THE MODERATING ROLE OF SOCIAL SUPPORT ON THE RELATIONSHIP OF MATERNAL STRESS AND INFANTS' BIRTH WEIGHT OF PREGNANT SMOKERS: A SECONDARY DATA ANALYSIS

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ABSTRACT

Low birth weight (LBW) infants face serious health problems. Maternal psychosocial stress may predict LBW outcomes, but the relationship is not consistent. Other factors such as social support and smoking have been studied as contributors to infant birthweight. The purpose of this study was to examine the relationship between maternal perceived psychosocial stress and infant birthweight among rural pregnant smokers, and to identify whether social supports from partner and other people are protective factors of infant birthweight. This secondary analysis used data from a randomized controlled trial of a social support intervention for poor rural pregnant smokers. The findings show that although pregnant women in this study perceived higher stress level at the beginning of study, they were less likely to deliver lower birthweight offspring and social support from other people plays an important buffering role in this relationship. These results can inform the efforts of health-care providers, advanced nurse practitioners, and researchers to develop potential interventions that may help pregnant smokers reducing stress through increasing social support and may allow for better pregnancy outcomes.

CHAPTER 1

Introduction

Low Birth weight (LBW) infants (those born weighing less than 2500 grams) (WHO, 2013) face serious health problems, including: increased risk of perinatal morbidity and infant mortality and longer-term health problems, such as delayed motor skills and learning disabilities. A large body of research links maternal psychosocial stress with LBW. Pregnant women experiencing high stress during pregnancy tend to engage in various types of unhealthy behaviors that affect infant birth weight, including cigarette smoking (Pickett, Wilkinson, & Wakschlag, 2009; Ruiz & Avant, 2005). In recent decades, social support factor has been increasingly incorporated in research on maternal stress in order to gain a more complex understanding of the factors affecting LBW (Corning, 2002; Glazier, Elgar, Goel, & Holzapfel, 2004). Evidences supported that increasing levels of maternal stress and decreasing levels of satisfaction with social support are associated with decreasing of infants' birth weight (Dole et al., 2003; Neggers, Goldenberg, Cliver, & Hauth, 2006). As the results, researchers have tended to study the individual effects of social support and psychological stress on infants' birth weight; these factors may interact to predict risk of infants' birth weight. In this study, the moderation model of maternal stress and social support would be utilized to identify incorporated predicting factors related to infants' birth weight. Information about a potential moderator of the relationship between maternal stress and infants' birth weight can help professional intervene in order to prevent or alleviate the negative impacts of maternal stress in pregnant smokers.

Background

The global prevalence of LBW is 15.5%, which amounts to about 20 million LBW infants born each year, 96.5% of them in developing countries, with lowest incidence in the Europe countries (6.4%) and the highest incidence in South-Central Asia (27.1%) (WHO, 2013). Even though the 2011 rate of LBW was 8.1%, down slightly from 2010 (8.15%) and 2% lower than the 2006 high (8.26%) (Martin, Hamilton, Ventura, Osterman, & Mathews, 2013), LBW is one of the highest risk factors for infant morbidity and mortality, contributing to 60% to 80% of all neonatal deaths and constituting a major public health problem in both developed and developing countries (Valero De Bernabe et al., 2004).

Compared to infants of normal weight, low birth weight (LBW) infants can cause serious health problems. Some LBW babies may risk perinatal morbidity and infant mortality as well as health care costs (Carissa, Ambalavanan, Chakraborty, Wingate, & Carlo, 2013). Other babies may suffer from longer-term health problems such as delayed motor and learning disabilities. In the long term outcome, LBW babies are more likely to experience higher rates of developmental delay including blindness caused by the liberal use of oxygen, deafness caused by antibiotics and brain damage related to the use of sulfa drugs (Wardlaw, Blanc, Zupan, & Åhman, 2004). Children born underweight also tend to have cognitive disabilities and a lower IQ, affecting their performance in school and their job opportunities as adults (Carissa et al., 2013).

LBW infant as an outcome of pregnancy can happen for many different reasons which may or may not be related. Risk factors for a pregnant woman to increase chances of having a LBW baby include both biological and psychosocial factors (Carissa et al., 2013; Valero De Bernabe et al., 2004). It is well known that maternal psychological stress during pregnancy is one of the important factors associated with LBW infants (Lau, 2013; Torche, 2011). Biological and psychosocial factors affecting maternal psychological stress are known to be associated with infants LBW (Lau, 2013). Although association of biological stress mechanisms effect on baby is not direct pathways, one possible mechanism can discuss through stress hormones (Hobel, 2004). When a pregnant woman is stressed or experiences chronic and extreme stress, human's bodies and brains will release cortisol and adrenaline typically known as stress hormones. Stress hormones in the mother's body do reach the baby. The baby's brain development can be impacted by exposure to unhealthy levels of stress hormones (DiPietro, 2004).

A number of studies have linked several behavioral and psychosocial factors to the association between maternal psychological stress and infant LBW. Those factors affecting maternal psychological stress may include life events, social support, self-esteem, mastery, depression, pregnancy-related anxiety, perceived discrimination, tobacco, other drugs used, and neighborhood safety during pregnancy (Alderdice & Lynn, 2011; Huizink, Mulder, & Buitelaar, 2004; Lobel et al., 2008b). Pregnant smokers, especially among rural areas, have the highest relative risk of low birth weight (Pickett et al., 2009) and the abundant evidence that birth weight is centrally implicated in neonatal and postnatal mortality as well as in significant developmental problems (Taylor et al., 2014). Evidences supported that less educated women, who were more often smoking

and exposed to environmental tobacco smoke, had a significantly higher risk LBW than highly educated women (van den Berg, van Eijsden, Vrijkotte, & Gemke, 2012). Moreover, other multiple psychosocial sources of maternal stress including life event, stress response, anxiety, abuse (during pregnancy, verbal or physical), and neighborhood also help to explain the effects of maternal stress on LBW outcome (Dole et al., 2003). The research supported that pregnancy-specific stress, anxiety, and life event contributed to preterm delivery and low birthweight in pregnant women who had gestation age less than 20 weeks in Northeastern United States (Lobel et al., 2008b). Overall, previous studies regarding maternal psychological stress and infant LBW are beginning to examine multiple factors that might be incorporated to explore the effects of maternal stress during pregnancy on LBW. The relationship between maternal psychological stress and outcome of pregnancy may contribute to our understanding of the complex of biological and psychosocial factors involved in pregnant women all around the world.

However, the literature examining the relationship between multiple maternal psychological factors and infant birthweight as an outcome of pregnancy is complex and inconsistent. Differences in methodologies and the measurement of those variable measures could partially explain these inconsistencies. Stress assessment had been problematic in many prior studies that used measures of unknown reliability or validity. To measure psychological stress, there is no single instrument that incorporates what we believe to be all of the crucial components needed for adequate screening of maternal stress (Sheldon, Kamarck, & Mermelstein, 1983). Literature suggested that the researchers might need to do multifaceted approach to the assessment of stress and should present the comprehensive instrument which the researchers consider to be the

essential components to target in any stress measurements. Furthermore, many previous studies examined maternal psychological stress being the main effect or direct effect on infant birth weight. There are buffering factors that may help moderate the effect of maternal stress during pregnancy on infant birth weight. Thus, in this current study, social support would be utilized as moderator within the relationship between maternal psychological stress and infant birth weight, which index pregnancy outcomes. To examine the moderating role of social support on maternal stress experiences, Lazarus's stress theory has been utilized as a conceptual model of this present study.

Purpose of the Study

The proposed study is a secondary analysis of data. According to the original study (Bullock et al., 2009), Bullock and colleagues conducted a randomized controlled trail of nurses' individualized social support for poor rural pregnant smokers. Two main stress assessments were used to measure perceived stress during pregnancy: the Cohen's Perceived Stress Scale (PSS), four-item version and the Prenatal Psychosocial Profile (PPP) stress subscale. By using these two stress measurements, the researchers found that there were not significantly different stress scores between control and intervention groups. The analysis combined between four-item version of PSS and PPP stress subscale has not been analyzed. Therefore, this secondary data analysis study presented a confirmatory factor analysis of the three-factor model of perceived stress during pregnancy in pregnant smokers.

