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# What Are The Relationships Among Cumulative Trauma, Posttraumatic Stress Disorder, Sleep Quality, And Perinatal Outcomes In African American Women?

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**WHAT ARE THE RELATIONSHIPS AMONG CUMULATIVE TRAUMA,  
POSTTRAUMATIC STRESS DISORDER, SLEEP QUALITY, AND  
PERINATAL OUTCOMES IN AFRICAN-AMERICAN WOMEN?**

by

**NANCY J. HAUFF**

**DISSERTATION**

Submitted to the Graduate School of

Wayne State University,

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

**DOCTOR OF PHILOSOPHY**

2015

MAJOR: NURSING

Approved By:

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Advisor

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## DEDICATION

To my husband Gary for without his ongoing love and support, this journey would not have been possible.

To the young mothers who opened their hearts and minds to share the traumatic events that they have experienced. As a society, we must do a better job to provide support, education, and opportunities for them so that they can heal, and effectively parent our next generation.

## ACKNOWLEDGEMENTS

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## CHAPTER 1 BACKGROUND, IDENTIFICATION OF VARIABLES, AND SIGNIFICANCE

Cumulative trauma exposure is known to have a negative effect on health outcomes (Kira, et al., 2008). Cumulative trauma events may be personal (childhood abuse, physical threat to self), family (abandonment or abuse by a parent), interpersonal (abuse at work), natural disasters or war, or collective identity (racism, discrimination). Infant mortality for African American women continues to be high with 11.8 per 1, 000 live births or fetal deaths, nearly one in eight pregnancies, and twice the rate of that among women from other racial groups (March of Dimes, 2013). Physical trauma, primarily the result of intimate partner violence or motor vehicle accidents, affects 6 to 8% of all U. S. births annually or approximately 30, 000 births a year (Mendez-Figueroa, Dahlke, Vrees, & Rouse, 2013; Oxford & Ludmir, 2009; Romero & Pearlman, 2012). Less is known, however, about relationships among cumulative trauma exposure and adverse perinatal outcomes specifically in African-American women (Dailey, Humphreys, Rankin, & Lee, 2011). This chapter presents the scope of the problem of cumulative trauma, its significance, current gaps in knowledge, and the purpose of this study.

### *Scope of the Problem*

For many women, and particularly African-Americans, exposure to trauma and violence begins in early childhood (Dailey, et al., 2011). Physical injury is one form of trauma exposure. Other forms include psychological abuse, sexual assault, witnessing family violence, divorce, or discrimination, and may be as traumatizing as intimate partner violence. Women may be at risk for trauma exposure when living in high crime

neighborhoods, being of low socioeconomic status, or live in environments where substance abuse is prevalent. While not all African American women live under these conditions, many do. African American women have a three-fold greater risk of being murdered compared to women of other groups (McFarlane, Campbell, Sharps, & Watson, 2002). Pregnant African American women with multiple lifetime trauma exposures attend fewer prenatal visits, and experience longer antepartum hospitalizations which place them at higher risk for perinatal complications (Dailey, et al., 2011). Women who experience trauma are likely to be exposed several more times during their lifetime than their non-exposed counterparts (Messman-Moore, Long, & Siegfried, 2000). Little is known about the effects of cumulative trauma exposure on health outcomes, specifically perinatal outcomes, and therefore, is the focus for this study.

### *Cumulative Trauma*

Cumulative trauma is defined as exposure to multiple traumatic events and situations of different intensity and duration that occur repeatedly and over one's lifetime (Kira, et al., 2008). To date, trauma research in pregnancy has focused primarily on personal trauma such as physical injury as the result of intimate partner violence or motor vehicle accidents. It is estimated that one in four women will be raped or sexually assaulted by an intimate partner or stranger during their lifetime (Cronholm, Fogarty, Ambuel, & Harrison 2011). Some of these assaults result in pregnancy.

Intimate partner violence (IPV) may begin for the first time with the knowledge of a new pregnancy (Keeling & Mason, 2010). Reports of violence during pregnancy vary widely with some United States (U.S.) studies reporting ranges from 0.9% to 20.1%

(Gazmararian, et al., 1996; Petersen, 1997). However, most studies report the incidence between 3.9% and 8.3% (Campbell, 2002; Campbell, et al., 1999). Physical injury to the pregnant woman may result in falls, burns, bruises, fractures, or penetrating trauma from knife or gunshot wounds. Pregnancy complications from these injuries may include spontaneous abortion, uterine or placental abruption, fetal injury and demise, or death (Mendez-Figueroa, Dahlke, Vrees, & Rouse, 2013). Sexually transmitted diseases, urinary tract infections, gestational diabetes, preeclampsia, antepartum hemorrhage, preterm contractions, and preterm birth are additional pregnancy complications associated with IPV and are conditions that lead to adverse maternal and fetal outcomes (Cronholm et al., 2011; Morland, Leskin, Block, Campbell, & Friedman 2008; Seng, 2002).

This study focused on African American women who have given birth as they have a higher incidence of infant mortality rates than women from other ethnic groups. For African American women, the rate is 11.8 for every 1, 000 live births or fetal deaths; that's one in eight pregnancies (March of Dimes, 2013). The reasons for disparity are not yet clear, but differential stressors, such as cumulative trauma may be a factor (Dailey, et al., 2011). Therefore, a better understanding of the relationship of cumulative trauma to perinatal outcomes is needed.

Cumulative trauma effects may begin early in life because children who are sexually assaulted are at greater risk for adult re-victimization (Kelly, Skelton, Patel, & Bradley, 2011; Messman-Moore, et al., 2000). Childhood trauma in the form of harassment, neglect, emotional abuse, sexual abuse, incest, or abandonment of a parent can have lifelong (or cumulative) physical or psychological consequences

(Cougler, Timpano, Sachs-Ericsson, Keough, & Riccardi, 2010; Heitkemper, Cain, Burr, Jun, & Jarrett 2010). The prevalence of childhood sexual abuse (CSA), both penetrative and non-penetrative, in the United States ranges from 15% to 33% (Messman-Moore, et al., 2000). Victims of physical and childhood sexual abuse have a higher incidence of insomnia, anxiety, depression, and PTSD symptoms (Bader, et al., 2007; Gal, Levav, & Gross 2011; Kelly et al., 2011; Seng, et al., 2013; Willis, 2010). CSA is associated with poor sleep quality and other sleep disturbances (Greenfield, Lee, Friedman, & Springer 2011; Poon & Knight, 2011; Willis, 2010).

Research has shown an association between CSA, health, and risky behaviors (Lukasse, Schei, Vangen, & Øian 2009; Nelson, Uscher-Pines, Staples, & Grisso 2010). CSA has been associated with increased reports of physical complaints, depression, increased tobacco and alcohol use, and sexually transmitted diseases during pregnancy. Women who reported any type of childhood abuse and current violence were five times more likely to report depression and substance use (Lukasse, et al., 2009).

Negative health outcomes associated with cumulative trauma may also be the result of other forms of psychological trauma, such as discrimination, racism, witnessing family violence, abuse in the workplace, poverty, failure in relationships or at school, and natural or man-made disasters (Dailey, et al., 2011; Kira, et al., 2008). The stress from repeated traumatic events or daily hassles, known as allostatic load (Stewart, 2006), can have cumulative effects over time, and has the potential for eliciting unhealthy behaviors, leading to a long term effect on overall health. Due to these long term physical and psychological effects, and the paucity of scientific studies, more

research is needed on the relationship of overall cumulative trauma, not just intimate partner violence alone, on perinatal outcomes.

### *Posttraumatic Stress Disorder*

Women with cumulative trauma exposure may or may not develop posttraumatic stress disorder (PTSD). PTSD is a strong predictor of poor health (Kira, et al., 2008). PTSD was found to be four times more prevalent in pregnant African American women who reported multiple trauma exposure, with fewer interventions and mental health services available to them than for women of other ethnic groups (Seng, Kohn-Wood, McPherson, & Sperlich (2011). Seng (2002) proposed that traumatic stress and PTSD mediate the relationship between violence and preterm birth, but this has not yet been tested. Kira et al. (2008) examined cumulative trauma versus PTSD alone for two reasons. First, the diagnosis of PTSD by DSM-V criteria is based on the occurrence of a single threatened or physically carried out trauma which excludes other non-physical forms of trauma such as abandonment, racism, or severe poverty. Second, trauma is a process defined by negative outcomes or symptoms that may or may not be PTSD. There is growing evidence to suggest that pregnant women, particularly African Americans, exposed to multiple traumatic events have symptoms of PTSD. Therefore, this study examined multiple forms of trauma, and their relationships with perinatal outcomes.

### *Sleep Quality*

Poor sleep quality is a clinically accepted construct that includes quantitative aspects of sleep such as sleep duration and latency, and subjective aspects such as the length and restfulness of sleep (Buysse, et al., 1988). Poor sleep quality is

associated with personal trauma resulting from IPV and PTSD (Humphreys, Lowe, & Williams 2009; Lowe, Humphreys, & Williams 2007; Pigeon, Cerulli, Richards, He, Perlis, & Caine, 2011; and Rauer, Kelly, Buckhalt, & El-Sheikh, 2010). PTSD effects sleep quality in the form of re-experiencing the traumatic event, memories, and bad dreams (American Psychiatric Association (APA), 2013). Women exposed to IPV had significantly more nightmares and insomnia, and depressed women exposed to IPV had more severe PTSD, and a greater risk for insomnia and nightmares than women who were not depressed (Pigeon, et al., 2011).

Poor sleep quality has been linked to gestational hypertension, preeclampsia, and gestational diabetes in pregnancy, but the data is limited, and has been primarily associated with obstructive sleep apnea (Fung, Wilson, Barnes, & Walker, 2012; IzciBalsarak&Pien, 2010; Louis, Auckley, Sokol, & Mercer, 2009; and Reid, et al., 2011). Okun, Dunkel-Schetter, & Glynn (2011) proposed an association between poor sleep quality and preterm birth, but this has not been validated.

In a violent relationship, sleep serves both as a coping mechanism for the woman and a control strategy for the perpetrator. Women will adjust their sleep patterns to times when the perpetrator is away. Abusers will awaken their sleeping victims and assault them. Women remain in abusive relationships in the hope that the beatings will go away, because of financial dependence, or to have a father for the baby (Lowe, et al., 2007). As poor sleep quality has been associated with insomnia, anxiety, PTSD, depression, ineffective coping, and chronic pain, it is possible that poor sleep quality and/or PTSD may have a direct relationship on perinatal outcomes among pregnant African-American women victimized by cumulative trauma. Of the eighteen

studies reviewed for sleep disturbance and pregnancy, only two had samples that were primarily African-American women (Facco, Kramer, Ho, Zee, & Grobman 2010; Louis et al., 2009). Therefore, a better understanding of the relationship on personal trauma, plus other forms of cumulative trauma and sleep quality in African-American women is needed, and was examined in this study.

### *Significance*

Cumulative trauma exposure is prevalent among pregnant women, and can lead to adverse health outcomes. Urban African-American women are at greater risk for trauma exposure, at higher risk for pregnancy complications, and have fewer interventions and mental health services available to them (Seng, et al., 2011). Studies that examine relationships among childhood abuse, lifetime trauma exposure, intimate partner violence, and health outcomes will provide a better understanding of the relative effects of these factors on health outcomes (Campbell, 2002).

A goal for nursing is to promote adaptation for individuals by assessing behaviors and factors that influence effective adaptation, and by intervening to enhance environmental interactions (Roy, 2009). This study focused on behaviors, and factors that influenced effective adaptation by studying the relationships between cumulative trauma and perinatal outcomes for mother and baby. Future studies may lead to interventions to improve sleep quality or reduce PTSD symptoms.

### *Gaps in Knowledge*

Pregnancy is a particularly vulnerable time in the life of a woman. Exposure to CT may result in PTSD symptoms or poor sleep quality, and lead to negative health outcomes such as high infant morbidity and mortality rates. Only one study (Dailey, et



al., 2011) with African-American women found an association between lifetime trauma exposure and perinatal outcomes, specifically, preterm premature rupture of membranes (PPROM). Research with pregnant African-American women is needed as infant mortality rates continue to be twice that of women of other ethnic groups (March of Dimes, 2013), and risk for cumulative trauma exposure may be a factor.

Experts in the field suggest that PTSD is believed to mediate the relationship between physical violence and adverse perinatal outcomes such as preterm birth, but the scientific evidence in this area is limited (Seng, 2002). Okun, et al., (2011) suggests an association between poor sleep quality and preterm birth. Campbell, et al., (2004) states that more evidence is needed about risk and protective factors related to trauma exposure, studies with specific cultures and groups, and how trauma is related to health outcomes. This study's aim was to assist in providing answers to these questions, and relationships proposed by experts in the field, through exploring the relationships among cumulative trauma, PTSD, sleep quality, and perinatal outcomes.

### *Statement of the Problem*

Trauma and violence in pregnancy continues to be a major public health problem resulting in increased costs to the health care system. The cost of personal trauma due to intimate partner violence in the U.S. was \$5.8 billion with \$4.1 billion for direct medical and mental health services (CDC, 2003). Physical trauma accounts for 6-8% of all pregnancy complications, and is the leading non-obstetric cause of death among pregnant women. With an estimated four million live births in the United States during 2012 (National Center for Health Statistics, 2013), between 250,000 and 325, 000 pregnancies were affected by physical trauma. Because physical injury may result in

spontaneous miscarriage or placental abruption, many of these pregnancies never reach viability (Mendez-Figueroa, Dahlke, Vrees, & Rouse, 2013). Only two studies were found that examined cumulative trauma history and pregnancy (Dailey, et al., 2011; Lewis, Cavanagh, Ahn, & Yoshioka, 2008), and only one of these was focused on African-American women, highlighting the need for additional research. Although not part of this study, it is worth mentioning that abused women generate 92% more health care costs per year than non-abused women, and are more likely to seek help from health care providers and emergency rooms. However, many women are isolated and kept from prenatal or medical attention all together (Campbell, 2002), which may ultimately result in higher physical and mental health care system costs.

A better understanding of cumulative trauma, PTSD, sleep quality, and perinatal outcomes among African-American women can lead to earlier prenatal assessment of these conditions. Development of nursing interventions to reduce PTSD symptoms & improve sleep quality may reduce the incidence of pregnancy complications and poor outcomes, reduce costs, and improve infant mortality rates for African-American women.

#### *Purpose*

The purposes of this study were to 1) to examine the relationships among cumulative trauma, PTSD, sleep quality, and perinatal outcomes; and 2) to examine whether PTSD or sleep quality mediates these relationships.

This study was guided by the Roy Adaptation Model (RAM) to examine associations between the focal, contextual, and residual stimuli of cumulative trauma (personal, family, collective, interpersonal, and natural disasters), the behavior output physiologic adaptive mode (PTSD and sleep quality), and adaptation of the life process

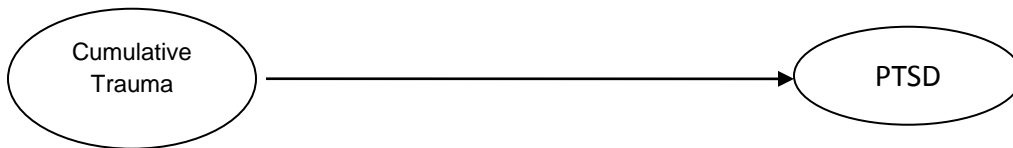
of reproduction (perinatal outcomes). The Roy Adaptation Model is presented later in this paper.

### *Research Questions and Hypotheses*

In order to examine the relationships among CT, PTSD, sleep quality, and perinatal outcomes in African-American women, and whether PTSD or sleep quality mediates these relationships, the following six research questions and hypotheses were proposed:

#### Research Question #1:

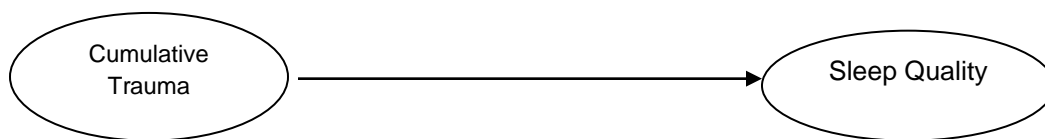
What is the relationship between cumulative trauma and posttraumatic stress disorder (PTSD)?



H1a: Higher levels of cumulative trauma will be positively related to increased posttraumatic stress disorder symptomatology.

#### Research Question #2:

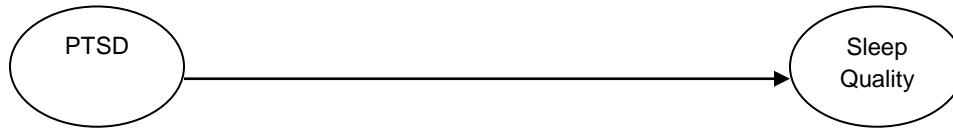
What is the relationship between cumulative trauma and sleep quality?



H2a: Higher levels of cumulative trauma will be negatively related to sleep quality.

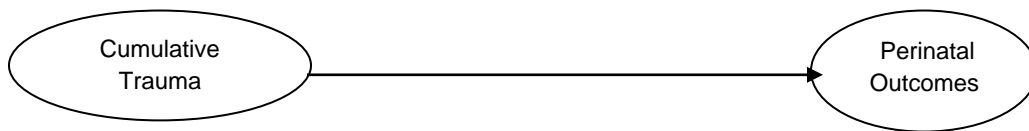
#### Research Question #3:

What is the relationship between PTSD, sleep quality?



H3a: Increased PTSD symptomatology will be negatively related to sleep quality.

Research Question #4: What is the relationship between cumulative trauma and perinatal outcomes?

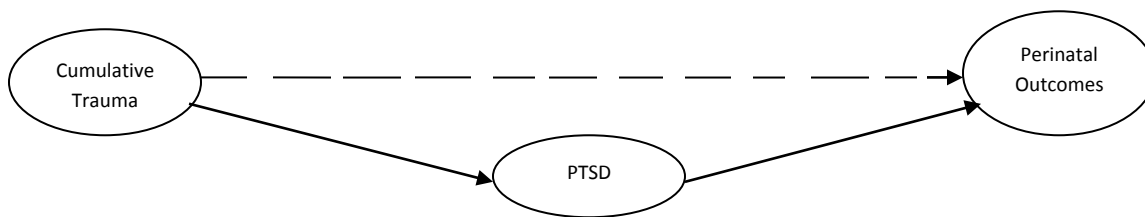


H4a: Cumulative trauma will be related to negative maternal perinatal outcomes.

H4b: Cumulative trauma will be related to negative neonatal perinatal outcomes.

Research Question #5:

Does PTSD mediate the relationship between cumulative trauma and perinatal outcomes?

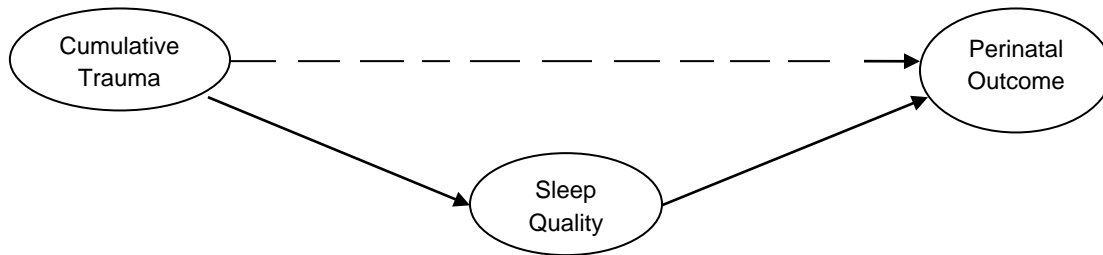


H5a: PTSD will mediate the relationship between cumulative trauma and maternal perinatal outcomes.

H5b: PTSD will mediate the relationship between cumulative trauma and neonatal perinatal outcomes.

Research Question #6:

Does sleep quality mediate the relationship between cumulative trauma and perinatal outcomes?



H6a: Sleep quality will mediate the relationship between cumulative trauma and maternal perinatal outcomes.

H6b: Sleep quality will mediate the relationship between cumulative trauma and neonatal outcomes.

#### *Control Variables*

Control variables were chosen to ensure that the relationships between the primary dependent and independent variables proposed in this study were not affected by secondary variables or within the RAM, contextual stimuli. Variables that are known to influence CT, PTSD, and sleep quality are age, employment, education, body mass index, and depression, and therefore, were included in this study.

*Age* was examined as a covariate as research has shown that 1) age of onset of abuse may play a role in PTSD symptoms (Seng, et al., 2011); and 2) older women were more likely to have higher trauma event scores than younger women (Dailey, et al. 2011).

*Education:* In previous studies, women with higher levels of educational achievement were less vulnerable to trauma, violence, and adverse perinatal outcomes (Campbell, 2002; Campbell, et al., 1999; Szanton, Gill, & Allen, 2005).

*Employment:* Campbell (2002) found that poorer women had the highest incidence of personal trauma related to IPV. Although employment and education may not protect a woman from physical trauma, she may have the resources to escape from the relationship.

*Body Mass Index (BMI)* was examined as the fourth covariate for this study as eating disorders have been reported in women exposed to trauma, particularly physical abuse, and may result in a woman being under or over weight (Campbell, 2002).

