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Life-Course Stress, Preterm Birth and African American women

by

Amy J. Law

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Nursing

in the

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of the

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

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by

Amy J. Law

Dedication

This work is dedicated with gratitude to the incredible women who shared their life stories with me over the course of this study. I am honored with your confidences and pray this research works against the injustices of race and class health disparities.

And to my amazing daughter, Tesiah Róis, may you always feel loved, supported, passionate about justice and mercy, and inspired to pursue your dreams.

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Abstract

This dissertation is a qualitative study of African American (AA) women and their experiences of life-course stress. In depth interviews were conducted with 25 women, half of whom delivered preterm. Data were transcribed verbatim and analyzed with dimensional analysis grounded theory method.

An overall conceptualization of life-course stress was developed. The context of stress included personal identifiers, social and physical geographies and individual perspective. Conditions of stress included relationships, traumatic events, financial strains, daily activities and interactions with “The System”. The most pertinent conditions reported were child abuse and neglect, living with substance abusing parents, separation from family members through death or placement in foster care and traumatic events such as rape, kidnapping and murders. The trigger of stress was not important in isolation. Each woman was embedded in the context of her life and experienced circumstances differently. Experiencing stress included cognitive, affective (fear, anger, shame and sadness) and physical dimensions. The roles of powerlessness, threat to social self and positions within hierarchies were explored. Coping, through constructive and destructive means, was integral to the stress experience. Consequences included choices made, conscious and unconscious burdens. The lasting effects included increased resiliency, an intensified stress experience, or lingering conscious or unconscious stress burdens.

Several intensifiers of the stress experience were identified including social isolation, a limited perspective, magnitude and multiplicity of stressors. Resiliency was characterized by personal strength, perseverance, optimism and peace. Preterm and

fullterm birth groups were compared for differences in life-course stress experiences; the most pronounced being the magnitude of the stressors, the social and physical geographies of women's lives, and position within macro- and micro- social hierarchies. These factors may be of particular concern when examining women's life-course trajectories.

The data demonstrate how life-course stress may impact reproductive outcomes. It provides insight into the stress experience of AA women and demonstrates the dynamic relationship between stress, intensifiers, coping and women's resiliency. The findings address why previous assessment of reported stress and preterm birth has not been effective and give an evidence-based foundation to build on for future assessment of stress and preterm birth in AA women.

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Chapter 1
INTRODUCTION

Preterm birth (PTB) is a significant and persistent health problem facing women and families. Infants born at less than 37 weeks gestation are at significant risk of experiencing a spectrum of poor health and development outcomes that can affect virtually every system in the body with acute respiratory, gastrointestinal, neurologic, and sensory complications leading to chronic motor, cognitive, and behavioral sequelae (Berkowitz & Papiernik, 1993). There is not a single cause of PTB, rather, it is believed to be a result of multiple, overlapping factors (Institute of Medicine, 2007). Despite decades of research and dramatic increases in access to and provision of prenatal care, the rates of preterm birth have only increased (Hamilton & Ventura, 2007).

Significant racial-ethnic disparities exist in the incidence of preterm birth. Approximately 12.8% of pregnancies end prematurely in the United States overall, however for African American (AA) women the incidence is 18.4% (Hamilton & Ventura, 2007). The numbers are even more alarming for those who deliver very preterm (birthweight less than 1500 grams), as AA women have more than four times the risk. The cause of these disparities is unexplained. Socio-economic status (SES) is a common explanation offered, however most studies control for SES and residual disparities remain (M. C. Lu & Halfon, 2003). In fact, high SES AA women have higher rates of PTB than low SES European American women (Ponce, Hoggatt, Wilhelm, & Ritz, 2005). Another common explanation is risky maternal behaviors during pregnancy such as drug and tobacco use. Yet again, the data do not support this explanation (M. C. Lu & Halfon, 2003). Individual behaviors account for very little of the disparate outcomes. Often, studies do not try to explain the disparities, but rather list race as a risk factor in itself, implying race is a biologic explanation of outcome. However, race is a social

construction based on a few visible characteristics that biologically exist as a spectrum rather than dichotomous categories. Genetic studies demonstrate greater genetic variability within races than between (Barbujani, Magagni, Minch, & Cavalli-Sforza, 1997; Cavalli-Sforza, 1998; Shen et al., 2000). Race cannot be offered as an endpoint explanation of risk for PTB.

In recent years, stress has become a significant factor in the pathway to PTB. Numerous studies have demonstrated biologic evidence of stress, specifically increased corticotropin-releasing hormone (CRH), as predictive of PTB (Hobel, Dunkel-Schetter, Roesch, Castro, & Arora, 1999; Wadhwa et al., 2004). However, studies that examine reported stress have been very poorly correlated with either birth outcome or with physiologic results. At issue, the way stress has been conceptualized and measured is often problematic. First, stress is often assessed only during pregnancy. Physiologically, stress reactivity, or the way an individual biologically reacts to stress, is complex and developed over a life-course. Second, stress measurement in many studies is either missing an individual's perception of stress, or is limited to a general construct of stress and coping is rarely considered. Understandably, results have been poorly correlated to either biologic markers of stress or to PTB as an outcome.

Stress is also a promising explanation for the racial-ethnic disparity in birth outcomes. Lu and Halfon's (2003) Life-course Health Development Model proposes racial-ethnic disparities in birth outcomes are a consequence of the differential exposure to more risk and less protective factors across the life-course, particularly during sensitive periods of development. On a community level, economic circumstances, environmental issues and social conditions create a social context that exposes AA women to chronic

stress. Race, class and gender are socially constructed individual categories within society that influence one's access to power, privilege and resources. African American women stand at the intersection of oppressions and inequality within society. When considering stress related health outcomes such as PTB, it is thus essential to understand and define stress from the perspective of AA women. There is, however, a paucity of research regarding AA women, stress and PTB. A PubMed, PsychInfo and SocAbstract search of the three terms together revealed zero studies on the subject.

This manuscript describes a dissertation research project completed in partial fulfillment of the doctorate of philosophy in nursing at the University of California, San Francisco. The goal of this qualitative study was to explore the individual understandings and meanings of life-course stress for a sample of AA women. Further, differences in the experience of life-course stress were explored between women who delivered preterm and those who delivered fullterm. This population was chosen because of the unusually and unexplained high incidence of PTB that exists. Building on the Life-course Health Development Model, the life-courses of AA women were explored for differential risks and protective factors.

The second chapter will be a detailed review of literature focused on three areas relevant to the topic: 1) the significance, etiology and risk factors for PTB; 2) the physiology of stress, how it relates to PTB as well as measurement of reported stress and PTB; and 3) the life-course disparities of AA women. The third chapter contains a paper written for publication that summarizes stress measurement and PTB.

The fourth chapter will be a critical analysis of the two theories that provide a framework for this study: the Life-Course Health Development Model and

Intersectionality, a synthesis of three theories representing race, class and gender: Racial Formation, the Ghetto Underclass and Black Feminist Thought, that together provide a foundation from which to explore dimensions of stress throughout women's lives that may influence racial-ethnic disparities in birth outcomes.

The fifth chapter outlines the methods used in this dissertation research study. It begins with an overview of qualitative methods, followed by a discussion of Dimensional Analysis, the specific qualitative method used, with a discussion of why this particular method was selected. The chapter concludes with a description of the methods as they were performed in the study.

The sixth and seventh chapters contain the study results. Two databased papers are presented, the first, titled "African American women and the embodiment of life-course stress" is a description of the overall process of life-course stress experienced by AA women. The second paper, "Life-course stress and preterm birth: intensifiers and resiliency in African American women" focuses on intensifiers of the experience of stress, resiliency in women against stress, and differences seen in the life-courses of women who delivered preterm and those who delivered fullterm.

The manuscript concludes with the eighth chapter, a discussion of how the results of this study contribute to our understanding of stress, how stress may impact health outcomes such as preterm birth and how stress may be measured in the future. Future directions in research are suggested.

Chapter 2

REVIEW OF LITERATURE

Background and Significance of Preterm Birth

Preterm birth is theorized to be a syndrome of multiple pathophysiological pathways, influenced by multiple overlapping factors (Institute of Medicine, 2007). The first differentiation necessary is between spontaneous PTB and medically-indicated PTB. Labor induced for maternal or fetal health indications such as severe pre-eclampsia or intrauterine growth restriction results in medically-indicated PTB and accounts for approximately one third of premature births (Ananth, Joseph, Oyelese, Demissie, & Vintzileos, 2005). While stress processes and HPA activation may well be involved in the pathologies leading to medically-indicated PTB, a discussion of this lies beyond the scope of this paper. The focus of this review will be on the relationship of stress to spontaneous preterm labor (PTL) and preterm premature rupture of membranes (PPROM) that results in PTB.

Etiology of Preterm Birth

A brief overview of the physiology of parturition is foundational for understanding the process of preterm birth. There are four stages that characterize normal parturition (See figure 1): 1) Uterine quiescence, 2) Activation, 3) Stimulation, and 4) Involution (Challis, 2000; Challis, Matthews, Gibb, & Lye, 2000). Uterine quiescence represents the majority of pregnancy. The myometrium is relaxed, facilitated by progesterone as well as prostacyclin, nitric oxide, relaxin, and parathyroid hormone-related peptide. These peptides increase intracellular levels of cyclic adenosine monophosphate and cyclic guanosine monophosphate, which in turn inhibit the release of calcium from intracellular stores and reduce activity of the enzyme myosin light-chain kinase (MLCK) - both of which are central to uterine contractility (Challis, 2000; Challis

et al., 2005). Only rare, mild, poorly coordinated uterine contractions, commonly referred to as Braxton-Hicks contractions, occur during this stage. Progesterone, parathyroid hormone-related peptide and relaxin levels inhibit contractility (Challis, 2000; Challis et al., 2005) and the absence of gap junctions that would allow cell-to-cell coupling, prevents the coordination in the myometrium that leads to labor (Garfield, 1988).

The activation phase is the initiation of labor. It is marked by increased levels of contraction-associated-proteins (CAPs), primarily Connexin-43 that function to connect gap junctions, allowing for coordination of the myometrium (Lye et al., 1998). Oxytocin levels also increase as do stimulatory prostaglandin receptors increasing the intensity of myometrial contractions. The activation of the myometrium is triggered by both uterine stretch, which increases the production of Connexin-43, and by signals from the fetal HPA axis. Increased CRH secretion from the fetal hypothalamus, leads to fetal pituitary production of adrenocorticotrophic hormone (ACTH), and ultimately to fetal adrenal production of cortisol and androgens, in particular sulfoconjugated dehydroepiandrosterone (DHEAS). Fetal DHEAS is an essential precursor to estrogen synthesis in the placenta which initiates the production of the numerous estrogen-dependent CAPs essential for the processes of cervical ripening, myometrial contractility and coordination that results in labor and birth (Challis, 2000).

The Stimulation phase is the progression of labor, including cervical ripening, effacement, dilation and ending with the birth of the infant. Like the activation phase, it is regulated primarily by fetal HPA activation as well as functional progesterone withdrawal, increasing maternal and fetal estrogens and prostaglandins (Institute of Medicine, 2007). The activation phase is the endocrine cascade that leads to the initiation

of labor, while the stimulation phase is a continuation of, and increase in intensity of the labor process resulting in birth. The Involution phase begins after the birth of the baby and includes placental separation and involution of the uterus. It is primarily controlled by maternal oxytocin (Institute of Medicine, 2007)

. Physiologic stress promotes PTB either by interrupting uterine quiescence or prematurely initiating the activation phase. Once labor is initiated, the progression (stimulation and involution phases) proceeds similarly for both preterm and fullterm births. It is not yet understood why HPA activation leads to PTB in some but not all women. Theories include the timing, chronicity of stress, or dysregulation of maternal HPA reactivity related to life-course experiences of HPA-related stress.

There are four commonly recognized biologic etiologies that lead to spontaneous PTB: 1) decidual hemorrhage, 2) uterine overdistention, 3) infection and inflammation and 4) activation of the maternal-fetal HPA axis (Institute of Medicine, 2007). These primary pathways lead to PTB through different mechanisms, and stress is believed to be an important factor through two of them. The inflammation and infection pathway ultimately interrupts uterine quiescence while HPA axis activation stimulates the Activation phase.

The first two pathways of PTB are not believed to be related to stress. Decidual hemorrhages are a result of vascular lesions in the placenta that lead to untermplacental ischemia (Institute of Medicine, 2007). The resulting inflammation cascade produces thrombin, a strong uterine stimulant that disrupts uterine quiescence. While the cause has not yet been identified, vascular lesions have been found in placentas of approximately

35 percent of women with PPRM (Arias, Rodriguez, Rayne, & Kraus, 1993) which strongly suggests a distinct pathway from infection-related PTB.

The mechanism of overdistention is not well understood, but uterine stretch triggers the expression of the gap junction proteins and oxytocin receptors which lead to the coordination of uterine contractions. Cytokine production and collagenase production are also implicated in cervical ripening (Loudon, Sooranna, Bennett, & Johnson, 2004; Maradny, Kanayama, Halim, Maehara, & Terao, 1996) When the uterus is prematurely overdistended as a result of multiple gestations, polyhydramnios or macrosomia, the coordination of myometrial contractions begins early and can lead to preterm birth. This also is a distinct pathway not believed to be related to stress.

Infection and the inflammatory processes have long been associated with PTB, with the proinflammatory cytokine-prostaglandin cascade playing a central role (Romero, Erez, & Espinoza, 2005). The initial response to intrusion of an infective agent is the synthesis and release pro-inflammatory cytokines by macrophages and monocytes, in particular interleukin-1 (IL-1 β), interleukin-6 (IL-6), tumor necrosis factor- α (TNF- α), and IL-8. These cytokines act as messengers, binding to various receptors and initiating the inflammation cascade (Da Costantzer, 2001). Increases in levels of pro-inflammatory cytokines stimulate the production of prostaglandins by the amnion and deciduas that results in cervical ripening and uterine contractions (Gravett et al., 1994). Intrauterine infections are responsible for the majority of extremely (<28 weeks) PTB (Institute of Medicine, 2007). This pathway is important because the cross enervation of the HPA axis and the immune cascade is emerging as an important element of PTB as will be discussed in the stress section of this review.

Activation of the maternal-fetal HPA axis is the final mechanism for PTB. In brief, stress triggers a neuroendocrine cascade resulting in increased levels of maternal CRH, ACTH and cortisol. Cortisol stimulates placental CRH secretion, activating the fetal HPA system, resulting in release of cortisol and DHEAS secretion which can initiate the activation phase of labor (Challis, 2000; Challis et al., 2005). This pathway will be the primary focus of the proposed research and thus discussed in greater detail with a critical review of related studies in the stress chapter of this review. Understanding the pathophysiologic pathways, provides a framework for evaluating research that examines contributing factors of PTB. The four known etiologic pathways of PTB: inflammation, decidual hemorrhage, uterine overdistention, and HPA activation each give distinctive biochemical signals that end uterine quiescence and prematurely initiate the activation stage of gestation leading to PTB. Over the past 60 years and enormous amount of research has delved into the problem PTB. However, much of it was searching for particular individual characteristic or lifestyle behavior or relating epidemiological trends. Approaching the problem from a biological framework allows the research to be filtered and critically examined for actual causation that can ultimately be useful in the work of prevention. The following section will review risk factors of PTB within the biologic framework of maternal-fetal HPA axis activation.

Influences on HPA Activation and Preterm Birth

Until recent years, research on PTB focused on individual health behaviors and sociodemographic risk factors. This approach had three major limitations. First, it accounts for only a fraction of the overall incidence of PTB with very modest sensitivity and specificity (Mercer et al., 1996). Second, racial/ethnic health disparities in PTB

incidence were not considered (Shiono, Rauh, Park, Lederman, & Zuskar, 1997). Finally, the risk factors were not linked to physiologic etiology of PTB. For example, sociodemographic risk categories for PTB such as AA race, low socioeconomic status (SES), history of prior PTB were all cited frequently, however, they are not causal in nature but rather function as makers for underlying physiological processes. A full review of all risk factors associated with PTB is beyond the scope of this review. Rather, this section will focus on factors that influence PTB specifically through the two pathways relevant to stress: infection and inflammation or through activation of the maternal-fetal HPA axis. A Pub Med search on the etiology of PTB resulted in 320 English references. Additional searches of Pub Med, PsychInfo and SocAbstract databases for each individual risk category were conducted, as well as bibliographic searches of each of the articles, resulting in a proliferation of related literature. All pertinent studies were selected and organized into two categories: individual level factors and community level factors.

Individual Level Factors

Behavioral Factors. Several individual behavioral influences on PTB have been studied including, alcohol and other substance use or abuse, body mass index and weight gain patterns, nutrition and douching. Some discrete behaviors may slightly increase the risk of PTB through etiologies other than HPA activation, but stress may be involved by increasing the likelihood of an individual participating in high-risk behaviors such as substance use or unhealthy nutritional habits as a coping mechanism, however, these behaviors account for only a small percentage of PTB (Whitehead, Brogan, Blackore-Prince, & Hill, 2003).

Health behaviors that may have an influence on stress-related pathways leading to PTB are smoking and exercise. Smoking, may have a direct effect on the HPA axis by significantly increasing the release of maternal catecholamines and ACTH (Hobel, 2004; Kyrklund-Blomberg, Granath, & Cnattingius, 2005) and smoking is a factor that several studies have found to have a strong association with PTB (Kyrklund-Blomberg et al., 2005; Simhan, Caritis, Hillier, & Krohn, 2005).

Exercise is known to have profound effects on stress, inflammatory and immune responses (Cooper, Radom-Aizik, Schwindt, & Zaldivar, 2007). Theoretically, mild and moderate exercise physiologically would be expected to be protective against HPA, inflammatory and immune-related PTB, while strenuous exercise could induce overstimulation of any or all of these systems leading to PTB. A number of studies investigated the relationship of various levels of physical activity. Moderate activity and exercise physiologically increases circulation and oxygenation and decreases activity in the HPA axis, both of which can be beneficial in prevention of PTB. Overall, studies have found exercise in pregnancy is protective and the longer in pregnancy exercise continues, the greater protection against PTB (Evenson, Siega-Riz, Savitz, Leiferman, & Thorp, 2002). A Danish prospective analysis of 87,232 women who self-reported regular physical exercise in pregnancy found the risk of PTB was reduced by almost 40 percent in women who engaged in exercise compared with non-exercisers (Juhl et al., 2008). A study that examined the difference between strenuous and non-strenuous exercise found no difference in PTB outcomes (Orr, James, Garry, Prince, & Newton, 2006). However, other studies have suggested that pushed beyond a body's capacity to cope, prolonged vigorous activity can be a physiologic stress leading to increased risk (Sternfeld, 1997)

although the mechanism is unknown, the theoretical pathway would be initiation of adrenaline and HPA activation. Physical exertion associated with employment also demonstrates no protective benefit, and may be associated with increased risk of PTB (Institute of Medicine, 2007).

Psychosocial Factors. Psychosocial factors, including various forms of social support and resiliency, are areas commonly believed to improve PTB outcomes through stress-related mechanisms; however the evidence does not strongly support this belief. Social support has been conceptualized in many different ways: social integration, network resources, perceived available support, and actual receipt of support. Over multiple observational studies, with consistently improved and specific measurement, there has been no relationship found between social support and preterm birth (Dole et al., 2003; Institute of Medicine, 2007). A review by the Institute of Medicine (2007) of social support intervention studies included studies dating back to the 1980's; a Cochrane meta-analysis of 16 trials involving 13,651 women; and Lu and colleagues (2005) review of randomized controlled trials providing psychosocial support were large, rigorous studies with consistent conclusions. Interventions to provide social support during pregnancy may have an effect on anxiety, satisfaction with care, perceived mastery, awareness and knowledge of risk conditions, engagement of the mother in health-promoting behaviors, but had no effect on prevention of PTB (Institute of Medicine, 2007). Several potential explanations were offered for these results including imprecise identification of women who are at high risk for PTB, and better matching of treatment to the risk groups.

One variation of these results was found in a recent study testing the Centering Pregnancy model of prenatal care. This group model of prenatal care provides social support throughout the pregnancy. Centering participants were found to have a decreased risk for PTB (OR .67) particularly in AA women (OR .59) who participated (Ickovics et al., 2007)). However, this model of care goes beyond social support as it emphasizes personal empowerment and control. It may well be this emphasis which could be a more precise mediator for HPA dysregulation leading to PTB.

Resiliency refers to stable character traits and personal resources that allow the individual the ability to cope with an external stress or hardship. The resilient individual not only copes with the stressful influence, but often can excel, grow and thrive despite or perhaps because of the hardship. The PTB literature conceptualizes and measures resilience through scales such as self-esteem, mastery, perceived control and optimism. Self-esteem has been found to have inconsistent results. One study (Edwards et al., 1994) measured self-esteem with the Rosenberg Self-Esteem Scale and it to be a strong predictor for PTB ($p < .001$); another using the same scale did not find significance ($p = .075$) (Jesse, Seaver, & Wallace, 2003). A third study (Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999) combined self-esteem with mastery and optimism measures and found a significance for birth weight, but not gestational age. The physiologic correlate for self-esteem and PTB is not well defined, although it may mediate an individual's perception of stress, and thereby influence the HPA response.

Studies measuring mastery (Copper et al., 1996) and optimism have not found significant relationships with PTB. One study, however, did demonstrate locus of control to be a predictor of PTB (OR 1.75) (Misra, O'Campo, & Strobino, 2001). This is

consistent with the theory that lack of a sense of control is a defining element for activation of the HPA axis in response to a stressor (Huether, 1996). While the few studies that have been conducted in this area have not provided strong relationships to PTB, it is an area ripe for further consideration as the constructs are refined and the physiologic mechanisms of PTB better understood.

Genetic Factors. Recent advances in genetics and genome sequencing have opened new avenues of genetics research into PTB. This field is in its infancy with a limited number of published studies. At least 124 candidate genes have been identified whose functional disruption could influence PTB (Institute of Medicine, 2007). While most experts doubt a single gene will be found, multiple candidate gene studies are another focus of growing research that simultaneously examines polymorphisms in multiple genes. The few genetics studies to date have examined polymorphisms in genes that code for cytokines and enzymes related to the PPRM pathway, but have resulted in inconsistent associations with PTB.

Gene-Environment interactions provide another important variable for future PTB and health disparities research that investigates how individual genetic variation may modify environmental exposure effects (Institute of Medicine, 2007). Very few gene-environment studies investigating PTB have been published at this time and none that have looked specifically at the HPA axis etiology of PTB. However, it is an important area for future research.

The presence of a correct genetic sequence does not necessarily translate to functional expression of the gene. Deoxyribonucleic acid (DNA) is organized within histone proteins to form chromatin (Haig, 2004). Epigenetics examines environmental

exposure related biostructural modifications that alter chromatin without altering the actual DNA nucleotide sequence. This alteration occurs through either DNA methylation or histone deacetylation, both of which prevent or alter gene expression (Haig, 2004). Proteomics refers to the protein expression of genes, facilitated by messenger ribonucleic acid. Posttranslational protein modification may occur through phosphorylation, methylation and compartmentalization that may dramatically influence the function of the protein (Shankar et al., 2005). These are both new areas of research. While no current studies have demonstrated an influence on spontaneous PTB, epigenetic or proteomic alterations could have an important functional influence on the HPA axis and is therefore an important area for future research.

Community Level Factors

Community level factors are influences that affect particular populations or groups. Sociodemographic categories such as maternal age, socio-economic status, race, neighborhood conditions and environmental toxins are community level factors associated with an increased risk for PTB, potentially through stress and HPA activation. These influences are embedded within a social and historical context and it is important to evaluate them with such a perspective. The following paragraphs include a summary of evidence for each of these influences on PTB. The section on life-course disparities will include a discussion of the social and historical context in which many of these factors are imbedded and how they may be related to racial disparities in PTB.

Sociodemographics. Maternal age is a factor that influences risk of PTB. Multiple studies have found significantly increased risk for PTB in women less than 16 or 18 years (Branum & Schoendorf, 2005; Chang, O'Brien, Nathanson, Mancini, & Witter,

2003; Scholl et al., 1992). The mechanisms of PTB in this population need further research, but most likely young maternal age is related to increased risk of multiple different pathways such biologic immaturity leading to overdistention, infection and stress activation of the maternal-fetal HPA axis. The risk of PTB is also increased for women over the age of 35, particularly in AA women (Rich-Edwards, Buka, Brennan, & Earls, 2003) . This interesting racial dynamic related to maternal age and PTB gives support to a life-course stress model through the etiology of HPA activation. Marital status and partnership is another sociodemographic variable that has been found to be a significant for risk of PTB. Single, un-partnered women have an adjusted OR of 1.41, and single but partnered women an OR of 1.14 compared with married women (Lou et al., 1994). Sociodemographic risk factors, such as age and partnership status are clearly markers for other etiologic pathway to PTB, such as stress level and related maternal-fetal HPA axis activation.

Socio-Economic Status. Socio-economic status has long been associated with PTB (Kramer, Seguin, Lydon, & Goulet, 2000). Women of lower SES have greater than two-fold risk of infant mortality, independent of race/ethnicity (Parker, Schoendorf, & Kiely, 1994). Multiple reasons for this association have been suggested, including health and lifestyle behaviors (Kramer et al., 2000), work conditions (Mozuekewich, Luke, & Avni, 2000), neighborhood conditions (Culhane & Elo, 2005), and access to and experience with health care (Institute of Medicine, 2003). At issue is that SES is a very broad, ill-defined categorization that is clearly a marker for underlying biologic pathways. HPA and immune dysregulation related to chronic stress is one of the most promising areas of research into class-related disparities in PTB. Many studies measure

one or two markers, such as income and education level as proxies for SES, and then treat them as individual-level variables. In actuality there are multiple factors that intersect with one another to create socioeconomic advantage or disadvantage, most that are far broader in scope and outside of an individual's control. Some of these elements contributing to SES including race, neighborhoods and environmental hazards will be further discussed in this section, while society-level components of class will be discussed below.

Race. African-American race is clearly associated with an increased risk of PTB compared with other racial/ethnic groups. Race is considered a community level factor because it is socially rather than biologically constructed. There are both historical as well as current social and environmental influences that affect AA as a group. Essentially every study that measures race as a variable finds a strong associated increase in risk. When analyzed by race/ethnic categories, the 2006 National Vital Statistics lists the highest incidence of PTB with AA women who experience a rate of 18.4 per 100 live births, followed by rates of 14.2 for American Indian/Alaska Native, 12.2 for Hispanic, 11.7 for EA and 10.9 for Asian/Pacific Islander women (Hamilton, Martin, & Ventura, 2007). Racial disparities in PTB are often attributed to the disproportionate representation of AA women in lower socioeconomic ranks. While poverty is indeed associated with increased rates of PTB, AA women not living in poverty continue to experience disparate birth outcomes. A spatial variation study found AA women had higher odds of delivering preterm whether they lived in high or low SES neighborhoods (Ponce et al., 2005). One study with AA and EA college graduates demonstrated AA graduates continued to have 1.95 times the risk of PTB as their EA counterparts (McGrady, Sung, Rowley, & Hogue,

1992). Another study examined ethnic differences in PTB with married, college-educated women, who received adequate prenatal care and reported no medical or behavioral risk factors during pregnancy. AA women continued to have 2.64 times the risk of having a LBW or SGA infant, and 1.61 times the risk of infant mortality as EA women (Alexander, Kogan, Himes, Mor, & Goldenberg, 1999). Yet Black women born in Africa have birth outcomes similar to US-born White women (Cabral, Fried, Levenson, Amaro, & Zuckerman, 1990; David & Colins, 1997). This evidence supports what genetics research clearly demonstrates (Barbujani et al., 1997; Cavalli-Sforza, 1998; Shen et al., 2000), that race is a social construct rather than biologically defined. Racial disparities in incidence of PTB therefore must be viewed as a product of the social influence of intersectional disparities within society.

Neighborhood conditions. Neighborhood characteristics affect an individual's experience of life in multiple ways and can be the cause of multiple stressors. Culhane and Elo (2005) reviewed empirical data that examined associations between neighborhood characteristics and reproductive health and developed three categories of neighborhood context: the social environment, service environment, and physical characteristics. The social environment includes level of neighborhood cohesion, norms of reciprocity, civic participation, crime, socioeconomic compositions, and residential stability. The service environment includes the availability of goods and services, quality health care, recreational facilities, police and fire protection. The service environment is influenced by degree of political organization and the residents' ability to demand public services, recruit private service providers as well as the type of services attracted. Finally, the physical environment includes noise, quality of housing, toxins present, air pollution

and quality of public space. All of these elements of the neighborhood context impact quality of life and experience of stressors.

Epidemiological studies have demonstrated consistent associations between neighborhood level characteristics and pregnancy outcomes (Kaufman, Dole, Savitz, & al., 2003; Rajaratnam, Burke, & O'Campo, 2006). O'Campo and colleagues (1997) performed a multilevel analysis of census tract level variables and demonstrated significant increase in odds ratio of LBW for census tracts with per capita income less than \$8,000, high unemployment rates, high per capita crime rate and those without health insurance. This study was important because it was one of the first studies to use multiple indicators of neighborhood characteristics in relation to birth outcome and demonstrated an association with block groups of individuals.

Pearl and colleagues found the influence of living in socially disadvantaged neighborhoods on birth outcomes depended on maternal race and nativity. Neighborhoods were characterized by 1000 resident census blocks and variables included income below federal poverty level, unemployment rate and less than high school education. As neighborhood disadvantage increased, birthweight decreased for AA and Asian American women, remained unchanged for EA and US-born Latina women, and increased for foreign-born Latina women (Pearl, Braveman, & Abrams, 2001). While it is clear from their results that SES matters and that race has a differential effect, there are far more neighborhood characteristics that are believed to influence risk that were not captured in this study's design.

A recent analysis of 16 cities found a significant association between PTB and neighborhood deprivation for both AA and EA women. Neighborhood deprivation was

an census variable index comprised of percentage of males in management and professional occupations, percentage of residents living in crowded housing, percentages of households in poverty, female-headed households with dependents, households on public assistance, households earning less than \$30,000 per year, percent of individuals with less than a high school education and percent unemployed. Stratifying by race, the PTB rate was significantly higher for AA (15.97) than for EA (10.42), and there was a differential effect of neighborhood deprivation by race, with a much stronger influence noted in EA women (O'Campo et al., 2008). These studies have consistently demonstrated that neighborhood characteristics are an important influence on birth outcomes, and that race also matters, beyond the influence of SES. The theorized pathway is through an increase in stressors and activation of the maternal-fetal HPA axis.

Environmental Hazards. Several epidemiological studies have found significantly higher rates of LBW from mothers who live in areas with significantly higher air pollution (Dejmek, Solansky, Benes, Lenicek, & Sram, 1999; Maisonet, Bush, Correa, & Jaakkola, 2001; Maroziene & Grazuleviciene, 2002; Mohorovic, 2004; Ponce et al., 2005; Rogers et al., 2000), exposure to agricultural chemicals and pesticides (Eskenazi et al., 2004; Longnecker, Klebanoff, Ahou, & Brock, 2001). While level of toxin may be quantified, precise maternal exposure is difficult to measure and multiple co-exposures exist within the populations studied prohibiting any type of causal hypothesizing from the methods that have been used in many of these studies. Several physiologic mechanisms have been hypothesized by which PTB may be stimulated by pollutants. For example, endocrine disruptors or exogenous hormone-like substances such as phthalates can disrupt the neuroendocrine axis, one result being in lower

progesterone (van den Hazel et al., 2006). This in turn would lower the threshold of uterine activation allowing leading to PTB. Other pathways include interfering with cell signaling stimulating the activation phase of labor, or through the inflammation cascade (Institute of Medicine, 2007). The studies previously cited give epidemiological correlations of a relationship between environmental hazards and PTB, but, further research into the effect on reproductive outcomes is needed, employing more precise measures of maternal exposure and controlling for confounding variables.

Society Level Factors

Society level factors are influences on reproductive health and birth outcomes that a product of the structure of society. Social factors set into a historical context that affect the structure of our nation and ultimately affect the health of individuals within that nation such as racism, concentrated poverty and disparities in opportunities. Institutional structural elements of society such as unequal access to medical care also are in this category. Many of these elements are difficult to measure related to a particular health outcome, such as PTB and as a consequence have until recently been ignored. Yet structural inequalities affect the quality of life over a woman's life-course and are particularly relevant when examining a stress-related health process. The third section of this review chapter, titled Life-Course Disparities, will concentrate on the society level factors.

Summary - Preterm Birth

Individual level factors and sociodemographic characteristics have been the emphasis of a majority of research in the field of PTB for decades. Individual level factors do not have a strong association with risk of PTB and do not provide explanation

for racial disparities. Only in the past decade has research moved into differentiating pathways of PTB and linking investigations to physiologic mechanisms. Greater emphasis needs to be placed on investigating influences of PTB within a proposed pathway. This review uses such a framework, discussing influences that may impact maternal stress and activation of the HPA axis.

Individual level characteristics include health behaviors and genetic influences. While some individual health behaviors matter, such as smoking tobacco and extreme physical exertion, overall individual behaviors do not explain a large proportion of PTB, and do little to explain racial disparities in incidence. Genetics research is just beginning in this field and shows potential for the future, although it is unlikely there is a specific gene responsible for PTB. More likely, gene-environment interactions may impact coding for various enzymes or cytokines that would impact one of the known physiologic pathways of PTB. This likely will be an emphasized area in the future.

Community level characteristics such as SES, race, neighborhood conditions and environmental factors all are significant for the amount of stressors and individual experiences that could disrupt the HPA axis leading to PTB. Numerous studies have found significant associations between these community level characteristics, although difficulties in measurement exist because of the multidimensional nature of these influences. Greater emphasis needs to be placed on the process of how community level factors impact PTB. The hypothesized link is through stress and HPA activation. The following section will discuss stress, its link to PTB and critically review literature investigating stress and PTB.

Stress

The global nature of the construct of stress has led to inconsistent conceptualization and measurement in the literature on stress and preterm birth. Folkman and Lazarus (1984) define stress as the “relationship between person and environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being.” From this definition, three critical elements are identified as necessary to elicit a stress response that may affect health: 1) a stressor; 2) the perception of stress by the individual; and 3) a physiologic response. A stressor is a physiologic or psychological demand. Life events scales measure potential external stressors to which an individual is exposed. However, mere existence of a particular stressor does not determine the experience of stress, and internal processes such as stressful thoughts or ruminations can also serve as stressors equal to external sources.

The second critical element is an individual’s internal perception and interpretation or appraisal of event as stressful. Perception is based on experience, memory, moods, emotions and personal resilience, that influence an individual’s response (Oatley, Keltner, & Jenkins, 2006). Perceived stress scales assess this element of the stress construct. Once a stressor is experienced, interpreted and perceived as a threat, the body responds by producing hormonal and neurotransmitter mediators resulting in a physiologic response in cells and tissues throughout the body (McEwen & Seeman, 1999). Several different physiologic responses may ensue, and the specific pathway depends on the individual’s interpretation of the type of perceived threat. CRH and cortisol measure the physiologic aspect of the stress construct. Much of literature on stress and preterm birth focuses only on one of these three elements of stress which may

explain many of the inconsistent results. Each of these three elements: a stressor (either internal or external), a perception of stress, and a physiologic stress response must be present and activated to elicit a stress response that over time may affect health.

Repeated exposure to stress throughout the lifespan will cause lasting physiologic changes to the brain, altering neuroendocrine and neuroimmune reactive responses (Henry, 1982, 1992). Animal models have provided significant evidence of the effects of chronic stress (Seligman, Weiss, Weinraub, & Schulman, 1980; Weiss & Glazer, 1975). Rodent studies by Richardson and colleagues (Richardson, Zorrilla, Mandyam, & Rivier, 2006) demonstrated that varied, repeated, stressful early life experiences shape brain function and behavior in adulthood including dysregulation of the HPA axis response to stressors. Evidence also suggests there may be critical periods where individuals are more vulnerable to neural changes related to chronic stress. In-utero (Coe & Lubach, 2005), early life (McEwen, 2003; Repetti, Taylor, & Seeman, 2002), and adolescence (McEwen & Dhabhar, 2002) may be three such critical periods although much further research is needed in this area.

In addition to harm to self, chronic stress may harm one's offspring. Prenatal stress in rodents has demonstrated alteration to offspring's baseline levels of multiple neurotransmitters as well as HPA stress reactivity through the lifespan (Darnaudery, Dutriez, Viltart, Morley-Fletcher, & Maccari, 2004). Behaviorally, stress-induced alterations result in decreased cognitive ability, increased anxiety, and social withdrawal behaviors (Kofman, 2002). Primate studies have also demonstrated altered endocrine, immune and neurobehavioral outcomes in offspring (Coe & Lubach, 2000, 2005; Schneider, Moore, & Kraemer, 2001). Although the neuroendocrine systems of humans

differ from those of other species, animal models give strong initial evidence that chronic stress results in enduring physiologic changes throughout the lifespan warranting closer examination in humans.

Stress is currently believed to be a main pathway to PTB through activation of the HPA axis as well as dysregulation in the immune cascades altering susceptibility and reactivity to pathogen exposure. The following section will review the literature related to stress and PTB. It is comprised of three subsections, beginning with a brief discussion of psychoneuroendocrinology and review of literature related to activation of the HPA axis and PTB, followed by an overview of psychoneuroimmunology and a review of literature that has measured markers stress related immune changes and PTB. The final subsection is a critical review of literature of reported stress and PTB.

Psychoneuroendocrinology

A discussion of the basic physiology of the stress response is an essential foundation for a review of stress and PTB. Within the endocrine system there are two main pathways initiated by a perceived stressor: the sympathetic-adrenal-medullary (SAM) and the HPA axes (See figure 2). The SAM pathway is the classic “fight-or-flight” response. It is activated in response to an acute threat, stimulates central neurons to release catecholamines epinephrine and norepinephrine (McEwen & Seeman, 1999). The physiologic effect is increased heart rate and cardiovascular tone, a shunting of blood to vital organs, the respiratory rate increases as does immediate metabolism, while growth and restorative functions of the parasympathetic system including gastrointestinal, genitourinary and immunity processes are inhibited (S. M. Smith &

Vale, 2006). Norepinephrine also cross-regulates the HPA axis by stimulating production of CRH.

The HPA axis differentially responds to threats or stressful stimuli by the hypothalamus secreting CRH and vasopressin (AVP). These neuropeptides in turn synergistically stimulate the anterior pituitary to secrete (ACTH) which in turn stimulates the adrenal cortex to secrete glucocorticoids, primarily cortisol (S. M. Smith & Vale, 2006). Cortisol has a functional role in response to a threat. It mobilizes glucose stores to provide energy, has a central role in inhibiting inflammation, and is necessary for catecholamine to produce cardiovascular changes such as vasoconstriction and increase in heart rate - all processes that provide protection and enable a response to a threatening situation (Dickerson & Kemeny, 2004). Cortisol also exerts negative feedback on CRH release from the hypothalamus and ACTH from the pituitary to limit the response when the threat passes.

A considerable amount of knowledge has been gathered in recent years regarding the role of the HPA axis in preterm birth. In pregnancy, CRH is secreted not only from the hypothalamus, but also the placenta. Placental CRH is identical to hypothalamic CRH in structure and function (Petraglia et al., 1990), but while glucocorticoids exert a negative control on hypothalamic CRH secretion, they stimulate further secretion of CRH in the placenta. A positive feedback loop is therefore created resulting in a progressive rise in CRH, ACTH and cortisol throughout pregnancy (Petraglia et al., 1994). CRH plays a key role in labor as it activates receptors on myometrial smooth muscle, and CRH and oxytocin have a synergistic effect on myometrial contractility (Romero, Chaiworapongsa, Kuivaniemi, & Tromp, 2004). Placental CRH also crosses the placenta

and activates the fetal HPA axis, stimulating fetal secretion of cortisol and DHEAS, a precursor for estrogen stimulation in the placenta. Placental estrogens lead a hormonal cascade ending in myometrial contractility and labor (Challis, 2000). An exponential rise in CRH occurs the final six weeks of pregnancy before a term delivery, and significant increases have been observed earlier in women who deliver prematurely (Hobel, 2004; Hobel, Dunkel-Schetter, et al., 1999).

Hans Selye (1956) proposed that the stress response was non-specific and all stressors, whether physical or psychological, would elicit a non-specific HPA stress response. Much of the early stress and PTB literature is based on this assumption. However, more recent research suggests the type of stressor mediates the stress pathway and HPA activation. Two well established mediators have been identified that preferentially activate the HPA axis: an individual's 1) sense of controllability of the stressor. If the stressor is perceived as controllable the individual has often experienced a similar situation in the past and learned adaptive coping mechanisms to that particular stressor, minimizing the stressful effects. However, the experience of a lack of control within the stressor, increases HPA activation (Huether, 1996; Sapolsky, 1993). 2) Perceived threat to social self. Threat to social self is defined a perceived threat to one's social value or standing which elicits feelings of low social worth and shame (Gruenewald, Kemeny, Aziz, & Fahey, 2004). Finally, more recent research suggests that a third factor, position within a hierarchy, may also shape reactivity. It has been observed in multiple animal models and the phenomenon is now being observed within human relationships (McEwen & Seeman, 1999; R. G. Wilkinson, 1999). The subjective social status is an important element of position within the hierarchy and have been linked with

both HPA activation and pro-inflammatory immune mediators (Gruenewald, Kemeny, & Aziz, 2006). Research in this area, however, is just beginning.

Several different patterns of HPA and SAM dysregulation have been noted in response to chronic stress. In some, baseline levels of NE hormones are lowered, in particular CRH and cortisol; hypothesized to be an exhaustion of the stress response from the recurrent exposures (Holzman, Jetton, Siler-Khodr, Fisher, & Rip, 2001; Susman et al., 1999). In others, a higher level of baseline CRH has been noted. A final pattern is a normal baseline, but higher reactivity to an induced stress. As a result, the relatively exaggerated physiological response to a minor stressor could trigger PTB in a woman who has adapted to chronic stress (Hobel, 2004). Further work is needed to determine causality of the different patterns of dysregulation, and relation to PTB.

Critical Review of Pertinent Studies – Hypothalamic-Pituitary-Adrenal activation and Preterm Birth. A Pub Med and PsychInfo search of the literature using a variety of search terms such as preterm birth, hypothalamic pituitary adrenal, stress, pregnancy and low birth weight produced a total of 12 studies examining physiologic measurements of stress and preterm delivery. All of the studies were prospective measuring various peptide markers within the HPA pathway. Five studies examined ACTH, with mixed results. Three demonstrated significantly increased levels of ACTH, although one of those had serious design issues bringing the results into question. Cortisol was measured in four studies resulting in contradictory results. Natural diurnal variation as well as rapid and varied reactivity to external stimuli in cortisol levels lead to difficulties in interpretation of results in existing studies and would present similar difficulties as a clinical marker in predicting PTB. The most consistent and promising

physiologic marker of HPA activation leading to PTB has been CRH which does not demonstrate the same degree of variation. Thirteen studies measured CRH; all but one demonstrated significantly higher levels of CRH in pregnant women who subsequently delivered preterm.

McLean and colleagues (1995) reported results from a prospective longitudinal study with a sample of 361 women, 24 of whom delivered preterm. Plasma CRH was drawn on all participants at prenatal visits throughout their second and third trimesters and levels of women who delivered preterm were compared to the mean of levels at that gestational age (GA) in women who subsequently delivered full term. Women who delivered at less than 37 weeks demonstrated significantly higher CRH levels than those who delivered full term. The higher levels were present throughout the second and third trimesters, but an exponential increase was noted at time points approximately 20 days before delivery characterized by a linear regression curve of log-plasma CRH to GA. The opposite effect of CRH was noted and significant in women who delivered post-term (greater than 41 weeks gestation). CRH Binding Protein (CRH-BP) binds to CRH and allows recognition to the CRH receptor, thus affecting the bioactivity of CRH. With the increase in CRH, a corresponding significant decrease in CRH-BP was also present with a nadir 10 days before delivery. This seminal study was significant for demonstrating a pattern of rise of CRH and opened up a new emphasis in PTB research focused on the markers of the HPA axis.

