The study categorical variables were cross tabulated in a contingency table to examine the differences between the dependent variable of preterm birth and the study independent variables.

Independent t-test sample statistics were conducted to determine significant mean differences among women who delivered preterm infants compared to those who delivered term infants based upon the continuous variables: (1) age at screening, (2) EPDS score, (3) TWEAK score, (4) DAST score, (5) AAS score, (6) gravida rank, (7) number of medical complications, (8) days infant in the hospital, (9) weeks' gestation, (10) baby's weight in grams, and (11) NICU days. Levene's test for equality of variances was performed to assess the variances among these groups. If the F statistic is non-significant $>.05$ variances among the groups are homogenous (Polit, 2010). Interpretation of the F statistic is crucial in analyzing the appropriate row for the data output to determine significance level for the t -test.

Based upon the aims of the study, the variables selected and their level of measurement, multivariable regression techniques (least square and logistic), were utilized for the analysis. Logistic regression analyzes the relationship between one or multiple independent variables and a dependent variable (Polit & Beck, 2012). As a result, a predictive equation is produced (Polit & Beck, 2012). Logistic regression can be a beneficial analysis to address many clinical questions because it models the probability of an outcome rather than predicting group membership (Polit & Beck, 2012). The

probability of an event occurring is transformed into odds where odds reflect the ratio of two probabilities – the probability of an event occurring and the probability that it will not occur (Polit & Beck, 2012). In binary logistic regression the dependent variable is a dichotomous variable and predictor variables can be continuous, categorical variables, or interaction terms (Polit & Beck, 2012).

Logistic regression is a more flexible type of analysis due to the fact that it avoids the restrictive assumptions of least-squares regression (Polit, 2010). Logistic regression does not assume a linear relationship between the dependent variable and the predictors and the dependent variable does not have to be normally distributed (Polit, 2010). In addition, there is no homogeneity of variance assumption (Polit, 2010). Logistic regression, however, does assume a linear relationship between continuous predictors and the log odds of the dependent variable (Polit, 2010). If this assumption is violated, the risk of Type II error increases (Polit, 2010).

Multicollinearity among a set of predictor variables should also be avoided because as the magnitude of correlations among predictors increases the standard errors of the logistic coefficients become inflated (Polit, 2010).

While there are no strict limits to the number of predictors that can be included, it is recommended to achieve a parsimonious model with strong predictive power using a small set of good predictors (Polit & Beck, 2012). To determine effect size or the magnitude of the relationship between the outcome and the set of predictors in the model, there are several options for logistic regression (Polit, 2010). One option for logistic regression is the Cox and Snell R^2 which utilizes a formula that involves the ratio of the likelihood indexes for the null model and the model being tested (Polit, 2010). However,

this statistic can be problematic because it cannot achieve a maximum value of 1.00 (Polit, 2010). An additional option would be to utilize bivariate analyses using the predicted probabilities from the logistic regression output and compute a correlation coefficient (r) (Polit, 2010). The correlation coefficient can be computed between the predicted probability value and the actual outcome and the r can be interpreted as the effect size (Polit, 2010).

To examine the relationships among the variables, first a correlation matrix was constructed to identify the potential for multicollinearity, which can occur when there are moderate to high correlations among predictor variables. Predictor variables scrutinized for moderate to high correlations can possibly be deleted and one variable will be reported, or variables may be combined to represent one measure of a construct to delete repetition (Mertler & Vannatta, 2005).

In order to examine the influence of the variables on gestational age outcome, multiple regression was performed. Regression techniques make use of the correlation between variables and permit predictions to be made from some known evidence to future events (Munro, 2005). Simultaneous multivariable regressions were computed for the purposes of this study.

Human Subjects

To ensure protection of participants in this study and due to the nature of this at risk population, a thorough review of human subjects procedures was completed. This study has been reviewed by the IRB at the University of San Diego (See appendix A). Consideration was made regarding the vulnerability of the population for this study. Pre-collected data have been de-identified to ensure protection of human subjects. All data

were accessed and protected by password-protected software. The proposal was submitted with a letter of authorization for the use of the data by this investigator, from Dr. Cynthia D. Connelly, Principal Investigator to the Institutional Review Board of the University of San Diego. See Appendix A.

Chapter IV

Results

The purpose of this study was to examine factors among ethnically diverse women who have depressive symptomatology and delivery outcomes. Secondary data analysis was performed utilizing statistical software via Statistical Package for the Social Sciences (SPSS) version 22 to obtain frequencies, correlations, independent t-tests, multiple regression, and logistic regression for the variables of this research study. For the study presented here, a purposive sample of mothers ($N = 302$) who had both screening and delivery data, provided data for analyses. Upon inspection and data cleaning analyses, 13 cases did not have data on preterm birth and were excluded from further analyses. In this chapter, study findings are presented. First, a description of the sample will first be provided followed by the results related to the specific aims.

Study Profile

The study population consisted of racially, ethnically, and economically diverse women with depressive symptomatology, as measured by the EPDS with a cutoff score of ≥ 10 . Among the women in this sample the average score for the EPDS was $M=13.9 \pm 3.67$. Mothers ranged in age from 14-43 with a mean age of 28.3 ± 6.22 . Slightly more

than half (55.3%) were aged 23-32 years, 24.8% aged 33 or over, and 2.6% 18 years and younger. The sample was diverse although predominately Latina (80.5%), with representation from White (8.9%), Black (5.6%), Asian/Pacific Islander (3.6%), and other (1.3%). The primary language was Spanish (59.6%), 38.7% English, and 1.7% identifying language as “other.”

Based upon self-report, slightly more than half (53.3%) were never married, 35.1% married, and 11.6% divorced, separated, or widowed. Slightly less than half (45.1%) had an educational level of less than twelfth grade, 22.8% graduated high school or had a GED equivalent, 19.9% had some college or trade school, 3% completed an A.A./2-year college degree, 7.6% completed a B.A. or B.S./4-year college degree, and 1.7% had a graduate or professional degree. Eighty-two percent had a partner. Approximately half (50.3%) had an income level of less than \$14,999, 22.5% reported \$15,000-29,999, 6.6% \$30,000-54,999, 3.3% \$55,000-99,999, 2% reported \$100,000.00 or more, and 15.2% responded with “Don’t know”.

The percentage of smokers found in this sample was 5.6%; 18.9% quit smoking after learning they were pregnant, 75.5% were non-smokers. The average scoring for alcohol use (TWEAK) was $M=1.99 \pm 1.82$, for drug abuse (DAST-10) $M=3.3 \pm 2.02$, and the AAS average score was $M=.55 \pm .898$. A drug abuse score cut point at greater than 3 (DAST cut point 3+) signified a positive score; 7.6% positive score and 92.4% negative. The alcohol abuse measurement average score of greater than 3 (TWEAK cut point 3+) results in a positive score, with 13.6% scoring positive and 86.4% scoring negative. The violence score greater than 2 (AAS cut point 2+) 11.6% scoring positive and 88.4% scoring negatively.