*Depression* is the fifth covariate, and has been associated with increased trauma exposure and poor perinatal outcomes. Depressive symptoms have been reported by 18.4% of all pregnant women (Hubner-Liebermann, Hausner, &Wittmann, 2012). Trauma was the only statistically significant factor between depressed and nondepressed pregnant adolescents of all ethnic groups (Meltzer-Brody, Bledsoe-Mansori, Johnson, Killian, Hamer, Jackson, et al., 2013). Poor mental health, including depression, has been associated with increased abuse, preterm birth, low birth weight, and fetal growth restriction (Bhandari, et al., 2011; Coker, Smith, Thompson, McKeown, Bethea, & Davis, 2002; Grote, Bridge, Gavin, Melville, Iyengar, &Katon 2010; Kennedy, 2005; and Yali&Lobel, 1999). Depression has been associated with PTSD (Mezey, Bacchus, Bewley, and White 2005), and sleep quality (Jomeen and Martin, 2007) during pregnancy. Depressed pregnant women are also at increased risk for poor pregnancy outcomes (Chaudron, 2013), but research on the effects of cumulative trauma on perinatal outcomes with respect to age, education, employment, BMI, and depression is less clear, thus, these variables were included in this study.

#### *Definitions of Terms*

The definitions below operationally identify the variables included in this study:

*Traumatic event* was defined as “exposure to actual or threatened death, serious injury, or sexual violence in one or more of the following ways: 1) direct experience of the event; 2) witnessing, in person, the event as it occurs to others; 3) learning that a traumatic event has occurred to a close family member or friend; 4) experiencing repeated or extreme exposure to aversive details of a traumatic event such as first responders collecting human remains or police officers exposed repeatedly to child abuse” (APA, DSM-V, 2013, p. 143).

*Cumulative trauma* (CT) was defined as exposure to multiple traumatic events and situations of different intensity and duration that occur repeatedly and over one’s lifetime (Kira, et al., 2008). Types of trauma exposure may include: 1) *personal* (physical abuse, sexual assault, childhood abuse, daily hassles, accidents); 2) *family* (abandonment by a parent during childhood, witnessing family violence, parents divorced, history of violence in the family, loss of a close relative, intergenerational poverty); 3) *collective* (discrimination, racism, holocaust, genocide, slavery); 4) *interpersonal* (sudden death of a friend, life-threatening or disabled close friend, abuse at work, abuse from a health care provider; and 5) *natural disasters* (storms, tornados/hurricanes, earthquakes, airline/train accidents). CT expands the DSM-V definition of trauma with additional experiences, for example, frequent failure in school; a race, culture, or religion having a history of being oppressed or discriminated against; or frequent failure in school.

*Violence* was defined as “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community,

which either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation” (WHO, 2013).

*Intimate partner violence* (IPV) was defined as “physical and /or sexual assault by a husband, partner, ex-husband, or ex-partner” (Campbell et al., 2002). An estimated one third of all women worldwide have experienced physical or sexual injury by an intimate partner (WHO, 2013).

*Physical harm* was defined as “repeated physical and/or sexual assault within a context of coercive control” (Campbell, Woods, Chouaf, & Parker, 2000, p.219). Forced sex is a subconcept of physical harm and was defined as “beatings during sex, coerced sexual acts by physical force, or painful sexual acts that the woman doesn’t want” (p.219).

*Psychological harm* occurs independently or with other forms of violence and was defined as “isolation from social supports, humiliation or degradation, demonstration of power or threats, ongoing threat of physical danger, and a chronic sense of fear or disempowerment” (Jun, Rich-Edwards, Boynton-Jarrett, & Wright, 2008).

*Childhood abuse* was defined as physical, sexual, or psychological harm occurring before the age of eighteen. Childhood sexual abuse was defined as “any abuse in which a dominant adult or peer forces or coerces a child into sexual activity including fondling, masturbation, oral-genital contact, digital penetration, and vaginal and anal intercourse. Sexual abuse may involve exposure, voyeurism, or child pornography” (Francisco, et al., 2008, p.238).

*Posttraumatic stress disorder (PTSD)* was defined as “duration of any of the following symptoms lasting more than one month: 1) *Intrusion symptoms*: recurrent,



involuntary, or intrusive distressing memories of the traumatic event. Recurrent distressing dreams, dissociative reactions or flashbacks in which the individual feels or acts as if the traumatic event(s) were recurring, intense or prolonged psychological distress at exposure to internal or external cues that symbolize or represent the traumatic event, or marked psychological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s); 2) *avoidance* of stimuli associated with the traumatic event(s) beginning after the event occurred as evidenced by avoidance of or efforts to avoid distressing memories, thoughts, or feelings about or closely associated with the traumatic event, or avoidance of external reminders (people, places, conversations, activities, objects, or situations that arouse distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s); 3) *negative alterations in cognitions and mood* associated with the traumatic event(s) such as persistent fear, horror, anger, guilt, or shame; and 4) *marked alterations in arousal and reactivity* associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by irritable behavior or anger outbursts, reckless or self-destructive behavior, hypervigilance, exaggerated startle response, problems with concentration, and sleep disturbances” (DSM-V, 2013, p. 144). The traumatic event in PTSD must be of an extreme nature such as a life-threatening situation. This distinguishes PTSD from CT in that CT may be due to other forms of non-life threatening events such as racism or a natural disaster.

*Depression* was defined as depressed mood or loss of interest or pleasure. Five (or more) of the following symptoms must be present nearly every day during the same two week period, and represent a change from previous functioning: 1) depressed

mood; 2) markedly diminished interest or pleasure in all or almost all activities during the day; 3) significant weight loss when not dieting or weight gain (defined as a 5% change in a month) or an increase or decrease in appetite; 4) insomnia or hyperinsomnia; 5) psychomotor agitation or retardation; 6) fatigue or loss of energy; 7) feelings of worthlessness or excessive or inappropriate guilt, 8) diminished ability to think or concentrate or indecisiveness; and 9) recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan to commit suicide (APA, DSM-V, 2013, p. 94). Severity of the depression (mild, moderate, or severe) is based on the number of criterion symptoms, the severity of those symptoms, and the degree that functionality is affected (p. 114).

*Sleep quality* was defined as a complex phenomenon that measures quantitative aspects of sleep including sleep duration, sleep latency, number of arousals, and the subjective reporting of the “depth” or “restfulness of sleep” (Buysse, et al., 1989). Frequent awakenings from an abusive partner may influence sleep quality (Lowe, Humphreys, & Williams, 2007). Sleep quality, especially in the third trimester and immediately after birth is known to decrease in normal pregnancy.

*Perinatal Outcomes* were conceptualized as a composite of birth events that have been described in multiple studies examining pregnancy outcomes by the Maternal Fetal Medicine Unit Network/NICHHD (Tita, et al., 2012), and items found in the literature specific to cumulative trauma, PTSD, or sleep quality (Campbell, 2002; Dailey, et al., 2011; Louis et al., 2009; Seng, 2002). A higher composite score indicates a poorer perinatal outcome. For the mother, seventeen perinatal outcomes were examined: 1) chorioamnionitis; 2) endometritis; 3) wound infection; 4) postpartum

blood transfusion; 5) cesarean delivery; 6) operative vaginal delivery; 7) premature preterm rupture of membranes (PPROM); 8) urinary tract infection; 9) sexually transmitted disease during the pregnancy; 10) anemia with Hgb. < 11.0); 11) gestational hypertension; 12) gestational diabetes; 13) preeclampsia; 14) substance use; 15) week gestation at first prenatal visit; 16) total number of prenatal visits, and 17) length of labor in hours (first + second stage). Twelve newborn events were examined: 1) meconium stained amniotic fluid; 2) five minute APGAR score  $\leq 5$ ; 3) respiratory illness (diagnosed as TTN or RDS); 4) intubation for CPR; 5) sepsis; 6) seizures; 7) treated hypoglycemia; 8) cord pH < 7.0; 9) NICU admission; 10) preterm birth < 37 weeks 0 days gestation; 11) Small for gestation age (SGA) weight (<10<sup>th</sup> percentile); and 12) SGA head circumference (<10<sup>th</sup> percentile) . A separate neonatal composite was created for gestational age, newborn weight, and newborn head circumference to determine preterm birth, and small for gestational age.

### *Conceptual Framework*

#### The Roy Adaptation Model

The Roy Adaptation Model was the theory used to guide this study of relationships among CT, PTSD, sleep quality, and perinatal outcomes. Roy's model has been used to study how nursing maintains or improves adaptive responses, or changes ineffective responses to adaptive responses (Fawcett, 2005). Relevant to the study of CT, PTSD, sleep quality, and perinatal outcomes, the Roy Model has been used to study women's health during and after pregnancy (Tulman& Fawcett, 2003), and adaptation as a mediator of intimate abuse and traumatic stress in battered women (Woods & Isenberg, 2001). The next section will present an overview of the theory, a

description of the main constructs, and how the Roy Adaptation Model guided this study.

### *Overview of the Roy Adaptation Model*

The main concepts of the Roy Adaptation Model are depicted in Figure 1. The model is based on general systems theory by Von Bertalanffy (1974) and adaptation theory by Harry Helson (1964), a physiologic psychologist. Adaptation is the core concept of this theoretical framework, and is both a process and a state (Roy, 1990).

The adaptation process “recognizes the thinking and feeling person as individuals or groups who use conscious awareness and choice to create human and environmental integration” (Roy, 2009, p.29). As a state, the person or group is viewed at a given time within the environment. The state of adaptation is the cumulative effect of the ongoing adaptive process.

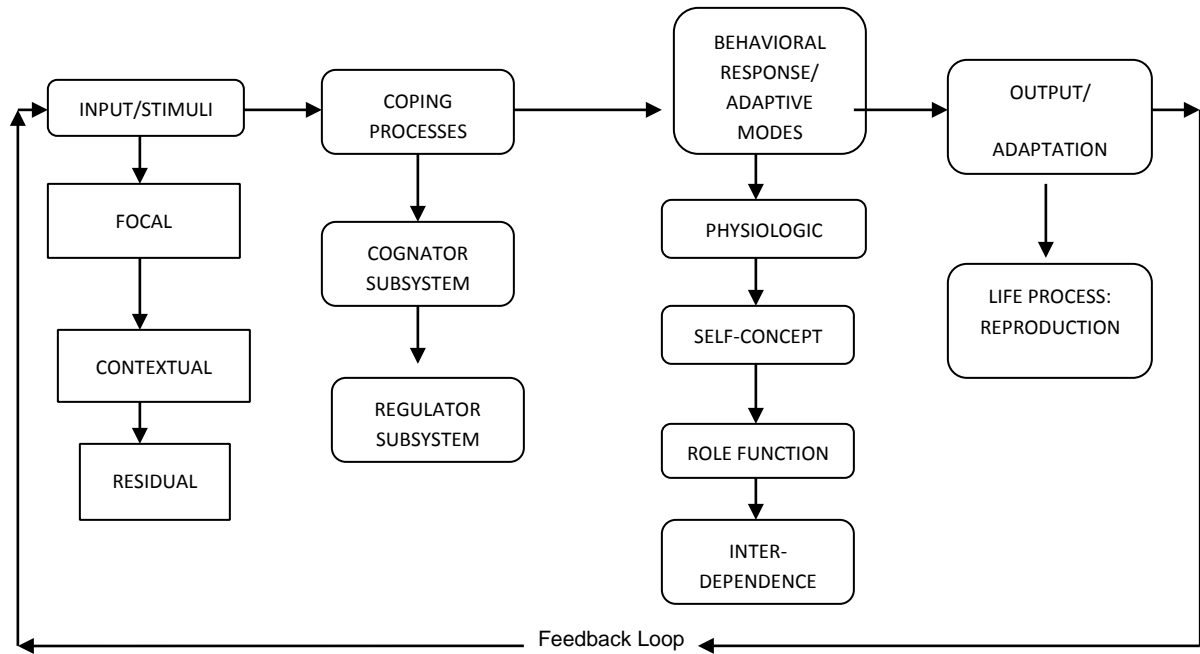


Figure 1: The Roy Adaptation Model (Roy and Andrews, 1991).

### *Stimuli*

Roy (2009) defines stimuli as “that which provokes a response” (p.62). Roy classifies stimuli into three categories: *focal*, *contextual*, and *residual*. Roy’s model depicts the individual as an adaptive system who interacts with constantly changing environmental stimuli. Roy defines environment as “all conditions, circumstances, and influences surrounding and affecting the development and behavior of individuals and groups” (Roy, 2009, p. 16). Stimuli provoke a response, the point of interaction of the human system and the environment (Roy, 2009). Roy used the work of Harry Helson (1964) as a basis to categorize focal, contextual, and residual stimuli. Human beings constantly interact with their environment, and the significance of any one stimulus changes with environmental changes (Roy, 2009, p. 36). For example, the weather may be considered residual stimuli, but in the face of an approaching tornado, weather

becomes the focal stimuli with the potential of a natural disaster traumatic event for the individual, resulting in alterations in sleep quality or signs of PTSD.

### *Focal stimuli*

Focal stimuli are those “immediately confronting the human adaptive system, the object or event most present in consciousness” (Roy, 2009, p. 35). Focal stimuli initiate the adaptation process. Pregnancy or intimate partner violence may be seen as focal stimuli.

### *Contextual stimuli*

Contextual stimuli are all other stimuli present in the situation that contribute to the effect of the focal stimulus. Witnessing trauma in the media or a family dispute are examples of contextual stimuli.

### *Residual stimuli*

Residual stimuli are defined as “environmental factors within or without human systems, the effects of which are unclear in the current situation” (Roy, 2009, p.36). Validation of a residual stimulus can take place through confirmation of those involved that the stimulus is having an effect, or from nursing experience to establish confirmation of the residual stimulus. Once a residual stimulus is confirmed, it becomes a focal or contextual stimulus (p. 64). Using the Roy model, cumulative trauma is the stimulus for this study, and may be assessed as focal, contextual, or residual.

### *Coping processes*

Individuals respond to stimuli through *regulator and cognator coping processes* that are manifested in observable behaviors within four adaptive modes (Roy, 2009, p.

41). The *regulator* coping subsystem involves the neural, chemical, and endocrine systems. For intimate partner violence, the regulator subsystem is activated in response to fear or flight from an abuser (Lowe, et al., 2007). In PTSD, the individual re-experiences the traumatic event she has been exposed to. The *cognator* subsystem involves four cognitive/emotive channels: perceptual and information processing, learning, judgment, and emotion. Coping processes cannot be directly observed, but the effects of coping are seen through behavioral responses that take place within four adaptive modes: physiologic/physical, self-concept/group identity, role function, and interdependence (Roy, 2009). For this study, the effects of PTSD and sleep quality were assessed through the physiologic mode.

#### *Behavioral Response/Adaptive Modes*

The first adaptive mode, *physiologic/physical mode*, is defined as “the way people as individuals interact as physical beings with the environment” (Roy, 2009, p. 43). Behavior in the physiologic mode is manifested as activities of all the cells, tissues, organs, and systems comprising the human body. For this study, the variables PTSD and sleep quality are placed within the physiologic mode. Roy describes five needs that are relevant to physiologic integrity within this mode: oxygenation, nutrition, elimination, activity and rest, and protection (p. 90). For PTSD, feelings of adequate rest, protection, and altered nutrition may be altered due to cumulative trauma exposure potentially affecting perinatal outcomes. Positive relationships have been established between lifetime abuse, IPV, or PTSD and depression, or substance use (Seng, et al., 2002). Poor sleep quality can affect activity and rest and oxygenation. Poor sleep quality in pregnancy and adverse perinatal outcomes are associated with obstructive

sleep apnea (Louis, et al., 2010; Fung, et al., 2012). In addition, Roy describes the physiologic processes involving the senses, fluid-electrolyte balance, acid-base balance, neurologic function, and endocrine function (p. 90). For this study, endocrine function can play a significant role on the pregnant woman's response to cumulative trauma, and hormone secretion, which may affect perinatal outcomes such as preterm birth.

The second adaptive mode, *self-concept*, is defined as “the composite of beliefs and feelings that an individual holds for him or herself at a given time” (Roy, 2009, p. 44). Components of the self-concept mode are physical self including body image and body sensations, and personal self including self-consistency, self-ideal, and moralethical-spiritual self. Self-concept directs behaviors through one's own perceptions and the perceptions of others. Group identity is the self-concept mode relating to groups.

The third adaptive mode is *role function*. A role is defined as “a set of expectations about how an individual occupying one position behaves toward an individual occupying another position” (Roy, 2009, p. 44). Role function is defined within every family or in the workplace. The fourth and final adaptive mode, *interdependence*, focuses on interactions related to the giving and receiving of love, respect, and value. The basic need of this adaptive mode is the feeling of security in nurturing relationships. PTSD and sleep quality will be examined under the physiologic/physical mode leaving the other three adaptive modes open for future research consideration.

#### *Adaptation*



Behavioral responses to and interactions with the environment are carried out through the four adaptive modes, so that adaptation can be observed. *Adaptation* is defined as “the process and outcome whereby thinking and feeling people, as individuals or in groups, use conscious awareness and choice to create human and environmental integration” (Roy, 2009, p. 26). Adaptation is the process and state in which behavioral responses promote the integrity of the human system in terms of the goals of adaptation: survival, growth, reproduction, and mastery (Roy & Andrews, 1999). The individual's ability to adapt effectively is related to situational demands and the current internal state of the person.

Adaptation represents a condition of the life process (in this case reproduction and perinatal outcomes) and is described on three levels: integrated, compensatory, and compromised (Roy, 2009). *Integrated level* describes the functions of a life process working as a whole to meet the individual's needs (p. 37). A *compensatory process* is one in which the cognator and regulator coping subsystems have been activated by a challenge to the integrated level. Examples of challenges to the integrated level are fever or anxiety. A *compromised level* occurs when both the integrative and compensatory levels are not working. Individual behavior in the physiologic mode involves activities of all cells, tissues, organs, and systems comprising the human body. Human beings have the need for oxygenation, nutrition, elimination, activity, and rest. The focus of this study is on the human need for rest. Four complexes affect physiologic adaptation: 1) the senses; 2) fluid-electrolyte imbalance; 3) neurologic function, and 4) endocrine function. The indicator of positive adaptation is physiologic integrity (p. 43). For this study, integrated adaptation is a healthy mother and newborn.

### Description of the Main Study Constructs

The conceptual-theoretical (C-T) model for the study of the relationships among cumulative trauma, PTSD, sleep quality and perinatal outcomes is depicted in Figure 2.

This model is derived from the Roy Adaptation Model (Roy, 2009).

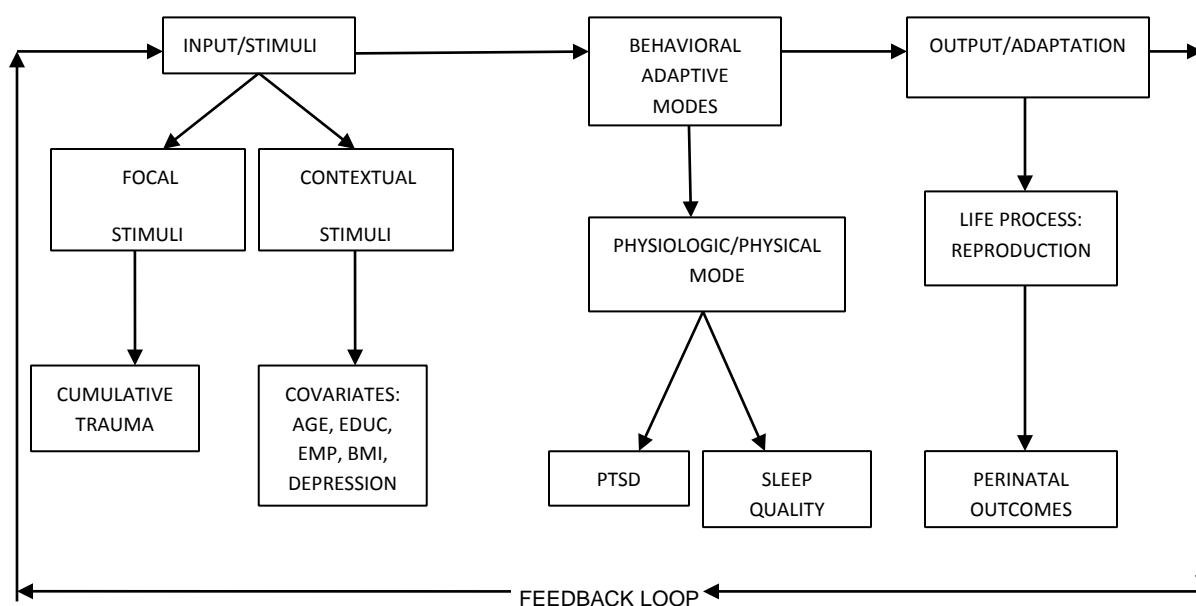


Figure 2: C-T Model to study the relationships among cumulative trauma, PTSD, sleep quality, and perinatal outcomes.

#### Input/Stimuli

Focal, contextual, and residual stimuli form the environment that is constantly changing. Stimuli provoke a response; the point of interaction of the human system and the environment (Roy, 2009). For this study, cumulative trauma was the stimulus that may present as focal, or residual. The *focal stimuli*, however, for this study was cumulative trauma. Cumulative trauma can be in the form of current or past physical/psychological abuse from an intimate partner, witnessing a violent act,

childhood physical or sexual abuse, abandonment from a parent, rejection or failure in school or work, and racism and discrimination.

*Contextual stimuli* are other stimuli that contribute to the effect of the focal stimuli. An individual may or may not be aware of contextual stimuli. The *contextual stimuli* for this study were age in years, BMI, years of education, employment, and depression. These contextual stimuli are present in the environment, but are not the focus of attention for the individual.

*Residual stimuli* are those factors in the environment that have an unknown effect on the individual in a current situation. A pregnant woman may have been abused as a child, or witnessed a form of violence on television, but the events do not have a direct relationship to her current situation. Once confirmation of these stimuli are assessed and validated, they can become contextual or focal. Focal, contextual, or residual stimuli may change as the exposure, situation, or environment changes. Cumulative trauma, therefore, can incorporate focal, contextual, and residual stimuli simultaneously.