The purpose of this study is to examine the potential moderating role of social support on the relationship between maternal stress and infant birth weight, among a

sample of poor rural pregnant women, an understudied population at high risk of LBW outcomes.

Research Aims

1. To present a confirmatory factor analysis of the three-factor model of perceived stress during pregnancy in pregnant smokers.
2. To examine the potential moderating role of social support on the relationship between maternal stress and infant birth weight.

Research Hypotheses

Based on the conceptual model, this study proposes the following hypotheses.

1. Given that previous studies provide evidence of a relationship between maternal stress and IBW, there will be a significant negative correlation between level of maternal stress and IBW.
2. Given that previous studies have found that social support is related to positive pregnancy outcome:
    a. There will be a significant positive correlation between perceived partner support and IBW
    b. There will a be significant positive correlation between perceived other support and IBW
3. Social support is expected to significantly moderate the relationship between maternal stress and IBW. Given that social support has been established as protective factor, this study proposed that social support will has a buffering effect on the relationship between maternal stress and IBW so that:

a. Pregnant women who report satisfaction with partner support will have less significant negative correlation between maternal stress and IBW.
b. Pregnant women who report satisfaction with support from others will have less significant negative correlation between maternal stress and IBW.

Theoretical Framework of the Study

The transactional model of stress (Lazarus, 1991; Lazarus & Folkman, 1984) views stress as being related to our cognitive perceptions of our ability to cope with a potentially threatening situation. Hobfoll (1989) asserts that the appraisal of coping resources is a more influential factor in determining whether demands will trigger stressful reactions than the appraisal of the stressor itself. Transaction has been viewed as a process of change which points of transition that cause stress. The transition to motherhood is generally viewed as an important and potentially stressful change in roles (Austin & Leader, 2000). The time points during a stressful encounter may distort what is actually happening. The emotional well-being of a woman during pregnancy would have potential effects on her child's body weight (Bryant Borders, Grobman, Amsden, & Holl, 2007).

Folkman and colleagues (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986) mentioned that social supports represent resources made available through interrelationships with significant others. These relationships provide emotional and tangible benefits to an individual, including a sense of meaning, of belonging, and of acceptance, plus information, transportation, and help. Furthermore a study showed that

social support has a beneficial effect on individuals exposed to demands or experiencing stress (Cohen & Wills, 1985). Evidence mentioned that social support acts to prevent the unfortunate consequences of crisis and change. Additionally, social support may partially reduce the effect of stress on symptomatology (Glazier et al., 2004). Direct effects of social support on a number of outcome variables, including stress, depression, and health outcomes have been found (Cohen, 2004). However, the relationship between stress and social support is not clear. Social support has been mentioned in research as one of the most important resources to buffer against the negative effects of stress. In relation to pregnant women, social support has a beneficial effect on infant birth weight. Different sources of support (e.g., partner, peers, and friends etc.) are related to maternal stress and pregnancy outcomes in different ways. In some case two or more kinds of support scales were used in the same study. Actual support may be assumed as partner support and other supports from family, friends, co-worker, and professional helpers (Russell & Taylor, 2009).

A moderator is a variable that modifies the strength of the relationship between the independent variable and dependent variable (Heinrichs, Baumgartner, Kirschbaum, & Ehlert, 2003). Naughton (spring 1997) illustrated three similar moderator models using the primary factor, outcome, and potential moderator. According to transactional theory (Lazarus & Folkman, 1984) current pregnancy would be viewed as stressful and assumes that maternal stress during pregnancy may result in poor outcome of pregnancy. Moreover, research has focused on social support as a potential buffer (i.e., moderator) of the stress. This study postulated and tested a specific causal model of interrelationships and relied on variable measures specific to maternal psychosocial stress, rather than on

general stress measures. Thus, the conceptual model used in the current study hypothesizes that the effect of the primary factor (i.e. maternal stress) on the outcome (i.e. infant birth weight) depends on the presence or level of the moderator (i.e. social support). The moderators tested separately are two forms of social support: social support from partner and social support from other people. In this study, a moderator is a phenomenon that interacts with maternal stress and alters the relationship between maternal stress and IBW. Information about a potential moderator of the relationship between maternal stress and IBW can help professionals intervene in order to prevent or alleviate the negative impacts of maternal stress in pregnant smokers.

CHAPTER 2

Review of the Literature

The purpose of chapter 2 is to review the literature concerning maternal psychosocial stress, which includes maternal psychological stress and infant birth weight. The review focused on these topics of interest: Stress Operationalization and Measurement; Maternal Psychological Stress and Infant Birthweight; Moderating Roles of Social Support and Conceptual Framework. The study framework hypothesized a link among maternal stress, social support, and infant birth weight.

Stress Operationalization and Measurement

Stress is universal to the human experience, and the context of the research seems to drive how it is conceptualized. Stress has been described as a stimulus, a response, and a person-environment transaction (Lazarus & Launier, 1978). Biologically, stress seems to prepare organisms to respond appropriately to threat and ultimately activates physiological responses that keep us alive (Krabbendam et al., 2005). However, stress is more than a series of responses because as humans we derive meaning from these responses. Selye (1973) extended the physical definition of stress by incorporating nonspecific responses of the body to any demand. He conceptualized stress as a process involving a stimulus, a demand for change, and a resulting attempt to regain homeostasis. Physiological stimulation prepares the individual for action with the goal of returning to the restorative functions of the parasympathetic nervous system (Dunkel Schetter, 2011a). Apart from the physiological aspect of stress, Folkman and Lazarus (1985) define psychological stress as a relationship between the person and the environment that is

appraised by the person as relevant to individual well-being, but in which the person's resources are taxed and exceeded. Different people, when confronted with similar stressors, may differ considerably in their emotional responses and adaptive consequences. Appraisal of what causes stress, how much control people have, and other psychosocial factors mediate their biological responses (Lazarus, DeLongis, Folkman, & Gruen, 1985a). Lazarus and Folkman's (1984) cognitive theory of psychological stress and coping has been widely recognized as the leading model to study stress and coping. According to their cognitive theory, the level of stress a person experience is based on the individual's appraisal of the stressful situation. Lazarus (2000) researched this area for over 50 years and was an important pioneer in the field. The theory has been applied in many studies, has served as the basis for a number of coping measurements and has been extended by other researchers. The theory emphasizes the transactions and processes involved in a stressful encounter. The interaction between the person and the external environment is conceptualized as a transaction because each affects the other mutually (Lazarus, 1998). A stressful encounter is conceptualized as a process that focuses on the changes of the interaction over time. The conceptual notions of transaction and process highlight the significance of the meaning people place on the transaction as those perceptions influence the amount of psychological stress they experience.

According to the transactional model (Lazarus, 1991; Lazarus & Folkman, 1984) stress is related to the cognitive perceptions of an individual's ability to cope with a potentially threatening situation. Experienced stress is perceived through a complex combination of self-attributions, outcome expectancies, and ability to cope with events. Folkman and Lazarus (1985) discussed the complexity of the issue and noted that

subjects felt both fear and challenge in the face of adversity. Often the degree to which they felt either emotion related to how successful they thought the outcome would be which was mediated by how much control they thought they had the outcome. It seems that the stress response is a heightened combination of the feeling of fear and challenge and the perceived adequacy of one's resources (Dunkel Schetter, 2011b).