Korebrits and colleagues (1998) examined hormones in the HPA axis to look for significant elevations in women who would deliver within 24 hours. Maternal plasma CRH, ACTH, cortisol and corticosteroid-binding capacity were measured in 233 women

admitted with a diagnosis of threatened PTL (PTL) between 24 and 36 weeks gestation. Of this sample, 48% of women with intact membranes and 95 percent with ruptured membranes gave birth prematurely. A total of 84 women gave birth within 24 hours of the blood draw. In women without chorioamnionitis, plasma CRH between 28 and 36 weeks gestation and cortisol to costeroid-biding capacity ratio levels were significantly higher at 24 to 36 weeks gestation in women who delivered within 24 hours than for those giving birth in greater than 24 hours or for normal controls. There was not a significant difference in ACTH or costeroid-binding capacity between women who delivered within 24 hours of admit and women who did not, nor with normal controls. Controlling for histological chorioamnionitis provided evidence for two separate etiologic pathways of PTB, cytokines related to infection and HPA axis activation, and gave initial suggestions of differentiation of pathway by gestational age.

Hobel and colleagues (1999) investigated the association of elevated maternal levels of CRH during pregnancy with preterm delivery. In a prospective study, 524 ethnically and sociodemographically diverse women were followed through pregnancy with plasma CRH, ACTH and cortisol levels were evaluated three times: at 18 to 20 weeks, 28 to 30 and 35-36 weeks gestation. Of this larger sample, 47 women delivered preterm, and blood samples from 18 case participants who delivered were matched based on age, prior birth outcome, smoking states and race with 18 participants who delivered at term. Participants who subsequently delivered preterm had significantly higher CRH and ACTH at all three measurements, and higher Cortisol levels at both 18 to 20 and 28 to 30 week gestational age measurements. This was the first physiologic evidence of the link between stress and preterm birth and elicited several subsequent studies. However,

the inclusion and exclusion criteria of this initial study were not provided to evaluate why only 18 of the 47 women who delivered preterm were included in the study, and if there were any differences between the 18 women included and 29 women who were not. The small sample size could lead to a type I error. Larger studies are needed to attempt to replicate this result.

The preterm prediction study (Moawad et al., 2002) searched for biochemical predictors of PTB (less than 35 weeks gestation) at 24 and 28 weeks gestation in 2,929 women. Alkaline phosphatase, alpha-fetoprotein and CRH were significantly greater in subjects who spontaneously delivered prematurely (greater than 90th percentile). Elevated ALP demonstrated the highest odds ratios for PTB for the earlier gestational ages (24 and 28 week measurements), while CRH was significantly associated with PTB at the later gestational draws (35 weeks). The results of this large study are important because they support the physiological framework of stress related HPA activation of the placenta leading to PTB.

Mancuso and colleagues (2004) investigated the correlation of maternal plasma CRH, reported stress and preterm delivery. Stress was measured with the Perceived Stress Scale, the Spielberg State Anxiety Scale and the Pregnancy-Specific Anxiety Scale at 18 to 20 and at 28 to 30 weeks gestation, maternal stress and timing of delivery in a prospective analysis of a sub-sample of 282 participants. Maternal plasma CRH and composite stress scores were correlated at both measurements times with shorter gestational age at delivery ($r=-.37$, $p<.01$; $r=-.41$, $p<.01$). Hierarchical regression confirmed CRH as a mediator for pregnancy-specific anxiety ($r=.15$ to $.45$, $p<.05$). One concern with the Pregnancy-Specific Anxiety Scale is that there is not a discussion of

ongoing complications that may have been happening in the pregnancy, such as episodes of PTL or monitoring for elevated blood pressures. The questions framed by this scale could be reporting anxiety associated with a complicated pregnancy.

Wadhwa and colleagues have conducted several studies examining the role and levels of CRH in women who deliver prematurely. An initial study with 54 women collected bioassays of ACTH, beta-endorphin (β e) and cortisol and self-report stress measures including the schedule of recent life events, daily hassles, perceived stress scale, emotional distress, pregnancy-related anxiety and social support. Perceived stress was moderately correlated with all of the biologic variables, and social support demonstrated a negative correlation (Wadhwa, Dunkel-Schetter, Chicz-DeMet, Porto, & Sandman, 1996). In their 1998 study, CRH was drawn prospectively in 63 women between 28 and 30 weeks gestation. CRH levels significantly ($p < .001$) predicted women who delivered preterm and accounted for 35% of the variance in GA at delivery (Wadhwa, Porto, Garite, Chicz-DeMet, & Sandman, 1998). The most recent (2004) prospective analysis collected CRH from 232 pregnant women at 33 weeks gestation. They found women with elevated levels of CRH at 33 weeks gestation demonstrated 3.3 relative risk for spontaneous PTB, and 3.6 relative risk for fetal growth restriction. Additionally, they found a dose-related relationship to CRH levels and length of gestation. From a clinical perspective, 33 weeks is perhaps too far along in the pregnancy for this to be a good marker of risk for PTB, however, the finding gives strong support for the physiologic connection between HPA dysregulation and PTB (Wadhwa et al., 2004).

A cohort study (Campbell, Challis, DaSilva, & Bocking, 2005) of 218 pregnant women admitted to the hospital with a diagnosis of threatened PTL at 22 to 36 weeks gestation investigated potential predictors of PTB in women presenting with threatened PTL. Blood was collected upon admit to the hospital and analyzed for CRH, ACTH, and Cortisol. A complete blood count (CBC) was completed and pathology analysis of placental tissue was completed on those to delivered preterm. Multivariate logistic regression analysis demonstrated increased odds of delivery with increased maternal WBC at 22 to 27 weeks, potentially indicating an infectious process. At 28 to 31 weeks and 28 to 36, increased levels maternal ACTH and CRH were the best predictors of PTB. This was a convenience sample of symptomatic women and therefore caution must be exerted in extending results to asymptomatic prediction of PTB, however the results strongly support the physiologic pathways of dysregulation of HPA and immune pathways, and within this study explained approximately 80% of the cases of PTL

A single measurement of CRH at 16 to 20 weeks gestation was analyzed as a biomarker of recurrent PTB as a secondary analysis in a larger randomized control trial of 17 alpha-hydroxyprogesterone caproate (17P) injections as prevention of PTB in women at high risk of recurrence (Sibai et al., 2005). Plasma CRH was measured in 170 participants before 17P injections began. Of this sub-sample, 113 participants were assigned to 17P and 57 to placebo injections. There was no significant difference between women who delivered preterm and women who did not. There are several limitations in this study design. In the larger sample, 17P injections significantly reduced rates of PTB, however, in the sub-sample included in this analysis there was not a significant difference in treated women. It is possible that 17P injections may have prevented preterm delivery

in women with high CRH levels who would have otherwise delivered preterm, therefore interfering with results. It is also possible that the smaller sub-sample did not have the power to show significance. However, other studies have not demonstrated significantly different CRH levels until later in pregnancy.

A prospective study was conducted to investigate the progression of elevation of CRH and other HPA hormones throughout pregnancy and their potential predictive value of preterm birth (Sandman et al., 2006). A sample of 203 participants was recruited between six and 10 weeks gestation. Blood was drawn at 15, 19, 25 and 31 weeks gestation to evaluate CRH plasma level, β -endorphin, ACTH and cortisol (drawn between 1400 and 1600). As expected, placental CRH increased throughout pregnancy, with rapidly accelerating levels after 25 weeks gestation. Placental CRH increased significantly faster ($p < .001$) and levels were higher at 31 weeks ($p < .02$) for women who delivered preterm. Cortisol, β -endorphin and ACTH also increased significantly throughout pregnancy ($p < .0001$), but only cortisol at the 15 week measure was significantly higher ($p = .03$) for women who delivered preterm. The hierarchical regression model significantly predicted PTB with cortisol levels 15 and 19 weeks gestation and CRH level at 31 weeks. Elevated cortisol at 15 weeks predicted CRH surge at 31 weeks ($p < .0001$). This study demonstrated that a CRH surge between 26 and 31 weeks gestation could predict PTB, and cortisol could predict that CRH surge. This adds additional strength to the evidence supporting HPA dysregulation in the process of PTB.

A study measured the serum CRH and ACTH levels of a convenience sample of women diagnosed with PTL to examine the clinical value of these measures as predictive of PTB (Makrigiannakis et al., 2007). CRH and ACTH levels were significantly higher in

women who delivered preterm. However, the controls used for this study were ten women recruited at the end of their second trimester, not experiencing PTL. The stress response in women experiencing PTL would elevate CRH and ACTH levels

A retrospective comparison AA and EA women demonstrated significant CRH levels in prenatal labs drawn between 15 and 19 weeks in women who delivered prematurely (Holzman et al., 2001). A total of 97 women who delivered before 35 weeks and 144 women who delivered at 35 to 36 weeks GA were matched in a case-control study by ethnicity (AA or EA) and maternal alpha-fetoprotein level to controls. AA women had significantly lower CRH levels than EA women overall, and significant increases in CRH levels were found in women who delivered before 35 weeks gestation, with an OR of 2.3 in EA and 5.0 in AA women. While increased CRH levels support the involvement of the HPA axis in PTB, especially in AA women, the specificity of the measure remains low (44%) indicating this is only one of several pathways to PTB.

A large prospective study examined CRH levels in 2,927 women in Denmark measured total CRH, free-CRH, bound-CRH, CRH binding protein (CRH-BP) and cortisol in women once between seven and 23 weeks GA, and a second time between 27 and 37 weeks GA. At the first measure, total CRH ($p=.01$), bound-CRH ($p=.03$) CRH-BP ($p=.01$) were significantly higher in women who delivered preterm. At the second measurement (27-27 weeks), total CRH ($p<.0001$), free-CRH ($p<0.0001$), bound-CRH ($p<0.0001$) and Cortisol ($p<0.0001$) were significantly higher in women who delivered preterm, while CRH-BP was significantly lower ($p<.0001$) at this time (Erickson et al., 2001).

Summary – Psychoneuroendocrinology and Preterm Birth. These numerous studies give strong evidence to the role of the HPA axis in PTB. One of the elements missing in all of these studies is an understanding of the experience of stress. Measuring CRH gives strong support to the theory that CRH and HPA axis is being activated and playing a role in spontaneous PTB. However, there is no discussion of why this is occurring in these particular women which is necessary if we are to take a preventive approach to PTB.

Psychoneuroimmunology

The immune system is a complex series of biochemical responses to an injury or pathogen, primarily regulated by antigen presenting cells such as monocytes and macrophages and other phagocytic cells as part of innate immunity, and the T-helper lymphocytes which are components of acquired immunity (Mosmann & Sad, 1996). Cytokines are proteins released by antigen presenting cells and travel throughout the body to mediate and control immune and inflammatory responses through complex series of biochemical reactions (Calcagni & Elenkov, 2006). There are two main branches of a T-helper immune response (See figure 3): the T-helper lymphocyte one (Th1) cascade results in a cellular or pro-inflammatory response and the T-helper lymphocyte two (Th2) cascade, responsible for humoral or anti-inflammatory immunity. The Th1 and Th2 immune responses are mutually inhibitory systems, and within each immune cascade, there are particular patterns of cytokine secretion (Elenkov & Chrousos, 1999). Cytokines are therefore increasingly being used as markers for a subtype of immune reaction.

Perceived stress, as previously discussed, activates both the SAM and HPA axis. Receptors exist in the immune system for both glucocorticoids and catecholamines and it

is well established that the immune system is activated and responds to acute psychological stress (Steptoe, Hamer, & Chida, 2007). Acute exposure to glucocorticoids, the end product of HPA activation, can in some cases alter immune function by inhibiting Th1 pro-inflammatory cytokines, causing a shift from a Th1 to Th2 response. (R. Glaser & Kiecolt-Glaser, 2005) However, with prolonged activation, or chronic stress, glucocorticoids enhance inflammation through increasing pro-inflammatory cytokine expression which in turn cause a down-regulation of glucocorticoid receptors (Norbiato, Bevilacqua, Vago, Taddei, & Clerici, 1997). The selection of Th1 or Th2 immune response has been shown to be a primary factor in clinical outcome in numerous infectious diseases, and therefore a stress-induced Th1 shift may have a profound effect on both susceptibility and response in infection (Elenkov & Chrousos, 1999). This becomes an important consideration with examining the strong relationship between infection and PTB because stress-related dysregulation of the inflammation response could contribute to disparities in PTB rates.

Stress-induced alterations in the immune response may affect pregnancy outcome in at least two main ways: higher susceptibility to infection, and initiation of cytokine cascades which may initiate labor prematurely (Institute of Medicine, 2007). During pregnancy, there is a natural shift from Th1 to Th2 immune response after implantation that may function to protect the fetus from rejection by the maternal immune system (Makrigiannakis, Margioris, Legoascone, & al., 1995). One hypothesis is that stress exposure, in addition to the natural immune shift, may result in an exaggerated Th2 response in pregnancy and the resulting imbalance may alter the immune response to acute or sub-acute infections (Hobel, 2004; Wadhwa et al., 2001). The second pathway

results from the actual pro-inflammatory cytokine secretion in response to a pathogen. The presence of pro-inflammatory cytokines, as previously discussed, may initiate PTL by stimulating the production of prostaglandins by the amnion and deciduas that results in cervical ripening and uterine contractions (Gravett et al., 1994). Finally, the down-regulation of Th1 may heighten susceptibility to infection leading to chorioamnionitis and PTB.

Critical Review of Pertinent Studies - Immune Dysregulation & Preterm Birth. While infection has long been understood to be an independent risk factor for PTB, few studies have examined immune regulation and PTB. Infection in the form of chorioamnionitis accounts for a significant percentage of incidence of PTB, and significant racial disparities exist within this etiology. Numerous studies have also documented significant differences in both acute and sub-acute vaginal infections and PTB. However, the contributing factors to disparities in infection rates remain largely unexplored. Given the present understanding of how exposure to stress results in immune dysregulation, data regarding PTB and infections need to be considered from a perspective of differential exposures to chronic stress.

A search of the Pub Med database included search terms cytokines, infection, inflammation, pregnancy, preterm birth and low birth weight in various combinations. A total of five studies resulted and will be included in this review. Numerous studies spanning decades have found correlation relationships between infection and PTB - a relationship undisputed in current practice. The studies included in this review were chosen not simply for evidence linking infection and PTB, but because they investigate

immune pathways in greater depth and give insight into the dysregulation of immune processes and PTB.

A study by Annells and colleagues (Annells et al., 2004) matched 202 EA women with PTB with 185 women with full term birth to evaluate genetic differences in genes that encode for cytokines and other mediators of immune response that may affect PTB. Interleukin (IL)-10, tumor necrosis factor (TNF), IL-4 and mannose-binding lectin (MBL) 2 gene polymorphisms were found to be associated with PTB. This study is significant because it provides information on the specific cytokines and immune mediators that may have an active role in PTB. IL-10 and IL-4 are two of the cytokines in the anti-inflammatory pathway. A down-regulation in production of anti-inflammatory cytokines would result in an increase in immune response with pro-inflammatory cytokines. The genotyping would have produced stronger results if actual measurement of cytokines had been measured in the participants, as it is unknown how significant polymorphisms in the genetic encoding may alter actual immune response. Additionally, only EA women were included in this study and therefore racial/ethnic differences in immune processes cannot be examined nor how these mediators may contribute to racial disparities in PTB. The authors discuss how previous studies have implicated IL-1 in the immune cascade associated with PTB and they were therefore surprised not to find alterations in IL-1 genotypes. However, a more diverse sample may have impacted results and would have provided greater depth of understanding to immune alteration and PTB.

Menon and colleagues, for example, demonstrated significant increases in stimulated IL-1 in amniochorionic membranes collected from AA women compared with

EA women (Menon, Merialdi, Lombardi, & Fortunato, 2006). Microarray analysis screened IL-1, IL-6, and IL-8 inflammatory and IL-10 anti-inflammatory genes in placental membranes collected from 8 AA and 8 EA women who underwent term elective cesarean section. Immunoassays were then performed to measure concentrations of the cytokines as well as enzymes involved in prostaglandin synthesis and metabolism: cyclooxygenase 1 (COX-1), cyclooxygenase 2 (COX-2) and 15-hydroxyprostaglandin dehydrogenase (PGDH). No significant differences were found between the unstimulated membranes of AA and EA women. However, when endotoxins were introduced into cultures and the membranes were stimulated to produce an immune response, increased gene expression of IL-1 ($p=.0002$), IL-8 ($p=.0006$) and COX-2 was found in AA membranes, while a more balance pro- and anti-inflammatory response was found in EA women with significantly increased concentrations of IL-6 ($p=.0002$), IL-10 ($p=.001$), COX-1 and PGDH. The differences in expressed patterns of cytokines and enzymes in response to infectious stimuli in the membranes of AA and EA are consistent with a pro-inflammatory shift in AA women and are consistent with inflammatory processes that may lead to PTB.

In a further study to examine racial differences between AA and EA women in cytokines IL-1 β and IL-8, (Menon, Williams, & Fortunato, 2007) amniotic fluid was collected from 165 (52 AA and 113 EA) women presenting with spontaneous PTL and 185 full term (87 AA and 98 EA) control cases. Amniotic fluid was collected by transvaginal amniocentesis during active labor before ROM, or during cesarean section before ROM. Subjects were assessed for chorioamnionitis through both clinical symptoms, and from placental histology. There was no significant difference between

AA and EA in incidence of chorioamnionitis. However, IL-1 β was significantly higher ($p < .0001$) in AA cases compared to AA controls. IL-8 not higher in AA cases-controls, but was higher EA cases-controls. The IL-1 β was significantly higher ($p < .0001$) in black women than white women with PTB. No significant racial difference was found in IL-8 levels. The increased levels of pro-inflammatory cytokine IL-1 β gives further evidence of an increased pro-inflammatory immune response to chorioamnionitis in AA and EA women.

Abrams and colleagues (Abrams et al., 2004) conducted a nested case-control study examining chorioamnionitis and PTB in 42 pregnant women in Malawi and 99 matched controls. Numerous cytokines and hormones were measured in placental, maternal and cord blood. Of the 18 cytokine measurements, elevated pro-inflammatory IL-6, IL-8 levels were significantly associated with both chorioamnionitis and PTB (OR 3.7, 5.4). This suggests a pro-inflammatory rather than balanced immune response to pathogens in women who experience chorioamnionitis and PTB.

Case-control comparisons demonstrated significantly higher concentrations of IL-6 in amniotic fluid as well as increased single nucleotide polymorphisms (SNP) in the IL-6R gene in women with PTB compared with those who delivered full-term. Genes encoding IL-6 and receptor IL-6 Receptor (IL-6R) analyzed in mothers and fetuses from 496 EA births and 397 AA births (Velez et al., 2007). While this study identified a significant difference in one IL-6 receptor allele between EA and AA women, this difference was observed in both those who delivered term and preterm. The concentration of IL-6 was significantly increased in the amniotic fluid of those that delivered preterm, but because genotype was not found to be a predictor of preterm birth, the authors are

forced to conclude that IL-6 concentrations are a product of gene by environmental interactions rather than the effect of a SNP.

Summary - Psychoneuroimmunology and Preterm Birth. The studies investigating the relationship between immune regulation and PTB are currently extremely limited. Three studies found significant increases in pro-inflammatory cytokine levels of IL-1 β , IL-8 and IL-6 in amniotic fluid or serum, with different profiles present between AA and EA women. The two studies that identified genetic polymorphisms reported first, alterations in cytokine response found alterations in genes that code for anti-inflammatory cytokines, although actual cytokine levels were not measured. Second, alterations were found in the pro-inflammatory IL-6 cytokine receptors which would also increase circulating pro-inflammatory cytokines. No studies have linked levels of cytokines to pertinent psychosocial factors such as perceived stress or racism, or contextual factors such as perceived status or social power. Much more work needs to be done in this area of research, in particular shifts in cytokine profiles that may be related to environmental or psychosocial conditions such as chronic stress.

Reported Stress

The multiple dynamics and individual nature of stress have made quantification difficult. Researchers have used various conceptualizations of stress. Within obstetric literature, there have been two main ways stress has been operationalized: measures of life events, or perceived stress and anxiety scales. While adequate reliability and validity exist for these scales, and significant relationships have been found with PTB, they are not specific enough to give predictive value that would make them clinically useful.

Stressful Life Events Measures

One approach in the literature to measuring chronic stress is a retrospective self-report count of life events deemed stressful. Seven studies used this approach as a measure of stress in examining the relationship of stress and PTB. None of the studies found significant relationships between a count of life events and PTB. One study (Hedegaard, Henriksen, Secher, Hatch, & Sabroe, 1996) assessed the stress (minor, moderate or high) associated with reported life events and found that highly stressful life events were associated with shorter GA and PTB. Another study found a threshold phenomenon for number of stressful life events in the first three years of their study, but were unable to replicate the results in an additional two years of data (Whitehead, Hill, Brogan, & Blackmore-Prince, 2002). Structural equation modeling and logistic regression modeling were used in other studies (Sable & Wilkinson, 2000; Sheehan, 1998) to determine significant variables from long lists of life events, but these results have yet to be validated in additional samples. Four other studies conducted found no significance between life events measures and PTB (Dole et al., 2003; Goldenberg et al., 1996; Stein, Campbell, Day, McPherson, & Cooper, 1987; Wadhwa, Sandman, Porto, Dunkel-Schetter, & Garite, 1993).

Hedegaard and colleagues (Hedegaard et al., 1996) conducted a population-based prospective study that investigated the relationship of stressful life events and PTB. Stressful life events were measured with the Modified Life Events Inventory that had moderate internal reliability (Cronbach's alpha .55-.72). Every Danish-speaking woman attending prenatal care (8,719) was asked to complete questionnaires at the 16th wk and 30th week gestation. A total of 5,873 (67%) completed all questionnaires. Participants were asked about life events experienced during pregnancy with the Modified Life

Events Inventory and Major Objective Life Events Score. When a participant indicated an event that was experienced, they were asked to rate the stress associated with that event as minor, moderate or high. Internal reliability of the life events scales was low to moderate ($\alpha=.55-.72$). The PTB rate in the study was 3.5%. Overall, there was no association with presence or intensity of a stressful life event with duration of gestation or risk of PTB. However, when only life events assessed by the individual as highly stressful were analyzed, there was an association with shorter GA and a higher risk of PTB, primarily if the event was experienced between 16 and 30 weeks gestation (CI 1.15-2.71). There are several reasons the results of this study should be examined. The low number (67%) of participants that completed the surveys limits the generalizability of the findings. The sizeable population that did not complete the surveys (31%) perhaps was significantly different from participants in the study, it would be logical to question if they had more “life events” or pregnancy stress occurring in their lives. The internal reliability of the life events scales is quite low, and the concept of stress itself is now well defined. Asking participants to classify an event as minor, moderate, or severe stress will result in a broad interpretation of the experience of stress and will not necessarily be correlated with physiologic responses that may affect health or pregnancy outcome. There was also no stratification based on type of stressor. For example, “worry about having a handicapped child” was rated the same as “homelessness” or “death of husband/boyfriend” in the simple count of life events. Further, all could potentially be rated as “severe” if it was the most severe stressor experienced by the participant, but one has to question if these stressors physiologically would affect the pregnant woman’s body in similar ways. These seem to be confounding factors in the stress measurement used in

this study. Additionally, life events were assessed only during pregnancy - giving no indication to life-course stress which is what is believed to be relevant to stress reactivity in pregnancy that may lead to PTB. Finally, the study is also with Danish women who not only have a very different cultural experience from American women, but are experiencing pregnancy in a very different health care system and the results therefore cannot be generalized to American women.

A more recent study (Whitehead et al., 2002) drew a stratified random sample of 70,840 participants from birth certificate data in 11 states. Participants were mailed a questionnaire two to six months after their infant's birth. Women were asked to reflect on the year before their infants were born and stressful life events were measured retrospectively with the Modified Life Events Inventory. Approximately 74% of women responded (70,840) and PTB rate of the sample was 24.2%. Without controlling for risk factors, the risk of PTB did not significantly increase with the number of life events experienced. Logistic regression was used to control for risk factors, and again, no significance was found in relation to stressful life events and length of gestation. Finally, a threshold model was developed by fitting a logistic model with each possible value of the threshold. Using this threshold model for a sub-sample of multiparous participants who gave birth between 1990-1993, risk of PTB increased with each event reported after 5 events were reported. Within this sub-sample, a woman's risk of PTB increased by 7% for each stressful event over 5 reported. However, these results were not repeated for participants in the 1994-1995 data collection period. Within this period, no threshold, or relation between stressful life events and PTB was found, and no relation between stressful life events and PTB was found for primiparas. Strengths of this study were the

population-based sample, with a large stratified random sample, and an adequate response ratio. However, the assessment of stress is limited by the 18 pre-determined items included in the questionnaire, and no assessment is done on the individual's perception or experience of stress associated with these events. There is also the potential of recall error as the questionnaire is retrospective. There may have been a potential to underreport socially unacceptable behaviors or events. A woman who delivered preterm may also have had the additional stressor of caring for a preterm infant with health problems. This significant stressor may have overshadowed stressors before delivery which would have confounded reporting between the two groups.

Sheehan (1998) identified seven categories of stressful life events from the literature. Interviews with 3,205 women were conducted where they were asked if any of those seven events were stressful to her during pregnancy. An additional ten risk factors were added from medical history. The 17 categories were reduced to 11 structured in 3 factors by 13 experts who clustered the stressors and created conceptual models linking those stressful events with LBW. The final model included economic stress, family stress, and no social support as core concepts of stressful events, mediated through addictive behaviors leading to LBW. This model was then cross-validated with 2,090 women demonstrating equal factor loadings and a good fit between theoretical and observed variables. There are several problems with this study. Primarily, the method with which the theoretical variables were identified presents bias with the close-ended nature of the interviews. There is no information provided on how the experts were identified or the methods they used to create the conceptual models. Finally, the results

are not consistent with other literature in the field. Addictive behaviors, according to all other sources, explain very little of the overall incidence of PTB.

A population-based case-control study for all infants less than 1,500 grams in Missouri (2/89-3/91) was conducted that matched each case to 2 controls one of LBW less than 2,500 grams and a normal birth weight infant (Sable & Wilkinson, 2000). A total of 3,102 participants were included, questionnaires conducted through mail, face-to-face and telephone interviews were completed at three to six months postpartum. Major life events were assessed with a list of 30 events derived from previous surveys. The list was not a previously constructed scale or validated in any way. Perceived Stress was measured with one general question of how often the participant felt stress during her recent pregnancy. Logistic regression modeling, followed by stepwise regressions resulted in a model including eight significant life events and a response of “almost always” feeling stress during the pregnancy. The general response of almost always feeling stress during pregnancy was associated with PTB in both unadjusted model and in the stepwise model (adj OR 1.57). The final adjusted model indicated five events: got back with husband/partner, suffered major injury/accident/illness, was in physical fight, unhappy about pregnancy and pregnancy denial each significantly increased risk for very LBW. Alternatively, taking out a mortgage or loan, having a close family member die, having a mistimed pregnancy and being a Medicaid recipient all reduced odds of a very LBW infant. This study was retrospective and therefore subject to recall bias. Data were collected three different ways: mail, face to face and telephone interview, which could impact the participant responses. The original list of life events was seemingly randomly derived, and no validation of study variables was conducted. There was very limited

assessment of the perception of stress related to these variables by the participant, and the timing of that stress was not assessed, such as controlling for stress associated with medical complications that may have been arising that resulted in PTB. While initial events were identified as significant, cross-validation of these results in further populations are needed.

Three additional studies were conducted using life events scales that did not find significant relationships with PTB. Stein and colleagues (1987) conducted a prospective study with 483 women, assessing recent adverse events and long term difficulties. Details of the tool were not reported. No significant associations were found between reported recent or chronic stressful life events and GA or birth weight. Goldenberg, Cliver, Mulvihill (1996) conducted a prospective study with 1,491 women at increased risk for intrauterine growth retardation (IUGR) based on history of a previous LBW infant, or present risk factors such as small stature or smoking during pregnancy. The life experiences survey as well as SSA, social support, self-esteem and mastery was given to women during a prenatal visit between 24 and 26 weeks gestation. None of the measures were significantly associated with PTB. More recently, Dole and colleagues (2003) examined the relationship of multiple psychosocial factors, including life events, social support, pregnancy-related anxiety, perceived discrimination and neighborhood safety to PTB. While significant differences were found between AA and EA participants in life experiences, mastery and self-esteem, no significant associations were found between any of the psychosocial measures and PTB or IUGR.

Mackey and colleagues (MacKey, Williams, & Tiller, 2000) explored stress variables associated with birth outcomes. AA and EA women who experienced PTL

during pregnancy with a matched sample of women who did not experience PTL. Stress was measured with the Daily Hassles Scale that measures 8 subscales: future security, time pressures, work, household responsibilities, health, inner concerns, financial responsibilities and neighborhood/ environment. Internal consistency reliability estimates were $\alpha=0.96$ for the PTL group and $\alpha=0.97$ for the control group. Such high alpha levels suggest that there is only one construct being tested with this scale rather than the multiple dimensions for which the scale was designed. The Profile of Mood State (6 dimensions of mood/state: tensions-anxiety, depression-dejection, anger-hostility, vigor-activity, ebullience and high-energy, fatigue-inertia, and confusion-bewilderment) was also used. This scale demonstrated satisfactory internal consistency that ranged from $\alpha=.74$ to $.91$ for various subscales. A total of 35 matched pairs were given questionnaires between 24 and 35 weeks GA. The women in the PTL group had significantly more medical risk factors than controls, and significantly higher tension-anxiety and depression-dejection on the POMS, lower mean birthweight, and higher incidence of preterm delivery. African American women who experienced PTB also had significantly more fatigue on POMS and more work and future security hassles on the DHS. The findings do not support a relationship between daily hassles or mood and PTB or LBW. There was no appraisal of the perception of stress from the daily hassles reported. There were also significant differences between groups that served as confounders.

Critique of Stressful Life Events Measures. Life events measures have not been consistent or significant predictors of PTB. There are several potential reasons for such results. One dominant problem is that many of the studies either do not assess perception of the life event, or assess it poorly. Perception, interpretation and threat of events are

essential for a physiologic stress response. While the existence of certain potential stressors are assessed with life events scales, none of the studies provide any measure of perceived stress of those stressors or biologic indication that a physiologic stress response was initiated. Several of the studies did not use previously validated measures and psychometric analysis statistics were not reported. The studies using the major life events inventory used a scale that has moderate reliability and validation in other populations, but has not been validated in pregnant populations or those with PTB. None of the studies included biologic measures of the stress cascade to give any indication of construct validity. A list of life events that one person or a group of people believe should be stressful does not assess the individual perception of those events.

Perceived Stress & State Anxiety

Individual perception of stress is an essential element in eliciting a biologic stress response. Another avenue of research into stress and PTB has been measuring perceived stress. Studies approaching the concept of stress from this perspective usually measure both state and trait stress or anxiety with the Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983) and Spielberger's State Anxiety Scale (SSA) (Spielberger, 1983). Seven studies collected data on perceived stress, state anxiety and PTB. The studies were all longitudinal, prospective designs investigating the predictive value of a reported prenatal perceived stress on PTB. None of the studies found significant predictive value in a single measure of either the PSS or SSA on pregnancy outcome. Two studies examined change in perceived stress at two points in the pregnancy.

Ruiz and colleagues (2002) assessed stress with the PSS at prenatal appointments first between 23-26, then again between 31 to 35 weeks gestation. No significance was found between mean PSS scores at either measurement time and PTL, PTB or with GA at delivery. They did find a moderate correlation ($r=.43$) between a decrease in perceived stress between the two measurements and an increase in GA at delivery.

Hobel and colleagues (1999) measured PSS and SSA at 18 to 20 weeks, then again at 28 to 30 weeks gestation in 524 women. A composite stress score was derived from the two measures at each measurement. The same study found significant correlations between increases in CRH and ACTH and PTB, however, no significance was found between reported stress and PTB, nor were correlations found reported stress levels and increases in CRH or ACTH. This study in particular strongly suggests that the PSS, often regarded as a standard measure of perceived stress, is not specific enough to capture the type of stress that leads to physiologic changes and may impact health.

Mancuso and colleagues (2004) conducted a prospective study with 284 pregnant participants. Stress was measured with the PSS, SSA, and Pregnancy-specific Anxiety Scales; CRH levels were measured 18-20 wks and at 28-30wks, and results were correlated with gestational age at delivery. Levels of CRH were significantly higher at the 18-20 week measurement in women who subsequently delivered preterm. There was a positive association between pregnancy-specific anxiety and PTB; CRH appears to mediate this response.

A study by Glynn and colleagues (Glynn, Schetter, Hobel, & Sandman, 2008) measured PSS and SSA as well as Pregnancy Specific Anxiety and number of major life events occurring in the past year. No significant differences were found in univariate

analysis of PSS or SSA scores between women who delivered preterm and women who delivered at term. However, increases in PSS or SSA scores between the two measurements was a significant increase in risk for PTB (OR= 3.08 and 2.49 respectively). A strength of this study is in the inclusion of pregnancy specific anxiety and life events measurements, allowing for post hoc analysis of the source of stress. Anxiety related to pregnancy complications and potential PTB would be expected to increase in women who were experiencing symptoms of PTL and provides a confounder in many designs. However, this study demonstrated increases in PSS and SSA, at the same time demonstrating no difference in pregnancy specific anxiety and increases in LE as a source of stress.

The construct of stress was explored by measuring stimulus, perception and emotional response components and timing of delivery and birthweight as developed by the researchers in a previous model through structural equation modeling (Lobel, Dunkel-Schetter, & Scrimshaw, 1992). A total of 130 women were given the PSS, SSA and prenatal life events measures, and a series of five measurements were conducted with each participant throughout pregnancy and at the prenatal visit. A stepwise structural equation modeling analysis resulted in a model that included perceived stress, anxiety, event distress and medical risk to predict birthweight ($R^2=.14$).

A structural equation analysis of 230 women examined if personal resources would modify the relationship between stress and birth outcomes (Rini et al., 1999). Personal resources were measured with self-report scales of mastery, self-esteem and optimism and stress was measured with SSA and pregnancy-related anxiety scales. Both stress and personal resources were significant in predicting birthweight. Structural

equation modeling was performed, but a significant mediating role of personal resources was not found.

Copper and colleagues (1996) conducted a prospective study that assessed stress once between 25 and 29 weeks gestation in 2,593 participants. The psychometric measure of stress was not described and reliability coefficients were not reported. The citation listed in the references for the measure is a 1973 study of cardiovascular health and stress in male factory workers in Zurich that was not available for review. Stress reported in the highest quartile was significantly associated with spontaneous PTB between 25 wks and 34.6 weeks GA and birthweight <2500g, (OR 1.16/1.08). The relationship remained after adjusting for adverse characteristics and health behaviors. The lack of information regarding the measurement of stress makes this study difficult to evaluate. While results indicate a direct association between stress and PTB, and perhaps a threshold phenomenon, further information is needed.

One study did incorporate perceived stress reports with biologic markers (Wadhwa et al., 1996). To assess stress, the Schedule of Recent Life Events, PSS, Daily Hassles Questionnaire, Hopkins Symptom Checklist measured emotional distress, and Pregnancy-related anxiety scales were given to 54 participants divided in two parts at 28 and 30 weeks gestation. Social support, pregnancy-specific social support, Type A behavior patterns, Affect Intensity Measure, Hardiness were also assessed. Neuroendocrine bioassays were drawn at 28 weeks gestation. Significant correlations were found.

Critique of Measurement of Perceived Stress. A strength of the PSS is emphasizing the importance of the subjective interpretation of life events. As stress is a

highly individualized experience, the emphasis of perceived stress adds to the previous method of measuring stress simply by counting various life events or experiences. One concern with the PSS is that the instrument was developed with populations of limited diversity. Two of the three original samples were healthy, presumably well balanced, college students. Although since publication in 1983, the instrument has been used in over 500 studies in multiple populations in the United States as well as around the world as a global measure of stress with similar psychometric results. One could however, question the content validity. Stress is a theoretical construct, and perceived stress extremely subjective. It is difficult to assess if reported stress is experienced with the same intensity and frequency from one individual to another, and there is the likelihood of PSS measures being influenced by psychological constructs such as anxiety or depression. A full discussion of the factor analysis process was not included in the literature and would have been helpful in assessing construct validity. While trends of the correlations of the predictive validity of the PSS corresponded with what would be expected, the correlations were not strong. Stress is clearly a multifaceted construct and the PSS is not measuring all aspects of the construct. The clinical usefulness will be restricted by the limitations of the measure.

Critique of Measurement of State Anxiety. The SSP is a validated measure of state anxiety, a separate construct from stress. It has been used in many studies perhaps because of how state anxiety is theorized to be related to stress over time, however, in the studies examined, a rationale for this particular measure as a proxy for stress was not discussed. The evidence demonstrates that the PSS and SSA are very poor and inconsistent measures of stress as predictors of PTB. However, studies are demonstrating

physiologic evidence of increases in stress leading to PTB. Therefore, one can conclude that these measures are not specific enough to capture the aspects of stress relevant to PTB. A better approach to reported stress is needed. No studies used the Life Events and Difficulties Schedule. This would be an avenue for future research as it is a validated measure that incorporates both life events and perception of stress.

Summary - Reported Stress & Preterm Birth

Physiological evidence gives strong support to the theory that stress activation of the HPA and immune systems are a significant cause of PTB. Yet there is often a null relationship between existing stress measures and pregnancy outcomes. There are several reasons for this. Primarily, PTB as previously discussed, has multiple influences - stress and HPA dysregulation being only one of those pathways. It is possible that the appropriate population is not being targeted for the assessment of stress. As other pathways are better defined, a more specific risk group may be able to be defined. Another issue is that of timing of the stress. Chronic stress exposure throughout the lifespan can lead to dysregulation of the HPA axis. Current studies have not captured any element of chronicity in their evaluations.

Another main difficulty is in the process of quantifying stress. One of the focuses for the future needs to be a higher specificity in stress measurement. The life events checklists miss the critical element of perception of stress related to those events. The perceived stress scale is a very global measure of acute events rather than a life-course measure; it also does not include the degree of distress elicited by those acute events. The state anxiety scale gives a baseline state assessment of individual anxiety, but does not capture chronic initiation of the stress response across the life-course.

Type (controllable, threat to social self), timing (early vs. late), pattern (ongoing episodes) and duration (acute vs. chronic) of stressors all are relevant in the physiologic response. It is quite apparent why this complex process has been difficult to measure with self-report stress assessment tools.

The Life-Course Health Development Model (M. C. Lu & Halfon, 2003) proposes that differential exposures to risk and protective factors over a life-course contribute to disparities in reproductive potential and ultimately birth outcomes. The disparate outcomes of AA women are theorized to be the result of cumulative exposure to more risks and fewer protections. Therefore, a chronic or cumulative assessment of stress through the life-course is needed in order to appropriately evaluate risk of poor birth outcomes. Stressors only during the last month are measured in the PSS, and the PDQ measures current pregnancy-specific stressors. These measures of stress are important, but not enough. A final consideration is that the construct stress cannot be considered without some measure of coping or resilience. Various individuals may perceive, interpret and react to perceived stressful events differently, based on individual elements of coping and resiliency. An instrument that integrates a longitudinal approach to perceived stress with elements of coping or resilience is needed for this field of research.

Life-course Disparities

African American women have significantly higher rates of PTB than other racial groups resulting in dramatic disparities in incidence of infant morbidity and mortality. Given that stress has emerged as a primary pathway of PTB it is therefore prudent to examine the lives of AA women for differential exposure to stress across the life-course. This section will discuss society level social processes that differentially affect AA

women, increasing their exposure to life-course stress, thus affecting health. In modern life, it is the nature of the social environment and social relationships that causes stress (R. Wilkinson, 2005a). The review will begin with a brief overview of the socio-historical context that has influenced the position of AA women within society. This will be followed by an exploration of the broad social categories of class, race and gender, all of which predict health status. A summary discussion of the intersectionality of multiple social dimensions may affect AA women's life-course stress will conclude the section.

Socio-Historical Context

Historical context is essential to understanding systemic patterns of poverty that disproportionately affect AA women at a society level. Therefore, a brief review of the history of African American migration and residential segregation will be outlined. Prior to the year 1900 there was not a high level of residential segregation. African Americans were overrepresented in poorer districts, but found in all neighborhoods, and rarely represented more than 30% of residents in a particular area (Massey & Denton, 1987, p. 20). Segregation was promoted during a period industrialization in 1900-1940. New demands for labor led to migration of southern AA to northern cities (p. 26-28). With rise of AA population in the north, came the rise of racial hatreds. The middle class was repelled by impoverished migrants, while working-class EA feared labor competition. Racial violence and institutional discrimination were used to maintain AA within confined residential areas (p. 29-42). Race riots erupted and characterized the period of 1900-1920. After 1920, the pattern of violence shifted from general riots to targeted violence concentrated around the periphery of an expanding ghetto (p. 34-35). By World

War II, the foundation of the modern ghetto with racial isolation was firmly established in every northern city.

World War II brought increased demands for labor in urban areas. African American migration from the south to urban areas increased resulting in increased population densities of the ghettos. Both social and spacial segregation became firmly entrenched, particularly after World War II. A postwar home construction boom and baby boom combined with increased demand for automobiles, better communications systems and federal investment in highways, all led to the rise of suburbanization. Workers, factories and retail all decentralized and moved to the suburbs leaving residents of central urban areas increasingly separated from jobs and without infrastructure. Concurrent increase in educational opportunities led to whites becoming better educated, leaving more manual labor, manufacturing, low wage service positions for black workers. Multiple levels of institutionalized discrimination within the real estate industry, the building of public housing, and in urban renewal projects accelerated racial turnover and expansion of the ghetto and to a maintaining the color line.

Urban areas became characterized by a largely black central city surrounded by predominantly white suburbs - hypersegregation and spatial isolation. The segregation acts to concentrate poverty. Rates of AA poverty increased because increased deprivation was confined to those dense, geographic areas and limited options for residents. In response, violent urban riots erupted in the late 1960's. The 70's brought increasing economic hardship, with bursts of inflation and recession which ultimately lowered wages, and lowered real welfare payments. Because of the concentration of poverty, economic hardships hit segregated areas more intensely and ultimately lead to a spiral of

decline in these neighborhoods. Census 2000 data documents that the residential segregation of AAs remains high and distinctive (Glaeser & Vigdor, 2001).

The context of institutional establishment of neighborhoods of concentrated poverty and social stigma of race are important because of the significant health consequences of poverty and the disparate influence on the health of AA populations. This brief overview clearly demonstrates that the establishment of racially segregated neighborhoods of intense poverty in urban-centers is a product of institutional and structural racism throughout American history. It positions us to examine elements of class, race and gender, not as individual attributes, but as relationships of individuals within the structures and institutions of society.

Socioeconomic Class

Class, race and gender are three socially constructed categories within society that determine access to power and resources. Class, or SES, refers to one's location within the structure of society and determines access to power, privilege and resources (Jackson & Williams, 2006). Often equated with income, education and occupational status in the market-based context of America, class conceptually is a representation of one's prestige and status within society. The inverse relationship between socioeconomic class and health has been well accepted for centuries and repeatedly demonstrated in multiple health outcomes; those in poverty experience more disease and die sooner (D.R. Williams & Collins, 1995). Until recent years biomedical researchers have simply accepted the correlation and statistically controlled for markers of SES such as income, education and at times job category. However, a more interesting and pertinent question is why the phenomenon exists. The Whitehall study was sentinel because it demonstrated the

correlation of class to health not simply for those in the lowest categories where basic needs may not be met, but at multiple levels throughout the social hierarchy (Marmot, Shipley, & Rose, 1984; Marmot et al., 1991). It is not simply a matter of access and resources, but of overall status and life experiences. Socioeconomic class influences the nature of stressors to which one is exposed.

Race

Race is a prominent stratifier within the context of American society. African American race has been listed as a risk factor for the spectrum of health disorders for decades, however, biologically, race is impossible to define (Krieger, 2003). Racial categories originated from visual rather than scientific classification, shaped largely by cultural, political and economic influences (Willaims, 1997). The phenotypic expression of superficial characteristics used to categorize race are not strongly related to biologic or genotypic characteristics. The genetic variation within races is far greater than between races (Barbujani et al., 1997; Cavalli-Sforza, 1998; Shen et al., 2000) and even the superficial characteristics exist on a genetic spectrum rather than dichotomous degrees of variation. In today's society race is biologically impossible to define. Therefore race must be viewed as a social rather than biologic construct.