#### *Adaptive Mode*

PTSD symptoms and sleep quality are the concepts to be studied under the physiologic behavioral adaptive mode. Post-traumatic stress has been associated with physical comorbidity in women across the lifespan, and in pregnancy, a relationship between PTSD and preterm birth has been suggested (Seng, et al., 2011). PTSD may be result of cumulative trauma exposure.

Poor sleep quality can also affect activity, rest, and oxygenation. Poor sleep quality in pregnancy and adverse perinatal outcomes are known to be associated with

obstructive sleep apnea (Louis, et al., 2010 and Fung, et al., 2012). Clinically significant insomnia and nightmares were observed in women with depression (Pigeon, et al., 2011). Depressed women experienced more severe PTSD symptoms. Research on pregnant women has shown relationships between sleep quality and preterm birth, gestational diabetes, gestational hypertension, and preeclampsia (Santiago, Nolledo, Kinzler, & Santiago, 2001); Reutrakul, et al., 2011; and Williams, et al., 2010), but relationships among cumulative trauma, PTSD, sleep quality, and perinatal outcomes are less clear. Sleep quality was conceptualized as the second physiologic variable in this study.

### *Adaptation*

Reproduction and childbirth are major life processes. The current condition of an individual's life process, as in reproduction, represents their adaptation level. An *integrated* process is the "adaptation level at which structures and functions of a life process are working to meet human needs" (Roy, 2000, p. 27). For this study, *integrated adaptation* is operationalized as positive perinatal outcomes for both mother and baby. Positive perinatal outcomes are defined for the mother as 1) a spontaneous vaginal birth; 2) absence of infection; 3) and absence of premature rupture of membranes; 4) initiation of prenatal care in the first trimester; and 5) more than three prenatal visits. For the newborn, adaptive positive perinatal outcomes include 1) term pregnancy > 37 weeks gestation; 2) average for gestational age newborn weight and head circumference 3) absence of resuscitation or an NICU admission, 4) a five minute APGAR score higher than five; and 5) absence of illness including respiratory distress, sepsis, seizures, or hypoglycemia. Associations between cumulative trauma have

been made with low birth weight or smaller for gestational age head circumference (Lewis, et al., 2008). Nursing has the responsibility to assess and promote adaptation for pregnant women exposed to cumulative trauma, and for women with PTSD, and poor sleep quality.

*The Roy Adaptation Model to Study the Effects of Cumulative Trauma on Perinatal Outcomes*

Roy's model is very useful in the examination of relationships between CT and adaptation to pregnancy and effect on perinatal outcomes, and to explore whether PTSD or sleep quality mediates this relationship. In this study, the investigator assessed the focal, contextual, and residual stimuli of cumulative trauma, and PTSD symptoms and sleep quality within the physiologic behavioral adaptive modes. This behavioral output was used to determine whether or not effective (or ineffective) adaptation was seen in the perinatal outcomes. The goal of this study was to gain a better understanding of this relationship.

*Summary*

Chapter 1 described background information on the problem of cumulative trauma in pregnancy, the significance of the problem, and gaps in current knowledge. CT, with its expected negative impact on perinatal outcomes, is of particular concern for African-American women who continue to have a two-fold increase in infant mortality over women of other ethnic groups, four times the PTSD symptoms when reporting multiple trauma exposure, and poor sleep quality. Nursing has a significant role to play in gaining a better understanding of the relationships between CT and perinatal outcomes so that pregnant women can be assessed earlier in pregnancy, interventions

can be used to reduce PTSD symptoms and sleep quality can be improved, and pregnancy complications and poor perinatal outcomes reduced. The Roy adaptation model provided the framework from which six research questions and hypotheses were examined to answer the questions: what are the relationships among CT, PTSD, sleep quality, and perinatal outcomes, and does PTSD or sleep quality mediate this relationship? In Chapter two, a comprehensive review of theory and research, as well as knowledge gaps related to the study of the relationships among cumulative trauma (CT), posttraumatic stress disorder (PTSD), sleep quality, and perinatal outcomes are discussed.

## CHAPTER 2 LITERATURE REVIEW

This literature review provides a comprehensive review of theory, research, and knowledge gaps related to the study of the relationships among cumulative trauma (CT), posttraumatic stress disorder (PTSD), sleep quality, and perinatal outcomes. Sections on each of the four major variables, CT, PTSD, sleep quality, and perinatal outcomes are presented.

### Cumulative Trauma

Within the Roy Adaptation Model, CT is the input stimuli that presents as focal stimuli. The majority of research on cumulative trauma has focused on personal physical harm from assault, motor vehicle accidents, other accidents such as falls and burns, and femicide. This literature review discusses research on other types of trauma exposure including family, interpersonal trauma, collective identity, and natural disasters. This review distinguishes CT from PTSD. Because the study of CT and sleep quality is limited, this review includes studies that have been conducted with military personnel and in non-pregnant populations. Gaps in knowledge on CT and perinatal outcomes are identified.

Types of cumulative or lifetime trauma exposure described by Kira et al. (2008) are personal, family, interpersonal and collective identity trauma, and natural disasters. This section expands on each of these trauma types, and their relationship to African-American women and perinatal outcomes.

Personal trauma is defined as “any act of gender-based violence that results in, or is likely to result in, physical, sexual, or mental harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in

public or in private life” (WHO, 2013). Examples of personal trauma are intimate partner violence, sexual assault, or motor vehicle accidents. Homicide, the ultimate result of trauma, will be presented in a separate section. For many women, personal trauma begins in childhood.

### *Childhood abuse*

Childhood sexual abuse (CSA), both penetrative and non-penetrative, affects 12% to 40% of America’s youth (Cogle, Timpano, Sachs-Ericsson, Keough, and Riccardi, 2010; Lev-Wiesel, Daphna-Tekoa, & Mod, 2009; Messman-Moore, et al., 2000; Seng, et al., 2013). Victims of childhood sexual abuse have higher incidence of insomnia, depression, posttraumatic stress disorder (PTSD), and mood and anxiety disorders (Bader, et al., 2007; Gal, Levav and Gross, 2011; Kelly, Skelton, Patel, & Bradley, 2011; Seng, et al., 2013; Willis, 2010). Earlier age of onset for either sexual or physical childhood abuse is associated with later psychological symptoms and disorders (Crowley, 2008; Gal, et al., 2011).

There is evidence that childhood abuse leads to unhealthy behaviors. Seng (2002) found that women with past abusive experiences, especially childhood sexual abuse, are more likely to experience depression and eating disorders. The women are more prone to tobacco, alcohol, and drug abuse, and are unable to stop substance use during pregnancy. The ACE study (Dube, Felitti, Dong, Chapman, Giles, & Anda, 2003) found that one adverse childhood experience increased the likelihood for early drug use 2-4 fold. Individuals with five or more adverse childhood events were 7-10 times more likely to report illicit drug use. Cogle, et al. (2010) added that childhood sexual abuse



was related to social anxiety, panic, generalized anxiety, and posttraumatic stress disorder symptoms.

Childhood sexual abuse and adult revictimization is associated with increased PTSD symptoms and other mental health disorders (Lev-Wiesel, et al., 2007; Messman Moore, et al., 2000; Seng, 2002). Messman-Moore et al. (2000) looked at the association between childhood sexual abuse and vulnerability to victimization in adulthood. Their sample was asked to complete the Life Experiences Questionnaire, Modified Sexual Experiences Survey (MSES), Conflict Tactics Scale, and the SCL-90-R, a measure used to assess current levels of psychological symptoms. Of 648 non-pregnant women (83.3% Caucasian; 6.6% Asian; 4.9% American Indian; 2.7% African American) from Oklahoma, 20.1% reported child sexual abuse; and women who were re-victimized as adults reported more somatic complaints, depression, anxiety, interpersonal sensitivity, hostility, and PTSD symptomatology than women with no abuse history or with adult abuse only. PTSD reported symptoms included chronic fatigue, intense startle reactions, disturbed sleep and eating patterns, and nightmares.

Childhood violence exposure (witnessed domestic violence) or experienced child abuse was associated with PTSD in a culturally diverse sample of 1,581 pregnant women (Kulkarni, Graham-Bermann, Rauch, & Seng, 2011). This secondary analysis utilized data from the Stress, Trauma, Anxiety, and the Childbearing Year (STACY) Project. Through telephone interview surveys, participants completed the Life Stressor Checklist, Abuse Assessment Screen, and National Women's Study PTSD module. Kulkarni et al. (2011) found that the woman's dual abuse experiences were positively correlated to current and lifetime PTSD symptoms. Women who witnessed violence

and were child abuse survivors were at increased risk for adult revictimization. Sociodemographic risk factors in this study linking childhood abuse and PTSD were 1) being younger at the time of abuse, 2) lower SES, 3) less educated, and 4) less likely to be in a partnered relationship. The study did not examine an association between childhood abuse, PTSD, and pregnancy outcomes.

Lev-Wiesel, et al. (2007) studied 559 Jewish women to determine if childhood sexual abuse was related to PTSD in survivors who were now pregnant. The results indicated that PTSD was significantly higher among the childhood sexual abuse victims compared to women exposed to other types of trauma. In a later study, Lev-Wiesel et al., (2009) reported a higher percentage of high-risk pregnancy and PTSD symptoms of intrusion and avoidance in women who reported a history of traumatic events.

Childhood abuse research shows no ethnic or cultural boundaries. Wyatt (1985), compared child sexual abuse among 248 African American and Caucasian nonpregnant women from the Los Angeles area, and found no difference in the percentage of occurrence of child sexual assault. When comparing the two ethnic groups, however, African American perpetrators involved their victims in significantly more contact abuse (fondling, intercourse, oral sex) than abuse that did not involve body contact before age 18. Although it did not reach statistical significance, African American women reported more abusive incidents involving stepfathers, mother's boyfriends, foster fathers, male cousins, or other relatives compared to the Caucasian group (Wyatt, 1985). A larger proportion of African American women lived in homes with stepfathers (28% vs. 16%). The father or stepfather was the most dominant perpetrator for both African American and Caucasian groups.

In a separate study of 566 nulliparous pregnant women, African American women (30% of sample) had more trauma exposure, PTSD symptoms and diagnoses, comorbidities, less mental health treatment, and more substance use during pregnancy than other groups (Seng, et al., 2011).

Nelson and colleagues (2010) found among pregnant women who reported any type of childhood violence, the likelihood of experiencing violence during their pregnancy was double that of women who had never been abused as children. For new mothers, childhood sexual abuse was related to ineffective coping in labor, problems with postpartum mental health, maternal-infant bonding, and poor infant sleep (Hairston, Waxler, Seng, Fezzey, Rosenblum, & Muzik, 2011; Humphreys, et al., 2008; Rose, 1992; Seng et al., 2013). Prenatal maternal anxiety or depression predicted sleep problems for infants (Willis, 2010). Women who were victims of sexual abuse as children were more likely to report sleep disturbances than those with other forms of abuse.

In summary, childhood sexual abuse has been associated with mental health, PTSD, and physical health symptoms. During pregnancy, a history of childhood abuse has been linked with an increase in physical complaints, pregnancy complications, post partum depression, decreased maternal-infant bonding, and poor sleep quality. Memories of childhood sexual abuse have been reported to surface during labor and childbirth (Rose, 1992). No evidence was found that linked childhood abuse, one type of cumulative trauma, with the perinatal outcomes of preterm birth or low birth weight.

*Personal/Family Trauma*

Intimate partner violence (IPV) against women continues to be a major public health problem. A World Health Organization (WHO) study, that included women from the United States, found that between 15% (Japan) and 70% (Ethiopia and Peru) experienced physical and/or sexual violence by an intimate partner at some point in their lives (World Health Organization, 2013). In the United States, it is estimated that two million women are sexually assaulted annually, with more than fifty million assaulted in their lifetime (Jasinski, 2004).

IPV refers to physical, sexual, or psychological harm caused by an individual currently or previously involved in an intimate relationship with the victim. The most commonly reported areas of physical injury are the face, neck, upper torso, breast, or abdomen (Campbell, 2002). Injuries to these areas lead primarily to complaints of headache; back pain; abdominal pain; and digestive problems, including loss of appetite, when women present to their primary provider or emergency room. Abused women are more likely to seek help from health care providers and emergency rooms. It is estimated that abused women generate 92% more United States health care costs per year than non-abused women, with costs of IPV estimated to exceed \$5.8 billion dollars annually, with \$4.1 billion for direct medical and mental health services (Campbell, 2002; Cronholm, et al., 2011).

Forced sex is a sub-concept of physical harm and is defined as “beatings during sex, coerced sexual acts by physical force, or painful sexual acts that the woman doesn’t want” (Campbell, 2002, p.219). Campbell et al. (2000) found that between 40-45% of abused women report forced sex by the battering partner or ex-partner.

Repeated sexual assault can lead to increases in pelvic pain, vaginal bleeding, vaginal infections, fibroids, and sexually transmitted infections including HIV, urinary tract infections, painful intercourse, and pregnancy (Campbell, 2002).

Psychological harm occurs independently or with other forms of violence, and is defined as isolation from social supports, humiliation or degradation, demonstration of power or threats, ongoing threat of physical danger, and a chronic sense of fear or disempowerment (Jun, Rich-Edwards, Boynton-Jarrett, & Wright, 2008). A qualitative study of interviews with sixteen African pregnant adolescents exposed to IPV described four coping strategies (Kaye, Ekstrom, Johansson, Bantebya, & Mirembe, 2007). The first theme, *minimizing damage*, was a coping strategy designed to decrease the impact or severity of the violence. Women would pretend being sick, or apologize about everything. Many felt helpless or had feelings of low self-esteem. *Withdrawal*, the second coping theme was similar to avoidance coping. The women felt socially, physically, and emotionally isolated. Many turned to alcohol and continued drinking even though they were aware that its consumption could hurt their babies; or left their abusers to live with relatives as often as possible. Their behavior was characterized by loss of self-esteem, hopelessness, and reluctance to seek social support or prenatal care. Most of the adolescents were unable to let go of the emotional attachment to their partner. *Retaliation, revenge and fighting back*, consisted of reporting the abuse to police, and local leaders. Most reported physically fighting during the first months of pregnancy, and then attempting to leave and live with relatives. In *seeking help*, a problem focused coping strategy, the adolescent reached out to neighbors, health workers, family, local leaders, and religious leaders for help. These individuals

intervened by reprimanding the perpetrator. While some adolescents found this strategy useful, others found that the violence worsened because the young woman was not protected by those from whom she sought help.

Lutz (2005) examined relationships among abuse experiences, perceptions, and pregnancy decisions related to prenatal care, their intimate relationship, and their unborn baby. This qualitative study used grounded theory, and consisted of interviews of 21 women (the majority of whom were high school graduates with some college and 50% Caucasian). The resulting themes led to the development of the Pregnancy and IPV Double-Bind Theory which highlights concurrent and contradictory processes of “binding” with the abusive partner and unborn child. Double-Bind Theory delineates five processes. The first process, *dreams*, was the process of maintaining family harmony and a positive image of their partner by separating their public and private worlds. The second process was *endurance* of the abuse for the sake of the family. Women would suppress their own needs and tolerate the abuse for the sake of family harmony. The hope of changing the abuser’s behavior lessens, and more ambivalent feelings on the part of the woman surface. There were increased feelings of helplessness and future survival needs. The third process was *balance*, in which the woman experienced increasing despair and a desire for a positive outcome, but began to refer to her partner as an abuser privately. The fourth process was the *reconciliation* of dreams with reality. Women either chose to resign to the abuse, or began to think about ending the relationship. The final process was *protection* of the newborn from abuse. The focus now was on the negative effects of the abuse. Hopes and dreams for family harmony were gone. A decision about the relationship was reached: to either end it, plan to end

it, or continue but with conditions for the abuser. Lutz (2005) found that an escalation of violence at 18-24 months after childbirth pushed women to leave their relationship due to fear of their babies being abused. The IPV Double-Bind theory may help health care providers better understand the depth and intensity of the psychological trauma experienced by some pregnant women and provide appropriate interventions.

Research has suggested a relationship between IPV during pregnancy and miscarriage, intrauterine fetal demise, antepartum hemorrhage, gestational diabetes, sexually transmitted diseases, and urinary tract infections (Morland, et al., 2008). IPV during pregnancy has also been associated with PTSD, and poor sleep quality (Seng, 2013), but research in this area is limited.

#### *Physiologic Responses to Personal Trauma*

Although the physiologic mechanisms of physical trauma will not be the focus for this study, it is important to understand these processes in order to understand the relationship between cumulative trauma and perinatal outcomes.

*Neuroendocrine changes:* Women can experience a fear response from a traumatic event such as IPV. Fear conditioning models have led to studies of early biological markers of PTSD (O'Donnell, Creamer, Elliott, & Bryant, 2007). The fear model proposes that exposure to a traumatic event leads to a strong fear reaction which becomes conditioned to many stimuli associated with the traumatic event. When individuals are exposed to reminders of the trauma at a later date, they experience a strong fear response. The physiologic mechanism is that stress hormones (neuropeptides and catecholamines) released at the time of the trauma contributed to fear conditioning and overconsolidation of trauma memories (O'Donnell, et al., 2007, p.

256). Future prospective studies may support these findings, and determine underlying mechanisms.

*Suppression of the immune system:* As a result of stress, studies have shown an increase in the self-reporting of colds and influenza along with sexually transmitted diseases among abused women. Stress hormones, corticotrophin releasing hormone (CRH) and cortisol along with catecholamine release (epinephrine, dopamine, and norepinephrine) change under stress (Giurgescu, 2009; Latendresse, 2009). The physical stress response involves alterations in the hypothalamic-pituitary-adrenal (HPA) axis and immune function. Under healthy conditions, the HPA axis will suppress the body's immune/inflammatory responses. As the hypothalamus is stimulated, CRH is released. When the hypothalamus releases CRH to the anterior pituitary, it initiates the release of ACTH, which tells the adrenal glands to release glucocorticoids. Cortisol is one type of glucocorticoid produced by activation of the HPA axis (Giurgescu, 2009). Latendresse (2009) suggests that activation of the autonomic nervous system and the HPA axis results not only in physiologic responses, but also in behavior changes such as decreased food intake, depression, or anxiety. Women with higher levels of the urinary catecholamines, norepinephrine, dopamine, and epinephrine at mid-pregnancy were at higher risk of spontaneous preterm delivery even when women with inflammation or infection were excluded from the analysis (Latendresse, 2009). Although research in this area is evolving, these studies suggest that stress may be related to perinatal outcomes.

*Central nervous system symptoms:* Fainting, seizures, and chronic pain from headaches or back pain have been associated with IPV (Campbell, 2002). The exact



mechanism is unknown, but recurrent injury, stress, or alterations in neurophysiology have been suggested. Abused women who have been choked, experienced incomplete strangulation, or have lost consciousness due to repeated blows to the head may have serious neurological sequelae.

#### *Other Health and Pregnancy Outcomes*

Research has suggested a relationship between IPV during pregnancy and miscarriage, intrauterine fetal demise, antepartum hemorrhage, gestational diabetes, sexually transmitted diseases, and urinary tract infections (Morland, et al., 2008). IPV during pregnancy has also been associated with PTSD, and poor sleep quality (Seng, 2013), but research in this area is limited. Finally, there is a documented association made between IPV, chronic stress, and gastrointestinal symptoms presenting as eating disorders, irritable bowel syndrome, or loss of appetite (Campbell, 2002). Abused women have reported cardiac symptoms such as hypertension or chest pain (Tollestrup, et al., 1999). Campbell (2002) states that it is reasonable to postulate that there are interactions between genetic tendencies for cardiovascular disease, risky behaviors, and stress from IPV, but the mechanisms have not been fully investigated. Stress response from violence has been suggested to be associated with preeclampsia and preterm delivery (Glynn, et al., 2008; Guendelman, et al., 2008).

In summary, women have many physiologic responses to personal trauma such as IPV. These responses include neuroendocrine changes, suppression of the immune system, and central nervous system symptoms. Finally, the overall health of the mother and infant can be compromised.

#### *Interpersonal and Collective Identity Trauma*

In addition to personal/family trauma such as childhood abuse and IPV, women are also affected by interpersonal and collective identity trauma (Kira, et al., 2008). Types of interpersonal trauma (Kira et al., 2008) include abandonment or death of one or both parents, parental alcohol or drug use, and crime related experiences involving weapons or muggings that have been associated with depression, anxiety, or panic disorders in young women (Dailey, et al., 2011; Kira, et al., 2008; Mezey, et al., 2005). Interpersonal trauma may be direct or indirect (Kira, et al., 2008). *Direct* trauma is the exposure of women to abuse from friends, co-workers, or their health care providers, whereas *indirect* trauma is witnessed violence or media-related violence exposure. African American women are more often exposed to family or friends being assaulted or murdered, home burglaries, or robberies than other groups (Dailey, et al., 2011). Family or interpersonal trauma places additional stress on the expectant mother and the level of social support she will receive during her pregnancy and childbirth. Little is known about the relationship of family and interpersonal trauma exposures and perinatal outcomes.

Kira and colleagues (2008) describe collective identity trauma as discrimination, racism, genocide, holocaust, or slavery. Mistrust of health care providers, historical racism and trauma, and perceived discrimination, can serve as barriers to effective patient-provider communication, and help seeking behaviors which in turn can influence health outcomes (Stockman, Hayashi, & Campbell, 2015). African American women were more likely to confide in a friend about a violent situation versus reporting it to a health care provider (Martinson, 2001). Main reasons cited were feelings of being rejected within their community, contributing to the racial stereotype and criminalization

of the African American male, the woman's economic situation, societal view of African American families overall, and the health care system's lack of response to her need for assistance. In addition, African American women reported poor experiences with authorities of different racial and cultural backgrounds, and general mistrust of authorities, and the judicial system (Martinson, 2001).