In this model (Lazarus & Folkman, 1984), stress is not a variable that exists solely in the individual or solely in the environment, but is an interaction between a person and the environment. Moreover, Lazarus theorizes that the individual's perception of the stressor determines how stressful the event will be, highlighting cognitive appraisal as an important component of the stress process. This perspective implies that individuals will experience stress when a situation or event is appraised as challenging and when they possess insufficient psychological resources to cope effectively with the event, accounting for individual variance in stress experience and response. Cognitive appraisal is one of the two key components of the stress and coping theory. Cognitive appraisal is defined as the process through which the person evaluates whether a particular encounter within the environment is relevant to his or her well-being (Folkman & Lazarus, 1980). It is the process of categorizing an encounter with respect to its significance to one's well-being (Lazarus & Folkman, 1984). There are two types of cognitive appraisals: primary and secondary. Primary appraisal reflects a person's evaluation of the stressfulness of a situation and whether he or she has anything at stake in the encounter (Folkman & Lazarus, 1980). Based on primary appraisal, the individual judges whether the transaction is irrelevant, benign-positive or stressful (Lazarus, 1998). A stressful appraisal is further assessed as three types: harm/loss, threat, and challenge. Harm/loss refers to injury or

damage that has occurred such as the loss of a friend, self-esteem or physical function. Threat refers to similar damage that has not yet occurred but which is anticipated. Finally, challenge refers to opportunity for growth, mastery or gain (Brown & Dutton, 1995). Lazarus (1998) pointed out the importance of identifying harm/loss, threat, and challenge in regards to the effectiveness of coping strategies. Secondary appraisal involves a person's evaluation of one's ability to manage the potentially harmful situation, or to prevent harm, or to establish a meaningful benefit from the situation (Folkman et al., 1986). These resources may include physical resources, such as one's state of health; the amount of energy one has; social resources such as a supportive family or friends; psychological resources such as self-esteem and self-efficacy; or material resources such as amount of money or type of tools to use (Naughton, spring 1997). Secondary appraisal is conceptualized by some researchers as an individual's perceived control of a stressful situation. Stress research indicates that coping strategies differ based on whether or not individuals perceive they can alter or exert control over the situation (Lazarus, 2000).

Primary and secondary appraisals interact to determine the degree of stress and the strength of a person's emotional reaction during the stressful encounter. Lazarus and Folkman (1984) illustrated this point with the example that if a person is helpless in dealing with a situation, the stress will be great because he or she cannot overcome or prevent the harm/loss that is experienced. Similarly, people who believe that they have significant control over a situation may still experience considerable stress if they have any doubts, particularly when the stakes are high. The relationship between cognitive appraisal and coping in the stress process has been studied by a number of researchers. Lazarus (1998) assumed that coping is shaped by appraisal and that certain forms of

coping reduce stress reactions. While both forms of coping have been found to be used in stressful encounters (Folkman & Lazarus, 1980), some conditions may be more effective with a specific approach.

Although Lazarus and Folkman's (1984) cognitive theory of psychological stress and coping is widely known and studied in several areas, research utilizing this framework in the study of pregnant smokers is remarkably low. A small number of studies have used element of this theory to explain stress and to predict infant birth weight in low-income pregnant women. However most of the studies utilized a different theoretical framework as their main model. The following section highlights the literature on the relationship between maternal stress and infant birth weight and some of the related studies. Research on maternal stress and infant birth weight has increased steadily and generally encompass several main areas. Large selections of the literature focus on the impact and experience of stress during pregnancy and how stress effect infant birth weight.

To measure psychological stress, the diversity of stress measurements include Checklist measures of major life events, Interview measures of major life events, Chronic stress measures, Daily event measures, Perceived stress measures, Negative affect measure, etc. Several measurements of self-report of psychological stress have been used to measure maternal emotional stress by face-to-face and telephone interviewing. The most popular measures of psychosocial stress were those assessing major life events and those evaluating stress responses and symptoms (self-esteem, anxiety, and depression). Criticism of stress measure clusters are made from a psychometric point of view (Sheldon et al., 1983). Appraisal-based stress measures have been found to be more

accurate and inclusive assessments of experienced stress. Although psychological stress theory focuses on people's appraisal of events as threatening or challenging, there have been very little developments of perceived stress measures. The instrument used most often is the Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983; Rondo et al., 2003). For the purposes of this study, two main stress measures were utilized to measure maternal-perceived psychosocial stress during pregnancy: the 4-items PSS and the Prenatal Psychosocial Profile (PPP) stress subscale.

The Perceived Stress Scale (PSS) (Cohen et al., 1983) was designed so as not to miss remotely experienced stress of close family and friends, future oriented stress, or events simply not listed on a stress event scale. The PSS is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to measure how unpredictable, uncontrollable, and overloaded respondents find their lives. There are three versions of the scale, with 4-items, 10-items, or 14-items. The 10-item version is suggested since it has maximum reliability, although the 4-item version can be used for telephone interviews and situations where the number of items is critical. This scale assessed the amount of stress in one's life rather than response to a specific stressor and has been used widely in studies of both mental and physical health. By taking into account the interaction of individual perceptions of an event and perceived ability to cope, global appraisal-based measures result in a more inclusive definition of experienced stress. According to Cohen, Kessler, and Gordon (1997), the PSS is the only established self-index available which measures general stress appraisal. The 4-item version is appropriate for use in situations requiring a very brief measure of stress perceptions. It was previously employed when collecting perceived stress levels over the phone during

follow-up interviews. It was not a diagnostic instrument, but intended to make comparisons of subjects' perceived stress related to current, objective events. The higher the degree and longer the duration of self-perceived stress, as indicated by a higher score, the more the stress is considered to be a risk factor for a clinical psychiatric disorder (Cohen et al., 1983). The short version, PSS-4, is an economical and simple psychological instrument to administer, comprehend, and score. It measures the degree to which situations in one's life over the past month are appraised as stressful. Items were designed to detect how unpredictable, uncontrollable, and overloaded respondents find their lives. The PSS-4 poses general queries about relatively current levels of stress experienced. All items begin with the same phrase: "In the past month, how often have you felt…?" Given that the questions are of a general nature and are not directed at any particular sub-population group, using this abbreviated version (or any version) with a diverse population is predicted to yield equally reliable results (Rondo et al., 2003; Sheldon et al., 1983). Subjects' responses are measured on a five-point scale (1 = never, 2 = almost never, 3 =sometimes, 4 = fairly often, 5 = very often). PSS-4 scores are obtained by summing all four items. Scoring items 2 and 3 require reverse coding. This involves assigning the opposite score, for example, a score of 1=5, 2=4, 3=3, 4=2, and 5=1. A higher score indicates more perceived stress. The 4-items PSS is based on psychometric principles and is considered to be sound. However, the limited four-item abridged scale suffers in internal reliability (r=.60). It provides a less adequate approximation of perceived stress levels than the larger scales. Test-Retest reliability and predictive validity are strongest for shorter time periods. The 10- and 14-item self-report instruments have established reliability and validity (r=0.85).

The Prenatal Psychosocial Profile (PPP): the PPP was designed to measure women's perceptions of stress, support from partners, support from others (i.e., non-partners), and self-esteem during pregnancy (Curry, Burton, & Fields, 1998). The conceptual framework underlying the PPP, its development, and original psychometric testing have been described elsewhere (Curry, Campbell, & Christian, 1994). The framework proposes a behavioral relationship between psychosocial factors and pregnancy outcomes. Psychosocial behaviors have the potential for directly or indirectly influencing the outcome of pregnancy (Curry et al., 1998). Furthermore, as they have the potential for being modified during pregnancy, they also are clinically relevant. The PPP stress subscale was established from the Daily Hassles Scale (DHS) (Kanner, 1981). Initially, 18 items from DHS were selected on the basis of their sensitivity in female populations. Based on the validity testing, the tool was reduced to 11 items that included 2 items related to financial worries and single items related to family and friends; recent moves and recent losses; problems with work; drug/alcohol use; the current pregnancy; current sexual, emotional, and/or physical abuse; and feeling generally "overloaded" (Curry et al., 1994). Each of the items is a self-report instrument asking about a current stressor or hassle on a four-point scale ranging from 1 (no stress) to 4 (severe stress). The Likert scores ranged with possible scores between 11 and 44. The recommended cut-off for high stress depends upon the population studied and the patient characteristics; there are no recommendations for differentiating between low and moderate stress. The scale's validity and reliability have been supported among ethnically diverse rural and urban pregnant women. Test-retest correlations range from 0.78 to 0.84 for each subscale and Cronbach's alpha for all four scales is 0.92.