Which pregnancy or the women's' gravida average was $M=3. \pm 2.107$. Only 5 (1.7%) of the women had multifetal pregnancies; all had twin pregnancies. The majority of women (98.3%) had singleton births. The overall mean gestation in weeks of infants born to women of this sample was $M=38.6 \pm 2.06$. Extremely premature infants from 24 to 27.99 weeks accounted for 0.7%, very premature infants 28 to 31.99 weeks accounted for 0.3%, and the largest percentage found were moderate to late premature infants from 32 to 36.99 weeks at 10.9%. Women who delivered prematurely or less than 37 weeks' gestation ($n=289$) accounted for 12.5% of the sample compared with 87.5% of women delivering an infant a term gestation. A higher percentage of women had medical complications during their pregnancy with 62.2%, compared with those who did not have complications, 37.8%. The number of medical complications found during pregnancy for all women were as follows: no medical complications 38.5%, 1 medical complication 16.5%, 2 medical complications 14.4%, 3 medical complications 13.4%, and 4 or more medical complications accounted for 17.2%. Medical complications ranged from pregnancy related to non-pregnancy related conditions. Gestational Diabetes accounted for 10.9%, with Type I & II diabetes accounting for an additional 6.8%, mental health disorders 9.7%, anemia 7%, hypertension 6.3%, genito-urinary conditions 5.8%, preeclampsia 4.1%, substance abuse 3.9%, obesity 3.4%, sexually transmitted infections 3.4%, and preterm labor 3.4%.

Over half (54%) of the women had spontaneous labor, 6.2% were induced, and 39.9% had a Cesarean section. When looking at the percentage of cesarean section versus non-cesarean section, the percentage of women who delivered via cesarean section was 40% compared to 60% who delivered vaginally. The baby's average birth weight in

grams was $M=3,303.2 \pm 660.37$. Thirty-one (11.1%) were born low birth weight or less than 2,500 grams. The average days the infants spent in the hospital was $M=11.45 \pm 8.33$. Babies who were found to have unusual problems, documented at birth, accounted for 33% of the sample. Twenty-four percent had infants admitted to the neonatal intensive care unit (NICU), the average days spent in the NICU was $M=11.45 \pm 15.2$. More than two thirds (64.4%) were exclusively breastfeeding at discharge from the hospital, 25.5% were breastfeeding and supplementing with formula, and 10.1% were not breastfeeding at discharge. Sample characteristics for the three samples are listed below in Table 1.

Table 1.

Sample Characteristics; Total sample, women who delivered prematurely, and women who delivered term

	Total (n=302)		Women who delivered prematurely (n=36)		Women who delivered term (n=253)	
Characteristic	N	%	N	%	N	%
Age at screening (years)						
<18 yrs	8	2.6	2	5.6	6	2.4
18-22	52	17.2	3	8.3	45	17.8
23-27	70	23.2	9	25	60	23.7
28-32	97	32.1	13	36.1	80	31.6
33-37	51	16.9	5	13.9	42	16.6
38+	24	7.9	4	11.1	20	7.9
Age (years) M(SD)	M	SD	M	SD	M	SD
	28.3	(6.22)	28.8	(6.23)	28.3	(6.194)
Race/Ethnicity						
Hispanic or Latino	243	80.5	31	86.1	199	78.7
White	27	8.9	2	5.6	25	9.9
Black/African American	17	5.6	2	5.6	15	5.9
Asian/Pacific Islander	11	3.6	1	2.8	10	4
Other	4	1.3			4	1.6

	Total (n=302)		Women who delivered prematurely (n=36)		Women who delivered term (n=253)	
Characteristic	N	%	N	%	N	%
Marital Status						
Married/Living together	106	35.1	13	36.1	90	35.6
Separated/Divorced/Widowed	35	11.6	7	19.4	27	10.7
Never Married/Single	161	53.3	16	44.4	136	53.8
Primary Language						
English	117	38.7	14	38.9	100	39.5
Spanish	180	59.6	22	61.1	148	58.5
Other	5	1.7			5	2
Education Level						
Less than sixth grade	18	6			17	6.7
Less than twelfth grade	118	39.1	15	41.7	96	37.9
High school or GED equivalent	69	22.8	12	33.3	53	20.9
Some college or trade school	60	19.9	6	16.7	54	21.3
A.A./2-year college degree	9	3	2	5.6	7	2.8
B.A. or B.S./ 4-year college degree	23	7.6	1	2.8	21	8.3
Graduate or professional degree	5	1.7			5	2
Have a partner						
No	54	17.9	7	19.4	44	17.4
Yes	248	82.1	29	80.6	209	82.6
Household income						
Less than \$14,999	152	50.3	18	50	125	49.4
\$15,000-29,999	68	22.5	12	33.3	54	21.3
\$30,000-54,999	20	6.6	2	5.6	18	7.1
\$55,000-99,999	10	3.3			10	4
\$100,000 or more	6	2.0			6	2.4
Don't know	46	15.2	4	11.1	40	15.8
Tobacco use						
Current smoking	17	5.6	2	5.6	14	5.5
Quit after learning of pregnancy	57	18.9	5	13.9	51	20.2
Does not smoke	228	75.5	29	80.6	188	74.3
EPDS Score M (SD)						
	M	SD	M	SD	M	SD
	13.9	(3.67)	12.94	(3.24)	13.92	(3.55)
Alcohol Use (TWEAK Score)						
	n=141				n=123	
M (SD)	M	SD	M	SD	M	SD
	1.99	(1.82)	2.67	(2.61)	1.89	(1.68)
Drug Use M (SD)						
	n=38				n=32	
(DAST Score)	M	SD	M	SD	M	SD
	3.3	(2.02)	1.4	(.89)	3.56	(2.03)
Abuse score for IPV M (SD)						
(AAS Score)	M	SD	M	SD	M	SD

	Total (n=302)		Women who delivered prematurely (n=36)		Women who delivered term (n=253)	
Characteristic	N	%	N	%	N	%
	.55 (.898)		.58 (1.13)		.53 (.84)	
DAST Cut point 3+					n=253	
Negative	279	92.4	35	97.2	232	91.7
Positive	23	7.6	1	2.8	21	8.3
TWEAK cut point 3+					n=253	
Negative	261	86.4	32	88.9	219	86.6
Positive	41	13.6	4	11.1	34	13.4
AAS cut point 2+					n=253	
Negative	267	88.4	31	86.1	226	89.3
Positive	35	11.6	5	13.9	27	10.7
Which pregnancy	n=300				n=252	
	M	SD	M	SD	M	SD
	3.26 (2.107)		3.89 (2.34)		3.17 (2.04)	
Multiple gestations	n=297					
No	292	98.3	34	94.4	250	98.8
Yes	5	1.7	2	5.6	3	1.2
Multiple gestation type						
Twins	5	1.7	2	5.6	3	1.2
Weeks' gestation M (SD)	n=288				n=252	
	M	SD	M	SD	M	SD
	38.6 (2.06)		34.61 (2.85)		39.12 (1.09)	
Weeks' gestation (categorized)	n=288					
Extremely premature (24-27.99)	2	.7	2	5.6		
Very premature (28-31.99 weeks)	1	.3	1	2.8		
Moderate to late premature (32 to 36.99 weeks)	33	10.9	33	91.7		
Premature birth (less than 37 weeks)	n=289					
	253	87.5				
No	36	12.5				
Yes						
Medical complications during pregnancy	n=291				n=251	
	110	37.8	6	16.7	104	41.4
No	181	62.2	30	83.3	147	58.6
Yes						
Number of medical complications M (SD)	n=291				n=251	
	M	SD	M	SD	M	SD
	1.66 (1.76)		2.72 (1.75)		1.53 (1.72)	