Disparities in birth outcomes for African American women continue. The March of Dimes Peristats data (2013) shows U.S. infant mortality for all groups as 6.6 per 1,000 births, but 12.1 per 1,000 for African Americans. Researchers have hypothesized that trauma exposure may contribute to perinatal health disparities including preterm birth, but few studies have tested the relationship between CT and perinatal outcomes (Dailey, et al., 2011; Rich-Edwards, et al., 2001; Seng, 2002). In a study of 116 low income African American women, Dailey et al. (2011) found 87% of the sample had reported at least one traumatic event, that crime related experiences were prevalent, and that trauma was associated with depression, anxiety, and stress. African American women with higher CT exposure had fewer prenatal visits and longer hospital stays (Dailey, et al., 2011). In this study, the women with higher levels of CT had a higher incidence of preterm premature rupture of membranes. More research is needed on the relationships between collective identify trauma and perinatal outcomes.

### *Trauma in Pregnancy*

Trauma accounts for 6-8% of all pregnancy complications, and is the leading cause of non-obstetric death among pregnant women in the United States (Leone, Lane, Koumans, DeMott, Wojtowycz, Jensen, & Aubry, 2010; Mendez-Figueroa et al., 2013). With an estimated four million live births in the U.S. in 2013, this translates into

250,000-325, 000 births per year (Martin, Hamilton, Osterman, Curtin, & Mathews, 2015).

The two most common forms of trauma are motor vehicle accidents and IPV. Motor vehicle accidents, fatal and non-fatal, occur in 207 of every 100,000 live births in the United States (Mendez-Figueroa, et al., 2013). Other accidents including falls, burns, suicide, and toxic exposure occur in nearly 76 of every 100,000 live births. In contrast, IPV is reported in 8,307 of every 100,000 live births (Mendez-Figueroa, 2013).

Placental abruption due to physical assault to the abdomen has been associated with fetal trauma, spontaneous abortion, and fetal death. A greater percentage of placental abruptions have been linked to intimate partner violence than to motor vehicle accidents (Jasinski, 2004). Physical or sexual assault in pregnancy can lead to poor pregnancy weight gain, anemia, first and second trimester bleeding, miscarriage, spontaneous abortion, maternal injury in the form of bruises or broken bones, sexually transmitted diseases, urinary tract infections, gestational diabetes, preeclampsia, antepartum hemorrhage, preterm contractions, low birth weight, fetal injury or demise, or maternal death (Cronholm et al., 2011; Leone, et al., 2010; Morland, 2008; Seng, 2002).

### *Homicide*

Homicide is the most severe and ultimate cause of maternal and fetal deaths. In the United States, 1,200-1,324 women (pregnant and non-pregnant) are killed each year by their intimate partner, accounting for more than 40% of all murdered women (Fisher & Shelton, 2006). Homicide of pregnant women occurs in 3 of every 100, 000 live births (Mendez-Figueroa et al., 2013). More women are killed during pregnancy

than at any other time during childbearing age. Outside of physical assault injuries and homicide, no other perinatal outcome has been consistently found to be directly associated with IPV during pregnancy (Petersen, 1997).

#### *Natural or man-made disasters*

Recent evidence shows that exposure to traumas in the form of earthquakes, tornadoes, hurricanes, or war can impact perinatal outcomes. In a recent study of 307 Iraqi families from the 1991 Gulf War, an association between exposure to burning oil pits and the chemical weapon mustard gas increased the risk for adverse birth outcomes two to four fold (Arnetz, Drutchas, Sokol, Kruger, & Jamil, 2012). A second study examining pregnant women living in the metropolitan New York area at the time of the 9/11 attack on the World Trade Center found that PTSD was associated with low birth weight and preterm delivery (Lipkind, Curry, Huynh, Thorpe, & Matte, 2010).

A third study by Tong, Zotti, & Hsia (2011), found significant increases in maternal medical risks, anemia, acute or chronic lung disease, eclampsia, and uterine bleeding in women giving birth in North Dakota following the catastrophic flood of the Red River between the years 1994-2000. In addition, the same study found an increase in low birth weight infants and preterm births. These studies provide beginning evidence that trauma exposure due to natural disasters can lead to adverse perinatal outcomes, but more research in this area is needed.

#### *Summary*

In summary, CT comes from multiple sources including personal, family, interpersonal and collective identity trauma, and natural disasters. Physical injury has been shown to result in adverse perinatal outcomes and even death for the mother or

fetus. There is limited evidence that exposure to war and natural disasters has been shown to affect head circumference and weight of newborns, with little knowledge of the psychological effects. Research on the relationship between cumulative trauma exposure and perinatal outcomes among African American women remains limited.

### *Cumulative Trauma and Posttraumatic Stress Disorder (PTSD)*

Within the Roy Adaptation Model, PTSD falls under the physiologic behavior adaptive mode. According to Roy (2009), the physiologic mode involves the physical and chemical processes involved in the function of living organisms, including oxygenation, nutrition, elimination, activity and rest, and protection. PTSD symptoms such as distressing memories of a traumatic event, flashbacks, or frightening dreams (APA, DSM-V, 2013, p. 144) may affect feelings of adequate rest and protection under the physiologic mode.

Research has shown that men are more likely to be exposed to life-threatening or major traumatic events, but women are twice as likely to develop PTSD following trauma exposure (Mezey, et al., 2005). Women exposed to childhood sexual abuse and multiple traumatic events had the highest reported PTSD symptoms. A diagnosis of PTSD is generally based on the occurrence of a single threat or traumatic event (DSMV), and does not capture the effects of prolonged or multiple traumatic events (Kira, et al., 2008). An individual exposed to a traumatic event may or may not develop PTSD symptoms.

Early studies on the phenomenon of PTSD began with the effects of war on combat veterans (Nayback, 2009). As of 2006, one in four veterans discharged from service had filed disability claims, with over 60,000 for mental health issues. The

National Vietnam Veterans study reported current and lifetime PTSD prevalence of 15% and 31% respectively. In studies of veterans from Operation Iraqi Freedom, the PTSD prevalence rates ranged from 5.4-12.1%. Severity of war zone and trauma, such as rape, torture, exposure to atrocities, or prisoner of war status predicted the development and maintenance of PTSD symptoms (Nayback, 2009). Kira et al. (2008) found a relationship between PTSD and all trauma types among 499 male and non-pregnant female Iraqi refugees. In the same study PTSD, survival, family trauma, and interpersonal trauma were associated with poor health.

Vrana and Lauterbach (1994) studied the prevalence of traumatic events and PTSD symptoms in a sample of 440 predominantly Caucasian college students. The students were asked to complete the Impact of Event Scale, Mississippi Scale for PTSD, and Traumatic Events Questionnaire to measure trauma, the Beck Depression Inventory for depression, and State Trait Anxiety Inventory for anxiety. The findings were that 84% of the freshman and sophomore students had experienced at least one traumatic event. One-third (n=112) reported four or more traumatic events, and 9% seven or more events. Females reported that they were more likely to have had unwanted sexual experiences, been raped, been in an abusive relationship, or had experiences “too traumatic” to discuss openly. The results of this study suggest the under reporting of abuse and traumatic events by college aged women seen by health providers.

#### *PTSD and Pregnancy*

In examining studies on PTSD and pregnancy, Loveland-Cook, Flick, Homan, Campbell, McSweeney, & Gallagher, (2004) found the prevalence to be 7.7% among a

sample of 744 pregnant women (57.4% African American) in St. Louis, Missouri. For women diagnosed with PTSD (the most common finding in this study) other significant comorbidities included: women being five times more likely to have depression, and three times more likely to have generalized anxiety disorder. Only 12.3% of the women received treatment for PTSD, although 26.3% reported wanting treatment. The most common PTSD symptoms reported by the women in this study were: 1) distressing recollection of the trauma (100%); 2) distress when exposed to cues resembling the trauma (96.5%); 3) difficulty concentrating (91.2%); and 4) irritability or anger (89.5%). Reported traumatic events included death of a close relative (84.3%); something terrible happening to a close relative (61.4%); being sexually assaulted by a non-relative (50.9%); being sexually assaulted by a relative (35.1%) and being mugged or robbed (45%). Similar to other studies, childhood sexual abuse was high for this pregnant population. Of particular interest was the high proportion of women reporting separation from their mother as a child for a period of six months or longer. The findings of this study support that PTSD was associated with past traumatic events, particularly childhood sexual abuse and separation from the mother. PTSD was associated with depression, generalized anxiety, and substance use, and mediated the relationship between traumatic events and a moderate impairment of daily functioning.

Another study, the STACY project conducted at the University of Michigan (Seng, 2002) examined the relationship between PTSD and pregnancy. Seng (2002) proposed that PTSD was the primary mechanism by which trauma exposure affects overall health. In a study of 566 nulliparous women either positive for PTSD symptoms, resilient to past trauma exposure, or not trauma exposed (Seng, et al., 2013), the



relationship between childhood sexual abuse and postpartum mental health and maternal infant bonding was mediated by their preexisting mental health. In a second qualitative study of fifteen pregnant abused women (Seng, et al., 2004), PTSD symptoms of intrusive re-experiencing, avoidance, numbing, and hyper-arousal were prevalent. In addition, the women showed signs of somatization, dissociation, and interpersonal sensitivity. All fifteen women admitted to unhealthy behaviors including substance use, disordered eating, high risk sexual behaviors, suicidal thoughts, and revictimization. A third study by Seng et al. (2011) found the prevalence of PTSD was *four times higher* among African American women compared to other ethnic groups.

The researchers found that there was increased substance use and less mental health treatment for African American women compared to other groups. This study did not indicate however, whether there were few mental health centers available for the women, or the women did not seek treatment. Seng and colleagues (2011), found that SES was not a factor, but the degree of trauma exposure was. The study further suggested that traumatic stress may be a factor in birth outcome disparities, but this has not been documented. Dailey and colleagues (2011) supported the findings of Seng and her research team in that reported trauma exposure was high (87%) among 116 African-American pregnant women in the San Francisco area. Their findings suggest that African-American women living in violent environments may be at risk for PTSD symptoms. This study resulted in a better understanding of cumulative trauma and birth outcomes in African-American women.

### *Summary*

African-American women are at greater risk for PTSD symptoms as a result of trauma exposure and living in high crime neighborhoods. Women exposed to childhood abuse at a younger age are particularly vulnerable to PTSD symptoms. PTSD has been shown to have an effect on birth outcomes including PPRM, preterm birth, and low birth weight. This study examined CT and PTSD, and the role PTSD plays, if any, in the relationship between CT and perinatal outcomes.

### *Cumulative Trauma and Sleep Quality*

Within the Roy Adaptation Model, sleep quality is the second concept under the physiologic behavioral adaptive mode. According to Roy, sleep is “a process by which rest is accomplished,” a person is able to sleep when their ability to respond to environmental stimuli is diminished (Roy, 2009, p. 169). Human beings spend an estimated one third of their lives sleeping (p. 169). Inadequate sleep has been shown to be associated with increased accidents, irritability with social relationships, and health problems (p. 177). Poor sleep quality and sleep disturbance have been associated with IPV, pregnancy, and perinatal outcomes (Abeyseena and Jayawardana, 2010; Louis, Auckley, Sokol, & Mercer, 2010; Lowe, Humphreys, & Williams, 2007; Okun, Dunkel-Schetter, & Glynn, 2011)

### *Sleep Quality and Normal Pregnancy*

Sleep quality is defined as “one’s perception that their sleep is unrefreshing, poor, or inadequate” (Okun, et al., 2011, p. 1493). Poor sleep quality may result simply from adapting to pregnancy and becoming a new parent. Although the physiology of sleep is not the focus of this study, it is important to understand normal sleep patterns during pregnancy.

During pregnancy, the sleep-wakefulness cycle follows a circadian rhythm that is controlled primarily by the suprachiasmatic nucleus of the hypothalamus (Santiago, Nolleto, Kinzler, & Santiago, 2001). This nucleus is sensitive to both the light-dark cycle and the hormone melatonin, which promotes wakefulness by influencing neuronal activity in the brainstem reticular formation, helping to regulate sleep-inducing neurons promoting non-rapid eye movement sleep and cortical slow-wave activity. The near 24 hour oscillation generated in the suprachiasmatic nucleus, and the alteration of sleep and wake states influence hypothalamic structures responsible for the release of hormones that stimulate or inhibit secretion of other hormones (p. 397). Prolactin, melatonin, cortisol, TSH, oxytocin, and placental chorionic gonadotropin, progesterone, estriol, and dihydroepiandrosterone are hormones that exhibit these 24 hour rhythms. The role of the central nervous system (CNS) and sleep-wakefulness cycle in pregnancy is depicted in Figure 3.

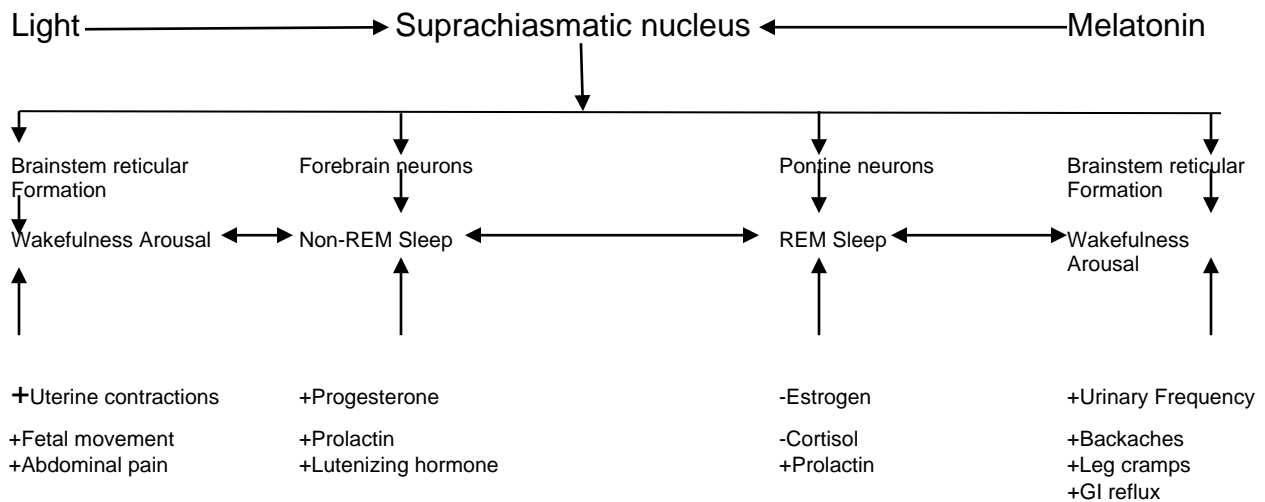


Figure 3: CNS structures involvement in the sleep-wakefulness cycle and pregnancy influences on the cycle (Santiago, et al., 2001)

Estrogen and progesterone increase in pregnancy. Estrogen is known to decrease REM sleep, whereas progesterone induces sleep (Santiago, et al., 2001). In nonpregnant women, cortisol levels peak in the morning and at noon. In pregnancy, cortisol concentrations increase twofold in late pregnancy and fourfold during labor. Women who sleep poorly in the third trimester have lower cortisol/melatonin ratios than good sleepers, however, no research was found on this phenomena and women exposed to trauma and violence.

The recommended total sleep time for women of childbearing age is 7 to 9 hours a night with 80% spent in non-rapid eye movement sleep (Santiago, et al., p. 399). Most pregnant women will experience changes in sleep pattern. In the first trimester, sleep quality decreases as total sleep time, daytime sleepiness, insomnia and nocturnal awakenings increase. Sleep normalizes in the second trimester, and decreases in the third as the mother awaits the onset of labor. The expectant mother experiences more abdominal discomfort, leg cramps, heartburn, backache, fetal movements, and urinary frequency.

Lee and associates (2000) examined 45 Caucasian, upper middle class, college educated women before and during pregnancy to describe sleep pattern changes from pre-pregnancy to postpartum. The women consented to polysomnography for two consecutive nights during the follicular and luteal phases of their menstrual cycle, and for the women who conceived, had the test repeated each trimester and after delivery. By 11-12 weeks gestation, significant changes in sleep pattern were found. A significant increase in total sleep time was found, but with less deep sleep and more

awakenings during night. Sleep quality improved three months after birth, but not back to pre-pregnant levels.

### *Obstructive Sleep Apnea (OSA) and Pregnancy*

Sleep disordered breathing (SDB) and obstructive sleep apnea (OSA) have been associated with adverse birth outcomes. Louis, et al. (2010) studied 57 pregnant women to estimate maternal and neonatal morbidities associated with OSA. In comparing obese pregnant women with OSA to pregnant women of normal weight, Louis, et al., (2010) found the OSA patients had more preeclampsia, preterm birth and medical complications than the control group. Other studies have shown a relationship between sleep disturbance disorders, gestational diabetes (GDM), hypertensive disorders and pregnancy, intrauterine growth retardation, and preterm births (Santiago, et al., 2001; Reutrakul, et al. 2011; Williams, Miller, Qiu, Cripe, Gelay, & Enquobahrie, 2010). Pregnant women with SDB were found to have more frequent snoring, sleep duration of < 7 hours/night, and increased risk for GDM. In a cohort of 1,272 clinic patients, elevated blood pressure and increased risks for hypertension were associated with short (<6 hours/night) and long (>10 hours/night) sleep (Williams, et al., 2010).

### *Sleep Quality and Intimate Partner Violence*

One cause of poor sleep quality is physical trauma by an intimate partner. IPV has been associated with nightmares and insomnia (Pigeon, et al., 2011; Rauer, Kelly, Buckhalt, & El-Sheikh, 2011; & Lowe, et al., 2007). The long term health consequences for women in these studies included increased risk for fatigue, fibromyalgia, substance abuse, GI upset, headaches, depression, and anxiety. Pigeon and associates (2011) found that among 121 non-pregnant women with and without depression, clinically

significant insomnia and nightmares were observed in 46% and 32% of the participants, respectively. Depressed women experienced more severe PTSD and were more likely to have insomnia. When controlling for PTSD in this study, the presence of insomnia was associated with an 8-fold increase of being depressed, with nightmares having a twofold increase in risk. Poor maternal sleep quality was associated with childhood physical and emotional abuse (Greenfield, et al., 2011; Poon & Knight, 2011). Qualitative studies on IPV and sleep have been conducted during pregnancy, but there is limited research on the relationship between sleep quality and perinatal outcomes.

#### *Sleep Quality and Perinatal Outcomes*

Sleep quality and sleep deprivation (< 8 hours/night during the second and third trimesters) were associated with inadequate maternal weight gain, low monthly income, multiparity, and standing or walking more than five hours per day among 710 pregnant women (Abeysena and Jayawardana, 2011). In addition, decreased sleep duration was associated with fatigue, with depressive symptoms predictive of more fatigue throughout the day (Tsai, Lin, Kuo, and Thomas, 2011). Okun and associates (2011) looked at the relationship between sleep quality and preterm birth. A sample of 166 women were given the Pittsburgh Sleep Quality Index (PSQI) in their first, second, and third trimesters and compared. The findings were that for every increase in the PSQI scores, the odds of preterm delivery increased by 25% in early pregnancy, and 18% in later pregnancy. Pathways between disturbed sleep quality and birth outcomes are unknown, but it is believed that stress, inflammation, metabolic syndrome, and insulin resistance may play a role. What is evident is more research is needed on the role sleep quality has on perinatal outcomes.

In summary, obstructive sleep apnea in pregnancy has been linked to gestational diabetes, gestational hypertension, and preeclampsia. Women exposed to physical trauma have reduced sleep quality with more PTSD symptoms and insomnia. Poor sleep quality has been linked to preterm birth, but the research is limited, particularly among African American women.

#### *Cumulative Trauma and Perinatal Outcomes*

Within the Roy Adaptation Model, adaptation is a life process or function that is integrated, compensatory, or compromised (Roy, 2009). For this study, the life process was reproduction and integrated adaptation was a full term pregnancy with a healthy mother and baby. According to Roy, changing conditions within the environment can affect an individual's ability to respond positively to a situation (p. 37). Changing conditions such as family violence, abuse from a co-worker, or racism may affect the mother's adaptation to pregnancy. Research has shown that intimate partner violence can bring harm to both mother and fetus, but the effects of cumulative trauma are less clear.

Several studies have shown a relationship between CT, PTSD, and depression (Mezey, et al., 2005; Seng, et al., 2011). A review of the research revealed one study that examined the relationship between CT and perinatal outcomes among pregnant African-Americans (Dailey, et al., 2011). The sample of 116 low income women showed that crime related experiences such as murders, robberies, and muggings were a common occurrence, and were associated with depression, anxiety, and generalized stress. Dailey, et al. found that the greater the trauma exposure, the higher the rate of

tobacco use, premature preterm rupture of membranes, and longer hospital stays. This study has built upon that knowledge.

### *Summary*

The literature related to cumulative trauma, PTSD, sleep quality, and perinatal outcomes was reviewed and synthesized. Cumulative trauma exposure is prevalent in pregnant women, particularly African Americans. Research on trauma and pregnancy has focused primarily on IPV and motor vehicle accidents. Pregnant African American women reporting trauma exposure were four times more likely to experience PTSD symptoms than women from other ethnic groups (Seng, et al., 2011). Research on poor sleep quality has been conducted primarily on women with obstructive sleep apnea or sleep disordered breathing, and an association was found with poor sleep quality and gestational diabetes, gestational hypertension, and preeclampsia.