A social constructivist perspective alternatively emphasizes the forces of history, politics and power in the establishment of boundaries, categories and experiences of race (Harrison, 1998). What then becomes important with race is how an individual defines herself, is defined by others and the socio-historical structural influences on those constructed categories. The resulting stigma and place within the hierarchy influences personal, institutional and structural interactions of AA women on an ongoing basis

throughout their lives. Thus, racial disparities in incidence of PTB are important to study as a reflection of injustice within society, the resulting exposure to stress, and the effects of stress on reproductive outcome.

Multiple spatial variation studies have demonstrated increased incidence of LBW for women in neighborhoods that are predominately AA (Roberts, 1997). Neighborhood quality often corresponds with SES; however, outcomes are not simply a product of SES. While poverty is associated with increased rates of PTB, AA women not living in poverty continue to experience disparate birth outcomes. A spatial variation study found that AA women had higher odds of delivering preterm whether they lived in high or low SES neighborhoods (Ponce et al., 2005). One study with AA and EA college graduates demonstrated AA graduates continued to have 1.95 times the risk of PTB (McGrady et al., 1992). Another study examined ethnic differences in PTB with married, college-educated women, who received adequate prenatal care and reported no medical or behavioral risk factors during pregnancy (Alexander et al., 1999). AA women continued to have 2.64 times the risk of having a LBW or SGA infant, and 1.61 times the risk of infant mortality. Unlike with EA, the risk of PTB and having a LBW infant increases with maternal age for AA women (Rich-Edwards et al., 2003). Yet Black women born in Africa have birth outcomes similar to U.S.-born White women (Cabral et al., 1990; David & Collins, 1997). The social risks of AA race need to be more closely examined to understand disparities in incidence of PTB.

Gender

Gender is another social category that confers status within society. While there is a clear biologic determinant of sex, gender is the social element of identity that does not

always correspond with genetic coding, and that carries meaning in how that individual relates with the world. Multiple international studies that have examined inequality and gender relations have demonstrated that where the status of women in society is better, the health of both women and men in society is improved (R. Wilkinson, 2005b; Williamson & Boehmer, 1997). The status of women suffers when there is an increased dominance hierarchy within society that affects those of both genders (Kawachi, Kennedy, Gupta, & Prothrow-Stith, 1999). American women of all racial groups earn less income than similarly educated males (Institute for Women's Policy Research, 2008). Yet gender cannot be examined in isolation of race and class. There is not a single experience of all women. Gender roles and oppressions are very much stratified by race and class. A critical approach to examining stress and health outcomes must therefore consider the intersection of multiple hierarchies within society.

Intersectionality

While increasing numbers of studies have examined the impact of race, class, and gender on health, few studies have concentrated on the impact of the intersection of these multiple dimensions. Treating race, class and gender as independent variables negates the historically embedded multiplicative influence of attributes that shape life opportunities (Caldwell, Guthrie, & Jackson, 2006). Within the current social context of the U.S. the experience of an AA woman throughout the life-course is unique from AA men, and unique from women of other races (P. H. Collins, 2000). The separate dimensions of race, class and gender are each individually important in social interactions, the composite of multiple attributes creates an overall social identity that is stratified within the social hierarchy (Caldwell et al., 2006). The overall intersection, for example, of

being AA and female and low SES may affect social interactions and overall status in society in a manner that is not simply a summation of each of those individual factors. Race, class and gender are important because of how they intersect together to affect stigma, position within the social hierarchy, oppression and thus stress across the life-course.

Oppression is defined as “Any unjust situation where, systematically and over a long period of time, one group denies another group access to the resources of society. Race, class, gender, sexuality, nation, age and ethnicity among others constitute major forms of oppression in the U.S. However, the convergence of race, class and gender oppression characteristic of U.S. slavery shaped all subsequent relationships that women of African descent had within Black American families and communities, with employers, and among one another (P. H. Collins, 2000, p. 4).” The research available that examines race often groups AA men and AA women together as a category. The research on class, again, groups all from various socioeconomic levels. Gender literature often groups all women together, assuming women of color have the same experience as those of EA descent. Collins (2000) argues that AA women have social histories unique from AA men, and unique from EA women (p.4). The historical, sociological situation was impacted by the fact that as women, their perspective and experiences are different from AA men who held leadership positions in the civil rights movements. African American women had to struggle to have their feminist perspective heard with the AA male authority (p 7). Yet, as AAs, their perspective and experiences differ from and were suppressed or omitted by the elite EA women who developed and promoted Western Feminist thought (p 7). A more complete discussion and analysis of Black Feminist

Theory will be included in a subsequent chapter, however, it is important to understand that AA women's experiences are more than a simple product of race or class or gender, but rather an intersection of multiple dimensions. The unique perspective of AA women has not been adequately examined in health research which was clearly evidenced by literature searches specific to AA women.

In an attempt to understand the differential life-course stress experienced by AA women, a search of SocAbstracts using the keywords African American or Black, women and stress was conducted. A total of 75 peer-reviewed journals listings were returned, 70 of which examined the relationship of stress symptoms with various diseases, risk behaviors or coping strategies, while five described the source or experience of stress. Of the five references, one was specifically related to structural neighborhood disadvantage, one to work experiences, one to educational experiences and those have been included under the appropriate section below. The remaining two articles will be reviewed below. A similar search in PsychInfo resulted in a greater number of references: 358, a vast majority utilizing standard stress measures and examining correlation with specific diseases or mental health disorders that use either general measures of stress, or specific known causes such as traumatic events, abusive relationships, work strain and racism. The social factors have been organized into categories and will each be addressed below. Additional resources were found by searches within each subcategory and following cited research.

Two studies were found that concentrated on sources and types of stress in AA women. Turner and Avison (2003) examine the patterning of stress exposure by systems of stratification such as gender, SES and race by measuring four dimensions of stressful

experience: recent life events checklist, chronic stress (Wheaton Chronic Stress Scale), lifetime exposure to traumatic events, and discrimination in middle and high school children. Young AA women experienced significantly higher levels of social stress than men (AA or EA) or EA women. The authors also report that stressful life events checklists alone “systematically and dramatically” underestimate social stress as measured across multiple domains, and the results are particularly biased estimates across gender, race and SES (Turner & Avison, 2003).

Becker and colleagues (2005) examined perceived control at the organizational, community and individual levels as a health protective factor in AA women. Worries about safety and social contextual stressors were consistently associated with poorer self-reported health and more frequent depressive symptoms. As a whole, perceived control did not have an effect on health, however, when stratified by age, perceived control was a significant predictor of self-reported general health in those 18 to 34 years old.

An intersectional approach is necessary in order to consider women not just on one dimension of gender or race or class, but as dynamic individuals that exist in society representing the intersection of multiple dimensions of privilege or oppression. While there is a paucity of research in this area, the studies that exist suggest that AA women in particular experience significantly higher levels of social stress than others, that social stress is underestimated with current psychometric measures of stress, and that stress affects their perceived control in life. The following subsections will address key areas that may affect AA women’s differential exposure to stress across the life-course including racism, neighborhoods of concentrated poverty, income and wealth, work, education and unequal access to healthcare.

Racism. Race has been a dominant organizing force within American society with a long history of stratification, inequality and oppression (Omi & Winant, 1994). Racism is defined as “institutional and individual practices that create and reinforce oppressive systems of race relations whereby people and institutions engaging in discrimination adversely restrict, by judgment and action, the lives of those against whom they discriminate (Krieger, 2003).” Racism contributes to cumulative amounts of stress throughout life and may have a direct effect on pregnancy (J. W. Collins, Jr. & Hammond, 1996). There is significant evidence that AAs experience individual, institutional and other forms of racism and that these actions, events and institutional practices are experienced as stressful (Harrell, 2000). The accumulation of stress can in turn impact women’s health and may well contribute to the yet unaccounted for disparities in PTB rates experiences by AA women. Measuring the effect of racism on health presents a challenge which is perhaps why it is often overlooked in biomedical studies. Racism can impact an individual through direct interactions or acts, but it can also impact individuals and groups through indirect means such as marginalization and systemic inequalities. People responses to discrimination are also important (Krieger, 2003). Some responses can be empowering and beneficial such as active resistance through community organization. However, many forms of resistance, such as internalized oppression or substance use may have serious negative health consequences that are rarely viewed as related to racism and may be an important individual variable in health-related outcomes. Three levels of racism, interpersonal, marginality and systemic racism will each be discussed below.

Interpersonal Racism. Racism at the interpersonal level manifests through both direct and vicarious experiences of prejudice and discrimination (Harrell, 2000). Perceived racism scales are the most direct measure whereby an individual's perception of racism experiences can be correlated with health outcomes. Studies that have examined individual perceived racism report between 50 and 80 percent of AA participants report having experienced some type of racially based discrimination (Broman, 1996; Krieger & Sidney, 1996; Krieger, Sidney, & Coakley, 1998; Krieger, 1990; Ren, Amick, & Williams, 1999). In one such study by Krieger and colleagues (1998), 80 percent of respondents reported discrimination in various aspects of life such as at school, getting a job, at work, obtaining housing, receiving medical care, from the police, or simply on the street or in a public setting. The study further looked at responses to unfair treatment and ways of handling anger. Overall responses to unfair treatment varied by both social class and gender. African American women were being the most likely to internalize anger, accept unfair treatment as a fact of life and keep unfair treatment to themselves.

Stancil and colleagues (2000) study of pregnant AA women aged 19-39 used a modified version of the scale developed by Krieger. The specific modifications were not reported. In this study, 54% of participants reported experiences of racial discrimination, with older women significantly more likely to report experiences. Those who coped passively had higher perceived stress, and significantly higher urinary cortisol levels. The authors stated they used a 90 percent confidence interval in the analysis because of the exploratory nature of the study. Results from only the initial 94 participants were reported. One would expect further results with a larger sample size and increased power

to be forthcoming. However, these initial findings are important because they describe experiences consistent with the type of stress that affects health such as status within the social hierarchy and a lack of control.

Accordingly, epidemiological studies are finding correlations between perceived racism and LBW. Murrell (1997) conducted a study with 147 AA pregnant women. Multiple regression analysis revealed a significant positive relationship between racism and stress and LBW ($p < .001$), and a significant negative relationship between self-esteem and stress and LBW ($p < .001$). Collins and colleagues (2000) report the adjusted odds of giving birth to a LBW infant is 3.3 times greater among low income AA mothers who report having experienced racial discrimination. A subsequent study by Collins (2004) used a case-control design with 104 AA women who delivered preterm and 208 AA women who delivered full term infants. There was a significant relationship between lifetime exposure to racial discrimination with a dose-dependent response. Exposure to racism in one or more domains resulted in an OR of 1.9 for having a VLBW infant, and exposure to racism in more than three domains increased OR to 3.2. No significant relationship was found between perceived racism during pregnancy. A prospective cohort study of 1,898 AA and EA women found those who reported high levels of perceived racial or gender discrimination were 1.8 times more likely to deliver preterm (Dole et al., 2004). African American women were less likely to smoke, reported a greater number of negative life events, slightly higher levels of depression and were less likely to be living with a partner compared with EA women. Mustillo and colleagues (2004) examined data from the 10 year prospective CARDIA data set. As expected, AA women had an increased risk of PTB (OR=2.54), however that risk was mediated by racism. Fifty

percent of AA women with PTB and 61 percent of women with LBW infants reported experiencing discrimination in at least three situations in their lifetimes, compared with five percent and zero corresponding percentages of EA women. The adjusted OR for PTB for women experiencing racial discrimination was 4.24.

A consistent relationship has been found between perceived racial discrimination and PTB. The physiologic mechanism of stress may be inferred, but has not yet been demonstrated in the literature. Refinement of stress measurements to the specific types of stress that impair health, validation of those refined scales with populations of AA women, and then studies that incorporate stress, racism and birth outcomes are needed.

Invisibility & Marginalization. Beyond overt acts, intersectional racism can occur in more subtle means that may not be captured by perceived racism scales. Marginalization may occur and may not be noted specifically by an individual; however the overall impact is one that impacts status and life experiences of stress. While the potential areas within which this may occur are profound, three areas will be briefly discussed: everyday experiences, media and in nation organizations.

Everyday racism is subtle, innocuous preconscious or unconscious degradations that are recurrent and reflections of socialized attitudes and behaviors (Essed, 1991). Experiences may be personal experiences, but they also are vicarious through friends and family members, other AAs, through the media or through general knowledge of racism within a system. Essed cites examples of everyday racism such as being overlooked in line, mistaken for service personnel or being followed and observed in public. Existing tools to measure racism may not capture these subtle exclusions, yet the impact is

lifelong, continuous, and affecting AA women's social self, perceived status, and sense of control - all areas critical to the type of stress that affects health.

Stereotypical images of AA women in media and literature, or ideals of beauty or womanhood that represent a white standard are further examples of racism (P. H. Collins, 2000; Essed, 1991; hooks, 1981) that would rarely be reported through existing research tools. Stereotypical images of AA womanhood portrayed in the media function as controlling images (P. H. Collins, 2000). Representing oppressive social relations, they both objectify AA women as "other" as well as legitimize the image and model hierarchy, status and oppression. The representation of poverty adds another dimension. Media images communicate that worth is related to material gain and negative images of the poor abound (hooks, 1994). Dignity is rarely portrayed. The internalization of such messages would direct one's concept of social self and status within society.

Angela Davis and bell hooks describe the repeated shunning of AA women by racially homogenous women's rights movements, representing the interests of only select branches of women's interests, specifically white women of privileged classes (Davis, 1989; hooks, 1981, 2000). In response, an alternative women's movement rose up representing the interests of women of color and EA working-class women. Yet there were two distinct continuums of the women's movement, one publicly acknowledged and visible; the other invisible and ignored. White women activists voiced repeated complaints that women of color are invited to meetings and fail to respond to the invitations, concluding women of color are not interested in the feminist agenda. Davis responds, "This process cannot be initiated merely by intensified efforts to attract Latina women or Afro-American women or Asian or Native American women into the existing

organizational forms dominated by white women of the more privileged economic strata. The particular concerns of women of color must be included in the agenda” (Davis, 1989, p. 8). Issues, Davis elaborates, such as unemployment, homelessness, racial violence, repressive immigration policy, and health disparities need to be included. Similarly, Patricia Hill Collins (2000) discusses the exclusion of AA women from not only the feminist movement, but also from AA social and political discourse and reform movements. African American women have accepted subordinate roles in male-run Black organizations that also do not stress issues important to AA women. The systemic marginalization within national movements could theoretically be internalized and impact individual’s perceptions of status within the social hierarchy. However, evidence for such a relationship is descriptive as the concept is difficult to capture and measure quantitatively.

Systemic Racism. Racism also affects life-course stress and health through indirect macro-pathways. Epidemiological statistics of health disparities as well as inequalities in income, education levels, unemployment and incarceration rates provide evidence of the collective effects of racism. Residential segregation, economic and social deprivation, unequal opportunities in work and education, and unequal access and treatment within healthcare are categories related to systemic racism that will each be addressed below.

Concentrated Poverty. The most prevalent structural arrangement impinging on the lives of AA women is concentrated poverty (D. R. Williams & Collins, 2001). Areas of concentrated poverty, formed through processes of racial segregation and economic disinvestment as described above, result in neighborhoods with an abundance of stressors

and limited protective resources. Multiple studies have demonstrated a relationship between neighborhood-level socioeconomic disadvantage and birth outcomes (Culhane & Elo, 2005; Kaufman et al., 2003; O'Campo et al., 2007, 2008; Pearl et al., 2001; Reagan & Salsberry, 2005; Shiono et al., 1997), and strong evidence links concentrated disadvantage with geographic isolation of AAs (Culhane & Elo, 2005; Sampson, Morenoff, & Gannon-Rowley, 2002). Identified stressors that cluster in neighborhoods of concentrated poverty have been grouped into physical and social conditions.

Physical neighborhood conditions that may either directly or indirectly influence health include physical decay (Sampson & Raudenbush, 2004), exposure to toxicants (Silbergeld & Patrick, 2005), noise, air pollution, and housing quality (D. R. Williams & Collins, 2001). Other factors include availability of goods and services such as quality health care, work opportunities, educational opportunities, grocery stores, recreational facilities, police and fire protection (Coulton, Korbin, Chan, & Su, 1999; Morenoff, Sampson, & Raudenbush, 2001).

Social characteristics of a neighborhood may have an influence such as neighborhood cohesion or disorganization (Sampson & Raudenbush, 2004), crime and violence (Morenoff, 2003; Zapata, Robolledo, Atalah, Newman, & King, 1992), social ties and interactions (Kawachi, 1999; Morenoff et al., 2001; Sampson, Raudenbush, & Earls, 1997; Warner & Rountree, 1997) norms of reciprocity, civic participation, availability of social support (Buka, Brennan, Rich-Edwards, Raudenbush, & Earls, 2003; Markowitz, Bellair, Liska, & Liu, 2001; Steptoe & Feldman, 2001), shared cultural norms such as smoking, alcohol and dietary practices (Diehr et al., 1993; Diez Roux et al., 1999; Duncan, Jones, & Moon, Smoking and deprivation: are there neighborhood

effects) and routine activities (LaGrange, 1999; Sampson & Raudenbush, 1999). Many of these factors may act as acute or chronic stressors that differentially affect AA women (Culhane & Elo, 2005).

According to Sampson and colleagues (1997) the neighborhood serves as a backdrop for exchange of social capital which includes a sense of mutual trust and shared expectations. It has been correlated with prevention of juvenile delinquency and crime, promotion of successful youth development, enhancement of schooling and education and political participation. Social capital has also been correlated with the health of a community through engagement in politics and social institution ensuring government response in policies benefiting health, as well as through informal social control, maintaining healthy norms and provision of social support (Kawachi, 1999). Social participation has been declining overall in recent decades, but particularly in impoverished neighborhoods. As income inequality increases, social cohesion decreases as does the healthy achievement of that society (Kawachi & Kennedy, 1997). In general, individuals with high social capital are more likely to have effective channels of communication, to have reciprocal relationships providing mutual support, and to be influenced by positive social norms, all increasing the likelihood that healthy behaviors will be adopted (Reagan & Salsberry, 2005).

Schieman (2005) examined the effect of social support on health by looking at the effect of neighborhood structural disadvantage on received and donated social support, looking to see if residential stability modifies the associations, and if there were gender and race-contingent patterns. Also considered were how individual-level socioeconomic conditions, perceptions of neighborhood problems and residential tenure contributes to

community-level effects. Neighborhood disadvantage is positively associated with donated and received support - only among AA women who reside in areas with greater residential stability. AA women living in chronic structural strain may develop higher levels of bonding social capital.

Neighborhoods of concentrated poverty are a primary structural influence on the life-course stress of AA women. Physical characteristics, social characteristics, social capital and social support shape the environment and consequent stress exposure of AA women.

Income & Wealth. It has been observed and accepted for centuries that those of lower SES and living in poverty will have poorer health outcomes. Until recently, income, education levels were measured in order to statistically control for the effect, but little efforts were invested into the reasons behind the poor health outcomes. It is well accepted that low SES is related to increases in infant mortality rates, LBW infants, and PTB (Kramer et al., 2000; Krieger, 1991; Mathews & MacDorman, 2007). African American women disproportionately experience low SES status (Institute of Medicine, 2007; D. R. Williams & Collins, 2001). In 1998 the median net worth of EAs was almost six times that of AAs, and AA women with a high school education earned only 64 cents for every dollar earned by a comparable EA woman (D. R. Williams & Collins, 2001) Oliver and Shapiro (1997) reported that EA families have approximately twice the income, four times the net financial assets, and nine times the net worth of AA families. Given these often hidden disparities in wealth, simply measuring one aspect of SES, such as income level, could potentially confound study results. Individuals or families with the

same income level could face very different economic pressures based on different overall levels of wealth and financial obligation.

The past decades have seen not only ongoing patterns of residential segregation in concentrated areas of poverty, but a trend of widening income inequality. During the 15 year period of 1977 to 1992, after-tax incomes of the top fifth of American households increased by 28%, the middle fifth increased only 1%, while the bottom fifth of American household experienced a 17% decrease in after-tax income (Shapiro, 1995). In more equal societies, people are much more likely to trust each other, there are increases in social capital and social cohesion and levels of violence are consistently lower (R. Wilkinson, 2005c), and there is a strong correlation between racial prejudice and income inequality (Kennedy, Kawachi, Lochner, Jones, & Prothrow-Stith, 1997). Additionally, the status of women suffers in terms of both political participation and earnings potential and there is larger gap between rich and poor (Blau & Kahn, 1992; Kennedy et al., 1997). The added dimensions of concentrated poverty income inequality and race add additional risk over and above income.

Economics alone, however, cannot adequately explain all of the existing racial disparities. When SES markers are controlled for, significant disparities remain in birth outcomes between AA and EA populations (Institute of Medicine, 2007; Shiono et al., 1997). High-SES AA women have higher infant mortality rates than do low-SES EA women (Singh & Yu, 1995). AA women's birth outcomes are affected to a greater extent by living in low-SES neighborhoods (Subramanian, Chen, Rehkopf, Waterman, & Krieger, 2005). Interestingly, other minority ethnic groups living at similar poverty levels do not share similar birth outcomes (Mathews & MacDorman, 2007). Reagan and

Salsberry (2005) evaluated 11 years of data correlating neighborhood poverty rates and incidence of PTB. They found a significant direct association between neighborhood poverty and very preterm births for AAs, but not for EA. While income and wealth is inarguably important for life-course stress and health outcomes, it must be considered in conjunction with other social dimensions such as race.

Education. Concentrated poverty results in highly segregated elementary and high schools and is a fundamental cause of racial differences in quality of education (D. R. Williams & Collins, 2001). Community resources are essential to the quality of public school. Racial residential segregation results in higher concentrations of AA and Latino students in neighborhoods of concentrated poverty, that provide students with poorer quality schools and they experience higher teen pregnancy and dropout rates (Orfield & Eaton, 1996). Given that education has a strong effect on earning potential as well as job characteristics and social status, those living in concentrated poverty are not receiving equal educational and work opportunities. At higher education, AA university students have fewer privileges and more negative experiences (Yoder, Aniakudo, & Berendsen, 1996). The life-course experiences of AA women in the education systems are daily exposures to increased amounts of stressors.

Work. Work encompasses many key aspects of women's lives and everyday stress experiences. Beyond the element of income, job opportunities, availability in neighborhoods of concentrated poverty, occupational conditions, potential hazards, potential for or the reality of unemployment are all elements that differentially impact AA workers. For working women, there is the added element of maternity leave and often childrearing responsibilities. Characteristics of jobs are stratified by social class,

and the characteristics of jobs have consequences on health (Marmot et al., 1984; Marmot et al., 1991; Martikainen, Stansfeld, Hemingway, & Marmon, 1999; Power, Matthews, & Manor, 1998). Job variety, challenge, control, demands, security, social support, organization, physical effort, ergonomics and safety are all characteristics that collectively influence worker health and well being. (Carayon & Smith, 2000; M. J. Smith & Carayon-Sainfort, 1989). Lower-status jobs expose workers to physical and psychosocial risks, occupational injury, exposure to toxic substances, job strain and lack of control over work (Marmot & Smith, 1997). Jobs that consist of repetitive work, high job demands, low social support, high job insecurity and high ergonomic exposures were found to predict worsening reported health over time (Borg & Kristensen, 2000). Another study found that differences in prestige, qualifications, rewards and job characteristics were linked to mortality risk (Gregorio, Walsh, & Paturzo, 1997). Warren and colleagues found a strong association between SES and health, mediated by physical and psychosocial job characteristics (Warren, Hoonakker, Carayon, & Brand, 2004). Higher rates of LBW infants are born in areas with higher unemployment and job insecurity (Catalano & Serxner, 1992). African American women are overrepresented in low-paying jobs and underrepresented in high-paying occupations, and even within the same occupation earn substantially less than men. It follows that work adds another dimension of differential life-course stress on AA women.

Unequal Access to Care. The Institute of Medicine's, "Unequal Treatment" (2003) reports ethnic minorities tend to receive a lower quality of healthcare than non-minorities, even when access-related factors are controlled. Inequalities stem from several different levels. Patient-level variables are situations such as refusal of

recommended services, poor adherence to treatment regimens and delay in seeking care. These are partly attributed to a poor cultural match between minority patients and their providers, mistrust, misunderstanding of provider instructions, and a lack of knowledge of how to best use healthcare services. Healthcare systems-level factors that may impact access are the ways in which systems are geographically located, organized, such as time pressure with client load, financed i.e. insurance issues, and the availability of services and supplies. Finally, care process-level variables are issues on the provider's side such as bias, prejudice, greater clinical uncertainty when interacting with minority patients and beliefs or stereotypes held by the provider about the behavior or health of minorities. All of these factors may influence health care disparities. Studies have also demonstrated there is a lack of health promotion information provided to AA women seeking prenatal care (Kogan, Kotelchuck, Alexander, & Johnson, 1994). Difference by race in the utilization of prenatal care technologies has also been found, in particular tocolysis for PTL. African American women with singleton pregnancies were slightly more likely to receive tocolysis than were white women (RR=1.1), however risk idiopathic preterm delivery estimated to be three times higher demonstrating a distinct difference in treatment practices for the presentation of PTL symptoms. African American women with multiple births received tocolysis only two thirds as often as white women. (Brett, Schoendorf, & Kiely, 1994). Early recognition and treatment of AA women's PTL symptoms could influence how many of those women progress to PTB. Health care is another area of racial inequality.

Summary – Intersectionality

The intersection of race, class and gender subjects AA women to increased life-course stressors through interpersonal and systemic racism. Studies have demonstrated an individual's sense of control, threat to social status and perceived position within a social hierarchy are important elements of stress response that impacts health. The stressors that AA women face theoretically represent these three specific types of stress. Such differential life-course exposure has the potential of explaining a significant amount of racial and class health disparities that have previously remained unknown. Future studies need to concentrate on a more specific perception of stress associated with known stressors, as well as specific stress perception linked with health outcomes, such as PTB.

Conclusion – Life-course Disparities

The etiology of PTB is multifactorial, but two key physiologic pathways, inflammation and HPA dysregulation are strongly linked to stress-related changes with several factors identified that work through these mechanisms (see figure 4). Multiple physiologic studies have linked CRH, and other hormones in the HPA cascade with PTB, and while the evidence is not as robust, several studies have also found correlations between stress-related immune shifts and PTB. However, the psychometric assessment of stress is poorly correlated with PTB. Because the physiological link is well defined, one must conclude that the psychometric assessment is therefore not specific enough to capture stress that leads to poor birth outcomes. African American women exist at the intersection of multiple social dimensions of oppression. They live daily lives at the bottom of the social hierarchy, endure threats to social selves through stigma and resulting racism, sexism and classism, and more often are of low SES which results in less control in their work and personal lives. All three factors are critical for the specific

life-course stress that causes psychoneuroendocrine and psychoneuroimmune dysregulation.

What is needed is: 1) a clear physiologic marker of stress to identify women at risk, 2) a better understanding of the specific type of stress perception that induces psychoneuroimmunologic and psychoneuroimmunologic changes that may lead to PTB, 3) a psychometric assessment of stress more specific to physiologic dysregulation, 4) an assessment of the process of life-course stress from the perspective of AA women who experienced PTB to gain insight into the profound disparities in morbidity, and 5) An examination of not just stressors, but stress perception by AA women. A deconstruction of stress and a focused exploration of stress in AA women's lives may offer greater understanding to the racial health disparities in PTB.

Chapter 3

Physiologic and Psychological Measures of Stress and Preterm Birth:

A Critical Review

This chapter consists of a manuscript prepared for publication that critically reviews physiologic and psychological measures of stress and preterm birth.

Physiologic and Psychological Measures of Stress and Preterm Birth:

A Critical Review

Preterm birth (PTB) is defined as birth before 37 completed weeks gestation (Centers for Disease Control and Prevention, 2008). In 2006, approximately 12.8% of all pregnancies delivered prematurely in the U.S. which reflects an increase of 21% since 1990 (Hamilton et al., 2007). Within the overall rates, significant racial disparities exist.

Preterm birth can lead to severe sequelae; the risk of life-long morbidity and mortality rises with the degree of prematurity (Mathews & MacDorman, 2007). PTB and prematurity related disease leads to 36.5% of infant deaths in the U.S. (MacDorman, Callaghan, Mathews, Hoyert, & Kochanek, 2007) and surviving premature infants demonstrate high rates of morbidities affecting every physiologic system, often resulting in life-long disability (Berkowitz & Papiernik, 1993; Institute of Medicine, 2007). The CDC (2008) estimates the societal economic burden associated with PTB in the U.S. is in excess of \$26.2 billion per year.

In recent years, stress has emerged as a physiologically significant factor in PTB (Institute of Medicine, 2007). The Life-Course Health Development Model (M. C. Lu & Halfon, 2003) proposes that differential exposures to risk and protective factors over a life-course contribute to disparities in reproductive potential and ultimately birth outcomes. Poor reproductive outcomes, such as preterm birth are theorized to be the result of cumulative exposure to more risks and fewer protections. Therefore, a chronic or cumulative assessment of stress through the life-course is needed in order to appropriately evaluate risk of poor birth outcomes. However, a standard and clinically useful measurement of subjective stress and preterm birth has not yet been established.

This purpose of this paper is to examine the mechanism of stress and PTB and to critically review the physiologic and subjective measures of stress and their association with PTB.

There are four commonly recognized biologic etiologies of PTB: 1) decidual hemorrhage, 2) uterine overdistention, 3) activation of the maternal-fetal hypothalamic-pituitary-adrenal (HPA) axis, and 4) infection and inflammation (Institute of Medicine, 2007). These pathways lead to PTB through different mechanisms, and stress is believed to be an important factor in two of them: activation of the maternal-fetal HPA axis and infection and inflammation. Each of these physiologic pathways will be discussed below and pertinent studies that measure markers of these pathways and PTB will be critically reviewed. This will be followed by an overview of subjective stress assessment, including a critical review of the subjective measures of reported stress and preterm birth. This paper concludes with a discussion of future needs for stress assessment with PTB.

Psychoneuroendocrinology

A considerable amount of knowledge has been gathered in recent years regarding the role of the HPA axis in preterm birth. Stress triggers a neuroendocrine cascade resulting in increased levels of maternal corticotropin releasing hormone (CRH), adrenocorticotrophic hormone (ACTH) and cortisol. In pregnancy, CRH is secreted not only from the hypothalamus, but also the placenta. Placental CRH is identical to hypothalamic CRH in structure and function (Petraglia et al., 1990), but while glucocorticoids exert a negative control on hypothalamic CRH secretion, they stimulate further secretion of CRH in the placenta. A positive feedback loop is therefore created resulting in a progressive rise in CRH, ACTH and cortisol throughout pregnancy

(Petraglia et al., 1994). CRH plays a key role in labor as it activates receptors on myometrial smooth muscle, and CRH and oxytocin have a synergistic effect on myometrial contractility (Romero et al., 2004). Placental CRH also crosses the placenta and activates the fetal HPA axis, stimulating fetal secretion of cortisol and DHEAS, precursors for estrogen stimulation in the placenta. Placental estrogens lead a hormonal cascade ending in myometrial contractility and initiation of labor (Challis, 2000). An exponential rise in CRH occurs the final six weeks of pregnancy before a term delivery, and significant increases have been observed earlier in women who deliver prematurely (Hobel, 2004; Hobel, Dunkel-Schetter, et al., 1999).

Physiologic Evidence of HPA Activation & Preterm Birth

A Pub Med and PsychInfo search of the literature using a variety of search terms such as preterm birth, hypothalamic pituitary adrenal, stress, pregnancy and low birth weight produced a total of 13 studies examining physiologic measurements of stress and preterm delivery (See Table 1). All of the studies were prospective measuring various peptide markers within the HPA pathway. Five studies examined ACTH, with mixed results. Three demonstrated significantly increased levels of ACTH in women who delivered preterm (Campbell et al., 2005; Hobel, Dunkel-Schetter, et al., 1999; Makrigiannakis et al., 2007) while two did not demonstrate any significant differences (Korebrits et al., 1998; Sandman et al., 2006). Cortisol was measured in four studies, also resulting in contradictory results, being higher at some measures and not significantly different in others (Erickson et al., 2001; Hobel, Dunkel-Schetter, et al., 1999; Korebrits et al., 1998; Sandman et al., 2006). Natural diurnal variation as well as rapid and varied reactivity to external stimuli in cortisol levels lead to difficulties in interpretation of

results in existing studies and would present similar difficulties as clinical markers in predicting PTB.

The most consistent and promising physiologic marker of HPA activation leading to PTB was CRH which does not demonstrate the same degree of variation. Thirteen studies measured CRH; all but one demonstrated significantly higher levels of CRH in pregnant women who subsequently delivered preterm. Measuring CRH gives strong support to the theory that CRH and HPA axis are being activated and play a role in spontaneous PTB. The only critique of CRH as a marker of PTB is that there is yet to be a consensus on the standard timing for measurement in a clinical sample and critical levels have yet to be developed. However, these numerous foundational studies give strong evidence to the role of the HPA axis in PTB. One of the elements missing in all of these studies is an understanding of the subjective experience of stress and a discussion of why CRH is increasing in these particular women which is necessary if we are to take a preventive approach to PTB.

Psychoneuroimmunology

The immune system is a complex series of biochemical responses to an injury or pathogen, primarily regulated by antigen presenting cells such as monocytes and macrophages and other phagocytic cells as part of innate immunity, and the T-helper lymphocytes which are components of acquired immunity (Mosmann & Sad, 1996). Cytokines are proteins released by antigen presenting cells and travel throughout the body to mediate and control immune and inflammatory responses through complex series of biochemical reactions (Calcagni & Elenkov, 2006). There are two main branches of a T-helper immune response: the T-helper lymphocyte one (Th1) cascade results in a

cellular or pro-inflammatory response and the T-helper lymphocyte two (Th2) cascade is responsible for humoral or anti-inflammatory immunity. The Th1 and Th2 immune responses are mutually inhibitory systems, and within each immune cascade, there are particular patterns of cytokine secretion (Elenkov & Chrousos, 1999). Cytokines are therefore increasingly being used as markers for a subtype of immune reaction.

Perceived stress activates both the sympathetic-adrenal-medullary as well as the HPA axis. Receptors exist in the immune system for both glucocorticoids and catecholamines and it is well established that the immune system is activated and responds to acute psychological stress (Stephens et al., 2007). Acute exposure to glucocorticoids, the end product of HPA activation, can in some cases alter immune function by inhibiting Th1 pro-inflammatory cytokines, causing a shift from a Th1 to Th2 response. (R. Glaser & Kiecolt-Glaser, 2005) However, with prolonged activation, or chronic stress, glucocorticoids enhance inflammation through increasing pro-inflammatory cytokine expression which in turn cause a down-regulation of glucocorticoid receptors (Norbiato et al., 1997). The selection of Th1 or Th2 immune response has been shown to be a primary factor in clinical outcome in numerous infectious diseases, and therefore a stress-induced Th1 shift may have a profound effect on both susceptibility and response in infection (Elenkov & Chrousos, 1999). This becomes an important consideration with examining the strong relationship between infection and PTB because stress-related dysregulation of the inflammation response could contribute to disparities in PTB rates.

Infection and the inflammatory processes have long been associated with PTB, with the proinflammatory cytokine-prostaglandin cascade playing a central role (Romero

et al., 2005). The initial response to intrusion of an infective agent is the synthesis and release of pro-inflammatory cytokines by macrophages and monocytes that act as messengers, binding to various receptors and initiating the inflammation cascade (Da Costantzer, 2001). Increases in levels of pro-inflammatory cytokines stimulate the production of prostaglandins by the amnion and deciduas that results in cervical ripening and uterine contractions (Gravett et al., 1994). This pathway is important because the cross enervation of the HPA axis on the immune cascade is emerging as an important element of PTB.

Critical Review of Pertinent Studies - Immune Dysregulation & Preterm Birth

While infection has long been understood to be an independent risk factor for PTB, few studies have examined immune regulation and PTB. Infection in the form of chorioamnionitis accounts for a significant percentage of incidence of PTB (Institute of Medicine, 2007). Numerous studies have also documented significant differences in both acute and sub-acute vaginal infections and PTB. However, the contributing factors to disparities in infection rates remain largely unexplored. Given the present understanding of how exposure to stress results in immune dysregulation, data regarding PTB and infections need to be considered from a perspective of differential exposures to chronic stress.

A search of the Pub Med database included search terms cytokines, infection, inflammation, pregnancy, preterm birth and low birth weight in various combinations. A total of five studies resulted and will be included in this review. Numerous studies spanning decades have found correlation relationships between infection and PTB - a relationship undisputed in current theory. The studies included in this review were chosen

because they investigate immune pathways in greater depth and give insight into the dysregulation of immune processes and PTB (See Table 2). The studies investigating the relationship between immune regulation and PTB are extremely limited. Three studies found significant increases in pro-inflammatory cytokine levels of IL-1 β , IL-8 and IL-6 in amniotic fluid or serum, with different profiles present between African American (AA) and European American (EA) women. The studies that identified genetic polymorphisms reported two critical findings. First, alterations in cytokine response appeared to alter genes that code for anti-inflammatory cytokines, although actual cytokine levels were not measured. Second, alterations were found in the pro-inflammatory IL-6 cytokine receptors which would also increase circulating pro-inflammatory cytokines. No studies have linked levels of cytokines to pertinent psychosocial factors such as perceived stress or racism, or contextual factors such as perceived status or social power. Much more work needs to be done in this area of research, in particular shifts in cytokine profiles that may be related to environmental or psychosocial conditions such as chronic stress.

Subjective Stress Assessment

The multiple dynamics and individual nature of stress have made quantification difficult. Researchers have used various conceptualizations of stress. Within obstetric literature, there have been two main ways stress has been operationalized: 1) measures of life events, or 2) perceived stress and anxiety scales. While adequate reliability and validity exist for these scales, and significant relationships have been found with PTB, they are not specific enough to give predictive value that would make them clinically useful.

One approach in the literature to measuring chronic stress is a retrospective self-report count of life events deemed stressful. Seven studies used this approach as a measure of stress in examining the relationship of stress and PTB. None of the studies found significant relationships between a count of life events and PTB. One study (Hedegaard et al., 1996) assessed the severity of stress (minor, moderate or high) associated with reported life events and found that highly stressful life events were associated with shorter gestational age (GA) and PTB. Another study found a threshold phenomenon for number of stressful life events in the first three years of their study, but were unable to replicate the results with an additional two years of data (Whitehead et al., 2002). Structural equation modeling and logistic regression modeling were used in other studies (Sable & Wilkinson, 2000; Sheehan, 1998) to determine significant variables from long lists of life events, but these results have yet to be validated in additional samples. Four other studies conducted found no significance between life events measures and PTB (Dole et al., 2003; Goldenberg et al., 1996; Stein et al., 1987; Wadhwa et al., 1993).

Life events measures have not been consistent or significant predictors of PTB. There are several potential reasons for such results. One dominant problem is that many of the studies either do not assess perception of the life event, or assess it poorly. Perception, interpretation and threat of events are essential for a physiologic stress response. While the existence of certain potential stressors are assessed with life events scales, none of the studies provide any measure of perceived stress of those stressors or biologic indication that a physiologic stress response was initiated. Several of the studies did not use previously validated stress assessment measures and psychometric analysis

statistics were not reported with their methods. The studies using the major life events inventory are using a scale that has moderate reliability and validation in other populations, but has not been validated in pregnant populations or those with PTB. None of the studies included biologic measures of the stress cascade to give any indication of construct validity. A list of life events that one person or a group of people believe should be stressful does not assess the individual perception of those events.

Individual perception of stress is an essential element in eliciting a biologic stress response. Another avenue of research into stress and PTB has been measuring perceived stress. Studies approaching the concept of stress from this perspective usually measure both state (transient) and trait (permanent) stress or anxiety with the Perceived Stress Scale (PSS) (Cohen et al., 1983) and Spielberger's State Anxiety Scale (SSA) (Spielberger, 1983). Seven studies collected data on perceived stress, state anxiety and PTB. The studies all investigated the predictive value of a reported prenatal perceived stress on PTB. None of the studies found significant predictive value in a single measure of either the PSS or SSA on pregnancy outcome, although two found change in reported stress throughout the pregnancy to be significant for PTB (Glynn et al., 2008; Mancuso et al., 2004). Two other studies used structured equation modeling (SEM) and were able to develop models predictive of PTB, although the models were not the same and neither has been further tested (Lobel et al., 1992; Rini et al., 1999).

A strength of the PSS is emphasizing the importance of the subjective interpretation of life events. As stress is a highly individualized experience, the emphasis of perceived stress adds to the previous method of measuring stress simply by counting various life events or experiences. One concern with the PSS is that the instrument was

developed with populations of limited diversity. Two of the three original samples were healthy, presumably well balanced, college students. Since publication in 1983, the instrument has been used in over 500 studies in multiple populations in the United States as well as around the world as a global measure of stress with similar psychometric results. One could however, question the content validity. Stress is a theoretical construct, and perceived stress extremely subjective. It is difficult to assess if reported stress is experienced with the same intensity and frequency from one individual to another, and there is the likelihood of PSS measures being influenced by psychological constructs such as anxiety or depression. A full discussion of the factor analysis process was not included in the literature and would have been helpful in assessing construct validity. While trends of the correlations of the predictive validity of the PSS corresponded with what would be expected, the correlations were not strong. Stress is clearly a multifaceted construct and the PSS is not measuring all aspects of the construct. The clinical usefulness will be restricted by the limitations of the measure.

The SSP is a validated measure of state anxiety, a separate construct from stress. It has been used in many studies; however, a rationale for this particular measure as a proxy for stress was not discussed. The evidence demonstrates that the PSS and SSA are very poor and inconsistent measures of stress as predictors of PTB. However, studies are demonstrating physiologic evidence of increases in stress leading to PTB. Therefore, one can conclude that these measures are not specific enough to capture the aspects of stress relevant to PTB. A better approach to reported stress is needed. No studies used the Life Events and Difficulties Schedule, an extensive tool commonly used in clinical psychological assessment (Brown & O., 1978). This would be an avenue for future

research as it is a validated measure that incorporates both life events and perception of stress.

Discussion

Physiological evidence gives strong support to the theory that stress activation of the HPA and immune systems are a significant cause of PTB. Yet there is often a null relationship between existing stress measures and pregnancy outcomes. There are several reasons for this. Primarily, PTB as previously discussed, has multiple influences - stress and HPA dysregulation being only one of those pathways. It is possible that the appropriate population is not being targeted for the assessment of stress. As other pathways are better defined, a more specific risk group may be able to be defined. Another issue is that of timing of the stress. Chronic stress exposure throughout the lifespan can lead to dysregulation of the HPA axis. Current studies have not captured any element of chronicity in their evaluations.

Another main difficulty is in the process of quantifying stress. One of the foci for the future needs to be a higher specificity in stress measurement. The life events checklists miss the critical element of perception of stress related to those events. The perceived stress scale is a very global measure of acute events rather than a life-course measure; it also does not include the degree of distress elicited by those acute events. The state anxiety scale gives a baseline state assessment of individual anxiety, but does not capture chronic initiation of the stress response across the life-course.

Type (controllability, threat to social self, other), timing (early vs. late), pattern (persistence) and duration (acute vs. chronic) of stressors all are relevant in the

physiologic response. It is quite apparent why this complex process has been difficult to measure with self-report stress assessment tools.

A chronic or life-course assessment of stress through the life-course is needed in order to appropriately evaluate risk of poor birth outcomes (M. C. Lu & Halfon, 2003). Stressors only during the last month are measured in the PSS, and the Pregnancy Distress Questionnaire measures current pregnancy-specific stressors. These measures of stress are important, but not enough. There is rarely an exploration of racial differences in biologic or subjective measures of stress and preterm birth despite the dramatic racial-ethnic disparities that persist in PTB outcomes (Hamilton & Ventura, 2007). A final consideration is that the construct stress cannot be considered without some measure of coping or resilience. Various individuals may perceive, interpret and react to perceived stressful events differently, based on individual elements of coping and resiliency. An instrument that integrates a longitudinal approach to perceived stress with elements of coping or resilience is needed for this field of research.

