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COMPARISON OF PERCEIVED STRESS, ALLOSTATIC LOAD AND RACIAL DISCRIMINATION IN DIFFERENT CULTURAL GROUPS OF PREGNANT BLACK WOMEN

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COMPARISON OF PERCEIVED STRESS, ALLOSTATIC LOAD AND RACIAL DISCRIMINATION IN DIFFERENT CULTURAL GROUPS OF PREGNANT BLACK WOMEN

by

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Dedication

Mom and Dad,
You are successful as parents when your child succeeds. Thank you for everything that you have done for my family. After having my own children, now I begin to understand all of the sacrifices that you have made for me.

Thank you.

Acknowledgements

But as for you, be strong and do not give up, for your work will be rewarded.
2 Chronicles 15:7

Thank you, Lord, for helping me to be strong and not give up. It is amazing when I think of all the wonderful people that you have put in my life to help me with this journey. If it takes a village to raise a child, then it takes just as large a community to complete a doctoral degree. There were many times when I had a plan and things did not work the way I thought they would; in hindsight, I could see your handiwork with much better results. For example, I wanted to rush and complete my coursework as soon as possible. When I became pregnant with my baby Grant, I decided that it would be best to wait an extra year for coursework so that I could enjoy time with him and our two girls. The following year, just four months before I was going to start the dissertation process, I was introduced to Dr Ruiz. When I began the program I knew I wanted to study the effects of stress and pregnancy. It just so happens that Dr Ruiz studies stress and pregnancy and was able to help me. If I had done things the way I wanted, I would have not met Dr Ruiz until after I was halfway finished with my dissertation. I would have missed an excellent opportunity to work with one of the nation's leading biobehavioral nursing researchers and missed the time spent with my precious children. So once again THANK YOU LORD!

James, I cannot tell you how much I love you and appreciate everything that you have done. You are not only my husband, but also my best friend. We have worked so hard and I am so proud of our family. I appreciate all of the small things that you have done over the years to make life better for me and the kids (though I am still not going to

do laundry when I graduate). Who knew that when we started dating in the ninth grade of high school that we would have such beautiful children and doing such a great job being role models for them? I guess Dad is going to say that he did since Mom and he signed for us to get married and made us promise that we would go to college if they did sign. Mom and Dad, I hope I have finished enough college that you do not regret letting James and I get married. Well, I cannot wait to see what else the Lord has in store for our family.

Katherine, Madelyn and Grant, I am so proud of you guys. You are beautiful on the inside and out. It is amazing that your father and I have such wonderful children. Katherine and Madelyn, thank you for being so understanding when I had to study or write on my paper, and for helping me put together packets for data collection. You have really made life wonderful for us and we appreciate everything that you do. I pray everyday that your dad and I do everything that you need us to. Every single day the three of you amaze your dad and me, and we could not have asked for a better family.

Mom and Dad, you guys are wonderful! You have done more for me and my family than I could ever say. Dad, you picked a great guy for me to marry and have kids with. Thank you for always encouraging me and telling me how proud you are of us. Mom, you have always encouraged me and been a great grandmother. The two of you have helped so much with the kids. I did not fret too much when I could not go on those field trips or go to a play at the school because I knew that I could count on you to be there. Billy and Shelia, thank you for always encouraging me and telling me how proud you are that I am your sister. Billy, I appreciate all of those prayers—they really worked.

I want to thank my faculty at UTMB and UT Health Science Center San Antonio. Dr. Ruiz, thank you for always encouraging me and keeping me on track. I have never heard of a dissertation chairperson that calls their students weekly or bi-weekly for over two years to check on their progress and keep them focused, but that is exactly what you have done. I was always trying to get something done because I knew you were going to call. I could not have asked for someone better to work with for the last two years and I feel so privileged. Dr Bishop, thank you for being so patient and always available to help. I do not know if I could have done this without your excellent instruction in statistics. I

still have a lot to learn, but you have given me an excellent foundation in statistics. Dr. Hill, thank you for always being there. I knew that if I had a question that I could come to you and you would help me. As you know, there were many times I poked my head in your office or called and you would make time for me. Dr Phillips, thank you for your excellent guidance and teaching throughout my educational career. I truly appreciate everything you have done to make me a better nurse and researcher. Dr. Avant, thank you for helping me with my conceptual model and my dissertation. You are like a rock star of nursing research and it has been an honor to have you on my committee.

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As hard as this dissertation was to complete, I am so thankful that I have had the opportunity to finish my doctorate in Nursing. I pray that I will use this in a manner that the Lord intended, and that I can make other people's lives better because of it. Whether I am teaching, doing research or caring for patients, I pray that others will see the Lord in my work.

"For I know the plans I have for you," declares the LORD, "plans to prosper you and not to harm you, plans to give you hope and a future."

Jeremiah 29:11

Comparison of Perceived Stress, Allostatic Load and Racial Discrimination in Different Cultural Groups of Pregnant Black Women

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Over 26 billion healthcare dollars are spent annually in the United States on the management of pre-term labor and the care of infants born prematurely. Studies have found that elevated levels of stress and anxiety during pregnancy significantly increase women's risks for poor perinatal outcomes. Previous research studies also suggest differences in stress response may exist between black women born in the U.S. and foreign-born. The purpose of this study was to compare racial discrimination and different measurements of stress, including perceived stress and allostatic load score, in two different cultural groups of African American women.

The specific aims of the research project were to: 1) determine if differences exist between African American women born in the United States and those who are foreign-born on perceived stress, measures of allostatic load and racial discrimination; 2) examine the relationships between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load in a sample of pregnant African American women; 3) determine the best model from the study variable set that predict each of the study variables.

The findings suggest the only variable that was statistically different between the two groups of African American women was the mean BMI (U.S.-born mean BMI 31.99

vs foreign-born mean BMI 25.58; $p<0.02$). Also, clinically significant differences were noted, such as a difference in ages (U.S.-born mean age 23.81 vs foreign-born mean age 30.25), income (U.S.-born mean income $2,385 vs foreign-born mean income $3,108) and measurements of stress (U.S.-born mean PSS score 18.11 vs foreign-born mean PSS score 16.20) and racial discrimination (U.S.-born mean RDS scores 24.01 vs foreign-born mean RDS score 17.25). When examining the entire sample there was a positive correlation between income and perceived stress ($r = -0.43$; $p < 0.019$) and between perceived stress scores and racial discrimination scores ($r = 0.34$; $p < 0.063$) . Regression models revealed income and racial discrimination predicted perceived stress scale scores ($p < 0.023$).

The findings provided supporting evidence in the identification of perceived stress and racial discrimination in pregnancy. Additional support was provided for the differences that exist between different groups of women within the same ethnic group. Future research is needed to understand how socio-demographic and psychological variables place a mother and her baby at risk.

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CHAPTER 1: INTRODUCTION

Research studies have found that elevated levels of stress during pregnancy significantly increased women's risks for poor perinatal outcomes, including pre-term delivery, decreased birth weight, an increased risk for infection, increased anxiety and depression, labor/delivery difficulties, and interference with psychosocial adaptation to pregnancy. Infection, anxiety, depression, and maladaptive psychosocial adaptation to pregnancy have all been linked to preterm delivery. Preterm delivery and low birth weight present enormous problems in the United States. Management of preterm labor and the care of infants born prematurely and of low birth weight account for over 18.1 billion healthcare dollars spent yearly in the United States (March of Dimes, 2006a). The Institute of Medicine estimates the cost of preterm birth at $26 billion per year (Institute of Medicine, 2006). These costs far outweigh other health problems such as hospitalization costs for hypertension which is estimated to cost about eight billion dollars annually (Current Medical Research and Opinion, 2002). It is also estimated that 90% of neonatal deaths are associated with complications from preterm labor and birth (March of Dimes, 2006).

Studies reporting incidences of preterm labor and delivery suggest that African American women are more vulnerable to poor outcomes of pregnancy, including preterm labor and delivery, than women of other ethnic groups. March of Dimes (2006) reported that in the year 2000, the preterm delivery rate for African American women was reported to be 17.3%, whereas non-Hispanic white women's preterm delivery rate was only 10.4% in the same time period. Despite evidence showing increased levels of stress increase the risks for poor perinatal outcomes, little has changed in clinical practice over recent decades. In a qualitative pilot study conducted by Kelly (2007), an emerging theme from research participants indicated a lack of psychosocial care from healthcare providers. None of the mothers interviewed were satisfied with their healthcare providers' evaluation of their psychosocial status, including evaluation of the mother's prenatal stress, during pregnancies that ended in preterm delivery (Kelly, 2007). More

research is needed to identify stress and its effect on perinatal outcomes, as well as factors that increase risks of pregnant women in minority populations. Limited research has been conducted on the effects of stress on the body, or on the concept of allostatic load. In previous research, an allostatic load score was calculated using up to 13 physiological biomarkers. Allostatic load scores were used to predict health and health related outcomes. By identifying biomarkers that predict perceived stress and chronic stressors, such as racial discrimination, clinicians can intervene before further complications arise. Tiedje (2003) stated that a better understanding of the connection between the psychosocial and biological pathways must be identified so that *prevention*, not just prediction, of prematurity may be established. Therefore, the overall purpose of this exploratory-observational study was to compare racial discrimination and different measurements of stress, including perceived stress and allostatic load score, in two different origin groups of African American women.

BACKGROUND AND SIGNIFICANCE

Significance

An objective of the Healthy People 2010 initiative is the national preterm birth rate to be at or below 7.6 percent (U.S. Department of Health and Human Services, 2000). The national preterm birth rate in 2002 was 12.1 for all infants. The Caucasian preterm birth rate was 11 percent and the African American preterm birth rate was 17.7 percent (March of Dimes, 2004). The rate of preterm birth in Texas is even higher. The average preterm birth rate in Texas between 2001 and 2003 was 13.4 percent for all infants, 12.8 percent for Caucasian infants and 18.6 percent for African American infants. The preterm birth rate in 2003 was 13.9 percent for all infants born in Texas, an increase of 22 percent over the 1993 state-wide preterm birth rate of 11.4 percent (March of Dimes, 2006c). The rate of preterm births is increasing over time, and it appears unlikely that the United States Healthy People 2010 objective will be met. The picture is even bleaker in Harris County, Texas, where the average preterm birth rate in 2003 was 14.3 percent for all infants, 12.3 percent for Caucasian infants and 19.1 percent for African American infants (March of Dimes, 2006b). Therefore, nearly one in five African

American infants born in Harris County in 2003 was born prematurely, demonstrating the health care disparity that exists between different ethnic groups. Collins et al. (1997b) state that the disparity between ethnic groups exists regardless of the prenatal care received during the pregnancy. The researchers propose that maternal race or some other factor closely related to race accounts for the disparity (Collins et al., 1997a). Additional research is needed to identify 1) why this disparity exists, and 2) the optimal methods to address the problem in the healthcare setting.

Birth weight and gestational ages differ not only by ethnicity, but also by birth place of the mother. That is, the birth weight patterns for U.S.-born White women and African-born Black women more closely resembled one another than U.S.-born Black women (David and Collins, 1997). For example, the average birth weight for babies born between 1980 and 1995 in Illinois to U.S.-born White women was 3,466 grams, 3,333 grams for African-born Black women and 3,089 grams for U.S.-born Black women. The percentage of low birth weight babies was 4.3% for U.S.-born White women, 7.1% for African-born Black women and 13.2% for U.S.-born Black women. U.S.-born Black women are 3.1 times more likely to deliver an infant with low birth weight when compared with African-born Black women. These findings weaken the gene theory argument and suggest that the decreased birth weight in African Americans is more likely due to environmental causes such as racial discrimination (David & Collins, 1997). Thus, it is important for researchers to determine whether the birthplace of the mother directly influences the outcome of the pregnancy.

Another concern is the widening gap between the health of Caucasian infants when compared to African American infants birth weights. Researchers examined available Illinois birth records between the years 1950 to 1990 (Chike-Obi et al., 1996). The researchers found that Caucasian babies born in the same family had increased their birth weight 74 grams over a 40-year time period, whereas African American babies had increased their birth weight by only 33 grams. However, even more concerning was the finding that the rate of very low birth weight has decreased by six percent for Caucasian babies, but increased by 56% in African American babies born in the same geographic area.

Background

The concepts of stress and health have been linked for over 2,000 years. Epicurus first described stress and coping in relation to health in the time period of 341-270 B.C. (Hobel, 2004). It was not until the 1940s that pregnancy outcomes and stress were linked, but even then it was not fully understood how stress affected pregnancy. Measurements of perceived stress in pregnant women began in 1963 by Gunter, who linked stress and infant birth-weight. In 1977, Schwartz linked perceived stress and prematurity (Hobel, 2004). It was not until the 1990s and the beginning of the 21st century that several large, well-designed studies were published that examined the relationship of stress and perinatal outcomes (Hobel, 2004). The results of these research studies will be examined in the review of literature chapter. Overall, during the last two decades researchers have attempted to identify ways to measure stress, examine the effects of stress on the mother/fetal unit, identify stressors particular to different ethnic groups, and identify psychological traits that may potentiate or reduce the effects of stressors on the body. The research studies have only begun to comprehend the impact of stress on the body during pregnancy and to identify reasonable means to measure stress during the antepartum period in order to recognize women at risk for poor perinatal outcomes.

Stress has been identified in a variety of ways. For example, there is chronic stress versus acute stress, maladaptive versus adaptive stress, hassles versus uplifts, and perceived stress versus the physiological reaction of the mother/fetal unit when exposed to stressors. The lack of standardized language further complicates the practicality of conducting research then applying the findings to the clinical setting. Future researchers must clarify the type of stress that is being measured and report findings in such a manner that clinicians can implement changes in the clinical practice.

Many other problems face researchers when examining the multidimensional aspects of stress and perinatal outcomes. One concern of researchers examining perinatal outcomes and stress is how demographic and social variables are identified and analyzed. For example, age is commonly removed from the data analysis model; however, recent research has identified age as a variable that can affect stress perception and the effect stress exhibits on the maternal/fetal unit (Rauh et al., 2001). Another concern is raised when examining different ethnic groups. After examining the literature, Federenko and

Wadhwa (2004) reported that African American women respond differently than Caucasian women to stressors, perhaps making them more vulnerable to poor perinatal outcomes. The researchers found that African American women's corticotrophin releasing hormone (CRH) levels at mid-gestation were lower than white women's. Moreover, they suggested that African American women were more susceptible to the adverse effects of elevated CRH (Federenko & Wadhwa, 2004). They hypothesized that it actually takes less CRH to cause damaging effects in the African American population, which could lead to poor perinatal outcomes than in other ethnic groups (Federenko & Wadhwa, 2004).

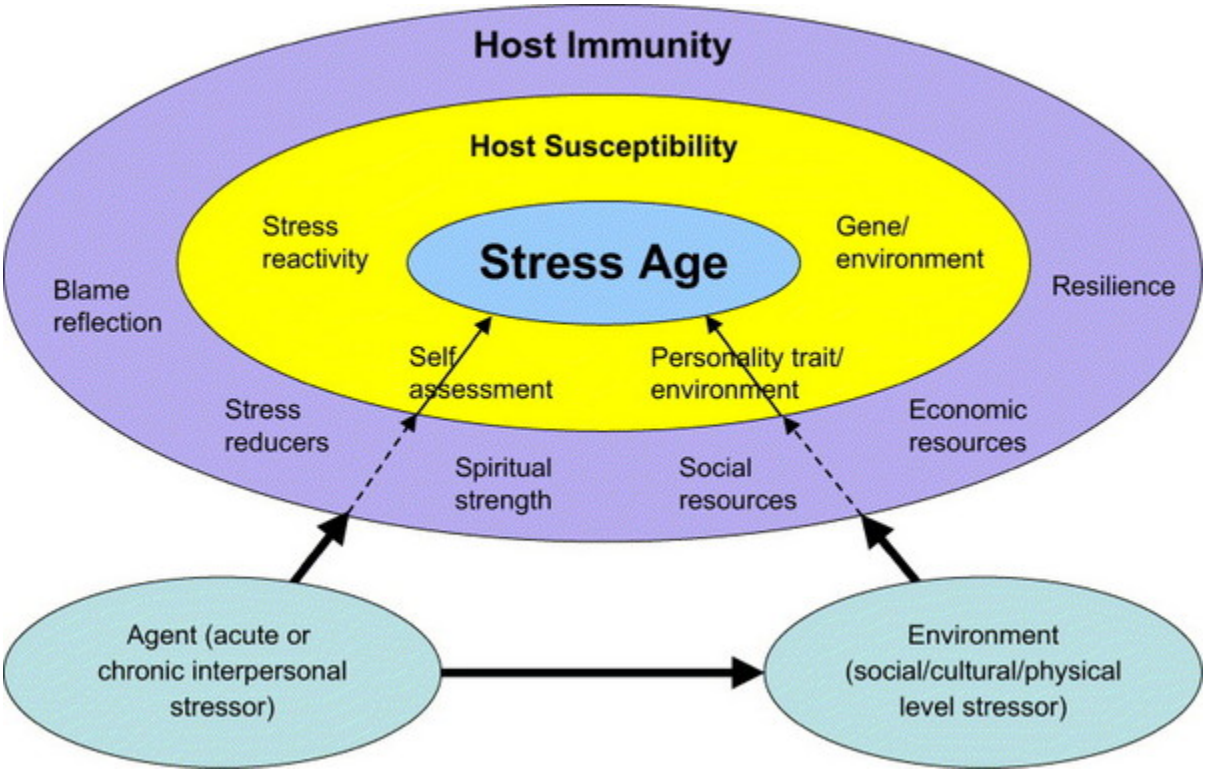
Acute stress has a significant impact on perinatal outcomes unless the event is dramatic and occurs in early gestation, e.g., the first trimester (Hobel, 2004; Wadhwa, 2005). However, chronic stress does affect health outcomes in pregnant and nonpregnant patients and in varying degrees across different ethnic groups. The panel of the National Heart, Lung and Blood Institute of the National Institutes of Health (2004) states that acute stress causes an immediate reaction in the hypothalamic-pituitary-adrenocortical (HPA) axis and the sympatho-adrenomedullary system (SAS). The panel found that chronic, or lifelong, stress disrupts the HPA axis and SAS, causing harm to the human body. Lifetime exposure to stressful events has been linked to poor health outcomes (Goldstein & McEwen, 2002). The effects of stress on the body over time are commonly referred to as "weathering" or "allostatic load." Geronimus et al. (2006) found that African American women had higher allostatic loads when compared with African American men and Caucasian men and women. African American women's allostatic load was higher than those of African American men's at all ages studied, particularly among non-poor African American women (Geronimus et al., 2006). The allostatic load score was determined by assigning one point for each biomarker above the high threshold (Crimmins et al., 2003; Geronimus et al., 2006). Biomarkers that may be included in the allostatic load score are systolic blood pressure, diastolic blood pressure, glycosolated hemoglobin, body mass index, triglycerides, high density lipoproteins, cholesterol, albumin, C-reactive protein, fibrinogen, lung capacity peak flow, creatinine, homocysteine, waist-hip ratio, urinary cortisol, urinary epinephrine, urinary norepinephrine, and serum dihydroepiandrosterone sulfate (DHEA) (Crimmins et al.,

2003; Geronimus et al., 2006; Seeman et al., 2001b). The high threshold of each biomarker was defined by current clinical practices or the upper 25% of the population (Crimmins et al., 2003; Geronimus et al., 2006). Researchers have used between three and 13 biomarkers to determine the total allostatic load score (Crimmins et al., 2003; Geronimus et al., 2006; Johnston-Brooks et al., 1998; Seeman et al., 2001a). The concepts of allostatic load and how cumulative stress impacts perinatal outcomes in pregnancy are only beginning to be examined. A literature revealed that there are not any published studies identifying methods to measure allostatic load in pregnant women. Methods to identify the best way to measure allostatic load in a pregnant population with varying ethnic backgrounds are needed. Also, future research should focus on the relationship between allostatic load, racial discrimination and stress during pregnancy.