Studies that examine relationships among childhood abuse, lifetime trauma, IPV, and health outcomes provide a better understanding of the relative effects of these factors on patient health (Campbell, et al., 2002). A current gap in knowledge is that only one study was found on trauma exposure & perinatal outcomes in African American women (Dailey, et al., 2011). PTSD is believed to mediate the relationship between physical violence and adverse perinatal outcomes such as preterm birth (Seng, 2002), but this has not been demonstrated conclusively. Okun et al., (2011) suggests an association between poor sleep quality and preterm birth. More evidence is needed on how trauma is related to perinatal outcomes (Campbell, et al., 2013).

This study has examined the relationships among cumulative trauma, posttraumatic stress disorder, sleep quality, and perinatal outcomes. The knowledge



from this study can provide better assessment of trauma, PTSD symptoms, and poor sleep quality during pregnancy. In addition, it can be used to develop nursing interventions to reduce PTSD symptoms and improve sleep quality for African American women.

## CHAPTER 3 METHODS

The purpose of this study was to examine relationships among cumulative trauma, PTSD, sleep quality and perinatal outcomes in African-American women who had recently given birth. The methodological procedures for this study which include design, setting, sample, measures, recruitment, data collection procedures, and data analysis. They are described below.

### *Design*

This retrospective, correlational, cross-sectional study examined relationships between the independent variables of cumulative trauma, PTSD, sleep quality, and the dependent variable, perinatal outcomes. In the study, age, years of education, employment, body mass index (BMI), and depressive symptoms were used as covariates to assess influence on the independent and dependent variables.

### *Setting*

Participants for this study were recruited from two mother/baby units of hospitals in the Detroit metropolitan area: 1) the Detroit Medical Center (DMC) Hutzel Women's Hospital, and 2) St. John Providence Hospital in Southfield, Michigan. Hutzel Women's Hospital is staffed by Wayne State University (WSU) faculty physicians and certified nurse midwives, and is located in midtown Detroit, Michigan. Hutzel Women's Hospital provides comprehensive inpatient obstetrical and gynecological services to primarily low income African American women who may be at risk for trauma exposure, PTSD, poor sleep quality, and adverse perinatal outcomes. For mothers who require additional psychosocial support, registered nurses, lactation consultants, social workers,

dieticians, psychologists, childbirth preparation classes, and a car seat safety program are available to help meet the mother's needs regardless of insurance coverage.

Women with Medicaid or Medicaid HMO insurance coverage are eligible for referral to community Maternal Support Services, and Women, Infant, and Children's (WIC) programs for prenatal, parenting, nutrition, and home visit support during the pregnancy and after hospital discharge. St. John Providence Hospital, part of the Ascension Health System, provides similar comprehensive inpatient and outpatient obstetrical and gynecological services to women who primarily reside in Detroit and southeast Oakland county. Registered nurses, lactation consultants, social workers, dieticians, and psychologists are available for support, and the hospital has a comprehensive childbirth and breastfeeding preparation program.

### *Sample*

A convenience sample of 152 African American women who had recently given birth constituted the sample for this study. A total of 162 mothers on the postpartum units of St. John Providence and Hutzel Women's Hospitals had been approached to hear more about the study. Ten mothers declined. Two more mothers were removed due to incomplete, missing data. One mother stopped the interview once family members arrived; the second mother stopped the interview stating that the questions were upsetting for her.

Eligibility criteria for study participation included:

### *Inclusion criteria:*

\*Women age 18 and older

\*Ability to speak and read English

\*Having recently given birth (a minimum six hours after delivery)

Exclusion criteria:

\*Multiple gestation

\*Diagnosed obstructive sleep apnea

\*Incarceration

\*Mental illness requiring medication or ongoing therapy

\*Fetal malformations, genetic disorders, or other anomalies

*Sample Size Determination*

Power analysis was computed apriori with an online SEM power calculator developed by Daniel Soper to compute the required sample size of 146 women based on the number of latent variables, observed variables, effect size, power, and  $p$  value ( $\alpha$ ) (Munro, 2005). Power is the likelihood of rejecting a null hypothesis ( $H_0$ ) or avoiding a type II error. Eighty percent is generally considered an adequate level of power (Munro, 2005). Alpha ( $\alpha$ ), the significance level, is the probability of rejecting the true null hypothesis. For power analysis, alpha was set at 0.05. As there is limited research on the relationship between cumulative trauma and perinatal outcomes, the effect size was set at 0.2, a small effect size. With the eight latent variables of cumulative trauma, PTSD, sleep quality, perinatal outcomes, age, BMI, education, employment, and depression, an effect size of 0.2, power at 80%, and a  $p \leq 0.05$ , it was determined that a minimum sample of 146 mothers would be needed. To perform effective structural equation modeling a minimum of 200 participants is preferred (Munro, 2005).

*Human Subjects*

Prior to data collection, the study received approval from the DMC Nursing

Research Committee, the DMC Corporate Research Compliance Committee, the WSU Institutional Review Board (IRB), and the St. John Providence Health System Institutional Review Board. Signed informed consent and HIPAA waivers were obtained from all study participants.

### *Pilot Feasibility Study*

The first 10 mothers consented to participate in the study constituted the sample for a pilot to verify the mother's ability to read, understand, and complete the questionnaires; and to assess for any interference with the mother's clinical care. It was estimated that the consenting and questionnaire completion process would take 60 minutes for each mother, and it was found that the actual time for consent and completion of the questionnaires was 35.2 minutes. After the mothers completed the instruments for the overall study, they were asked to complete a seven question evaluation form to assess their perception of the questionnaires. Examples in this evaluation form were "Were the questions easy to read?" and "Were the questions easy to answer?" Table 1 summarizes the mother's responses to the study questions.

Table 1. Measure of Burden	
1.How difficult was it to understand and answer the questions?	0-Very difficult 0-Somewhat difficult 0-A little difficult <b>10-Not at all difficult</b>
2.How much did taking the time to answer questions take away from your time with your baby?	<b>1-A great deal</b> 0-A good bit 0-A little bit <b>9-Not at all</b>
3.How much did taking the time to answer the questions take away from your time with your nurses and doctors?	0-A great deal <b>1-A good bit</b> 0-A little bit <b>9-Not at all</b>
4.How clear were the questions?	<b>8-Very clear</b> <b>1-Somewhat clear</b> <b>1-A little clear</b> 0-Not at all clear
5.How comfortable did you feel in answering the questions?	<b>8-Very comfortable</b> <b>2-Somewhat comfortable</b> 0-A little comfortable 0-Not at all comfortable
6.How much did taking the time to answer the questions interfere with feeding your baby?	0-A great deal 0-A good bit <b>1-A little bit</b> <b>9-Not at all</b>
7.Overall, how difficult was it to answer the questions?	0-Very difficult <b>2-Somewhat difficult</b> <b>1-A little difficult</b> <b>7-Not at all difficult</b>

Overall, the mothers thought the questions were easy to understand, and did not take them away from the care of their infants or health care providers. Many mothers thanked the researcher for speaking with them. Three mothers indicated that they had difficulty answering a few of the questions. The mothers felt these questions were difficult to answer because of their personal situation or past experiences. Based on the mother's perceptions about the ease of questionnaire completion, it was determined that

no changes were needed in either the wording of questions on any study measure, or the structured interview visit procedure. Mothers participating in the pilot arm of this study were included in the final data analysis.

### *Measures*

The following measures were used to examine cumulative trauma, PTSD, sleep quality (independent variables), and perinatal outcomes (dependent variable).

#### *Cumulative trauma-The Cumulative Trauma Scale*

The Cumulative Trauma Scale (Kira, et al., 2008) was used to assess 22 kinds of traumatic experiences, including 1) *personal* trauma such as physical and sexual abuse; 2) *collective identity* trauma such as racism; 3) *family* trauma such as witnessing abuse of a relative or abandonment by a parent; 4) *interpersonal* trauma including abuse from acquaintances or co-workers; and 5) *natural disasters* such as tornadoes or earthquakes. The measure asked each participant to identify the number of times an event, in one of these categories occurred, and to rate that experience. For items related to racism and history of family trauma, however, participants were asked to rate each event on a five-point Likert scale, with 0 indicating that the trauma did not occur, and 4 indicating that the trauma occurred on four or more occasions. In the original study that examined trauma in 501 Iraqi refugees, overall adequate internal consistency was established for males and females combined ( $\alpha=0.847$ ), and for females alone ( $\alpha=0.854$ ). Concurrent and discriminant validity were tested and established through correlations with convergent and divergent measures. The measure had not previously been used in a sample of African American women who have recently given birth.

### *Cumulative Trauma-Conflict Tactics Scale (CTS-I)*

The Conflict Tactics Scale (CTS-I) (Straus, Hamby, Boney-McCoy, & Sugarman, 1996) was used to measure the degree to which partners in dating, cohabiting, or marital relationships psychologically or physically attack one another, and their use of reasoning or negotiation to deal with conflicts. The CTS-I is the measure most frequently used to examine physical assaults on a partner, and has been used with over 70,000 study participants from diverse cultural backgrounds, including African Americans. The original CTS-I, first published in 1979, had a total of 78 items (Straus, 1979). The CTS-I Short Form used for this study, contained 19 items. That measure consisted of three subscales: violence, verbal aggression, and reasoning.

The CTS-I Short Form has good reliability, with a Cronbach's alpha  $\alpha=0.79-0.95$  across the four subscales. The measure is designed to be administered as an interview between the researcher and participant, and has been found to take an average of 10 minutes to complete (Straus, et al., 1996). The questions for the CTS-I are based on a Likert scale from 0=Never to 25=More than 20 times. Examples of questions asked on the CTS-I are: In the past year and during your entire relationship have you "discussed an issue calmly" and "insulted or swore at each other?"

### *Community Safety Questionnaire*

The Community Safety Questionnaire is a 13 item measure that examines feelings of security within a neighborhood. Examples of questions asked include, "Are you awakened to the noise of gunshots?" and "Do you feel safe moving around alone at night in your neighborhood?" Based on a Likert scale of "0" for never, to "3" for often, a higher score indicates inadequate feelings of safety. No reliability data was available for



the Community Safety Questionnaire. Its use in African-American women who have recently given birth is unknown.

### *Posttraumatic Stress Disorder-CAPS II*

The Clinician Administered Posttraumatic Stress (CAPS-II) (Blake, et al., 1995) measure is a clinician rating scale for the assessment of current and lifetime PTSD symptoms. CAPS-II is an 18 item shortened version of the 30 item Clinician Administered Posttraumatic Stress Scale (CAPS-I) based on DSM-III criteria for PTSD (Blake, et al., 1990). Like CAPS-I, the CAPS-II measures frequency of feelings of core PTSD symptoms such as re-experiencing, avoidance and dissociation, hyper-arousal, and total PTSD score (Blake, et al., 1995). The key difference between CAPS-I and CAPS II is that with CAPS-II, symptom status can be assessed over one week versus one month. The study participant was asked by the researcher to respond to each of 18 questions describing PTSD symptom severity. Examples of questions on the CAPS-II are: During the past week, "Have you had bad dreams or nightmares", and "Do you try to avoid reminders of painful past events"? On this 0-5 Likert scale, a higher number indicates a more severe response.

Excellent inter-rater reliability was obtained ( $r=0.92$  to  $0.99$ ) in the initial testing of the CAPS-I among combat veterans (Blake, et al., 1990). Internal consistency was calculated for the three PTSD symptom subgroups consisting of: 1) re-experiencing (Cronbach's  $\alpha=0.77$ ; 2) dissociation and avoidance (Cronbach's  $\alpha=0.85$ ); and 3) hyperarousal (Cronbach's  $\alpha=0.73$ ), indicating homogeneity among the CAPS-I items. Concurrent validity of the CAPS-I was estimated by calculating correlations between the mean intensity rating across the diagnostic items. Three validated measures for PTSD,

the Mississippi Scale ( $r=0.70$ ), MMPI PTSD subscale( $r=0.84$ ) , and the CES ( $r=0.42$ ), were found to have at least moderate concurrence with the CAPS-I (Blake, et al., 1990). Internal consistency and reliability for the sample of postpartum African American mothers in this study was established as described above.

*Sleep Quality: The Pittsburgh Sleep Quality Index*

The Pittsburgh Sleep Quality Index (PSQI) has 19 self-rated questions and five questions rated by the bed partner that are used to assess sleep quality over the past month, and for this study, the last trimester of pregnancy (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The five bed partner rated questions were included in this study. Significant relationships have been found between IPV, trauma symptoms, and poor sleep quality in non-pregnant women (Huber, Woods, Hall, & Angott, 2008).

There are seven subscales and a total score generated with this measure: 1) subjective sleep quality; 2) sleep latency; 3) sleep duration; 4) habitual sleep efficiency; 5) sleep disturbances; 6) use of sleeping medications; and 7) daytime dysfunction. The 19 self-rated questions are combined to form seven component scores based on the subscales, and each has a range of 0-3 points. A score of "0" indicates no difficulty; a score of "3", severe difficulty. The seven component scores are summed to create a total score with a range of 0-21. An individual who records a score of  $\geq 5$  indicates poor sleep quality (Buysse, et al., 1989). Homogeneity and consistency of the separate 19 items was assessed using test-retest reliability in the original Buysse, et al., 1989) study and a high degree of reliability was found (Cronbach  $\alpha=0.83$ ). Sensitivity of the PSQI was found to be 89.6%, and specificity 86.5% ( $\kappa=0.75$ ,  $p<0.001$ ). Content validity in this study was obtained. Buysse et al., (1989) found that age was negatively associated

with subjective sleep quality, with younger women reporting poorer sleep quality. Also, depressed women had higher PSQI scores, indicating poorer sleep quality.

The PSQI has been used to study sleep quality in pregnant women. Internal consistency in studies during pregnancy ranged from Cronbach's  $\alpha=0.70$  to  $0.76$  across the subscales (Hung, Tsai, Ko, & Chen, 2013; Ko, Chang, & Chen, 2010; Skouteris, Wertheim, Germano, Paxton, & Milgrom, 2009). Internal consistency of the PSQI across the subscales improved in the Skouteris et al. study (2009) with removal of the use of the sleep medication item (Cronbach  $\alpha=0.72$  to  $0.78$  respectively). In the current study, the question was retained as no recent research was found on the use of sleep medications in late pregnancy among African American women.

#### *Perinatal Outcomes*

Pregnancy and birth outcomes were examined through a retrospective chart review of the absence or presence of specific perinatal events. The perinatal outcome measure for this study consists of 29 items (17 maternal outcomes/12 neonatal), and was adapted from a study conducted by the Maternal Fetal Medicine Unit (MFMU) Network that examined timing of delivery among first time mothers (Tita, et al., 2012). The objective of the Tita, et al., study (2012) was to compare pregnancy outcomes by completed week of gestation after 39 weeks in laboring or induced nulliparous women. The authors found risks for cesarean section, uterine atony, and chorioamnionitis significantly increased after 39 weeks gestation. Both NICU admissions and composite neonatal outcomes (respiratory illness, intubation for CPR, sepsis, seizures, treated hypoglycemia, cord pH  $<7.0$ , and five minute Apgar  $\leq 3$ ) were higher at 36-38 weeks compared to 39 weeks gestation. There was no increase in the number of cesarean

section births with labor induction compared to expectant management (Tita, et al., 2012).

In the Tita et al., (2012) study, a composite score was created for five maternal complications 1) chorioamnionitis; 2) endometritis; 3) wound infection; 4) postpartum blood transfusion; and 5) cesarean delivery. For the purpose of this study, the perinatal outcome measures from Tita, et al. (2012) were used along with additional outcomes found in the trauma literature suggestive of a relationship with CT, PTSD, or sleep quality (Campbell, et al., 2002; Campbell et al., 2006; Dailey, et al., 2011; & Johnson, et al., 2007). These additional items included: 1) gestational diabetes; 2) gestational hypertension; 3) preeclampsia; 4) number of hours in labor; 5) operative vaginal delivery; 6) premature preterm rupture of membranes; 7) sexually transmitted infection; 8) urinary tract infections; 9) late entry into prenatal care, defined as after twelve weeks gestation; and 10) less than adequate number of prenatal care visits, defined as less than three.

Eight neonatal outcomes were examined in the Tita et al. (2012) study: 1) respiratory illness; 2) intubation for CPR; 3) sepsis; 4) seizures; 5) treated hypoglycemia; 6) umbilical cord pH <7.0; 7) five minute APGAR  $\leq 3$ ; and 8) NICU admission. For this study, the only outcome revised from the Tita et al. study was APGAR score  $\leq$  five. Neonatal items outcomes that are associated with CT, PTSD, or sleep quality, that were added for this study included 1) meconium stained fluid; 2) preterm birth; 3) small for gestational age (SGA) by gestational age and newborn weight; and 4) SGA newborn head circumference (El-Kady, et al., 2004; Shah & Shah,

2010). During data analysis this measure was used to compare perinatal outcomes for women who reported cumulative trauma or current abuse with perinatal outcomes of women reporting no trauma or abuse.

### *Demographic Data Form*

The Demographic Data Form (DDF) was completed by the investigator or a PhD prepared research nurse during an interview with the study participant. Thirteen items were asked related to age, race, education, occupation, work hours, religion, visits to the emergency room or hospitalizations within the last 12 months, questions about the pregnancy, and social support. The participants were asked if they have been diagnosed with obstructive sleep apnea as this has been associated with poor sleep quality. The purpose of the demographic data form was to accurately describe the sample population, and to collect data on covariates.

### *Control variables*

Other variables known to influence CT, PTSD, and sleep quality are age, education, employment, body mass index (BMI), study site, and depression (Huber, et al., 2008; Meltzer-Brody, Boschloo, Jones, Sullivan, & Penninx, 2013; Meltzer-Brody, Zerwas, Leserman, VonHolle, Regis, & Bulik, 2011; Okun, Tolge, & Hall, 2014), and therefore will be included in this study. Covariates are chosen to evaluate whether or not the independent variable is affected by variables other than the dependent variable. Information on age, education, employment, and BMI, were asked on the Demographic Data Form. Age, unemployment, previous miscarriage, and stillbirth are risk factors for depression (Koleva, Stuart, O'Hara, & Bowman-Reif, 2011; Meltzer-Brody, et al., 2013; Okun, et al., 2014) but little is known about relationships between these variables.

Lower income has been associated with PTSD and poor sleep quality (Okun, et al., 2014). African American women with PTSD have less access to prenatal care, mental health services, and are at greater risk for poor perinatal outcomes (Dailey, et al., 2011). *BMI* was calculated using the mother's height/weight from her prenatal record, hospital electronic medical record, or self-report.

*Depressive symptoms* were assessed with the Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987). The EPDS is a 10 item self-report scale that was developed specifically to screen for symptoms of postnatal depression. The measure asks the new mother to describe how she has felt in the past seven days. Each of the 10 items is scored on a scale of 0 to 3, for a possible maximum score of 30. A score of 10-12 indicates probable depression, and a score of  $\geq 13$ , likely depression. The measure has a reliability coefficient of Cronbach's  $\alpha=0.87$  which was similar in two separate studies (Beck and Gable, 2000; White, 2008).

#### *Data Collection Procedures*

##### *Study Recruitment*

An education session describing the study was presented to the nursing staff of the two respective units prior to recruitment. As potential study participants were identified, a clinician asked the mothers if they would like to hear more about the study. Mothers who agreed to hear more about the study, were approached by the investigator or a PhD prepared research nurse, and informed consent was secured. The consent process included a thorough explanation of the purpose of the study, study procedures, risks, benefits, compensation, and confidentiality procedure. In order to secure confidentiality of the participant, and adhere to HIPAA requirements, each mother was

assigned a non-identifying code number. All study records were secured in a locked cabinet in the investigator's office, with the consent forms stored separately from the questionnaires.

Following informed consent, the mothers were interviewed for completion of the Demographic Data Form, CTS-I, and CAPS-II. Each mother was given specific instructions on how to complete the Cumulative Trauma Scale, Pittsburgh Sleep Quality Index, and Edinburgh Postnatal Depression Scale.

Since the reading level of the participants was expected to be approximately 6-8<sup>th</sup> grade, and the questions were sensitive in nature, the investigator remained in the room, and offered to read the items on each measure. Mothers were encouraged to ask questions if they did not understand any items in the instruments. If a mother showed signs of distress, the interview was terminated. If termination occurred, the PI asked the mother if she could call her within the week to complete the remaining measures. Mothers experiencing severe distress were immediately referred to their primary provider. Following completion of all questionnaires, each mother was given a listing of community mental health agencies, and the phone number of the PI to contact for further questions about the study.

Study participants were then given a \$10 Target gift card, and had their name entered into a drawing for \$250.00 cash which took place at the end of study recruitment. The researcher collected and secured all study instruments at the end of each data collection session. Following IRB approval, the total study took nine months to complete.

#### *Data Management and Analysis*

All data elements were entered into the SPSS Data Builder System, version 4.0. Double data entry was used to ensure accuracy of the data. Descriptive statistics (measures of central tendency, frequency distributions, and dispersion) were performed to understand and organize the data. The data were analyzed in SPSS version 22, for symmetry, skewness, modality, kurtosis and outliers. Internal consistency reliability of the CT Scale, CTS-I, CSQ, CAPS-II, EPDS, and PSQI for this sample were determined using Cronbach's alpha. Pearson's product moment correlation and multiple regression analysis, while controlling for the control variables, were used to identify significant causal relationships among the independent and dependent variables. For a neonatal composite of birth measures (gestational age, newborn weight, and newborn head circumference), z-scores were calculated and averaged together. A z-score is a method of expressing a score in terms of its distance from the mean. When raw scores in a distribution are converted to z-scores, the resulting distribution will have a mean of zero and an SD of 1 (Munro, 2005, p. 78).