Maternal Psychological Stress and Infants' Birthweight

In general, both physical and psychological stresses are common in pregnancy. Maternal prenatal development has been understood in terms of lifespan complexity (Glover & O'Connor, 2006). Pregnancy marks a significant life change requiring major psychological adjustments, often associated with maternal emotional health problem during pregnancy, such as depression/anxiety and stress (Da Costa, Larouche, Dritsa, & Brender, 1999; Lau, 2013). These changes are well recognized. The sources of variability in physiology and emotions during pregnancy and in pregnancy outcomes are more interesting to explore (Dunkel Schetter, 2011a). Stress during pregnancy initiates in different ways and may develop from emotional or physical stressors (Carolan-Olah & Barry, 2013). Emotionally, a lack of psychosocial and emotional adjustment during pregnancy constitutes a risk factor for the mother. For example, a depressed mood during pregnancy has been identified as a predictor of post-partum depressed mood (Da Costa, Larouche, Dritsa, & Brender, 2000). Significant evidence supports the foundation that psychological stress contributes to adverse pregnancy outcomes, such as infant low birth weight (McElroy et al., 2012). Emotional distress, particularly symptoms of depression and/or anxiety, reportedly increase the risk of pregnancy and birth complications, poor neonatal status, low birthweight, prematurity and intrauterine growth retardation, although negative or unclear findings have also been reported (Wadhwa, Entringer, Buss, & Lu, 2011). Psychological stress during pregnancy may also be a key factor related to several maternal-child health problems including poor outcome of pregnancy (Class, Lichtenstein, Langstrom, & D'Onofrio, 2011). Infant low birthweight as an outcome of pregnancy is one of the most significant maternal-child health problems linked to

maternal stress during pregnancy (Torche, 2011). Maternal psychological stress during pregnancy can significantly affect both physiological and psychosocial factors.

The physical response to maternal stress is associated with a stimulation of both the sympathetic nervous system and the hypothalamic–pituitary adrenal (HPA) axis. This stimulation will increase levels of Corticotrophin releasing hormone (CRH) and Cortisol, Adrenaline and Nor-adrenaline (Glover, 2007; Huizink et al., 2004; Talge et al., 2007; Weinstock, 2005). In pregnancy, the release of these stress hormones may be triggered by a number of stressful life events during pregnancy, including lack of social support, substance use (Pineles, Park, & Samet, 2014), and perceived higher stress level (Zhu, Tao, Hao, Sun, & Jiang, 2010). There is strong evidence to suggest that higher levels of stress hormones in pregnancy negatively affect fetal development. For example, a study on the effects of pregnancy stress on the infant's development concluded that there was a strong relationship between antenatal stress and poorer infant neurological development (Ruiz & Avant, 2005).

Physiological response-based conceptualizations of stress rely on biological measures of stress. Stress hormones, cardiac output, blood pressure, and immune response are just some of the indicators used to measure stress in the biological tradition (Dunkel Schetter, 2011b). Cause and effect relationships between environmental demands and physiological changes are evident in many research areas, but problems exist in measurement of the activation of biological systems (Dunkel Schetter & Tanner, 2012). Confounding individual differences in physiological responses may be overlooked when using biological indicators. Biological indicators of stress are often assessed at specific, isolated points in time, usually close to the stressful event, bringing into question

their generalizability to the global experience of stress (Cohen et al., 1997). D`Aanna-Hernandez and colleague (2012) investigated the effects of acculturation on cortisol in Mexican pregnant women staying in American hospitals by using saliva collection. They found that maternal cortisol late in pregnancy also related with infant low birthweight. An additional study also investigated the biochemical influence on the outcome of pregnancy in urban African-American low-income pregnant women (Edwards, Cole, et al., 1994). In this study, biochemical status was analyzed by checking standard clinic blood work procedures for serum protein, albumin, globulin, creatinine, uric acid, vitamin E, ascorbic acid, vitamin B-12, folate, ferritin, lead, calcium, phosphorus, and magnesium, blood urea nitrogen, hemoglobin, hematocrit, mean corpuscular volume, whole blood folate, red cell count, white blood cell count, cocaine, marijuana, PCP, and heroin. The results showed that infant low birthweight was correlated with serum concentrations of the antioxidant vitamins, vitamin E and ascorbic acid, and the free radical scavenger, uric acid. The study by Borders, Grobman, Amsden, and Holl (2007) also showed that chronic stress is associated with biological changes during pregnancy. The researchers found an association between chronic psychosocial stress and infant low birthweight in low-income pregnant women in the Illinois Family Study. The chronic psychosocial stress in this study was indicated by having difficulty obtaining food, caring for a child with a chronic illness, living in a crowded home, and being unemployed. The participants were receiving Temporary Assistance for Needy Families. This investigation showed that among low-income women, both the presence of chronic stressors and having fewer coping skills were associated with increasing infant low birth weight. While other researchers focused on the effect of life events and anxiety on maternal psychological

stress, D` Aanna-Hernandez and colleagues (2012) studied acculturation as a source of stress. The finding showed a significant relationship between higher levels of acculturation and infant low birthweight. Also, there was only one study that looked at disaster as a stressor (Torche, 2011). This study was conducted in Chilean pregnant women in Chile and identified earthquakes as a major source of physiological and psychological stress. The finding showed that stress, especially experienced early in the pregnancy, resulted in a decline in birthweight and an increase in the proportion of low birthweight.

Psychosocial factors affecting maternal psychological stress during pregnancy include life events, social support, anxiety, self-esteem, mastery, depression, pregnancy-related anxiety, perceived discrimination, and neighborhood safety. Those psychosocial factors have been found to be associated with maternal stress and infant birth weight. Thus, one cannot illustrate the psychological experiences of pregnancy in any single way for women as a whole (Dunkel Schetter, 2011a). Several studies investigated life events during different stages of gestation as a stressor. For example, death and/or serious illness of family members were significant life event factors related to infant low birthweight. Khashan and colleagues (2008) conducted a cohort study in Denmark during 1979-2002 to explore the association between maternal exposure to severe life events and fetal growth (birth weight and small for gestational age). The findings showed that death of a relative during pregnancy or in the 6 months before pregnancy reduced infant birthweight. Similar to Khashan's study, Class and colleagues (2011) identified the impact of the timing of prenatal stress exposure on offspring risk for shortened gestational age and infant low birthweight. The 31-events Cause of Death Registry was

used as an indicator of stress during pregnancy. The researchers found that women exposed to prenatal maternal stress during early and mid-gestation experienced an unexpected increase in gestational length and infant low birthweight. In particular, perceived stress from the death of the father of the child or first-degree relative of the mother was associated with elevated risk of gestational length and infant low birthweight. Krabbendam and colleagues (2005) examined the association between stress during early pregnancy and pregnancy outcomes in pregnant women at 14 and 30 weeks of pregnancy in the Netherlands. The researchers measure the degree to which situations in one's life are appraised as stressful. The result showed that a high level of perceived stress at 14 weeks of pregnancy increased the risk for delivery of an infant low birthweight. In addition, the study of Zhu and colleagues (2010) demonstrated that financial stress was significantly associated with an increasing risk of preterm birth. This study examined the effects of maternal exposure to severe life events during different stages of gestation on preterm birth and infant birthweight in women who delivered after 32 weeks' gestation. The finding demonstrated that higher levels of stressful life events during the first and second trimester were significantly associated with an increasing risk of preterm birth. This study also found that each increasing unit of perceive stressful life events during first trimester was associated with decrease in infant birthweight.

In relation to socioeconomic factors, Dominguez, Schetter, Mancuso, Rini, and Hobel (2005) explored the relationship among psychosocial stress, socioeconomic status and birth outcomes in African-American pregnant women in Los Angeles, California. This study singled out socioeconomic status (SES) as a life event one year prior to and during the course of the pregnancy. The finding showed that a higher number of stressful

life events predicted gestational age at birth. However, there was no significant relationship between stress and SES in this study. Paarlberg and colleagues (1999) also examined the relationship between perceived life events as daily stressors and infant low birthweight in nulliparous women in the Netherlands. The finding showed that in the first trimester of pregnancy maternal psychosocial factors were associated with an increased risk of low birthweight. Occupational stress has also been mentioned as a source of stress. Lee and colleagues (2011) investigated the association between prenatal maternal occupational stress and birthweight. They conducted the multi-center prospective cohort study with 310 Korean women during the first trimester of pregnancy, in Korea. The Job Content Questionnaires of job strain and effort-reward imbalance questionnaires were used to collect the data from the Mothers and Children's Environmental Health, Korea. The finding showed lower birthweight in the passive group of the job strain model. The high strain group was associated with a reduction in birthweight.