	Total (n=302)		Women who delivered prematurely (n=36)		Women who delivered term (n=253)	
Characteristic	N	%	N	%	N	%
Number of medical complications	n=291				n=251	
None	112	38.5	6	16.7	104	41.4
1	48	16.5	2	5.6	44	17.5
2	42	14.4	7	19.4	35	13.9
3	39	13.4	11	30.6	28	11.2
4 or more	50	17.2	10	27.8	40	15.9
Type of labor	n=291				n=252	
Spontaneous	157	54	14	38.9	141	56
Induced	18	6.2	3	8.3	15	6
Cesarean section	116	39.9	19	52.8	96	38.1
C-section	n=291				n=252	
No	175	60	17	47.2	156	61.9
Yes	116	40	19	52.8	96	38.1
Days infant in the hospital M (SD)	n=265				n=235	
	M SD		M SD		M SD	
	11.45 (8.33)		13.83 (16.17)		3.52 (5.94)	
Baby weight in grams M (SD)	n=280				n=244	
	M SD		M SD		M SD	
	3,303.2 (660.37)		2,371.69 (737.74)		3,440.6 (524.21)	
Baby weight in grams	n=280				n=244	
Low birth weight (less than 2,500 grams)	31	11.1	20	55.6	11	4.5
Normal birth weight (2,500 grams or more)	249	88.9	16	44.4	233	95.5
Unusual problems at birth	n=280					
No	188	67.1	11	30.6	176	72.4
Yes	92	33	25	69.4	67	27.6
NICU admission	n=279				n=243	
No	212	76	7	19.4	205	84.4
Yes	67	24	29	80.6	38	15.6
NICU days M (SD)	n=62				n=38	
	M SD		M SD		M SD	
	11.45 (15.2)		15.54 (17.34)		8.87 (13.43)	
Breastfeeding at discharge	n=267		n=33		n=234	
Not breastfeeding	27	10.1	8	24.2	19	8.1
Yes, exclusively (human milk)	172	64.4	8	24.2	164	70.1

	Total (n=302)		Women who delivered prematurely (n=36)		Women who delivered term (n=253)	
Characteristic	N	%	N	%	N	%
Yes and supplementing with formula	68	25.5	17	51.5	51	21.8

Aim 1. Describe the characteristics of racially/ethnically diverse women with depressive symptomatology who deliver prematurely compared to women who delivered term infants.

Characteristics of women who delivered prematurely

Women who delivered prematurely accounted for 12.5% (n=36) of the total sample. The average age was 28.8 ± 6.23 years; 61.1% fell in the age range of 23-32 years of age. Eighty-six percent reported race/ethnicity Hispanic, 5.6%. White and other 8.3%. Spanish was reported as the primary language by 61.1%. Slightly less than half (44.4%) reported never married or single; 36.1% married or living together; and 19.4% separated/divorced/widowed. Twenty-nine (80.6%) identified having a partner. Approximately 41.7% reported less than a twelfth grade education and 33.3% had high school or GED equivalent, 16.7% some college or trade school, 5.6% A.A./2-year college degree, and 2.8% a B.A. or B.S./4-year college degree. None of the women who delivered prematurely had a graduate or professional degree. Half reported annual household income less than \$14,999, 33% reported \$15,000-29,999, 5.6% reported \$30,000-54,999, and 11.1% did not know.

Women who delivered prematurely had an average EPDS score of $M=12.94 \pm 3.24$. Edinburgh Postnatal Depression Scale mean scores for mothers with preterm birth

were lower than those who delivered term infants but they were not statistically significantly different. For alcohol abuse, the mean score for the TWEAK was 2.67 ± 2.61 , and for drug abuse DAST 10, $M = 1.4 \pm .89$. The drug abuse cut point of 3+ or a positive score was found with 2.8% of women; 97.2% scored negative. The alcohol abuse cut point of 3+ or a positive score was found with 11.1%. The violence abuse cut point of 2+ was considered a positive score and 13.9% were found scoring positive.

Which pregnancy or gravida level the woman was at was $M = 3.89 \pm 2.34$. Multiple gestations were found in 94.4% of the women who delivered prematurely, multifetal pregnancies accounted for 5.6% of the subsample with two sets of twin pregnancies. Premature infants of the mothers ranged from extremely premature (24-27.99 weeks' gestation) 5.6%, very premature (28-31.99 weeks' gestation) 2.8%, and the majority for moderate to late premature (32 to 36.99 weeks' gestation) category with 91.7%.

Medical complications during pregnancy were found in 83.3% of these women, the mean number medical complications during pregnancy for women who delivered prematurely were 2.72 ± 1.75 . No medical complications were reported by 16.7%; 1 medical complication 5.6%; 2 medical complications 19.4%; 3 medical complications 30.6%; and 4 or more medical complications, 27.8%. Slightly more than half (52.8%) reported cesarean birth, 38.9% reported spontaneous, 8.3% reported induced labor, and 47.2% reported a vaginal birth.

The infant's mean weight was $2,371.69 \pm 737.74$ grams, 55.6% were born low birth weight or less than 2,500 grams, 44.4% were a normal birth weight or greater than 2,500 grams. Unusual problems at birth were found in 69.4% , 80.6% were admitted to

the NICU, the average days infants spent in the NICU were $M=15.54 \pm SD=17.34$. The average days the infants spent in the hospital were $M=13.83 \pm 16.17$. Eight (24.2%) mothers were not breastfeeding at discharge, 8 (24.2%) were exclusively breastfeeding, and slightly more than half (51.5%) were breastfeeding and supplementing with formula.

Independent Samples T-test

To determine the differences between the ethnically diverse women with depression symptomatology who delivered prematurely compared to those who delivered term infants, independent samples t-tests were performed. Group statistics were first calculated with the interval variables. Levene's test for equality of variance was performed to determine if the variances were homogenous. A significant value for the t-test for equality of means was considered at a level of $p = <.05$.

Independent t-tests were run for the following variables: age at screening, EPDS score, TWEAK score, DAST score, AAS score, gravida rank, number of medical complications, days infant in was in the hospital, weeks' gestation, baby's weight in grams, and NICU days. Not all of these variables achieved statistically significant differences. Statistically significant differences were found between the two groups of women when comparing the means of the drug abuse scores ($t(35) = 2.32, p = <.05$). Women who delivered term infants had a higher mean drug abuse scores $M=3.56 \pm 2.03$ than women who delivered premature infants $M=1.4 \pm .89$. The number of medical complications women had during their pregnancies was significantly different ($t(285) = -3.88, p = <.01$). Women who delivered prematurely had significantly more medical complications $M=2.72 \pm 1.75$ than the women who delivered term $M=1.53 \pm 1.72$.