CONCEPTUAL FRAMEWORK

Hogue et al. (2001) suggest using an epidemiological framework to examine the multidimensional concept of stress and pregnancy. This proposed model uses the concepts "host," "environment" and "agent" to describe the stress response of the pregnant woman. Hogue et al. (2001) describe the agent as the stressor, the host as the pregnant woman and the environment as social and cultural conditions that buffered or potentiated ongoing stressors. In 2005, Hogue and Bremner included stress age, or the concept of weathering, in the epidemiological model. Hogue and Bremner (2005) suggest that stress age can impact perinatal outcomes in much the same way as chronological age. The researchers suggest using the following conceptual model (Figure 1) to base future research involving pregnant, African American women.

Figure 1. Conceptual Framework. Hogue and Bremner (2005).



Reprinted from American Journal of Obstetrics and Gynecology, volume 192, Authors: Hogue, C.J.R. & Bremner, J.D., Title: Stress model for research into preterm delivery among black women, S47-S55, 2005, with permission from Elsevier

AGENT

Hogue et al. (2001) identify the agent as stress, which encompasses social and cultural stressors. Stress can be defined as "a nonspecific response of the body to any demand made on it" (Lewis et al., 2004). Wadhwa et al. (2001) define stress as a multidimensional construct "in which there is a perceived discrepancy between environmental demands and the individual's biological, psychological, or social resources." Bryce et al. (1988) go further in reporting that responses elicited by stress include physical components, endocrine components, emotional components, and altered loci of control.

Exposure to stress stimulates the neuro-endocrine-immune response in such a way that the maternal/fetal unit can be impacted significantly. In previous research, the components of the endocrine system that initiate changes in the body to maintain homeostasis have been identified, but if the stressor is not removed, these changes may lead to detrimental effects that impact the maternal/fetal unit.

Neuro-Endocrine-Vascular Response

General adaptation syndrome (GAS) explains changes in the body when responding to a perceived stressor. The GAS is composed of three stages: 1) the alarm reaction, 2) the stage of resistance, and 3) the stage of exhaustion. Once an individual is exposed to an environmental event or stressor, the central nervous system is stimulated and a multiple system response reaction occurs involving the hypothalamic-pituitary-adrenal axis and autonomic nervous system. Immediate or early symptoms that the individual may experience include increased blood pressure, increased heart and respiratory rate, decreased gastrointestinal motility, pupil dilation, and increased perspiration (Lewis et al., 2004). During this multiple system response reaction a pregnant women will have decreased blood flow to the uterus (Glover, 1999). Lederman (1995) reported that maternal anxiety also increases catecholamine release and sympathetic nervous system activity, which could result in constriction of uterine blood vessels, in turn initiating decreased uterine blood flow, placental intervillous space perfusion, and fetal oxygenation.

As described above, the changes in the body when responding to a perceived stressor begin with the stimulation of the neuroendocrine system. Three main regulators of the stress response during pregnancy that have been examined by researchers are corticotrophin releasing hormone (CRH), adrenal corticotrophin hormone (ACTH), and cortisol (Hobel, 2004). The following paragraphs will review the role of these regulators in the neuroendocrine-vascular response in the pregnant female.

Hobel et al. (1999) review of the literature identifies the role of the neuroendocrine axis in pregnancy as it relates to neurotransmitters and peptides that control the release of CRH. The researchers identifies norepinephrine, epinephrine, acetylcholine, angiotensin II, interleukin 1, arginine vasopressin and oxytocin as potential

initiators of the release of CRH. Ruiz et al. (2002) identify sources of CRH once stimulated by these neurotransmitters and/or peptides. CRH is produced primarily by the hypothalamus and the placenta in pregnant women. Kalantaridou et al. (2004) found that reproductive CRH is released from ovarian, uterine and placental sites.

Kalantaridou et al. (2004), reviewed the extant research and suggest that CRH may be involved in ovarian failure, anovulation, corpus luteum dysfunction, infertility, recurrent spontaneous abortion, premature labor, delayed labor, and pregnancy induced hypertension. Moreover, CRH may play a key role in the parturition process. A study conducted by Warren et al. (1992), associated maternal plasma CRH levels with preterm labor. CRH also may interact with both prostaglandins and oxytocin and thus play a role in the stimulation of uterine contractions (Ruiz et al., 2002). Lockwood (1999) reports that CRH enhances prostaglandin production to promote parturition. Hayashi and Mozurkewich (2000) report that CRH increases the amount of fetal cortisol release, which may have a role in the delivery process. Hobel et al. (1999) stipulate that CRH has the ability to stimulate pituitary-adrenal axes of both the mother and fetus, which may lead to labor and delivery.

Once CRH is released into the circulating bloodstream, it stimulates the release of ACTH and beta-endorphin. After conducting a review of the literature, Hobel (2004) posits that ACTH is synthesized and released from the pituitary gland, gastrointestinal system, reproductive organs and placenta. However, ACTH release is not only controlled by CRH, but may also be regulated by other peptides such as arginine, vasopressin, oxytocin, angiotensin II and vasoactive intestinal peptide (Hobel, 2004). ACTH is much like CRH in that it normally increases with advancing gestational age and in response to exposure to stressors (Hobel, 2004). ACTH and beta-endorphin have been linked to increased perceived stress and poor perinatal outcomes in pregnancy (Hobel et al., 1999)

Once released, ACTH stimulates the secretion of glucocorticoids, specifically cortisol (Hobel, 2004). Increased maternal stress results in an increase in maternal and fetal cortisol (Goldenberg, 2002), which changes the amount of blood flow to the uterus and, consequently, blood flow to the fetus (Lederman, 1995). This change in uterine blood flow may lead to fetal distress if the stressor is severe enough or lasts long enough. Oxorn (1986) identified fetal distress as a potential initiator of labor, with changes in the

fetal cardiovascular and endocrine systems inducing contractions of the uterine muscle. Increase fetal serum cortisol levels result from maternal prenatal anxiety. Researchers report a relationship between fetal plasma cortisol levels and preterm labor (Goldenberg, 2002). A fetus has two mechanisms that can lead to an increase in fetal serum cortisol levels: 1) a decrease in blood flow to the uterus can result in fetal cortisol release, and 2) increased fetal cortisol levels can also result from maternal transfer. Indeed, it is estimated that as much as 25% of the fetal serum cortisol levels are from maternal transfer (McCool et al., 1994).

Inflammatory/Immune Response

The neuroendocrine system and immune system are closely linked. Once the neuroendocrine response has been stimulated, changes can occur in the inflammatory/immune system, specifically changes caused from the end-effector hormones, including the glucocorticoids (Chrousos & Kino, 2005). Glucocorticoids, such as cortisol, affect all components of the immune system, including suppression of the innate and cellular immune response and promotion of the humoral immune response (Chrousos & Kino, 2005). Initially, this is a protective mechanism; however, if the suppression of the immune response continued for any length of time, depletion of essential immune components place the individual at risk due to a weakened immune response (Chrousos & Kino, 2005). Additionally, research suggests that certain components of the immune system, such as TNF, IL-1, IL-6, and IL-8, may stimulate the HPA axis through the hypothalamic, pituitary and adrenocortical sites (Chrousos & Kino, 2005). This creates a vicious cycle of infection presenting as a stressor, leading to the stress response and in turn affecting the immune system as a whole. The literature review will substantiate the proposed model linking stress, immune/inflammatory response and poor perinatal outcomes in pregnancy.

HOST

The conceptual model proposed by Hogue et al. (2001), identifies the host as the pregnant woman. Potential host factors that could influence the stress response include gender, race, pregnancy, allostatic load (or weathering) and coping. An example of gender influencing the stress response is that women respond differently than men when exposed to stressors. Geronimus et al. (2006) found that allostatic load was higher for white and black women when compared to white and black men, with black women having the highest allostatic load of the four groups. Race also influences the stress response. As noted earlier, African American mothers respond differently to stressors and their HPA axis involvement differs from Caucasians (Federenko & Wadhwa, 2004). Pregnancy is also a factor—Mullings et al. (2001) found that pregnancy may increase the perception and magnitude of preexisting stressors. For example, when a woman living in poverty discovers that she is pregnant. Already limited resources will need to be stretched even further to support herself and her baby. Different types of coping have been identified in the literature as protective against poor perinatal outcomes of pregnancy. All of these factors influence the stress response and will be examined more closely in the literature review.

ENVIRONMENT

Hogue et al. (2001) conceptual model proposed the environment as social and cultural conditions that are ongoing stressors or modifiers of stress. Social support, neighborhood safety and racial discrimination, for example, are considered to be grouped under the umbrella concept of environment. Lack of social support is associated with increased perceived stress, increased physiological measurements of stress and poor perinatal outcomes (Da Costa et al., 2000; Rini et al., 1999; Lespinasse et al., 2004; Wadhwa et al., 1996). Conversely, when a woman perceives that social support is available, it may have a buffering effect on stress and the stress reaction (Wadhwa et al., 1996). Perceived neighborhood safety and actual urban violence is linked to increased stress and poor perinatal outcomes (David & Collins, 1997). Racial discrimination is a risk factor for preterm labor and low birth weight (Collins et al., 2004; Dole et al., 2003;

Dole et al., 2004). The research studies examining these concepts will be examined further in the literature review.

DESCRIPTION OF VARIABLES

The present study considers that maternal prenatal stress is a subjective and objective response to a perceived or actual stressor that results in a multi-dimensional reaction by the pregnant mother with substantive effects on the fetus. Multiple instruments have been used to measure maternal perceived stress in pregnancy. These instruments include: Perceived Stress Scale (Culhane et al., 2001; Hobel et al., 1999; Mancuso et al., 2004; Ruiz et al., 2001; Ruiz et al., 2002; Stancil et al., 2000; Wadhwa et al., 1996); Everyday Problems Checklist (Paarlberg et al., 1999); Hassles and Uplifts Scale (Ayers, 2001); Daily Hassles Scale (Da Costa et al., 2000; Jesse et al., 2003; Mackey et al., 2000; Ruiz & Fullerton, 1999; Wadhwa et al., 1996); Life Events Inventory (Lespinasse, 2004; Stancil et al., 2000); Life Events Scale (Shiono et al., 1997); Daily Stressful Life Events (Collins et al., 1998); Daily Stress Inventory (DiPietro et al., 2004); Life Experiences Survey (Dole et al., 2004); Denver Maternal Health Assessment (Coussons-Read et al., 2005); Pregnancy Specific Anxiety Scale (Holzman et al., 2001a; Mancuso et al., 2004); Pregnancy Experiences Questionnaire (Da Costa et al., 2000); State Anxiety Inventory (Da Costa et al., 2000; Hobel et al., 1999; Mancuso et al., 2004; Rini et al., 1999; Sjostrom et al., 2002); Spielberger's State Trait Anxiety Inventory (DiPietro et al., 2004; Shiono et al., 1997); Pregnancy Related Anxiety (Rini et al., 1999); Prenatal Social Inventory Scale (Dole et al., 2004); Prenatal Psychosocial Profile (Jesse et al., 2003); Schedule of Recent Life Events (Wadhwa et al., 1996); Pregnancy Experience Scale (DiPietro et al., 2004); Life Experiences Survey (Dole et al., 2003).

The physiological changes, i.e., objective responses that occur in the pregnant woman include stimulation of the neuro-endocrine axis of the mother and fetus, elevation in stress hormones, and resultant physiological changes elicited by those stress hormones. Different assays used to measure the physiological response to stress in pregnancy include: CRH (Brunson et al., 2001; Hobel et al., 1999; Holzman et al., 2001b; Mancuso et al., 2004; Ruiz et al., 2002; Sandman et al., 1999; Wadhwa et al., 1997; Wadhwa et al.,

1998; Wadhwa et al., 2004); beta-endorphin (Sandman et al., 2003; Wadhwa et al., 1996; Wadhwa et al., 1997); ACTH (Sandman et al., 2003; Wadhwa et al., 1996; Wadhwa et al., 1997); and cortisol (Ruiz et al., 2001; Stancil et al., 2000; Wadhwa et al., 1996; Wadhwa et al., 1997).

For purposes of this research project, the perceived and actual response to stress will be measured. Perceived stress will be measured with Cohen's Perceived Stress Scale (PSS; Cohen et al., 1983), which has been used reliably in many different pregnant populations and across various ethnic groups (Culhane et al., 2001; Hobel et al., 1999; Mancuso et al., 2004; Ruiz et al., 2001; Ruiz et al., 2002; Stancil et al., 2000; Wadhwa et al., 1996). The PSS is a ten-item inventory with Likert responses ranging from zero to four. The PSS includes such statements as "How often have you felt nervous or stressed" and "How often have you felt difficulties were piling up so high that you could not overcome them?" Cronbach's alpha reliability coefficient of the PSS in a pregnant population including African American women is 0.77 (Culhane et al., 2001).

The total allostatic load score was calculated using the following four biomarkers: systolic blood pressure, diastolic blood pressure, CRH and body mass index. When the systolic blood pressure was greater than 120 mmHg, one point toward the allostatic load score was given. The American Heart Association reports that a systolic blood pressure between 120-139 mmHg is pre-hypertension or high normal (American Heart Association, 2007). When the diastolic blood pressure was greater than 80 mmHg, one point was given toward the allostatic load score. The American Heart Association reports that a diastolic blood pressure between 80-89 mmHg is pre-hypertension or high normal (American Heart Association, 2007). A conservative high threshold for blood pressure was chosen because systolic and diastolic blood pressure decreases 5-10 mmHg in the second trimester of pregnancy, which is when data collection occurred for the current study (Ayala, et al., 1997). One point toward the total allostatic score was given for a body mass index 25 or more. The World Health Organization and the Center for Disease Control define a BMI 25 or more as overweight or obese (Halls, 2003). One point was added to the allostatic load score for a CRH analysis that was in the upper 25% of the sample population. Previous allostatic load research defines the high threshold by current clinical practices or the upper 25% of the population (Crimmins et al., 2003; Geronimus

et al., 2006). Since CRH analyses are not commonly done in clinical practice, the 25% threshold was used. The total allostatic score could, therefore, range between 0-4 with zero indicating the lowest risk for poor perinatal outcomes and four the highest risk.

Self-reported perceptions of racial discrimination will be measured with Krieger's Racial Discrimination Scale (RDS). This instrument has been used previously in pregnant populations (Collins et al., 2004; Dole et al., 2003; Dole et al., 2004; Lespinasse et al., 2004; Rosenberg et al., 2002; Stancil et al., 2000). The RDS is an inventory with Likert responses ranging from zero to four. The RDS includes such statements as "In the past year, how much did you worry about yourself experiencing unfair treatment because of your race, ethnicity, or color," and "How often do you feel that racial/ethnic groups who are not white, such as African Americans and Latinos, are discriminated against?" The Cronbach's alpha reliability coefficient of the RDS in an African American non-pregnant population was 0.74 in the available literature (Krieger et al., 2005a).

PURPOSE AND GOALS

The purpose of this exploratory-observational study was to compare racial discrimination and different measurements of stress, including perceived stress and allostatic load score, in two different origin groups of African American women. The research project was aimed at providing a better understanding of stress, racial discrimination and pregnancy in African American women. The study examined two different origin groups of African American women: those born in the United States and those who are foreign-born. Previous research suggested that differences exist between these two groups. Additionally, racial discrimination was measured to validate previous research projects that have identified racial discrimination as a stressor to lend additional insight into the extremely high rate of preterm births in Texas, specifically in Harris and Galveston Counties. Past research studies involving racial discrimination in a pregnant sample have been conducted in other geographical locations, however, no research could be found where racial discrimination was measured in a pregnant population in Texas, nor in any of the southern states.