### Summary

A convenience sample of 150 African American women was approached following birth at two medical centers in the metropolitan Detroit area. Following informed consent and HIPPA waivers, the mothers were interviewed using the Demographic Data form, CTS-I, and CAPS-I. The mothers were given the option of self-reporting items on the CT Scale, CSQ, PSQI, and EPDS, or having the investigator continue the interview for completion of these forms. Descriptive statistics, Pearson's Product moment correlation, and multiple regressions were used for analysis of the *data*.



## CHAPTER 4 RESULTS

In this chapter, the results of the statistical analysis are reported. First, data management and analysis are described. Following that, sample characteristics are described, and descriptive results are presented for all major study variables. Finally, results related to the research hypotheses are presented.

### *Data management*

Prior to analysis, the data were checked for missing data, out-of-range data, and deviations from normality. Two participants' data were removed due to excessive missing data. One participant stopped answering questions after completing two measures when several family members arrived; the second participant because the questions on the Cumulative Trauma Scale were "too upsetting" for her.

An analysis of outlying data points and non-normal distributions resulted in the need to winsorize or log-transform several variables. The following variables were winsorized: maternal weight, community safety total score, PTSD Arousal (CAPS), PTSD Avoidance (CAPS), PTSD Dissociation (CAPS), and Conflict Tactics past year total score. Depression total score was log-transformed due to skewness.

### *Data Analysis*

The initial statistics presented are the univariate analyses for all study variables. Bivariate analyses, including t-tests and chi-square analyses are presented second, followed by the multivariable analyses (multiple regression analysis to test study hypotheses). In the regression analysis to test hypotheses for cumulative trauma, the measures of Cumulative Trauma Scale and Conflict Tactic Scale-Past Year separated because of the potential overlap in questions and conceptual differences. The

Community Safety Questionnaire was not included in the analysis of cumulative trauma due to poor internal reliability. A Neonatal Composite consisting of gestational age, newborn weight, and newborn head circumference was created to examine the relationship between trauma and the neonatal outcomes of preterm birth and small for gestational age. Significance level was set at  $p \leq 0.05$ .

### *Sample Characteristics*

A total of 150 participants from the mother-baby units of the Detroit Medical Center's Hutzel Women's Hospital and St. John Providence Southfield Hospital were included in the data analysis. Table 2 provides an overview of the demographic characteristics of the sample including the covariates of age, years of education,

**Table 2. Sample Characteristics.**

	All (N=150)				Providence (N=65)		Hutzel (N=85)		t/ $\chi^2$	p
	Mean /%	SD	Min	Max	Mean /%	SD	Mean /%	SD		
Years of Education	13.0	2.0	8.0	19.0	14.0	2.2	12.2	1.4	5.74	<0.001
Age (years)	26.6	5.7	18.5	45.1	28.1	5.9	25.5	5.3	2.82	0.005
Employment (% yes)	72.7	--	--	--	69.2	--	75.3	--	0.68	0.409
Live with FOB (% yes)	48.0	--	--	--	56.9	--	41.2	--	3.67	0.056
Insurance (% Medicaid)	80.7	--	--	--	66.2	--	91.8	--	17.64	<0.001
Food Assist. (% yes)	79.3	--	--	--	70.8	--	85.9	--	5.13	0.023
Gov Assist. (% yes)	62.7	--	--	--	44.6	--	76.5	--	16.00	<0.001
Pre-Preg. Weight (kg)	78.7	23.4	41.0	154.0	81.5	23.9	76.9	23.1	1.14	0.255
BMI	29.7	8.5	15.0	61.0	30.3	8.3	29.4	8.7	0.58	0.562
HTN HX (% yes)	18.0	--	--	--	16.9	--	18.8	--	0.09	0.764
Diabetes HX (% yes)	8.7	--	--	--	10.8	--	7.1	--	0.64	0.423
Parity	1.3	1.7	0.0	10.0	1.2	1.5	1.4	1.9	-0.85	0.395
<u>Prenatal Care (% adeq.)</u>	<u>71.7</u>	<u>--</u>	<u>--</u>	<u>--</u>	<u>73.4</u>	<u>--</u>	<u>70.4</u>	<u>--</u>	<u>0.17</u>	<u>0.684</u>

employment, and BMI. Depression is presented in a later section.

Of the total, 65 (43%) were from Providence Hospital and 85 (57%) from Hutzel

Women's Hospital. All participants were African American and non-Hispanic. Mean age of all mothers was 26.6 years, 42% had recently given birth to their first child, 83% had completed high school, 73% were working at least part-time, 80% were enrolled in a Medicaid insurance program, 79% received food stamps, and 63% received other forms of government assistance.

As a group, 48% of the mothers were currently living with the father of their baby. When asked, "Who would you describe as your number one support person," the most common response was their mother (36%) or the father of the baby (22%). Other, but much less common responses included: I have no support person (8.7%), a sister (8%), a grandparent (7.3%), a friend (5.3%), or father (4.7%). The remaining 8% of the participants identified their brother, church or clergy member, a cousin, a niece or nephew, aunt or uncle, or their own young daughter as their primary support. When asked "What is your religion," 67% responded Christian, 14% Baptist, 13% No Religion, and 6% Other.

Nearly 72% of the women received adequate prenatal care, 18% had a prepregnancy history of hypertension, and 8.7% had a pre-pregnant history of diabetes. Prior to pregnancy, average maternal weight was 78.71 kilograms (173 lbs.), and average BMI was 29.74. According to national standards (NIH/NHLBI, 2015), the group's mean BMI falls into the overweight category. Among all women, 3% were identified as underweight prior to pregnancy, 27% were within normal limits, 28% were overweight, and 42% were obese.

#### *Examination of Demographic Variables by Study Site*

To explore for potential differences in demographic variables by study site, t-test and chi-square analyses were performed. Results revealed significant differences between the two study sites in the following four variables: maternal age, years of education, insurance, and frequency of government assistance. On average, Hutzel Women's Hospital mothers were younger, less educated, and more likely to be enrolled in a Medicaid program, receive food stamps, or receive other forms of government assistance (Table 2).

### *Study Predictor Variables*

The descriptive statistics for the predictor variables of trauma, posttraumatic stress, sleep quality, and perinatal outcomes are presented in Table 3. The Conflict Tactic Scale (CTS-I short form) consists of 19 questions asking how couples handle conflict situations (Straus, et al., 1996). Participants were asked on a seven point Likert scale from 0-6 (0=Never, 1=Once, 2=Twice, 3=3-5 times, 4=6-10 times, 5=11-20 times, and 6=More than twenty times) how conflict between them was handled in the past year, and over their entire relationship. The CTS has four subscales: reasoning, verbal aggression, minor aggression, and severe aggression. Reliability for each of the subscales in this study were: 1) Reasoning (Cronbach  $\alpha=0.31$  past year/ $\alpha=0.29$  ever); 2) Verbal aggression (Cronbach's  $\alpha=0.82$  past year/ $\alpha=0.82$  ever); 3) Minor Aggression (Cronbach's  $\alpha=0.80$  past year/ $\alpha=0.86$  ever); and 4) Major aggression (Cronbach's  $\alpha=0.72$  past year/ $\alpha=0.89$  ever). Scores were calculated for each subscale, with a higher number indicative of more reasoning or aggression.

Verbal aggression for the past year (M=12.8, SD=8.2), was the most frequent form of handling conflict, followed by reasoning (M=8.5, SD=3.8), minor aggression

(M=2.7, SD=4.6), and major aggression (M=0.5, SD=1.8). Similarly, for handling conflict over the entire relationship, verbal aggression was cited most frequently (M=14.7, SD=8.7), followed by reasoning (M=9.2, SD=3.9), minor aggression (M=3.5, SD=5.8), and major aggression (M=0.8, SD=3.5). There were no statistically significant differences between study sites.

Table 3. Trauma Descriptive Statistics.

	All (N=150)				Providence (N=65)		Hutzel (N=85)		t	p
	Mean	SD	Min	Max	Mean	SD	Mean	SD		
<b>Conflict Tactics Scale</b>										
Total <u>Past Year</u>	24.5	13.0	4.0	63.0	23.7	12.5	24.9	13.4	-0.58	0.562
Reasoning	8.5	3.8	0.0	18.0	8.3	4.0	8.6	3.7	-0.57	0.570
Verbal Aggression	12.8	8.2	0.0	30.0	12.7	7.8	12.9	8.6	-0.18	0.859
Minor Aggression	2.7	4.6	0.0	25.0	2.1	3.7	3.1	5.2	-1.40	0.161
Severe Aggression	0.5	1.8	0.0	16.0	0.7	2.4	0.3	1.1	1.16	0.248
Total <u>Ever</u> in Relationship	28.2	16.2	5.0	108.0	27.7	15.9	28.6	16.5	-0.32	0.750
Reasoning	9.2	3.9	0.0	18.0	9.1	4.0	9.3	3.7	-0.40	0.692
Verbal Aggression	14.7	8.7	0.0	30.0	14.6	8.3	14.8	9.0	-0.17	0.863
Minor Aggression	3.5	5.8	0.0	30.0	3.1	5.4	3.7	6.1	-0.65	0.518
Severe Aggression	0.8	3.5	0.0	32.0	0.9	3.3	0.7	3.6	0.47	0.641
<b>Cumulative Trauma Events</b>	10.3	4.8	1.0	26.0	10.3	4.9	10.4	4.8	-.11	0.912
<b>Community Safety Total</b>	9.4	3.6	2.0	23.0	9.1	3.3	9.6	3.8	-0.85	0.399

The Cumulative Trauma Scale (Kira, et al., 2008) consists of 32 types of trauma experiences that may occur in a person's lifetime. The total number of trauma

experiences each woman reported was counted and used as a total score. The minimum number of reported trauma experiences reported at both sites combined was one and the maximum twenty-six ( $M=10.3$ ,  $SD=4.8$ ). There were no statistically significant differences between study sites.

The Community Safety Questionnaire (Caregiver, 2003) consists of 13 questions regarding how often unsafe events occurred in their neighborhood. Participants responded on a four point Likert scale (0=Never, 1=Rarely, 2=Sometimes, or 3=Often). Total possible range of scores is 0 to 39. A higher total score indicated a less safe community. The mean for total community safety was 9.39 ( $SD=3.6$ ; range =2-23). The reliability coefficient for this measure was Cronbach's  $\alpha=0.33$ . There were no statistically significant differences between the St. John Providence and Hutzel Women's Hospital groups for cumulative trauma, conflict tactics, and community safety.

There were no significant differences between study groups in reporting how conflict was handled over the past year or ever in the relationship. Being able to discuss issues calmly (reasoning) was the most frequently cited response, followed by crying (verbal aggression) and sulking or refusing to talk about an issue (verbal aggression).

Table 4. Conflict Tactic Scale: Ten Most Frequently Reported Methods of Handling Conflict (Past Year).

Rank	Item	Percent
1	Discussed an issue calmly (Reasoning)	92%
2	Cried (Verbal aggression)	83%
3	Sulked or refused to talk about an issue (Verbal aggression)	75%
4	Got information to back up your/his/her side of things (Reasoning)	74%
5	Insulted or swore at each other (Verbal aggression)	63%
6	Did or said something to spite one another (Verbal aggression)	62%
7	Stomped out of the room or house or yard (Verbal aggression)	61%
8	Brought in, or tried to bring in, someone to help settle things (Reasoning)	39%
9	Threatened to hit or throw something at the other (Verbal aggression)	29%
10	Threw or smashed or hit or kicked something (Minor aggression)	27%

Although not in the top ten, 22% of the mothers reported being pushed, grabbed, or shoved by the partner, and 15% reported throwing something at the other.

The top ten most frequently reported trauma events on the Cumulative Trauma Scale experienced over their lifetime are presented in Table 5. Feelings of racism and discrimination were reported most frequently; followed by life threatening events of loved ones; having experienced a life-threatening accident; and experiences of having a nervous breakdown or feeling that they were about to lose control. Although not in the top ten, 25.3% of the women had been sexually abused, raped, or involved in unwanted sex; 22.7% had been in jail; 19.7% had been abandoned or separated from their mother; and 18.7% had been physically abused by a parent or caretaker. One mother

reported seeing yellow police ribbons and blood in her driveway from her relative being shot dead while she was at work. Two mothers reported that the fathers of their newborns were deceased.

Table 5. Cumulative Trauma Scale: Ten Most Frequently Reported Traumas.

Rank	Item	Percent
1	My race has history of being oppressed, discriminated against, or threatened by genocide.	66.0%
2	I have experienced a life threatening or permanently disabling event for loved one.	60.0%
3	I have experienced a life-threatening accident, for example, a motor vehicle accident.	56.7%
4	I have experienced a nervous breakdown or felt that I was about to have one.	54.7%
5	I have experienced employment termination, been laid off, or failed in business	49.3%
6	My father has abandoned or left me, or separated from me when I was young.	46.0%
7	I have experienced serious rejection or failure in my relationships	46.0%
8	I have experienced being part of a poor family with many hardships	44.7%
9	I have experienced frequent failures in school	43.3%
10	I have been threatened to be killed or to be seriously harmed	37.3%

Descriptive statistics for PTSD and Depressive Symptoms are presented in Table 6. CAPS-1 measures four core PTSD symptoms: re-experiencing, avoidance, arousal, dissociation, and the total score (Blake, et al., 1995). The study participant was asked to respond to 18 questions evaluating PTSD symptom severity on a six point Likert scale (0=Not at all, 1=<than once a week, 2=2-3 times a week, 3=4-5 times a week, 4=once a day, and 5=more than once a day). The total score for each of the PTSD symptom subscales, and a total score were computed. A higher score represents more severe PTSD symptoms.



Overall, women from both groups had re-experiencing (M=4.1, SD=4.6), and arousal symptoms (M=4.6, SD=4.3) once a day, and avoidance (M=2.9, SD=3.7) and dissociation (M=2.2, SD=3.1) symptoms two to three times per week. Although the results were not statistically significant, women at Hutzel Women's Hospital experienced PTSD symptoms more frequently than the women at Providence Hospital.

*Depressive symptoms* were analyzed using the 10-item Edinburgh Postnatal Depression Scale (EPDS). The EPDS was developed to screen for postnatal depression (Cox, Holden, & Sagovsky, 1987). The measure asked mothers to describe how they felt during the past seven days. Each item was scored on a scale of 0 to 3, with a maximum score of 30. A score of  $\leq 10$  indicated no evidence of depression, a score between 10-12 probable depression, and a score  $\geq 13$  likely depression. The reliability coefficient for this measure in this study was Cronbach  $\alpha=0.84$ . The results indicated that 73.3% of the mothers screened showed no evidence of depression, 8.7% possible for depression, and 18.0% likely for depression (Table 7). There was no difference in risk for depression by study site ( $\chi^2 = 0.92, p = 0.633$ ). During the interviews, three mothers expressed suicidal thoughts and were referred to their primary care providers. Depression and posttraumatic symptoms were present in approximately one fourth of the total sample. None of the mothers were actively seeing a mental health specialist at the time of interview.

Table 6. PTSD Symptom Frequency &amp; Depression Descriptive Statistics.

	All (N=150)				Providence (N=65)		Hutzel (N=85)		t	p
	Mean	SD	Min	Max	Mean	SD	Mean	SD		
<b>PTSD</b>										
Re-experiencing	4.1	4.6	0.0	19.0	3.4	3.9	4.7	5.0	-1.73	0.085
Arousal	4.6	4.3	0.0	17.0	3.9	4.3	5.1	4.2	-1.72	0.088
Avoidance	2.9	3.7	0.0	15.0	2.4	3.3	3.2	4.0	-1.41	0.160
Dissociation	2.2	3.1	0.0	16.0	1.9	2.9	2.5	3.3	-1.15	0.250
Total	15.7	14.6	0.0	68.0	13.2	13.1	17.7	15.5	-1.88	0.062
<b>Depression Total</b>	6.9	5.5	0.0	27.0	6.7	5.2	7.1	5.8	-0.40	0.694

Table 7: Depression Results by Frequency and Percent

EPDS Score		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Score 0-9: No evidence of depression	110	73.3	73.3	73.3
	Score 10-12: Possible depression	13	8.7	8.7	82.0
	Score 13+: Likely depression	27	18.0	18.0	100.0
	Total	150	100.0	100.0	

Descriptive statistics for sleep are summarized in Table 8. The 19-item Pittsburgh Sleep Quality Index (PSQI) (Buysse, et al.,1989) consists of seven subscales and a total score. The seven subscales are 1) subjective sleep quality; 2) sleep latency; 3) sleep duration; 4) habitual sleep efficiency; 5) sleep disturbances; 6) use of sleeping medications; and 7) daytime dysfunction. Each item is rated on a 4-point scale (0=no problem at all; 1=Only a very slight problem; 2=Somewhat of a problem; and 3=A very big problem). Total scores range from 0 to 21. A total score of five or more is an indicator of poor sleep quality.

The majority of mothers (82.6%) reported poor sleep during the last month of their pregnancy with difficulty falling asleep, difficulty staying asleep, and waking up during the night to go to the bathroom. There were no statistically significant findings between the two hospital groups. Sleep disturbance was reported most frequently, followed by sleep efficiency, sleep quality, sleep duration, sleep latency, and sleep dysfunction. For *sleep duration* ( $M=1.34$ ,  $SD=1.25$ ), 28% reported sleeping less than five hours a night, 35% reported sleeping five to six hours, and 37% reported sleeping seven or more hours a night. *Sleep disturbance* was related to question #5 on the PSQI. The number of reported responses plus frequency question number five “During the past month, how often have you had trouble sleeping because you....” results in a higher score and high sleep disturbance. “Waking up in the middle of the night or early morning,” and “have to get up to use the bathroom,” were cited the most, and not surprising during the third trimester of pregnancy. *Sleep quality* ( $M=1.39$ ,  $SD=.936$ ) is determined by “During the past month, how would you describe your sleep quality overall.” Sixteen percent reported their sleep quality to be Very Good, followed by 43%

Fairly Good, 26% Fairly Bad, and 15% Very Bad. Nearly 40% of both groups reported having bad to very bad sleep quality. *Sleep latency* is the time (in minutes) it takes to fall asleep each night. Overall, 49% reported falling asleep within 0-15 minutes (very good), 18% within 16-30 minutes (good), 31% within 30-60 minutes (fair), and 2% longer than 60 minutes (poor). *Sleep dysfunction* (M= 0.64, SD= 0.88) refers to daytime dysfunction such as trying to stay awake while driving or eating a meal, or finding enough enthusiasm to get work done.

As part of the PSQI, each mother was asked “During the past month, how often have you taken over-the-counter medicine to help you sleep?” Overall, 15.3% reported that they had taken over the counter medications to help them sleep. One mother reported taking Tylenol with codeine. There was no documentation on use of over-the-counter medications for sleep in any of the medical records.

Table 8. Sleep Descriptive Statistics.

	All (N=150)				Providence (N=65)		Hutzel (N=85)		t/ $\chi^2$	p
	Mean	SD	Min	Max	Mean	SD	Mean	SD		
Sleep Duration	1.3	1.3	0.0	3.0	1.4	1.3	1.3	1.2	0.65	0.519
Sleep Latency	0.7	0.8	0.0	3.0	0.7	0.8	0.6	0.8	1.02	0.306
Sleep Quality	1.4	0.9	0.0	3.0	1.5	0.9	1.3	1.0	1.50	0.134
Sleep Disturbance	2.0	0.8	0.0	3.0	2.0	0.8	2.0	0.8	0.71	0.476
Sleep Efficiency	1.6	0.3	0.0	3.0	1.5	1.3	1.7	0.3	-0.83	0.406
Sleep Dysfunction	0.6	0.9	0.0	3.0	0.7	0.9	0.6	0.9	-0.49	0.961
Total Score	7.9	3.8	1.0	17.0	8.1	3.7	7.7	3.9	0.55	0.586

### Perinatal Outcomes

Descriptive statistics for the Perinatal Outcome variables are summarized. Table 9 presents the frequency of each outcome variable. For both groups, the mean GA at the first prenatal visit was 12.7 weeks gestation. Participants attended an average of 910 prenatal visits and the majority of the women received adequate prenatal care (based on Kotelchuck, 1994). Only 27.3% of all mothers (26.6% Providence, 29.9% Hutzel) did not meet criteria for adequate prenatal care. Overall, mean length of labor was 12.2 hours (range = 0 to 79.5 hours) with 18% identified as prolonged labor (greater than 24 hours). The mothers from the Providence sample had more inductions or augmentation with Pitocin ( $\chi^2=5.86, p=.015$ ) and more operative vaginal births ( $\chi^2=4.96, p=0.26$ ). A higher percentage of mothers from the Hutzel Women's Hospital had anemia ( $\chi^2=3.82, p=.05$ ) and a history of substance use ( $\chi^2=7.93, p=.005$ ). For neonatal outcomes, there were statistically significant differences in NICU admissions ( $\chi^2=10.19, p=.001$ ), treatment for sepsis or suspected sepsis ( $\chi^2=11.82, p=.001$ ), TTN/RDS ( $\chi^2=7.44, p=.006$ ), and intubation for CPR ( $\chi^2=6.50, p=.011$ ). For all indicators with significantly different proportions by study site, neonates at Hutzel had a higher frequency of adverse outcome events than neonates at Providence.