In addition, the days the infant was in the hospital was significantly different between these two groups ($t(28) = -3.85, p < .01$). Women who delivered prematurely $M = 13.83 \pm 16.17$ had an increase in the amount of days spent in the hospital compared to those who delivered at term $M = 2.24 \pm 1.02$. The weeks' gestation was significantly different between these two groups ($t(44) = 8.51, p < .01$). Women who delivered prematurely had infants born at fewer weeks' gestation $M = 34.61 \pm 2.85$ than women who delivered term $M = 38.91 \pm 1.04$. The baby's weight in grams was also significantly different among women who delivered premature infants versus those who did not ($t(70) = 6.57, p < .01$). Women who delivered term, delivered larger babies in grams $M = 3,403.42 \pm 586.048$ compared to those who delivered prematurely $M = 2,371.69 \pm 737.74$. The results for the variables of hospitalized days for infant, weeks' gestation, and baby's weight require caution with interpretation due to violations of the assumption of homogeneity of variance and unequal sample sizes. Statistical procedures were performed to account for this issue and significant results remained.

Lastly, the results for NICU admission rate indicated 212 of infants were not admitted to the NICU and 67 were admitted. The mean value for the number of medical complications of mothers who had babies admitted to the NICU is 2.82 ± 1.766 as compared to 1.30 ± 1.586 for those mothers who did not have a baby admitted to the NICU. Women who had a baby admitted to the NICU had a statistically significant greater number of medical complications (2.82 ± 1.766) than those who did not have a baby admitted to the NICU ($1.30 \pm 1.586; t(277) = -6.647, p = .000$).

Twenty-nine premature infants were admitted to the NICU, 7 were not. Admission is expected as infants born prematurely are more likely to be admitted to the

NICU for further care and intervention. The mean value for the number of medical complications for the mothers who had infants admitted to the NICU was 3.07 ± 1.689 as compared with 1.29 ± 1.254 for those moms who did not have a baby admitted to the NICU. Therefore women who had a baby admitted to the NICU had a statistically significant greater number of medical complications (3.07 ± 1.689) than those who did not have a baby admitted to the NICU (1.29 ± 1.254 ; $t(34) = -2.613$, $p = .013$).

Table 2.

Statistically significant mean differences for mothers delivering prematurely and those delivering term infants

	Preterm Birth	Term Birth	t-test
Drug abuse score	M = 1.4 ($\pm .89$)	M = 3.56 (± 2.03)	2.324*
Days infant in hospital	M = 13.83 (± 16.17)	M = 2.24 (± 1.02)	-3.851**
Weeks' gestation	M = 34.61 (± 2.85)	M = 38.91 (± 1.04)	8.509**
Baby weight in grams	M = 2,371.69 (± 737.74)	M = 3403.42 (± 586.048)	6.570**
Number of medical complications	M = 2.72 (± 1.75)	M = 1.53 (± 1.72)	-3.879**

$p < .05 = *$

$p < .01 = **$

Table 3.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Drug abuse (DAST)	Equal variances assumed	2.614	.115	2.324	35	.026
	Equal variances not assumed					
Days Infant in hospital	Equal Variances Assumed					
	Equal Variances Not assumed	29.989	.000	-3.851	28	.001
Weeks' gestation	Equal Variances Assumed					
	Equal Variances Not assumed	11.205	.001	8.509	44	.000
Baby weight in grams	Equal Variances Assumed					
	Equal Variances Not assumed	.740	.393	6.570	70	.000
Number of medical complications	Equal Variances Assumed	.197	.657	-3.879	285	.000
	Equal Variances Not assumed					

Aim 2. Examine the relationship between Demographic Characteristics (age at screening, race/ethnicity, primary language, marital status, presence of a partner, educational level, household income), Maternal Risk Factors (EPDS score, alcohol abuse, drug abuse, tobacco use, intimate partner violence, gravida rank, antenatal and perinatal medical complications), Maternal Outcomes (type of labor, type of delivery), Infant Outcomes (preterm birth, weeks' gestation, baby birth weight in grams, low birth weight or normal birth weight of infant, unusual problems at birth, NICU admission, NICU days, hospitalized days, breastfeeding

status at discharge) and the occurrence of premature birth among racially/ethnically diverse women with depression symptomatology.

Chi-square tests for categorical variables, ANOVA, or t-test for continuous variables by categorical variables, and correlations between continuous variables were used to examine bivariate relationships between participant characteristics and preterm birth.

Cross tabulations

Cross tabulations were performed for the nominal and ordinal variables. Significant relationships were found among several variables with the outcome variable of whether or not the baby was premature.

Chi-square tests indicated infant's birth weight ($\chi^2 = 83.03$, $df = 1$, $p = .000$), the presence of unusual problems documented at birth ($\chi^2 = 24.87$, $df = 1$, $p = .000$), infants admitted to the NICU ($\chi^2 = 72.42$, $df = 1$, $p = .000$), mothers' medical complications ($\chi^2 = 8.17$, $df = 1$, $p = .004$), number of medical complications mothers had during pregnancy ($\chi^2 = 19.761$, $df = 4$, $p = .001$), and breast feeding status at discharge ($\chi^2 = 26.9$, $df = 2$, $p = .000$) were significantly related to whether or not the baby was premature or not, respectively.

Eleven (4.5%) women delivered term infants who had a low birth weight; 20 (55.6%) infants born preterm were born at a low birth weight. Low birth weights accounted for a higher percentage, 64.5% among premature infants, only 6.4% of infants with a normal birth weight were born premature.

One hundred seventy-six (72.4%) term and 11(30.6%) preterm infants did not have any unusual problems at birth; 67(27.6%) term and 25(69.4%) preterm infants had an unusual problem at birth. Thirty-eight (15.6%) of term and 29(80.6%) preterm infants were admitted to the NICU. There were 7 (9.4%) preterm infants who were not admitted to the NICU. NICU admissions were higher among premature infants at 43.3% compared to no admission 3.3%.

Whether or not the baby was premature was significantly related to whether or not the mother had medical complications during her pregnancy ($\chi^2 = 8.171$, $df=1$, $p =.004$). There were 104 (41.4%) women who delivered term infants who had medical complications during pregnancy, 147 (58.6%) did not. Six (16.7%) mothers who delivered prematurely had no medical complications, 30 (83.3%) had medical complications.

The number of medical complications women had during their pregnancy was also significantly related to whether or not the infant was born term or premature ($\chi^2 = 19.761$, $df = 4$, $p =.001$). One hundred four (41.4%) women had no medical complications, 44 (17.5%) had 1 medical complication, 35 (13.9%) 2 medical complications, 28 (11.2%) 3 medical complications, and 40 (15.9%) 4 or more medical complications delivered at term. For preterm birth 6 (16.7%) had no medical complications, 2 (5.6%) 1 medical complication, 7 (19.4%) 2 medical complications, 11(30.6%) had 3 medical complications, and 10 (27.8%) had 4 or more medical complications. Higher percentages of medical complications were found with 3 or more medical complications for women who delivered prematurely.