The goals of the research project were to:

1. Determine if differences exist between the African American women born in the United States and those who are foreign-born in perceived stress, measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) and racial discrimination.
2. Examine the relationships between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) in a sample of pregnant African American women.
3. Determine the best model from the study variable set including perceived stress, individual measurements of allostatic load, total allostatic load score, racial discrimination, age, years in the United States, income, number of hours worked per week and gestational age that predicts each of the study variables.

RESEARCH QUESTIONS

The following research questions were proposed to achieve the aims of this exploratory observational study:

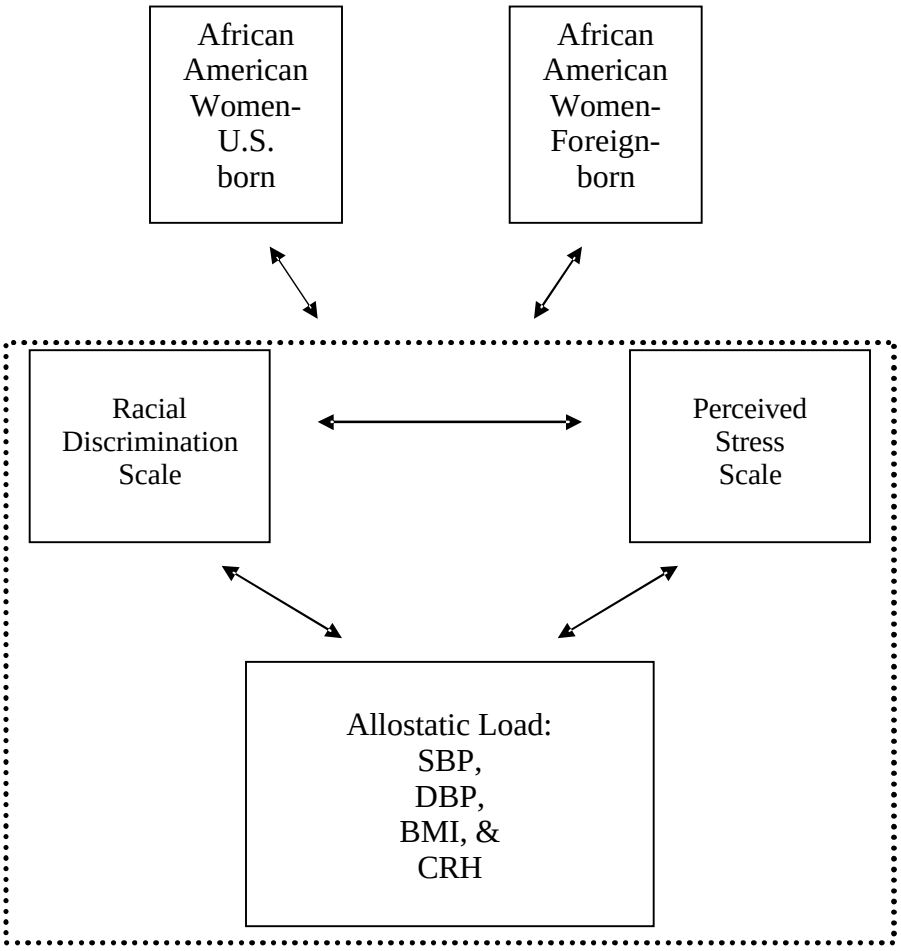
1. What are the differences that exist between African American women born in the United States and those who are foreign-born in perceived stress, measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) and racial discrimination?
2. What are the relationships that exist between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) in a sample of pregnant African American women?
3. What is the best model from the study variable set including perceived stress, individual measurements of allostatic load, total allostatic load score, racial discrimination, age, years in the United States, income, number of hours worked per week and gestational age that predicts each of the study variables?
    a. Which set of variables predicts perceived stress?

b. Which set of variables predicts individual measurements of allostatic load?
c. Which set of variables predicts the total allostatic load score?
d. Which set of variables predicts racial discrimination?

OVERVIEW OF DESIGN

The research design for the study was an exploratory-observational design developed from a predictive model (see Figure 2, pg. 17). Data for measurements of perceived stress, allostatic load and racial discrimination was gathered from both origin groups, which includes African American women born in the U.S. and foreign-born African American women. Two group tests of differences, e.g., Mann Whitney U, and chi-square analyses assessed group differences between the different cultural groups and variables of interest. In addition, multiple regression models were utilized to determine if the variables of interest were predictive of chosen outcomes.

Figure 2. Conceptual Model of Research Study



CHAPTER 2: REVIEW OF LITERATURE

MATERNAL PRENATAL STRESS

There are conflicting views concerning the exact role of maternal stress in pregnancy. Some researchers purport that maternal stress and anxiety often accompany ongoing maternal adaptation and progression through the developmental tasks of pregnancy, and are considered normal and even desirable inasmuch as they may motivate adaptation efforts (McCool et al., 1994). McCool et al. (1994) suggest that some maternal anxiety is necessary for the maturation process of the fetus, and they provide two examples to support this claim. They cite the example of women who deliver via cesarean section without going through labor. The woman and fetus have not had to address the challenge of labor. Therefore, they have decreased levels of stress hormones, which places the newborn at a higher risk of the infant developing respiratory distress syndrome (McCool et al., 1994). McCool et al. (1994) also provides support to the premise that some prenatal anxiety is necessary to facilitate a normal intrauterine to extra-uterine transition. McCool et al. (1994) examined maternal anxiety levels in labor with the Spielberg State Trait Anxiety inventory and salivary cortisol levels and found that women with higher anxiety levels on both measures were less likely to deliver infants with evacuation of meconium before delivery. Meconium evacuation during the fetal period is considered a sign of fetal distress. Limitations of the study include limited generalizability because of a small sample size (n=38) and homogeneity, in that the study only included adolescent primaparous women. Ducsay (1998), using sheep and rat models of pregnancy, proposed that the fetus and mother may adapt to chronic stressors and that chronic stress may actually decrease uterine contractility over time, although, it is unclear if the same is true in human subjects.

Healthy mothers who reported mild to moderate psychological distress during pregnancy had children with increased cognitive and physical development at age two. The children of these mothers showed positive affect, attention and persistence toward tasks and mature quality of motor behavior (DiPietro et al., 2006). Limitations of the study include limited generalizability because of lack of an ethnically diverse sample and

a small sample population of n=94 (DiPietro et al., 2006). However, the research lends further support to the hypothesis that mild to moderate stress/anxiety is necessary and normal in the prenatal period and facilitates normal physiological processes of pregnancy and infant/child development.

Negative Effects of Maternal Prenatal Stress

Although some research suggest ambiguity regarding mild or moderate stress, many investigators agree that when stress escalates to a moderate or severe level it has detrimental effects on pregnancy and perinatal outcomes. The following review of the literature will demonstrate that increased levels of maternal prenatal stress, whether the stress is physiological or psychological, can be linked to a) poor perinatal outcomes; b) negative effects on the fetus, infant and child; c) negative effects on the child-mother relationship; and d) possible interference with maternal prenatal psychosocial adaptation efforts—which may also lead to poor perinatal outcomes.

Poor Perinatal Outcomes

Moderate to severe maternal anxiety has been shown to have significant effects on the perinatal outcomes of pregnancy. Spietz and Kelly (2002) review of the literature concluded that unresolved mental health issues can have both physical and emotional consequences for the mother and infant including, but not limited to, elevated stress levels. Stress elevation can lead to less optimal uterine blood flow, with resultant low birth-weight and prematurity (Goldenberg, 2002). Stressors can cause an increase in maternal and fetal stress hormones levels, including adrenocorticotrophic hormone (ACTH), corticotrophin-releasing hormone (CRH), cortisol and beta-endorphin. High maternal anxiety has been linked to prematurity (Barnett & Parker, 1986; Berkowitx & Kasl, 1983; Newton et al., 1979; Ruiz, et al., 2002; Wadhwa et al., 1993), postmaturity (McCool et al., 1994), decreased birth weight (Newton & Hunt, 1984; Rini et al., 1999), abnormal fetal heart rate during labor (Dipietro et al., 2006; Lederman et al., 1981; Sandman et al., 2003), and lower neonatal Apgar scores (Crandon, 1979; Erikson, 1976).

Psychosocial Adaptation to Pregnancy and Stress

Lederman (1996) states maternal prenatal anxiety and conflict play a significant role in maternal prenatal psychosocial adaptation. Among the expected developmental changes during pregnancy are maternal acceptance of pregnancy, identification with a motherhood role, changes in the relationship with mother and the relationship with partner or husband, and preparation for labor. Lederman (1996) reports that developmental conceptualization of pregnancy implies a continuum of reproductive health and adaptation, in which prenatal psychosocial adaptation may influence the childbirth process, subsequent maternal adjustment, and maternal-infant relationships in the postpartum period. Women who are unable to accept the pregnancy and successfully resolve specific cognitive themes have higher levels of psychological stress (Affonso & Sheptak, 1989).

Pregnant women cope and adapt to reconcile such issues as mastery, self-esteem and the search for meaning (Affonso et al., 1999). Acceptance and attachment to the fetus are among the primary tasks of maternal prenatal psychosocial adaptation (Lederman, 1996). Moderate to severe anxiety can affect women's ability to adapt to the pregnancy, but a difficult psychosocial adaptation to pregnancy may also be a source of anxiety for many women. A woman who has a negative perception of pregnancy is 1.41 times more likely to deliver preterm (Jesse et al., 2003). Nielsen-Forman et al. (2000) report that anxiety can cause impaired bonding with the infant. Spietz and Kelly (2002) reported that the more successful a woman is at adapting to the changes during pregnancy, the more likely she is to have a close, healthy relationship with her child. Gaffney (1986) further reports that as trait anxiety (or general anxiety) increases, maternal-fetal attachment decreases; likewise when trait anxiety decreases, maternal-fetal attachment increases. Lederman (2003) suggests that pregnant women with high anxiety are more likely to delay seeking prenatal care. A woman often will not seek prenatal care until she has experienced maternal acceptance of pregnancy and has begun the process of acceptance and attachment to the fetus (Lederman, 2003). Lack of adequate prenatal care has been associated with low birth weight, i.e., less than 2,500 grams, and an increase in infant mortality (Lowdermilk & Perry, 2004). Inadequacy of prenatal care has also been associated with preterm birth (Jesse et al., 2003).

Fetal/Infant/Child Response to Maternal Stress

Higher prenatal anxiety levels continue to affect the child long after delivery. Stott (1973) found that infants born to mothers with increased stress levels during pregnancy were more likely to have problems with eczema, poor growth, achieve developmental milestones later, and exhibit early behavioral disorders. Werner et al. (1967) found that two year olds who were exposed to increased perinatal stress were more likely to be below normal on physical health status and intellectual and social development. Not only does increased maternal prenatal anxiety affect the infant and child, it also affects the mother-child relationship (Norbeck & Anderson, 1989). Farber et al. (1981) also reported that anxious mothers interact less skillfully, communicate less, and are less sensitive to their babies' needs.

Recently published research continues to support the hypothesis of perinatal stress affecting the fetus and child long after delivery. Ruiz and Avant (2005) extensively reviewed the literature and proposed that prenatal stress affects the infants' health, development and function of the child's immune system and neurological development.

McEwen (2003) suggests there are five ways that fetuses' neurological development may be altered by perinatal stress, probably lead to cognitive impairment and behavioral changes in the fetus and subsequently in the child after birth. The first is a decline in the excitability of neurons a problem that is easily and quickly reversible. The second is a retraction of dendrites in the hippocampus. Again, this process is reversible, but may take days or weeks. The third is a hypertrophy of the dendrites in the hippocampus because of the retraction. The fourth process is a decrease in the amount of new neurons being formed in the hippocampus. The fifth and final way that the fetal brain may be altered from stress is by permanent loss of nerve cells in the hippocampus (McEwen, 2003).

Brunson et al. (2001) conducted a study that offers support to the McEwen's hypothesis. The researchers administered CRH into rat brains and at death noted a significant loss of neurons in the hippocampus caused by the CRH administration. This finding supports the premise that perinatal stress does affect the physical anatomy of the brain in the fetus.

If the physical anatomy of the brain is changed, the fetal brain will not respond to stressors in the same manner as a brain that is unchanged by maternal perinatal stress hormones. Sandman et al. (1999) reported that the fetus of women with elevated CRH at 31-33 weeks gestation did not respond appropriately to vibroacoustic stimuli. This supports the premise that perinatal stress does affect fetal neurological development, not only via physical change in the neurons, but also in how these neurons respond to future stressors. Sandman et al. (2003) also detailed that when there is dysregulation between ACTH and beta-endophin, there are lower rates of fetal heart rate habituation at 32 weeks gestation. The researchers proposed that this lack of habituation suggested that memory recall is not adequate, and further posited that the influence of the stress hormones may persist over a lifetime. In another study, Sjostrom et al. (2002) found that women with higher reports of anxiety, measured via the State Trait Anxiety Inventory at 37-40 weeks gestation, had fetuses with an unstable fetal heart rate pattern, which included prolonged accelerations and sustained tachycardia. However, McEwen (2003) also reported that postnatal "handling" may reduce or reverse the effects of perinatal stress on the infant, and may also reduce the infant's stress hormone reactivity.

MEASUREMENTS OF STRESS

Maternal prenatal stress can be measured as perceived stress by using a psychometric instrument, or by the physiologic reaction of the mother and fetus. Maternal stress can affect the pregnancy and the perinatal outcomes of pregnancy. It is important to differentiate the literature according to perceived stress and the stress response when exposed to different stressors. The following sections are a review of the literature as it pertains to perceived stress and poor perinatal outcomes in pregnancy.

Perceived Stress

Maternal perceived stress has been associated with preterm labor (Mackey et al., 2000), preterm birth (Dole et al., 2003; Mancuso et al., 2004), and decreased infant birth weight (Collins et al., 1998; Mackey et al., 2000; Paarlberg et al., 1999; Rini et al., 1999). Increased perceived maternal stress scores have been found to be associated with decreased self esteem, increased physical abuse, increased drug use during pregnancy and

inadequate prenatal care (Jesse et al., 2003). Increased maternal prenatal stress has also been associated with labor or delivery difficulties. Da Costa et al. (2000) found that increased perceived stress was associated with labor and/or delivery difficulties including abnormal labor progression, fetal distress, prolonged labor, premature rupture of membranes, forceps delivery and cesarean delivery. Perceived stress was measured each month of the pregnancy after the third month using the State Anxiety Inventory, Hassles Scale, and Pregnancy Experiences Questionnaire. The study sample included 80 women, of whom the majority were married (86%) and with a planned pregnancy (70%) (Da Costa et al., 2000). The literature demonstrates that abnormally high levels of maternal perceived stress are associated with poor perinatal outcomes of pregnancy.

Maternal perceived stress scores can be examined once during pregnancy, or researchers can identify associations of poor perinatal outcomes when examining the change of stress scores across the pregnancy. Ruiz et al. (2002) found that a decrease in perceived stress scores, when measured from 23-26 weeks to 31-35 weeks gestation, correlated positively with gestational age. The study sample included 78 pregnant women, of whom 60% were married (60%), 20% were Hispanic and 75% were Anglo-American. The sample included five African American women.

Some researchers have examined the number of stressful events experienced by pregnant women to identify factors associated with poor perinatal outcomes of pregnancy. Collins et al. (1998) found an association between the number of daily stressful life events and an increased incidence of delivering a very low birth weight baby, defined as less than 1,500 grams. Paarlberg et al. (1999) also found that the number of daily stressors is associated with a decrease in infants' birth weight, regardless of the gestational age delivered. Other researchers have examined the association between anxiety and preterm delivery and decreased birth weight. Mackey et al. (2000) reported an association between tension/anxiety and decreased birth weight and gestational age. The study sample was comprised of 69% African Americans and 77% on a form of Medicaid. Although the study sample was small (n=70), the design included 35 women who had delivered prematurely. Controls were chosen that matched these women in sociodemographic variables (Mackey et al., 2000). The study design strengthened the reliability and validity of the study findings despite the small sample size. Dole et al.

(2003) also found an association between pregnancy-related anxiety and preterm birth. Women in the study were 2.1 times more likely to deliver prematurely when anxiety levels were elevated (Dole et al., 2003).

Neuro-Endocrine-Immune Response

Increased maternal perinatal stress may be a cause of premature labor and/or a decrease in infant birth weight. Perinatal stress may initiate preterm labor through neuroendocrine, immune and/or vascular pathways. There is a complex, multilevel causation pathway that is difficult to measure and report through the literature. Various pieces of the complex puzzle have been examined by researchers. The following section of the review of literature examines the relationship of the psychoneuroimmunologic reaction of the pregnant female and perinatal outcomes.

HPA Axis Activation

Corticotrophin-releasing hormone (CRH) is the master controller of the neuro-endocrine response from a triggering stressor. Elevated CRH is associated with preterm delivery and decreased birth weight (Hobel et al., 1999; Holzman et al., 2001b; Mancuso et al., 2004; Ruiz et al., 2002; Wadhwa et al., 1998; Wadhwa et al., 2004). Wadhwa et al. (1998) found that CRH negatively predicted gestational length after adjusting for antepartum risk. The researchers also found that CRH levels at 28-30 weeks gestation were an independent marker of antepartum risks such as diabetes, intrauterine growth retardation, nonimmune hydrops, placenta previa, pregnancy-induced hypertension, preterm labor, and premature rupture of membranes (Wadhwa et al., 1998). Certain limitations of the study include a small sample size (n=63) and mostly middle to upper-middle class Anglo women.