Perceived life events as stressors were also examined during the post-partum period. Hisham and Moawed (2000) determined the relationship between low birthweight and psychological stress during a period of 12 months prior to delivery in Saudi post-partum mothers. The participants were Saudi women who delivered babies' weight with less than 2500 grams. A structured interview was conducted within the first 24 hours after delivery from a hospital in Saudi Arabia. The results reflected that intermediate level of stress during a period of 12 months prior to delivery was associated with an increasing risk of new born low birthweight. An additional study in post-partum mothers who delivered very low birthweight (infants born weighting less than 1,500 grams) has been done by Sable and Wilkinson (2000). The results showed that mothers who felt

stress during pregnancy were at an increased risk of delivering very low birth weight babies. Moreover, studying the post-partum mothers also revealed other life event factors associated with an increasing risk of very low or moderately low birthweight including getting back with a husband or partner or experiencing a major injury, accident or illness. Rothberg, Shuenyane, Lits, and Strebel (1991) explored the relationship between moderate to severe stress factors and pregnancy outcome in mothers in the South Africa who were interviewed within 36 hours of delivery. The finding showed that a history of moderate to severe stress was associated with infant birth weight. Other factors affecting infant birthweight included death of a close family member (especially a spouse), younger maternal age, loss of income, and having to leave school as a consequence of the pregnancy. However, a cohort study of pregnant women in Norway during 1998-2008 found that being emotionally distressed at gestational weeks 17 and 30 was not significantly associated with infant low birthweight (Adams, Eberhard-Gran, Hofoss, & Eskild, 2011).

Other research has identified symptoms such as anxiety, depression, and self-esteem as sources of stress related to infant birthweight. Neggers and colleagues (2006) used a 28-item psychosocial scale (trail anxiety, self-esteem, mastery, depression, and stress) to evaluate the psychosocial profile in African-American pregnant women receiving prenatal care at the Jefferson County Health Department in Missouri, U.S. The result showed that lower psychosocial scores were associated with the risk of both infant low birthweight and preterm delivery. Rondo and colleagues (2003) evaluated the prevalence of stress and distress, the association between maternal psychological stress, distress and infant birthweight and a gestational age, and the interactions between

maternal stress, distress, smoking, alcohol, and coffee intake. The participants were pregnant women who attended antenatal care in Brazil. The finding showed that maternal distress was associated with infant low birthweight and prematurity. There was an interaction between distress and smoking in the middle and late gestational ages of pregnancy. Elizabeth Jesse, Seaver, and Wallace (2003) also identified an association between psychosocial criteria and preterm birth in pregnant women between 16 and 28 weeks gestation. The results showed that symptoms of depression, low self-esteem and more negative perception towards the pregnancy were significantly associated with delivering a preterm baby. Copper and colleagues (1996) found an association between several psychosocial factors (anxiety, stress, self-esteem, mastery, and depression) and spontaneous preterm birth, as well as fetal growth restriction. The results showed that pregnant women who perceived their lives as being stressful during pregnancy were at increased risk of spontaneous preterm birth and low birthweight.

As mentioned earlier, no single variable is associated with stress. Thus, multiple variables were selected into the research. For example, Holland, Kitzman, and Veazie (2009) described the relationships between multiple sources of maternal stress with birthweight. Those multiple sources included financial stress (current income), anxiety (the anxiety subscale of the RAND Mental Health Index), abuse (during pregnancy, verbal or physical), and neighborhood (an aggregate measure of troubled neighborhoods). The research found that neighborhood disorganization had the most significant impact on birthweight, whereas abuse and anxiety were contributed via a source of shared variance. Additionally, the study of Dole and colleague (2003) also examined a comprehensive array of psychosocial factors, including life events, social support, depression,

pregnancy-related anxiety, perceived discrimination, and neighborhood safety in relation to preterm birth. This prospective cohort study was conducted in pregnant women between 24 and 29 weeks' gestation in central North Carolina. The study showed an increasing risk of preterm birth among women with high counts of pregnancy-related anxiety related to life events negatively associated with negative impact weight. Lobel and colleague (2008a) also investigated the relationship between pregnancy-specific stress and birth outcome compared with general stress in pregnant women who had gestation age less than 20 weeks in Northeastern United States. The results showed that pregnancy-specific stress, anxiety, and life event contributed to preterm delivery and low birthweight. However, pregnancy-specific stress factor predicted birth outcomes better than other factors. Edwards and colleague (1994) evaluated multiple factors (nutritional medical biochemical, psychosocial, socioeconomic, lifestyle, and environmental factors) that influenced the outcome of pregnancy in urban African-American low-income pregnant women. The finding showed that women with a positive self-attitude and higher self-esteem were associated with delivering infants at term. There was a positive correlation between the number of persons in the mother's social support network and her infant's gestational age at birth.

Overall, most recent research in this literature has shown the complexity of association between maternal psychological stress and infant low birthweight (<2500 grams). Stress response and symptoms of stress, life events, and chronic and acute stress are among the psychosocial stressors explored in relationship to low birthweight and gestational age at birth. Most of these studies stated that maternal exposure to psychosocial stress increases risks of low birthweight significantly. The relationship

between maternal psychological stress and outcome of pregnancy may contribute to our understanding of the complexity of biological and psychosocial factors experienced by pregnant women all around the world.

Negative behavioral and lifestyle factors have also been added to the complexity of stress resources. Many individuals adopt negative behavior and lifestyle changes (e.g., smoking, alcohol/drug use/abuse, poor diet, and inadequate sleep) as coping strategies that can be harmful and contribute to adverse health outcomes (Latendresse et al., 2008). Smoking is a common form of maternal substance abuse during pregnancy and is thought to be important risk factors for pregnancy (Conde-Agudelo, Althabe, Belizán, & Kafury-Goeta, 1999). Moreover, smoking during pregnancy could be viewed as one of the consequences of poor psychosocial adjustment (Crawford, Tolosa, & Goldenberg, 2008). The effects of cigarette smoking result only from exposure during pregnancy, because mothers who stopped smoking before pregnancy had babies with birthweight similar to those of never-smokers (Bittoun & Femia, 2010). Smoking during pregnancy is the leading cause of poor pregnancy outcome and prenatal death. It can cause serious health problems including ectopic pregnancy, increased risk of miscarriage, complications during labor, preterm birth, stillbirth, low-birth weight, and sudden unexpected death in infancy (Conde-Agudelo et al., 1999; Pineles et al., 2014). Furthermore, smoking during pregnancy may increase risks of gestational bleeding, Abruptio placenta, Placenta previa and premature rupture of membranes related to preterm birth and infants' low birthweight (Jakab, 2010).

As a result, smoking during pregnancy shows strongly a significant relationship with adverse pregnancy outcomes, especially leading to infant low birthweight (Li,

Windsor, Perkins, Goldenberg, & Lowe, 1993). Maternal smoking can affect infants' birthweight in many different ways. For example, biologically, increasing Carboxyhaemoglobin levels in pregnant smokers will attenuate blood oxygen unloading to fetal tissues and reduce the maternal blood supply to the placenta (Bittoun & Femia, 2010). Moreover, Nicotine induces an increase in maternal Catecholamines with consequent uterine vasoconstriction. Another reason is related to Canide compounds in tobacco smoke, which may interfere with fetal oxidative metabolism (Shea & Steiner, 2008). The relationship between maternal smoking during pregnancy and infant low birth weight has been reported in many previous studies that observed an inverse relationship between the number of cigarettes smoked during pregnancy and birthweight (Blake et al., 2000). Additionally, a study found that stopping smoking during pregnancy led to an increase in birthweight relative to babies whose mothers smoked throughout pregnancy. Li and colleague (1993) confirmed the benefits of stopping or reducing smoking during pregnancy by measuring urinary cotinine levels. Furthermore, a study found that pregnant smokers are also less likely to breastfeed, tend to wean their babies earlier and have lower milk production than non-smokers (Jakab, 2010). Thus, pregnant smokers could be characterized as an interested population to explore others associated factors associated with infant birth weight. This current study would analyze the relationship among maternal psychosocial stress, social support, maternal self-esteem, and infant birth weight among pregnant smokers.