Whether or not a baby was admitted to the NICU was significantly related to the number of medical complications during a woman's pregnancy ($\chi^2 = 39.954$, $df = 4$,

$p = .000$). The statistically significant relationships found are displayed below in Table 5.

Table 4

Cross tabulation

Medical complications * Baby Premature					
Medical complications during pregnancy					Significance
	No	Yes	Total	Chi-square	
Baby Premature					
No	Count	104	147	251	$\chi^2=8.171$ $df=1, p=.004$
	% within baby premature	41.4%	58.6%	100%	
	% within medical complications	94.5%	83.1%	87.5	
Yes	Count	6	30	36	
	% within baby premature	16.7%	83.3%	100%	
	% within medical complications	5.5%	16.9%	12.5%	
Total					
	Count	110	177	287	
	% within baby premature	38.3%	61.7%	100%	
	% within medical complications	100	100	100	

$p < 0.05 = *$

$p < 0.01 = **$

Table 5

Chi-square test results

Premature Birth			χ^2	<i>p</i>
	Yes n=36	No n=253		
Baby weight in grams			83.03	.000
Low birth weight	55.6% (20)	4.5% (11)		
Normal birth weight	44.4% (16)	95.5% (233)		
Unusual problems at Birth			24.87	.000
Yes	69.4% (25)	27.6% (67)		
No	30.6% (11)	72.4% (176)		
Admitted to the NICU			72.42	.000
Yes	80.6% (29)	15.6% (38)		
No	19.4% (7)	84.4% (205)		
Medical complications			8.17	.004
Yes	83.3% (30)	58.6% (147)		
No	16.7% (6)	41.4% (104)		
Number of medical complications			19.76	.001
None	16.7 (6)	41.4% (104)		
1	5.6% (2)	17.5% (44)		
2	19.4% (7)	13.9% (35)		
3	30.6% (11)	11.2% (28)		
4 or more	27.8% (10)	15.9% (40)		
Breastfeeding at discharge			26.9	.000
Not breastfeeding	24.2% (8)	8.1% (19)		
Exclusively breastfeeding	24.2% (8)	70.1% (164)		
Breastfeeding and supplementing with formula	51.5% (17)	21.8% (51)		

Correlations

Correlations were performed to determine significant relationships among the continuous variables. A weak association was noted at a correlation coefficient of $\pm 0.1-0.3$, a moderate association was noted at $\pm 0.4-0.6$, and a strong association was noted at $\pm 0.7-0.9$, and a perfect relationship at ± 1 . Correlation coefficients were rounded to the nearest tenth to determine the strength of the correlation. A correlation matrix was constructed to identify the potential for multicollinearity, which can occur when there are moderate to high correlations among predictor variables.

Correlational analysis indicated a statistically significant inverse relationship between weeks' gestation and gravida ($r = -.207, p = < .01$); number of medical conditions during pregnancy ($r = -.309, p = < .01$); days infant remained in hospital ($r = -.377, p = < .01$); days in NICU ($r = -.314, p = < .05$); and a statistically significant positive relationship between weeks' gestation and baby's birth weight ($r = .439, p = .06$).

The drug abuse score or DAST score was positively correlated with which pregnancy the women had, with a moderate association ($r = .36, p = < .05$). The higher the drug abuse score the higher number of pregnancies a woman had. Which pregnancy was positively correlated with the number of medical complications, with a weak association ($r = .220, p = < .01$). The number of medical complications increased with more pregnancies. The household income of the women sampled was positively correlated with the educational level, with a weak association ($r = .183, p = < .01$). As women's household income increased so did their educational level and vice versa. The educational level was negatively correlated with the alcohol abuse score or TWEAK

score ($r = -.175, p = <.05$), with a weak association. As the educational level increased the alcohol abuse score decreased for the women sampled.

The depression score or EPDS was positively correlated with the abuse score or AAS ($r = .198, p = <.01$), with a weak association. As the depression score increased the substance abuse score increased. Educational level was negatively correlated with which pregnancy ($r = -.179, p = <.01$), with a weak association. As the educational level increased the amount of pregnancies decreased. Which pregnancy was negatively correlated with household income ($r = -.126, p = <.05$), with a weak association. As the amount of pregnancies increased, household income decreased. Which pregnancy was negatively correlated with weeks' gestation ($r = -.207, p = <.01$) with a weak association and was positively correlated with age at screening ($r = .495, p = <.01$) with a moderate association. When the number of pregnancies increased the weeks' gestation decreased. When the number of pregnancies increased the age at screening increased. The number of medical complications was negatively correlated with weeks' gestation ($r = -.309, p = <.01$), with a weak association. As the number of medical complications increased for women during their pregnancy the weeks' gestation decreased for their infants.

The number of medical complications and age at screening was positively correlated ($r = .151, p = <.05$), with a weak association. As the number of medical complications increased the age at screening increased. The weeks' gestation of the infant and the days the infant remained in the hospital were negatively correlated ($r = -.377, p = <.01$) with a moderate association. As weeks' gestation increased the days an infant spent in the hospital decreased. The weeks' gestation and the baby's weight in grams was positively correlated ($r = .439, p = <.01$), with a moderate

association. As the weeks' gestation increased the baby's weight in grams increased. The age at screening and the days infant in hospital were positively correlated ($r = .144$, $p = <.05$), with a weak association. As the age at screening increased the days infants spent in the hospital increased. The weeks' gestation and the days in NICU were negatively correlated ($r = -.314$, $p = <.05$), with a weak association. As the weeks' gestation increased the days spent in the NICU decreased. Which pregnancy and the days infants were in the hospital were positively correlated ($r = .155$, $p = <.05$), with a weak association. With more pregnancies for women there was an increase in the days infants spent in the hospital.

The number of medical complications and days infant in hospital were positively correlated ($r = .372$, $p = <.01$), with a moderate association. As the number of medical complications increased the days the infant remained in the hospital also increased. The number of medical complications and baby weight in grams was negatively correlated ($r = -.212$, $p = <.01$), with a weak association. As the number of medical complications increased the baby's weight in gram decreased. The days the infant was in the hospital was negatively correlated with the baby weight in grams ($r = -.200$, $p = <.01$), with a weak association. As the days increased for the infant's hospital stay, the infant's weight in grams decreased. The days spent in the NICU and baby weight in grams were negatively correlated ($r = -.384$, $p = <.01$), with a moderate association. As the days an infant spent in the NICU increased, the baby's weight in grams decreased.

Regression Analysis

Simultaneous multiple regression was conducted to determine the degree to which the independent variables of gravida rank, medical complications during pregnancy, and

unusual problems at birth predicted weeks' gestation among ethnically and racially diverse women with depressive symptomatology. The variables chosen for the regression analysis were based on the significant findings from prior statistical analyses for this study. Regression results indicated that the model significantly predicted weeks' gestation (see Table 6.).

Weeks' gestation

The model explained 16% of the variance in the weeks' gestation: $R^2 = .156$, $R^2 \text{ adj} = .147$, $F(3,275) = 16.912$, $p = .000$. Unusual problems at birth and medical complications significantly contributed to the model. A summary of regression coefficients for weeks' gestation is presented in Table 6.