Hobel et al. (1999) examined CRH levels at three different time periods: Time 1: 18-20 weeks gestation; Time 2: 28-30 weeks gestation; and Time 3: 35-36 weeks gestation, and found that the women who delivered preterm had significantly elevated CRH at all measurement points in the pregnancy. The study conducted by Hobel et al. (1999) included 524 women of diverse ethnic and socioeconomic status. Also, women who delivered preterm had elevated cortisol levels at 18-20 weeks and 28-30 weeks

gestation, and elevated ACTH levels at all three measurement points. The researchers also found that an elevated perceived stress score, calculated using an abbreviated version of the Perceived Stress Scale—eight items—and Spielberger's State Anxiety Inventory—ten items—with maternal age was predictive of change of CRH from measurement at Time 1 to Time 2 (Hobel et al., 1999).

Other research studies have examined the association between perceived stress, physiological measurements of stress and preterm birth. Ruiz et al. (2002) found that elevated CRH was significantly associated with preterm birth when measured at 31-35 weeks, but not significantly associated when measured at 23-26 weeks. However, lower CRH, when measured at 23-26 weeks and 31-35 weeks, was associated with increased gestational age at birth. Ruiz et al. (2002) findings support the hypothesis that CRH is involved in the physiology of parturition, and that CRH levels may be useful for their negative predictive abilities. Although, perceived stress scores were not associated with preterm labor or birth nor CRH levels, the researchers did report an association between smoking and increased perceived stress scores at the 23-26 week measurement (Ruiz et al., 2002). Limitations of the study include a small sample size (n=76) and homogeneity, in that the participants were primarily married (60%) and Anglo-American (76%) women on Medicaid. However, Mancuso et al. (2004) found an association between CRH and perceived stress scores at 28-30 weeks gestational age at delivery. Perceived stress scores were determined with measurements from the Perceived Stress Scale, Spielberger's State Anxiety Scale, and a pregnancy specific anxiety measurement developed by the researchers. Women who delivered preterm had significantly higher CRH levels at 18-20 weeks and 28-30 weeks gestation. The sample included 282 ethnically diverse women (Mancuso et al., 2004).

An abnormal neuroendocrine response of a pregnant female is not only associated with preterm delivery, but may contribute to fetal growth restriction. Wadhwa et al. (2004) found that an elevated CRH level at 33 weeks gestation was associated with a 3.3 fold increase in preterm delivery and a 3.6 fold increase in fetal growth restriction. This supports the hypothesis that the neuroendocrine response may initiate a vascular response that can lead to fetal growth restriction. The study sample included 232 mostly married

(62.6%) Anglo (48.1%) or Hispanic (45.5%) women. Only 1.3% of the study participants were African American women (Wadhwa et al., 2004).

(Holzman et al., 2001b) examined the neuroendocrine response and preterm delivery in African American women in comparison to Anglo women and found that CRH levels can predict preterm labor as early as 15-19 weeks gestation. The researchers examined CRH levels at 15-19 weeks gestation and found the positive predictive values to be 6% in whites and 16% in blacks, and the negative predictive values to be 97% in whites and 93% in blacks. In addition, CRH levels were consistently lower in black women (Holzman et al., 2001b). This finding suggests that African American women respond differently to the hormones involved in the neuroendocrine axis and may be more sensitive to CRH and its role in parturition.

Immune Response to Stress

The literature review has demonstrated the link between perceived stress, the neuroendocrine response and negative perinatal outcomes. Another important variable in the psychoneuroimmunology reaction is the interaction of stress and infection and its role in preterm delivery and other negative perinatal outcomes. Stress may not only predispose an individual to infection, but infection may initiate a stress response in the mother including activation of the HPA axis. Although, the research is limited in this area, preliminary research supports the link between infection and stress. The following discussion will review studies that support this hypothesis.

A direct link between stress and an immune/inflammation response has been identified. Coussons-Read et al. (2005) found an association in elevated stress scores and cytokines, specifically interleukin 6, interleukin 10 and tumor necrosis factor. Increased perceived maternal perinatal stress was measured with the Denver Maternal Health Assessment and was associated with a increase in IL-6 and TNF, which are considered inflammatory markers, and IL-10 was decreased, which is considered an anti-inflammatory marker (Coussons-Read et al., 2005). Although, the study revealed a direct link between stress and an immune/inflammatory reaction, a limitation of the study includes a small, ethnically diverse sample population of 24 Caucasian, Hispanic and African American women.

Culhane et al. (2001) also found that women with increased perceived stress scores, measured with the PSS at 14.3 weeks ± 0.3 weeks gestation, had a 2.5 fold increase in bacterial vaginosis. An increase in perceived stress levels was an independent and significant predictor of bacterial vaginosis. The sample included 454 socially and ethnically diverse women (Culhane et al., 2001).

Women with increased stress are more likely to develop infections during pregnancy, which can lead to poor perinatal outcomes including preterm labor. The link between infection and preterm birth is well established. For example, Ruiz et al. (2002) found that an increase in genitourinary infections is associated with preterm birth when the infection was present in late second trimester and early third trimester of pregnancy. Holzman et al. (1999) found that an increase in immunoglobulin M (IgM), sampled at 15-19 weeks gestation in an ethnically diverse population, was associated with a 15.6-fold increase in delivery before 29 weeks gestation. IgM is strictly from maternal serum and does not reflect fetal immune response reaction, unlike cytokines, which can originate from maternal and fetal sources (Holzman et al., 1999). Increased maternal prenatal stress may stimulate an immune/inflammatory reaction that increases the risk for developing an infection during the pregnancy leading to poor perinatal outcomes in pregnancy.

Allostatic Load

Allostatic load is a measurement of chronic stress and its effects on the body (Geronimus et al., 2006). Allostatic load has not been examined during pregnancy and it has not been determined how it impacts pregnancy. Researchers in the field of psychoneuroimmunology are beginning to examine allostatic load in relation to pregnancy among different ethnic groups; however, as of May 2008 no published research could be found that address allostatic load and pregnancy. Allostatic load has been described as a predictor of health and associated with a decline in cognitive and physical functioning and mortality (Seeman et al., 2001a). Allostatic load has been determined using systolic and diastolic blood pressure, hip/waist ratio, serum high-density lipoprotein, total cholesterol, blood levels of glycosylated hemoglobin, serum dehydroepiandrosterone sulfate, urinary cortisol excretion and urinary norepinephrine and epinephrine excretion levels (Seeman et al., 2002) The researchers found that the

combination of these measurements was a better predictor of health than the predictive value of each variable (Seeman et al., 2002). Allostatic load in a nonpregnant population is highest among African American women (Geronimus et al., 2006).

Research studies have looked at the concept on allostatic load and its impact on health issues in a variety of non-pregnant ethnic groups. Stumvoll et al. (2003) found that increased allostatic load is correlated with an increase in fasting and postprandial blood glucose levels included primarily Pima Indians (n=413) and some Caucasians (n=60). Johnston-Brooks et al. (1998) examined the impact of allostatic load on missed days of school because of sickness. The researchers found that the higher the allostatic load, the higher the likelihood that the research participant would miss school because of an illness. The study included 81 6th grade boys and their mothers; 77% of the children were Caucasian.

The effects of allostatic load goes beyond the physical health of the individual. Lindfors et al. (2006) found that allostatic load scores predict sense of coherence better than clinical risk factors. The study included the Sense of Coherence scale which measures a person's feelings regarding their ability to manage life, find meaning in life and have comprehensibility of life. The research study included 639 Swedish women.

Relatively few research studies have examined allostatic load. This may be due to the fact that it is a fairly new concept. However, additional research needs to be done to determine the best way to measure allostatic load in a pregnant population across the different ethnic groups. Also, additional research needs to be done to determine the association between allostatic load and poor perinatal outcomes.

PSYCHOLOGICAL TRAITS AND RESOURCES THAT AFFECT STRESS

Another challenge facing researchers is to identify variables that could alter the stress response in the mother, potentially impacting the reaction to stress and affecting perinatal outcomes. For the purpose of this study, important variables to examine include social support and coping. The following paragraphs review the literature on these variables.

Social Support

Social support affects the stress response in pregnancy and has been well documented in the literature. A lack of social support is linked to an increase in maternal perinatal stress and poor perinatal outcomes (Da Costa et al., 2000; Rini et al., 1999; Lespinasse et al., 2004; Wadhwa et al., 1996). Social support appears to have a buffering response that decreases the woman's perception of stress and her physiological reaction to stress during pregnancy. Also, ethnicity affects the perception of social support and how this support impacts the pregnancy.

Different demographic variables have been associated with different types and levels of social support. Sagrestano et al. (1999) found that women in the study population who reported increased social support from family and friends tended to be younger, unmarried, pregnant with their first baby, and of higher social economic status. Also, African American women reported more support from family and friends than Caucasians and Latinos. Women who were married, of higher socio-economic status and older reported decreased social support from the father of their baby (Sagrestano et al., 1999). These demographic variables may help to identify women at risk for poor perinatal outcomes simply because of a lack of social support.

Researchers have linked decreased levels of social support to decreased birth weight. Da Costa et al. (2000) found that social support independently predicted infant birth weight after controlling for gestational age, parity, income and exposure to partner smoking. Rini et al. (1999) also found that increased social support was associated with infant birth weight. Lespinasse et al. (2004) conducted a study of African American mothers to determine the effects of support in the delivery room. The study researchers found that a lack of support in the delivery room was associated with a three-fold increase risk of delivering a very low birth weight infant (less than 1,500 grams). The women tended to be older, have received less prenatal care, had four or more pregnancies and reported a higher rate of stressful life events. Lack of support in the delivery room may simply be an additional indicator of other risk factors for delivering a very low birth weight baby, such as stress and poor prenatal care. Nevertheless, lack of social support is associated with infant birth weight.

Lack of social support also is associated with increased stress levels, both perceived stress and physiological measures of stress hormones including ACTH, beta-endorphin and cortisol. The association between stress and poor perinatal outcomes has been examined in the previous section of this literature review. Coussons-Read et al. (2005) found that decreased social support was associated with increased perceived stress scores. Jesse et al. (2003) found that women with increased perceived stress scores reported decreased social support. Wadhwa et al. (1996) reported that women with increased social support had decreased levels of ACTH, beta-endorphin and cortisol levels. It is impossible to determine if a lack of social support increases stress levels, or if an increase in stress causes individuals to minimize or not use social networks to their fullest. Whichever the case, the outcomes are the same, including poor perinatal outcomes; negative effects on the fetus, infant and child; negative effects on the child-mother relationship; and interference with maternal prenatal psychosocial adaptation efforts, of which all result in poor perinatal outcomes in pregnancy.

Coping

Coping is another variable that could potentially impact the maternal response to stressors. Coping has been linked to poor perinatal outcomes including preterm labor (Demyttenaere et al., 1995); preterm delivery (Dole et al., 2004); decreased birth weight (Da Costa et al., 2000); depression (de Tychey et al., 2005); and labor and delivery difficulties (Da Costa et al., 2000). Different types of coping have been identified in the literature as protective against poor perinatal outcomes of pregnancy. The following paragraphs are a review of the literature as it relates to coping and pregnancy.

Demyttenaere et al. (1995) found that specific coping mechanisms predict the course of contractions in women with preterm labor. Women who used palliative coping had shorter hospital stays and shorter duration of intravenous drug treatment for preterm labor. Palliative coping involves reaching out to others for support. Women who used social support seeking as a form of coping were more likely to have longer gestations. Contrary to common belief, women who used active coping were more likely to deliver prematurely. Active coping is defined as trying to do something about the situation or change the stressful situation. The limitations of the study include a small sample size of

23 women and 22 controls, and that the sample included all primagravida Dutch women (Demyttenaere et al., 1995).

Other researchers have examined specific coping mechanisms and their association to poor perinatal outcomes in pregnancy. Da Costa et al. (2000) found that women who used distancing or denial as coping mechanisms were more likely to have labor and delivery difficulties including fetal distress, post-term deliveries, prolonged labor, premature rupture of membranes and forceps deliveries. The researchers also reported that women who used emotional coping, such as distancing or denial, delivered babies with decreased birth weights. Dole et al. (2004) reported that African American women who used distancing as a coping mechanism were 1.8 times more likely to deliver prematurely.

VARIABLES THAT PRODUCE STRESS IN AFRICAN AMERICAN WOMEN

In the literature, certain variables have been identified that can potentiate stress and the stress response in African American women. These variables include racial discrimination, poor housing environment and urban violence. The association between these variables and poor perinatal outcomes is just beginning to be understood and few researchers have examined these concepts in relation to pregnancy and its outcomes. The following paragraphs are an integrative review of these variables as reported in the literature.

Racial Discrimination

Racial discrimination has been identified as a stressor in the African American population and has been linked to increased perceived stress scores (Stancil et al., 2000). The preceeding paragraphs have demonstrated the association between increased perceived stress scores and poor perinatal outcomes. Researchers also have linked racial discrimination to poor perinatal outcomes in pregnancy, including preterm birth (Collins et al., 2004; Dole et al., 2003; Dole et al., 2004) and decreased birth weight (Collins et al., 2004; Lespinasse et al., 2004).

Racial discrimination constitutes an independent risk factor for preterm labor (Collins et al., 2004). Collins et al. (2004) interviewed 104 African American women

who delivered babies born prematurely (<37 weeks gestation) and very low birth weight (<1,500 grams) and 208 African American women who delivered non-low birth weight (>2,500 grams) term infants in Chicago, IL. Using Krieger's Racial Discrimination Scale, the researchers found that women who had experienced one or more domains of racial discrimination were 1.7 times more likely to deliver babies with very low birth weights, and women who reported three or more domains were 2.6 times more likely to deliver babies with very low birth weights. Dole et al. (2004), interviewed African American women between 24 and 29 weeks gestation about racial discrimination, found that women who reported higher levels of racial discrimination were 1.8 times more likely to deliver prematurely. The study was conducted in North Carolina. The researchers used a modified version of Krieger's Racial Discrimination Scale.

Poor Housing Environment and Urban Violence

Another variable identified in the literature that can increase stress and be linked to poor perinatal outcomes in pregnancy for African American women is poor housing environment and urban violence. Dole et al. (2004) found that African American women were more likely to rate their neighborhoods as unsafe when compared to white women. David & Collins (1997) found an association between actual violent crime in an area and a decrease in infants' birth weight. Collins et al. (1998) reported an association between an unfavorable subjective report of residential environment and very low birth rate. An unfavorable evaluation of the residential environment was associated with a 3.2 increase in very low birth weight infants. Shiono et al. (1997) found that babies born to women living in public housing were on average 83 grams lighter after controlling for ethnicity, age, marital status, education, poverty level, type of insurance, body mass index and smoking.

GAPS IN THE LITERATURE

The previous literature review demonstrates that stress impacts pregnancy and pregnancy outcomes. It is still unclear how best to measure stress in. Many different psychometric instruments and physiological measurements of the stress response are used

in research to measure stress; however, no one measurement stands out as a gold standard. Perhaps it is not one instrument or test that is needed, but a combination of measurements that will provide a better predictive value for identifying women at risk for poor perinatal outcomes. In addition, researchers continue to struggle with the best time to measure prenatal stress so that a stress response can be seen at a time that offers the opportunity for interventions in women deemed to be high risk. Little research exists that identifies effective interventions to decrease stress in pregnancy. This researcher believes that additional research is needed to identify stress before effective interventions can be utilized to prevent poor perinatal outcomes.

Another problem noted in the literature is the abundance of terms used to describe stress and its response. Terms that appeared in the literature include: stress response, chronic stress, anxiety with pregnancy, psychological distress, distress, stress, self-reported anxiety, objective anxiety, subjective anxiety, workload, maternal anxiety, anxiety, emotional distress, pregnancy specific anxiety, high anxiety, high stress, maternal stress, psychosocial stress, repressed coping style, psychological functioning, perceived stress, chronic stressors, acute psychosocial stressors, stressed or anxious mothers, stressful events, negative life events, life stress, prenatal psychological state, psychosocial factors, stressors, psychosocial risk factors, psychological burden, stressful conditions, stress reduction, generalized stress, psychological adaptation, social stress, and physiological stress. The abundance of terms indicates the absence of an accepted standardized language, this in turn contributes to the difficulty surrounding research and application of findings in clinical practice. Also, the lack of consensus supports the claim that maternal prenatal anxiety is a multi-dimensional concept which may be difficult to identify and measure.

It is still unclear from the literature exactly how African American women differ from other ethnicities in their stress response. This study will compare racial discrimination and different measurements of stress, including perceived stress and allostatic load score, in two different groups of African American women. The research project aims to provide a better understanding of stress, racial discrimination and pregnancy in African American women.

CHAPTER 3: METHODS

This chapter describes the research design, setting and sampling methods, human subjects, measurement methods, and data collection process. Also included is a description of the data analysis procedures that were conducted.

RESEARCH DESIGN

The research design used for this study is an exploratory-observational design (see Figure 2; pg. 17). Data for measurements of perceived stress, allostatic load and racial discrimination were gathered from two origin groups of African American women, i.e., those born in the U.S. and foreign-born African American women.

SETTING AND SAMPLING METHODS

All African American women who met the inclusion and exclusion criteria and were seeking care at a West Houston, Texas, private physician's office were offered the opportunity to participate in the study (Appendix A). All study procedures were approved by the Institutional Review Board at the University of Texas Medical Branch in Galveston, Texas. Study subjects signed two copies of the informed consent form to participate in the study (Appendix E).