**Table 9. Perinatal Outcomes Descriptive Statistics.**

	All (N=150)	Providence (N=65)	Hutzel (N=85)	$\chi^2$	p
Risk Score I or II	%	%	%		
<b>Maternal</b>					
Chorioamnionitis (I)	0.14	10.8	16.5	1.00	0.319
Endometriosis (I)	0.01	1.5	1.2	0.04	0.848

Wound Infection (I)	0.01	0.7	0.0	1.31	0.251
Blood Transfusion ( I)	0.03	4.6	1.2	1.67	0.195
Induction (II)	0.53	64.6	44.7	5.86	0.015
Cesarean Delivery (I)	0.37	33.8	38.8	0.39	0.531
Operative Vag. Del. (II)	0.09	15.4	4.7	4.96	0.026
PPROM (II)	0.19	15.4	21.2	0.81	0.367
UTI (II)	0.15	9.2	18.8	2.70	0.100
STD (II)	0.49	53.8	45.9	0.94	0.334
Anemia (II)	0.51	41.5	57.6	3.82	0.051
HTN (II)	0.18	20.0	16.5	0.31	0.577
Diabetes (II)	0.08	4.0	4.0	0.24	0.627
Preeclampsia (II)	0.06	7.7	4.7	0.58	0.445
Fetal Growth Restriction (II)	0.08	6.2	9.4	0.53	0.466
Substance Use (II)	0.34	21.5	43.5	7.93	0.005
<b>Neonatal</b>					
TTN/RDS (I)	0.15	6.2	22.4	7.44	0.006
Intubation for CPR (I)	0.08	1.5	12.9	6.50	0.011
Sepsis (I)	0.19	6.2	28.2	11.82	0.001
Hypoglycemia (I)	0.12	10.8	12.9	0.17	0.685
Cord pH < 7.0 (I)	0.01	0.0	2.4	1.55	0.213
Apgar ≤ 5 (I)	0.04	1.5	5.9	1.81	0.179
NICU Admission (I)	0.31	16.9	41.2	10.19	0.001
GA < 37 Weeks (II)	0.17	6.0	11.3	0.97	0.324
SGA for GA (II)	0.15	4.7	10.0	1.39	0.238
SGA for Head Circ. (II)	0.17	20.0	14.1	0.92	0.338
Meconium Fluid (II)	0.24	23.1	24.7	0.05	0.817

Table 10 presents mean maternal and neonatal risk scores. Maternal Risk Score

1 was based on the commonly used perinatal scoring proposed by the Maternal Fetal Medicine Unit (MFMU) Network/NICHD (Tita, et al., 2012). Maternal Risk Score II has additional outcomes including gestational diabetes, gestational hypertension, preeclampsia, number of hours in labor, operative vaginal delivery, premature preterm rupture of membranes (PPROM), sexually transmitted infection, urinary tract infection, late entry into prenatal care, and less than adequate number of prenatal care visits (Campbell, et al., 2006, Dailey, et al., 2011, Johnson, et al., 2007, &Kotelchuck, 1994). Similarly, the Neonatal Risk Score 1 was based on the Maternal Fetal Medicine Unit (MFMU) Network/NICHD risk model (Tita et al., 2012). For Risk Score II, additional neonatal outcome measures included were meconium stained fluid, preterm birth, small for gestational age (SGA) by newborn weight, and SGA newborn head circumference.

**Table 10. Perinatal Risk Score Descriptive Statistics.**

	All (N=150)				Providence (N=65)		Hutzel (N=85)		t	p
	Mean	SD	Min	Max	Mean	SD	Mean	SD		
<b>Maternal</b>										
Risk Score 1	0.5	0.7	0.0	3.0	0.5	0.7	0.6	0.7	-0.47	0.641
Risk Score 2	2.9	1.6	0.0	8.0	2.9	1.6	2.8	1.6	0.68	0.111
<b>Neonatal</b>										
Risk Score 1	0.9	1.5	0.0	6.0	0.4	0.9	1.3	1.8	-3.69	<0.001
Risk Score 2	1.4	0.8	0.0	5.0	1.1	1.5	2.0	2.1	-3.11	0.002

For both groups, the mean GA at the first prenatal visit was 12.7 weeks

gestation. Participants attended an average of 9-10 prenatal visits and the majority of the women received adequate prenatal care (based on Kotelchuck, 1994). Only 27.3% of all mothers (26.6% Providence, 29.9% Hutzel) did not meet criteria for adequate prenatal care. Overall, mean length of labor was 12.2 hours (range = 0 to 79.5 hours) with 18% identified as prolonged labor (greater than 24 hours). The mothers from the Providence sample had more inductions or augmentation with Pitocin ( $\chi^2=5.86$ ,  $p=.015$ ) and more operative vaginal births ( $\chi^2=4.96$ ,  $p=0.26$ ). A higher percentage of mothers from the Hutzel Women's Hospital had anemia ( $\chi^2=3.82$ ,  $p=.05$ ) and a history of substance use ( $\chi^2=7.93$ ,  $p=.005$ ).

For neonatal outcomes, there were statistically significant differences in NICU admissions ( $\chi^2=10.19$ ,  $p=.001$ ), treatment for sepsis or suspected sepsis ( $\chi^2=11.82$ ,  $p=.001$ ), TTN/RDS ( $\chi^2=7.44$ ,  $p=.006$ ), and intubation for CPR ( $\chi^2=6.50$ ,  $p=.011$ ). For all indicators with significantly different proportions by study site, neonates at Hutzel had higher rates of complications than neonates at Providence.

#### *Statistical Analysis of Research Hypotheses*

Hypotheses #1 through #6 were tested using regression analysis. Step-wise regressions were performed by simultaneous entry of covariates (list) in step one and simultaneous entry of predictor variables in step two. There is a strong relationship between study site and many of the study covariates. Specifically, Providence mothers have more mean years of education than mothers at the Hutzel location (Providence mean years = 14.0; Hutzel mean years = 12.2,  $t=6.09$ ,  $p<.001$ ). Providence mothers are more likely to be employed full time than Hutzel mothers (49.2% vs 31.8%,  $\chi^2= 4.7$ ,  $p=0.03$ ), and Providence mothers are more likely to be older (mean age = 28.1) than



Hutzel mothers (mean age = 25.5,  $t=2.8$ ,  $p<.001$ ). Thus, including study site as a covariate would be over-controlling for the impact of years of education, maternal age, and employment.

Hypothesis 1: Higher levels of trauma will be positively related to increased posttraumatic stress disorder symptomatology. The results of the analysis identified that trauma (cumulative trauma and conflict-past year measures) significantly predicted PTSD symptoms, thus H1 was supported. As shown in Table 11, the only covariate that significantly predicted PTSD symptoms was years of education. Higher education was related to a decrease in PTSD symptoms. When entered into the model in the first step, the covariates accounted for 11% of the variance ( $F=.13$ ,  $p=.003$ ). Adding conflict in the past year to the regression model (step 2), significantly increased the amount of variance accounted for (15% increased variance,  $F=9.95$ ,  $p<.001$ ). Similarly, Table 12 shows that in step 1, the covariates of years of education, age, BMI, and employment accounted for 11% of the variance, and significant ( $F=4.12$ ,  $p=0.003$ ).

Step	Variables	R <sup>2</sup>	β	p
1	<b>Covariates</b>	0.11		
	Maternal BMI		-0.04	0.442
	Age		-0.01	0.501
	Years of Education		-0.23	0.005
	Employment		-0.04	0.582
		R <sup>2</sup> Δ	β	p
2	<b>Hypothesis Predictor</b>	0.15		
	Total Trauma (past year)		0.30	<0.001

Step	Variables	R <sup>2</sup>	β	p
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		R <sup>2</sup> Δ	β	p
1	<b>Covariates</b>	0.11		
	Maternal BMI		-0.07	0.419
	Age		-0.02	0.799
	Years of Education		-0.29	0.001
	Employment		-0.05	<u>0.582</u>
<hr/>				
1	<b>Hypothesis Predictor</b>	0.18		
	Cumulative Trauma Count		0.30	<0.001

When cumulative trauma count was added in step 2 in the regression model, there was also a significant increase in the amount of variance accounted for (18% increased variance,  $F=10.956$ ,  $p<0.001$ ).

Hypothesis 2: Higher levels of trauma will be positively related to poor sleep quality.

The results of the analysis identified that trauma significantly predicted poor sleep quality; as trauma increased, sleep problems also increased. Table 13 presents the regression results for total sleep problems and conflict in the past year. The overall regression model in step 1 was not significant ( $F = 1.08$ ,  $p = 0.368$ ). None of the covariates were significantly related to sleep problems. Adding conflict in the past year to the regression model (step 2), significantly improved the regression model ( $F=2.53$ ,  $p=0.032$ ). Adding past year conflict to the regression model increased  $R^2$  by 6%. For cumulative trauma count (Table 14), the covariates in step 1 accounted for 3% of the variance, and was not significant ( $F=1.081$ ,  $p=0.368$ ). Adding cumulative trauma count in step 2 accounted for an 8% increase in variance, and was significant ( $F= 3.469$ ,  $p= 0.006$ ). In summary, trauma significantly predicted increased sleep problems even after controlling for important maternal covariates. H2 was supported.

Table 13. Trauma and Sleep Quality.

Step	Variables	Total Sleep Problems		
		R <sup>2</sup>	$\beta$	p
1	<b>Covariates</b>	0.03		
	Maternal BMI		-0.02	0.842
	Age		0.09	0.297
	Years of Education		-0.02	0.837
	Employment		0.16	0.070
		R <sub>2</sub> $\Delta$	$\beta$	p
2	<b>Hypothesis Predictor</b>	0.06		
	Total Conflict (Past Year)		0.24	0.005

Table 14. Trauma and Sleep Quality.

Step	Variables	Total Sleep Problems		
		R <sup>2</sup>	$\beta$	p
1	<b>Covariates</b>	0.03		
	Maternal BMI		-0.03	0.694
	Age		0.08	0.362
	Years of Education		-0.06	0.501
	Employment		0.15	0.082
		R <sub>2</sub> $\Delta$	$\beta$	P
2	<b>Hypothesis Predictor</b>	0.08		
	Cumulative Trauma Count		0.24	0.006

Hypothesis 3: Increased PTSD symptomatology will be negatively related to sleep disturbance. In Table 15, the results for the regression analysis of PTSD and total sleep quality problems are shown. Results of the analysis revealed that the covariates accounted for 3% of sleep problem variance ( $F = 1.08$ ,  $p = 0.368$ ), and were not significant. Employment, however, significantly predicted total sleep quality problems ( $p=0.04$ ). Adding PTSD symptoms to the model accounted for a significant amount of sleep problem variance (11%;  $F = 4.39$ ,  $p < .001$ ), thus H3 was supported.

As PTSD symptoms increased, sleep quality problems also increased. Those who were employed had more total sleep quality problems. In summary, increased PTSD and employment significantly predicted an increase in total sleep quality problems.

Table 15. Trauma and Neonatal Perinatal Outcomes.				
Step	Variables	Neonatal Risk <sup>a</sup>		
		R <sup>2</sup>	$\beta$	p
1	<b>Covariates</b>	0.06		
	Maternal BMI		0.17	0.051
	Age		0.00	0.971
	Years of Education		0.19	0.035
	Employment		-0.10	0.230
		R <sup>2</sup> $\Delta$	$\beta$	P
2	<b>Hypothesis Predictors</b>	0.02		
	Total trauma (past yr)		0.13	0.115

Hypothesis 4a: Cumulative Trauma will be negatively related to maternal perinatal outcomes.

Results of analyses examining the impact of trauma on maternal perinatal risk scores are shown in Table 16. No significant predictors were found. In step 1 of the analysis for predicting Maternal Risk Score 1, adding covariates into the model yielded non-significant results ( $F = 0.59$ ,  $p = 0.668$ ). Adding trauma to the regression model (step 2) did not significantly account for increased variance ( $F = 0.91$ ,  $p = 0.474$ ). With the exception of years of education, similar results were found for Maternal Risk Score II (Step 1:  $F = 0.156$ ,  $p = 0.189$ ; Step 2:  $F = 1.47$ ,  $p = 0.204$ ). Years of education did significantly predict Maternal Risk Score II; more education was related to lower maternal risk. H4a was not supported by the data.

Table 16. Trauma and Maternal Perinatal Outcomes.

Step	Variables	Maternal Risk Score I			Maternal Risk Score II		
		R <sup>2</sup>	$\beta$	p	R <sup>2</sup>	$\beta$	p
1	<b>Covariates</b>	0.02			0.04		
	Maternal BMI		0.11	0.228		0.08	0.355
	Age		-0.09	0.287		-0.01	0.920
	Years of Education		0.08	0.350		-0.18	0.040
	Employment		-0.01	<u>0.877</u>		<u>-0.01</u>	<u>0.914</u>
		R <sup>2</sup> $\Delta$	$\beta$		2		
2	<b>Hypothesis Predictors</b>	0.03		P	R $\Delta$	$\beta$	P
	Total Conflict (Past Year)		0.13	0.143		0.09	<u>0.295</u>

To further explore the impact of trauma on maternal outcome, additional regression analyses were performed stratifying by study site. Although trauma did not predict either Maternal Risk score in the Providence sample (Risk Score I  $\beta = .17$ ,  $p = 0.221$ ; Risk Score II  $\beta = -0.09$ ,  $p = 0.531$ ), past year trauma did significantly predict Risk Score II in the Hutzal sample ( $\beta = 0.24$ ,  $p = .041$ ). In the Hutzal sample, increased past year trauma was related to increased maternal risk.

Hypothesis 4b: Cumulative Trauma will be negatively related to neonatal/perinatal outcomes. Regression analysis evaluating the impact of trauma on neonatal outcome is presented in Table 17. In the regression model, the covariates predicted 6% of the total variance, but the effect was not significant (6%,  $F = 2.12$ ,  $p = 0.082$ ). However, both years of education and maternal BMI both were significant predictors of the neonatal composite score (mean of standardized birth measures: gestational age (GA), birth weight, and head circumference size at birth). Increased years of education and increased BMI both predicted a higher composite neonatal score. Adding conflict past year increased the amount of variance explained by 2% ( $F = 2.21$ ,  $p = 0.056$ ), but the effect was still not significant. When looking at cumulative

trauma count (Table 18), the covariates of maternal BMI and years of education in step 1 explained 7% of the variance, and was significant ( $F=2.681$ ,  $p=0.034$ ). Adding cumulative trauma count to step 2 increased the variance accounted for by 1%, and was not significant ( $F=2,212$ ,  $p=0.57$ ). The effect of trauma on neonatal outcome was not significant. Analyses were performed on the sample stratified by study site.

Analyses were performed for each neonate measure that was included in the composite. The effect of trauma was not significant on infant birth weight ( $p=0.057$ ), GA ( $p= 0.263$ ), or neonatal head circumference size ( $p= 0.110$ ). H4b was not supported by study results.

Step	Variables	Neonatal Risk <sup>a</sup>		
		R <sup>2</sup>	$\beta$	p
1	<b>Covariates</b>	0.06		
	Maternal BMI		0.17	0.051
	Age		0.00	0.971
	Years of Education		0.19	0.035
	Employment		-0.10	<u>0.230</u>
		R <sup>2</sup> $\Delta$	$\beta$	
2	<b>Hypothesis Predictors</b>	0.02		
	Total Conflict (Past Year)		0.13	0.115

Step	Variables	Neonatal Risk <sup>a</sup>		
		R <sup>2</sup>	$\beta$	p
1	<b>Covariates</b>	0.07		
	Maternal BMI		0.19	0.027
	Age		-0.02	0.838
	Years of Education		0.17	0.044
	Employment		-0.11	<u>0.190</u>

	$R^2\Delta$	$\beta$	p
<b>2 Hypothesis Predictors</b>	0.01		
Cumulative Trauma Count		0.13	0.057

Hypothesis 5a: PTSD will mediate the relationship between cumulative trauma and maternal perinatal outcomes. Given the lack of relationship between trauma and maternal perinatal outcomes in analyses evaluating Hypothesis 4, analyses for mediation of PTSD were not performed.

Hypothesis 5b: PTSD will mediate the relationship between cumulative trauma and neonatal perinatal outcomes. Given the lack of relationship between trauma and neonatal outcomes in analyses evaluating Hypotheses 4, analyses for mediation of PTSD were not performed.

Hypothesis 6a : Sleep quality will mediate the relationship between cumulative trauma and maternal perinatal outcomes. Given the lack of relationship between trauma and maternal perinatal outcomes in analyses evaluating Hypothesis 4, analyses for mediation of sleep problems were not performed.

Hypothesis 6b: Sleep quality will mediate the relationship between cumulative trauma and neonatal perinatal outcomes. Given the lack of relationship between trauma and neonatal outcomes in analyses evaluating Hypothesis 4, analyses for mediation of sleep quality were not performed.

#### *Results Summary*

Hypotheses 1-4 were supported or partially supported. Hypotheses 5 and 6 could not be tested due to the results of Hypotheses 4 being not significant. The results

of this study showed that both cumulative trauma count and conflict-past year uniquely predicted PTSD symptomatology. The results also show that women have more PTSD re-experiencing and arousal symptoms, and less avoidance and dissociation. Cumulative trauma count and conflict-past year both uniquely predicted sleep quality problems. The data shows that 82.6% of women reported having poor sleep, and that PTSD and employment predicted poor sleep quality. Fifteen percent reported the use of over the counter medications to help them sleep. Eighteen percent of the women were likely to have depression. Twenty-five percent had been raped or sexually abused, 19% physically abused as children or adults, and 37% threatened to be seriously harmed or killed.

In examining perinatal outcomes, years of education did significantly predict Maternal Risk Score II; more education was related to lower maternal outcome risk. In addition, past year trauma did significantly predict Risk Score II in the Hutzel sample; increased past year trauma was related to increased maternal outcome risk. The impact of trauma on neonatal outcome overall was not significant. Increased years of education and increased BMI both predicted a higher composite neonatal score for the mean of standardized birth measures: GA, birth weight, and head circumference. More education and a higher BMI predicted more full term, average or large for gestational age babies. Adding trauma increased the amount of variance explained to 8% (2% change,  $F= 2.21$ ,  $p= 0.056$ ), but the effect was not significant.



## CHAPTER 5 DISCUSSION

The purpose of this study was to gain knowledge about the relationships among cumulative trauma, posttraumatic stress disorder symptoms, sleep quality, and perinatal outcomes. Within the Roy Adaptation Model (RAM), focal stimuli were conceptualized as cumulative trauma count and conflict-past year. The contextual stimuli, or covariates of age, years of education, employment, BMI, and depression, that could influence cumulative trauma were considered and measured throughout the study. The first section of this chapter provides a discussion about the key findings of the study within the Roy Adaptation Model, with comparisons to current literature on cumulative trauma and perinatal outcomes in African American, non-Hispanic women. Subsequent sections describe the strengths and limitations of the study, implications for nursing, and recommendations for future research.

### Key Findings of the Study

A total of 152 eligible women were recruited from either St. John Providence Hospital in Southfield, or Hutzel Women's Hospital in Detroit, Michigan; two were dropped from the study due to incomplete data. Every study participant reported experiencing at least one traumatic event. Feelings of racism or discrimination were the most frequently reported trauma experience. In addition, 37% of the women had been threatened to be seriously harmed or killed sometime in their lives, 24% had been raped or sexually abused, and 18% had been physically abused as a child or adult. The Cumulative Trauma Scale and the Conflict Tactic Scale uniquely predicted PTSD symptomatology. For the PTSD and depression scales, nearly one fourth of the women scored in the range of being at risk for having PTSD and/or depression. The PTSD

symptom results showed that women reported more re-experiencing and arousal symptoms, and less avoidance and dissociation.

This study supports that women have poor sleep quality (82.6%) in the third trimester. Fifteen percent of the mothers reported using over the counter medications to help them sleep. For perinatal outcomes, the regression analysis showed that higher education was related to lower adverse maternal outcome risk, and past year conflict was related to an increase in maternal risk score for adverse outcomes at Hutzel, but not at Providence. For neonatal outcomes, years of education and BMI were predictors of higher neonatal composite scores for birth measures (mean of gestational age, newborn weight, and newborn head circumference). Adding cumulative trauma to the neonatal composite score was not significant ( $p=0.057$ ).

#### *Demographic data*

There were significant demographic differences with participants at St. John Providence being older, more educated, having private or non-Medicaid insurance, and receiving less food or other government assistance. The participants at St. John Providence were more likely to be living with the baby's father. At both sites, the majority of study participants described their religion as Christian, but many stated that they were not affiliated with any specific church.

The mean pre-pregnancy BMI for participants in both groups was similar ( $M=29.74$ ), indicating that on average, they entered pregnancy overweight. Eighteen percent of the women had a history of hypertension, either chronic hypertension, or gestational hypertension with a previous pregnancy. A history of diabetes was reported by 8.7% of the women. Obesity has been shown to be associated with gestational

hypertension, gestational diabetes, preeclampsia, and newborn weight (Institute of Medicine, 1990). Overeating or lack of adequate nutrition has been linked to exposure to violence, particularly physical abuse (Campbell, 2002). For the sample in this study, 42% of the participants met criteria for obesity, 28% overweight, and 3% underweight (NIH/NHLBI, 2015).

Nearly 72% of the women received adequate prenatal care based on criteria by Kotelchuck (1994). For women in this study, the mean gestational age for the first prenatal visit was 12.7 weeks or the beginning of the second trimester; and most women attended 9-10 total prenatal visits. The overall mean length of labor was 12.2 hours, with 18% identified as experiencing prolonged labor of greater than 24 hours. Adequate prenatal care has been associated with fewer preterm births and overall improved perinatal outcomes (March of Dimes, 2013). The findings from this study also support the following goals of Healthy People 2020: 1) Common barriers to a healthy pregnancy and birth include lack of access to appropriate health care before and during pregnancy. This study showed 72% of the women met criteria for adequate prenatal care, but more work is needed to increase that percentage to 100%; 2) Identification of areas affecting the mother's health directly, or affecting her ability to engage in healthy behaviors; 3) Child health status varies by both race and ethnicity, as well as by related factors, including educational attainment among household members and health insurance coverage (Healthy People 2020.gov). Education, research, and interventions are needed to improve the percentage of African American women receiving adequate prenatal care including childbirth education, and how trauma exposure can affect the

mother's overall health, and ability to engage in healthy behaviors such as nutrition, adequate sleep, and attending prenatal appointments.