Table 6

Regression Model for Weeks' Gestation

<u>Independent Variable</u>	<u>Weeks' gestation</u>			
	<i>r</i>	Beta	<i>t</i>	<i>p</i>
Unusual problems at birth	-.313	-1.125	-4.497	.000
Number of medical complications during Pregnancy	-.298	-.258	-3.739	.000
Gravida rank	-.144	-.068	-1.208	.228
N = 288				
R^2	.16			
Adjusted R^2	.15			
F	16.92, $p = .000$			

Logistic Regression

Logistic regression analysis was conducted to estimate the probability of preterm birth when the independent variables of gravida rank, medical complications during

pregnancy, and unusual problems at birth were utilized as predictors in the logistic regression model. Logistic regression results indicated that the model significantly predicted the likelihood of preterm birth ($\chi^2(3) = 31.517, p = .000$), among the sample of ethnically and racially diverse women with depression symptomatology. The model was successful in classifying 87% of the women in the sample. With the exception of gravida rank, the independent variables, unusual problems at birth and medical complications, were significant in predicting the likelihood of preterm birth. Infants with the presence of unusual problems at birth were 4.873 more times likely to be preterm. As each additional medical complication during pregnancy increased by 1 unit, the odds or likelihood of preterm birth increased by 1.289. A summary of the logistic regression results are presented in Table 7.

Table 7

Logistic Regression results predicting the probability of a preterm birth (N=279)

Predictor	<i>b</i> (SE)	Wald	Odds Ratio	95% CI, Odds Ratio	
				Lower	Upper
Unusual problems at birth	1.584 (.400)	15.656**	4.873	2.224	10.68
Number of Medical complications during pregnancy	.254 (.106)	5.751*	1.289	1.048	1.587
Gravida rank	.074 (.082)	.812	1.077	.917	1.266

Model (likelihood ratio) chi-square = 31.517, $df = 3$, $p = .000$

Nagelkerke $R^2 = .199$

Percent correctly classified = 87%

Reference category = Preterm Birth or Term Birth

* $p < .05$

** $p = < .01$

Chapter V

Discussion

The purpose of this descriptive, correlational study was to identify factors associated with preterm birth among a sample of racially and ethnically diverse women with depressive symptomatology. In this chapter, a discussion of the significance of the study related to the health sciences, nursing science, and establishes the connection to national and global health initiatives is presented. Future research directions, strengths, and limitations of this study will also be provided.

Significance of Research Findings

Women remain vulnerable to the threat of delivering a premature infant during their pregnancy due to the unknown etiology of premature birth processes. While many factors have been identified that predispose a woman to premature birth, not one has been determined as a sole causative agent. Factors including a history of preterm birth, current multifetal pregnancy, and some uterine and or cervical abnormalities (March of Dimes, 2007) have been found to increase the risk of a premature delivery. Medical conditions such as diabetes mellitus, hypertension, late or no prenatal care, smoking, alcohol and illicit drug use, and infection, particularly genito-urinary infections, have been also identified as possible risk factors (March of Dimes, 2007). It is important to further identify risk factors that can influence prevention strategies.

The percentage of multiple gestations for the total sample was small at 1.7% or 5 births. Among the 36 women who delivered prematurely, it was identified that only a

small percentage 5.6% or 2 of the premature births were multiple gestation. This provided more clarity and understanding regarding the total percentage and the percentage that may have contributed to the preterm births. Multiple gestation pregnancies are known to increase the risk of preterm birth. Therefore, a large percentage of multiple gestations were not a contributing cause or factor to the overall high percentage of preterm births in the sample.

Women had a number of medical complications that were identified during chart abstraction. The conditions ranged from pre-existing conditions such as obesity, hypertension, mental health disorders, as well as pregnancy induced conditions such as gestational diabetes and preeclampsia. This study adds to the current research by demonstrating a relationship between medical complications and premature birth. The mothers who delivered prematurely had more medical complications than those who did not and this is consistent with the literature. However, the findings of this study are unique in identifying these factors in a predominately racially and ethnically diverse sample with a positive screening for depressive symptoms.

Research examining women who are ethnically diverse, particularly Latina, with depressive symptoms and a preterm birth are underrepresented in the current literature. Ethnically diverse women have an additional layer of vulnerability including language barriers, cultural factors, educational, and income factors that predispose them to adverse conditions and outcomes such as depression and premature birth and requires further investigation.

This research study also identified among the women sampled, that smoking, drug, and alcohol use were not found to be a statistically significantly related factor to

premature birth. Overall, the use of tobacco, alcohol, and drugs were not found in a high percentage of women in this sample. Women who delivered prematurely in this sample actually had lower levels of drug use than women with term births, which was an unexpected finding and in contrast to findings in the literature. Further research to understand the unique relationship of these factors among ethnically diverse women is imperative and necessary for further health care policy development. Factors surrounding smoking, drug, and alcohol use among diverse women require further knowledge as to their relationship between the reasons why culture may or may not influence substance abuse.

Many questions remain. Is health information related to prematurity that is culturally appropriate reaching women of this sample? Health literacy and language barriers are important factors to consider for education for patients. Are resources available for these women such as adequate nutritional support, medical management, and mental health counseling during pregnancy? Why are ethnically diverse women with depressive symptoms and medical complications delivering premature infants at a higher rate than women without medical complications? Why do the number of medical complications during pregnancy for these particular women matter? It is well documented in the literature that medical complications add further physiological stress to a woman's body during pregnancy. This additional factor needs further exploration as to the biological and physical processes that are altered as such particularly for racially and ethnically diverse women.

This study also provides new information about the infants of ethnically diverse women with depressive symptoms who deliver prematurely. Information regarding the

outcomes of the premature infants was described and identified by examining the amount of days spent in the hospital and the neonatal intensive care unit (NICU), birth weights, gestational age in weeks, and breastfeeding percentages.

Overall it was found that infants among women in this sample, particularly those who delivered prematurely, had unusual problems at birth. While this study was not able to demonstrate a likelihood of events surrounding premature birth as did Bansil et al. (2010) who found women with depression were more likely to experience adverse maternal and fetal outcomes, spend more time in the hospital, and incur higher hospital charges, overall the findings were consistent with adverse infant outcomes among premature infants such as lower birth weights, longer lengths of stay, and smaller percentages of mothers breastfeeding their premature infants at discharge.

This research found that a high percentage of preterm births were in the moderate to late preterm birth category. In 2013, 7.99% of babies were born late preterm or 34 to 36 weeks gestation in the United States (Martin et al. 2015). This study found 10.9% of infants were in the moderate to late preterm category, which is higher than the national average for late preterm birth percentages. Of those infants delivered prematurely, 91.7% were found to be in the moderate to late preterm category, which is consistent with the current national and local statistic trends. Late preterm infants continue to remain vulnerable to adverse neurodevelopmental issues. The morbidity and mortality for late preterm infants contributes to the overall neonatal mortality rate and remains a concern for health care professionals and organizations such as the March of Dimes who recognize the impact of the late preterm birth on future health outcomes over the lifespan. Liu et al. (2015) recently conducted a systematic analysis to determine the causes of

childhood mortality from 2000-2013 on a global, regional, and national level. Liu et al. (2015) found preterm birth complications to be one of the leading causes of death for children under 5 years of age.