Inclusion criteria for the study participants included African American women between the ages of 18 and 34 with single gestation pregnancy dated between 14-19 weeks gestation based on last menstrual period and/or ultrasound. The gestational age of 14-19 weeks was chosen because the literature suggests that differences in corticotrophin-releasing hormone can be seen as early as 14 weeks in women who will experience poor perinatal outcomes. This may be early enough in pregnancy that preventive measures or conservative treatment therapies might be implemented to prevent complications in the mother/fetal unit (Hobel et al., 1999; Holzman et al., 2001a). The research participants needed speak and read English. Exclusion criteria included that the study participants were free of placenta previa, fetal or uterine anomalies, hydramnios,

any chronic conditions such as diabetes and hypertension and were not taking any medications other than prenatal vitamins. Originally, a power analysis was performed and determined that the necessary sample size was 25 participants per group, or 50 participants total (Pedhazur & Schmelkin, 1991). However, data collection was discontinued after one year and the sample included 26 American-born participants and four foreign-born participants. A sample of convenience was used for the sampling method.

HUMAN SUBJECTS

Data collection for the study took place during an interview and physiological data collection process conducted in a private location and at the convenience of the participants. Participants were adult (at least 18 years of age), African American women who met the inclusion and exclusion criteria. However, one participant did have chronic hypertension that was diagnosed one month prior to data collection and she was taking antihypertensive medication. She did not disclose this information to the researcher until after the data collection process was complete. There were no treatments or interventions associated with the study's procedures.

Participants were recruited using IRB-approved flyers that were posted at the private physician's office (Appendix A). Permission to post the flyers at the location was verbally negotiated by the researcher and the proprietors. The flyers informed potential participants about how to contact the researcher if they wanted more information about the study or wished to inquire about participation in the study. Individuals interested in participating in the study received the informed consent document after the study had been explained and questions answered. The research participants who completed the data collection process were given postcards to return for an embroidered diaper bag to compensate for time spent during the collection process (Appendix B).

Informed consent for the study was obtained from every participant (Appendix E). The consent form was written using simple sentence structure and wording. Although, all participants in the research project were able to read English the informed consent was verbally explained by the researcher including all risks and benefits of the study. All potential participants were given the opportunity to ask questions their questions were

answered by the investigator. Those who agreed to participate in the study signed two copies of the informed consent document, one copy for the research participant to keep and one copy of the informed consent remained with the researcher. Once the participants signed the informed consent form, the investigator begin the data collection process.

Interviews were conducted according to the IRB-approved structured interview guide (Appendices J and K). Biodemographic data were collected using an IRB-approved form created for the study, and coded like all other study materials so that the identity of the participant could not be determined by anyone other than the researcher (Appendices H and I). There was minimal risk of the loss of confidentiality, which was communicated verbally and in the informed consent form. Interviews lasted no more than 20 minutes, and the entire data collection process took approximately 40 minutes. The researcher met with each participant only once. All study materials, including the demographic questionnaire, physiological data sheet, questionnaires and blood sample, were coded to maintain the confidentiality of the participants. Signed consent documents were kept in a locked file in the investigator's office, but separate from any identifying materials.

Participants who wished to stop the interview or withdraw from participation could do so at any time without harm or penalty, which was made explicit in the consent form and explained verbally to each participant. The investigator was an advanced practice nurse with skills to recognize discomfort in a participant, and none was observed during data collection procedures.

Stopping the interview and redirecting to less sensitive topics could have occurred if needed. Had any participant requested a referral to a counselor or to an organization or facility, support or information on the process this would have been provided and assistance from the researcher would have been available. However, this was not necessary for any participant during the data collection process. No children or prisoners were eligible to participate in the study.

Instrumentation

Cohen's Perceived Stress Scale:

Perceived stress was measured with the Cohen's Perceived Stress Scale (PSS; Appendix J), which has been used reliably in many different pregnant populations and

across different ethnic groups (Culhane et al., 2001; Hobel et al., 1999; Mancuso et al., 2004; Ruiz et al., 2001; Ruiz et al., 2002; Stancil et al., 2000; Wadhwa et al., 1996). The PSS is a ten-item inventory with Likert responses ranging from zero to four. The PSS includes such statements as "How often have you felt nervous or stressed?" and "How often have you felt difficulties were piling up so high that you could not overcome them?" Cronbach's alpha reliability coefficient of the PSS in a pregnant population that included African American women was 0.77 (Culhane et al., 2001). Items number 4, 5, 7 and 8 were reverse coded and the total score of the PSS was calculated from the 10 answers with a range of 0-40, with 40 indicating the highest level of perceived stress.

Kreiger's Self-Reported Perceptions of Racial Discrimination:

Self-reported racial discrimination was measured with the Krieger's Self Reported Perceptions of Racial Discrimination Scale (RDS; Appendix K). This instrument has been used with pregnant women (Collins et al., 2004; Dole et al., 2003; Dole et al., 2004; Lespinasse et al., 2004; Rosenberg et al., 2002; Stancil et al., 2000). The RDS is an inventory with Likert responses ranging from zero to four. The RDS includes such statements as "In the past year, how much did you worry about yourself experiencing unfair treatment because of your race, ethnicity, or color?" and "How often do you feel that racial/ethnic groups who are not white, such as African Americans and Latinos, are discriminated against?" The Cronbach's alpha reliability coefficient of the RDS in an African American non-pregnant population was 0.74 in the available literature (Krieger et al., 2005b). No published reliability coefficients for the RDS when used in a pregnant population were identified. Sections E and H of the RDS were reverse coded for scoring purposes. The total score of the RDS was calculated from the 34 quantitative answers. The score could range from 0-98, with 98 indicating the highest level of self-reported perceptions of racial discrimination.

Allostatic Load Score:

The total allostatic load score was calculated using the following four biomarkers: systolic blood pressure, diastolic blood pressure, CRH and body mass index. If the systolic blood pressure was greater than 120 mmHg, one point toward the allostatic load

score was assigned. The American Heart Association (2007) identified that a systolic blood pressure between 120-139 mmHg as pre-hypertensive or high normal. If the diastolic blood pressure was greater than 80 mmHg, one point was assigned. The American Heart Association (2007) identified that a diastolic blood pressure between 80-89 mmHg as pre-hypertensive or high normal (American Heart Association, 2007). A conservative high threshold for blood pressure was chosen because systolic and diastolic blood pressure decreases 5-10 mmHg in the second trimester of pregnancy, which is when data collection occurred (Ayala, et al., 1997). One point toward the total allostatic score was awarded for a body mass index of 25 or more. The World Health Organization and the Center for Disease Control defines a BMI of 25 or more as overweight or obese (Halls, 2003). One point was added to the allostatic load score for a CRH analysis in the upper 25th percentile of the sample population. In previous allostatic load research the high threshold is defined by current clinical practices or the upper 25th percentile of the population (Crimmins et al., 2003; Geronimus et al., 2006). Since CRH analyses are uncommon in clinical practice, the 25th percentile threshold was used. The combined scores from the biomarkers used to calculate the allostatic score could yield a score that ranged between 0-4. Zero indicates the lowest risk for poor perinatal outcomes and four the highest risk.

PROCEDURE

The researcher approached self-identified potential participants and explained the study before obtaining written consent (Appendix E). After the informed consent form was signed by the participant, a copy of the consent form was given to the participant, and the data collection process began. All necessary supplies were provided by the researcher (Appendix C). The data collection process was done in a private area that allowed privacy and confidentiality to be maintained. The participant's blood pressure measurements were taken and recorded on the physiological data sheet (Appendix H). It was important to select the correct cuff size, confirm that the participant had not had any caffeine or nicotine within 30 minutes of measuring the blood pressure and had been allowed to rest for five minutes before assessment to prevent inaccurate results. The methods for assessing the blood pressure as described by Lynn (2008) were utilized

(Appendix F). Blood pressure was assessed prior to beginning the blood collection process and completing other psychometric instruments because these activities could have a temporarily effect on the participant's blood pressure (Lynn, 2008). The participant's height and weight were measured using a standardized process including the use of the same measuring tape to measure each participant's height; the scale was calibrated before weighing each participant (Appendix G). These data were recorded on the physiological data sheet (Appendix H); then, a blood sample was drawn to test for CRH. The protocol developed by Ruiz et al. (2007) described below was used for CRH sampling (Appendix L):

1) A chilled, lavender top collection tube and needle were used for the sampling (Rationale: lavender top tube contains ethylenediaminetetra-acetic acid which is an anticoagulant. Chilling the needle and tube maintains the integrity of the CRH).
2) 0.312 mL Aprotinin was added to lavender top tube before collection (Rationale: Aprotinin keeps the CRH from breaking down).
3) 6 mL of blood was drawn from each research participant (Rationale: This amount is an adequate blood sample so that additional radioimmunoassays (RIA) may be completed if necessary).
4) The sample was centrifuged at 3,200 RPM for 10 minutes within 30 minutes to 1 hour after collection (Rationale: This allowed the researcher to collect the plasma that was used to complete the RIA, and the promptness of centrifuging the sample was needed to maintain the integrity of the CRH hormone).
5) The plasma was divided into two aliquots and labeled with appropriate subject information (Rationale: This assured that an appropriate amount and quality of plasma was obtained. Also, appropriate labeling was necessary to maintain the reliability and validity of the research findings).
6) The specimens were stored on dry ice until transferred to the Biobehavioral Lab at UTMB-SON within 12-24 hours after collection (Rationale: Keeping the plasma cold was necessary to maintain the integrity of the CRH hormone for analysis).

The CRH samples were analyzed at the UTMB Biobehavioral Lab in Galveston, Texas. Initially, the samples were extracted using the CRH extraction protocol developed by Phoenix Laboratories (Appendix M):

1) Add 3 mL of ice cold Methanol into each 15 mL conical tube. It is necessary to keep the samples on ice. Next, add 1 mL of plasma (previously mixed very well). Vortex immediately and keep on ice for 20 minutes. Vortex samples 3 times during incubation time.
2) Along with human samples, prepare a tube of Normal Human Plasma (1 mL) and Normal Human Plasma spiked with 100 counts of I-125-CRH. These will yield "percent recovered" from the extraction process. During the process, assay the recovery tubes just like sample tubes.
3) Spin samples for 20 minutes at 1700 g (3250 rpm) at 4°C. Decant supernatants to glass test tubes and keep on ice.
4) Once dried overnight, the samples may be stored up to 90 days in the -20°C freezer if tops are covered tightly with parafilm.

After extraction, the Phoenix Radio-Immunoassay (RIA) kit was used to identify the amount of CRH in the plasma sample. The protocol developed by Phoenix Laboratories was followed for the CRH analysis. On day one of the assay process, the sample or standard was combined with the 1st antibody, or the rabbit anti-peptide serum. The CRH peptide is too small to assay without creating a larger molecule, so the 1st antibody is added to the plasma samples to create an antibody-antigen complex. This antibody-antigen complex is the unknown concentration. The mixture was vortexed and incubated for 16-24 hours at 4°C. On day two of the assay process, the radioactive isotope I-125 peptide was added to the samples. The isotope binds with the remaining, unbound antibody from day one. These antibody-antigen complexes are the known concentration. The mixture was vortexed and incubated for another 16-24 hours at 4°C. On day three of the assay process, the 2nd antibody was added, which included goat anti-rabbit IgG serum and normal rabbit serum. The 2nd antibody mixture is used to remove all other peptides and proteins from the sample so that the known concentration of CRH can be assayed with the gamma-radioactive counter. The mixture was once again vortexed and incubated at room temperature for 90 minutes. A buffer was added to remove the

protein complexes that were not being accounted for with this assay. Next, the sample was vortexed and centrifuged for 20 minutes at 1700 x g (3250 rpm). After the procedure the supernatant, or excess fluid, was aspirated off of the pellets. The pellets are the antibody-antigen complexes containing the CRH from the subjects, or the unknown concentration of CRH, and the antibody-antigen complexes with the CRH peptides, or the known concentrations. The pellets were counted with the gamma counter. The gamma counter accounted for the known concentration of the CRH peptides and the software calculated the unknown concentration of CRH based on the known results.

All specimens were run in the same batch to avoid interassay variation. A standard from the kit manufacturer was also used to confirm accuracy. Table 1 identifies the contents of each of the tubes that was used during the CRH analysis.

Table 1. Tube Contents

Tube	**Contents**	**RIA Buffer**	**STD or Sample**	**1st Antibody**	**I-125 Isotope**
1 & 2	Total Counts				100 • L
3 & 4	Non-specific binding	200 • L			100 • L
5 & 6	Total binding	100 • L		100 • L	100 • L
7 & 8	H standard		100 • L	100 • L	100 • L
9 & 10	G standard		100 • L	100 • L	100 • L
11 & 12	F standard		100 • L	100 • L	100 • L
13 & 14	E standard		100 • L	100 • L	100 • L
15 & 16	D standard		100 • L	100 • L	100 • L
17 & 18	C standard		100 • L	100 • L	100 • L
19 & 20	B standard		100 • L	100 • L	100 • L
21 & 22	A standard		100 • L	100 • L	100 • L
23 & 24	Positive Control		100 • L PC	100 • L	100 • L
25-85	Samples		100 • L	100 • L	100 • L

Once physiological data had been collected, the participant was asked to complete the demographic questionnaire (Appendix I), Cohen's Perceived Stress Scale (Appendix J) and Krieger's Racial Discrimination Scale (Appendix K). The demographic questionnaire included such questions as age, income, gestational age of current pregnancy and number of years in the United States.

The total data collection time took 30-45 minutes. After data collection had been completed, the study participant was given a postcard (Appendix B) to return to the researcher for a personalized embroidered diaper bag.

DATA ANALYSIS PROCEDURES

The data collected were analyzed with SPSS 14.0. The raw data were examined for errors (Burns & Grove, 2005). Demographic data were analyzed with frequencies, percents, means, standard deviations and ranges. When appropriate, other variables were analyzed using a correlation analysis. The following research questions were analyzed using the corresponding methods:

Research Question #1:

> What are the differences that exist between the African American women born in the United States and those who are foreign-born in terms of perceived stress, measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) and racial discrimination?

Analysis of Question #1:

> Mann Whitney U t-tests were performed to determine whether differences exist between African American women born in the United States and foreign-born African American women in terms of perceived stress, measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) and racial discrimination.

Research Question #2:

> What are the correlations that exist between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load (total allostatic load score,

CRH, BMI, systolic and diastolic blood pressure) in a sample of pregnant African American women?

Analysis of Question #2:

Pearson's correlation analyses were used to examine the relationships between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) in a sample of pregnant African American women.

Research Question #3:

What is the best model from the study variable set including perceived stress, individual measurements of allostatic load, total allostatic load score, racial discrimination, age, years in the United States, income, number of hours worked per week and gestational age that predicts each of the study variables?

a. Which set of variables predicts perceived stress?
b. Which set of variables predicts individual measurements of allostatic load?
c. Which set of variables predicts the total allostatic load score?
d. Which set of variables predicts racial discrimination?

Analysis of Question #3:

Backward multiple regression analyses were utilized to determined the best model from the study variable set including perceived stress, individual measurements of allostatic load, total allostatic load score, racial discrimination, age, years in the United States, income, number of hours worked per week and gestational age that predicted each of the study variables.

The p-value and the effect size were examined to evaluate the incidence of a type I error. Homogeneity of the different groups and appropriate sample size in each group was examined to ensure that the analysis was reliable (Pedhauzer & Schmelkin, 1991).

Appropriate reliability analyses were completed on each of the instruments used to collect data. Calculation of the Cronbach alphas on each of the instruments was conducted as evidence for internal reliability. Daily quality controls were performed and

recorded, per the protocols developed by Ruiz et al. (2007), to ensure the quality of the CRH analysis (Burns & Grove, 2005).

CHAPTER 4: RESULTS

This chapter includes the purpose of the study, sample characteristics, and the research findings for the three research questions.

PURPOSE

The purpose of this exploratory-observational study was to compare perceptions of racial discrimination and different measurements of stress, including perceived stress and allostatic load scores, in two different groups of pregnant African American women. The intent of the study was to provided a better understanding of stress, racial discrimination and pregnancy in African American women. The study examined two different groups of African American women: those born in the United States and those who were foreign-born. Previous research suggests that cultural differences exist between these two groups within African Americans (David and Collins, 1997). Additionally, the study examined racial discrimination to validate previous research projects that have identified racial discrimination as a stressor.

SAMPLE CHARACTERISTICS

Demographic data were analyzed with descriptive statistics including frequencies, percents, means, standard deviations, and ranges (Table 2). There were a total of 30 research participants. Data collection was discontinued after one year due to time and resource constraints, thus reducing the total size of the sample from 50 to 30. Twenty-six of the women were born in the United States and four were foreign-born. One of the women born in the United States had high blood pressure, but did not disclose this to the researcher until after the data were collected. The data were examined for outliers and none of the variables demonstrated significant skewness.

Seventy-five percent of the study participants were less than 30 years of age (n=23). Thirty-seven percent of the women had a household income of less than $1,600 per month (n=11). A household income of less than $1600 per month placed the family

below the poverty level for a family of four. With 37% of the sample population living in poverty, this average is higher than the Texas poverty level of 22 % for African Americans (Center for Public Policy Priorities, 2005). Forty-three percent of the women did not work (n=13) and 47 % worked 40 hours or more per week (n=14).

Table 2. Demographic Data for Sample (N=30)

Variable	Range	Mean	Standard Deviation
Age (years)	18-34	24.67	5.17
Income per month	$0-$5833	$2481.80	$1517.54
Hours Worked Per Week	0-56	22.53	20.93
Years in the U.S. (n=4)	.67-25	10.67	11.54
Systolic Blood Pressure (mmHg)	92-145	117.07	12.70
Diastolic Blood Pressure (mmHg)	57-88	69.63	8.39
Height (inches)	59-72	65	2.99
Weight (pounds)	106-333	187.10	65.15
BMI	18.80-57.20	31.14	10.93
Gestational Age (weeks)	14.43-19.86	17.03	2.12
Number of Pregnancies	1-6	2.73	1.76
Number of Deliveries	0-4	1.07	1.17
Complications with Previous Pregnancies	0-1	0.033	.18
CRH (pg/mL) (n=29)	5.67-22.17	11.78	3.72
Allostatic Load Score (n=29)	0-4	1.45	0.99
Perceived Stress Score	7-30	17.86	5.85
Racial Discrimination Score	2-53	23.11	15.32

Twenty-six women were born in the United States and four women were foreign-born. Two of the foreign-born women were from Jamaica and two were from Africa. Of the foreign-born participants, time in the U.S. ranged from 8 months to 25 years.