Conclusion

Existing studies have established a strong physiologic relationship between stress and PTB through HPA and immune pathways. However, subjective stress assessment has been poorly correlated with PTB. Future research needs to focus on linking the physiologic pathways with subjective reported stress in order to develop clinically useful screening tools for women at risk for stress-related PTB. A more specific assessment of the types of stress linked to health outcomes is needed. This can be developed through an inductive approach to understanding stress. Once more refined subjective stress assessment tools are developed, these need to be collected with physiologic markers of

stress and with PTB outcomes. Together this approach can provide the foundation to better understand stress-related PTB and work towards prevention.

Chapter 4

ANALYSIS OF THEORETICAL FRAMEWORKS

This chapter will describe and analyze the theoretical concepts and frameworks that inform my approach to this research. The discussion will begin with a discussion of AA women's health disparities and the philosophical imperative of such a course of study. The Life-Course Health Development Model (M. C. Lu & Halfon, 2003) and Intersectionality are the two theories that provide structure and orientation for how disparities in life-course stress influence reproductive outcomes in AA women. Intersectionality is not yet a well-developed theory, rather the theoretical concept described by Mullings and Schultz (2006) is discussed, and three additional theories will be analyzed that frame race, class and gender respectively: Racial Formation (Omi & Winant, 1994), Ghetto Underclass (Wilson, 1987) and Black Feminist Thought (Collins, 2000). These frameworks will each be presented and critiqued using Walker & Avant's (2005) method of theory analysis. The concepts will be evaluated and discussed specifically as they pertain to the phenomenon of study. The goal is to answer the question, "What are the dimensions of stress that affect PTB in AA women?"

Health Disparities - An Issue of Justice

Justice is an issue essential to discussions of health disparities. Philosophers throughout the ages have considered the issue of justice. It is a concept cited in all systems of law, and considered by all as a basic human right. Oxford defines justice as "fairness" (Blackburn, 1996). Plato, in his dialogues in the Republic (n.d./1956), states that justice is to give back what is proper to each; to do well to the friend and to injure the enemy if he is bad. Political philosophers claim injustice is rooted in government systems. Rousseau's famous quote in *The Social Contract* (1762/2005), "Man is born free and everywhere is in chains. One thinks himself the master of others, and still remains a

greater slave than they (p. 2).” pontificates on the bondage of government systems and the structure of society in general. Although an individual may be born “free,” social systems continually compromise freedom. Rousseau envisions a set of laws that defends and protects the whole, while allowing men to be free unto themselves.

Modern discussions of justice outline that each person has an equal right to the basic liberties compatible with the liberties for others. While social and economic inequalities will always persist, they must be arranged so positions of authority and responsibility are accessible by everyone. The distribution of wealth need not be equal, but must be to everyone’s advantage (Rawls, 1999). A concise definition of justice is the “Right exercise of power or authority.” (Haugen, 1999) There are many forms of power: economic, social, moral, cultural, familial, coercive, intellectual. While there is always a distribution of power among people of every society, injustice occurs when power is misused to take from others life, liberty, dignity, or the fruits of their labor and love (Haugen, 1999).

So why is a discussion of justice important? If health disparities are due simply to genetic differences or differences in personal lifestyle choices, Plato’s statement of justice would hold - individuals are receiving back what is due. I would say this is not the case. Rather, reproductive health disparities are influenced by deeper issues of systemic injustices within society. Patterns of systemic racism, classism and sexism have permeated all aspects of social relations, manifesting in such ways as neighborhoods of concentrated poverty, economic, educational and occupational inequalities. These inequalities are forms of oppression and comprise some of the elements that lead to increased subtypes of stress that over time impact health. Power or authority has often

been inappropriately exercised throughout history, resulting in disparate experiences of life-course stress which in turn affect health outcomes. These patterns of life-course social stress therefore become an important subject of study in order to better understand and explain health disparities.

Race as a Category of Risk

The concept of race as a category of risk deserves further discussion. Early paradigms approached race as a fixed biological variant that determined susceptibility to disease. Race, categorized by seemingly obvious phenotypic characteristics, was believed to be an objective, unchanging factor tied to physiologic weakness to or resistance from illness. However, this assumption was problematic on multiple levels. First, the categorization of race is not as obvious as previously assumed. Phenotypic traits, such as melanin production resulting in skin color, bone structure, hair texture and color, etc. are each traits that exist within a spectrum of expression. It is impossible to define a biological line between races.

Second, race has been constructed and reconstructed within changing historical and social contexts. The phenotypic identifiers selectively used for categorization are inconsistent through time. At one time the racist “one drop” rule defined who was considered AA. Today, many would argue that one has to either “look” or self-identify as a particular race rather than simply have one remote ancestor, but this categorization is very subjective. Each identification process (self or other) may group individuals differently. Clear dividing lines do not exist between races and within our multicultural society are becoming increasingly blurred.

Finally, substantial evidence has established the notion of race as a biological variant in health and disease as erroneous (Barbujani et al., 1997; Cavalli-Sforza, 1998; Shen et al., 2000). With few exceptions, phenotypic characteristics society uses to define race are not correlated with genetic factors known to lead to disease. Studies of genetic variability have found far greater genetic variation within races than among races (Barbujani et al., 1997; Cavalli-Sforza, 1998; Shen et al., 2000). Race has clearly been demonstrated to be a social rather than biological construct. Immigration studies provide further evidence. Black women born in Africa have birth outcomes similar to US-born White women (Cabral et al., 1990; David & Colins, 1997), and the birth outcomes of women of color from multiple countries demonstrate a decline with time spent in the U.S. (Cabral et al., 1990; David & Colins, 1997).

The alternate extreme, is then to view race as a mere ideological construct that would be eliminated if a truly non-racist social order were achieved (Omi & Winant, 1994). This too presents problems. Primarily, it minimizes the importance of race, allowing it to be swallowed into other dimensions of social distinction such as class. The notion of race as a biological variant was replaced by race as a function of culture and lifestyle choices. Labeled theories of the “culture of deviance,” epidemiological outcomes, including health are attributed to poor health habits and lifestyle choices of a group. Race is socially constructed from visible traits that identify individuals as members. The resulting social relationships within a racialized society are legitimate, separate from other social identifiers and have profound effects throughout individuals’ lives.

Omi and Winant's theory of racial formation, as will be discussed in greater detail below, engages race not as a purely biological variant nor solely an artifact of social construction, but as an integration of the two, and more importantly as an ongoing political contestation. It is this definition of race that is adopted for this project. Race matters when it comes to PTB. AA women have repeatedly and decisively been shown to have a dramatically increased risk of PTB. I would argue it is not the biological inheritance or lifestyle choices of a particular group, but the social hierarchies and the meaning of race within society that impact outcome through differential life experiences. The category of race is constructed from both biological and sociological elements. There is a pattern of phenotypic physical traits classified into racial categories. However, the way in which those particular traits are defined, chosen and classified within a socio-historical context is a sociological construction. The position within the social hierarchy and experience within their lives and social relationships that influence individual and group health and wellbeing of AA women is through the mechanism of stress.

“Risk” is a word used frequently in these discussions and merits further exploration. Risk can be understood in various ways (Lupton, 1999). The socio-cultural perspectives of risk emphasize the social and cultural contexts in which risk is understood and negotiated. The cognitive science perspective, also called the techno-scientific or realist approach is a standard view of risk within biomedicine and health care. The cognitive science perspective defines risk as a probability of an adverse event that can be measured independently of social and cultural processes but may be distorted through frameworks of interpretation. Risk calculations are presented as neutral and unbiased. The objective calculations of risk by experts within the field are at times contrasted with

lay people's subjective understanding, perceptions and response to risk. The approach to risk in this analysis is a synthesis of both, but most closely aligned with the weak social constructivist position. I hold the assumption there are multiple social worlds that surround and influence the objective numerical calculation of risk of a particular outcome. The social and cultural contexts of the social worlds surrounding risk are important and deserve extensive examination and deconstruction. Included in the social world is the subjective understanding of the researcher in choosing a phenomenon to research, in approaching the problem and interpreting conclusions. However, I take a cognitive science perspective to the risk itself - it is an objective and neutral mathematical calculation for the subjective population chosen and in the subjective manner it was chosen. To dismiss any calculation of risk, as the strong constructivists would seem to argue, excuses and ignores differences in outcomes, such as health disparities in health outcomes, and precludes examining elements that may be contributing to social injustice.

Therefore, for the purpose of this paper, risk of preterm birth in AA compared with EA women is taken as an objective and significant disparity that deserves examination. Examining how race shapes women's risk of preterm birth means to examine and understand the social hierarchies that impact AA women's life-course, impacting reproductive health outcomes. The Life-course Health Development Model and Intersectionality are two theories that provide a framework to discuss and explore AA women's increased risk of PTB.

Theory Analysis

Mid-range theories provide testable ways to identify and express key concepts about a specific area of research (Walker & Avant, 2005, p. 13). The purpose of analysis

is to dissect a theory into components to better understand the whole. The theory analysis method that will be used for this paper is that of Walker and Avant (2005) that consists of six elements: 1) The origins and purpose of the theory are identified. 2) The meaning of the theory is examined by identifying the concepts, statements and relationships. 3) The logical adequacy of the theory is analyzed by asking four primary questions: is there a system for prediction independent of content, can scientists in the field agree on those predictions; does the actual content make sense; and are there obvious logical fallacies. 4) The usefulness of the theory established if it provides new insights into a phenomenon, explains a phenomenon better, or helps the scientist make better predictions. 5) The degree of generalizability and parsimony of theory considered; 6) The testability of the theory determined. In the following section, each of these steps will be conducted with theories of Life-Course Health Development Model and Intersectionality.

Theoretical Framework: Life-Course Health Development Model

Origins and Purpose of the Life-Course Perspective

The Life-Course Health Development Model (LCHDM) was formulated to offer an explanation of racial disparities that have been persistent in birth outcomes (M. C. Lu & Halfon, 2003). The authors identified that much of the research was focusing on risk and protective factors only during pregnancy to explain birth outcomes. The current studies were not offering an explanation for the racial-ethnic disparities that existed in outcomes. Lu and Halfon performed a literature review to search for longitudinal models of birth outcomes and health disparities, and identified two leading theoretical models used in this field that each had supporting empirical evidence: Early Programming, and what they termed Cumulative Pathways from which they cite both the Weathering

Hypothesis and Allostatic Load models. The early programming model emphasizes the importance of sensitive developmental periods in utero or early life which impact future reproductive potential, but does not adequately address development and decline beyond the early years of life. The cumulative pathways model describes a gradual decline from cumulative wear and tear over the life-course, but does not acknowledge potential critical or more sensitive periods of vulnerability. Lu and Halfon synthesized these two theoretical approaches to offer a comprehensive, longitudinal model to explain the forces impacting women's reproductive health potentials resulting in racial-ethnic disparities in birth outcomes. The ethnic disparities are explained as a result of differential developmental trajectories over the life-course: both during hypothesized sensitive periods, as well as cumulative exposures to risks and protections across a life span.

Meaning of the Life-Course Health Development Model

Concepts of the Life-Course Health Development Model. Major concepts of the LCHDM are early programming model, cumulative pathway model, life-course, health trajectory, reproductive potential, birth outcomes, sensitive periods, risk factors, protective factors, disparities. Early programming model (EPM) is a concept in LCHDM given a theoretical definition. The author defines EPM as exposures and experiences during particular sensitive developmental periods in utero or early life that may encode the functions of organs or systems and become manifest in health and disease later in life. The existing empirical support for this concept is strong, yet still in its infancy. The existing studies reflect the impact of exposures during sensitive periods on future risks for coronary heart disease, diabetes mellitus, hypertension and adult chronic diseases. However, studies do not currently exist that show there is a critical period in early life

that impacts reproductive potential. There is evidence, however, that stress reactions developed during sensitive periods both perinatally and in early childhood persist into adulthood. The physiological changes to the stress response are proposed to increase vulnerability to PTL and low birth weight although direct evidence does not currently exist. As a theoretical definition, operational rules for classifying or measuring this concept are not discussed.

Cumulative pathway model (CPM), also called cumulative allostatic load, is another concept with a theoretical definition. CPM is defined as wear and tear that can up over time to affect health and function. Differential exposures to damaging physical and social environments at different life stages are responsible for health disparities. The authors cite numerous studies lending empirical evidence to the impact of the CPM on other systems, increasing risk for cardiovascular diseases, concerns, autoimmune disorders and various chronic diseases that increase health disparities. The effects of chronic and repeated stress are clearly discussed within the CPM and how that could increase vulnerability to preterm delivery.

Life-course is a concept not directly defined in the model. By context, it is understood to mean a woman's life span as it has been influenced by risk and protective factors. The pictorial model (see Figure 5) of the concept shows the life-course as a product of the time in utero as well as throughout the life span, including and accounting for sensitive periods of vulnerability as well as wear and tear over time. Maternal birth weight, maternal grandfather's occupation and chronic social stressor are examples of life-course factors used by the authors in the discussion. The concept is therefore understood to be very broad and encompassing

Health trajectory, also referred to as developmental trajectory, is a theoretical concept in the LCHDM. The Health Trajectory concept is not specifically defined. The meaning of the concept is gleaned from context in the description of the model. Health trajectories are understood to mean the developmental pathways that result in a woman's reproductive health potential. Pictorially the concept is depicted curved lines traversing across the life span, influenced by risk and protective factors.

Reproductive potential and birth outcomes are concepts not directly defined by the LCHDM theory. The introductory discussion clearly focuses on birth outcomes, specifically PTB and LBW infants which would be concrete and specific. Yet when the LCHDM model is presented and discussed, the concept is labeled reproductive potential and is left very ambiguous. Reproductive potential could possibly encompass concrete outcomes such as birth defects, infertility, number of potential childbearing years, or rate of pregnancy complications such as pre-eclampsia or gestational diabetes mellitus. However, there is an abstract element introduced to the concept by use of the word potential. Potential is something that is often unmeasurable. The goal of the ambiguity is perhaps to broaden the theory beyond PTB and LBW. Sensitive periods, interchangeably termed critical periods, is a concrete concept derived from EPM. Sensitive periods are particular times during development when an individual is particularly vulnerable. Risk factors or protective factors exerting an influence during sensitive periods results in increased slope on the health trajectories. The pictorial model suggests that sensitive periods may be the time in utero, the first five years of life, puberty and pregnancy. The authors offer that these times are suggestions and much more research is needed in to the concept of sensitive periods and their influence on reproductive potential.

Risk factors and protective factors are two concepts with primitive definitions within the health community. The concepts are therefore not discussed in great detail, only used within the model as influences on the health trajectory. Because of the early stage of theory development, the important risk and protective factors are yet unknown.

Disparities is a final concept within the LCHDM. This is a concrete, primitive concept. The introductory discussion clearly outlines the disparities that exist between AA and EA women in PTB and LBW. The aim is to provide a model to explain these reproductive disparities.

Statements and Relationships of the Life-Course Health Development Model.

There are seven statements within the LCHDM (See figure 5). The relational statements of each will be examined. The first statement is that Allostatic load over the life-course affects reproductive health. This is also a causal relationship, although the relationship is not presented as absolute. The allostatic load affects reproductive health, positively or negatively, but the statement leaves room for other factors to also be included influences. The statement is time-ordered as the allostatic load comes first to affect reproductive health.

Critical periods during development encode future reproductive potential. This is a causal, time-ordered statement. Events, i.e. influences and exposures during the periods of increased vulnerability to risks and protections, effect later outcomes. The causation relationship affects a woman's potential. Reproductive potential, however, is an abstract concept. Therefore, the causal statement cannot lead to a direct predictable and measurable outcome such as may occur in physics or chemistry. The abstract concept of

reproductive potential leaves room for variation at an individual level as does the dynamic interaction of risks and protections.

EPM and CPM synthesized together develop health trajectories. This is a synergistic statement as EPM and CPM work together. It also is a necessary statement as the two together develop health trajectories.

The following two statements are related. Risk factors “push down” on the health trajectory, decreasing reproductive potential. Similarly, protective factors “push up” on the health trajectory, increasing reproductive potential. These are causal relationships as the risk and protective factors impact the health trajectory. They are not absolute associations as there is room within the statement for other factors to be involved as well, but they exert a causal influence on the trajectory.

A woman’s reproductive potential is a function of her developmental trajectory set forth by EPM with sensitive periods of vulnerability and altered by cumulative allostatic load over the life-course. This multi-part statement is a synergistic, time-ordered, causal statement that summarizes the LCHDM model. EPM and CPM synergistically, and in a time-ordered manner, affect the developmental trajectory. A woman’s developmental trajectory causally determines reproductive potential.

The final statement is that disparities in birth outcomes result from differential developmental trajectories over the life-course. This is a time-ordered, causal statement. The different life-course trajectories cause the racial disparities in birth outcomes. The conclusiveness of this final statement deserves pause. The way the statement is phrased implies that different trajectories over the life-course are the only cause of disparities in birth outcome which is quite an ambitious statement.

A pictorial model of the relationships is included in the LCHDM which clarifies the relationships of the concepts. The authors state the shape of the trajectories are conjecture at this point. Not enough testing of the model has been completed to adequately determine the shape of the health trajectories. The boundaries for the LCHDM are consistent with a middle-range theory. The focus of the content is specific to reproductive potential and birth outcomes, but the concepts are broad and abstract enough for application to other areas of health disparities. The statements are consistent throughout the theory, although multiple terms used for some of the concepts are used interchangeably. Regardless, there is not cross-over between concepts and the meanings of the statements are clear. Empirical support is provided for both the EPM and CPM which have been synthesized to form the LCHDM. The LCHDM also fits the vast amount of literature on PTB as well as racial disparities. However, the theory is in an early stage of development. Clear definitions of concepts are needed within the theory and substantially more research is needed to support the synthesized LCHDM model.

Logical Adequacy of the Life-Course Health Development Model

The logical flow is one of the strengths of the LCHDM. The theory makes sense. Predictions can be made from the theory independent of the content. For example, if one wanted to examine disparities in cardiovascular diseases between AA and EA individuals, the model fits. Differential exposures to risk and protective factors at sensitive periods as well as cumulatively throughout a woman's life-course impact health trajectories. Disparities in cardiovascular potential result from differential developmental trajectories over the life-course. Since the theory was introduced at maternal child health conferences, there has generally been applause in the OB/GYN, public health arenas.

Usefulness, Generalizability, Parsimony & Testability of Life-Course Health

Development Model

The LCHDM is extremely useful in understanding the multiple dynamic factors that impact women's health and reproductive potential in particular. Not only does the theory add to the understanding of racial disparities in birth outcomes, it has the potential to generate significant amounts of research. Operational rules for classifying or measurement have not yet been outlined for any of the concepts. As further development occurs, the usefulness will increase. The specific factors that increase or decrease health trajectories are currently unknown. Once specific risk and protective factors are identified and tools to measure those factors are developed, there may need to be a paradigm shift to women and children's health care throughout the life-course in order to effectively address reproductive health. The LCHDM has the potential to completely transformed prenatal and women's health care.

The LCHDM is generalizable. While developed specifically to explain racial disparities in birth outcomes, the model could be applied to other existing health disparities as previously discussed. The theory is also parsimonious. It is clear and easily understood. The complete theory can be capsized in a few simple, brief statements. While the theory presents a longitudinal model, it is quite testable, although supporting evidence may take years to compile. Concept definitions need to be refined and clearly stated, and operational rules of measurement need to be addressed. Despite the areas needing refinement, however, the meaning and relational statements, and clarity of the theory are extremely beneficial to the field of health disparities research.

Critique of Life-course Health Development Model

The strength of LCHDM is the overall framework it offers that provides a simple way to understand the complex phenomenon of stress over the life-course and PTB. The advantage it provides over popular previous models such as Allostatic Load is the inclusion of heightened periods of sensitivity or vulnerability. It also allows for development of the concept of stress beyond that of simple homeostasis, into specificity of the types of stress that affect health. The main weakness of LCHDM is ambiguity regarding the disparate risk and protective factors. However, the theory is in early stages of development and gives a very broad way of thinking about reproductive health disparities. Using this broad framework, further evidence will define the specific risk and protective factors. One approach would be to understand the dimensions of stress that affect PTB in AA women. The Life-course Health Development Model provides overall structure to seek out and understand these different dimensions. The LCHDM does not provide a lens for understanding risk and protective factors. A physiologic understanding of both preterm birth and stress, and Intersectional Theory to understand the social factors, provide other two essential pieces to answer my specific question.

Intersectional Theory

Intersectional Theory (Mullings & Schulz, 2006) is a critical social theory that also informs and orients this inquiry. Intersectionality examines the ways gender, race and class are socially constructed, intertwined and expressed in disparate chances for health, illness, and well-being. The intersectional approach understands race, class and gender not as individual attributes, but as historically created relationships of differential distributions of resources, privilege and power, advantage and disadvantage. AA women are at the intersection of these relational concepts which are multiplicative and mutually

constitutive. The Intersectional framework suggests that the meaning of womanhood will vary as a function of race and class and other dimensions of difference as they work together, rather than as single factors. Applied to the field of stress and reproductive health, the perception and experience of stress will vary as a function of the intersection of race and class and gender, and thus will uniquely affect the biologic stress response and consequently impact health outcomes. This interrelatedness gives structure to the study of health disparities, vulnerability and resilience and will therefore provide the lens to view and understand the processes of stress affecting AA women across the life-course. While the LCHDM conceptually links disparities in reproductive outcomes to stress across the lives of AA women, Intersectionality gives a framework for theoretically understanding how the lives of women of color are different from those of European descent potentially resulting disparities in life-course stress. Intersectionality consists of race, class and gender theories interacting together. Accordingly, theories of race (Racial Formation), class (Ghetto Underclass) and gender (Black Feminist Thought) have been selected and will each will be analyzed and discussed below.

Racial Formation Theory

Origins and Purpose of Racial Formation Theory. Racial Formation Theory (RF) (Omi & Winant, 1994) began in the late 1970s. Omi and Winant's initial purpose was to critique main social science literature on race. They classified existing theories as either ethnic group, class- or nation-based perspectives, and deemed all insufficient to explain the dynamics of race in society. Ethnicity theories fundamentally examine the process of incorporation of minority groups into dominant society with particular emphasis on the tensions of assimilation and cultural pluralism. Class-based theories

understand racial dynamics primarily in terms of imperfections in the market, political power and labor control, resulting in inequalities in social advantage and disadvantage. Nation-based theories consider race as a function of colonial domination and national oppressions. While elements of each of these theories explain significant elements of race dynamics, they each neglect race as an individual factor that holds force rather than simply a secondary element of another social process. Racial Formation aims to incorporate the adaptability of racial identities from ethnicity-based theories, patterns of exploitation, mobility and social control from class-based theories, the legacies of colonialism from nation-based theories, but also address the primary complexities of racial identity, politics and social structure in the U.S.

Meaning of Racial Formation Theory

Concepts of Racial Formation. There are seven major concepts in RF including race, social structure, cultural representation, racial projects, hegemony, racial formation and racism (Omi & Winant, 1994). Each of these will be defined below as outlined in the Omi and Winant theory. Assumptions and context of concepts will be included.

“Race” is an abstract concept, defined in RF as “a concept which signifies and symbolizes social conflicts and interest by referring to different types of human bodies (p.55).” The biological basis to distinguish the lines of race is non-existent, but race is an element of social structure. The authors describe the tendency in discourse to create a dichotomy of race being either a fixed, concrete, objective essence, or a mere ideological illusion. Racial Formation theory proposes that race is neither of these extremes. There are objective physiological traits related to race, but the particular phenotypic characteristics of human bodies selected are always and necessarily a social and historical

process. Race is therefore understood as an “unstable and de-centered complex of social meanings constantly being transformed by political struggle (p.55).”

“Social structure” is a primary concept not specifically defined in RF. It is understood within the field of sociology and the context of the theory to signify the way society is organized, including both macro-level activity such as policy, state activity, public debate and collective action as well as micro-level activity of everyday experiences and interactions. In a racialized social structure, race becomes a “common sense” way of comprehending, explaining and acting in the world. An assumption of the theory is that “Race is an element of social structure rather than irregularity within it (p.56).” Social structures are represented and organized by historically situated projects.

“Human representation” is a primary concept, at times used interchangeably in the theory with the term “Cultural representation.” It is not specifically defined in RF, but understood from the context of the theory to be the attributes of a culture, or society-wide signification system. In RF, race is understood as a dimension of human representation rather than illusion. Like social structures, human bodies are represented and organized by historically situated projects.

Projects are the representation and organization of human bodies and social structures. A “racial project” is an abstract concept defined in RF as “simultaneously an interpretation, representation or explanation of racial dynamics, and an effort to reorganize and redistribute resources along particular racial lines (p.56).” Racial projects connect what race means, both structurally and in everyday encounters, to how it is organized within a social context based on that meaning. Racial projects exist on both

macro- and micro-levels. They do the work of linking cultural meaning and social organization.

“Hegemony” is a primary concept defined in RF as “the way in which society is organized and ruled (p.56).” Hegemony functions by simultaneously structuring and signifying, opposition requires a rejection of the “common sense” understanding racial hegemony imposes, insisting on self-identification, and transformation of the social structures. The conditions are necessary for achievement and consolidation of rule include both coercion and consent. The historical context of hegemony is important in the process of RF. In the Americas, racial rule was established by pure coercion through violent force in the expulsion and genocide of indigenous peoples and enslavement of Africans. Over time, the balance of coercion and consent change as the subjugated adopt the oppressor’s philosophical ideals, in an attempt to gain emancipation. Domination moves to hegemony as the oppressed incorporate elements of racial rule into their thought and practice, and work within the oppressor’s system for freedom or democracy. In the U.S. the historical context of racial dictatorship has three major consequences: The definition of American identity as “White”, with the negation of “otherness,” first largely Native American and African, later including Latin American and Asian. Second, it established the “color line” as a fundamental division within society through institutional structure, as well as in individual psyches. Third, it consolidated oppositional racial consciousness and organization from individual nations and people groups, to “native” and “black.” These consequences are now core to the identity, structure, function, and evolution of society at both a macro and individual levels.

“Racial Formation” is an abstract concept defined as, “the socio-historical process by which racial categories are created, inhabited, transformed and destroyed (p.55).”

Racial formation is always historically situated and the context always needs to be understood. The understanding of race changes over time, as does the way race structures society. The processes of racial formation are therefore outcomes of a complex historical evolution. However, as each of these elements are ever changing and evolving, contemporary racial order remains transient.

“Racism” is the final concept presented in RF. It is a primary concept, although the authors discuss a division, primarily among racial lines, regarding the understood definition of racism. A generalization is presented where Whites understand racism as color-consciousness while non-Whites view racism as a system of power. Racial Formation theory defines “racism” within the context of racial projects. A racist project is one that “creates or reproduces structures of domination based on essentialist categories of race (p. 71).” Racism therefore is a fluid, changing concept that is defined within a fluid and contested socio-historical context. Racism during the slavery era looked different than it did during the 1960s civil rights era and will look different during the current context today.

Statements & Relationships of Racial Formation. There are 12 statements of relationship in RF (See figure 6). 1) Race is a matter of both social structures and cultural representation. This statement is a theoretical definition. It provides an association of multiple concepts in the theory that is linear, yet not causal. Both structure and representation are essential elements for the definition and understanding of race, but one does not necessary lead to the other, and other factors may be involved. Both the

definition and relationships are abstract in nature and therefore operationalization is not specified.

The next two statements are abstract, theoretical definitions that provide organization to several concepts in the theory. 2) Human bodies are represented and organized by historically situated projects. This is an association between representation and projects. It is not possible to represent race discursively without simultaneously locating it, explicitly or implicitly, in a social structural and historical context. 3) Social structures are represented and organized by historically situated projects. It is not possible to organize, maintain, or transform social structures without simultaneously engaging, explicitly or implicitly, in racial signification. The relationship is between projects and both social structure and human representation is one of association. Projects co-occur and represent the abstract concepts of both social structure and human representation as the functional unit.

A causal, linear relationship is established by the next statements, as they theoretically define the process of RF. 4) The process of RF occurs through a linkage of both structure and representation. Racial Formation is a synthesis, an outcome, of the interaction of racial projects on a society-wide level. The process is further expanded with an additional causal statement, 5) the process of RF occurs in two steps: development of historically situated projects, and then evolution of hegemony. The process is further refined by the following definitional statement, 6) racial projects connect what race means in a particular discursive practice, with the ways in both social structures and everyday experiences are organized based upon that meaning. Racial projects do the ideological “work” of making these links - they connect what race means

in a particular discursive practice and the ways in which social structures and everyday experiences are racially organized, based on that meaning.

The next relationship statements provide context and boundaries to the theory. 7) Society is suffused with racial projects, large and small, to which all are subjected. This is a theoretical definition of the concepts of projects and the process of RF. The projects and therefore the process of RF affects all within society. 8) Projects are building blocks not just of racial formation, but of hegemony in general. This provides association and theoretical definitions between the concepts of projects, racial formation and hegemony. Further context and definition is provided with the following, 9) Since racial formation is always historically situated, our understanding of the significance of race and of the way race structures society, has changed enormously over time. . . the contemporary racial order remains transient. Understanding the evolution helps us better discern where it is heading. The theory itself is bound by historical context.

The final statements provide association as well as operationalization within the context of wider social theory. 10) To recognize the racial dimension in social structure is to interpret the meaning of race. 11) It is not possible to organize, maintain, or transform social structures without simultaneously engaging, explicitly or implicitly, in racial signification. 12) To identify a racial project as racist, one must demonstrate a link between essentialist representations of race and social structures of domination. Each of these statements provides further definition of the concepts and how the concepts interact with one another, within the framework of the theory.

The abstract nature of social theory such as this makes it difficult to operationalize to quantitative measurement. However, empirical support is given through

discussion of historical evidence presented in theory. Historical trends, political statements and instances of everyday experiences are each deconstructed and explained using the theory of RF.

RF has wide boundaries. It is abstract and attempts to describe race relations on a broad level throughout society. Additionally, the authors state the theory can be extended to explain other regions of hegemony such as class, gender, sexual orientation – all attributes that are socially constructed, whose common feature is the linkage of social structure and signification. They emphasize there are not clear boundaries of hegemony. Regions such as race, class, gender and sexual orientation are not autonomous or discrete, but overlap, intersect and fuse with each other. Racial Formation theory supports the concept of intersectionality.

Logical Adequacy of Racial Formation. The theory of RF is logically adequate. Predictions can be made independent of content. If for example, social class was substituted for race, within a historical context, projects of both social structure and cultural representation can be examined, the linking of which, along with the influence of hegemony provides understanding to the meaning of class and class relations within society. Within the realm of social relations however, there are a multitude of factors to consider when applying such a theory. Not all experts in the field will have precise predictions that agree, although broad concepts would be expected to be similar. The actual content of the theory makes sense and there are no obvious logical fallacies.

Usefulness, Generalizability, Parsimony & Testability of Racial Formation. The theory of RF is useful for understanding how race influences an individual's experience. It provides new insight with the emphasis on context and a synthesis of both

structure and representation to understand race. The strength of the theory is that it explains the phenomenon of race and influence of racial hegemony both differently and better than previous theories of race. The theory has a wide focus and therefore is transferable to a broad spectrum of racial phenomena. Within nursing research RF can be used to better understand the influence of race, health and disparities in both process and outcomes. While the theory is broad in content and offers considerable insight into the process of RF, it is not simple. The explanation of concepts and statements of relationship are quite complex. The parsimony of the model could be improved with a model outlining the process, and clear and concise statements of relationship. The testability of the theory is the final consideration. As an abstract theory, there is not a specific operationalization of measures provided. However, the insight gained by understanding the process of RF and influence of hegemony, guides a researcher interested in the experience and influence of race. It is therefore valid as a critical social theory, providing a basis in particular for qualitative exploration of phenomena related to race.

The usefulness of the theory ultimately needs to be evaluated specific to the question being studied: what are the dimensions of stress that affect PTB in AA women? Racial Formation frames race as constructed and utilized within a racialized society as an element of social structure. Notions of race are accepted as a “common sense” way of understanding and explaining the world and are therefore rarely questioned. These racial representations then order society, with a system of hegemony. This creates a racialized society where inequalities and oppressions exist. AA women exist at the oppressed end of the hegemony. Consequently, life exposures and experiences are different and subject women to a greater degree of the types of stress that activate the hypothalamic-pituitary-

adrenal (HPA) system and consequently affect health. The system of hegemony surrounding race and resulting oppression therefore increases AA women's risk for PTB.

The Ghetto Underclass Theory

Class theories of race attribute social differences primarily to economic structures and processes. Social class plays an important role in the social pressures on AA women. The theory examined for this dimension of intersectional forces is the Ghetto Underclass theory (Wilson, 1987).

Origins and Purpose of Ghetto Underclass Theory. The Ghetto Underclass (GU) Theory was developed as a response to the discourse surrounding the Moynihan report released in the late 1960s that argued legislation to protect liberty did not ensure racial equality. The report is best known for an unflattering depiction of the AA family, emphasizing rates of broken marriages, female-headed homes, out-of-wedlock births, crime and welfare dependency that sparked intense criticism. However, Moynihan was attempting to draw attention to the cumulative effects of discrimination and division of the AA population into two groups: a stable, middle-class growing stronger and an increasingly disadvantaged lower-class group, characterized by multiple social problems. Moynihan recommended federal civil rights activities shift to concentrate on restoring stability and resources of the AA family.

Wilson responded initially with a controversial book entitled "The Declining Significance of Race" (1978) in which he called attention to worsening conditions of the "black underclass" by comparing it to the improving conditions of the black middle class. Wilson's initial critics focused on his depiction of the middle class, often using his analysis to further conservative political agendas that contrasted from his own

conclusions. Wilson therefore undertook a comprehensive analysis of the ghetto underclass in “The Truly Disadvantaged” (1987), concluding with policy recommendations. It is this analysis that will be critiqued below.

Meaning of Ghetto Underclass Theory.

Concepts of Ghetto Underclass Theory. The GU is comprised of eight core concepts including the Urban Ghetto, Black Underclass, discrimination, flow of migrants, age structure, structural economic changes, concentration and social isolation. Wilson does not explicitly define any of the concepts, but extensively discusses each with supporting statistics allowing an understood definition. Each will be discussed below.

The first concept is the “Urban Ghetto.” At alternative places in the theory this abstract concept is also termed the “inner city” or “central city.” While this may be considered a primary concept with a generally understood definition, interpretations and boundaries of exactly what is and what is not the urban ghetto vary considerably leaving the concept somewhat ambiguous. In GU, the core components of an urban ghetto include neighborhoods with high rates of poverty, social dislocation such as crime, joblessness, out of wedlock births, female-headed families, addiction and welfare dependency, low-achieving schools and poor social networks.

The “Black Underclass” or “Ghetto Underclass” is an abstract concept defined as “A heterogeneous grouping of inner-city families and individuals whose behavior contrasts sharply with that of mainstream America (p. 6)”. This group is characterized by living in neighborhoods of the urban ghetto and is therefore subjected to or participants in the social pathologies associated with ghetto communities. Wilson includes individuals who lack training and skills and either experience long-term unemployment or do not

participate in the labor force, those involved in crime and families experiencing poverty and/or welfare dependency. “Discrimination” (p. 30) is a primary concept that is not expressly defined in the theory, but discussed in terms of unemployment rates, crime rates and the criminal justice system, and anti-discrimination legislation. Wilson divides discrimination into two sub-concepts: “historic discrimination” occurred before the middle of the 20th century, while “contemporary discrimination” is that which has occurred after the middle of the 20th century. The reasons behind this particular timeline of the division are not discussed, although contrasts are made of the social organization found in communities prior to 1960 and after. The periods are also divided by the passing of significant civil rights legislation. Wilson prioritizes these sub-concepts with the following statements, “There is no doubt that contemporary discrimination has contributed to or aggravated the social and economic problems of the ghetto underclass (p. 30) . . . however, historic discrimination is far more important than contemporary discrimination (p. 32).”

Wilson describes the primary concept of the “Flow of migrants (p. 34)” as the most important contributor to varying rates of racial and ethnic progress in the twentieth century. Various patterns of migration are discussed including rural to urban, south to north migration and patterns of European, Asian and Latin American immigration to the U.S. The flow of migration enhanced negative dispositions and antagonisms against AA. It also concentrated AA in central cities that combined with economic changes led to the urban ghetto.

“Age Structure” is a primary concept defined in the theory as the average age of an ethnic group. “The higher the median age of a group, the greater the representation in

higher income categories and professional positions (p. 36).” Because of the flow of black migrants, and population explosions, the age structure of the urban black community is skewed younger. A younger age structure contributes to rates of unemployment, crime and other markers of social dislocation in the central city.

One of the key factors in the GU theory is the primary concept of “Basic Economic Changes (p. 39).” Economic changes such as production shifts from goods producing to service-producing industry, administration and information exchange centers, and higher-order service provision polarized the labor market into low-wage and high-wage sectors. Concurrently, manufacturing relocated out of central cities increasing joblessness in the urban ghetto. Additional general weakness in the overall economy impacts all segments of society, but the effects of a resulting “labor surplus environment (p. 45)” are particularly pronounced in the lower-wage and unskilled sectors.

An abstract, theoretical concept of “Concentration Effects (p. 46)” results from outmigration of non-poor blacks leaving only the poorest in the urban centers. While overall populations in urban areas decreased, populations in poverty areas dramatically increased in the 1970s and 1980s. “The social transformation of the inner city has resulted in a disproportionate concentration of the most disadvantaged segments of the urban black population, creating a social milieu significantly different from the environment that existed in these communities several decades ago (p. 58).” It results in a transformation of the class structure, increasing the proportion of “truly disadvantaged” in the inner city. Concentration is a key phenomenon in the formation of the urban ghetto.

“Social Isolation” is the final concept in GU. It is a key theoretical concept defined as “the lack of contact or of sustained interaction with individuals and institutions

that represent mainstream society (p. 60).” Residents of highly concentrated poverty neighborhoods in the inner city infrequently interact with individuals or families who have had a stable work history and have had little involvement with welfare or public assistance. Because of social isolation, values and norms of behavior within the ghetto subculture enhance the effect of living in a neighborhood of concentrated poverty, decreasing overall life chances.

Statements and Relationships of Ghetto Underclass Theory. A total of 28 statements of relationship between concepts were found in GU. A full list of these individual relationships can be found below (see figure 7) as well as one potential model diagramming the relationships described. In summary, Wilson proposes that present-day discrimination has contributed to the increasing social and economic woes of the ghetto underclass, however, the problems are due to “a far more complex web of other factors that include shifts in the American economy producing extraordinary rates of black joblessness, the historic flow of migrants, changes in the urban minority age structure, population changes in the central city and the class transformation of the inner city (p. 62).” “Urban minorities have been particularly vulnerable to structural economic changes such as the shift from goods-producing to service-producing industries, the increasing polarization of the labor market into low-wage and high-wage sectors, technological innovations, and the relocation of the manufacturing industries out of the central cities (p. 39).” As middle and working class families move out of the inner city neighborhoods, a concentration of poverty occurs. The result is social isolation that magnifies the social dislocation that plagues poverty-stricken neighborhoods, creating the phenomenon of the urban ghetto.

The relationships described are non-exclusive positive associations. Numerous times Wilson describes the antecedents in terms such as a “web of influences.”

Boundaries of the theory are not defined, although the implication is this is a macro theory to describe the formation of the urban ghetto and black underclass. The statements are used consistently and significant empirical support is provided.

Logical Adequacy of the Ghetto Underclass Theory. Regarding logical adequacy, the content of GU makes sense and there are not obvious logical fallacies. Predictions are able to be made from the theory, however, extensive further analysis, over time would need to be conducted to test those predictions. Because of the complexity and multiple social factors incorporated into the theory, it would be unlikely for multiple social scientists to arrive at identical predictions, although trends would be expected to be similar.

Usefulness, Generalizability, Testability & Parsimony of Ghetto Underclass Theory. Wilson’s theory is very useful to consider the multiple social dynamics that contribute to the class structure and concentrated effects on the inner city populations. It provides insight into class-related factors that impact individuals. However, the theory is specific to analysis of the urban black underclass and is not generalizable to other populations. Testability of the theory is difficult because of the complexity. The theory is applicable to examining population-based trends. The theory was published in 1987 and a current examination of similar population statistics twenty years after the original formulation of the theory would be extremely helpful. The theory cannot be considered parsimonious. Both the concepts and relationships are complex. The concepts are not clearly defined within the theory, and statements of relationship need to be derived from

long discussions. The ideas outlined within the theory are important, but difficult to apply.

The usefulness of the GU theory also needs to be considered related to the question of the dimensions of stress that affect PTB in AA women. One of the most profound points that GU describes is the concentration effects that result in the neighborhoods of profound poverty and social ills such as violence and overall crime, poor quality schools, lack of employment opportunities, environmental toxins, poor housing quality, and overall social dislocation and isolation. All of these elements compound the stress experiences of the residents, and AAs specifically as AA women are disproportionately represented in these neighborhoods of concentrated poverty. Thus the stress experiences are compounded which in turn affects health and PTB.

Black Feminist Theory

Origins and Purpose of Black Feminist Thought. The overarching purpose of Black Feminist Thought (BFT) (P. H. Collins, 2000) is to resist oppression and the ideas that justify it. AA women are in the position of facing intersecting oppressions of race, class and gender. BFT is a critical social theory that explores central questions facing U.S. Black women collectively. As an historically oppressed group, AA women's social thought is designed to oppose oppression. BFT reflects women's efforts to come to terms with their lived experiences within intersecting oppressions of race, class, gender, sexuality, ethnicity, nation and religion. It aims to resist by empowering AA women within the context of social injustice sustained by intersecting oppressions.

BFT is a theory that has been and is being formed by black intellectuals. However, because of the different histories US black women have had, Collins then

deconstructs the definition of an intellectual. Not all black intellectuals are educated or work in academia. An intellectual is defined as one doing self-conscious struggle on behalf of Black women, regardless of the actual social location of where that work occurs (p15).

BFT starts from the assumption that AA women have created independent, oppositional, yet subjugated knowledges concerning their own subordination. US black women intellectuals engage in the struggle to reconceptualize all dimensions of the dialectic of oppression and activism as it applies to AA women. Central to this enterprise is reclaiming black feminist intellectual traditions. Black women's critical social theory was stimulated by two factors: ghettoization and the common experiences women gained from their jobs.

According to Collins (2000), prior to World War II, racial segregation in urban housing became so entrenched that the majority of AA women lived in self-contained all-Black neighborhoods, their children attended all-Black schools, they belonged to all-Black churches and community organizations. Termed ghettoization, the goal of the majority culture was to foster political control and economic exploitation of Black Americans. However, as a result of this grouping, a worldview emerged and developed. As a social group composed of individuals originating mainly from diverse West African ethnic groups, significant elements of the origin cultures remained. The worldview individuals had when they were brought as slaves to the US was used to understand and explain their experiences through alternate explanations than those offered by slave owners and the majority culture. These African-derived views laid a foundation for a distinctive ethos in Black civil society, regardless of different original cultures,

languages, religions, and belief systems. Confining AAs to all-Black areas through segregation and ghettoization led to a solidification and evolution of a unique worldview. Concurrently, US black women primarily worked in one of two occupations: agriculture or domestic work. Domestic work fostered AA women's economic exploitation, but also allowed AA women to see white elites from an "outsider-within" perspective. The marginality fostered a distinctive perspective on many aspects of life and society.

The historical, sociological situation was impacted by the fact that as women, their perspective and experiences are different from AA men who held leadership positions in the civil rights movements. AA women had to struggle to have their feminist perspective heard by the AA male authority. Yet, as African-Americans, their perspective and experiences differ from and were suppressed or omitted by the elite White women who developed and promote Western Feminist thought. US Black women therefore created independent, oppositional, yet subjugated knowledges concerning their own subordination. These unique perspectives were nurtured by an era of social reform and revolutionary thinking, and developed over time into a critical social theory.

Meaning of Black Feminist Thought.

Concepts of Black Feminist Thought. BFT is constructed of seven core themes that encompass the seven major concepts and numerous sub-concepts of the theory (see figure 8). All of the concepts are descriptive concepts and explicitly defined as the definitions are specific to AA women's experiences and perspective. Being a critical theory, the definitions of concept are inductive in nature and constructed within the theory itself. The definitions are clear and developed through examples and empirical evidence. Similar concepts are defined differently, and the boundaries between different

concepts are thoroughly delineated through discussion and examples. The major concepts in BFT are: work, controlling images, self-definition, sexuality, love relationships, motherhood and activism.