The cost to care for a premature infant remains extremely high and the long-term adverse outcomes and significant health care burdens for these infants and their families remains a serious health priority. Average NICU days were 11.45 days, which can be translated to a tremendous amount of health care costs.

The significance of each research aim will be described, followed by suggestions for further research and how this study is relevant to nursing science and the nursing profession.

Aim 1

The first aim of this study was to describe the characteristics of racially/ethnically diverse women with depressive symptomatology who deliver prematurely compared to women who delivered term infants.

Overall, women who delivered prematurely accounted for 12.5% of the sample, which is higher than the national average of premature births currently at 11.4% (March of Dimes, 2014b). All of the women had depressive symptoms with positive EPDS scores of ≥ 10 as a cut point for a positive depression score. This is consistent with the literature noting that perinatal depression has been identified in high-risk groups of women who are racially and ethnically diverse. Women were primarily Hispanic (86.1%), with an average age of 28.8 years (SD=6.23), primarily Spanish speaking (61.1%), with an educational level of high school/GED or less (75%). These women mostly had a partner (80.6%) and over half were low-income, earning under \$29,999

(83.3%). A large percentage were non-smokers (80.6%), did not score positive for drug abuse with (97.2%) scoring negative, and did not score positive for alcohol abuse with (88.9%) scoring negative. Over three quarters (86.1%) of the women did not screen positive for abuse for Intimate Partner Violence. This was on average the third pregnancy for the women ($M=3.89$, $SD=2.34$). Multiple gestations did not account for a large percentage of premature births with only 5.6% delivering multiple infants with two sets of twins.

The majority of women delivered moderate to late premature infants (32-36.99 weeks) (91.7%), then extremely premature (24-27.99 weeks) (5.6%), with the least in the 28-31.99 weeks) range (2.8%). Women had a large percentage of medical complications during their pregnancy (83.3%) with the majority having 3 or more medical complications (68.4%). Over half of the women delivered via cesarean section (52.8%), and had infants weighing an average of 2,371.69 grams ($SD=737.74$). Women delivering prematurely had mostly low birth weight babies (less than 2,500 grams) (55.6%), with a large percentage (69.4%) having unusual problems at birth. Infants were admitted to the NICU for 80.6% of the women delivering prematurely with average NICU days of $M=15.4$ ($SD=17.34$). Over half of these mothers were breastfeeding and supplementing with formula (51.5%), with a quarter exclusively breastfeeding (24.2%), and a quarter (24.2%) not breastfeeding.

When examining the difference between the women sampled who exhibited depressive symptoms and were ethnically diverse and had either a preterm or term infant, significant differences were found. Women who delivered term had a significantly higher drug abuse score $M=3.56$ ($SD=2.03$) compared to the women who delivered

prematurely $M=1.4$ ($SD=.89$). This was surprising as the literature describes drug abuse among women as a risk factor for premature birth (IOM, 2007).

The other significant difference between the two groups of women was found when examining the number of medical complications during pregnancy. Women who delivered prematurely had significantly more medical complications $M=2.72$ ($SD=1.75$), than women who delivered term $M=1.53$ ($SD=1.72$). Based on the literature and the IOM report (2007) this information supports existing research related to factors that are associated with preterm birth.

Aim 2

The second aim of this study was to examine the relationship between demographic characteristics (age at screening, race/ethnicity, primary language, marital status, presence of a partner, educational level, household income), maternal risk factors (EPDS score, alcohol abuse, drug abuse, tobacco use, intimate partner violence, gravida rank, antenatal and perinatal medical complications), Maternal outcomes (type of labor, type of delivery), Infant Outcomes (preterm birth, weeks' gestation, baby birth weight in grams, low birth weight or normal birth weight of infant, unusual problems at birth, NICU admission, NICU days, hospitalized days, breastfeeding status at discharge and the occurrence of premature birth among racially/ethnically diverse women with depression symptomatology).

A correlation matrix was computed to identify relationships between all pairs of variables. Inter correlations between predictor and outcome variables showed significant correlations ranging from .34 to .71. Correlation significance ranged from a level of $p \leq .05$ and $p \leq .01$.

There were significant positive relationships with household income and educational level which was an expected finding. The age at screening and gravida was significantly correlated which would be expected, as women age they may have more pregnancies over time. The EPDS score positively correlated with gravida, which was an interesting finding. With each subsequent pregnancy, screening scores for the EPDS become more elevated. The weeks' gestation was negatively correlated with the days an infant remained in the hospital which was to be expected given that infants born premature or at earlier weeks' gestation require further interventions and care for survival. Additionally, the weeks' gestation was also positively significantly related with the baby's weight in grams. This was an anticipated finding recognizing that infants born prematurely are typically born at lower birth weights due to their gestational size. Another anticipated finding was a significant inverse relationship between the weeks' gestation of an infant and the days spent in the NICU. The more preterm an infant is the more days are required for care and intervention. Preterm infants are typically discharged at what would have been their original anticipated due date and the more preterm the infant is the more days required to establish milestones and criteria for discharge from the NICU.

The days an infant spent in the hospital were significantly inversely related to their weight in grams. This was also an expected finding, premature infants born at a lower weight require more days in the NICU which would translate to a longer overall hospital length of stay. The days an infant spent in the NICU was significantly related negatively to the baby's weight in grams. This was an expected finding with infants at

lower birth weights requiring further time, care, and intervention to achieve milestones for discharge from the NICU.

Infants born at a low or normal birth weight was significantly related to whether or not the women delivered prematurely. The women who delivered prematurely had a larger percentage (64.5%) of low birth weight (weight less than 2,500 grams) and only 6.4% were born at a normal birth weight (weight greater than or equal to 2,500 grams). This was an expected finding, however, interesting when examining the weeks' gestation that most women delivered premature infants; a majority in the moderate to late preterm range requires further examination to determine if those infants were lower birth weights compared to the general range of weights for moderate to late preterm infants. If in fact the women delivered moderate to late preterm infants at lower weights, this would need further examination and future research as to why this phenomenon may be occurring among this sample of women.

A significant positive relationship was found among mothers who delivered prematurely and the presence of unusual problems at birth. This was an interesting finding as not all infants born prematurely have congenital issues, however most require additional advanced airway support and will exhibit a degree of respiratory distress. However, the unusual problems documented ranged from congenital anomalies to adverse birth or delivery events. These women in particular delivered premature infants with over two-thirds (69.4%) with unusual problems.

A significant relationship was found between mothers who delivered prematurely and whether or not their infant was admitted to the NICU with a large percentage (80.6%) requiring NICU admission. Even with a predominately large group of moderate to late

preterm infants for these women (91.7%) they still required intervention and care for sustaining physiological functioning. This provides further information regarding the need for more assessment and monitoring of this fragile group of infants. These infants struggle with breathing difficulties, feeding, and temperature regulation. Often these infants are discharged too soon and do not receive adequate follow-up care.