Moderating Role of Social Support

A moderating effect is achieved when a third variable affects the zero-order correlation between two other variables (Frazier, Tix, & Barron, 2004). A moderator variable divides the causal relationship between the independent and dependent variables into separate patterns that determine the direction and/or strength of the relationship between a predictor and an outcome (Baron & Kenny, 1986). In regard to causal order, a moderator variable is prior to the dependent variable and has no causal relationship with the independent variable. The main concern of moderation is the effect of the independent variable; it is suitable for answering when the independent variable influences the dependent variable (Baron & Kenny, 1986). In short, a moderator variable most strongly predicts or causes an outcome variable. Operationally, the moderator variable should be measured before manipulating the independent variable. To test the Lazarus' stress and coping theory in this current study, social support is viewed as secondary appraisal, which serves as moderator variable. Maternal stress is an antecedent variable affecting the infant birth weight, which serves as dependent variable. Thus, the hypothesized moderation effect of this study is the following: if social support is a significant moderator in this case, then maternal stress increases infant birth weight for women who have more satisfaction with social support than those who have less satisfaction with social support.

Social support is a complex theoretical construct that has been conceptualized in many ways. Social support has been understood as a broad concept and in more interpersonal light as an exchange between providers and recipients (Shumaker & Brownell, 1984). Although these concepts are not identical, they share a focus on the

relevance and significance of human relationships. Moreover, social support refers to the various types of support (e.g., assistance/help) that people receive from others (Jacobson, 1986). Social support is also currently identified as a multidimensional construct, and researchers have attempted to differentiate various types of social support (Zimet, Dahlem, Zimet, & Farley, 1988). A number of researchers have argued against the usefulness of a global concept of social support and have described different types or categories of social support that should be considered and that are hypothesized to have differing consequences (Etzion, 1984). For example, Schaefer, Coyne, and Lazarus (1981) specified three types of social support: emotional support, informational support, and tangible support. Cobb (1976) defined social support as information that results in the subject feeling either cared for, valued, or belonging to a network, with each type serving a distinct function. Cohen (2004) noted that three main types of support emerge: instrumental, informational, and emotional. Instrumental support, which has also been referred to as physical or non-psychological support, involves the facility of material aid, such as financial assistance that others may provide (e.g., help with childcare/housekeeping, provision of transportation or money). Informational support contains contributing information relevant to the individual's dilemma, as is the case with advice giving, and refers to the help that others may offer through the provision of information. In contrast, emotional support focuses on meeting social-emotional needs, often through expression of empathy, caring, or understanding. Emotional support also refers to the things that people do that make us feel loved and cared for, that bolster our sense of self-worth (e.g., talking over a problem, providing encouragement/positive

feedback). The type of support must match the perceived coping requirements of the recipient in order to be effective.

House's conceptualization of support, which served as the foundation of the current investigation, included 4 supports: emotional support, instrumental support, appraisal support, and informational support (House, 1981; House, Umberson, & Landis, 1988). Emotional support is related to the amount of love and caring, sympathy and understanding and or esteem or value available from others. Emotional support also involves verbal and nonverbal communication of caring and concern and is believed to enhance perceptions of control by reducing confusion and providing patients with strategies to cope with their difficulties. This type of support is most often provided by a confidant or intimates other, although less intimate ties can provide such support under circumscribed conditions. Instrumental support refers to help, aid in kind of money or labor, the provision of material goods or assistance with physical needs such as getting groceries, getting to appointments, phoning, cooking, cleaning, or paying bills. Instrumental support may also help decrease feeling of loss of control (Hogan, Linden, & Najarian, 2002). Appraisal support, often defined as the third type of support, relates to help in decision-making, giving appropriate feedback, or help deciding which course of action to take. Informational support is related to the provision of advice or information in the service of particular needs.

In relation to pregnant women, all four supports can help an individual perceive a love value relationship and create self-confidence during pregnancy (Hoffman & Hatch, 1996). In addition, perception of information, knowledge, advice and guidance also help pregnant women cope with encountering problems (Brown, 1986). Perhaps even deeper

than support are the ways in which social relationships provide a basis for intimacy and attachment. Intimacy and attachment have meaning not only for relationships that we think of traditionally as intimate (e.g., between partners, parents, and children) but for more extended ties. For instance, when relationships are solid at a community level, individuals feel strong bonds and attachment to places (e.g., one's neighborhood) and organizations (e.g., voluntary and religious organizations). An association between social support (particularly emotional support) and a health outcome is seen in relation to psychological well-being. A large literature documents a lower risk for depression and for psychological distress for those who perceived greater social support (George, Blazer, Hughes, & Fowler, 1989; Stansfeld, Rael, Head, Shipley, & Marmot, 1997). Relationships to physical health outcomes are less well documented. This may partly reflect the longer history of epidemiologic research using measures of social integration (i.e., network size) rather than social support (House, Landis, & Umberson, 1988; Seeman, 1996).

The association between social support, psychological stress and pregnancy outcome is undoubtedly complex (Hoffman & Hatch, 1996; Sheehan, 1998). It has been proposed that effective psychosocial resources, particularly social stability and social participation providing emotional and instrumental support, are protective by buffering the impact of life stress on the emotional well-being of the mothers (Glazier et al., 2004). Their social support networks reflect the relative importance of community, family, and friends. According to the adverse consequences of poverty in relation to physical, emotional, and cognitive development, pregnant rural women either anticipated or experienced greater support for their pregnancies than did their non-rural peers (Rahman,

Iqbal, & Harrington, 2003). Researchers have also identified the importance of specifying sources of social support. Although it may be important to measure availability of a confidant, Cohen and McKay (1984) note that it may be misleading to assume all support givers are equal. Evidence of the importance of including source as well as type of support is shown in findings that indicate source of support is a better predictor of psychological well-being than type of support (Lincoln, 2000; Neuling & Winefield, 1988). In addition, social support may be one determinant of lifestyle habits and relevant health behaviors, including use of substances during pregnancy such as alcohol and tobacco, as well as dietary habits, which can by themselves adversely, affect pregnancy outcomes (Harley & Eskenazi, 2006; Heaman, 2005). Social support is an important factor having an effect on birth outcomes both directly and indirectly on an individual's safety (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993). Several researchers have studied the effects of social support on pregnancy outcomes and infant birth weight. The findings indicated that social support has a positive relation with outcomes of pregnancy and self-adaptation during stress state (Elsenbruch et al., 2007; Glazier et al., 2004; Younger, Kendell, & Pickler, 1997). Cohen and Wills (1985) identified that social support promotes health both through an overall beneficial effect of support (main or direct effect model) and by a process of support serving as a protective factor against the adverse effects of stress (i.e., buffering model).

Support as a main effect: Cohen and Wills (1985) theorized that direct effects are found when global support measures are used. Buffering effects are better targeted by source-specific measures (such as friends, family, and advisors) in which the type of support matches the demand of the stressor (Cohen, 2004). The main effect of support on

major health outcomes occurs as a contrast between persons who are essentially social isolates (i.e., those with very few or no social contacts) and persons with moderate or high levels of support. Large social networks provide persons with regular positive experiences and a set of stable, socially rewarded roles in the community and cognition of self-worth. This kind of support could be related to overall well-being, because it provides a positive effect. This kind of social network support could be related to physical health outcomes through emotionally induced effects on neuroendocrine or immune system functioning. Models that hypothesize and test the main effect of social support propose that there is a direct relationship between social support and outcome variables such as well-being. The main effects of social support have been supported in many studies. For example, a study found that lower perceived social support from a partner correlated with greater psychological distress in African-American women seeking medical care at a large urban hospital (Thompson et al., 2000). Moreover, Gleazier and colleagues (2004) found that decreased perceived social support correlated with increased stress levels. Increased perceived support from the medical staff was correlated with increases in optimism. In a study of 31 mothers who delivered premature infants (Younger et al., 1997), ratings of the helpfulness of others in providing emotional, informational, tangible, and general support were positively correlated with mastery and negatively correlated with depression. Partner and family support were also found as the main effects of stress in men and women being infertile in the study of Martins and colleagues (Martins, Peterson, Almeida, Mesquita-Guimarães, & Costa, 2014).