Work, Family and Black Women's Oppression explores the concept of AA women's work, both paid and unpaid. "Mules uh de world" is the definition Collins quotes, depicting AA women as creatures that are dehumanized. They are treated as part of the scenery while they do the hardest of labor for others. This is supported by the statistical overrepresentation of AA women in low-paying service paid work, as well as experiences of racial discrimination within the labor force. Simultaneously, AA women engage in confining and paradoxically empowering unpaid family work. Work within extended families, such as keeping families together and teaching survival skills, is often seen by AA women as a form of resistance to oppression. Collins redefines the concept of work from AA women's perspective where the lines between public and private, paid and unpaid, as well as gender roles are often blurred.

Mammies, Matriarchs, and Other Controlling Images is a theme that challenges stereotypical images of Black womanhood. The concept is controlling images. Collins contends that the intersecting oppressions of race, class, gender and sexuality could not continue without powerful ideological justification for their existence. The stereotypical images of Black womanhood such as the matriarch, hoochie, Sister, pretty baby, auntie, mammy, girl, unwed mother, welfare recipient and inner city consumer are designed to make racism, sexism, poverty and other forms of social injustice appear to be natural, normal and inevitable parts of everyday life. AA women become the "others" of society who never really belong and who threaten the social and moral order.

Self-Definition is another concept addressed. In order to survive, AA women became watchers of society by living two lives. They adopted behavioral conformity, but secretly maintained an independent self-definition. AA women's lives therefore are a series of negotiations reconciling the contradictions between the internally defined image and the controlling images imposed on them and the objectification as "other." Self-Definition is powerful as a form of resistance to the psychological attacks and oppression AA women face.

The Sexual Politics of Black Womanhood explores the core concept of sexuality. Within that core concept are multiple sub-concepts such as violence, power, silence, and heterosexism. Pornography, prostitution and sexual violence and exploitation are each explored, as well as the persistent silence by AA women of Black women's sexuality.

The theme of Black Women's Love Relationships explores relationships that tap Black women's deep feelings, whether or not they find sexual expression. Relationships with family and children as well as sexualized love relationships and all forms of loving friendships are included in this concept. The "love and trouble" relationships of AA women with AA men are a particular focus with the intense love women feel coupled with the tensions that exist in the relationships. Masculinity and femininity are redefined. The sub-concepts of aloneness and competition are also included as women deal with the reality of rejection within relationships.

The concept of motherhood is another core theme of BFT. The self-definition of Black motherhood is presented as an essential as a way of honoring mothers' sacrifices. The idea of motherhood has been glorified within the AA community, especially by AA men. Yet the image of the super-strong mother itself is a controlling image as women are

forced to put their needs aside, living their lives as sacrifices as they minister to the needs of others in order to be the authentic black woman. AA women's definition of motherhood differs from that of AA men as much as from the majority culture and is very dynamic. Some view motherhood as a burdensome condition that stifles creativity, exploits labor and makes them partners in their own oppression, while others see motherhood as a basis for self-actualization, as providing status in the Black community and as a catalyst for social activism. Historically, in West African communities there were much more fluid boundaries associated with motherhood and it was considered unwise to vest one woman with the responsibility for mothering a child. As West African women were brought to the US as slaves, the institution of slavery enhanced this practice as children were sold and blood families separated. As African-American communities were established post-slavery, the changing social pressures again reinforced fluid boundaries in caretaking and mothering. The result is organized, resilient, woman-centered networks of othermothers and bloodmothers (three sub-concepts of this theme), who share responsibilities of motherhood.

Activism is a concept addressed in the final theme of BFT. Two dimensions of this concept are the struggle for group survival and struggles for institutional transformation. The struggle for group survival consists of actions to create Black female spheres of influence within existing social structures. Institutional transformation focuses on direct actions by individuals or groups to change discriminatory policies and procedures of institutions.

Statements & Relationships of Black Feminist Thought. As a critical social theory BFT aims to describe distinctive themes of AA women's experiences from AA

women's perspectives. There are no statements of relationship of concepts, or attempts at formal linear relationships or structure. The concepts are not ordered or configured in any way. The implicit relationship is that the concepts, encompassed by the themes of the theory, blend together to describe AA women's experiences and ideas, describe oppressions and call for social change. Boundaries of the theory are AA women. The authors discuss that individual experiences within this large, varied group of women will vary, but the aim is to present common themes shared by the group. The boundaries therefore are narrow as no attempt is made to apply the findings to other populations. The experience of AA women is unique and the critical theory developed through BFT aims only to construct a theory from that unique perspective. The voice is added to many others calling for social justice and change.

Logical Adequacy of Black Feminist Thought. The theory is very simple as it is a description. The concepts are each presented and defined and make up the substance of the theory. Paradoxically, the theory is also incredibly complex as each concept is deconstructed and defined within AA women's perspectives with multiple sub-concepts discussed within each theme. The lack of structure and relationship is essential to the purpose of the critical social theory; however, it also increases the complexity as the influence of each concept cannot be defined. The evidence presented with BFT strongly supports the premise.

Usefulness, Generalizability, Parsimony & Testability of Black Feminist Thought. BFT is extremely useful. It provides valuable insight into AA women's thought and experience and significantly adds to the body of knowledge. The theory has stimulated research relevant to AA women's experience and oppressions in the fifteen

years since it was introduced. Transferability is the term used with qualitative projects rather than generalizability which is established by rigor employed in methodology (Hall & Steven, 1991). Collins states in her introduction that a distinctive methodology was used; however details of the method are not discussed. The theory cannot be defined as parsimonious. It is simple to understand because of the elaborate discussion of each theme. Yet it is not concise and cannot be reduced to simple mathematical expressions. The text is elegant, and fully develops and supports each theme. The testability is not in a traditional objective, predictive manner. However, the concepts lend themselves to critical thought and stimulate significant research questions.

The critical usefulness of BFT is emphasizing the unique perspective of AA women in the world. Life experiences of AA women are unique from those of other racial and ethnic groups. Experiences of life-course stress, therefore, will be unique. It is this unique experience of stress that needs to be better understood in order to understand the dimensions of stress that influence disparities in PTB.

The Synthesis: Intersectional Factors

Racial Formation, GU and BFT each contribute unique and essential components of intersectionality (see figure 9). Racial Formation gives a strong framework to understand the concept of race, and the power structure or hegemony resulting from racial ideologies. A weakness of the theory is that it gives little consideration to class or to gender and how those intersect with the social meaning and contestation of race. It also does not provide structure to apply the theory to questions of health and racial disparities in outcomes. The Ghetto Underclass theory is a class stratification theory, emphasizing economic and social structural factors to explain racial inequalities. While stating that

contemporary discrimination contributes to social and economic problems of the black underclass, the entirety of his analysis focuses on historical patterns and current economic trends with no further discussion of the role of contemporary discrimination. Race is considered almost happenstance within Wilson's theory and the role of gender and potentially different issues faced by AA women is never approached. Black Feminist Thought focuses exclusively on the life experiences and unique perspective of AA women. The conceptual discussion in BFT, however, provides no structure for measurement or operationalization within research.

Each of the theories individually provides important insights to understand the dimensions of stress that affect PTB in AA women. There will be different intersections, different balance of important constructs and social relations for different individuals. While this is a strength of critical social theory, it presents a challenge for application to biomedical and health disparities research. However, when confronted with a whole individual with a unique context, it is impossible to separate out only one category, such as race, or class, or gender, and expect to understand her experiences in life. Synthesized together, these three theories give a strong understanding of the major social constructs and relations that influence AA women's status and experiences in the world, and thus may impact her experiences of stress and ultimately health.

Racial Formation defines race as a merger of both biologic and social constructed elements. The meaning of race is defined by the racial ideologies that have been structured into a racially hegemonic society. Because of the social meaning of race throughout history and evolution of hegemony, profound inequalities within the social structure exist. African American women consequently will experience more of the

oppressive inequality that leads to physiologic stress experiences throughout their lives that affect health. The effects of concentrated poverty as outlined in the GU theory gives further example of the oppressive stressors that disproportionately affect AA women. Because of the racial hegemony, the social factors described by Wilson in the GU affected the AA population more profoundly. In particular, the concentration effects resulted in concentrated neighborhoods of poverty which in turn perpetuates the hegemony and racial social system of power and oppression. Each element holds truth. Together, the effect is profound. BFT emphasizes the unique perspective of AA women. Their life experiences are unique from AA men and unique from women of other racial groups – precisely because of the racial projects and hegemony described by the RF theory. The unique dimensions of stress of AA women need to be understood in order to understand and explain racial disparities in PTB.

Evaluation of Theoretical Frameworks

The LCHDM and Intersectionality are very different theories, from different philosophical assumptions and with different objectives. They have in common that they each provide important components to understanding racial disparities in PTB. The overall framework to approach the disparate incidence of PTB between EA and AA women is offered by the LCHDM. The LCHDM concentrates on explaining in a positivist, empirical manner the dynamic relationship of risk and protective factors over the life-span and their influence on reproductive potential. The main weakness of LCHDM is ambiguity regard the disparate risk and protective factors that occur across the life-course.

Intersectionality provides a strong framework for understanding socio-cultural risks, protections and overall experience of stress over the life-course. The meaning of race, the meaning of class and the meaning of gender provide insight into risks AA women may face throughout their lives. Power is associated with constructs of bodily norms and deviance (Urla & Terry, 1995). They hold that bodies have become sites of political struggles over representation and over the meaning of what is normal and what is not. Norms of race, class and gender are established within the context of American culture, and AA women fall in the category of deviance on multiple axes.

A stigma as a relationship between an attribute and society's constructed categories that is deeply discrediting, even not quite human, and "based on this assumption we exercise varieties of discrimination, through which we effectively, if often unthinkingly, reduce his life chances (Goffman, 1963), p. 5)." AA women carry stigma within American society that places them at the intersection of oppressions on multiple dimensions. bell hooks writes,

"As a group, black women are in an unusual position in this society, for not only are we collectively at the bottom of the occupational ladder, but our overall social status is lower than that of any other group. Occupying such a position, we bear the brunt of sexist, racist, and classist oppression. At the same time, we are the group that has not been socialized to assume the role of exploiter/oppressor in that we are allowed no institutionalized 'other' that we can exploit or oppress (hooks, 2000, p. 16)"

Such a position effectively reduces life chances, but also subjects women to experiences in life different from those in other socially constructed categories. Such stigma exposes women to precisely the forms of stress: low status on the social hierarchy, perceived social identity and lack of control, that over time lead to physiological changes and damage health. Stresses experienced through stigma, structural hierarchies and social status need to be better understood in order to understand women's health disparities.

Intersectionality offers a framework for understanding AA women's experiences of chronic stressors. Presence of hardship is not enough, the perception and interpretation of a stressor is what causes chronic stress reactions. It is essential to understand which exposures are important, but that cannot be accomplished without approaching social environments from an intersectional perspective. However, alone, intersectionality does not offer operationalization to questions of health outcomes. It provides understanding, but not application to questions of health. Paired with the Life-course perspective, the two theories fill in the gaps of the other and offer a strong framework to approach the question of how life-course stress impact the AA women's disparities in PTB. Together, these theories offer a strong theoretical basis for the research of interest.

Chapter 5

DISCUSSION OF METHODS

Overview of Qualitative Methods

This chapter will provide an overview of qualitative methods of inquiry, discuss the evolution of Grounded Theory and then focus on the specific method of Dimensional Analysis as an appropriate inductive approach to understand of the life-course stress of AA women. The chapter concludes with a discussion of methods specifically used for this dissertation research study.

Qualitative research is philosophically rooted in the naturalistic paradigm (Polit & Beck, 2004). Evolving as a countermovement to positivism, naturalism incorporates tenets of postmodernism, in particular an emphasis on deconstruction and reconstruction in thinking and understanding reality. Ontologically, a naturalistic paradigm views reality as existing within a context, and therefore reality is not fixed as positivism would claim. There are multiple subjective realities constructed by individuals. Regardless of stringency of method, naturalism believes the researcher always interacts with participants, and therefore the findings are a creation of that interaction. Subjectivity is viewed as inevitable. While positivism seeks to eliminate value and bias through strict controls and adherence to method, naturalism holds objectivity is impossible. Rather, bias is minimized by an identification of values and subjective perspective of the researcher. Methodologically, naturalism often obtains knowledge through inductive inquiry (Polit & Beck, 2004). Naturalistic researchers critique traditional scientific method as reductionist in nature. Scientific method takes the phenomenon of interest out of the context of reality, reduces it to a few concepts of interest that are pre-defined by the researcher in accordance with their subjective perspective, and all other information is controlled, eliminated, or defined as noise in the results. Qualitative researchers emphasize the

importance eliciting rich description and greater understanding by studying a phenomenon inductively, in the context of setting and situation.

Qualitative research is an interpretive process that situates the observer in the world and then makes the world visible through representation and interpretation (Denzin & Lincoln, 2005). Knowledge is considered relative; it is a creation of the interaction between the researcher and researched (Bailey, 1997). The researcher studies a phenomenon in its natural setting and aims to make interpretations according to the meanings people have for things. Data are collected primarily through unstructured interviews and participant observation (Bailey, 1997) and at appropriate times through analysis of documents and artifacts. Reliability and validity is not equivalent to objectivity as in quantitative research as the postmodern perspective claims there is no ultimate truth to discover. Validity in qualitative projects is establishing the findings as sufficiently authentic or trustworthy enough to act on the implications (Lincoln & Guba, 2000).

There are four elements of trustworthy qualitative data: credibility, dependability, confirmability and transferability (Lincoln & Guba, 1985; Polit & Beck, 2004). Credibility is established through prolonged engagement, triangulation, peer debriefing and member-checking. Prolonged engagement in the field is essential in order to invest sufficient time to develop an in-depth understanding of the participants and situation. Data triangulation enhances credibility through using multiple data sources to validate conclusions and to investigate those data sources across time, space and person to determine congruence of the phenomenon. Peer debriefing is a form of external validation; exploring the data and ongoing analysis with peers to challenge interpretations

and search for bias or errors in interpretation. Member validation is how the researcher ensures she understands and represents the participant's views authentically by discussing her understanding, representations and interpretations with the participant, allowing the participant to refine or correct those interpretations. This is done throughout the interviews, as well as later in the analysis process by returning to participants with preliminary and final results.

Dependability of qualitative findings indicates a stability of the data over time and conditions (Polit & Beck, 2004). Approaches to assessing dependability include a step-wise replication with different members of the research team analyzing parts of the data separately, then comparing results. An inquiry audit is another approach, with a scrutiny of the data and analysis by an external reviewer. An inquiry audit may also be used to establish confirmability of the data with development of an audit trail that would lead an independent auditor to come to the same conclusions.

Transferability refers to the extent findings may be generalized to other groups or settings (Polit & Beck, 2004). Transferability is established by providing sufficient descriptive data in the research report to allow readers to evaluate the applicability to their particular context. This includes rich descriptions of setting and context, as well as the process of inquiry permits appropriate judgments of transference.

Overview of Qualitative Methods

There are many approaches to inductive research. A case study or life history approach, phenomenology, ethnography, grounded theory and dimensional analysis are a few of the main types of qualitative methods. Each method approaches the phenomenon with different questions and therefore generates different results. As an exemplar, the

phenomenon of life-course stress and preterm birth in AA women, will be presented and discussed within the context of each method.

A Case Study or Life History may take a single individual and ask what can be learned about that single case (Stake, 2005). The case chosen may be representative of other cases or it may be unique and of interest because it illustrates a particular problem. Often it is chosen to bring a particular issue into broader consciousness. The research question for a case study approach may be, “What was the life-course stress of this particular individual?” The participant would be one who clinically demonstrates the phenomenon of interest, such as an AA woman who delivered a preterm infant. Data may include interviews with the participant, as well as a further analysis of important elements contributing to the phenomenon, such as her neighborhood, school, work, family and relationships. The results would be a detailed description of the life history of the one participant that may provide insight into the experience of life-course stress of an AA woman who delivered preterm.

Phenomenology is a qualitative method that seeks to understand and describe the essence or lived experience of a phenomenon (Streubert Speziale & Carpenter, 2003). The focus is on how an individual experiences a phenomenon (Creswell, 1998). The investigator searches for her preconceived notions of the phenomenon in order to separate it from the voices of her participants. The researcher interviews and collects data from individuals who have experienced the phenomenon of interest and clusters concepts to describe the essence of the experience. A phenomenological approach to the exemplar topic may be a question such as, what is the lived experience of stress throughout the life-course? AA women who have experienced preterm birth would then be interviewed in

depth about their experiences of stress in order to described the conscious experience or essences of stress

Interpretive Ethnography searches for the main themes of the particular culture or subgroup being studied, culminating in knowledge about people within a setting or situation, the way they relate to others and perceive themselves (Holloway & Todres, 2003). It focuses on how people are situated within a cultural context and provides a description of a way of life, culture or subgroup of a society, as they are understood and shaped through the meaning- conferring response of members. Ethnographers typically involve themselves in a social setting or community in order to learn about the people residing there, in particular the conventions, prescriptions and proscriptions of life peculiar to their world (Anderson, 2004). Mullings and Wali (2000) used an ethnographic method to study the social context of reproduction in Harlem. Their stated purpose was to address gaps in understanding of how the changing social, economic, political conditions affect the health of AA women and their reproductive experiences. The authors identified the broad social context of gender roles and pregnancy outcomes in Harlem.

Grounded Theory (GT) and two methods that evolved from GT, Situational Analysis (SA) and Dimensional Analysis (DA), are methods used to explore social processes that present within human interactions. They seeks to generate middle-range theory around social processes rather than describe an specific experience or culture. GT seeks to understand and describe the dominant social process (Charmaz, 2006), SA focuses on the larger domain of social action, interactions and the full situation of the inquiry (Clarke, 2005), while DA aims to understand the multiple social processes and dimensions of a particular phenomenon (Kools, McCarthy, Durham, & Robrecht, 1996).

At a basic level, where a GT study may focus on the actions, processes and interactions, an ethnographic study would focus more on the environmental and cultural characteristics and events for the actors, and phenomenology focuses on the essence or experience of the phenomenon. The goals vary with each method. GT aims to develop theory of how individuals, concepts and activities and the meanings ascribed fit together to explain a phenomenon, while ethnography aims to describe, interpret, and understand the characteristics of a particular social setting. Data gathering in grounded theory begins with broad, general, open-ended questions. Concurrent analysis of data will lead to an evolution in the questions over time, progressive focusing and theoretical sampling in response to the emerging theory. Data gathering in ethnography incorporates more field observations and participant observations as well as interviews with key informants who are experts on the social setting being studied. Phenomenology conducts multiple, in depth interviews with participants to understand their perspectives. Grounded theory data analysis involves constant comparison and organization of data into conceptual categories to construct a plausible theory or explanatory model, grounded in data, to explain the phenomenon and which can be tested in other contexts. Ethnographic data analysis searches for the main themes of the particular culture being studied, culminating in knowledge about people within a setting or situation, the way they relate to others and perceive themselves.

All methods result in findings that can give greater understanding of a phenomenon. GT, in particular DA has been highlighted because it concentrates on understanding the particular dimensions of stress, an area identified as profoundly needed in the study of stress and preterm birth. There is strong evidence to support the

physiologic mechanism of stress and PTB (Institute of Medicine, 2007), yet past psychometric assessment of stress has been poorly correlated with birth outcomes. Stress is a very global construct. The current understanding of stress has not been specific enough to correlate with PTB. Chronic or cumulative stress simply cannot be measured effectively until the specific dimensions of stress that impact PTB are better understood. While certain existing psychometric measures that have been used in other biopsychosocial studies, with other populations, may physiologically be more specific and display greater significance to PTB, there is no way to determine if these measures are adequate without conducting an inductive DA with a population of AA women. The ethnography that exists on the subject (Mullings & Wali, 2000) gives valuable insight in the context of stress, and social environment of stress in Harlem, however, it does not delve into the experience or process of stress nor try to break stress down into a more specific categories that may be more relevant to the physiologic experience of stress. Dimensional Analysis can explore all aspects of the phenomenon of stress in AA women's lives. It can investigate, as no other method is able, if there are dimensions of stress that have not previously been considered that may impact reproductive health outcomes. A qualitative DA is the ideal method to understand the life-course stress in AA women that may be related to PTB.

Origins and Evolution of Grounded Theory

Grounded Theory is a qualitative empirical method for the study of social life (Clarke, 2005, p. xxxi). It was developed by Barney Glaser and Anselm Strauss in the early 1960's specifically to generate and test theory (Strauss, 1987). While conducting a field observational study of hospital staffs' handling of dying patients they identified the

need for a method that focused on the context of problem solving, with actions and therefore social processes being the central area of study (Charmaz, 2006). Qualitative methods of the time were limited to merely descriptive reports that often ignored the complexity of social phenomena (Strauss, 1987). Glaser and Strauss believed qualitative analysis could be used as much more than a simplistic precursor to quantitative analysis. Aiming to move qualitative inquiry beyond descriptions by providing abstract, conceptual understandings of phenomena through explanatory theoretical frameworks, they developed the GT method to explore social processes that present within human interactions. Deeply “grounded” in data, GT seeks to generate middle-range theory around a dominant social process, combining both inductive and deductive research methods to generate theory. Strauss and Corbin (1990) emphasized that GT is a research style rather than simply a procedural method. Although there is a distinct methodology and set of procedures, GT offers a way to think about the world and approach data in an inductive manner, with few a priori assumptions.

Strauss (1987) identified two core influences on the formation of the research style: American Pragmatism and the tradition of the Chicago School of Sociology. Glaser, a graduate of Columbia University, brought a background of quantitative training and positivist assumptions that emphasized the empiricism and their rigorous codified method are seen in their original, objectivist GT descriptions (Charmaz, 2006). Strauss’ training in the Chicago school of sociology and symbolic interactionism (SI) contributed the view of human beings as active agents in their lives and world rather than passive recipients of social forces. Process rather than structure are seen as the key to human existence and subjective social meanings that emerge through actions. The construction

of action, therefore, became the central problem to be understood. The ideas are a reflection of Pragmatism, in particular the writings of Dewey, Mead and Peirce, concentrated on actions, problematic situations and the necessity of method in the context of problem solving. These features became hallmarks of GT.

The evolution of thought over time often takes divergent pathways as is true with the development of the GT method of analysis. After the initial period of working and teaching together, Glaser moved from sociology to work in the construction field while Strauss and Corbin began their partnership as research methodologists. Subsequent publications (Strauss, 1987; Strauss & Corbin, 1990) further developed GT by emphasizing new technical procedures in analysis such as constant comparative methods and GT became a dominant method within qualitative analysis (Charmaz, 2006). The goal was to identify the action-based basic social process of a particular phenomenon.

As Glaser and Strauss went their separate ways, Strauss's branch of GT developed a stronger constructivist leaning through the influence of Blumer and Robert Park and SI became a core foundation of the method. SI, in particular, was highly contributory to the growing discussion of the methods. SI (Blumer, 1969) is based on three foundational principles: 1) People act towards things and one another based on meanings they have for them; 2) Meanings are derived from social interactions; and 3) Meanings are interpreted by the individual as he interacts with the world. These tenets of SI brought the ideas of constructionism into GT. Consider the exemplar, chronic stress in the lives of AA women who delivered preterm infants. SI holds that the experience of stress is not a simple byproduct of exposure to experiences or to the social and physical environment, but of the meanings people attribute towards life experiences and

exposures. Thus, two women may be exposed to the same “stressor” but with different effects because of the different meanings they attribute to that stressor. The meanings themselves are derived from the social relationships and interactions and do not exist outside of interactions. The individual interprets those meanings, and then interacts with the world and with herself based on the meanings.

SI exemplifies constructionism. Constructionism views reality as an emergent product, constructed through the process of interaction between two people (Charmaz, 2006). As GT developed over time, the influence of Strauss, who viewed human beings as active agents in their lives and worlds, brought GT away from its positivistic roots, and focused on the construction of action as the central problem to understand. Glaser re-entered the discourse decades later with harsh critiques of the evolution of GT in his absence. In a series of self-published works, Glaser redefined “classical GT” emphasizing a systematic utilization of a coding paradigm to examine the data for the causal conditions, phenomena, intervening conditions, action strategies and consequences from the data (B. G. Glaser, 1992). The main contention between Glaser and Strauss’s branches of GT stems from their differing philosophical assumptions – Glaser taking a positivist approach to data and research, Strauss a constructivist approach. Glaser holds that the theory and basic social process is to be discovered and that researchers therefore need to remain separate from the data and objective. He claimed Strauss and Corbin’s methods force data and analysis into preconceived categories by using the process of comparative analysis and verification (B. G. Glaser, 1992).

As the next generation of researchers emerged in the field, GT naturally further developed and diversified. Kathy Charmaz and Adele Clarke’s publications (Charmaz,

2006; Clarke, 2005) among others, incorporated even more of a postmodern, constructivist approach. Postmodernism challenges universal claims to authoritative knowledge with a “recognition of the partial, tenuous, shifting, and unstable nature of the empirical world and its constructedness” (Clarke, 2005). Clarke noted that much research attempts to filter out the messiness of the unstable world, focusing on commonalities of social life. She poses an alternative conceptualization called Situational Analysis as an approach to GT that welcomes the complexities of situatedness. It focuses on the larger domain of social action, discourse, interactions and the full situation of the inquiry. Researchers draw together studies of “discourse and agency, action and structure, image, text and context, history and the present moment to analyze complex situations of inquiry (p. xxii).” Rather than a basic action-based social process, in situational analysis, the situation becomes the unit of analysis, with the goal to understand the elements and their relations within that situation. This emphasis diverges in many ways from Strauss GT and SI’s foundational roots that claimed the process was more important than structure. It also makes any transferability of results problematic as every situation is indeed unique. While the method may be useful for the analysis of a specific micro or macro level setting or circumstance; it is difficult to apply the analysis to broader social phenomena that are more conceptually rather than situationally related, such as the process or experience of stress.

Charmaz (2006) maintains traditional GT’s emphasis on process and the study of action, but she approaches data from a postmodern perspective. She differs from the Strauss and Glaser’s original approach by rejecting the positivistic idea that theories emerge from data separate from the observer. Rather, Charmaz maintains that researchers

are part of the world being studied and, therefore, theories are constructed through the researcher's involvement with people and their subject matter. Her approach also differs slightly from Clarke's (2005) by maintaining the focus on process rather than the situation as the unit of analysis. Where Clarke's emphasis is on the situation, using of analytic maps and tools to consider new perspectives on the situation. In contrast, Charmaz returns to emphasize process, considering the situatedness, but not disengaging the situation from the participants. She emphasizes the basic mechanics of the GT method, claiming the GT product as an interpretive portrayal rather than exact description or explanation of a particular phenomenon. Charmaz provides a clear and logical step by step process for a GT research study that she emphasizes are flexible guidelines rather than methodological rules – providing yet another distinction from Glaser's strict objectivist approach with precise methodology.

According to Charmaz (2006), the basic tenets of GT consist of: simultaneous data collection and analysis; constructing analytic codes or categories inductively from the data rather than from pre-existing theory; constant comparative analysis; advancing theory development at each step of data collection and analysis; memo-writing to elaborate categories, specify properties, define relationships and identify gaps; theoretical sampling; conduct lit review after developing independent analysis (See Table 3). This constructive approach to GT could be used to formulate an understanding of the process of stress. While the results would beneficially add to the understanding of stress and health, such an approach would focus on the stimuli of the stress process, the social world surrounding stress, and meaning of stress to the individual. An alternate approach, DA may be better suited to break down the global concept of stress into specific subtypes and

the meanings those subtypes or dimensions have for individuals which is an area of specific need within this area of study.

Dimensional Analysis is another approach that evolved out of traditional GT. Leonard Schatzman (1991), first a student of Strauss, later a colleague at the University of California, San Francisco, identified a lack of overriding paradigm in GT that would structurally link the separate operations of the method. Consequently, he described experiences working with students attempting to implement the Strauss's GT method and found many were confused by the process of analysis. As there was no clear outline of the interpretive or analytic process, many students had difficulty comprehending and performing its operations. While his intention was never to develop method, Schatzman became interested in the nature of analysis and how researchers learn to do analysis (Bower, 2009).

Method – Dimensional Analysis

The objective in DA is to generate theory by differentiating and understanding the multiple dimensions of a particular problematic situation (Kools et al., 1996). Natural analysis is the hallmark of DA. It is a term used to refer to the analysis all human beings learn and use understand and interact in the world (Bower, 2009). It entails the dimensionalizing of experiences, constructs and situations in order to understand and describe complexity. Schatzman claimed research analysis is fundamental component of the same processes people use every day, but with an explicit process and maintaining a transparent perspective.

While comparison is a key element of GT analysis, Schatzman dismissed the concept of an objective comparison promoted by GT, recognizing that much more was

involved in the analytic process than simple comparison (Bower, 2009). In DA, Schatzman (1991) begins with the question, “What ‘all’ is involved?” There is then a conjuring of ideas and perspectives of an experience, retrieved from the data, attempting to locate a full range of dimensions. Throughout the comparison value is assigned to some options over others based on understandings of nature and importance of the dimension of experience. Comparison often does not begin as early in DA as in GT, it is delayed until there is a significant representation of dimensions of the experience. The prioritization within the comparative analysis leads to the interpretive results.

Perspective is an element that was not being considered when GT was originally developed, but with the postmodern infusion has become an essential consideration. The researcher’s perspective, whether engaging in inductive or deductive study, will always influence how and what questions are asked as well as the dimensions of the experience acknowledged. Within both GT and DA, perspective will influence the valuing and prioritization of ideas throughout the interpretation process. Personal perspective therefore has to not only be acknowledged by the researcher, but the researcher must aim to understand and pursue the multiple perspectives of the participants (Bower, 2009). Consequently, the results will often not be one representative social process, but multiple social processes or dimensions, reflective of multiple perspectives.

Analysis proceeds simultaneously with data collection, primarily using the explanatory matrix as the framework for understanding data. (Kools et al., 1996). Dimensionality of a phenomenon is defined by interpreting, through natural analysis, the attributes, context, processes and meaning (Kools et al., 1996; Schatzman, 1991). The explanatory matrix, consisting of the perspective, dimensions-properties, context,

conditions, specified actions and consequences, frames a story of what is involved and highlight gaps in the data leading to further questions to be asked.

The DA approach to the generation of GT is highly appropriate to learn more about the subjective experience of the life-course stress of African American women, particularly in their perinatal periods. An appropriate sample would be AA women who delivered preterm and AA women who delivered fullterm, comparing and contrasting life-course dimensions of stress within this population. While there are many similarities in the process of GT and DA, there are also a few notable distinctions (See Table 4). Data collection strategies would include in-depth interviews and field observations memos. The interviews would be minimally structured and the participants encouraged to guide the interview pace and content. Interviews are recorded, then transcribed verbatim for analysis. Texts are coded to designate the dimensions and properties of stress. Data collection proceeds until a critical mass of dimensions are understood and theoretical saturation achieved. The result would be a discussion of the dimensions of stress in the lives of AA women who delivered premature infants.

Core issues in Inductive Analysis & Interpretation

Dimensional Analysis is a qualitative method of analysis that seeks to understand the multiple components or dimensions of a social process or experience. It uses natural analysis to explore multiple dimensions and perspectives, prioritize and interpret data from interview with participants. DA is an ideal qualitative method to explore types of life-course stress experienced by AA women.

DA, like all research methods, has both design strengths and weaknesses. One of the strengths of qualitative research is the flexibility that allows for thorough exploration

of a phenomenon or construct such as life-course stress. It allows exploration into dimensions that have perhaps never been investigated and those that theory-testing quantitative research may miss. However, this strength can also be a weakness. Qualitative analysis, by its nature of in-depth exploration, is conducted with a small sample of participants, situated in a particular location and history. It is subjective by nature, not aiming to control or filter out external variables. As a result, there are limitations to the generalizability of results on a broad scale, although with adequate description transferability to relevant populations is certainly a goal. It also is not able to utilize some of the research that has already been completed in this field, such as evidence relating particular types of stress to Hypothalamic-Pituitary-Adrenal (HPA) and immune dysregulation.

Summary – Qualitative Approach

The inductive, qualitative approach investigates meanings of concepts, searching for unexplored dimensions of the phenomenon. Inductive methods can help form theories and explore questions of why, how, and the meanings things hold for people. Deductive research provides statistical evidence of relationships. It is theory-testing and establishes if a relationship likely exists, how strong the relationship may be and if other tested elements may mediate the effect. Deductive approaches assume and strive for objectivity, but objectivity can never be truly attained. Everyone has values and biases and they always impact research. With even the strictest maintenance of methods, the selection of the question to be studied and the theoretical framework that forms the assumptions of the study incorporates the investigators personal beliefs and bias. How a question is asked will determine the answers received and the knowledge discovered. Construct validity of

psychometric scales can be supported, but never truly verified. Inductive research, accepts that there is bias and always will be bias in research. It seeks to identify personal belief and bias and with acknowledgment, seeks to identify how that bias may influence results and to separate out the researchers perspective from the participant's reality.

Alone, no one method can deliver a full picture and understanding of stress and preterm birth. Given the past methods employed to understand the phenomenon of stress, and the inconsistent results with perinatal populations, I am not convinced the concept of stress is adequately conceptualized or operationalized. Prior studies have used an exclusively deductive approach to understanding the phenomenon of stress and often begin with an assumption of the general stress reaction which recent evidence has increasing brought into question. There may be important distinctions with AA women that quantitative measures developed and validated with alternative populations have not identified. The inconsistent psychometric results of stress and PTB are likely directly related to inappropriate measurement. I propose that there may be different dimensions of stress, and only some of those dimensions, over time, affect AA women's reproductive health outcomes.

An inductive approach to life-course stress in AA women who have delivered preterm could provide greater insight about important dimensions in their stress experiences, and if there are additional dimensions that previous deductive approaches have not captured. AA women have poor health outcomes not just in PTB, but in a litany of diseases and health measures. An inductive dimensional analysis of chronic stress of AA women could provide invaluable insight into the dimensions of stress that may affect reproductive outcomes.

Description of Methods in Dissertation Research Project

Population studied

A purposive sample of 25 AA women, 18 years or older who either experienced preterm birth at less than 34 completed weeks gestation, or who birthed a fullterm (greater than 37 weeks gestation) infant was selected. This population was selected because of the high rates of preterm birth experienced by AA women. Exclusion criteria included having an induction of labor for an obstetrical complication other than preterm premature rupture of membranes or pre-existing health condition that could impact pregnancy outcome. The goal was to include participants who either delivered a fullterm infant, or who spontaneously delivered a preterm infant in order to explore how the experience of stress may have differed for these two groups. Women who gave birth between 35 and 37 weeks gestation were excluded in order to better differentiate between the preterm and fullterm groups. Participants were recruited through flyers posted in public areas, Internet postings and distribution of flyers from public health nurses working with the Black Infant Health program. Human subjects protections and institutional review board approval were received through the University of California, San Francisco and informed consent was obtained from each participant.

Design

This qualitative study utilized the Dimensional Analysis (DA), a method developed by Leonard Schatzman (Schatzman, 1991) as an evolution of traditional Grounded Theory. It aims to understand the multiple social processes and dimensions of a particular phenomenon (Kools et al., 1996). Dimensions are differentiated into *context*, the situation or environment, *conditions*, dimensions that facilitate, block or shape the

action, *processes*, the actions or interactions of the phenomenon, and finally, *consequences* are the outcomes. Relationships among the salient dimensions are explored and the final product is a data-based theoretical explanation of a phenomenon that can be further expanded, revised and tested in future research.

Data were gathered inductively from in depth interviews and field notes on observations of the participants and their environment. Broad, open-ended questions (See Table 5) guided the interviews about women's life-courses, their social and environmental influences and their meaning and definitions of stress. Interviews were digitally recorded and transcribed verbatim. Texts were coded using the Atlas.ti 6 qualitative software to designate the dimensions and properties of stress. Memos were written and used for analysis. Simultaneous data collection, coding, and constant comparative analysis were employed and as concepts and categories were identified during the analysis, further data collection via theoretical sampling was guided to clarify conceptualizations and address gaps identified in the developing theory. Data collection proceeded until a critical mass of dimensions was understood and theoretical saturation achieved.

Theoretical and Methodological Verification

Theoretical verification was done throughout data collection with participants to enhance credibility. Participant clarification and elaboration of preliminary analyses were also incorporated into the developing conceptualizations to promote credibility of the findings. Integrity and consistency of theory were reviewed regularly by a methodological expert in grounded theory and dimensional analysis methods.

Sample Characteristics

The sample included 25 AA women, 18 to 46 years of age with a mean age of 32.4 and median of 30.5. Reported income ranged from zero to \$200,000 per year with a mean income of \$23,444 and median of \$28,880. Four women in the study did not complete high school, eight earned a high school diploma or general education diploma, five had a college degree and three had earned a graduate degree. The women all gave birth within the last seven years; all but two were within the last two years. Thirteen women gave birth prematurely at less than 34 completed weeks gestation; twelve women gave birth at greater than 37 weeks gestation.

Chapter 6

Results

African American women and the embodiment of life-course stress

This chapter consists of a data-based manuscript written for publication presenting the overall process of life-course stress experienced by women in the study.

African American women and the embodiment of life-course stress

The disparities of African American (AA) women in a multitude of health outcomes are well known and undisputed. In 2006, the preterm birth (PTB) rate for AA women was 18.4 per 100 live births, compared with rates of 11.7 for European American and 10.9 for Asian and Pacific Islander women (Hamilton et al., 2007). In the very PTB (birth weight less than 1500 grams) category AA women have nearly four times the risk compared to European American women.

Stress is considered an important factor in many health measures, such as PTB. The physiological mechanisms of chronic stress response and the effects on PTB have been demonstrated (Hobel, 2004; Huether, 1996), and several well conducted studies provide strong initial evidence of the physiological adaptation and increased reactivity to chronic stress as it relates to PTB (Hobel, Dunkel-Schetter, et al., 1999; Sandman et al., 2006; Wadhwa et al., 2004). However, studies to date have not been able to consistently demonstrate a link between reported stress and birth outcome, or a significant difference between ethnic groups (M. C. Lu & Chen, 2004). Part of the reason for inconsistent results could be the way stress is understood by various individuals and groups and measured in the PTB literature.

Much of the stress and health literature is based on the assumption of a non-specific biologic stress response as originally proposed by Seyle (1956). Stress measurement tools that are repeatedly used are global in nature and consequently rarely yield significant and meaningful results when paired with health outcomes. Recent research in the stress field suggests the type of stressor may mediate the stress pathway and hypo-thalamic-pituitary axis activation (Gruenewald et al., 2004; McEwen &

Seeman, 1999; Sapolsky, 1993; R. G. Wilkinson, 1999). It thus is prudent to understand more specifically the stress experienced by those with poor health outcomes.

The goal of this qualitative study was to understand the dimensions and individual meaning of life-course stress as experienced by AA women. The specific aims were to understand the subjective experience of stress, as well as the context. What different types of stress did AA women experience, what made the experience worse, what protected against the experience, how did they react to or cope with stress, and finally, to explore if there were differences in the experience of stress between women who gave birth preterm and women who did not. This paper will outline the overall experience of stress from all participants (both preterm and fullterm). Understanding the different dimensions and consequences of stress may lead to improved assessment of the specific types of stress that impact health outcomes. Discussion of intensifiers and resiliency of stress and the differences between women who birthed preterm and those who birthed fullterm are discussed elsewhere (Chapter 7).

Methods

Population studied. The purposive sample was of 25 African American women, 18 years or older who either experienced preterm birth at less than 34 completed weeks gestation, or who birthed a fullterm (greater than 37 weeks gestation) infant. This population was selected because of the high rates of preterm birth experienced by AA women. Exclusion criteria included having an induction of labor for an obstetrical complication other than preterm premature rupture of membranes or pre-existing health condition that could impact pregnancy outcome. The goal was to include participants who either delivered a fullterm infant, or who spontaneously delivered a preterm infant in

order to explore how the experience of stress may have differed for these two groups. Women who gave birth between 35 and 37 weeks gestation were excluded in order to better differentiate between the preterm and fullterm groups. Participants were recruited through flyers posted in public areas, Internet postings and distribution of flyers from public health nurses working with the Black Infant Health program. Human subjects protections and institutional review board approval were received through the University of California, San Francisco and informed consent was obtained from each participant.

Design. This qualitative study utilized the Dimensional Analysis (DA), a method developed by Leonard Schatzman (Schatzman, 1991) as an evolution of traditional Grounded Theory. It aims to understand the multiple social processes and dimensions of a particular phenomenon (Kools et al., 1996). Natural analysis is the hallmark of DA, a term used to refer to the analysis all human beings learn and use understand and interact in the world (Bower, 2009). It entails the dimensionalizing of experiences, constructs and situations in order to understand and describe complexity. Dimensional Analysis begins with the question, “What ‘all’ is involved?” There is then a conjuring of ideas and perspectives of an experience, retrieved from the data, attempting to locate a full range of dimensions. Analysis proceeds simultaneously with data collection, primarily using the explanatory matrix as the framework for understanding data. (Kools et al., 1996). The explanatory matrix is used as a framework to organize the data in a meaningful way, providing structure and context for explanation (Kools et al., 1996). Dimensions are differentiated into *context*, the situation or environment, *conditions*, dimensions that facilitate, block or shape the action, *processes*, the actions or interactions of the phenomenon, and finally, *consequences* are the outcomes. Relationships among the

salient dimensions are explored and the final product is a data-based theoretical explanation of a phenomenon that can be further expanded, revised and tested in future research.

Data were gathered inductively from in depth interviews and field notes on observations of the participants and their environment. Broad, open-ended questions (See Table 5) guided the interviews about women's life-courses, their social and environmental influences and their meaning and definitions of stress. Interviews were digitally recorded and transcribed verbatim. Texts were coded using the Atlas.ti 6 qualitative software to designate the dimensions and properties of stress. Simultaneous data collection, coding, and constant comparative analysis were employed and as concepts and categories were identified during the analysis, further data collection via theoretical sampling was guided to clarify conceptualizations and address gaps identified in the developing theory. Data collection proceeded until a critical mass of dimensions was understood and theoretical saturation achieved.

Theoretical and Methodological Verification. Theoretical verification was done throughout data collection with participants to enhance credibility. Participant clarification and elaboration of preliminary analyses were incorporated into the developing conceptualizations to also promote credibility of the findings. Integrity and consistency of the theory were reviewed regularly by a methodological expert in grounded theory and dimensional analysis methods.

Results

Sample Characteristics. The sample included 25 women, ages ranged from 18 to 46 with a mean age of 32.4 and median of 30.5. Income during the pregnancy ranged from

zero to \$200,000 per year with a mean income of \$23,444 and median of \$28,880. Four women in the study did not complete high school, eight earned a high school diploma or general education diploma, one had an associate's degree, four had a bachelor's degree and three had earned a master's degree. The women all gave birth within the last seven years; all but two were within the last two years. Thirteen women gave birth prematurely to an infant less than 34 completed weeks gestation; twelve women gave birth to fullterm infants (greater than 37 weeks gestation).

Findings. The experience of stress for AA women who participated in the study was contextually situated (figure 10). Myriad conditions or triggers led to the experience of stress which existed together with some form of coping by individuals. Intensifiers increased the experience of stress while resiliency improved the coping, lessening the experience of stress. This was not dichotomous, with women often having intensifying as well as resilient effects on their stress and coping experiences. As women moved through stressful experiences, there were consequences that resulted from stress. All of these factors fed into one another, and at times were very chaotic, resulting in an ongoing cycle of stress and coping. The choices and decisions made often brought her back to new conditions of stress, or at times improve her resiliency by strengthening her resources. Each of these elements of the stress experience will be discussed below.

Context of stress. The context of stress across the life-course was the context within which women lived their lives. Context was established by the intersectionality of personal identifiers, physical and social geography and perspective.

Personal Identifiers. Race, class, gender, age, sexual orientation and religion were identifiers that emerged from the data that are culturally-based and used to define

individuals within society. The intersection of these identifiers was both how women see and define themselves, but also how they felt categorized and defined by others within society. How women were defined by others, contributed to interactions and how they were treated by others. The self-definition helped women understand and interpret circumstances and interactions. The intersectionality of these dimensions set the context for social experiences within life.