The relationship between premature birth and whether or not a woman had a medical complication during her pregnancy was significantly related. Almost all of the women who delivered prematurely had a presence of medical complications (83.3%) and a greater number of medical complications with (77.8%) having 2 or more medical complications during their pregnancy. This was an alarming finding. Inferences cannot be determined at this time as to whether or not depression has a role in the development of more medical complications. However, it would be important for future research to help elucidate this finding.

Women who delivered prematurely with depressive symptoms had a statistically significant relationship to whether or not they were breastfeeding at discharge. Among these women almost one third (29.6%) were not breastfeeding at discharge, 25% were receiving a combination of breast milk and supplementation of formula, and only 4.7% were exclusively fed breast milk. This provided interesting information and provides more information as to the unique relationship between breastfeeding a premature infant for an ethnically diverse woman with depressive symptoms. According to a recent study by Hwang et al. (2013) mothers of late preterm infants were significantly less likely to initiate and continue breastfeeding compared with mothers of term infants and this supports previous studies. Often it is difficult for a mother to pump breast milk while her

infant is hospitalized in the NICU. Education, encouragement, and supplies are necessary to support mothers of NICU patients to establish and support lactation. Preterm infants require specialized feeding regimens, consultations from occupational and speech therapists, and careful assessment and monitoring for aspiration and feeding tolerance. This delicate balance presents challenges for the mother who wishes to breastfeed or provide breast milk for her premature infant. Also fear of the infant's fragile condition may be a potential factor as to why a mother may not initiate breastfeeding. Further information is necessary to understand this unique relationship.

Aim 3

The third aim was to assess the likelihood of preterm birth among ethnically and racially diverse women with depression symptomatology. The findings of the logistic regression model underscore the importance of recognizing and considering medical complications during pregnancy and their contribution to adverse birth outcomes. In this study when the number of medical complications increased by 1 unit the likelihood of preterm birth increased 1.289 times. Preterm infants have a multitude of problems and health challenges when they are born. This study found that when mothers have medical complications during their pregnancy the likelihood of a preterm birth increases. Recognizing that this sample of mothers also have depression symptoms and are diverse adds an additional layer of complexity to the relationship. Additionally, preterm infants have a variety of unique and individual needs compared to term infants. This study further highlights these special considerations and important healthcare needs, with finding that infants born with unusual problems at birth were almost five times more likely to be preterm.

Strengths and Limitations of the Study

The findings of this study must be taken in the context of several limitations. The ability to compare these women to women who did not have depression is one of the biggest limitations. Current studies have examined the presence of depression among women with a preterm birth and for women without depression and their percentage of preterm births. This study was only able to examine women with the presence of depressive symptoms and did not take account their differences compared to a similar sample of women who did not have depression symptoms. The ability to generalize findings will be specific to racially and ethnically diverse sample of women. Additionally, limitations are related to data obtained from chart abstraction and secondary data analysis methods. Despite these limitations there are several strengths. One of the strengths of this study is there are not any current studies identifying factors associated with premature birth among racially and ethnically diverse women with depressive symptomatology. The data were rich with information describing these women to understand their unique characteristics and differences. This study shed new light on premature birth rates among ethnically and racially diverse women with depressive symptomatology.

Further analysis with a larger sample of ethnically and racially diverse mothers with and without depression would provide further clarity and insight into the relationship between depression and preterm birth.

Future Research

The findings from this study provide the basis for additional research related to premature birth among ethnically diverse women with depressive symptomatology.

Further research is required with a larger sample of mothers collected prospectively with and without depressive symptoms to compare their birth outcomes and to determine whether or not ethnically and racially diverse women with depressive symptoms are more likely to have preterm births than women who do not have depressive symptoms. With depression remaining a predominant feature among women before, during, and after pregnancy, recognition for screening and early identification is paramount in providing care and treatment to combat the devastating effects. With a combination of unknown etiology of prematurity, ethnic diversity, and a psychosocial determinant such as depression, and the gaps in the literature surrounding the association of these variables, women with any of these characteristics remain even more vulnerable to negative outcomes. Future research should include identifying the likelihood of women delivering prematurely who have the presence of depression. Other future research should include investigating the factors surrounding women who are ethnically and racially diverse with depression and their perceptions of breastfeeding. In addition further research for women who have premature births and depression and the factors that may or may not influence their breastfeeding initiation and continuation would be important to help understand the unique challenges surrounding breastfeeding for women with depression and preterm births.

Implications for Nursing Practice

Nurses are in the perfect position to recognize, advocate, and promote health for patients in the maternal-child health domain. Women at risk for adverse medical complications and health issues can be identified by a nurse's astute assessment skills of physical and psychosocial underlying history and present health status. By recognizing a

population at-risk for adverse outcomes early, identification and screening can be conducted to provide intervention and management that is optimal for the patient's needs. Working with pregnant women is a delicate balance of nurturing and meeting the needs of the mother and her unborn child. With many women entering pregnancies with an increase in co-morbidities such as obesity and hypertension, nurses are challenged with caring for pregnant women with complex health care needs. The psychosocial health care needs, particularly depression, require as much attention as the physical needs and nurses are able to assess both simultaneously. Knowing the significant relationships among health factors for women who are ethnically diverse, have depression symptoms, and have the presence of medical complications allows for better advocacy for health policy for recommended screening guidelines and management. Nurses continually provide education and resources for patients and can ensure positive outcomes are achieved for high-risk groups. By understanding these unique relationships for these particular women, early intervention can be achieved for improved outcomes. Nurses have the ability to assist and collaborate to lower the premature birth rate by recognizing women at risk and educating with health promotion strategies before, during, and after pregnancy to decrease the potential development of adverse health outcomes.

Nurses coordinate care and collaborate with multi-disciplinary teams which is particularly important for all patients and especially for mothers and their infants. Coordinating care delivery for patients within the maternal-child health arena such as perinatologists, obstetricians, lactation educators and consultants, and doulas, provides assistance and support for high-risk mothers to navigate a complex care delivery system. Nurses embody the philosophy and art of caring and science and are most suitable to

collaborate in designing, implementing, and evaluating interventions that promote and support mothers at risk of adverse health outcomes.

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Appendix A: USD IRB

ENTERED
1/30/15

Institutional Review Board Project Action Summary

Action Date: January 29, 2015 *Note: Approval expires one year after this date.*

Type: ☐ New Full Review ☐ New Expedited Review ☐ Continuation Review ☒ Exempt Review
☐ Modification

Action: ☒ Approved ☐ Approved Pending Modification ☐ Not Approved

Project Number: 2015-01-162
Researcher(s): Elizabeth Light Doc SON
Dr. Cynthia D. Connelly Fac SON
Project Title: Perinatal Depression and Maternal Child Health Outcomes

Note: We send IRB correspondence regarding student research to the faculty advisor, who bears the ultimate responsibility for the conduct of the research. We request that the faculty advisor share this correspondence with the student researcher.

Modifications Required or Reasons for Non-Approval

None

The next deadline for submitting project proposals to the Provost's Office for full review is N/A. You may submit a project proposal for expedited review at any time.

Dr. Thomas R. Herrinton
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