Of the 30 women included in the study, 53% of the women had an ultrasound to date the pregnancy (n=16). It was the practice of the private physician to perform an ultrasound for dating unless the woman was sure of her last menstrual period, with normal menses, and the pregnancy measurement corresponded with the dates from the last menstrual period. Forty-seven percent of the sample did not have an ultrasound for

dating because they met the preceding criteria (n=14). Forty-three percent of the women were pregnant with their first baby (n=13). The remaining 57% that had a completed pregnancy prior to the current pregnancy: of these 12% experienced complications during a previous pregnancy (n=2). These complications included hypertension and gestational diabetes. One participant had chronic hypertension (diagnosed one month prior) with the current pregnancy and was taking anti-hypertensive medication. She did not disclose this to the researcher until after data collection was complete. The diagnosis of chronic hypertension should have excluded the participant from the research study, however, none of the data collected from this individual was significantly different than the remaining 29 women included in the study.

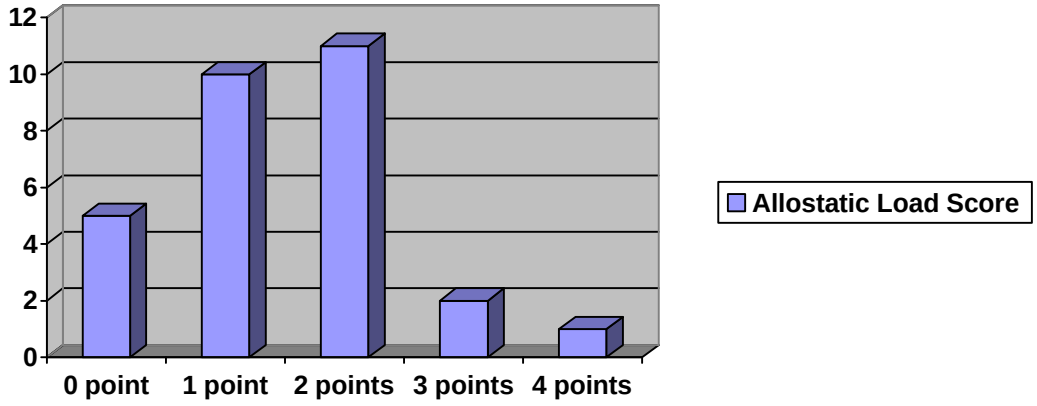
Descriptive Statistics on Study Variables:

The total allostatic load score was calculated from the physiological data collected as a part of the current research study (Table 3). Forty-three percent of the women had a systolic blood pressure greater than 120 mmHg (n=13); one point toward the allostatic load score was added for these women. Thirteen percent of the women had a diastolic blood pressure greater than 80 mmHg (n=4); one point toward the allostatic load score was added for these women. Sixty-three percent of the women had a BMI greater than 25 (n=19); one point toward the allostatic load score was added for the 19 women with a BMI greater than 25. Eight women had a CRH level greater than 14.31 pg/mL, placing them in the upper 25^{th} percentile for the study sample. One point toward the allostatic load score was added for these women. One sample of the CRH was unreadable by the gamma counter during analysis; therefore, there are only CRH data and allostatic load scores for 29 research participants. The total allostatic load scores ranged from 0-4, with 4 indicating the highest physiological risk (Figure 3). Ninety percent of the women had an allostatic load score of less than two (n=26).

Table 3. Allostatic Load Calculation

	Did not receive a point toward allostatic load score	**Received point toward allostatic load score**
Systolic Blood Pressure (N=30)	<120 n=17	> or = 120 n=13
Diastolic Blood Pressure (N=30)	<80 n=26	> or = 80 n=4
BMI (N=30)	<25 n=11	> or = 25 n=19
CRH (N=29)	lower 75th percentile n=21	upper 25th percentile n=8

Figure 3. Allostatic Load Scores for Sample



Cohen's Perceived Stress Scale was used to measure the subjective perceptions of stress. The scores ranged from seven to thirty in the sample population. Nine of the women fell in the upper 25th percentile on the Perceived Stress Scale. The alpha reliability coefficient for the research study was 0.81, indicating excellent reliability of the instrument in the sample population.

Krieger's Racial Discrimination Scale was used to measure the self-reported experiences of racial discrimination. The scores ranged from 5-53 in the sample population. Seven of the women fell in the upper 25th percentile on the Racial Discrimination Scale. The sample alpha reliability coefficient for the research study was 0.91, indicating excellent reliability of the instrument in the sample population.

Research Questions

Research Question #1:

> *What are the differences that exist between the African American women born in the United States and those who are foreign-born in terms of perceived stress, measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) and racial discrimination?*

When examining the two origin groups, 26 of the research participants were born in the United States and four were foreign-born. Because a sample of four foreign-born participants is not representative and constitutes a limited and inadequate sample size, nonparametric statistics were required across all group analyses.

The only variable of interest that revealed statistical significance between the two groups was BMI (Table 4). The foreign-born women had a lower mean rank BMI versus the American-born women. None of the other variables examined revealed statistically significant differences between foreign-born and U.S.-born African American pregnant women utilizing the Mann Whitney U nonparametric test. Statistically significant differences may not have been seen due to the small number of research participants that were foreign-born. With the small number of research participants in the group of foreign-born participants the effect size of the different variables would have to had been very large to see a statistical difference. However, there may be clinical significance that is worth investigating. The foreign-born women were older, with a mean age of 30.25 compared to the U.S.-born women's mean age of 23.81. The foreign-born women had a higher monthly income mean of $3,108 versus $2,385 for the women born in the Unites

States. In addition, the U.S.-born women scored higher on the PSS and RDS than the foreign-born women.

Table 4. Mann-Whitney U Test Comparing U.S. versus Foreign-born Women

	N	Rank	Significance
Age			
U.S.-born	26	14.15	0.11
Foreign-born	4	24.25	
Income			
U.S.-born	26	14.94	0.41
Foreign-born	4	19.13	
Systolic Blood Pressure			
U.S.-born	26	14.50	0.17
Foreign-born	4	22.00	
BMI			
U.S.-born	26	15.96	0.02
Foreign-born	4	12.50	
CRH			
U.S.-born	26	14.81	0.57
Foreign-born	3	16.67	
Allostatic Load Score			
U.S.-born	26	14.71	0.83
Foreign-born	3	17.50	
PSS			
U.S.-born	26	15.96	0.47
Foreign-born	4	12.50	
RDS			
U.S.-born	26	15.98	0.47
Foreign-born	4	12.38	

Research Question #2:

What are the relationships that exist between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) in a sample of pregnant African American women?

Significant correlations existed between some of the variables investigated. The women with a higher diastolic blood pressure had a higher weight ($r = 0.58$; $p<.001$) and BMI ($r = 0.52$; $p<.003$). Interestingly, height was positively correlated with the Racial Discrimination Scale ($r = 0.38$; $p<.037$), i.e., the taller the woman, the more likely she was to report higher perceptions of discrimination. There was a positive correlation between age with the number of previous pregnancies ($r = 0.57$; $p<.001$) and number of previous deliveries ($r = 0.52$; $p<.003$). The lower the income, the more likely the study participant scored higher on the Perceived Stress Scale ($r = -0.43$; $p<.019$). A few correlations existed that did not meet the criteria of statistical significance but are worth noting. Age is marginally correlated with income ($r = 0.36$; $p<.054$), i.e., the older the woman, the more likely she has a higher household income. Additionally, the study participants with higher Perceived Stress Scale scores were more likely to have higher scores on the Racial Discrimination Scale ($r = 0.34$; $p<.063$).

Research Question #3:

What is the best model from the study variable set including perceived stress, individual measurements of allostatic load, total allostatic load score, racial discrimination, age, years in the United States, income, number of hours worked per week and gestational age that predicts each of the study variables?

a. Which set of variables predicts perceived stress?
b. Which set of variables predicts individual measurements of allostatic load?
c. Which set of variables predicts the total allostatic load score?
d. Which set of variables predicts racial discrimination?

Backward stepwise regression with POUT set to 0.1 was used to investigate predictive sets for each of the outcome variables. Using this method of analysis, all variables are entered into the model then eliminated based on predictive values. This method of analysis was chosen based on the limited sample size and to confirm the capture of synergistic effects between the study variables which might have been overlooked using a forward stepwise approach. In backward regression, all variables are entered initially and nonsignificant variables are removed in order of least contribution at each step. The model is complete when the omnibus (overall model) test reaches statistical significance. Unique variance is computed for all variables remaining in the model to indicate their contribution. R-squared is calculated for the set, indicating the percent of variance accounted for those variables remaining in the model at termination.

All regression models were limited to four or fewer predictor variables due to the small sample size (minimum criteria is five to ten subjects per variable). Any more than four predictor variables would have over-specified the regression model. The predictor variables that were entered into the model were chosen after examination of intercorrelations between candidate variables and consideration of clinical significance. To avoid multicollinearity, predictor variables must not be significantly intercorrelated with each other.

Research Question 3a: Which set of variables predicts perceived stress?

When income, Racial Discrimination Scale score and total allostatic load score were entered to predict the Perceived Stress Score, racial discrimination and income remained in the model ($p<.023$). Twenty-five percent of the variance in the perceived stress model is accounted by income and racial discrimination. Of the 25% of variance accounted for, income uniquely accounts for 37% and the Racial Discrimination Scale score accounts for 27%.

Research Question 3b: Which set of variables predicts individual measurements of allostatic load?

To investigate whether the set of study variables (age, PSS, RDS and income) were predictive of the individual components of the allostatic load index (systolic blood

pressure, diastolic blood pressure, BMI and CRH), four individual regression models were created to investigate each component. None of the models significantly predicted the individual measurements of allostatic load, including systolic blood pressure, diastolic blood pressure, BMI or CRH (Table 5).

Table 5. Predictors of Allostatic Load

Criterion	**Systolic Blood Pressure**	**Diastolic Blood Pressure**	**BMI**	**CRH**
Predictors Age, PSS, RDS & Income	p=0.61	p=0.10	p=0.14	p=0.43
	R^2=0.00	R^2=0.00	R^2=0.00	R^2=0.00

Research Question 3c: Which set of variables predicts the total allostatic load score?

Regressing the set of predictor variables hours worked per week, household income per month, perceived stress score and perceptions of racial discrimination score on total allostatic load score failed to identify a significant set of predictors as well (R^2=0.00, p=0.14).

Research Question 3d: Which set of variables predicts racial discrimination?

When age, perceived stress score and income were entered into a backward regression model to predict racial discrimination score, the resulting model was marginally significant with perceived stress score remaining in the model (p<.063). Twelve percent of the variance in racial discrimination is accounted for by the perceived stress score.

CHAPTER 5: DISCUSSION

This chapter includes a summary of the study, overview of problem, and a discussion of the findings. Also, a discussion on the challenges and limitation of the study and concluding remarks are presented in the chapter.

SUMMARY OF STUDY

The conceptual framework that guided the research study was proposed by Hogue et al. (2001). The model suggests using an epidemiological framework when examining the multidimensional concept of stress and pregnancy. In the model, the concepts "host," "environment" and "agent" are used to describe the stress response of the pregnant woman. Hogue et al. (2001) describe the agent as the stressor, the host as the pregnant woman and the environment as social and cultural conditions that buffer or potentiate ongoing stressors. Hogue and Bremner (2005) added stress age, or the concept of weathering, to the epidemiological model. Hogue and Bremner (2005) suggested that stress age could impact perinatal outcomes in much the same way that chronological age does. Therefore, the overall purpose of this exploratory study was to:

1) Determine if differences exist between the African American women born in the United States and those who are foreign-born in perceived stress, measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) and racial discrimination.
2) Examine the relationships between racial discrimination, perceived stress, age, income, number of hours worked weekly, gestational age, total allostatic load score and measures of allostatic load (total allostatic load score, CRH, BMI, systolic and diastolic blood pressure) in a sample of pregnant African American women.
3) Determine the best model from the study variable set perceived stress, individual measurements of allostatic load, total allostatic load score, racial discrimination, age, years in the United States, income, number of

hours worked per week and gestational age that predicts each of the study variables.

OVERVIEW OF PROBLEM

Research studies have found that elevated levels of stress during a woman's pregnancy significantly increased the woman's risks for poor perinatal outcomes, including pre-term delivery, decreased birth weight, an increased risk for infection, increased anxiety and depression, labor/delivery difficulties, and interference with psychosocial adaptation to pregnancy. Infection, anxiety, depression, and maladaptive psychosocial adaptation to pregnancy have all been linked to preterm delivery. More research is needed to identify stress and its effect on the physiological status in the clinical setting as well as factors that increase risks of pregnant women in minority populations. There is little data available on the wear and tear effect of stress on the body, or on the concept of allostatic load. These measures may help clinicians identify stress markers and perhaps intervene before further complications arise. Tiedje (2003) stated that a better understanding of the connection between the psychosocial and biological pathways must be identified so that *prevention*, not just prediction, of prematurity may be established.

MAJOR FINDINGS

Sample Characteristics

The study sample demographics reflected characteristics of the Texas African American child-bearing population. Seventy-five percent of the participants were under the 30 years of age (n=23); in comparison, the percentage of pregnant women state-wide under 30 years of age was 69% (March of Dimes, 2006c). Thirty-seven percent of the sample population lived below the poverty level for a family of four, compared to the state average of 22% for African American families (Center for Public Policy Priorities, 2005). Surprisingly, few researchers have reported that income was included in the analysis despite the fact that low income is linked to poor health and perinatal outcomes.

The higher poverty rates for the overall sample population may have occurred because the data collection site had a population of primarily Medicaid patients.

Forty-seven percent of the sample population worked 40 hours or more per week. This is lower than the national employment status average of 58% for African American women between 20 and 24 years of age. Paarlberg et al. (1999) reported that number of hours worked in the first trimester was predictive of low birth weight in a group of Dutch women. While the stressor of work and work-related hassles such as childcare may be less in the study population, the stressor of lower income is increased. It is possible that these findings are a result of the geographic area and/or the participant selection methods, i.e., a single data collection site.

The allostatic load scores for the study population were relatively low, with 90% having a score of two or less (n=26). In future research it is necessary to include additional biomarkers to calculate the allostatic load scores. Possibly with additional biomarkers a greater distribution of allostatic load scores will be seen. The study participants had a higher than expected systolic blood pressure. Thirteen of the women had a systolic blood pressure greater than 120 and four women a diastolic blood pressure greater than 80. These cut-off levels are appropriate based on previous research of normal blood pressure levels in pregnancy and guidelines set by the American Heart Association. Ayala et al. (1997) found that in the second trimester of pregnancy the average systolic blood pressure is 104 mmHg and the average diastolic blood pressure is 62 mmHg in women who did not experience complications during pregnancy. The American Heart Association reports that a systolic blood pressure between 120-139 mmHg and diastolic between 80-89 mmHg is pre-hypertension or high normal (American Heart Association, 2007). Additional research should be done to determine the cause for the increased systolic blood pressures that was seen in the sample population. Sixty-three percent of the women had a BMI greater than 25 (n=19). While this number may seem high, National Center for Health Statistics (2001) reports that 65% of the U.S. population is overweight. The sample BMI is reflective of the BMI seen in the U.S. population.

The final component of the allostatic load score was the CRH levels. A cut-off of the upper 25% was chosen based on previous research with allostatic load scores with biological indicators. Eight of the women had a CRH level greater than 14.31 pg/mL,

placing them in the upper 25th percentile of the sample. Because of the nature of this study and limited resources, only four measurements were taken to calculate the allostatic load score. Previous researchers have used up to 13 markers for allostatic load including systolic blood pressure, diastolic blood pressure, glycosolated hemoglobin, body mass index, triglycerides, high density lipoproteins, cholesterol, albumin, C-reactive protein, fibrinogen, lung capacity peak flow, creatinine, homocysteine, waist-hip ratio, urinary cortisol, urinary epinephrine, urinary norepinephrine, and serum dihydroepiandrosterone sulfate (DHEA) (Crimmins et al., 2003; Geronimus et al., 2006; Seeman et al., 2001b). Future research studies should include other biomarkers to calculate the allostatic load score with a greater number of participants. It also would be beneficial to complete a longitudinal study with perinatal and infant/child outcomes to determine how allostatic load predicts poor health outcomes.

The two psychometric instruments used in the study included Cohen's Perceived Stress Scale and Krieger's Self-Reported Perceptions of Racial Discrimination Scale. The psychometric properties of the instruments were excellent. The PSS had an internal reliability of 0.81 and the RDS was 0.91. It would be appropriate to include these instruments in future research endeavors.

Research Questions

Research Question #1

Despite the fact that statistically significant differences only existed between the mean BMI for the two groups, some of the other findings are worth noting because of possible clinical significance and implications for future research endeavors. Caution must be used when examining the statistical analysis results between the two origin groups since the foreign-born participants sample size was small and only included four participants, however, the results may indicate where future research pursuits should focus. The foreign-born women were older, with a mean age of 30.25 compared to the U.S.-born women's mean age of 23.81. Researchers have identified age as a variable that can affect stress perception and the effect stress exhibits on the maternal/fetal unit (Rauh et al., 2001). The foreign-born women had a higher mean monthly income of $3,108

versus $2,385 for the women born in the Unites States. These findings should be investigated further because income may explain the stress measurement differences between the two origin groups that have been found in previous research studies with other ethnic groups.