“I guess being black and being a woman was always like a double whammy. Always, so I always had to work harder. Even my first um, my first position when I went into the workforce. I was the only black female. . . I still had to let them know that I belong here just like you. So, yeah, I had, I still had to, I felt like I had to prove myself always. Yeah, that’s stressful. That’s is so, that’s really stressful, but you know, that was the environment I was always in.” (P11:231)

Geography. The physical geography was an important dimension of the context of women’s lives. A majority of participants grew up in lower-income neighborhoods. Many described their neighborhood as “the projects,” “the hood” or described a life of “running the streets.” They were speaking of particular physical geographical locations, but there was also a culture attached to these terms and locations that was part of the context of women’s lives.

“I lived in Oakland with all the drugs. Every corner there is drugs, there is liquor stores, guys hanging out; you know, sayin’ stuff to girls and selling drugs and just hanging out and people fighting. You can - gotta hear gun shots and always someone gettin’ killed, someone dying, someone getting hurt by the fight or any weapons. That’s the type of lifestyle, the neighborhood I always lived in . . . I feel like I grew up in the hood, it makes you - it push you to a position to feel like you gotta be tough. You got to be tough. If you’re not tough then, you’re kind of like a nobody in the hood if you’re not tough.” (P7:163-7)

For many, although they grew up in poorer neighborhoods, they were neutral or had positive things to say about their childhood environments. For some, being in a predominately AA neighborhood provided a sense of belonging or community.

The structure of family and social relationships surrounding participants is the social geography. The family structure – or lack of family structure in some cases, was a context of stress for many, and a source of support and resilience for others. It was part of the context of women's lives. Five of the 25 participants grew up with both of their parents in the household. A vast majority grew up with single moms or with a mom and stepdad. Eight participants were removed from their homes by the child welfare system and lived in foster and group homes. Fourteen reported drug or alcohol abuse in at least one parent. Several experienced domestic violence in their own relationships, and in parents' relationships. Many experienced child abuse. Two women in the preterm group and three in the fullterm group reported growing up in a strong, positive relationship with a parent.

All women had at least one child; most had more. Family and their children were listed by several as sources of support and motivation for them. Four were married, in stable relationships, although two of those had children from previous partners as well. Two others were married, but separated. Several were in partner relationships, although they all reported various problems in the relationships that brought them into an unstable category. Two women were bisexual and had previous long term relationships, marriage for one, with a same sex partner.

These family structures alone were not the cause of stress, but rather it was the relationship quality and interactions within that structure. It is the patterns of abuse, neglect and support that lead to stress and resilience. Social geography is part of the context of stress and relationship qualities and experiences become the conditions of stress or dimensions of resiliency for women.

Perspective. Perspective was part of the context of stress, and perhaps the most important element. Perspective was her interpretation of her reality -- the individual's unique view of the world that shaped her subjective interpretation of experiences. Life experiences contributed to and shaped perspective throughout life. In turn, perspective shaped an individual's interpretation of experiences. Thus perspective was fundamental to the context of women's lives and the context of life-course stress. The same circumstance may have been interpreted differently based stage of life and past experiences that formed an individual's perspective. For example, one participant discussed how her age and maturity influenced her perspective,

“And then I don't know, maybe it probably was bad back then, but you know how when you're a kid you don't really pay attention to stuff like that, but when you're an adult you're like well all of this is goin' on around me and you're tryin' to raise kids, so you really take a look at all that.” (P2:25)

Conditions of Stress. Conditions of Stress are the circumstances and events throughout participants' lives that elicited stress. They were the actual triggers of stress identified by participants. These conditions were set in the context of women's lives – the intersectionality of personal identifiers, or who they were in the world, their social and physical geographies, and their individual perspectives. These triggers or conditions fell into five main categories: relationships, traumatic events, financial strains, daily activities, and “The System”.

Relationships. Relationships were a source of both stress and support throughout women's lives. Relationships with parents, step-parents, and partners were the most common triggers or conditions of stress, although other relationships were named as well. While extremes exist – extremely positive or extremely negative, relationships were often very convoluted, offering both good and hurtful elements to participants' lives. There

were several dimensions of relationship stressors. Experiences with child abuse and neglect, domestic violence, instability and loss of relationship and tension or fighting within relationships, and having a close relationship with partners who abuse substances were all triggers of stress for participants. Often these dimensions overlapped and participants experienced multiple dimensions of relationship stress at the same time.

Substance abuse. Substance abuse was commonly reported among participants. A majority reported drug or alcohol abuse in at least one parent, many reported abusing drugs or alcohol themselves, and others reported drug and alcohol abuse in a current or previous partner. Several reported dealing drugs or reported their partners were dealers. The substance abuse was often a problem because negative consequences resulted. Fighting, violence, abuse and neglect in relationships, loss through death, separation or involvement of the system through Child Protective Services (CPS) or law enforcement, financial strains and unemployment were some of the problems women discussed as related to substance abuse. Stressors often overlapped and led to one another, so that it becomes difficult to parcel out a root cause. Substance abuse, however, was a dominant dimension in many women's recounting of their life-course stress. The impact on them as children from parents abusing drugs or alcohol was overwhelming. Several women discussed their parents' drug abuse and the impact it had on them.

"Mom was yelling all night, 'cause she's drunk, playing music loud, you know, she's going through all personal feelings and maybe reminissin' about old things throughout her life. So, you know, she's going through different emotions, she's crying. She's yelling, she's arguing and at times we were go sleep late and you know, and we had to get up for school in the morning. So, that wasn't good, that affect our schooling. And, at times, sometimes, I might not want to come home. And that's when, that's when that came in me startin' get rebellious, like I stay at my friend house, she say "Come home" and I'll just stay there and spend the night and not listen to my mom. So, also her, also her drug habit, it caused her to be violent at times. . . . and sometimes she would be abusive. Like she would get mad, she would

slap me and but I knew it was drugs, 'cause if she was sober, she were, you know best mom in the world, so..." (P7:51-5)

Child abuse and domestic violence. Many participants reported experiencing abuse as children. These abusive situations were a source of ongoing stress, fear and pain in their lives.

"I: Was she (mom) physically abusive?"

P: Yeah, I mean horribly so like she tied ropes around my neck until I passed out. She would hold me under the water in the tub until I passed out and so I would wake up hung over the tub like this and I was like, you know nine. You know, and then when I would wake up just kind of you know, so she is just - she was terribly abusive." (P8:23-5)

Being in abuse situations led to extreme fear for participants. They felt betrayed by parents, people who were supposed to protect them. They did not have a safe person to turn to for support. It led to feelings of powerlessness in their lives. Some were removed from their homes and placed into foster care, then raised in group homes or with another family member. Others ran away and started living the "street life", turning to prostitution or selling drugs to support themselves. The stress of being abused was carried with them and in the consequences that followed in their lives

Women discussed stress from domestic violence situations, both witnessing it with their parents, and in their own relationships. In parents, it was often ongoing and was brought up when the participants were asked if they had ever felt powerless in their lives. These were stressful situations that as children they had no control over. Women who were in abusive relationships themselves experienced fear and powerlessness. Most did not have stable parental relationships as examples and struggled with their own relationships.

"I was goin' through domestic violence, at times I felt like I'm going to lose my life in this situation or my kids is goin' to lose their life. . .that's fear. Yeah, I just felt like, oh God, it, it's just, I mean it's scary for a woman to be in a domestic violence

situation anyway, but when you're pregnant it just seems so much more, just scary. All you think about is your baby, it's all you could think about like why they are hitting or whatever they're doing. All you think about is your baby.” (P7:458-64)

Instability and loss of relationship. Instability and loss of relationships were significant sources of stress for many. In childhood, being removed from parents' custody or loss of parents through sickness or death were conditions of stress. Several participants discussed being removed from their homes by CPS and being placed in group homes or with another family member.

“Then I got taken away when I was like um I think I was 14, yeah. I think got taken away when I was like 14-years-old and um my, cuz my grandmother, well she wasn't on drugs at the time that they took us away, but before she was and we were in a shelter. It was me and my two cousins and um when they took us away um I was just in the program like in a group homes back and forth and everything.” (P18:33)

Some discussed their parents divorcing and being separated from one parent because of the divorce. Many participants discussed family members dying as a significant source of stress, in particular the death of a parent had a profound impact on women.

Most of the participants were either single, or separated from their children's father and married or together with another partner. For some, the separation or a divorce was not a source of stress, it was their choice or it came after a lot of tension and fighting in the relationship and ending the relationship was positive for them. For others, however, it was a significant condition of stress. *“Me and my ex-husband went through a really bad divorce where we had to go back and forth to court, back and forth to court like for 3, 4 years, you know” (P3:104)*

Several participants lost children through death, or lost custody to a partner or family member, or had the child removed by CPS. These losses seemed the most profound for participants. The trauma of losing a child was apparent through sadness seen

on their facial expressions and body posture as they discussed it and caused ongoing stress in their lives.

“I gave birth in prison and nobody came to the hospital, okay. I got my first one back. My son, I came home, trying to fight to get him back, put myself in rehab, was testing for him, and it was - by the time that they were supposed to bring him home and what they did is - does the home have the adequate amount of space for a boy because the other people in the house were girls and was there an extra rooms. So they said I could either look into adoption or look into placing him with a relative. So I gave him to his father, I gave him to relative care and he gave my child to the system. I went in on a violation and they adopted my children out. . . . My son I'll never see until he's eighteen. You know, it messes with me. . .” (P5:240-4)

Tension and fighting. Stress from arguing and fighting within relationships was very common in women's lives. Participants discussed tension with parents, step-parents, partners, fellow group home members and classmates at school. One participant describes her ex-partner,

“He just had like a temper. Like that, he never hit me or nothin' like that, but he had a temper. He would like blast off, like, you know yell, and you know what I'm saying, he's just like an angry person when he gets mad. So that was one of the things I didn't like, you know. Then it's like with me, I have an attitude problem too. It's like, I'm not gonna let you sit here and scream at me, so it's like we clashed on that part. We got along when we got along, but when we didn't get along it was like world war II, sort of like.” (P2:96)

Traumatic events. Women recounted experiences of trauma such as being kidnapped, having a child kidnapped, being raped, exposure to violence, being pressured into having an abortion, and having a partner murdered. Those single events affected them profoundly. The events changed the individuals involved, and changed the way they viewed and interacted in the world.

“Basically stress didn't come in for me until my daughter was kidnapped and then my Grandmother passed. I think that's where my biggest stress and biggest depression first started like. I think that I would have been perfectly fine if I never went through like that trauma. And I think that's where some depressions start from, cuz' a person has been through a trauma situation that they haven't got over, like a real dramatic situation that have scarred them you know, internally and they

haven't found nowhere you know to like place that or get over with it or have anyone to really understand where you're coming from.” (P13:224)

For each of these women, there was ongoing rumination about this seminal event, and worldviews were shaped by these events that influenced their interactions with others in the future. The effects lasted long beyond the event itself that fed into an ongoing stress burden for these women.

Financial strains. Finances were consistent sources of strain and stress in adulthood. As children, however, being in poorer families was not often reported as a source of strain. Childhood was viewed by many as a time without having to worry about responsibilities. The exceptions were those who were neglected by their parents. Some needed to worry about having enough food to eat. Five of my participants also experienced various levels of homelessness as teens,

“It's an awful feeling, not having anywhere to go, sleeping where you can, you know, then using drugs and when you know you're high and then you come down. You're so tired. You're sleeping anywhere. Anybody can do anything to you. It was a crazy feeling. It was really crazy. It was very crazy. It was you know not being clean and being able to use the bathroom like anyone else you know just being able, oh I gotta use the bathroom. That, I mean just food and that bothered me.” (P17:200)

Daily activities. Women also reported stress related to daily activities such as school, work, and maintaining the household. This category is broad, but it encompasses stressors that come from women's normal daily activities. A few participants listed school-related activities such as school assignments and for some, struggling to graduate. Work was verbalized as stressful for a few, but more often, the lack of work, unemployment, was a dominant stressor for women. Some were actively looking for a job, while others had given up or accepted that they were going to be chronically unemployed. A few, although not the majority, listed childrearing as stressful as well.

These stressors are things that everyone deals with in life, but the degree and intensity of experience, and women's coping abilities are what makes these stresses important in the broader life-course perspective.

The System. "The System" is a term used by participants to refer to either being followed by a social worker, CPS, or some aspect of the legal system – jail, juvenile hall, mandatory rehabilitation or probation. The System often is spoken of as a normal, expected part of life, yet it adds stress and strain on women. Several women were followed by CPS, mostly for drug abuse and having drug-exposed babies. Some had their children taken away and placed with a foster parent or adopted out. Several women had experienced being in prison themselves, many others had partners who were or had been in prison.

Interactions with "The System" added a dimension of feeling powerless into women's lives. There were rules that need to be followed, and someone was watching over their actions and judging whether they were safe enough to keep their children or not. Being a prisoner is a complete loss of autonomy and freedom, but even with a partner being incarcerated, there were rules and stresses with visitation, with getting to the prison, waiting in lines, and interactions with others that take time, energy and again, a loss of control and choice in life.

Relationship stressors such as substance abuse, child abuse, domestic violence, loss of relationships and fighting; traumatic events such as rape, kidnapping and murder, financial strains, daily activities and interactions with "The System" are all conditions of stress. Conditions of stress are triggers, or the events and occurrences in women's lives that lead to life-course stress. They are steeped in the context of women's lives, and cause

basic core emotions as well as cognitive and physical components that are understood as stress.

Experiencing stress. Regardless of the trigger or condition, the experience of stress contained similar dimensions for women. Participants described cognitive, emotional and physical components to the experience of stress. Qualities of stress commonly included the affective intensity of the experience, a sense of powerlessness, feeling overwhelmed and a sense insufficiency.

Cognitive process of stress. Participants described thinking about their problems or circumstances that cause stress as a core element of the experience of stress. They often ruminated about situations or experiences that perpetuated the experience in their minds. There are particular defining qualities to the cognitive experience. The mind “*going out of control*” (P6:289), affecting the ability to focus and consuming thoughts so one can’t think of other things. Participants described thinking or dwelling on stressors, reliving experiences or considering potential solutions to those stressors constantly and to the extent that one is not able to rest or relax.

“I feel stress is all in the mind though too. Like it’s all in the mind because it is just like - for example, if you get in an argument and if you keep that argument in your mind, keep thinking about it, you can make yourself stress over that argument, or what was the outcome of that argument.” (P7:426)

The process was always paired with an affective experience and at times, physical response.

“Stress it affects your whole you know your whole demeanor, you whole mind, you can’t focus, you know just like, all, you know, you got these thoughts you know what I’m sayin’ in your head, and it’s botherin’ you emotionally and then it should, you know it’s affectin’ your body too” (P2:255)

Participants often would dwell on their problems, ruminating about what is going on or potential solutions. This was part of the conscious burden of stress. As one

participant phrased it, stress “*distracts from life.*” Experiencing stress was part of life, everyone experienced stress in some form, but it was seen as distinct, something that imposes on and intrudes into life.

Affective process of stress.

Emotions of stress. Stressful circumstances were experienced and re-experienced through cognitive-thinking about the circumstances, but the circumstances are charged with negative emotion connected to the experience. Stress always carried an emotional component, and there are particular qualities attached to it. Stress itself isn’t an individual emotion, it was used by participants to describe different emotions, including fear, anger, sadness and shame. Often a combination of different core emotions were described as being experienced with stressful experiences.

Fear was a prevalent emotion described in stressful experiences. Traumatic situations that created direct, overwhelming fear for women such as violence, kidnapping, being raped and being abused were labeled as stress by participants. One participant described the following,

“I had got raped. . . It was a stranger, he was a stranger, he was actually a pimp. He was a stranger and I actually, he had a girl that works with him and she, I guess, she was -- there was like a team, you know, team they was like partners. They would go, promote, go get girls to put out there on street to make money from them . . . and he told me that I was going to have to stay there and live with him and that I would never see my family again, I could never go home ever again. . . .”(P7:512-20)

This participant described fear throughout a long narrative of her experiences being kidnapped and raped. Women also described fear paired with a lack of control when it came to PTL, birth and their children’s health.

At times the fear was more indirect. There was not a specific personal threat, but living in dangerous neighborhoods created an atmosphere of fear. One participant described her neighborhood as *“It’s just shootin’ over here almost every night its shootin’ around here or somebody gettin’ killed”* (P2:25) Hearing gunshots regularly, knowing people who were murdered, seeing the atmosphere of drug dealing, rough kids hanging out, and knowing she has to protect herself and her children all contribute to an underlying fear in their own homes for some participants. Some women describe feeling they have to be tough in order to protect themselves in their neighborhoods or communities. One participant described being in jail, seeing people being taken out *“in body bags”* and realizing there is no guarantee of survival.

Anger and a subset of anger, frustration, were often discussed as other experiences of stress. These types of stress were often triggered by perceived injustice, such as being disrespected by others, by being in circumstances they did not deserve. One participant facing the conflict in relationships and bureaucratic hassles with the prison system, described the following,

“What does stress feel like?”

P104: Irritated, angry, um, pull out your hair if you could. . .” (P4:241-243)

“And then, it’s just like sometimes I get angry, like you know I don’t lash out at anybody, but like I really feel angry, like, you know, like I just don’t want to deal with nobody, I just get upset” (P2:137)

She also linked her anger to her preterm birth,

“Because certain things can make me so angry to where I’m just stressed out to where I get dizzy, like, you know what I’m sayin’, it’s just like, wow, overwhelming. And that’s kinda how I felt like that like the night, um, that my water broke with my son” (P2:141)

She vividly described the experience of anger the night she went into PTL,

“so now I’m leavin’, I’m cryin’, I’m so mad I just, I feel like my blood is boiling. That’s how mad I was.” (P2:181)

She went home and that evening is when her water broke and she went into PTL, losing her child.

Shame is another emotion commonly associated with stress. Several women spoke of experiencing shame-related stress from unintended pregnancies. Women spoke of shame and embarrassment of having a parent who was addicted to drugs. For one participant, having people in the neighborhood know about her mom’s substance abuse was spoken of on the same level as actually dealing with her mom being high.

“I hated it, because it was, it was embarrassing at times, because like people in my community starting knowing, like my friends of my age starting knowing that my mom did drugs, and she would go out and buy it from some of the sellers, dealers outside. And that, you know, that’s embarrassing, you know, to know peer, peers around you to know that about your mom, you know, she smoke that stuff; you know that’s embarrassing.” (P7:67)

Another participant revealed the shame she felt that her son was removed from her custody by CPS and adopted out,

“Now when people ask me how many kids do you have? Is this your first baby? The shame kicks me in bad. For me that’s when my shame kicks in. . . ‘cuz everytime. They say, “oh is this your first one?” And I want to say, “yeah”, but knowing deep inside I have a nine-year-old and (her partner) even mentioned it one time. We were at a church getting some food and stuff and the lady seen I was pregnant and she goes, “oh is that your first baby?” And I said, “yeah”. And later on he goes, “why did you not say you had a son.” And I said I was too embarrassed to. The shame part kicked in mentally like, oh, you know I got a son but he’s not with me. And that’s my shame. I am ashamed of it.” (P16:561)

One participant spoke of being followed in stores to make sure she was not stealing anything, another of being bullied and called names growing up and feeling insecure and ashamed of who she was. Some spoke of experiencing racism, judgments from neighbors or strangers and not receiving respect. Their actions, or what is happening in their lives is in contrast to the ideal they believe their life should be and there is a self-judgment that

occurs in response to the social judgments they perceive. That shame is described as stress.

Sadness was the final emotion women described as a dimension of stress.

Profound loss overwhelmed many women. Experiences such as losing a parent to death, being put into foster care and losing all family or losing a child all create stress through loss to women. Everyone was confronted with loss of some sort in their lives.

Grandparents passing, divorces, separations and relationship break-ups occurred in the lives of every participant. But for some, a loss was profound and overwhelming and produced an exceptional experience of stress.

“Sometimes I be sad. . . . I can’t believe my Mom didn’t raise me, but I used to be like, I used to be sad. I used to be like, you know I can’t believe that my Mom didn’t raise me. Like what is wrong with her? And I didn’t understand. Um, now I’m appreciative, you know, that she didn’t raise me. But before I was so angry that she didn’t raise me and I was just like, she didn’t want me? You know, is that what it is? Or you know, that’s how I felt, but now I see she can’t raise nobody.” (P18:264)

Although she denied that it bothered her now, her tone, facial expression and body language contradicted those statements. She may have cognitively understood that her mother wasn’t capable of raising children, but the sadness remained and weighed on her. In addition to events that produced profound sadness-related stress, for some, stress experienced as a different emotion, such as anger or shame led to sadness and depressive symptoms as a reaction or result.

Inconsequentiality is another dimension of sadness that has to do with feeling unloved, uncared for, or neglected. It was the sentiment that one doesn’t matter in the world, of being on your own, by default, not choice. It was not quite loss – because many times women/girls were with their families, but not being nurtured or cared for the way they should have been. There was an ongoing, undercurrent of profound sadness that

emanated from the descriptions, often paired with acceptance or frank description of the circumstances. The lack of support/social resources is a condition of stress; the experience of stress is a dimension of sadness called inconsequentiality. It was the experience of not being loved, heard, understood or protected.

It was difficult to find distinct quotes to express inconsequentiality. Often it was the overall life-course that women disclosed. It was a theme that pervades their stories and an undercurrent of sadness in their telling of it. It was the participant who was removed from her mother's home for abuse, placed with her grandfather while her siblings were adopted by other families. A few years later, she was removed from her grandfather's home for abuse and then, grew up in group home after group home. She expressed anger, she expressed sadness, she expressed dealing with low self-esteem and as an adult finding herself in abusive partner-relationships.

Quality of experience. The affective qualities of stress included dimensions such as intensity of the experience, powerless, chaos and instability, and insufficiency. There was always an intensity to the experience of stress, whether it be sadness, anger, fear, or shame-related stress. The word "overwhelmed" was commonly used by participants to describe stress. The intensity of the emotional experience was overwhelming. Even if the experience was not described as overwhelming, for the circumstances to be noted and reported, they were an intense experience for the participants. All of the descriptions of stress were meaningful and vivid experiences.

Feeling powerless or lacking control was also an essential quality of stress. When one did not have the power to change things, it brought on an experience of stress.

"When I was homeless. I felt that there was nothing I could do. I was defeated. I felt helpless, especially after my Mom told me "you can't come back here." I did. I felt

like I wanted to die. I really did. . . Then I had to give my Mom my eight and a half-month daughter. You know, I was powerless then.” (P17:330-8)

Another dimension of stress was instability brought on by circumstances that are chaotic, and often a culmination of many difficult circumstances resulting in uncertainty. It was often a flood of challenges coming too much or too fast to sort out. For example, one participant described being pregnant while her partner, who was married to another woman, was put in jail. She was regularly taking a long trip on public transportation to visit him, dealing with the system and all the rules with prison visitation, dealing with, often fighting with her partner’s spouse who was stalking her and threatening her. She also was a mother to other children and dealing with unemployment, financial strain and living in a dangerous neighborhood where she was hearing gunshots nightly. Another participant spoke of the chaos that was introduced into her life when her mother died when she was a young child. She went from order and a stable life, to living with a grandmother who did not provide any discipline or structure. The instability introduced into her life while coping with the loss of her mother resulted in sadness anger and rebellion. She got in progressively more trouble, was put in juvenile hall, and eventually her grandmother relinquished custody because she couldn’t “deal” with her, and the participant spent the rest of her youth in and out of group homes, the streets and juvenile hall. All of these stories and experiences have in common a pattern of instability as a defining dimension of stress.

Insufficiency was another quality-related dimension of stress. Very often this was reported by the many participants who discussed financial strains. They spoke of the stress of just not having enough money to meet their needs, often having to choose which bills to pay. Women discussed having to learn to work the system in order to have

enough food every month, have a place to live and clothe their children. Insufficiency was not always financial; women spoke of coping with multiple stressors, and just having too much to do. Within their daily lives, women described being flooded with multiple responsibilities and not having the energy or resources to do everything that needed to be done.

Physical process of stress. The experience of stress often, although not always, contains physical symptoms and experiences. The emotions occur and have corresponding feelings in the body. There is often the adrenaline rush of a fight/flight response. Fighting itself – both verbally and physically, was a common response by women. Women also often described other physical symptoms such as being tired, gastric upset, chest pain, nervousness, dizziness, and depression. Descriptions were at times very general with statements such as the “*body shuts down.*”

Coping with Stress.

“I think we all deal with stress probably on an everyday basis, but it’s all how we cope with it, really” (P24:36)

Coping was intertwined with stress. Women encountered a stressful situation and there was automatically a means of coping. They described an action-reaction type of connection. There was a cycle of having a stressful situation and using different coping mechanisms that at times carried them through the experience, and at times fed back into or added to the stress experience. At times, women were unable to completely cope and they described being or feeling overwhelmed by the circumstances.

There were many different coping mechanisms described by participants, including both constructive and destructive methods, as well as social and isolated ways of coping. However, coping strategies did not fall distinctly into these dichotomous

categorizations; much fell in the middle of these descriptions and contained qualities of both. Distraction using a vast variety of activities, for example, was discussed by several participants as a means of coping. It doesn't fall directly into any of these categories as it depends on what they were distracting themselves with. Women discussed coping through distraction in general terms such as just focusing on other things. Many also listed other activities that they do to cope. Women listed activities such as exercise, entertainment, shopping and cleaning. Stealing was listed by two women as a means of coping. It may be a distraction, but it also was a means of physically providing for themselves and how they spoke of it suggested a bit of excitement as well.

Social coping methods were those in which women coped through means that involved others such as communicating with friends or family members, protecting others, usually siblings or their children, or through fighting with others or rebelling against authority figures in their lives. Isolated coping methods are those where women coped alone such as through thinking through their problems and problem-solving, personal achievement such as focusing on school and studying, adopting a positive attitude, avoidance, withdrawal, and internalizing problems. These were not dichotomous categories and some coping methods were practiced with elements of both such as substance abuse. Women at time abused alcohol or drugs on their own, but often were also involved in "*partying*" with others. Distraction as a coping mechanism depended on what they were distracting themselves with. Women listed means such as eating, exercising, shopping, stealing, and pampering themselves, all of which were performed at times by themselves and at times with other. Emoting, meaning crying or yelling, could

be by themselves or with others. Likewise, spirituality, faith and religious practice carried elements of both social and isolated coping.

There were several primarily constructive means of coping with situations, meaning the methods used were both helpful to the women and were not harmful to others or society. Some of the more constructive ways women in this study described coping were through communicating with mothers, friends, partners or mentors, caring for or protecting others such as children or siblings, spirituality, emoting such as crying, thinking or problem-solving, achievement and attitude choice such as positivity and optimism.

“Mainly what I do is I pick up the phone and I call my sisters, call my mom, talk about what’s going on, you know.” (P5:416-8)

“I would get myself in my books, and escape academically, you know, doing my homework or whatever. That way.”(P11:123)

Women also discussed some primarily destructive means of coping. These were means that were harmful to either themselves or others. Some of these means were fighting, lashing out, rebelling, substance use and abuse, avoidance and internalizing. By avoidance women described just not thinking about the stressful situation at all. Women described internalizing stress as keeping it all inside. Physical or emotional symptoms were often described in association with internalization of their stress.

“I keep everything internally and I guess that’s I guess that’s where a lot of my depression come from, cuz’ I hold everything inside. I don’t physically let it out on the open or let anyone know that I’m angry about something, you know, or something’s bothering me. I hold everything inside.” (P13:218-20)

“It was hard living with people, especially moving into a group home first and then just having to live in a room with people that I don’t even know.

I: What did you do to cope with that?

P: Ah, I was angry. Um, I think I just lashed out most times. Most of the time we argued, I would leave the room. I would AWOL [run away]. Um, I think I would just kind of brush it off like not deal with it more so.” (P18:252-6)

Women coped in many different ways, some constructively, others destructively. Some coped with social means, some in isolation. How women cope with their stress contributes to the consequences of that stressful experience.

Consequences of Stress. The immediate consequence of stress was that women coped in some way. After the initial, immediate response, there were lasting effects of both the circumstances as well as the choices women made in response to the circumstances.

Those choices sometimes left women in a better position, such as reinforcing or strengthening family ties or friendships through communication and relying on supportive relationships. Resiliency was enhanced as a result – stronger family support, excelling in school, better health through regular exercise. Or at times, they were in more difficult and stressful circumstances, for example, if they used substances or theft as a coping mechanism. These new circumstances then fed back into the cycle of stress and stress was intensified through more or increasingly difficult circumstances, for example, an arrest for illegal activities, increasing tensions in relationships from lashing out in anger or fighting, increased rules and restrictions from rebellion at home or in foster care and group homes.

Conscious & Unconscious Burdens. There was a weight that is carried by women as a result of stressful circumstances. Some of it was very conscious. Rumination played into this as women continued to think about circumstances or problems. It consumed time, energy and focus long after the initial episode or trigger has passed or been resolved. Some burdens were unconscious. Unconscious stress, as one participant described, is the stress that you carry throughout the day, but don't consciously think about. The first participant to discuss this concept directly, described stress this way,

“I believe there are two types of stress. There’s the stress that you’re conscious of and then there’s that unconscious stress, because to be honest with you, I don’t really see myself as being stressed, but at the end of the day when I lay down I can feel like the tension like something just relaxed. Like I’ve been tightened or holding something in within, that I wasn’t conscious of. And then when I lay down it’s like, okay. It just kind of like takes it releases itself to where I’m just so relaxed that I’m feeling like okay I can breathe or blood is flowing now to those regions that I probably that were starved all days because I was so tense and didn’t get to it, you know.” (P14:218)

She spoke of getting into bed at night and realizing her muscles were tense and only then relaxing and letting go of what she may be stressing about. She related it only to current things happening in her life; issues that were currently unresolved. But unconscious stress could be more as well – some women carried around unresolved or chronic problems for years. Perhaps they thought about it off and on, but that heaviness of the unresolved problems weighed on them.

“I think um somewhere deep in our sub-psyche our subconscious we think of thing or we retain things that we don’t appropriately deal with, that, so that when we’re not thinking about them they’re still playing some role within our our our being, causing us to be tense or be perplexed about it, but we’re just not, it’s just not coming to the forefront.” (P14:226)

People described feeling these burdens to varying degrees. The actual trigger is not the most important part of the stress experience, it is how women cope and the burdens that are carried as a result. The “what” people were stressed about was not as important as the internal process in response.

“So I gave him to his father, I gave him to relative care and he gave my child to the system. I went in on a violation and they adopted my children out. . . I get to see my one daughter. My son I’ll never see until he’s eighteen. You know, it messes with me.” (P5:240-4)

This woman has many, many things that weighed on her, but I could visualize changes in her demeanor in particular when she spoke of her children, especially her son who was adopted out against her will. None of her three children lived with her and that weighed

on her, but that she can't see or visit with her son was obviously a chronic burden on her that brought her near tears when she spoke of it.

Many women had issues from their childhood, such as abuse, neglect, or abandonment. Others had issues from choices they made and consequences of those choices such as substance abuse, incarceration or losing children to CPS. Many of these things were carried by the women as burdens throughout their lives, even when they weren't in the forefront of consciousness.

Achievements. For some women, the stressful situations and/or the coping were constructive in their lives. For example, for some women who had supportive relationships with their families during stressful times coped with stress by communicating with and relying on their family. In turn, this strengthened family bonds and relationships. Some women distracted themselves from stresses in their home lives by concentrating on school and academics; they in turn became successful through college and in their careers. Others focused on achieving daily goals during stressful times, such as completing paperwork for government financial assistance, and as a consequence, they worked themselves into more stable situations.

Summary. The process of stress was situated within the context of women's lives consisting of personal identifiers, social and physical geography. The conditions or triggers of stress included relationship stressors, traumatic events, financial strains, daily activities and interactions with "*The System.*" The experience of stress had cognitive dimensions including thinking and rumination; affective dimensions including an emotional dimension and qualities including the intensity of the experience, powerlessness, instability and insufficiency; and physical dimensions. The experience of

stress was always intertwined with some form of coping by women. Coping included both constructive and destructive, social and isolated methods, all within a spectrum of experience. As a consequence of stress, women often felt “*overwhelmed.*” There were conscious and unconscious burdens and lasting effects that fed back into further conditions of stress, intensifiers, or resiliency.

Discussion. The goal of this qualitative study was to understand the dimensions and individual meaning of life-course stress as experienced by AA women. A better understanding of stress may provide a window to creating an improved means of measuring stress and health outcomes, such as preterm birth, as well as provide an evidence-based foundation for intervention and prevention of stress-related disease. Several observations were made regarding the experience of stress that inform future study and measurement of stress.

The condition or the trigger of stress is not important in isolation. There were some common themes about what triggers stress, but the experience of stress is very individual. Each woman is embedded in the context of her life and may have a very different experience under similar circumstances. For example, living in a dangerous neighborhood was not described as stressful to some, while it was extremely stressful to others. Relationship breakups and divorce were very stressful to some, not to others. A list of life events, as a common mechanism for measuring stress, will therefore never be adequate, consistent, or valid. One approach in the literature on measuring chronic stress and preterm birth is a retrospective self-report count of life events deemed stressful. Several studies used this approach as a measure of stress in examining the relationship between stress and PTB. None of the studies found significant relationships between a

count of life events and PTB (Dole et al., 2003; Goldenberg et al., 1996; Stein et al., 1987; Wadhwa et al., 1993). The meaning ascribed to an experience is much more important than the event itself or the number of events.

Stress is a general term women applied to vastly different experiences. With these participants it was used to describe experiences from the mundane daily hassles to life-changing traumatic events. Another avenue of research into stress and PTB has attempted to assess individual perception of stress by using the Perceived Stress Scale (Cohen et al., 1983) or Spielberger's State Anxiety Scale (Spielberger, 1983), considered standard stress measures, yet these studies yield inconsistent results (Glynn et al., 2008; Hobel, Arora, & Korst, 1999; Mancuso et al., 2004; Ruiz et al., 2002) despite numerous studies demonstrating physiologic evidence of increases in stress leading to PTB (Erickson et al., 2001; Hobel, Arora, et al., 1999; Wadhwa et al., 2004). Therefore, one can conclude that these general stress measures are not specific enough to capture the aspects of stress relevant to PTB. Using the various dimensions of experiencing stress, such as the various emotions and qualities associated may provide more specific measures and allow researchers to determine the important dimensions of stress related to health outcomes.

Research within the stress field suggests the type of stressor may mediate the stress pathway and hypothalamic pituitary adrenal (HPA) activation. An individual's sense of controllability of the stressor (Huether, 1996; Sapolsky, 1993) and a perceived threat to social self (Gruenewald et al., 2004) are two well established mediators that have been identified that preferentially activate the HPA axis. If the stressor is perceived as controllable, the stressful effects are minimal, while the experience of a lack of control within the stressor increases HPA activation (Huether, 1996; Sapolsky, 1993).

Powerlessness and lack of control were very common dimensions of stress identified by women within this study. A threat to social self is defined a perceived threat to one's social value or standing which elicits feelings of low social worth and shame and has also been associated with HPA activation (Gruenewald et al., 2004) . Several areas were identified within this study that could be experienced as a threat to social self, including inconsequentiality, shame and embarrassment related stress, and situations where participants felt judged. Finally, more recent research suggests that a third factor, position within a hierarchy, may also shape reactivity to stress. It has been observed in multiple animal models and the phenomenon is now being observed within human relationships (McEwen & Seeman, 1999; R. G. Wilkinson, 1999). The subjective social status is an important element of position within the hierarchy and has been linked with both HPA activation and pro-inflammatory immune mediators (Gruenewald et al., 2006). Hierarchy and a woman's place within both her macro- and micro-social hierarchies as well as assertiveness and aggressiveness as means of coping were also significant with the participants in this study, lending confirmation to the physiological stress research.

In this study, several key dimensions of stress were identified. Stress was related in different circumstances to emotions of fear, anger, shame and sadness. The quality of experience was also pertinent. There is an emotional intensity associated with the experience and the retelling of stress experiences. Powerlessness or lack of control was almost always associated with stress. Other qualities that were sometimes described were instability and insufficiency. Further study is needed to examine these individual dimensions of stress with specific health outcomes such as PTB.

Coping of some form was always associated with stress for women in this study. Coping did not have to be socially acceptable for it to be effective for the woman. In understanding a woman's stress experience, an assessment of coping as well as how stress and coping function together to affect the woman may be beneficial. Some women reported extremely stressful experiences, but were extremely resilient, had good coping skills and had very little reported lasting negative effects. Similarly, other women discussed rather common experiences, yet did not have support in place, had very ineffective coping and suffered ongoing burdens from the stress experience or from negative consequences associated with their coping. Stress cannot be viewed in isolation.

The lasting effect of stress may be personal strength and increased resiliency, it may be intensified stress experience, or it may just linger with a conscious or unconscious stress burden. The consequences of stress have much to do with the intensity of the experience and if there are multiple stressors at once, as well as the nature of a woman's coping and resiliency. It is also a very individual experience and needs to be considered with the individual meanings ascribed. Further study is again needed, to understand if the consequences of stress are important in the overall impact on health.

African American women are at higher risk for PTB and a litany of other poor health outcomes. Stress must be better understood in order to effectively assess and intervene to prevent stress-related disease. This description of the experience of stress in AA women gives a solid foundation to build on for stress measurement in future studies of stress and health.

Chapter 7

Results

Stress & Preterm Birth: Intensifiers and Resiliency in African American Women

This chapter consists of a data-based manuscript written for publication that describes the intensifiers of stress, resiliency in women and the differences seen between women who delivered preterm and those who delivered fullterm.

Stress & Preterm Birth: Intensifiers and Resiliency in African American Women

Despite decades of research on preterm birth (PTB), little progress has been made in understanding or preventing the significant racial-ethnic disparities that exist between African American (AA) women and other racial-ethnic groups (M. C. Lu & Halfon, 2003). Approximately 12.8% of all pregnancies delivered prematurely (less than 37 completed weeks gestational age) in the United States. There have been dramatic increases in the utilization of prenatal care, yet the incidence of PTB has increased 21% since 1990 (Hamilton et al., 2007). African American women experienced a rate of 18.4 per 100 live births, compared with rates of 11.7 for European American (EA) and 10.9 for Asian and Pacific Islander women (Hamilton et al., 2007). The racial disparities in the very PTB (birth weight less than 1500 grams) category is even more concerning with AA women having a rate of 4.07 compared to only 1.65 in EA women.

The consequences of PTB can be devastating; the risk of life-long morbidity and mortality rises with the degree of prematurity (Mathews & MacDorman, 2007). PTB and prematurity related disease lead to 36.5% of infant deaths in the U.S. (MacDorman et al., 2007) and surviving premature infants demonstrate high rates of morbidities affecting every physiologic system, often resulting in life-long disability (Berkowitz & Papiernik, 1993; Institute of Medicine, 2007). The Center for Disease Control and Prevention (2008) estimates the societal economic burden associated with PTB in the U.S. is in excess of \$26.2 billion per year.

In recent years, stress has emerged as a physiologically significant factor in PTB (Institute of Medicine, 2007). Physiological evidence gives strong support to the theory that stress activation of the HPA and immune systems is significantly related to PTB

(Hobel, Dunkel-Schetter, et al., 1999; Sandman et al., 2006; Wadhwa et al., 2004). Yet there is a very inconsistent and often a null relationship between existing stress measures and pregnancy outcomes (Chapter 2-3). The life events checklists miss the critical element of perception of stress related to those events. The perceived stress scale (Cohen et al., 1983) is a very global measure of acute events rather than a life-course measure; it also does not include the degree of distress elicited by those acute events. The state anxiety scale (Spielberger, 1983) gives a baseline state assessment of individual anxiety, but does not capture chronic initiation of the stress response across the life-course. Type (controllable, threat to social self), timing (early vs. late), pattern (ongoing episodes) and duration (acute vs. chronic) of stressors all are relevant in the physiologic response. It is quite apparent why this complex process has been difficult to measure with self-report stress assessment tools. A better understanding of women's experience of stress is needed in order to measure and ultimately intervene to prevent stress related PTB.

The purpose of this qualitative study was to understand the dimensions and individual meaning of life-course stress as experienced by AA women. The specific aims were to understand the subjective experience of stress, including its context, different types of stress, what made the experience worse, what protected against the experience, how women reacted to or coped with stress, and finally, if there were differences in the experience of stress between women who delivered preterm and women who did not. Discussion of the overall experience of stress is discussed elsewhere. This paper will outline the intensifiers of the stress experience and the differences between women who delivered preterm and those who delivered fullterm. Dimensions and enhancement of resiliency in a sample of AA women will be discussed.

Methods

Population studied. A purposive sample of 25 AA women 18 years or older was recruited from Internet postings and flyers both posted and distributed by public health nurses working with a Black Infant Health program in Northern California. Participants were sought that had either delivered a fullterm (greater than 37 weeks gestation) infant or spontaneously delivered a preterm (less than 35 weeks gestation) infant in order to explore how the experience of stress may have differed for these two groups. Exclusion criteria included induction of labor for an obstetrical complication other than preterm premature rupture of membranes, a known uterine anomaly or pre-existing health condition that could impact pregnancy outcome. Women who gave birth between 35 and 37 weeks gestation were excluded in order to better differentiate between the preterm and fullterm groups. Human subjects protections and internal review board approval were received through the University of California, San Francisco.

Design. The qualitative study used Dimensional Analysis (DA), (Schatzman, 1991) an approach to the generation of Grounded Theory. It aims to understand the multiple social processes and dimensions of a particular phenomenon (Kools et al., 1996). Analysis proceeds simultaneously with data collection, primarily using the explanatory matrix as the framework for understanding data. (Kools et al., 1996). The explanatory matrix, consisting of the perspective, dimensions-properties, context, conditions, specified actions and consequences, frames a story of what is involved and highlights gaps in the data leading to further questions to be asked. (For a more detailed explanation of the method, see Chapter 6)

Data Collection Procedures. Written informed consent was received from each participant. Data were gathered from in depth interviews lasting approximately 90 minutes each and field notes on observations of the participants and their environments. The phenomenon of interest was approached inductively. Broad, open-ended questions (See Table 5) guided the interviews about women's life-courses, social and environmental influences on their lives, and their meaning and definitions of stress. Interviews were digitally recorded and transcribed verbatim.

Analysis. Texts were coded using Atlas.ti 6 qualitative software to designate the dimensions and properties of stress. Simultaneous data collection, coding, and constant comparative analysis were employed as concepts and categories were identified. Further data collection via theoretical sampling was conducted to meet needs and gaps identified in the emerging theory. Dimensionality of the phenomenon was defined by interpreting, through natural analysis, the attributes, context, processes and meaning (Kools et al., 1996; Schatzman, 1991). Data collection proceeded until theoretical saturation was achieved.

Theoretical and Methodological Verification. Theoretical verification was conducted throughout data collection with participants to enhance credibility. Feedback and clarification of participant meaning were incorporated into the developing conceptualizations. Integrity and consistency of theory were reviewed regularly by a methodological expert in grounded theory and dimensional analysis methods.

Results

Sample Characteristics. The sample included 25 AA women, 18 to 46 years of age with a mean age of 32.4 and median of 30.5. Reported income ranged from zero to \$200,000

per year with a mean income of \$23,444 and median of \$28,880. Four women in the study did not complete high school, eight earned a high school diploma or general education diploma, five had a college degree and three had earned a graduate degree. The women all gave birth within the last seven years; all but two were within the last two years. Thirteen women gave birth prematurely at less than 34 completed weeks gestation; twelve women gave birth at greater than 37 weeks gestation.

Findings. The women's described experience of stress was contextually situated, triggered by specific conditions, and was closely paired with some form of coping. Intensifiers increased the negative experience of stress, while resiliency seemed to mediate the effect. The consequences of stress too often fed back into the cycle, triggering more stress, intensifying the experience or enhancing resiliency (Figure 10).

Overview of the Overall Process of Stress. The context of stress included the intersectionality of personal identifiers such as race, class and sexual orientation; physical (neighborhood) and social (family structure) geography and perspective, which was a woman's unique view and understanding of the world formed by her experiences and values. Conditions included the actual triggers of a stress experience such as relationship stressors (substance abuse, abuse, instability and loss, tension and fighting), traumatic events, financial strains, daily activities and "The System." The experience of stress consisted of cognitive, affective and physical dimensions. The affective experience of stress included emotions such as fear, anger, shame and sadness. Particular qualities including feeling overwhelmed, powerlessness, instability and insufficiency. There was also a physical embodiment of the experience of stress, manifested through physical symptoms. The experience of stress existed together with some form of coping (both

constructive and destructive methods) by individuals. As women moved through stressful experiences, there were consequences that resulted from stress including conscious and unconscious burdens, achievements, and often factors that fed back into the cycle of stress and coping. The choices and decisions made often brought her back to new conditions of stress, or at times improved her resiliency by strengthening her resources. This overall process of stress is addressed in detail elsewhere (Law, in review).