### *Support during pregnancy*

As a group, 48% of the mothers were currently living with the father of their baby. The mother's mother (36%) or the father of the baby (22%), were most frequently reported as the primary support person. Of concern was 8.7% of the women indicated that they had no support person, and 3 mothers (2%) identified their own young daughter as their primary support person. Isolation from social support is linked to psychological harm, and with other forms of violence (Jun, et al., 2008). Although 67% of the women reported being Christian, 13% indicated that they did not have a religious affiliation.

### *Trauma and PTSD*

The findings of this study show a positive relationship between trauma and PTSD. All women who participated in the study reported being exposed to at least one traumatic event, and the types of trauma reported included personal victimization, family trauma, interpersonal, and collective identity trauma. An important finding was that the most frequently reported trauma experience (66% of study participants) was racism and discrimination. Racism, feelings of oppression, and discrimination can affect a woman's seeking prenatal care, patient-provider communication effectiveness, and reporting physical and psychological forms of abuse (Stockman, Hayashi, & Campbell, 2015). A recent study (Hilmert, et al., 2014) found women who had two or more indirect exposures to racism had increases in diastolic blood pressure between 18 and 32 weeks gestation, and neonates with lower gestational age adjusted birth weight than

other women. More research is needed in examining relationships between racism and perinatal outcomes.

Verbal aggression ( $M=12.8$ ,  $SD=8.2$ ) was reported as the most frequent means of handling conflict followed by minor ( $M=2.7$ ,  $SD=3.8$ ) or severe ( $M=0.5$ ,  $SD=1.8$ ) physical aggression. Third trimester pregnancy and birth has been associated with a decrease in physical abuse (Campbell, 2002), which may be a factor in the lower reporting of physical aggression to handle conflict. Several women in this study, however, reported experiences of being physically abused either as children or adults (19%), sexually abused (25%), or threatened to be killed or seriously harmed (37%). This percentage of sexual abuse supports the research of Cronholm, et al., (2011) that one in four women are sexually abused or raped. Similarly, the percentage of physical abuse found in this study supports other research findings (Gazmararian, et al.,1996; Petersen, 1997).

Intimate partner violence has been found to be associated with minority ethnicity, and health disparities (Stockman, Hayashi, & Campbell, 2015). One mother, who asked if she could help me fill out the questionnaires, proceeded to record actual physical abuse and threats from the father of the baby who was sitting in the room next to us. There was no difference between the St. John Providence and Hutzel groups in the handling of conflict between themselves and their partner in the last year. While the proportion of women in this study who experienced domestic violence (18%) or sexual abuse (24%) was high, this information was recorded in the medical record for only two of the women.

This study provides support for a positive relationship between trauma exposure, depression, and PTSD. The study supports the research of Seng et al., (2011) that African-American women report all forms of PTSD symptoms, and that African-American women reported four times the PTSD symptoms compared to women from other groups. This study supports Seng's work, but more specifically showed that women had more re-experiencing and hyper-arousal symptoms, and less avoidance and dissociation.

On average, women had re-experiencing symptoms once a day (at least once a day for the Hutzel sample), and arousal symptoms 2-3 times a week (4-5 times a week for Hutzel). PTSD is associated with childhood abuse, depression, generalized anxiety, substance use, and mediates the relationship between trauma and daily functioning (Loveland-Cook, et al., 2004; Seng, et al., 2013). For this study, however, given the lack of relationship between trauma and perinatal outcomes in the analysis of hypothesis 4, analyses for mediation of PTSD was not performed.

In examining depressive symptoms, 8.7% of study participants screened probable, and 18.8% likely for having depression. These percentages do not include two women who were excluded from the study because of current treatment for depression. Depression is a major health concern affecting 13% of all women, with 19% of women experiencing depression within 12 months of giving birth (Liu & Tronick, 2013). Three women expressed feelings of wanting to harm themselves, and were immediately referred to their primary care providers. As prenatal depression is a predictor of postpartum depression, assessment for depression must become the standard of care for pregnancy.

In summary, this study found a positive relationship between cumulative trauma, handling of conflict in the past year, and PTSD symptoms. Only a higher level of education was related to fewer PTSD symptoms. A significant finding was that both cumulative trauma and strategies to handle conflict uniquely predicted PTSD symptoms. The current standard of care for all women entering a health care provider's office or hospital is to ask "Are you safe"? The results of this study show that health care providers must go beyond safety, and ask about past traumatic events, how conflict is handled, PTSD, and depressive symptoms.

### *Sleep Quality*

The majority of women (82.6%) had poor sleep quality. Over one fourth of the mothers indicated that they slept less than five hours per night. These findings support research on lack of sleep during the third trimester of pregnancy (Hayase, Shimada, & Seki, 2014).

The study found that cumulative trauma ( $F=3.469$ ,  $p=0.006$ ), and the handling of conflict in the past year significantly predicted sleep quality problems ( $F=2.53$ ,  $p=0.032$ ). As trauma and conflict increased, sleep problems also increased. These findings support previous research that found physical and psychological violence to be associated with poor sleep quality (Lowe, et al., 2007, Pigeon, et al., 2011, & Rauer, et al., 2011).

An important finding was that 15.3% of the women reported using over the counter medications during their third trimester to help them sleep. Multiple trauma has been linked to increased substance use, but there is no research linking cumulative

trauma, sleep quality, and the use of sleep aids during pregnancy. Documentation of the use of over the counter medications was not found in any of the medical records.

### *PTSD and Sleep Quality*

PTSD significantly predicted an increase in total sleep quality problems. The covariates accounted for 3% of sleep problem variance, but when adding PTSD symptoms, the model accounted for a change in variance of 11% ( $F=4.395$ ,  $p<0.001$ ). Employment also significantly predicted total sleep quality problems ( $p=0.04$ ). This study supports other research findings that PTSD is associated with insomnia and nightmares (Lowe, et al., 2007; & Seng, 2013). Pigeon and associates (2011) found that among 121 non-pregnant women with and without depression, depressed women experienced more severe PTSD and were more likely to have insomnia. This study showed that 24% of the women screened likely for either PTSD or depression. These findings support the need for assessment of PTSD and depression in pregnancy.

### *Perinatal Outcomes*

Trauma literature, specifically physical and psychological abuse, has been associated with increased anemia, substance use, and sexually transmitted infections (Campbell, 2002; Dailey, et al., 2011). For maternal outcomes, this study found high levels of anemia (51% of sample with hemoglobin levels less than 11.0) and sexually transmitted infections (49%). There is limited data on trauma exposure and the use of pitocin in labor, however in this study, 53% of the women had pitocin used for labor induction or augmentation. The Hutzel mothers were more likely to be substance using than the Providence mothers. Dailey et al., (2011) found that greater trauma exposure



in African American women was related to a higher rate of substance use and PPROM, but PPROM was not found to be significant in this study.

Twenty-seven percent of the mothers had inadequate prenatal care (Kotelchuck, 1994). The average woman entered prenatal care at 12.7 weeks, or the beginning of the second trimester. The results of this study indicate that more work needs to be done to improve access to prenatal care as part of Healthy People 2020 objectives, so that 100% of women receive adequate prenatal care.

For this study, years of education significantly predicted Maternal Risk Score II which also supports trauma research. Higher education was related to lower maternal risk ( $\beta=-0.18$ ,  $p=0.040$ ). The handling of conflict in the past year significantly predicted Maternal Risk Score II in the Hutzal sample ( $\beta=0.24$ ,  $p=0.041$ ), but not Providence. The less minor and severe aggression was used to handle conflict, the lower the maternal risk for adverse outcomes.

The number of adverse neonatal events from St. John Providence averaged 0.4 events, and at Hutzal Women's Hospital, 1.3 events. The neonates from Hutzal were more likely to be admitted to the NICU, be intubated for CPR, have transient tachypnea or respiratory distress, and be treated for suspected or confirmed sepsis. The Hutzal findings for this study provide initial support of the literature that trauma exposure is related to adverse neonatal outcomes (Cronholm, et al., 2011; Leone, et al., 2010; Morland, 2008; Seng, 2002). However, because the sample size in this study was not adequate, I will recruit mothers at Hutzal Women's Hospital, and continue to examine all perinatal outcomes.

Two of the research hypotheses postulated that PTSD or sleep quality would mediate the relationship between trauma and birth outcomes. Given the lack of relationship between trauma and maternal and neonatal outcomes for hypotheses 4, analyses for mediation of PTSD and sleep quality were not performed.

#### *Study Results and the Roy Adaptation Model*

This study supports use of the Roy Adaptation Model (RAM) in nursing research on pregnancy. The RAM provided theoretical constructs that were used as the foundation for understanding relationships between cumulative trauma, posttraumatic stress, sleep quality, and perinatal outcomes in this study. The study used RAM to identify the focal stimuli of cumulative trauma, handling of conflict, and community safety that affects PTSD, sleep, and perinatal outcomes. The contextual stimuli of age, education, employment, BMI, and depression helped this researcher identify those factors that could influence trauma. This study found a positive relationship between the focal stimuli, contextual stimuli, and the physiological/physical behavioral adaptive modes of PTSD and sleep. This study found that more years of education was related to maternal outcome adaptation, and education and BMI significantly predicted positive neonatal outcomes, but the relationship between trauma and perinatal outcomes hypotheses is less clear. The RAM has been used in other trauma related studies in adults and adolescents, and in pregnancy. This is the first study utilizing the RAM to increase the understanding of how trauma affects perinatal outcomes in African American women.

#### *Implications for Nursing*

Registered nurses are in a prime position to assess pregnant women for trauma exposure at first history intake, and over the gestation of the pregnancy. The first step for the detection and intervention for a traumatic event is to have the mother in a quiet, private room. The mother may not respond initially, but as trust and feelings of safety are established, she may reveal her experiences or situation over time.

The cumulative trauma and conflict tactic scale measures uniquely predicted PTSD symptoms. Assessment of IPV during pregnancy alone is no longer adequate. The percentage of women in this study found to have PTSD and/or depression alone suggests the need for better assessment during pregnancy. As health care providers, we continue to miss significant trauma, depression, and PTSD symptoms, and must begin to incorporate appropriate assessment measures, such as the EPDS into our practice. Nursing can play a critical role in accurate documentation of these events in the medical record.

Poor sleep quality is common during pregnancy, especially in the third trimester. Nursing can continue to assess for poor sleep quality, and provide interventions for pregnant women sleeping less than the recommended 8 hours of sleep a night. In addition, women with gestational diabetes or gestational hypertension should be evaluated for poor sleep quality, and possibly obstructive sleep apnea. Nurses and other health professionals need to assess all pregnant women for prescribed and nonprescribed over the counter medicines. Women entering prenatal care with poor sleep histories, or who appear for their visits fatigued should be assessed for IPV in the past year. Discussions on trauma, PTSD, depression, and sleep quality should be

incorporated into childbirth education classes. Finally, nurses serve as excellent resources for community mental health agencies.

### *Study Strengths*

#### *Strengths of the Sample*

The study included an exclusively African American, non-Hispanic population to improve understanding of relationships among cumulative trauma, posttraumatic stress disorder symptoms, sleep quality, and perinatal outcomes. This study is one of few studies on trauma exposure and perinatal outcomes in this population. Homogeneity was established through strict adherence to the inclusion criteria (African American women, age 18 and older, recently given birth), but demographic differences for age, employment, receiving Medicaid insurance, and other forms of government assistance between study sites were found.

#### *Strengths Related to Measures*

All measures used in this study were well established, used in multiple previous studies, and tested for reliability and validity. A particular strength in looking at cumulative trauma within the Roy Adaptation Model was inclusion of three measures: cumulative trauma scale and conflict tactics-past year which predicted PTSD, and community safety. These findings suggest that health care providers do more to capture cumulative exposure to traumatic events, and possible PTSD or depressive symptoms.

#### *Strengths of Data Collection Methods*

Strict adherence to data collection procedures reduced the potential for researcher bias. Women were interviewed exclusively during the day (before 5:00pm)

on the mother/baby units of two urban hospitals at least six hours after they had given birth. The researcher screened for potential participants, and had the unit nurse approach the women first, asking if they would like to hear more about the study. This reduced the potential for study participation coercion. Informed consent was obtained by reading and reviewing each section of the consent form, and asking the mother if all her questions had been addressed and answered. The mother was told that her participation was voluntary, and that she could refuse to answer any question or withdraw at any time. A copy of the signed consent was left with each mother with the telephone number of the PI.

A second strength is that the data were gathered through a face to face interview between the researcher and the participant. This approach differed from the Seng et al. study (2011) where women were interviewed over the phone. Although not systematically documented, many mothers expanded upon their responses and shared their experiences during the face-to-face interview. Many mothers thanked me for coming to speak with them, and two asked if this was available to other women who they felt could benefit from talking to someone.

### *Strengths of Nursing Theory in Research*

This study promotes continued use of the Roy Adaptation Model (RAM) in pregnancy. The RAM delineates theoretical constructs that were used to provide a foundation for the study of the relationships among cumulative trauma, posttraumatic stress, sleep quality, and perinatal outcomes. The study used the RAM to identify cumulative trauma as focal stimuli, covariates as contextual stimuli, PTSD and sleep quality as the physiological/physical behavioral adaptive mode, and perinatal outcomes

as adaptation. The RAM had been previously used in studies on trauma and pregnancy, but this is the first study of trauma exposure in pregnancy among only African-American women.

### *Study Limitations*

#### *Limitations of the Sample*

The study used a convenience sample of African-American, non-Hispanic women from two Detroit area hospitals. The inclusion criteria were limited specifically to adult African-American women in order to maximize homogeneity and thus reduce other sources of variance, but in doing so, the study cannot be generalized to other ethnic groups. The study was conducted in the metropolitan Detroit area, therefore, cannot be generalized to African American women from rural areas or countries. Finally, the study was limited to women who had recently given birth, thus the results cannot be generalized to non-pregnant women.

#### *Limitations in Design*

A limitation for this study was that it used a cross-sectional study design. Cross-sectional designs can capture a participant's responses at one given point in time, but cannot capture changes in responses over the long term. This was particularly evident during the interviews as a few women stated "If you would have asked me this question years ago, I would have answered differently," or "I would have answered this differently when I lived at my old address."

Another limitation was collecting data on years of education and employment, but not on socio-economic status (SES). Information on annual income and other resources may have been helpful in looking at how SES can influence trauma exposure and birth

outcomes. On a positive note, a new finding was that years of education significantly predicted maternal risk. This finding supports the need for comprehensive prenatal education programs. Another limitation was measurement of perinatal outcomes. The outcomes described by Tita and colleagues (2012) as part of the Maternal Fetal Medicine Unit Network did not incorporate all maternal and neonatal outcome measures reported in the literature for trauma exposure, and therefore, several variables were added. The addition of outcomes reported in trauma literature resulted in significant findings for maternal outcome risk, and neonatal outcomes in the Hutzell sample. These findings support the need to review multiple perinatal outcomes, and conduct future studies at Hutzell Women's Hospital to determine if study results on perinatal outcomes would change with a larger sample.

### *Significance*

All women in this sample had been exposed to at least one trauma experience. Feelings of racism and discrimination were the most frequently reported trauma event. At least one fourth of the women were likely or probable for posttraumatic stress disorder and/or depression. A total of 82.6% reported poor sleep. Fifteen percent of the women reported that they used over the counter medications to help them sleep. Cumulative trauma and the handling of conflict in the past year predicted PTSD symptoms, and poor sleep quality. There were distinct differences in results between study sites warranting continued research.

African-American women are living in an environment of trauma and giving birth. Our society continues to fail women as we continue to inadequately assess for violence, depression, PTSD, and sleep, and ignore specific health behaviors and symptoms.

Identification of these conditions and interventions early in pregnancy may lead to a reduction in the number of adverse pregnancy events.

#### *Interventions for Trauma Exposure, PTSD symptoms, and Poor Sleep Quality*

Unfortunately, not all trauma experiences can be prevented. Nurses and other health care providers are in a position to recognize symptoms of trauma exposure, and to quickly intervene to minimize negative consequences. Prenatal clinics and hospitals should have information on agencies available to assist with intimate partner violence in every bathroom. Creating an open, calm, welcoming environment will increase the chance of reporting traumatic experiences without feelings of shame, guilt, or discrimination. Nurse should be knowledgeable of available mental health, and domestic violence services in their community, and serve as resources for referral and treatment for these mothers.

Interventions must include the availability of mental health specialists, counselors, and community programs. PTSD is more prevalent in African American women, but Seng et al. (2011) found there were fewer services available to them. Women with probable depression or PTSD should be treated as at-risk for pregnancy complications, and may need to be seen more frequently. Another area for intervention is sleep quality problems. Women identified at risk for poor sleep or obstructive sleep apnea (obesity, pauses between breaths while sleeping, frequent snoring, or hypertension) should be evaluated for obstructive sleep apnea so that interventions can take place to reduce the incidence of gestational hypertension and preeclampsia.

#### *Advocacy*



Nurses have contributed more to the literature on intimate partner violence and other forms of trauma than any other profession. Nurses must continue to actively advocate for pregnant women who are victims of multiple trauma exposure and PTSD by working in shelters, testing new interventions, or working with local and state legislators. Advanced practice nurses are in a position to diagnose and initiate therapeutic interventions for pregnant women with multiple trauma exposure, PTSD, and sleep disturbance, and should continue to do research in this area.

#### *Recommendations for Future Research*

Areas for future research include future studies for recruitment at Hutzell Hospital to examine perinatal outcomes with a larger sample. Additional studies on the identification of risk factors for cumulative trauma, PTSD, or poor sleep may lead to earlier detection and interventions.

#### *Conclusion*

This study was the first to gain a better understanding of the relationships among cumulative trauma, posttraumatic stress, sleep quality, and perinatal outcomes in a sample that included only African American, non-Hispanic women. The findings showed: 1) African American women experience traumatic events (mean=10.3). 2) cumulative trauma is associated with PTSD, depression, poor sleep quality, and neonatal outcomes; 3) nursing must go beyond the assessment of IPV, report active trauma, and record findings in the medical record; 4) more research is needed to better understand mothers' use of over the counter and other medications to help them sleep. A better understanding of the relationship between cumulative trauma, PTSD, and sleep quality can be used to begin to develop interventions such as early prenatal screening,

childbirth education, and actions to help mothers improve sleep quality, reduce PTSD symptoms, and overall improved health.

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**ABSTRACT****WHAT ARE THE RELATIONSHIPS AMONG CUMULATIVE TRAUMA,  
POSTTRAUMATIC STRESS DISORDER, SLEEP QUALITY, AND PERINATAL  
OUTCOMES IN AFRICAN AMERICAN WOMEN?**

by

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Trauma, primarily in the form of intimate partner violence and automobile accidents, accounts for 6-8% of all pregnancy complications. Much less is known about cumulative trauma (CT) exposure, especially in African American women. Women exposed to several types of trauma including childhood abuse, discrimination, or witnessed family violence may develop symptoms of posttraumatic stress or have difficulty sleeping.

The purpose of this study was to examine relationships among cumulative trauma, posttraumatic stress, sleep, and perinatal outcomes. A sample of 150 healthy African-American women, who had recently given birth, were recruited at Hutzel Women's Hospital and St. John Providence Hospital Southfield, and asked to complete the Cumulative Trauma Scale, Community Safety Questionnaire, Conflict Tactics Scale, Clinician-administered PTSD Scale, Pittsburgh Sleep Quality Index, Edinburgh Depression Inventory, and Demographic Data Form. The prenatal and hospital medical records were reviewed for multiple maternal and neonatal outcomes. Regression

analysis was used to determine if relationships between the variables exist, and the strength of those relationships.

The findings of this study showed: 1) African American women experience traumatic events. 2) cumulative trauma is associated with PTSD, depression, poor sleep quality, and neonatal outcomes; 3) nursing must go beyond the assessment of intimate partner violence, report active trauma, and record findings in the medical record; and 4) more research is needed to better understand mothers' use of over the counter and other medications to help them sleep. The relevance to maternal child health is that a better understanding of cumulative trauma exposure, PTSD, poor sleep, and the risk for poor perinatal outcomes among African-American women can lead to earlier identification and the development of nursing interventions.

## **AUTOBIOGRAPHICAL STATEMENT**

My educational journey began with the attainment of Bachelor and Master of Science in Nursing degrees with a focus on Women's Health from Wayne State University. As a doctoral student, I have been employed as the Perinatal Research Coordinator, Department of OB-GYN/Maternal Fetal Medicine Unit Network at Wayne State University School of Medicine. In addition, I am clinical faculty for undergraduate students in the College of Nursing, and contingent staff nurse at Hutzel Women's Hospital. My professional career includes staff nursing, unit management, women's health nurse practitioner, director of nursing, nurse consultant, and university clinical faculty. In addition, I was employed by Eli Lilly Pharmaceuticals, and served as Director of Nursing for the Perinatology Research Branch/NIH/DHHS.

Honors include the Oakland University Nightingale Award for Excellence in Nursing Administration for the Family Road program at Hutzel Women's Hospital; outstanding achievement for the Betterment of the Health of Women and Children from the Michigan Council for Maternal Child Health, and the United Community Services Award for Outstanding Community Based Program. I was inducted into the nursing honor society, Sigma Theta Tau Lambda Chapter, been awarded several grants, and have served as program chair for Michigan Healthy Mothers, Healthy Babies, vicepresident of the Detroit Medical Center Guild, and currently serve on the Board for Gianna House Pregnancy and Parenting residence. Two professional goals of mine are to continue to improve the health and well-being of families, and to educate undergraduate and graduate nursing students. I hope to continue my community service of supporting pregnant adolescents.