There was some evidence from the current research study to support the premise that acute stress is more prevalent in African American women who are foreign-born and chronic stress is more prevalent in women who are born in the U.S. Ruiz and Bishop (2008) reported that pregnant Hispanic women who were more acculturated, i.e., lived in the U.S. greater than ten years, had higher levels of depression, perceived stress and anxiety. Acculturation was not examined in the current research project, however, place of birth may be a proxy variable for acculturation. Ruiz and Bishop (2008) also reported that the more acculturated women had lower CRH and cortisol levels. The researchers speculated that the lower physiological markers of stress may be attributed to a down-regulation in CRH receptors from an increased exposure to stress hormones over an extended period of time. While the foreign-born women have higher levels of acute stress, the women born in the U.S. have higher levels of chronic stress. It does not appear that acute stress has a significant impact on perinatal outcomes unless the event is dramatic and occurs in early gestation, e.g., the first trimester (Hobel, 2004; Wadhwa, 2005). However, chronic stress has negative effects the health of the mother/fetal/child unit (Mackey et al., 2000; Dole et al., 2003; Mancuso et al., 2004; Collins et al., 1998; Paarlberg et al., 1999; Rini et al., 1999).

The foreign-born women had higher systolic blood pressure and CRH levels than the women born in the U.S., which support the premise that acute stress causes changes in physiological measurements. The increased CRH levels in the foreign-born African American women supports the research reported by Ruiz and Bishop (2008), also in a different ethnic group, and supports the view that years lived in the U.S. is a rough proxy for acculturation.

Although not statistically different, U.S.-born women scored higher on the PSS and RDS than the foreign-born women. The Perceived Stress Scale and Perceptions of Racial Discrimination are scales that generally are considered measurements of chronic stress. It is possible that the higher perceived stress score can be accounted for because of

the lower income for the U.S.-born African American women. The current research study found that income predicts perceived stress. In addition, the U.S.-born women had a significantly higher BMI (31.99) compared to the foreign-born women (25.58). This may indicate higher chronic stress levels in the U.S.-born women because of higher glucocorticoids levels, such as cortisol, over a longer period of time leading to an increase in abdominal fat. These findings may begin to explain the outcomes identified by David and Collins (1997) who found that birth weight patterns of babies born to U.S.-born White women and African-born Black women more closely resembled one another than those of U.S.-born Black women. The average birth weight for babies born between 1980 and 1995 in Illinois to U.S.-born White women was 3,466 grams, 3,333 grams for African-born Black women and 3,089 grams for U.S.-born Black women. The percentage of low birth weight babies was 4.3% for U.S.-born White women, 7.1% for African-born Black women and 13.2% for U.S.-born Black women. U.S.-born Black women are 3.1 times more likely to deliver an infant with low birth weight when compared with African-born Black women. Future research should include a greater number of foreign-born women who have lived in the U.S. less than ten years so that possible differences between U.S.- and foreign-born African American women may be noted if they exist.

Research Question #2

There were significant correlations between variables investigated by the current research project. There was a positive correlation between diastolic blood pressure and BMI. This finding was expected. The National Heart, Lung and Blood Institute (1998) reports that there is a two-fold increase in the risk of high blood pressure with a BMI greater than 25. Another finding that was not surprising was that age was positively correlated with number of pregnancies and deliveries. Age was also found to have a positive correlation with income. It would seem that as a woman ages she is likely to have more children and a higher income.

There was a negative correlation between income and perceived stress. Women with lower incomes reported a higher perceived stress score. Also, study participants with higher perceived stress were more likely to have higher scores on the Racial Discrimination Scale. These findings are similar to those researchers who found that

perceived stress is positively correlated with reports of racial discrimination (Stancil et al., 2000). Just as stress has been linked to poor perinatal outcomes, researchers have found that higher scores on racial discrimination scales are linked to preterm delivery (Rosenberg et al., 2002) and low birth weight (Collins et al., 2004).

There also were correlations within the study group that were unexpected. There was a positive correlation with height and the Racial Discrimination Scale scores, indicating that the taller a woman was, the more likely she was to report higher perceptions of discrimination. The instrument asked women to identify the main reason they feel like they have been discriminated against, the choices includes an option that combines both height and weight. Thus it is impossible to tell whether the participant thought height was the salient factor related to reports of the perceptions of racial discrimination. In future research studies, it may be more informative to separate these two reasons to clarify whether the participant feels the discrimination occurred because of height or weight.

Research Question #3

Variables included in the regression models were significantly limited due to small sample size. Those included sought to maximize the relationship with the criterions while simultaneously minimizing intercorrelations between the predictor set. Racial discrimination scores and income predicted perceived stress. Women with higher perceptions of discrimination and lower income had higher perceived stress. In a separate regression model, perceived stress predicted racial discrimination while income did not significantly contribute. This is particularly concerning considering the harm that can result to the mother/fetal/child unit from higher perceived stress. Maternal perceived stress has been associated with preterm labor (Mackey et al., 2000), preterm birth (Dole et al., 2003; Mancuso et al., 2004), and decreased infant birth weight (Collins et al., 1998; Mackey et al., 2000; Paarlberg et al., 1999; Rini et al., 1999). Increased perceived maternal stress scores have been found to be associated with decreased self esteem, increased physical abuse, increased drug use during pregnancy and inadequate prenatal care (Jesse et al., 2003).

The total allostatic load score was calculated from four physiological measurements including the systolic blood pressure, diastolic blood pressure, BMI and CRH. Ninety percent of the sample population had an allostatic load score of two or less. The regression models involving allostatic load measurements were not statistically significant. As mentioned earlier, future research endeavors should focus on including more participants, multiple sites for data collection and additional biomarkers for calculation of the allostatic load score. Additionally, future research projects could include longitudinal data examining maternal/fetal/child health outcomes.

CHALLENGES AND LIMITATIONS

There were challenges that presented themselves over the course of the research project. Data collection was originally attempted at two different sites, including a private physician's office and a local church. No participants called the researcher as a result of the recruitment flyer. No one responded to the flyer in the church. The researcher went to the private physician's office one to three days a week and waited for patients to arrive who met the participation criteria. After four months of data collection at the private physician's office there were only 12 participants enrolled in the research study. As a result, two additional sites for data collection were added. The additional sites included a low-income community clinic and another private physician's office. However, the clinic was not suitable for data collection because of the method used for seeing patients. All pregnant women were seen by eight to ten resident physicians within a couple of hours. Since there was only one researcher completing the data collection, it was not feasible to include research participants from the clinic. Also, the clinic was unsure of the patients' ethnicity before arrival, which made recruitment difficult. The second private physician's office staff was not comfortable with the research project and provided little support for the researcher. During data collection, it was discovered that many participants would not consent to participate in the research study until after they had discussed it with their care provider. Fortunately, the original private physician and office staff were very supportive of the research project and actively helped to recruit participants. Therefore, this site was retained as the only data collection site.

Data collection was difficult. Due to limited resources and the nature of data collection, i.e., the CRH sample having to be centrifuged and frozen immediately after collection it would have been useful to have two to three individuals involved in data collection, five days a week, at multiple sites. It is absolutely necessary to have cooperation from health care providers and office personnel when completing future research projects. Sufficient time should be taken to orient these individuals to the purpose and methods involved in the research study.

Limitations of the research project include small sample size and lack of reporting of the perinatal outcomes. The limitations significantly limit the ability to generalize the findings. This was an exploratory study to test relationships between the study variables and the psychometric properties of the instruments. Recommendations for future research project are discussed in the conclusions section and include an in-depth discussion on ways to improve the current research project.

CONCLUSIONS

The purpose of the study was to compare racial discrimination and different measurements of stress, including perceived stress and allostatic load score, in two different origin groups of African American women. The study revealed that differences existed between the two origin groups and further investigation should be done involving the two groups. Differences existed between income and acute and chronic measurements of stress in the two groups. It would seem that it is inappropriate to group all members of one ethnicity together because of the uniqueness of the individuals within the ethnic group. Efforts need to focus on the appropriate manner to classify individuals even within an ethnic group.

Analysis revealed that four allostatic load markers were insufficient to predict perceived stress and racial discrimination. Future research should include additional biomarkers with an examination of the predictive values of allostatic load for perinatal outcomes.

The study results suggest that income and racial discrimination was predictive of perceived stress scale scores. Efforts must be made to continue to include income in the

data analysis procedures to capture the effects of income on physiological and psychosocial outcomes. Interventions focused on resources to increase income or appropriate utilization of available resources may decrease perceived stress and improve perinatal outcomes. Also, efforts should be made to decrease perceptions of racial discrimination to decrease perceived stress.

The study revealed that perceived stress scale scores predicted racial discrimination. Perhaps interventions that focus on helping a woman to decrease her subjective response to stress may decrease her perceptions of racial discrimination. Future research is needed to validate the findings from the current study and develop interventions that focus on variables that could impact perinatal outcomes.

Recommendations for Future Research

Future research projects are strongly recommended involving the two different groups of African American women—those born in the U.S. and those who are foreign-born. Based on the findings of this study and other studies involving different ethnic groups, there is enough evidence to support the need for further investigation of the two origin groups and the differences that may exist between the two groups.

Future research projects could use longitudinal designs to investigate the effects of stress and racial discrimination on the maternal/fetal/child unit. This is important to understand where interventions should be focused to improve the health of these vulnerable populations. Further investigation of allostatic load is needed. Allostatic load scores could possibly predict perinatal outcomes and would help to identify the physiological pathways that exist leading to poor perinatal outcomes in pregnancy. A larger sample size and possibly different types of statistical analysis are recommended. Structural equation modeling (SEM) and cluster analysis could be used for data analysis with a larger number of participants. These methods of data analysis lend themselves to model testing and would be appropriate to further testing of the conceptual model proposed by Hogue and Bremner (2005). SEM and cluster analysis could not be used for this research project due to limited sample size.

When considering the cost and poor health outcomes that arise from elevated stress levels in pregnancy, it is obvious that nursing must be involved in the discussion as

well as research investigating methods to identify and prevent perinatal stress. The research study provided supporting evidence for identification of chronic stress and racial discrimination in pregnancy. Additional support was provided for the differences that exist between different groups of women within the same ethnic group. Research and clinical practice must focus on the socio-demographic and psychological variables that would place a mother and her baby at risk. Over the last 30 years, progress has been made toward identifying physiological risk factors in pregnancy, and the same progress needs to be made for identifying psychological risk factors.

APPENDIX A: Recruitment Flyer

Research Study

African American women are needed to volunteer for participation in a research study. The study is being done to examine stress and pregnancy. Participants will be asked to complete a questionnaire and have a blood sample drawn. All efforts will be made to draw the blood sample during routine pregnancy care that includes blood testing. Research participants must be African American, born in U.S. or foreign born, between ages 18-34 and less than 19 weeks pregnant.

Research conducted by Jennifer L. Kelly MSN, RN
Supervised by R. Jeanne Ruiz PhD, RN
Institution Review Board Approval of Study by UTMB

If you are interesting in possibly participating and would like to speak with the investigator please email me at jkelly@utmb.edu or call 281-450-5323.

Women that participate in the research study will receive a diaper bag with their baby's name embroidered on it.

Personalized Diaper Bag

Diaper Bag
281-450-5323
jkelly@utmb.edu

Diaper Bag
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jkelly@utmb.edu
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jkelly@utmb.edu

APPENDIX B: Diaper Bag Postcard for Reimbursement

Personalized Embroidered Diaper Bag

Mother's name_____

Shipping Address_____

_____

Contact phone number_____

Name to be emboidered on diaper bag_____

Please limit embroidery to one name and less than 12 letters.

☐ Red Diaper Bag or ☐ Blue Diaper Bag

Offer expires 05/08. Please allow 6-8 weeks for delivery

_____

_____

_____

Mermaid Manor
P.O. Box 1203
Santa Fe, TX 77510

APPENDIX C: Patient Packet and Needed Supplies

Patient Packet & Needed Supplies
Stress Measurements/Cultural Differences Study

Patient Packet:

Informed Consent (2 copies)
Physiological Data Collection Sheet
Demographic Data Sheet
PSS
RDS
Postcard for Diaper Bag
Labels
CRH collection kit (alcohol swab, needle, 10 cc syringe, lavender tube with 0.364 mL aprotinin, Band-Aid, tourniquet, 1 piece of hard candy)

Needed Supplies:

Magic Marker
Labels
1 cooler
Weight (5 lbs)
Measuring tape
Pens & clipboard
Pipettes
Aloquot tubes (2)
Baggy for CRH sample
Stethoscope
BP cuff (2 sizes)
Diaper bag
Tape
Gloves
Dry ice

APPENDIX D: IRB Approval Letter

UTMB®
The University of Texas Medical Branch

OFFICE OF RESEARCH SUBJECT PROTECTIONS
Institutional Review Board

March 14, 2008

MEMORANDUM

TO: Roberta Ruiz, PhD, RN/Jennifer Kelly, RN, MSN
SON 1029 - Jonica Roberson

FROM: Wayne R. Patterson, PhD
Senior Assistant Vice President for Research
Office of Research Subject Protections
Institutional Review Board 0158

SUBJECT: Continuing Review, Human Subjects

Project Director: Roberta Ruiz, PhD, RN/Jennifer Kelly, RN, MSN IRB #07-161
Project Title: Comparison of Perceived Stress, Allostatic Load and Racial discrimination in Different Cultural Groups of Pregnant Black Women

Under the Institutional Review Board's policies and procedures for reviewing protocols by an expedited review process, your project referenced above was reviewed and **approved** for continuation on **March 14, 2008**. The approval of this protocol is effective **March 31, 2008** and will expire on **March 31, 2009**. **Research that has not received approval for continuation by this date may not continue past midnight of the expiration date.**

Project Directors of approved projects are responsible for reporting to the Institutional Review Board any unanticipated adverse reactions observed during the conduct of the project as well as any severe or serious side effects whether anticipated or unanticipated. If the adverse reactions were unanticipated or death has occurred, the adverse reactions must be reported to the IRB within 24 hours.

Should your project require modification which alters the risk to the subject or the method of obtaining informed consent, the project must be reevaluated by the Institutional Review Board before the modification is initiated.

Completed subject consent forms should be maintained in the designated place for at least three years after the closure of the project. In order to be in compliance with the requirements of the FDA regulations, 21 CFR 56.27a, a copy of the completed consent document must be provided to the subject. Federal regulations require that informed consent be obtained in a language understandable to the subject. Therefore, when obtaining consent for research procedures from subjects whose first language is not English, a consent form written in the first language of the subject must be used. Foreign language consent forms must be translated from the English version by a certified translator, and a translator must be present during the consent process.

Closed projects cannot be reactivated without reevaluation by the Board.

Comments: Attached is the consent form(s) with the date of the IRB approval. Please use this consent form(s) with the IRB approval date and make additional copies as they are needed. **In accordance with amendments to 21 CFR Parts 50, and 812 effective 12/5/96, consent forms must be dated when consent is obtained.**

WRP/jr

Attachment: Consent Form

4.500 REBECCA SEALY HOSPITAL • 301 UNIVERSITY BOULEVARD • GALVESTON, TEXAS 77555-0158
(409) 266-9475 • FAX (409) 266-9499 • www.utmb.edu/irb

APPENDIX E: Subject Consent Form

SUBJECT CONSENT FORM

You are being asked to participate as a subject in the research project entitled, "Comparison of Perceived Stress, Allostatic Load and Racial Discrimination in Different Cultural Groups of Pregnant Black Women", under the direction of Jennifer L. Kelly RN, MSN, a student in UTMB's Graduate School of Biomedical Sciences Doctoral Program in Nursing. This project is being supervised by R. Jeanne Ruiz, PhD, RN, Associate Professor in the School of Nursing.

PURPOSE OF THE STUDY

The overall purpose of this study is to compare racial discrimination and different measurements of stress, including perceived stress and allostatic load score, in two different cultural groups of African American women. The research project will provide a better understanding of stress and pregnancy in African American women. The study will examine two different groups of African American women, those born in United States and in a foreign country. Previous research suggests that differences exist between these two cultural groups. Additionally, racial discrimination will be measured to validate previous research projects that have identified discrimination as a stressor. This study was developed by Jennifer Kelly who is an advanced practice nurse who has provided care to pregnant women. She is continuing her education to earn a doctoral degree and this dissertation project fulfills the requirements for the doctoral degree and will allow her to become an independent researcher. As an advanced practice nurse who hopes to improve care to pregnant women experiencing stress during pregnancy, Mrs. Kelly is interested in learning from you about stress and racial discrimination and its effects on the pregnant female.

PROCEDURES

During this study, Mrs. Kelly will have you complete a demographic questionnaire, a questionnaire on perceived stress and racial discrimination. Additionally, your blood pressure, weight, height and a blood sample will be collected by Mrs. Kelly. The data collection should not take more than 45 minutes. All study materials will be kept in a locked file cabinet in the researcher's office. All data collected will be coded and all identifying information will be kept confidential.

RISKS OF PARTICIPATION

The potential risks from participation in this study are few. You may become fatigued when completing the questionnaires. There is minimal risk with the blood specimen collection and these include: infection, bruising, and additional blood loss. However, the researcher will take steps to minimize these risks. The principal investigator will take all possible steps to assure your confidentiality by coding study data and removing your

name and other identifiers from study materials. However, there remains a minimal risk of the loss of confidentiality.