Intensifiers of Stress. Several factors intensified the stressful experiences for women, including a lack of support, having a limited perspective of the options available in life, the intensity of a particular stressor and facing multiple stressors at the same time. Being socially isolated and having limited or no social support was an experience for several participants at some point in their lives. Several described it as “*Everybody against me*”. One participant who had been abused and neglected by her mother and who had no other family support described it, “*There is nothin’ you can do to escape it. Nothing. Cause you don’t have nowhere to go, nobody to turn to.*” (P3:321). This isolation led to a despair and intensified all of the experiences of stress for women, regardless of the specific circumstances that triggered stress.

“Just feels like you just got - just have a load on, a weight, like a big weight load on your shoulder that you are just dealin’ with by yourself, like it’s almost just like you carrying a load by yourself and you just needed that help, but you’re just all by yourself. It’s like your back against the wall and you are just you against, you know, against the situation and, Oh God (sighs).” (P7:456)

A limited perspective on life or within the situation was another factor that intensified the stress experience. The more choices a woman saw as available to her, the less she described experiencing stress within a specific situation. Not having positive role models, or in some way seeing that there were other options, intensified stressful

experiences for women. Without a broader perspective that things could be different, there was no hope. One participant discussed being in an abusive relationship,

“I went through a lot of abuse, a lot of verbal, emotional, physical abuse . . . my son’s father he, he was all I knew at the moment, you know, I’d been with him since I was like 15 so - six years. So it, it’s kinda, my house was with him, you know what I mean, my relationship was with him, he was all I knew at that point. And I didn’t feel good about who I was and um, I, I just didn’t know that I was a good person at that time and that I deserved better. Uh, it was like I lived in a dark cloud probably for like those six years.” (P24:19)

These women’s lives and experiences of stress were viewed in contrast to those who had a strong role model, or perspective that provided hope and motivation to challenge or change their circumstances, as will be described below in the resiliency section.

The intensity of the stress experience described by women was quite consistent, overwhelming, and wide-ranging. For some women, the stressful experiences were incredibly intense and included traumatic childhood experiences, financial destitution, homelessness, being raped and being kidnapped.

“Then I had to give my Mom my eight and a half-month daughter. You know, I was powerless then. . . That was that was just I was defeated. You know I was like that broke my heart because it’s like I turned my back on her. You know, I gave up, powerless. . . I had lost my partner. I had lost my job. Then I tried to find a job, with the frustration and trying to find a job, it was just, it wasn’t happening. It wasn’t happening fast enough where I could pay the rent or anything like that. It just became to be unbearable. I was on drugs. It took the place of the reality of everything, so, I called my Mom up and I said I can’t care for her. And for me to say that, that was you know that was painful, that I couldn’t care for her. ” (P17:338-42, 46-50)

Multiplicity of stressors was another intensifier of stress. When women faced multiple stressors at the same time the overall experience of each intensified and led to women feeling overwhelmed by all that was going on in their lives.

“Me and my fiancé we was goin’ through problems. And the problems were with his, his, well his ex-wife now, but it was his wife. They were still married at the time. So it’s like, they were goin’ through a situation where they were tryin’ to get separated. She wouldn’t sign the papers and she was still like stalkin’ us and

comin' over, breakin' windows and just you know, stressin' me out. . . and then he ended up goin' to jail. And when that happened, it's like you know, I would go up to see him and she would be up there. And there would just be this big commotion. She would try to get my visits taken to where there was just a lot of stress on me while I was pregnant, you know and I'm already goin', getting' up early in the morning tryin' to make it out there on the BART and it's just like, everything at the time was just a stressful situation for me." (p2:133)

Resiliency.

Resiliency is the ability to thrive despite stress and challenges. One of the critical elements for women affected by stress and the resulting consequences was their resiliency. Four main characteristics of resiliency were identified in the women's stories, including personal strength, perseverance, optimism and peace. These characteristics all existed in a range of variation with all participants. Several women in the PTB group had many of the resilient characteristics and several in the FTB group demonstrated few or none of the characteristics, but these seemed to correspond with intensity and multiplicity of stresses in their lives. Seven women demonstrated all 4 characteristics. Two of those were in the PTB group, but they were also women with the some of the most intensely challenging life stories. Their resiliency was perhaps molded and enhanced because of the numerous challenges they faced in their life. Three participants did not demonstrate any of these characteristics; they were all in the PTB group. As the concept of resiliency emerged as a critical dimension in the process of stress, it was explored and clarified with additional participants through theoretical sampling.

Dimensions of Resiliency. One of the defining characteristics of resiliency was personal strength. Women spoke of taking control of situations positively through asserting themselves, as well as through aggression, fighting and defiance. The role of hierarchy was apparent in these women; they were powerful within their environments. They resisted abuse. They fought, physically or with words, when they felt it was needed. They

were defiant and resisted when they confronted oppression or an authority that they didn't accept.

"I wasn't gonna be beaten on and I wasn't gonna be treated bad and I'm gonna to say what I think and I'm gonna do what I want and I'm gonna eat what I want and I'm gonna wear what I want." (P8:362)

"Continue to overcome." Another defining characteristic of resilient women was their perseverance, often resulting in success. They pursued and achieved their own goals in life and were satisfied with their lives. They were thriving within the context of their lives. Success was primarily through academic and career achievement and through establishing a family that they desired. There was a confidence that was apparent and their life stories contained narratives of success in academics, in their careers and in being mothers. Their success was not easy; they worked hard to achieve their goals. *"Like just keep moving forward no matter what happens. And whatever obstacles you go through just continue to overcome because that is all you can do."* (P9:276)

Optimism was another dimension of resiliency. Women who demonstrated this characteristic had hope and they viewed life and challenges in a positive way.

"I'm a total optimist. I never stop to be pessimistic about anything. And that's the way I like to surround myself with people that are, you know positive thinking, forward thinking. If you're negative I'm like oh dear this is just not, you know. It's hard for me to embrace you." (P14:200)

They often believed they had the power to choose how they thought about things. They chose to view life's challenges in a positive way.

"But I've learned to that stress is not stress. Stress is an uncontrolled situation and you're used to having control. And so I just look at it as being a hiccup of life. I've learned to manage it because I have two babies that came early that did not fit into my plan, and that I had to think that 'Oh my. I can't handle it. This is so stressful.' I had to think it's really not. It's really not. It's just a hiccup. It's just a change of plans that you didn't include in - in your map. When you mapped out your plan it's not there. So I just think of it as a hiccup." (P25:277)

Finally, there was a peacefulness and groundedness that characterized resilient women. There was an acceptance of past and present life experiences and challenges. They weren't emotionally struggling; they did not demonstrate anger or sadness over their past, but rather seemed to calmly accept it and move on. Challenges had been accepted as important in developing who they are today and in developing their strength.

"I think what makes me as a woman as strong as I am is just going through the things that I've been through, um, I think that's what really made me tough. . . I think going through the things I've been through like you know seeing my Grandfather pass away or um seeing my Mom and my Grandmother on drugs, seeing the way people have lived, you know, um I mean, just things like that, just hard struggles. That's what makes me the person that I am. . . and the things that I've been through I wouldn't change them. I wouldn't change them because I wouldn't be who I am today." (P18:304)

Factors that enhance resiliency. Six factors were identified that enhanced resiliency in women, including maternal relationship, observing role models, education, caring for others, some select forms of coping, and a positive experience of family. One of the most important factors that enhanced a woman's resiliency was having a strong, positive relationship with her mother or with a mother-figure such as her grandmother. The support offered and lessons instilled from mothers were powerful and provided a foundation of resiliency that enabled women to feel they could take on whatever challenges they faced.

"I think (my resiliency is) from my Mom. She's always been so optimistic and always been, you know, told us that there isn't anything you can't do. There's no such thing as impossible. Everything is, anything is possible, so I think having that engraved and delved into my head you know you just you thrive on it. You really thrive on it. So, I think that's where it came from. Cuz' I'm like that." (P14:200)

In contrast, the women who did not have that relationship struggled in many areas in their lives and were often the ones who reported feeling overwhelmed by life and challenges.

Role models provided either a strong positive example for women to follow, or motivation to make different choices to avoid a negative role model. Viewing role models was different from receiving support from someone because it was not the relationship that was central to this dimension. The observation of values and choices of a role model and the subsequent consequences broaden the perspective of women and instill a resolve to either follow the example, or to not. It was just as likely that women learned from viewing negative role models as positive.

“I remember there was an internal drive in me almost like I wanted to better myself so that I wouldn’t be like my parents, and I used to always tell people that my parents were like my role models too and my grandparents were like the role models of the good things I should do and my parents were the role models of the bad things I shouldn’t do, you know, so I always felt like I learned from both sets.” (P19:35)

Education was another important factor that contributed to resiliency. Some women used academics as a coping mechanism for stress, focusing on school rather than on what was happening in their home lives. *“I would get myself in my books, and escape academically, you know, doing my homework or whatever.” (P11:123)* Others enjoyed the rewards of academic achievement or being looked up to by classmates for academic success. Staying in school, graduating, having a positive experience in school and academic achievement contributed to the resiliency observed in women.

Caring for others presented women with challenges, but also increased their resiliency in facing stresses. Several women took on the responsibilities of caring for younger siblings.

“When my sister was born I would take her and like cover her ears and like in a closet you know, in our bedroom in our closet, bathrooms, whatever, um so that she wouldn’t hear the yelling and the cussing you know . . . that’s pretty much what I would do at home is I would just try to protect my younger sister from hearing all the bad language and the yelling and things like that.” (P19:226)

Protecting siblings from abuse and traumatic experiences became the focus, rather than suffering from the experience themselves. When women became mothers, the responsibilities of caring for children provided them with motivation to persevere when faced with challenges, helped them to make changes in their lives such as leaving abusive relationships as well as provided them with love and support.

“My kids are so loving that they make me feel better when I’m stressed out. Like if I’m sad or something, I’m stressed out, my son will walk up to he’d be like ‘Mommy I love you’. And I’d be like ‘Oh, I love you too, baby’”. (P18:236)

How women viewed their children: as sources of stress and additional burden or as a source of love, support and motivation for perseverance and positive choices in life, often correlated with their being overwhelmed or resilient in life overall.

Some forms of coping enhanced women’s resiliency including communicating with others, physicality and spirituality. Just as being isolated and lacking support intensified the experience of stress, having a supportive person to talk with about the stress seemed to enhance resiliency. Communicating with supportive parents, partners or friends provided women with increased resources and strengthened their ability to cope with stresses. *“Mainly what I do is I pick up the phone and I call my sisters, call my mom, talk about what’s going on, you know.”* (P5:416-8). Physicality through playing outside as a child or through regular exercise later as an adult enhanced women’s coping and resiliency to stress. Resilient women often had idyllic memories of running around outside and playing as a child,

“I liked to play outside so I had, it wasn’t a tree house, it was a tree that was really easy to climb into, so I would hang out back there and I would play with my brothers a lot, so we’d ride bikes and sort of physically get away to relieve stress.” (P1:127).

Faith and spirituality provided hope and strength for many women. *“Like no matter like what life difficulties bring you I mean through God you’ll be okay.”* (P13:25) These were all ways of coping that enhanced women’s resiliency.

Finally, a sense of family established through constructive parenting and traditions provided stability and enhanced women’s resiliency. Family stability was also established through constructive household rules and limits as well as establishing family traditions. Women spoke of little things, like bedtime stories, having breakfast made for them, going to church, celebrating birthdays and holidays, as well as larger things like family vacations.

“One of my favorite memories is that my mom always made birthdays special, um, so I remember being 5, turning 5 and ah, for my birthday, for breakfast she made me a stack of pancakes and she made it look like a birthday cake and put candles in it and I just, you know, simple things like that she always tried to make things good for us in little ways.” (P1:47)

These factors were noted just as, or more often by women who did not have them growing up. For most women who had this stability, it was described in their life stories, but not explicitly acknowledged. Some recognized it as vitally important and spoke of seeing it with others. Others were lacking this stability and their life stories were characterized by intensive life-course stress.

Stress and Preterm Birth. One of the objectives of this study was to see if there was a difference in life-course stress of participants who had preterm from those who had fullterm births. To explore these differences, the women were divided into groups (PTB and FTB) and each of their life-courses were outlined in detail and analyzed by group. A few dominant themes were identified. Overall, the women interviewed often experienced many of the same things in life – poverty, exposure to substance abuse in their families or themselves, dangerous neighborhoods. However, women in the PTB group more often

faced more fractured and challenging social and physical geographies, they were often lower in their social hierarchies, they experienced increased intensity in their stressful experiences, and often faced multiple stressors at the same time. Commonalities and distinctions between the two groups will be presented.

The social geography is the family and relationship structures in women's lives and for most of the PTB participants was very difficult and stressful. Many participants did not have parents involved because of drug abuse, death or separation. Many experienced child abuse from family members. As they grew older, women faced challenges in relationship, instability and domestic violence. These family structures alone were likely not the cause of stress as there were similar patterns of single parent homes, and women living outside of a traditional family unit in both groups. Rather the relationship quality and interactions within those structures; the patterns of abuse, neglect and support lead to stress and resilience for women.

The physical geography was a challenge for women in both groups. Most grew up and or currently lived in impoverished neighborhoods that were dangerous. As one participant phrased it, "*Gunshots, yelling and war every night*" (P102, *fieldnotes*). An *in vivo* code in this theme was "*The Streets*" by which women described not just hanging out in dangerous neighborhoods, but a culture of doing and often selling drugs, at times engaging in prostitution, at times going to jail, and in general engaging on a "*Reckless path*" (P103). For some, a source of stress was moving frequently either with their family or because they were in the custody of Child Protective Services and were forced to move from group home to group and foster care homes. Several women experienced homelessness for a period. Living in a poorer neighborhood was not automatically

stressful to women; some had fond childhood memories of growing up in “the projects” and the social support they found through other children and families they were surrounded by. Often the impact of the physical geography depended on their age, how they were parented and their individual perspectives. Ten out of 13 women in the PTB group discussed their physical environments as significant sources of stress in their life stories, while only five out of 12 women in the FTB group reported the same. The intensity of the stressful situations described in their physical environments was also more pronounced for the PTB women.

“ It’s just shootin’ over here almost every night its shootin’ around here or somebody gettin’ killed and it’s just like the murder rate went up a whole lot more. Um, the kids are much more reckless than they were back then, you know. Now days you turn the news and see kids goin’ to jail for robbery or murder, or you know they’re only like 14, 15, 16, um, it’s just you know more, I don’t know, it’s worsen now.” (P2:25)

The role of hierarchy became profoundly apparent through many interviews. Class is a basic element of the social hierarchy. Those with more money have more privilege and power in society. Several participants commented directly on the role of class in their lives,

“People can be put into those classes because some people do work harder than other people. But then you got some people who considered the lowest class, you know, but they’re slavin’ you know what I’m sayin’ at their job, they’re probably liftin’ boxes that are 100 pounds, or 200 pounds and workin’ 12 hour, 14 hour shifts, you know what I’m sayin’ every day breakin’ they backs, maids workin’ in hotels, and then some of these people only makin’ minimum wage or somethin’ when you got the upper class, you know, they’re probably go to work every day, just sit there and just look at the computer screen. But they’re makin’ thousands, you know. So it’s just like, I think that that’s, that’s kinda weird for me. It seems like, the more work you do, or the harder you work, the more you should get paid. I think. I think that’s how it should be.” (P2:205)

This participant considered herself in “the lowest class” and her struggles with chronic unemployment and the corresponding financial strains were one of the significant sources

of stress in her life. Her views on the injustice of social classes and work were paired with an acknowledgement that she did not have money, status or power within society.

“Anyway it goes. If you have money, you can make things happen.” (P2:209)

Hierarchy, however, was more nuanced than broad social categories. Within their family and social relationships, hierarchies were present. Those that are oppressed, abused or neglected are low or at the bottom of their family hierarchies. Those that are teased or bullied at school are low in the hierarchy in their school social hierarchies. In neighborhoods, particularly lower class, dangerous neighborhoods, the role of hierarchy was present. In *“The Streets,”* women talk about having to be tough, and having to fight to survive.

“I feel like I grew up in the hood, it makes you - it push you to a position to feel like you gotta be tough. You got to be tough. If you’re not tough then, you’re kind of like a nobody in the hood if you’re not tough.” (P7:167-173)

Women in both the preterm and fullterm groups described all types of hierarchies; both spoke of their roles in families and in *“The Streets.”* The difference seemed to be where they were in those hierarchies. Many in the preterm group were abused, were oppressed within their families. Women in the fullterm group more often spoke of fighting and being tough because of pressures in their social hierarchies. They were in the same social class – a macro hierarchy within society, but higher in their respective more micro- social hierarchies. One women who delivered fullterm said the following,

“Cause growin’ up in the projects and bein’ around all these ghetto people, you know, you feel like you have to prove yourself to somebody, just like you know you can’t let nobody cuss you out there in the street, you know, you can’t let nobody hit you and you not hit them back or whatever. I mean, I never have, I mean, that was one of those things I never have let nobody take advantage of me, you know, or try to break me” (P21:378)

Women in both groups experienced a range of stressful experiences throughout their lives. However, women in the PTB group very consistently experienced a greater intensity of their stressors through social and physical geographies and experiences such as homelessness, “*running the streets*” abuse, neglect, complete lack of family support and parenting. They were lower in the micro- and macro social hierarchies, and women in the PTB group more often endured multiple stresses concurrently. Overall, the magnitude of the life-course stress for women who experienced PTB was greater.

“Before I went into recovery. It's like I really wanted to change but I really didn't - I really had got so far deep into everything as to where I didn't know how to go about even - asking or getting the help that I needed. It's like I felt lost. I tried to kill myself, you know, on more than one occasion. I mean there were times to where I got so tired as to where early in the morning when detox opened and I'd go up there just praying that they had a bed and they didn't. It kind of really got discouraging, you know, when I was like trying to get it together as to where I felt like I had no option, you know. All my friends did drugs. I really didn't have a positive person trying to push me in the right direction or trying to help me get out of what I was in.” (P5:369-70)

Discussion

The Life-Course Health Development model (M. C. Lu & Halfon, 2003) hypothesizes racial-ethnic disparities in health outcomes such as preterm birth are a result of both a cumulative exposure to stress as well as exposures and experiences during critical periods early in life. Cumulative exposure to stress adds up over time creating an allostatic load that results in HPA and immune-inflammatory dysregulation. Critical exposures may impact developing and maturing organ systems, manifesting in disease later in life. The Life-Course Health Development model theorizes a woman's reproductive potential is a product of her developmental trajectory over her life-course. The increased incidence of preterm birth in African American women, therefore, is attributed to exposures to more risk factors and less protective factors across the life span,

especially during sensitive periods of development, as well as a lower starting point due to an intergenerational effect. Understanding and comparing the life-course experiences of AA women is a step towards testing this model.

There were several factors identified that intensify the experience of stress for women including a lack of social support, a limited perspective within the situation or their lives, the intensity and magnitude of the stressors and facing multiple stressors concurrently. There were also several differences identified between women who delivered preterm and those who delivered fullterm, including the magnitude of the stressor, the social and physical geographies of women's lives, and a woman's place within her macro and micro social hierarchies. These "risk factors" may be particular areas of concern when examining women's life-course trajectories.

The finding of social support as an important factor in a woman's experience and embodiment of stress is supported by a consensus of work in public health and medical literature that validates the protective effect of social connectiveness and support on health (Berkman, 1995; Broadhead, Kaplan, Sames, & al., 1983). In pregnancy, however, there has been little evidence that social support prevents preterm birth (Orr, 2004). Social support, as it is operationalized in studies, however, is riddled by conceptual and measurement inconsistencies. What was found with participants in this study was that the experience of stress was intensified for women who existed in a social isolation, where they felt they had no one to turn to for support or help in times of difficulty. Another consideration is that lack of social support also is not an isolated cause of preterm birth. It is important in the experience of stress and perhaps needs to be considered as a mediator of stress rather than a direct factor.

The magnitude of the life-course stressor, including both the intensity of experience and experiencing multiple stressors concurrently, was also very important in the embodiment of stress experienced by subjects in this study. Many studies that have examined preterm birth have not measured intensity or multiplicity while assessing stress, or they have measured perceived stress only during pregnancy (Hobel, 2004). Yet stress biology suggests a life-course approach to stress assessment is imperative.

The HPA axis differentially responds to threats or stressful stimuli secreting CRH and vasopressin (AVP) from the hypothalamus, adrenocorticotrophic hormone (ACTH) from the pituitary and ultimately glucocorticoids from the adrenal cortex, primarily cortisol (S. M. Smith & Vale, 2006). Cortisol has a functional role in response to a threat, but also exerts negative feedback on CRH release and ACTH to limit the response when the threat passes. In pregnancy, CRH is secreted not only from the hypothalamus, but also the placenta. Placental CRH is identical to hypothalamic CRH in structure and function (Petraglia et al., 1990), but while glucocorticoids exerts a negative control on hypothalamic CRH secretion, they stimulate further secretion of CRH in the placenta. A positive feedback loop is therefore created resulting in a progressive rise in CRH, ACTH and cortisol throughout pregnancy (Petraglia et al., 1994). CRH plays a key role in labor as it activates receptors on myometrial smooth muscle, and CRH and oxytocin have a synergistic effect on myometrial contractility (Romero et al., 2004). Placental CRH also crosses the placenta and activates the fetal HPA axis, stimulating fetal secretion of cortisol and DHEA-S, a precursor for estrogen stimulation in the placenta. Placental estrogens lead a hormonal cascade ending in myometrial contractility and labor (Challis, 2000).

Repeated exposure to stress throughout the lifespan will cause lasting physiologic changes to the brain, altering neuroendocrine and neuroimmune reactive responses (Henry, 1982, 1992) and several different patterns of HPA dysregulation have been noted in response to chronic stress (Holzman et al., 2001; Susman et al., 1999). Animal models have provided significant evidence of the effects of chronic stress (Seligman et al., 1980; Weiss & Glazer, 1975). Rodent studies by Richardson and colleagues (Richardson et al., 2006) demonstrated that varied, repeated, stressful early life experiences shape brain function and behavior in adulthood including dysregulation of the HPA axis response to stressors. Evidence also suggests there may be critical periods where individuals are more vulnerable to neural changes related to chronic stress. In-utero (Coe & Lubach, 2005), early life (McEwen, 2003; Repetti et al., 2002), and adolescence (McEwen & Dhabhar, 2002) may be three such critical periods. The effects of chronic stress are important because they clarify that stress across the life-course may impact reproductive outcomes, not simply experiences during pregnancy. The findings of this study support this biological evidence. The differences noted between preterm and fullterm groups were not differences in experiences during pregnancy; they were differences in women's experiences of stress throughout their life-courses. With a foundation of stress physiology, the impact of intense and multiple stressors that were experienced throughout the life-course by subjects in this study becomes a concern because of the HPA dysregulation that can result. A limitation of this study is that biologic markers of stress and HPA dysregulation were not concurrently evaluated and that is an important area for future research.

Resiliency, a woman's ability to thrive despite stress and difficulties, was important in her overall experience of stress and may add to her protective factors on her life-course trajectory. The PTB literature conceptualizes and measures resilience through scales such as self-esteem, mastery, perceived control and optimism. Self-esteem has been found to have inconsistent results. One study (Edwards et al., 1994) measured self-esteem with the Rosenberg Self-Esteem Scale and found low self-esteem to be a strong predictor for PTB ($p < .001$); another using the same scale did not find significance ($p = .075$) (Jesse et al., 2003). A third study (Rini et al., 1999) combined self-esteem with mastery and optimism measures and found significance for birth weight, but not gestational age. Studies measuring mastery (Copper et al., 1996) and optimism have not found significant relationships with PTB. One study, however, did demonstrate external locus of control to be a predictor of PTB (OR 1.75) (Misra et al., 2001). This is consistent with the theory that a lack of a sense of control is a defining element for activation of the HPA axis in response to a stressor (Huether, 1996). While the few studies that have been conducted in this area have not provided strong relationships to PTB, there are several significant limitations with how resiliency has been measured. The areas of resiliency that have been significant in previous studies are consistent with resiliency being a mediator of stress rather than a stand-alone factor. The construct of resiliency, refined by the findings of this study, may add significant dimensions to assessment and development of resiliency.

Conclusion

This study provided insight into the experience of stress for a population of AA women, some of whom experienced PTB. In particular, the findings demonstrate how

generalized stress assessment tools may easily miss the critical intensifiers of stress that may be related to poor health outcomes. Resiliency is also an important dynamic influence on impact of life-course stress and needs to be assessed in conjunction with stress. Until more specific, nuanced measures of stress and resiliency are developed, reported stress will continue yield inconsistent results, poorly correlated to outcomes.

The strengths of this study include a life-course approach to understanding the experience and embodiment of stress in AA women. As with all qualitative research, the results are not generalizable, but the results provide an evidence-based foundation for a more specific assessment of the life-course stress that may be important in preterm birth. Future goals of research would be linking life-course stress with HPA dysregulation and preterm birth.

The next steps in future research are to develop evidence-based psychometric assessment tools of life-course stress and resiliency, testing the validity of the factors identified through this inductive research. Subjective reported stress needs to then be correlated with biomarkers of stress and perhaps inflammation such as CRH and cytokines, as well as with outcomes such as PTB. By developing strong stress assessment measures, stress-related PTB can be better assessed, measured and work can proceed towards prevention.

Chapter 8**Conclusion**

The goal of this qualitative study was to understand the dimensions and individual meaning of life-course stress as experienced by AA women and to explore differences between women who delivered preterm and those who delivered fullterm. The data provide insight into the experience of stress by AA women and demonstrate there is a very dynamic relationship between stress, intensifiers of stress, coping and women's resiliency. These findings shed light on why the previous assessment of reported stress has not been effective in studies of stress and preterm birth. They also give an evidence-based foundation to build on for future assessment of stress and PTB in AA women.

The Life-Course Health Development model (M. C. Lu & Halfon, 2003) hypothesizes racial-ethnic disparities in health outcomes such as preterm birth are a result of both a cumulative exposure to stress as well as exposures and experiences during critical periods early in life. Cumulative exposure to stress adds up over time creating an allostatic load that results in HPA and immune-inflammatory dysregulation. Critical exposures may impact developing and maturing organ systems, manifesting in disease later in life. The Life-Course Health Development model theorizes a woman's reproductive potential is a product of her developmental trajectory over her life course. The increased incidence of preterm birth in African American women, therefore, is attributed to exposures to more risk factors and less protective factors across the life span, especially during sensitive periods of development, as well as a lower starting point due to an intergenerational effect. Understanding and comparing the life course stress experiences of AA women was a first step towards testing this model. For many women in this study, life-course stress was not commensurate to the stress experienced specifically during pregnancy. The greater magnitude of life-course stress experienced by

women who delivered preterm is consistent with the LCHDM theorized trajectories. From a subjective perspective, early childhood and pre-teen and early adolescence seemed to be particularly critical periods in women's recounting of life-course stress. Further study is needed to determine if these subjective accounts are correlated with HPA and immune dysregulation and PTB.

Intersectionality theory defines race, class and gender as historically created relationships of differential distributions of resources, privilege and power (Mullings & Schultz, 2006). Further, being at the intersection of multiple oppressions has a multiplicative effect not explained by the individual impact of each. In this study, intersectionality was integral to understanding the context of women's lives as well as in their conditions of stress. Women interviewed were each in their unique intersection of relationships of power, resources, privilege. Many lived currently or in their youth in areas of concentrated poverty and the effects of that are seen in the social and physical geographies. Social and physical geographies are products of macro level forces: hegemony of racial formation and the concentration and social isolation outlined in GU. As women, they were at the intersection of the multiple social realms and stereotypes outlined in BFT. These individual hierarchies impacted the magnitude of stressors and the resources they had for resiliency and coping.

The most pertinent conditions of stress reported from women were child abuse and neglect in their younger years, living with substance abusing parents, separation from family members through death of a parent or placement in the foster care system, and traumatic events such as rape, kidnapping and murders. To impact the life-course stress of women, upstream interventions are indicated to prevent abuse and violence in

communities, to prevent substance abuse and to heal family systems. Financial stressors and unemployment were other common sources of stress for women in lower SES.

Several women were single mothers trying to provide the necessities of life, including rent, utilities, food and childcare for their families on a minimum wage salary and they found it was not possible. They were forced into being in “the system,” public assistance, in order to survive and gave up attempting to work. There was a loss of dignity and stress associated with chronic unemployment for some. Interventions to prevent this type of stress also need to be upstream with economic, education and work reform.

The condition or the trigger of stress is not important in isolation. Each woman is embedded in the context of her life and may have a very different experience under similar circumstances. For example, living in a dangerous neighborhood was not described as stressful to some, while it was extremely stressful to others. Relationship breakups and divorce were very stressful to some, not to others. A list of life events, as a common mechanism for measuring stress, will therefore never be adequate, consistent, or valid. One approach in the literature on measuring chronic stress and preterm birth is a retrospective self-report count of life events deemed stressful. Several studies used this approach as a measure of stress in examining the relationship between stress and PTB. None of the studies found significant relationships between a count of life events and PTB (Dole et al., 2003; Goldenberg et al., 1996; Stein et al., 1987; Wadhwa et al., 1993). The meaning ascribed to an experience is more important than the event itself or the number of events.

Stress is a general term women applied to vastly different experiences. With participants in this study it was used to describe experiences from the mundane daily

hassles to life- traumatic events. Another avenue of research into stress and PTB has attempted to assess individual perception of stress by using the Perceived Stress Scale (Cohen et al., 1983) or Spielberger's State Anxiety Scale (Spielberger, 1983), considered standard stress measures, yet these studies yield inconsistent results (Glynn et al., 2008; Hobel, Arora, et al., 1999; Mancuso et al., 2004; Ruiz et al., 2002) despite numerous studies demonstrating physiologic evidence of increases in stress leading to PTB (Erickson et al., 2001; Hobel, Arora, et al., 1999; Wadhwa et al., 2004). Therefore, one can conclude that these general stress measures are not specific enough to capture the aspects of stress relevant to PTB. Using the various dimensions of experiencing stress, such as the various emotions and qualities associated may provide more specific measures and allow researchers to determine the important dimensions of stress related to health outcomes.

Research within the stress field suggests the type of stressor may mediate the stress pathway and hypothalamic pituitary adrenal (HPA) activation. An individual's sense of controllability of the stressor (Huether, 1996; Sapolsky, 1993) and a perceived threat to social self (Gruenewald et al., 2004) are two well established mediators have been identified that preferentially activate the HPA axis. If the stressor is perceived as controllable, the stressful effects are minimal, while the experience of a lack of control within the stressor increases HPA activation (Huether, 1996; Sapolsky, 1993). Powerlessness and lack of control were very common dimensions of stress identified by women within this study. A threat to social self is defined a perceived threat to one's social value or standing which elicits feelings of low social worth and shame and has also been associated with HPA activation (Gruenewald et al., 2004) . Several areas were

identified within this study that could be experienced as a threat to social self, including inconsequentiality, shame and embarrassment related stress, and situations where participants felt judged. Finally, more recent research suggests that a third factor, position within a hierarchy, may also shape reactivity to stress. It has been observed in multiple animal models and the phenomenon is now being observed within human relationships (McEwen & Seeman, 1999; R. G. Wilkinson, 1999). The subjective social status is an important element of position within the hierarchy and has been linked with both HPA activation and pro-inflammatory immune mediators (Gruenewald et al., 2006). Hierarchy and a woman's place within both her macro- and micro-social hierarchies as well as assertiveness and aggressiveness as a means of coping were also significant with the participants in this study, lending confirmation to the physiological stress research.

In this study, several key dimensions of stress were identified. Stress was related in different circumstances to emotions of fear, anger, shame and sadness. In Folkman and Lazarus's (1984) seminal work on stress, different emotions were related with stress and in the psychology literature, core emotions are studied as very separate programs of research. However, in the medical literature, there is rarely such distinction. In recent years, cardiovascular studies have begun to look at the cumulative effects of anger (Change, et. al. 2002), but in the field of Obstetrics, specifically with PTB, stress has never been conceptualized in such a way. Breaking down the concept of stress into different emotional experiences may help to increase the specificity needed in assessment in the future.

The quality of stressful experiences was also pertinent. There is an emotional intensity associated with the experience and the retelling of stress experiences.

Powerlessness or lack of control was almost always associated with stress. This is consistent with previous work identifying control as a critical factor in stress cascades and HPA activation (Huether, 1996). Other qualities that were identified in this study were instability and insufficiency. Further study is needed to examine these individual dimensions of stress with HPA activation as well as with specific health outcomes such as PTB.

Coping of some form was always associated with stress for women in this study. Coping did not have to be socially acceptable for it to be effective for the woman. In understanding a woman's stress experience, an assessment of coping as well as how stress and coping function together to affect the woman may be beneficial. Some women reported extremely stressful experiences, but were extremely resilient, had good coping skills and had very little reported lasting negative effects. Similarly, other women discussed rather common experiences, yet did not have support in place, had very ineffective coping and suffered ongoing burdens from the stress experience or from negative consequences associated with their coping. Stress cannot be viewed in isolation. Future studies examining the role of stress need to include assessment of coping simultaneously.

The lasting effect of stress may be personal strength and increased resiliency, it may be intensified stress experience, or it may just linger with a conscious or unconscious stress burden. The consequences of stress have much to do with the intensity of the experience and if there are multiple stressors at once, as well as the nature of a woman's coping and resiliency. It is also a very individual experience and needs to be

considered with the individual meanings ascribed. Further study is again indicated, to understand if the consequences of stress are important in the overall impact on health.

There were several factors identified that intensify the experience of stress for women including a lack of social support, a limited perspective within the situation or their lives, the intensity and magnitude of the stressors and facing multiple stressors concurrently. There also several differences identified between women who delivered preterm and those who delivered fullterm, including the magnitude of the stressor, the social and physical geographies of women's lives, and a woman's place within her macro and micro social hierarchies. These "risk factors" may be particular areas of concern when examining women's life course trajectories.

The finding of social support as an important factor is a woman's experience and embodiment of stress is supported by a consensus of work in public health and medical literature that validates the protective effect of social connectiveness and support on health (Berkman, 1995; Broadhead et al., 1983). In pregnancy, however, there has been little evidence that social support prevents preterm birth (Orr, 2004). Social support, as it is operationalized in studies, however, is riddled by conceptual and measurement inconsistencies. Because social support is such a broad, ill-defined category, there may well be very important elements that are being missed because of the generalized conceptualization and measurement.

What was found with participants in this study was that the experience of stress was intensified for women who existed in a social isolation, where they felt they had no one to turn to for support or help in times of difficulty. Having a support person to communicate with and maternal support improved resiliency. Another consideration is

that lack of social support also is not an isolated cause of preterm birth. It is important in the overall experience of stress and perhaps needs to be considered as a mediator of stress rather than a direct factor. There is a very dynamic process of stress and resiliency. Preventing social isolation, providing support is one piece of many that need to be enacted to prevent stress-related PTB. The support offered may explain the modest prevention of PTB provided by Centering Pregnancy model prenatal care (Ickovics et al., 2007).

The magnitude of the life course stressor, including both the intensity of experience and experiencing multiple stressors concurrently, was also very important in the embodiment of stress experienced by subjects in this study. Many studies that have examined preterm birth have not measured intensity or multiplicity while assessing stress, or they have measured perceived stress only during pregnancy. Yet stress biology suggests a life course approach to stress assessment is imperative.

The HPA axis differentially responds to threats or stressful stimuli. Repeated exposure to stress throughout the lifespan will cause lasting physiologic changes to the brain, altering neuroendocrine and neuroimmune reactive responses (Henry, 1982, 1992) and several different patterns of HPA dysregulation have been noted in response to chronic stress (Holzman et al., 2001; Susman et al., 1999). Animal models have provided significant evidence of the effects of chronic stress (Seligman et al., 1980; Weiss & Glazer, 1975). Rodent studies by Richardson and colleagues (Richardson et al., 2006) demonstrated that varied, repeated, stressful early life experiences shape brain function and behavior in adulthood including dysregulation of the HPA axis response to stressors.

Evidence also suggests there may be critical periods where individuals are more vulnerable to neural changes related to chronic stress. In-utero (Coe & Lubach, 2005), early life (McEwen, 2003; Repetti et al., 2002), and adolescence (McEwen & Dhabhar, 2002) may be three such critical periods. The effects of chronic stress are important because it clarifies that stress across the life course may impact reproductive outcomes, not simply experiences during pregnancy. The findings of this study support this biological evidence. The differences noted between preterm and fullterm groups were not differences in experiences during pregnancy; they were differences in women's experiences of stress throughout their life courses. With a foundation of stress physiology, the impact of intense and multiple stressors that were experienced throughout the life course by subjects in this study becomes a concern because of the HPA dysregulation that can result. A limitation of this study is that biologic markers of stress and HPA dysregulation were not concurrently evaluated and that is an important area for future research.

Resiliency, a woman's ability to thrive despite stress and difficulties, was important in her overall experience of stress and may add to her protective factors on her life course trajectory. The PTB literature conceptualizes and measures resilience through scales such as self-esteem, mastery, perceived control and optimism. Self-esteem has been found to have inconsistent results. One study (Edwards et al., 1994) measured self-esteem with the Rosenberg Self-Esteem Scale and found it to be a strong predictor for PTB ($p < .001$); another using the same scale did not find significance ($p = .075$) (Jesse et al., 2003). A third study (Rini et al., 1999) combined self-esteem with mastery and optimism measures and found significance for birth weight, but not gestational age.

Studies measuring mastery (Copper et al., 1996) and optimism have not found significant relationships with PTB. One study, however, did demonstrate locus of control to be a predictor of PTB (OR 1.75) (Misra et al., 2001). This is consistent with the theory that a lack of a sense of control is a defining element for activation of the HPA axis in response to a stressor (Huether, 1996). While the few studies that have been conducted in this area have not provided strong relationships to PTB, there are several significant limitations with how resiliency has been measured. The areas of resiliency that have been significant in previous studies are consistent with resiliency being a mediator of stress rather than a stand-alone factor. The construct of resiliency refined by the findings of this study may add significant dimensions to assessment and development of resiliency.

Even with a life-course approach to understanding stress and PTB, there are several recommendations practitioners enact with clients during pregnancy that may help decrease the effects of stress on PTB. The first is to ask about stress. Often the subject is ignored, perhaps because do not feel they have any way of changing things for the client, however, just talking about stresses may be of some help to clients. Practitioners need to assess for abuse, domestic violence and unstable family situations and refer to a social worker or appropriate community resources as needed. All women should be educated about early signs of preterm labor and PTB and what to do if preterm labor begins. Practitioners need to educate about and encourage stress relief strategies, particularly prenatal yoga, prayer or meditation, communicating with support people, regular exercise, getting enough sleep and taking a few minutes every day doing what works for the individual to decrease stress and improve coping. Stress interventions need to be framed as important for the health of the pregnancy and the child not simply a luxury.

Discuss the importance of attitude in approaching stressors, perhaps helping clients refocus the problem with a new perspective and re-framing things to help them take back control if possible. Consider starting stress and pregnancy support groups or prenatal yoga classes within your practice. Finally, consider offering Centering Pregnancy as an option for prenatal care.

The strengths of this study include a life course approach to understanding the experience and embodiment of stress in AA women. African American women are at higher risk for PTB and a litany of other poor health outcomes. Stress must be better understood in order to effectively assess and intervene to prevent stress-related disease. This description of the experience of stress in AA women gives a solid foundation to build on for stress measurement in future studies of stress and preterm birth. Other strengths of the study are the in depth nature of interview that was conducted with each participant, and that developing concepts were discussed with participants and refined with their input. A weakness with this study, as with all qualitative research, is that the results are not generalizable. The results do, however, provide an evidence-based foundation for a more specific assessment of the life course stress that may be important in preterm birth. Future goals of research would be linking life course stress with HPA dysregulation and preterm birth.

The next steps in future research are to develop evidence-based psychometric assessment tools of life-course stress and resiliency, testing the validity of the factors identified through this inductive research. Such a tool would include assessment of cognitive and affective dimensions of stress, intensifiers, coping, resiliency and burdens of stress. Subjective reported stress needs to then be correlated with biomarkers of stress

and perhaps inflammation such as CRH and cytokines, as well as with outcomes such as PTB. By developing strong stress assessment measures, stress-related PTB can be better assessed, measured and work can proceed towards prevention.

Table 1
HPA Markers of Stress and Preterm Birth

Reference	Measure	When Measured/Whom?	Outcome	Comments
(McLean et al., 1995)	CRH	Less than 37 wks GA	Highest 20 days before delivery	Prospective, longitudinal n=361
	CRH-Binding Protein	10 days before delivery	Higher	
(Korebrits et al., 1998)	CRH	28-36 weeks in PTL/PTB	Higher	n=233, convenience sample. Controlled for chorio – evidence for 2 separate pathways of PTB
	ACTH	28-36 weeks in PTL/PTB	Not Sig	
	Cortisol: Coster ratio	28-36 weeks in PTL/PTB	Higher	
	Cortisol binding cap	28-36 weeks in PTL/PTB	Not Sig	
(Hobel, Dunkel-Schetter, et al., 1999)	CRH & ACTH	18-20 weeks GA (not in labor)	Higher	Prospective, case matched PTB Small sample (n=18) possible Type 1 error
		28-30 weeks GA	Higher	
	35-36 weeks GA	Higher		
	Cortisol	18-20 weeks GA	Higher	
		28-30 weeks GA	Higher	
		35-36 weeks GA	Not Sig	
(Moawad et al., 2002)	CRH, alk phos, AFP	24 weeks GA	Higher (p<.10)	n=2929
		28 weeks	Higher	
(Mancuso et al., 2004)	CRH:GA	18-20 weeks GA	r= -0.37	Correlation
		28-30 weeks GA	r= -0.41	
(Wadhwa et al., 1998)	CRH	28-30 weeks GA	Higher	n=63, prosp. 35% var in GA at delivery
(Wadhwa et al., 2004)	CRH	33 weeks GA	Higher	n=232, prospective, 3.3 RR for PTB 3.6 RR for IUGR
(Campbell et al., 2005)	CRH, ACTH, Cortisol	22-27 weeks GA, admit for PTL	Elevated WBC better predictor for PTB	n=218, convenience sample Multivariate logistic reg

HPA Markers of Stress and Preterm Birth

(Sibai et al., 2005)	CRH	16-20 weeks GA	Not sig	n=170, CRH was secondary analysis of 17P injections to prevent PTB
(Sandman et al., 2006)	CRH	15 weeks GA	Not Sig	n=203, prospective
		19 weeks GA	Not Sig	
		25 weeks GA	Not Sig	
		31 weeks GA	Higher	
	Cortisol	15 weeks GA	Higher	
		19 weeks GA	Not Sig	
		25 weeks GA	Not Sig	
		31 weeks GA	Not Sig	
	ACTH, β -endorphin	15 weeks GA	Not Sig	
		19 weeks GA	Not Sig	
		25 weeks GA	Not Sig	
		31 weeks GA	Not Sig	
(Makrigiannakis et al., 2007)	CRH and ACTH	Dx of PTL	Higher	Convenience sample Poor controls
(Holzman et al., 2001)	CRH	PTB before 35 weeks GA	Higher OR 2.3 in EA OR 5.0 in AA	n=97, retrospective from prenatal labs at 15-19 wks GA, case matched
(Erickson et al., 2001)	Total CRH	7-23 weeks GA	Higher	n=2927, prospective
	Free CRH		Not Sig	
	Bound CRH		Higher	
	CRH-BP		Higher	
	Cortisol		Not Sig	
	Total CRH	27-37 weeks GA	Higher	
	Free CRH		Higher	
	Bound CRH		Higher	
	CRH-BP		Lower	
	Cortisol		Higher	

Table 2
Immune dysregulation and PTB

Reference	Measure		Outcome	Comments
(Annells et al., 2004)	IL-10	Evaluated genetic differences in genes that coded for immune response	Significant	Matched 202 PTB with 170 FTB Blood cytokine levels not measured in participant
	TNF		Not Significant	
	IL-4		Significant	
	MBL		Not Significant	
(Menon et al., 2006)	IL-1	Stimulated from amniochorionic membranes Elective c-section, FTB	Increased AA	n=8 AA, n=8 EA EA women had more balanced pro- and anti-inflammatory response. AA demonstrated pro-inflammatory shift
	IL-6			
	IL-8		Increased AA	
	IL-10			
	COX-1			
	COX-2		Increased AA	
	PGDH			
(Menon et al., 2007)	IL-1 β	Amniotic fluid women with PTL with transvaginal/cesarean amniocentesis during active labor, before ROM	Higher in AA cases-AA controls Higher AA cases – EA cases	N=165 (52 AA, 113 EA) cases, 185 FT controls No difference in chorio dx Increased pro-inflammatory immune response
	IL-8		Higher in EA cases- EA controls No racial difference	

Immune dysregulation and PTB

(Abrams et al., 2004)	Measured 18 cytokines IL-6 and IL-8	Women with both chorioamnionitis and PTB	Significant increased	Nested case-control 42 cases, 99 controls Demonstrates pro-inflammatory rather than balanced immune response to pathogens
(Velez et al., 2007)	IL-6	Amniotic fluid	Significantly increased in PTB	N=496 EA and n=397 AA mothers and fetuses Genotype not predictor of PTB – increased pro-inflammatory response therefore considered environmental interaction
	IL-6R	Gene single nucleotide polymorphism	Significantly increased in PTB and AA both PT and FT	

Table 3
Grounded Theory – Basic Tenets

<ul style="list-style-type: none"> • Simultaneous data collection and analysis • Constructing analytic codes or categories inductively from the data rather than from pre-existing theory • Constant comparative analysis • Advancing theory development at each step of data collection and analysis • Memo-writing to elaborate categories, specify properties, define relationships and identify gaps • Theoretical sampling • Conduct lit review after developing independent analysis

(Charmaz, 2006, pp. 5-6)

Table 4
A Comparison of Grounded Theory and Dimensional Analysis

	Grounded Theory	Dimensional Analysis
<i>Qualitative Approach</i>	Basic tenets of GT	Basic tenets of GT
<i>Timing of analysis</i>	Begin immediately	Delay until larger bank of data collected
<i>Process of Analysis</i>	Comparative analysis	Natural Analysis Dimensionalizing through: Comparative analysis Conjuring dimensions/properties Assigning value Inferring
<i>Perspective</i>	Unaddressed	Identify multiple perspectives
<i>Goal</i>	One basic social process	Multiple social processes – What <i>all</i> is involved?