Support as a stress buffer: Sufficient support may play a role at two different points in preventing a person from stress. First, a social support can suffice to help a

person rate a situation as less severe or as not severe due to sufficient social support offered to pregnant women. Second, a social support can suffice to help a person to reduce stress, which has a direct effect on physical health (Elsenbruch et al., 2007). For example, a social support may play a vital role in solving a problem because realization of a problem greatly affects the hormone system (Apter-Levy, Feldman, Vakart, Ebstein, & Feldman, 2013; Heinrichs et al., 2003). In addition, a social support can help a person have a better understanding in an incident and urge a person to encounter a problem both in therapy and recovery in severe cases (Martins et al., 2014). According to Cohen (2004), social support can serve as a buffer of stress, and directly affect psychological well-being (Cohen & Wills, 1985). Using the transactional model of stress, the social buffering model argues that the belief that others will provide necessary resources may increase the perceived ability to cope with demands, changing the appraisal of the situation and ultimately decreasing the effects of stress (Cohen, 2004; Wethington & Kessler, 1986) (see Figure 1).

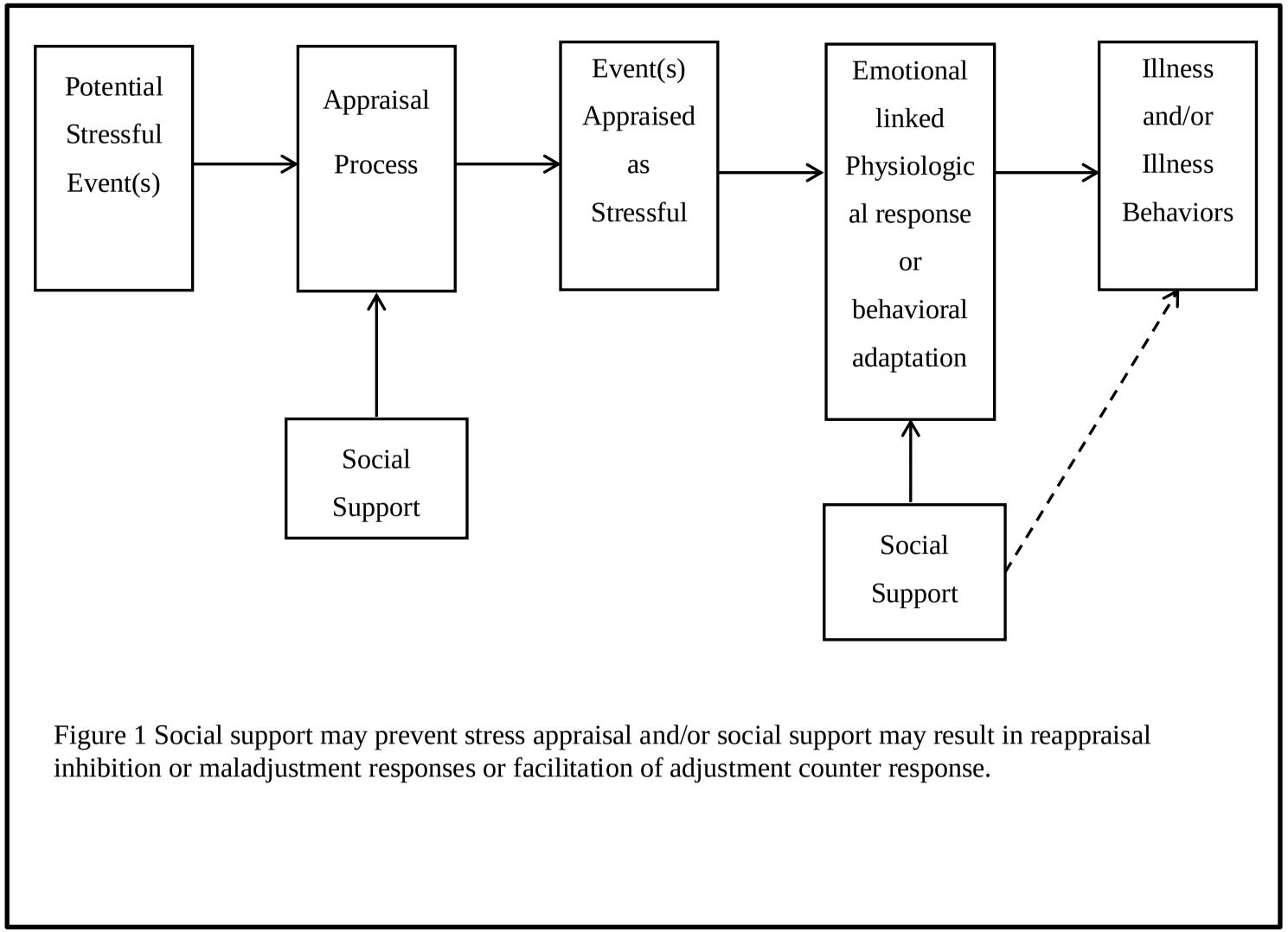

Figure 1 Social support may prevent stress appraisal and/or social support may result in reappraisal inhibition or maladjustment responses or facilitation of adjustment counter response.

The moderating or buffering effect of social support has been examined by several researchers. For example, when social support was measured on the basis of perceived support from spouse/partner, family, and friends, Russell and Taylor (2009) found that support buffered the relationship between living alone and depression for 947 Hispanic and non-Hispanic older adults in an urban setting. Also, a study of community mothers with a history of childhood sexual abuse who have a child living at home showed the result that spousal or partner support was a strong protective factor and buffered the relationship between depressive symptoms and parenting competence (Wright, Fopma-Loy, & Fischer, 2005). However, research in this area has shown inconsistent results; while some studies found social support to have a buffering effect on stress, others did not find that social support buffered the effects of stress (Cohen & Wills, 1985; Leserman, Li, Hu, & Drossman, 1998). Reviews of studies have provided some evidence that the perception of support may be more important than support actually received due to more consistent correlations with positive outcome variables. Wethington and Kessler (1986) presented rather compelling evidence for the primacy of perceived support over received support in buffering the effect of stressful events. They document not only that perceptions of support availability are more important than actual support transactions but that the latter promote psychological adjustment through the former, as much as by practical resolutions of situational demands. In two other studies, as in much of the research on health and well-being in general, interest focused on the hypothesis that social support may constitute a buffer or mediator of the effects of life stress. Norbeck and Tilden (1983) used a prospective design to study the relationship of life stress, social support, and emotional disequilibrium to the occurrence of pregnancy

complications. They reported evidence of a buffering effect of social support based on the observation of a significant relationship between complications and life stress-social support interaction. The buffering influence of social support can be demonstrated by an incident that recently took place in my community. Women with support from their communities or within their kinship networks may find that they are buffered from stressors such as poverty, mental health, severe financial problems, etc. Even women at the poorest end of the spectrum have better lives if they do not need to face their stressors alone. Social support appears to be especially important for people with lower incomes. In one recent study, people with low incomes who had social support had better cardiovascular health and natural-killer-cell activity than people with low incomes who did not have support. These findings did not occur for subjects with higher incomes (Vitaliano et al., 2001). Women of lower socioeconomic status tend to have fewer resources available and less support. They may face the constant worry about whether child support payments will arrive.