NUMBER OF SUBJECTS PARTICIPATING AND THE DURATION OF YOUR PARTICIPATION

The anticipated number of subjects involved in this pilot study is fifty. All will be pregnant African American mothers between 14 and 19 weeks gestation, determined with last menstrual period and/or ultrasonography. Mrs. Kelly will collect data between the months of May 2007 through May 2008.

BENEFITS TO THE SUBJECT

There are no direct benefits to you for your participation in this research project. By answering Mrs. Kelly's interview questions, you may gain some insight into your experiences with stress during pregnancy and racial discrimination.

ALTERNATIVE TREATMENT

An alternative to participate in this study is to choose not to participate. You understand that you do not have to participate.

REIMBURSEMENT FOR EXPENSES

For the pregnant African American women who chose to participate in the research project an embroidered diaper bag will be offered. You will be asked to complete a pre-addressed stamped postcard, including the baby's sex, name, and address. The diaper bag will be mailed to the address included on the returned postcard.

COSTS OF PARTICIPATION

There will be no cost to you for your participation in this study.

USE AND DISCLOSURE OF YOUR HEALTH INFORMATION

Study records that identify you will be kept confidential as required by law. Federal privacy regulations provided under the Health Insurance Portability and Accountability Act (HIPAA) provides safeguards for privacy, security, and authorized access of your records. These regulations require UTMB to obtain an authorization from you for the use and disclosure of your health information. By signing this consent form, you are authorizing the use and disclosure of your health information for the purpose of completing the research study. Except when required by law, you will not be identified by name, social security number, address, telephone number, or any other direct personal identifier in study records disclosed outside of the University of Texas Medical Branch

(UTMB). For records disclosed outside of UTMB, you will be assigned a unique code number. The key to the code will be kept in a locked file in Mrs. Kelly's office.

As part of the study, Mrs. Kelly and her study team will not report the results of your study-related data to any recipients. There is no sponsor of this study who may further disclose this information to regulatory agencies or other recipients.

If you sign this form, you are giving us permission to collect, use and share your health information. You do not need to sign this form. If you decide not to sign this form, you cannot be in the research study. We cannot do the research if we cannot collect, use and share your health information. Whether or not you agree to the research project or give us permission to collect, use or share your health information will not affect the care you will be given at UTMB.

Mrs. Kelly will use and disclose your study related results to complete the research study. These would include the complete demographic questionnaire, perceived stress questionnaire, racial discrimination questionnaire, blood pressure, height, weight, and a blood sample. You may see or receive a copy of any research information that will be included in your medical record. For all other health information we collect on you that will not be included in your medical record, you may not be allowed to access or receive a copy of the information until the conclusion of the study.

Your records may be reviewed in order to meet federal or state regulations. Reviewers may include, for example, Dr. R. Jeanne Ruiz. This authorization for the use and disclosure of your health information as described above expires upon the conclusion of the research study.

If you change your mind later and do not want us to collect or share your health information, you need to contact the researcher listed on the attached consent form in writing. You need to say that you have changed your mind and do not want the researcher to collect and share your health information. You may also need to leave the research study if we cannot collect any more health information. We may still use the information we have already collected. We need to know what happens to everyone who starts a research study, not just those people who stay in it.

ADDITIONAL INFORMATION

1. An offer has been made to answer any questions that you may have about these procedures. If you have any questions before, during or after the study, or if you need to report a research related injury, you should immediately contact

Jennifer L. Kelly RN, MSN at (281) 450-5323 or, Dr. R. Jeanne Ruiz at (409) 772-1011.

2. Your participation in this study is completely voluntary and you have been told that you may refuse to participate or stop your participation in this project at any time without prejudice and without jeopardizing your medical care at UTMB. If you decide to stop your participation in this project and revoke your authorization for the use and disclosure of your health information, UTMB may continue to use and disclose your health information in some instances. This would include any health information that was used or disclosed prior to your decision to stop participation and needed in order to maintain the integrity of the research study. If we get any information that might change your mind about participating, we will give you the information and allow you to reconsider whether or not to continue.

3. If you have any questions regarding your rights as a subject participating in this study, you may contact Dr. Wayne R. Patterson, Senior Vice President for Research at (409) 266-9475.

The purpose of this study, procedures to be followed, risks and benefits have been explained to you. You have been allowed to ask questions and your questions have been answered to your satisfaction. You have been told who to contact if you have additional questions. You have read this consent form and voluntarily agree to participate as a subject in this study. You are free to withdraw your consent, including your authorization for the use and disclosure of your health information, at any time. You may withdraw your consent by notifying Jennifer L. Kelly RN, MSN at (281) 450-5323 or, Dr. R. Jeanne Ruiz at (409) 772-1011. You will be given a copy of the consent form you have signed.

Date	Signature of Subject
Signature of Witness	Signature of Authorized Representative *(if applicable)*

Description of Representative's Authority to Act for Subject *(if applicable)*

Using language that is understandable and appropriate, I have discussed this project and the items listed above with the subject and/or his/her authorized representatives.

Date	Signature of Person Obtaining Consent

APPENDIX F: Blood Pressure Protocol

Blood Pressure Protocol
Stress Measurements/Cultural Differences Study

1. Obtain verbal and written informed consent.
2. Explain procedure to study participant.
3. Wash hands and ensure participant's privacy.
4. Select appropriate arm for blood pressure measurement.
5. Ensure appropriate size cuff is used and patient has been allowed to rest for five minutes before blood pressure measurement is done.
6. Ask patient if any caffeine or nicotine has been consumed in the last 30 minutes. If so, delay blood pressure measurement until 30 minutes has lapsed.
7. Position participant in a sitting position with forearm supported at the level of the heart and the palm upward.
8. Expose brachial artery, never take blood pressure through clothing or constrict circulation above the area where the blood pressure will be taken.
9. Palpate the brachial artery and center the cuff over the brachial artery, 1-2" above the elbow.
10. Apply the cuff smoothly and snugly.
11. Check that the needle on the gauge is at the zero mark.
12. Assume a position within 3 feet of the patient.
13. Estimate the systolic blood pressure by palpating the brachial artery while inflating the cuff and noting when the pulse disappears.
14. Deflate the cuff and wait 15 seconds.
15. Place the diaphragm of the stethoscope on the brachial artery with light pressure. Stethoscope should not touch the clothing or the cuff.
16. Inflate the cuff 30 mmHg above the point that the systolic blood pressure was estimated.
17. Deflate the cuff slowly (2-3 mm per heartbeat).
18. Note the first faint, but distinct sound as the systolic blood pressure.
19. Note the point that the sound disappears as the diastolic blood pressure.
20. If a repeat reading is needed, deflate the cuff entirely, wait one full minute and then repeat.

APPENDIX G: Height and Weight Protocol

Height & Weight Protocol
Stress Measurements/Cultural Differences Study

Height

21. Obtain verbal and written informed consent.
22. Explain procedure to study participant.
23. Wash hands and ensure participant's privacy.
24. Tape a piece of paper to wall around participant's height.
25. Ask study participant to remove shoes, stand with back against a wall and look straight ahead.
26. Make a mark on paper aligned with uppermost point of participant's head.
27. Using the study measuring tape (to be used on all participants) measure from floor to mark on the wall.
28. Record height in centimeters and inches.

Weight

1. Obtain verbal and written informed consent.
2. Explain procedure to study participant.
3. Wash hands and ensure participant's privacy.
4. Place study five-pound weight on scale and document the weight recorded on the scale.
5. Ask participant to remove shoes and heavy outer clothing.
6. Ask participant to stand on scale and record weight in pounds and kilograms.

APPENDIX H: Physiological Data Sheet

Physiological Data Sheet
Stress Measurements/Cultural Differences Study

1. Was informed consent obtained (verbal and written) and a copy of the signed consent form given to the participant? _____ Yes (initial)
2. Was the protocol followed for obtaining the blood pressure measurement followed? _____ Yes (initial)
3. Was the correct blood pressure cuff used? _____ Yes (initial)
4. Did the participant use caffeine or nicotine within 30 minutes of the blood pressure measurement? _____ No (initial)
5. Was the participant allowed to rest for five minutes before the blood pressure was taken? _____ Yes (initial)
6. Was the protocol followed for obtaining the height measurement followed? _____ Yes (initial)
7. Was the protocol followed for obtaining the weight measurement followed? _____ Yes (initial)
8. Was the protocol followed for obtaining the corticotrophin-releasing hormone followed? _____ Yes (initial)

Systolic Blood Pressure _____

Diastolic Blood Pressure _____

Height _____ (inches) _____ (centimeters)

Weight _____ (pounds) _____ (kilograms)

APPENDIX I: Demographic Questionnaire

Participant #_____ Data Entry Date_____ Initials_____

Data Collection Date _____ Initials _____ Data Verification Date _____ Initials _____

Please answer the following questions. If you have any questions feel free to ask the researcher collecting the information.

Name?	
Age?	
Birthplace?	
Number of years in the US?	
Number of pregnancies (including this pregnancy and any miscarriages or abortions)?	
Number of deliveries after 20 weeks gestation (or 5 months of pregnancy)?	
Any complications with this pregnancy?	
Any complications with previous pregnancies?	
Household Income?	
Number of Hours worked per week (include school or work)?	
When is the baby due?	
Last Menstrual Period?	
Has an ultrasound has been done during this pregnancy?	
If so, when does the ultrasound say the baby is due?	

APPENDIX J: Cohen's Perceived Stress Scale

Participant #_____ Data Entry Date_____ Initials_____

Data Collection Date _____ Initials _____ Data Verification Date _____ Initials _____
Revised 05/01/07

The questions in this scale ask you about your feelings and thoughts during the **last month.** In each case, please circle the number that corresponds to how often you felt or thought a certain way.

IN THE LAST MONTH….	**NEVER**	**ALMOST NEVER**	**SOME-TIMES**	**FAILY OFTEN**	**VERY OFTEN**
1. How often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. How often have you felt that you were unable to control the important things in you life?	0	1	2	3	4
3. How often have you felt nervous of "stressed"?	0	1	2	3	4
4. How often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. How often have you felt that things were going your way?	0	1	2	3	4
6. How often have you found that you could not cope with all the things that you have had to do?	0	1	2	3	4
7. How often have you been able to control irritations in your life?	0	1	2	3	4
8. How often have you felt that you were on top of things?	0	1	2	3	4
9. How often have you been angered because of things that happened that were outside of your control?	0	1	2	3	4
10. How often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

APPENDIX K: Krieger's Racial Discrimination Scale

Participant #_____ Data Entry Date_____ Initials_____

Data Collection Date _____ Initials _____ Data Verification Date _____ Initials _____
Revised 03/05/07 JK

A. If you feel you have been treated unfairly, do you usually: (please select the best response)

1. Accept it as a fact of life.
2. Try to do something about it.

B. If you have been treated unfairly, do you usually: (please select the best response)

1. Talk to other people about it.
2. Keep it to yourself.

C. Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your race, ethnicity, or color? (please select the best response)

1. Yes
2. No

D. If you circled yes in question number C, how many times did this happen?

How many times did this happen?	Once	Two or Three Times	Four or More Times
1. At school?	1	2	3
2. Getting hired or getting a job?	1	2	3
3. At work?	1	2	3
4. Getting housing?	1	2	3
5. Getting medical care?	1	2	3
6. Getting service in a store or restaurant?	1	2	3
7. Getting credit, bank loans, or a mortgage?	1	2	3
8. On the street or in a public setting?	1	2	3
9. From the police or in the courts?	1	2	3

E. How much have you worried about discrimination in the past or present?

How much have your worried about discrimination?	Most of the Time	Some of the Time	Rarely or Never
1. When you were a child or teenager (up to age 18), how much did you worry about people in your race/ethnic group experiencing unfair treatment because of their race, ethnicity, or color?	1	2	3
2. When you were a child or teenager (up to age 18), how much did you worry about yourself experiencing unfair treatment because your race, ethnicity, or color?	1	2	3
3. In the past year, how much did you worry about people in your race/ethnic group experiencing unfair treatment because of their race, ethnicity, or color?	1	2	3
4. In the past year, how much did you worry about yourself experiencing unfair treatment because your race, ethnicity, or color?	1	2	3

F. Global Questions: Please choose the number that best represents how you feel.

Global Question	Never	Rarely	Sometimes	Often
1. How often do you feel that racial/ethnic groups who are not white, such as African Americans and Latinos, are discriminated against?	1	2	3	4
2. How often do you feel that you, personally, have been discriminated against because of your race ethnicity, or color?	1	2	3	4

G. How many times have you ever filed a formal complaint because of racial discrimination?

Number of Formal Complaints for Racial Discrimination.	Once	Two or Three Times	Four or More Times
1. How many times have you ever filed a formal complaint because of racial discrimination?	1	2	3

H. How many times have you experienced any of the following situations?

Experiences with Situations	Once	Two or Three Times	Four or More Times	**Main Reason (see note below). 1-11**
1. How many times in your life you have been unfairly fired?	1	2	3	
2. How many times you have not been hired for a job for unfair reasons?	1	2	3	
3. How many times you have been unfairly denied a promotion?	1	2	3	
4. How many times you have been unfairly stopped, searched, questioned, physically threatened or abused by the police?	1	2	3	
5. How many times you have ever been unfairly discouraged by a teacher or advisor from continuing your education?	1	2	3	
6. How many times have you been unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment?	1	2	3	
7. How many times have you ever moved into a neighborhood where neighbors made life difficult for you or your family?	1	2	3	
8. How many times have you ever been unfairly denied a bank loan?	1	2	3	
9. How many times have you ever received services from someone such as a plumber or a car mechanic that was worse than what other people get?	1	2	3	

I. For each situation listed in question "H", what do you think was the main reason for this experience? (Please list choice in last column under question "H")

1. Your ancestral national origins
2. Your gender
3. Your race
4. Your age
5. Your religion
6. Your height or weight
7. Your shade of skin color
8. Your sexual orientation
9. Your education or income level
10. A physical disability
11. Other

J. Day-to-Day unfair treatment: In you day-to-day life, how often have any of the following things happened to you?

Day-To-Day Unfair Treatment	Four or More Times	Two or Three Times	Once	Never	**K. Main Reason (see question K below). 1-11**	**L. Resp to Unfair Treatment (see question L below). 1-7**
1. You have been treated with less courtesy than other people.	1	2	3	4		
2. You have been treated with less respect than other people.	1	2	3	4		
3. You have received poorer service than other people at restaurants or stores.	1	2	3	4		
4. People have acted as if they think you are not smart.	1	2	3	4		
5. People have acted as if they're afraid of you.	1	2	3	4		
6. People have acted as if they think you are dishonest.	1	2	3	4		
7. People have acted as if they are better than you are.	1	2	3	4		
8. You have been called names or insulted.	1	2	3	4		
9. You have been threatened or harassed.	1	2	3	4		

K. For each situation listed in question "J", what do you think was the main reason for this/these experience(s)? (Please list choice in provided column under question "J")

1. Your ancestral national origins
2. Your gender
3. Your race
4. Your age
5. Your religion
6. Your height or weight
7. Your shade of skin color
8. Your sexual orientation
9. Your education or income level
10. A physical disability
11. Other

L. For each situation listed in question “J”, how did you respond to this/these experience(s)? (Please list choice in last column under question “J”)
1. Tried to do something about it.
2. Accepted it as a fact of life.
3. Worked harder to prove them wrong.
4. Realized that you brought it on yourself.
5. Talked to someone about how you were feeling.
6. Expressed anger or got mad.
7. Prayed about the situation.

APPENDIX L: CRH Protocol

CRH Protocol
Stress Measurements/Cultural Differences Study

1. Wash hands before procedure.
2. Gather all supplies after receiving consent from subject.
3. Attach syringe to lower hub of butterfly (remove needle from lower hub of butterfly prior to attaching syringe)
4. Place a protective towel/barrier on work surface area, under subject's extremity.
5. Locate largest, most distal vein; place tourniquet on extremity.
6. Don gloves.
7. Clean vein area, beginning at the vein and circling outward to a 2-inch diameter with alcohol.
8. Remove cap from butterfly needle and hold skin taut with one hand while pinching the wings of butterfly needle together.
9. Maintaining needle sterility, insert needle, bevel up, into the straightest section of vein; puncture skin at 45 degree angle.
10. When needle has entered skin, lower needle until almost level with skin.
11. Watch for back flow of blood; once a "flash" of blood is noted, draw back on syringe slowly. Hold syringe below venipuncture site to allow gravity to aide in filling syringe.
12. Once syringe is filled, stop withdrawing and release tourniquet.
13. Place cotton ball over site & remove needle from vein while applying pressure with cotton ball. (syringe may stay attach to butterfly until needle removed completely from site).
14. Hold pressure for 2-3 minutes. Check for bleeding & continue to hold pressure until bleeding has stopped. Place band aid to site.
15. Dispose butterfly needle in biohazard/sharps container.
16. Proceed with blood sample preparation.
17. Transfer blood collected in the10cc syringe into previously prepared 15ml Lavender top polypropylene conical centrifuge tube.
18. Mix the blood and the EDTA/Aprot in the Lavender conical tube several times by gentle inversion.
19. Place in cooler with ice until ready for centrifuging.
20. Remove the Aprot/EDTA prepared lavender conical centrifuge tube from the cooler.
21. Balance the centrifuge by placing a second conical tube filled with equal amount of water on opposite side of the chosen slot for plasma tube.
22. Verify: Rotor #, carrier
23. Verify & set: RPM: 3000 (1500 G)
24. Spin for 10 minutes.
25. Allow centrifuge to completely stop before opening.
26. Separate the plasma (yellowish fluid) using the graduated disposable pipette & place in two Corning polypropylene tube.
27. Label these with the subjects pre-printed labels found in the subject's packet.

28. Place the both tubes in a specimen collection transport/storage box.
29. Keep the specimen in the cooler on dry ice.
30. Store at -80 C freezer as soon as possible.

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