(Bower, 2009)

Table 5
Interview Questions

1. Would you tell me about your childhood? (Where did you grow up, who did you live with, what was it like?)
2. Throughout your life, what particularly good/wonderful/memorable experiences stand out for you?
3. Are there any particularly difficult or challenging experiences you would be willing to share?
4. Tell me about your pregnancy?
 - a. What was best about your pregnancy/Why?
 - b. What was worst about your pregnancy/Why?
5. Have you ever felt powerless? When have you felt that the most? Would you tell me about that?
6. Have you ever been treated differently or felt judged based on race or some other factor? Could you give me an example?
7. What does stress mean to you? Can you define it? What does it feel like?
8. What is stressful to you? Would you give me examples?
9. What do you do to deal with stress?

Figure 1 Mechanisms of Preterm Birth

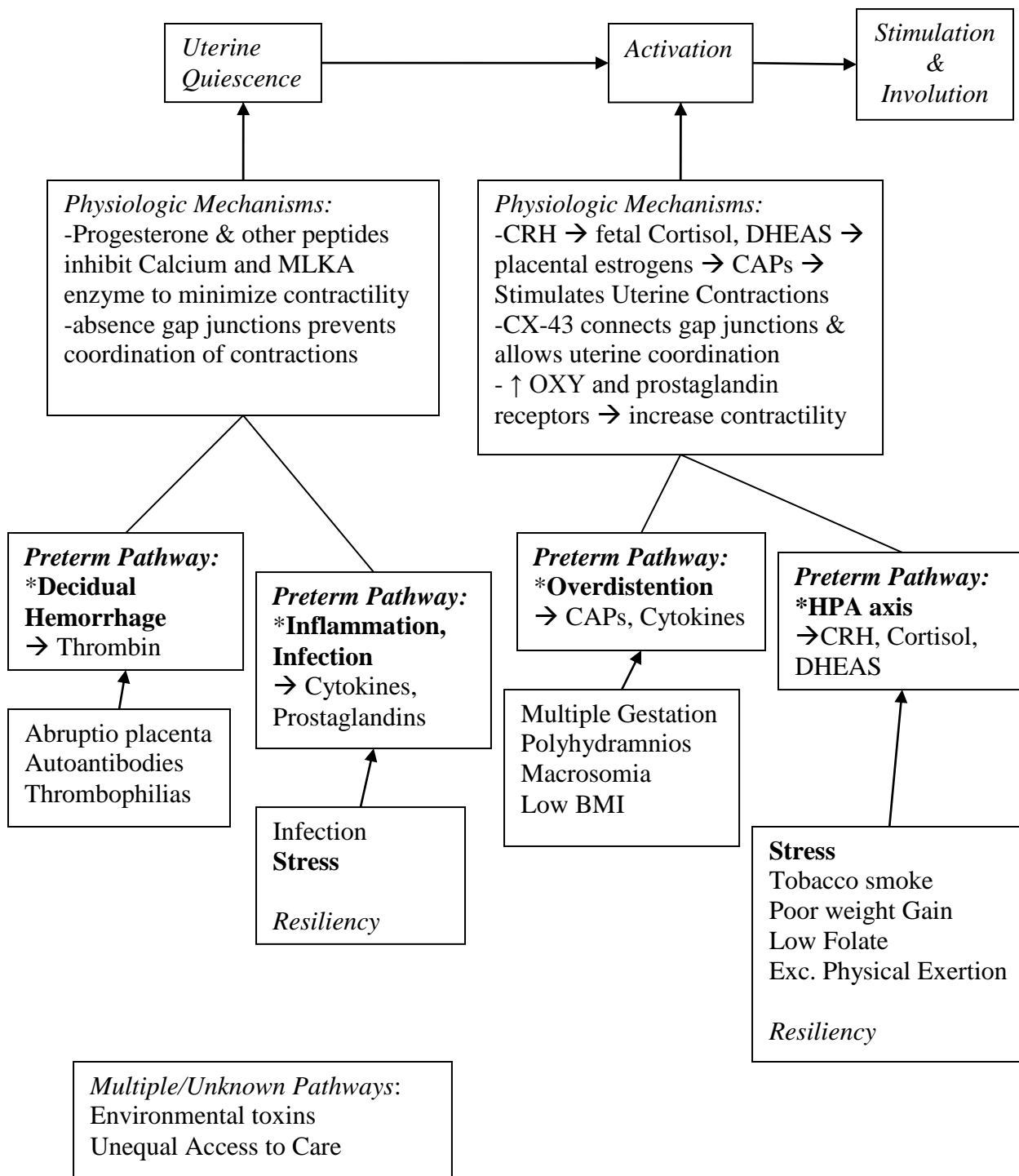


Figure 2
Stress Pathways

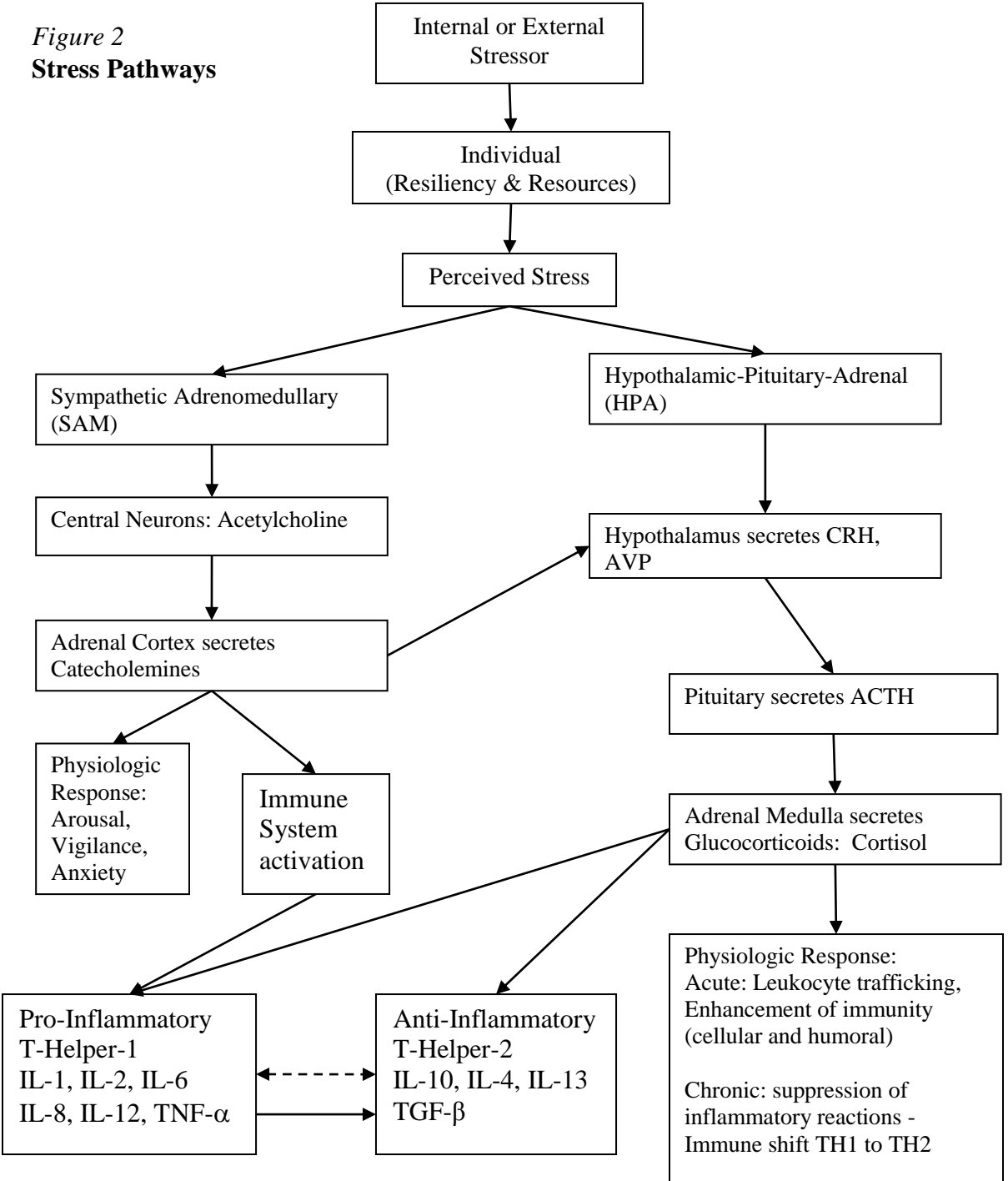


Figure 3
Chronic Stress & Preterm Birth

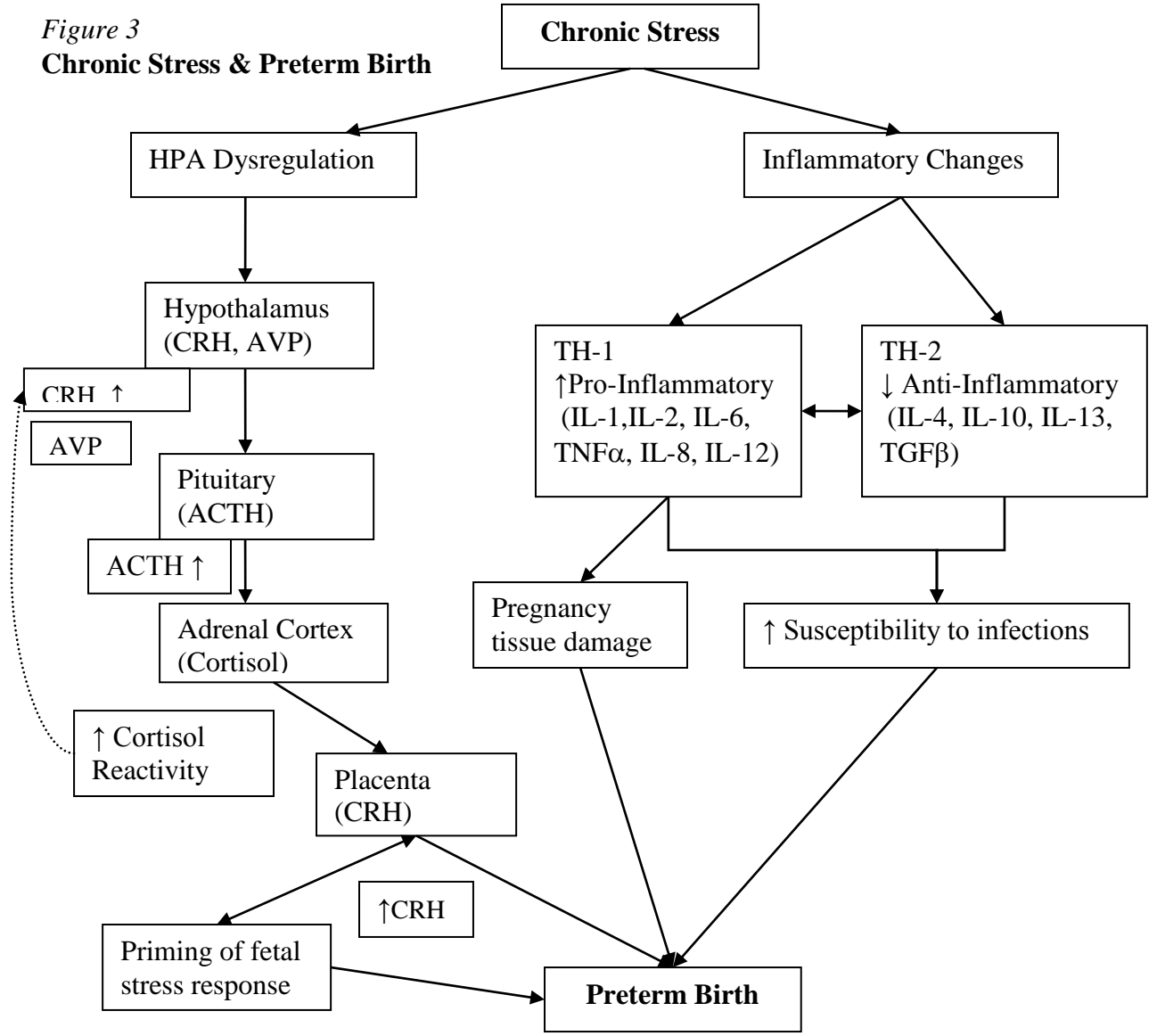


Figure 4

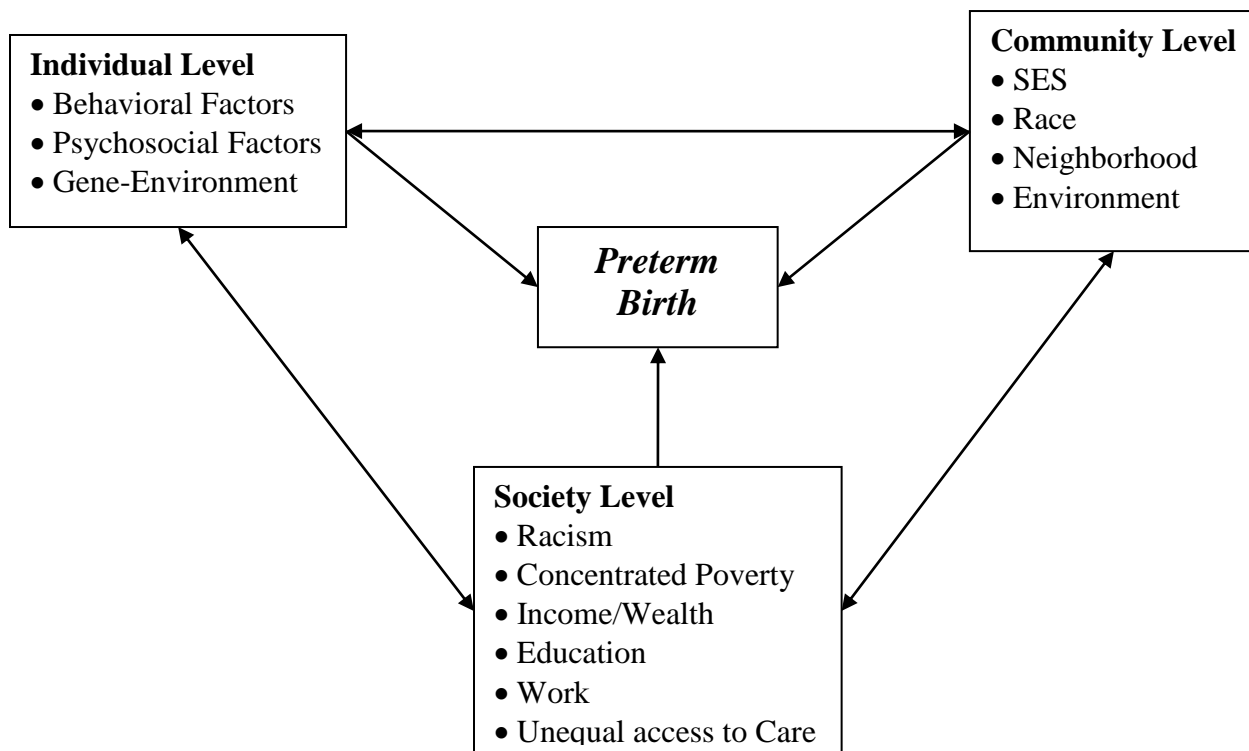
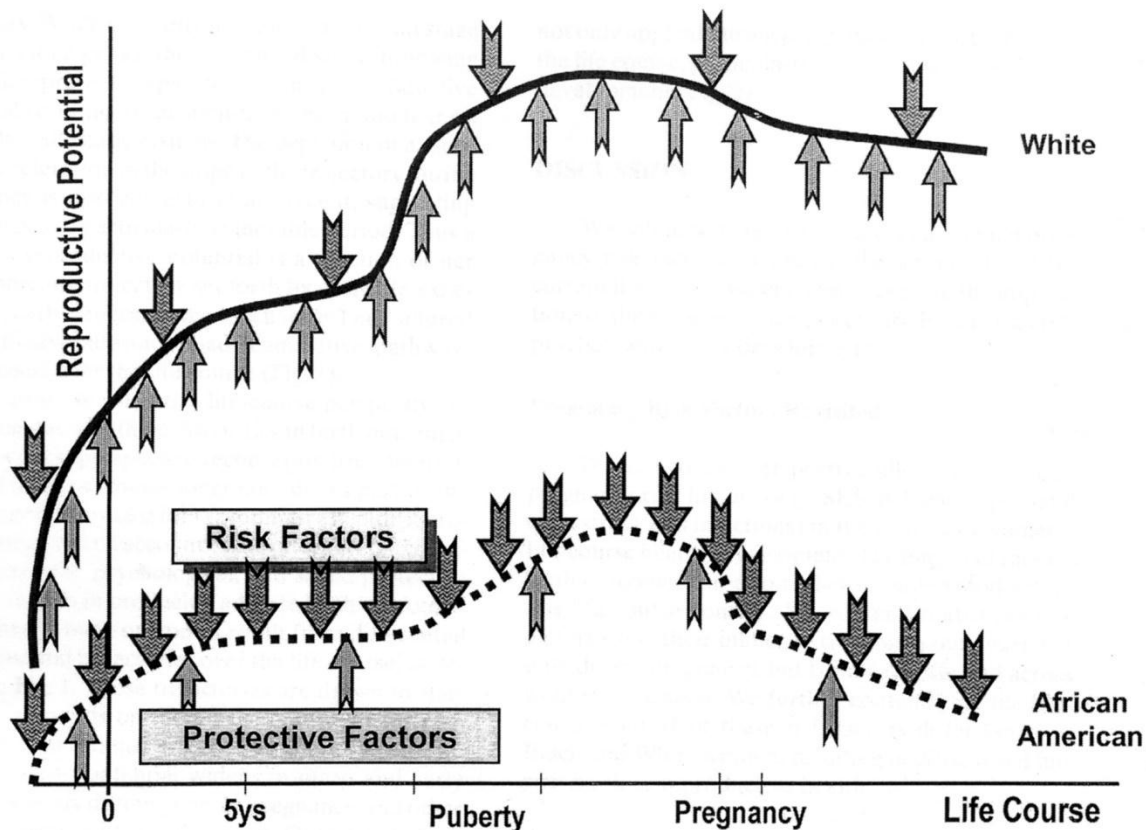
**Influences on Preterm Birth:
Chronic Stress**

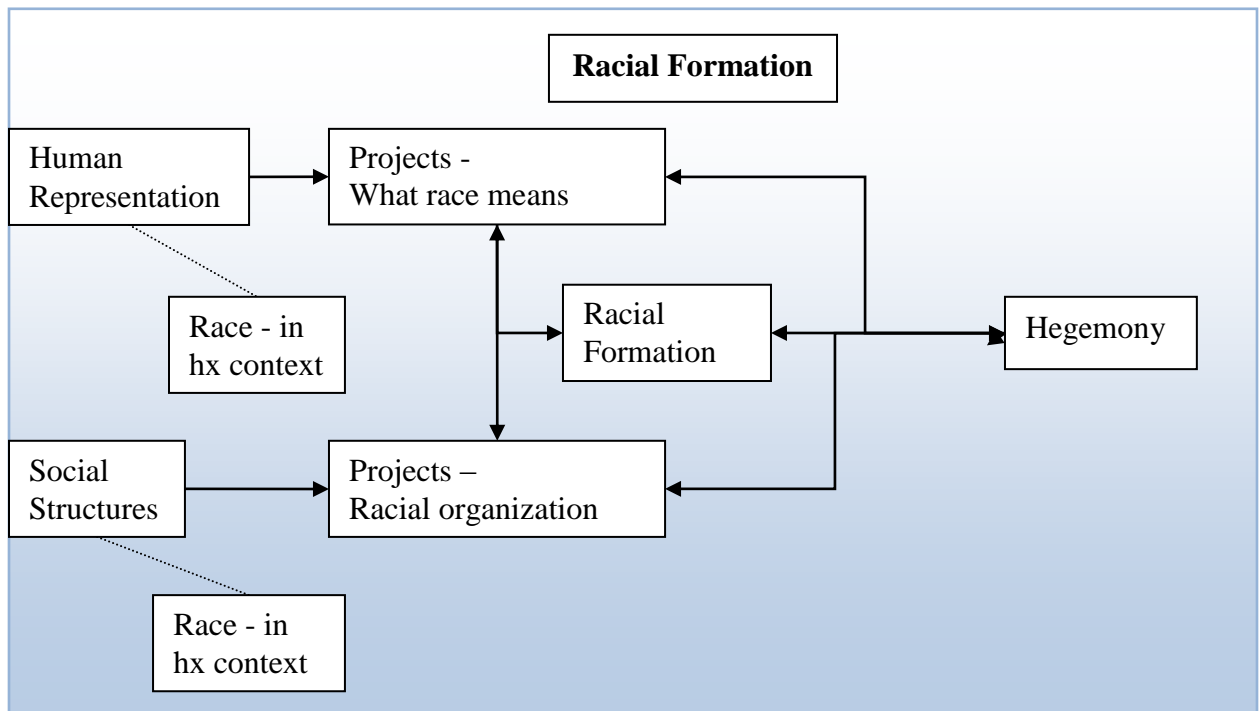
Figure 5
Life-Course Health Development Model
 (M. C. Lu & Halfon, 2003)



Statements in Life-Course Health Development Model

1. Allostatic load over the life-course affects reproductive health.
2. Critical periods during development encodes future reproductive potential.
3. EPM and CPM synthesized together develop health trajectories.
4. Risk factors “push down” on the health trajectory, decreasing reproductive potential.
5. Protective factors “push up” on the health trajectory, increasing reproductive potential.
6. A woman’s reproductive potential is a function of her developmental trajectory set forth by EPM with sensitive periods of vulnerability and altered by cumulative allostatic load over the life-course.
7. Disparities in birth outcomes result from differential developmental trajectories over the life-course.

Figure 6
Racial Formation Theory
(Omi & Winant, 1994)

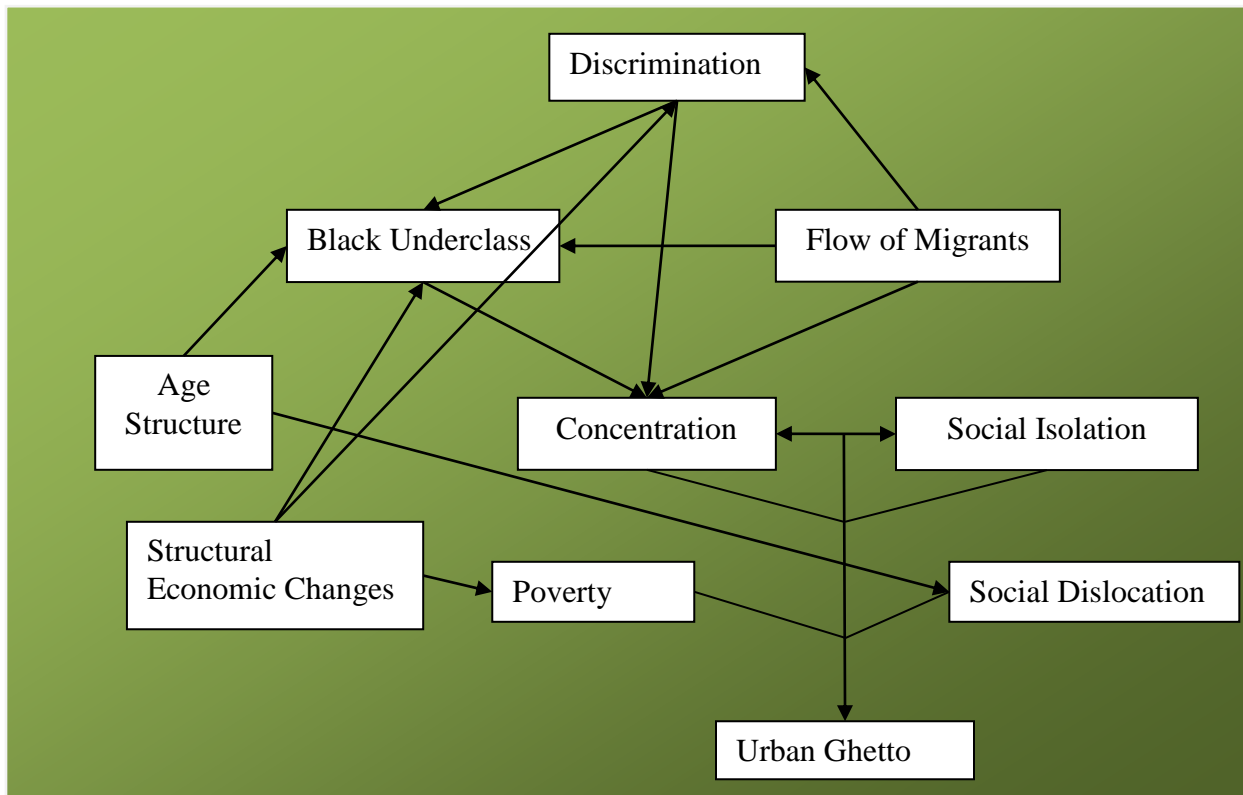


Statements of Racial Formation:

1. Race is a matter of both social structures and cultural representation.
2. Human bodies are represented and organized by historically situated projects.
 - a. It is not possible to represent race discursively without simultaneously locating it, explicitly or implicitly, in a social structural and historical context.
3. Social structures are represented and organized by historically situated projects.
 - a. It is not possible to organize, maintain, or transform social structures without simultaneously engaging, explicitly or implicitly, in racial signification.
4. Process of RF occurs through a linkage of both structure and representation.
5. The process of RF occurs in two steps: development of historically situated projects, and then evolution of hegemony.
6. Racial projects connect what race means in a particular discursive practice, with the ways in both social structures and everyday experiences are organized based upon that meaning
7. Society is suffused with racial projects, large and small, to which all are subjected.
8. Projects are building blocks not just of racial formation, but of hegemony in general.

9. Since racial formation is always historically situated, our understanding of the significance of race and of the way race structures society, has changed enormously over time. . . the contemporary racial order remains transient.
10. To recognize the racial dimension in social structure is to interpret the meaning of race.
11. It is not possible to organize, maintain, or transform social structures without simultaneously engaging, explicitly or implicitly, in racial signification.
12. To identify a racial project as racist, one must demonstrate a link between essentialist representations of race and social structures of domination.

Figure 7
Ghetto Underclass Theory
 (Wilson, 1987)



Statements of Ghetto Underclass Theory

Discrimination

1. There is no doubt that contemporary discrimination has contributed to or aggravated the social and economic problems of the ghetto underclass (p. 30), however, historic discrimination is far more important than contemporary discrimination (p. 32).
2. One of the legacies of historic discrimination is the large black underclass in central cities (p. 33).

Flow of Migrants

3. The dynamic factor and perhaps most important single contributor to varying rates of urban racial and ethnic progress in the 20th U.S. is the flow of migrants (p. 33).
4. The flow of migrants made it much more difficult for blacks to follow the path of both the new European and Asian-Americans in overcoming the negative effects of discrimination by finding special occupational nooks (p. 34).
5. Sizable numbers of newcomers raise the level of ethnic and/or racial consciousness on the part of other members of the group (p. 34).
6. The continuous migration of blacks from the South to the North coupled with the curtailment of immigration from eastern, central and southern Europe created a situation in which other whites muffled their negative disposition toward the new Europeans and directed their antagonisms against blacks (p. 34).

Age Structure

7. The higher the median age, greater its representation in higher income categories and professional positions.
8. On the basis of age alone one would expect blacks and Hispanics to contribute disproportionately to the increased rates of social dislocation in the central city such as crime.
9. Youth is not only a factor in crime; it is also associated with out-of-wedlock birth, female-headed homes and welfare dependency.

10. An abrupt rise in the number of young persons has an exponential effect on the rate of certain social problems. There may be a critical mass of young persons in a given community such that when that mass is reached or is increased suddenly and substantially, a self-sustaining chain reaction is set off that creates an explosive increase in the amount of crime, addiction and welfare dependency.

Basic Economic Changes

11. All major northern cities had consistent job losses in industries where employer education averaged less than HS degree and consistent employment growth in industries where workers on average acquired some higher education.
12. Urban minorities have been particularly vulnerable to structural economic changes such as the shift from goods-producing to service-producing industries, the increasing polarization of the labor market into low-wage and high-wage sectors, technological innovations, and the relocation of the manufacturing industries out of the central cities.
13. (There is) a serious mismatch between current education distribution of minority residents in large northern cities and the changing education requirements of their rapidly transforming industries bases.
14. This mismatch is one of the reasons why both unemployment rates and labor-force dropout rates among central-city blacks are much higher than those of central-city residents, and why black unemployment rates have not responded well to economic recovery in many northern cities.
15. Nearly all of the national growth in entry-level and other low education requisite jobs has accrued in the suburbs, exurbs and non-metropolitan areas far removed from growing concentrations of poorly educated urban minorities.
16. Low wage and newly hired workers, disproportionately represented by blacks are most adversely affected by a slack economy.
17. Economic problems of low income blacks have been reinforced by labor surplus environment – employers can be particularly choosy about whom they hired.

Concentration Effects

18. Heavily concentrated in the central cities, blacks have experienced a deterioration of their economic position on nearly all the major labor-market indicators.
19. The exodus of middle and working class families from many ghetto neighborhoods removes an important social buffer that could deflect the full impact of the kind of prolonged and increasing joblessness that plagued inner-city neighborhoods, created by uneven growth and periodic recessions.
20. Even if the truly disadvantaged segments of an inner-city area experience a significant increase in long-term spells of joblessness, the basic institutions in that area (churches, schools, stores, recreational facilities, etc.) would remain viable if much of the base of their support comes from the more economically stable and secure families; moreover, the very presence during such periods provides mainstream role models that help keep alive the perception that education is meaningful, that steady employment is a viable alternative to welfare, and that family stability is the norm, not the exception.
21. Communities of the underclass are plagued by massive joblessness, flagrant and open lawlessness and low-achieving schools and therefore tend to be avoided by outsiders.
22. Significant increase in the poverty concentration in these overwhelmingly black communities is related to the large out-migration of non-poor blacks (p. 50)
23. A simple comparison between poor whites and poor blacks is confounded by the fact that poor whites reside in areas which are ecologically and economically very different from blacks.

Social Isolation

24. Social isolation makes it much more difficult for those who are looking for jobs to be tied to the job network.
25. Social isolation also generates behavior not conducive to good work histories (tardiness and absenteeism), different from those that accompany a life of regular or steady work (waking up early in the morning to a ringing alarm clock).
26. The concept of social isolation does not mean that cultural traits are irrelevant, rather it highlights that culture is a response to social structural constraints and opportunities.

Summary

27. The increasing social isolation of the inner city is a product of the class transformation of the inner city, including the growing concentration of poverty in inner-city neighborhoods; and the class

transformation of the inner city cannot be understood without considering the effects of fundamental changes in the urban economy on the lower-income minorities, effects that include joblessness and that thereby increase the chances of long term residence in highly concentrated poverty areas. (p. 62)

28. Present-day discrimination has contributed to the increasing social and economic woes of the ghetto underclass, however, the problems are due to a far more complex web of other factors that include shifts in the American economy producing extraordinary rates of black joblessness, the historic flow of migrants, changes in the urban minority age structure, population changes in the central city and the class transformation of the inner city. (p. 62)

Figure 8
Black Feminist Thought
(P. H. Collins, 2000)

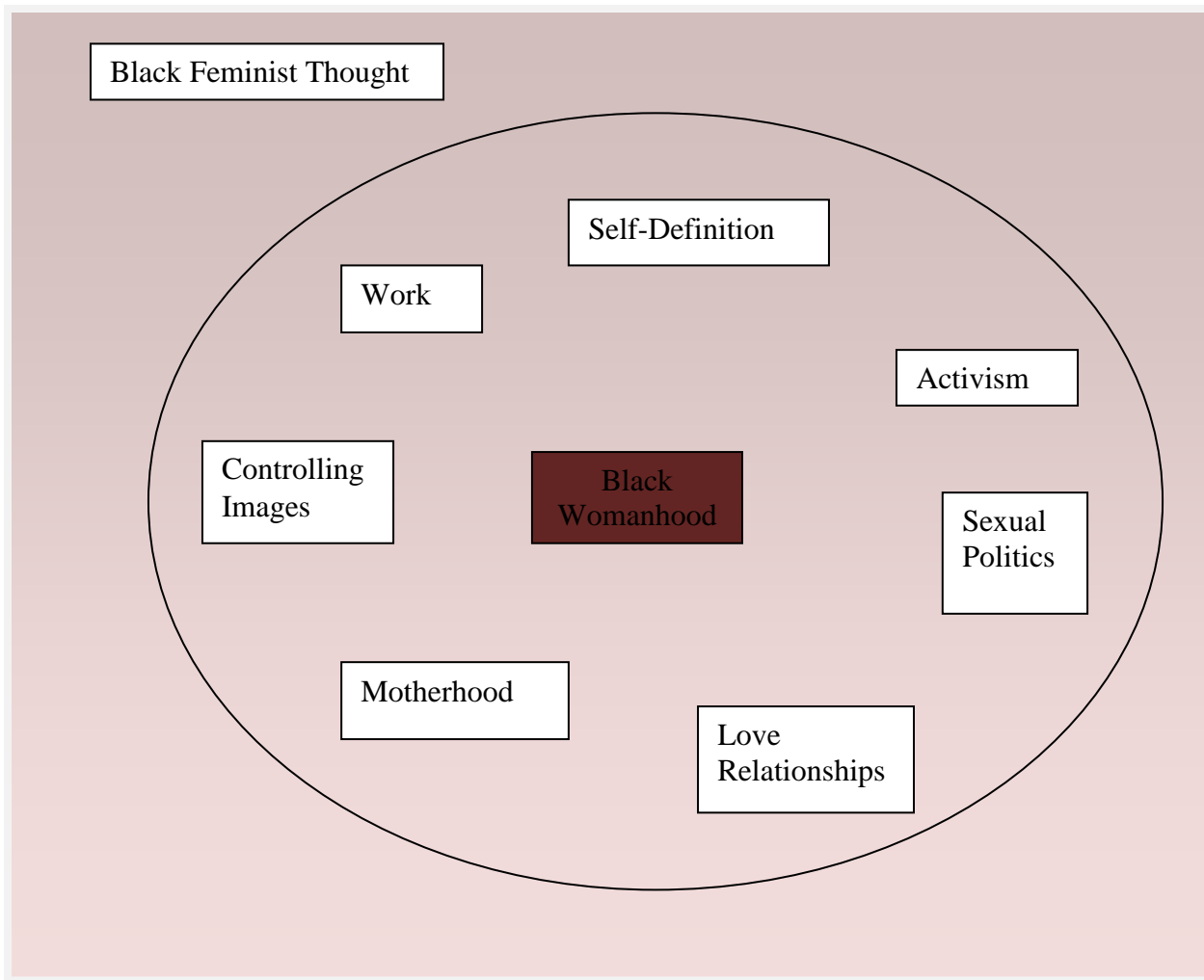


Figure 9
Intersectional Theory

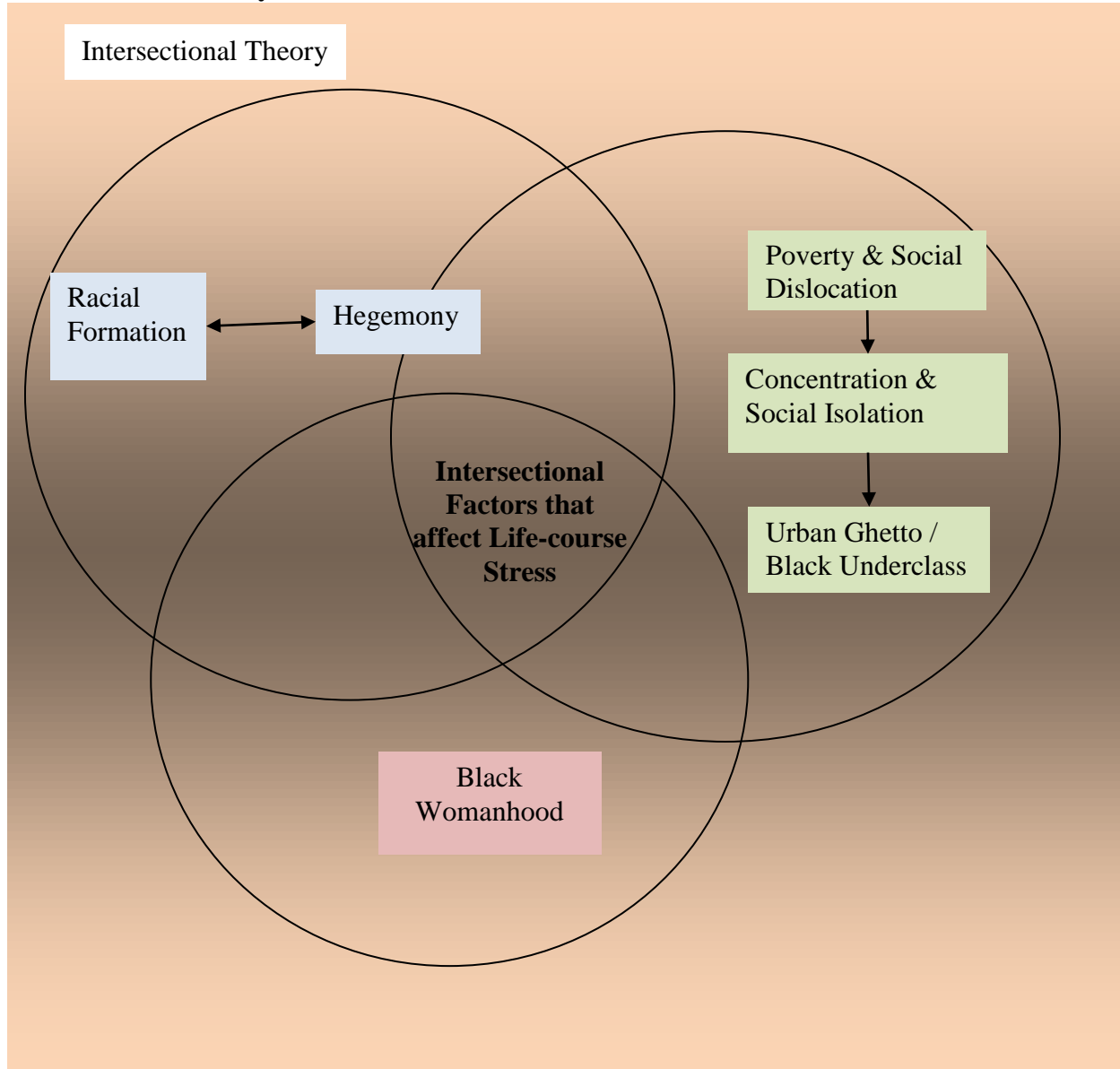
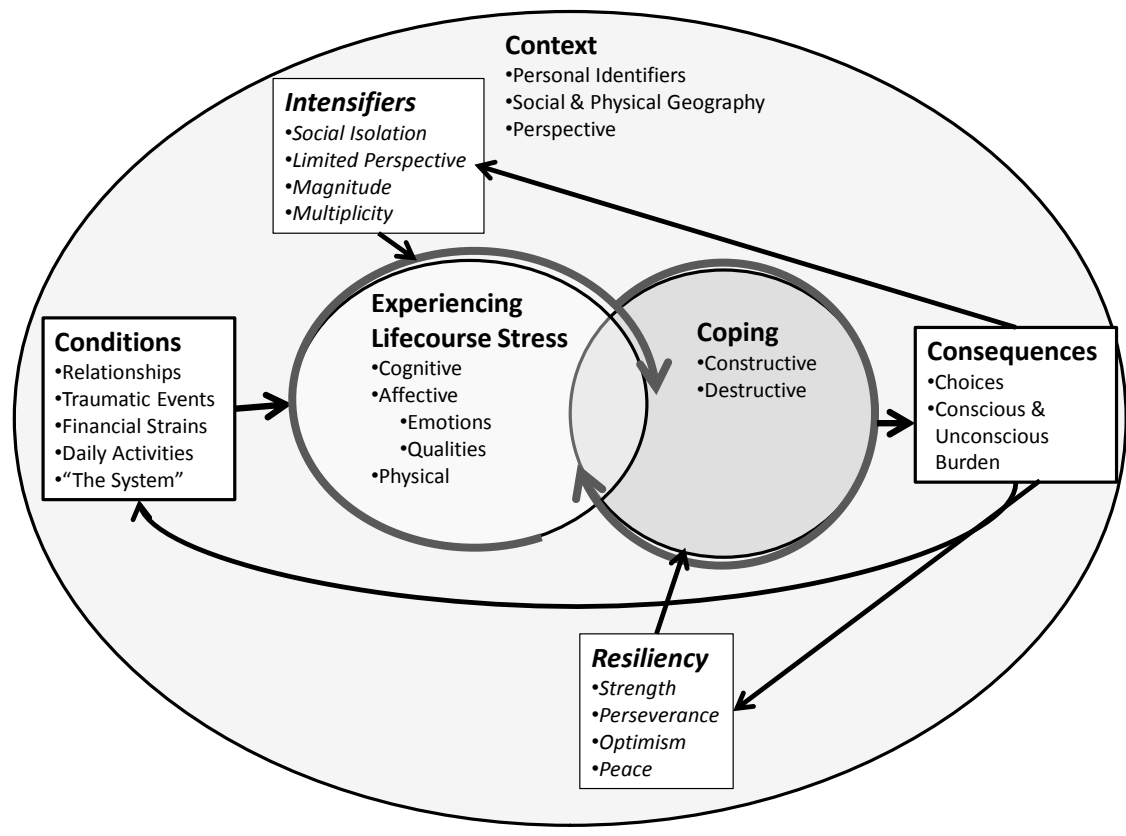


Figure 10
Experiencing Life-Course Stress



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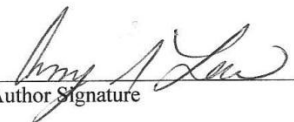
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