Social support continues to be widely researched as both a main effect and buffering of stress. The inconsistencies in evidence supporting either mechanism are largely due to variability in both conceptualization and measurement (Nezlek & Allen, 2006). Nevertheless, both professional and lay groups continue to use support as a way to enhance coping with stressful life events and health challenges (Hogan et al., 2002). In this current study model, social support is thought to protect pregnant women from the potentially harmful effects of exposure to a stressor during pregnancy. It is unclear whether it works through influencing the individual's appraisal of a potential stressor. It might be useful to study whether or not having a strong support network would act as a

moderator by producing a healthier environment, by decreasing events appraised as threatening or harmful or both. Other researchers have supported the idea that social support forms a protection that isolates the individual from stress exposure (Pearlin, 1989; Thoits, 1995). Clay, Roth, Wadley, and Haley (2008) also suggested that social support acts to reduce the risk of illness by reducing harmful stress appraisal. In regards to the interaction between maternal stress and infant birth weight, it is hypothesized in this current study that perceived support could buffer the impact of maternal stress during pregnancy on infant low birth weight by reducing stress symptoms over time. Overall, the importance and implications of social support during pregnancy remain incompletely understood.

Conceptual Framework

Lazarus and Folkman (1984) have long been acknowledged as the leaders in the field of stress and coping, and their theoretical model have been widely accepted. This framework provides a theoretical basis for understanding how appraisals of social support affects the amount of stress experienced and how stress experienced during pregnancy affects the pregnancy outcomes (i.e., infants' birth weight). Evidences show that maternal stress is associated with lower role satisfaction and with higher psychological and somatic symptomatology for those mothers with less satisfaction with social support (Bodecs et al., 2011; Lincoln, 2000; Roesch, Schetter, Woo, & Hobel, 2004; Thoits, 1995). Buffers of stress responses have been reported to include social support, resilience, good self-esteem, and levels of behavioral and emotional control (Ruiz & Fullerton, 1999). In this current study, the researcher focused on social support as a

potential buffer (i.e., moderator) of the stress outcomes. This study hypothesized and tested a specific causal model of interrelationships and rely on variable measures specific to maternal psychosocial stress, rather than on general stress measures.

To examine the moderating role of social support on maternal stress experiences, Lazarus's stress theory has been utilized as a conceptual model of this present study (Lazarus & Folkman, 1984, 1987). It was hypothesized that infant birth weight would have a negative relationship with maternal stress. Within this general framework, stress is the result of the appraisal and coping processes used by individuals exposed to concrete environmental demands associated with their occupation of various roles. Thus, pregnant women experiencing stress during current pregnancy would be under greater stress and might be at greater risk for negative outcomes of pregnancy such as low birth weight. This negative outcome is likely to occur, however, especially for those women lacking adequate resources such as social support from partner and non-partner. The stress events during pregnancy to be examined here are those common psychosocial stresses experienced within a few months before pregnancy and during pregnancy and are not thought to reflect any other process of stresses. The present study thus stands as a test of the impact of maternal psychosocial stress, support from partner, and support from others to infants' birth weight (see Figure 2).

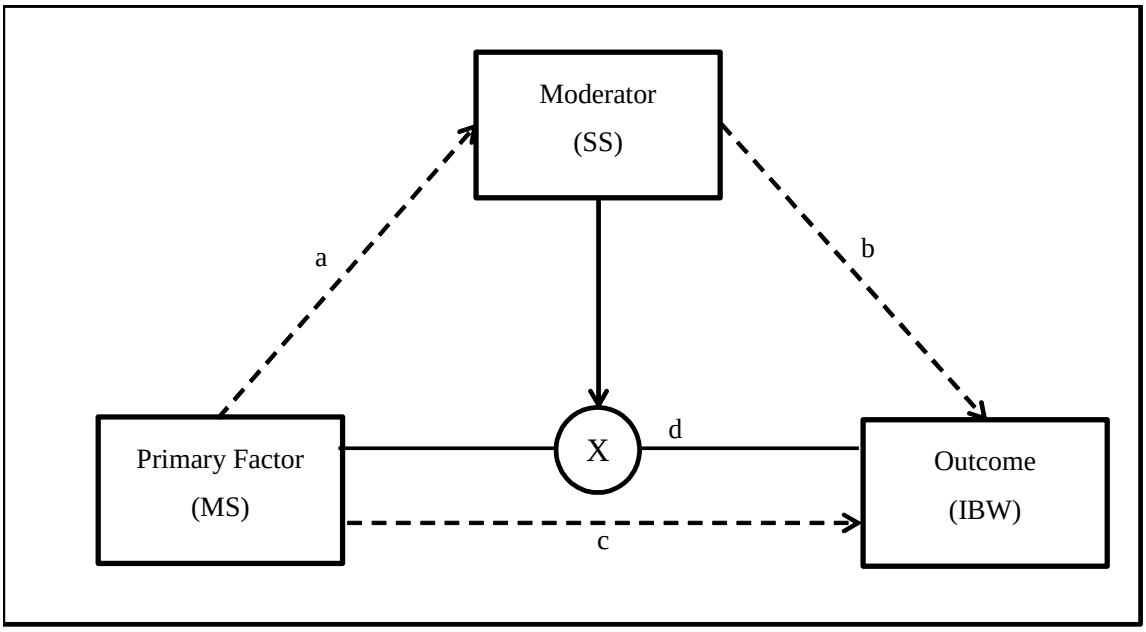

Figure 2 Conceptual Model
Moderating role of social support on the relationship of maternal stress and IBW of pregnant smokers. Abbreviations: MS – maternal stress; SS – social support; IBW – infant birth weight. The dashed connectors represent three direct paths that are not statistically critical to observing moderation: maternal stress→social support (path a), social support→infant birth weight (path b), and maternal stress→infant birth weight (path c). The solid line represents the critical path in moderation analysis; the circled X represents the interaction of maternal stress and the moderator on infant birth weight (path d). This figure was adapted from Wang and colleagues' illustrative models. Wang, P. P., Badley, E. M., & Gignac, M. (2006). Exploring the role of contextual factors in disability models. *Disability and Rehabilitation, 28*(2), 135-140. doi: doi:10.1080/09638280500167761

CHAPTER 3

Research Methodology

According to the previous section, the proposed research is an effort to examine the moderating role of social support on the relationship between maternal stress and infant birth weight.

The specific aims of the study are the following:

1) To present a confirmatory factor analysis of a three-factor model of perceived stress during pregnancy in pregnant smokers using the Prenatal Psychosocial Profile (PPP) and the Cohen's Perceived Stress Scale 4-item version (PSS).
2) To examine the potential moderating role of social support on the relationship between maternal stress and infant birth weight.

The research hypotheses:

Based on the conceptual model, this study proposes the following hypotheses.

1) Given that previous studies provide evidence of a relationship between maternal stress and IBW, there will be a significant negative correlation between level of maternal stress and IBW.
2) Given that previous studies have found that social support is related to positive pregnancy outcome:
    a. There will be a significant positive correlation between perceived partner support and IBW;
    b. There will a be significant positive correlation between perceived other support and IBW;

3) Social support is expected to significantly moderate the relationship between maternal stress and IBW. Given that social support has been established as protective factor, this study propose that social support will has a buffering effect on the relationship between maternal stress and IBW such that:
    a. Pregnant women who report satisfaction with partner support will have less significant negative correlation between maternal stress and IBW.
    b. Pregnant women who report satisfaction with support from others will have less significant negative correlation between maternal stress and IBW.

The intent of this section is to describe the methodology that is proposed for such a research effort. Included in the section are a description of the study design, study sample, and proposed data collection methods, procedures, and analysis efforts. The study design, sample, and data collection procedures for a study focusing on pregnant smokers were discussed in the following sections. Data analysis and instruments proposed to answer the study aims were introduced.

Research Design

This study relied on a secondary analysis of data from the Baby BEEP (Behavioral Education Enhancement of Pregnancy), a randomized controlled trial of nurses' individualized social support for poor rural pregnant smokers during three different periods [Baseline (Time 1); between 28 and 32 weeks gestation (Time 2), and 6-weeks post-delivery (Time 3)].

The current study is a secondary analysis using Time 1 data collected and entered from the 21 rural Women Infant and Children Nutritional Supplement (WIC) clinics in a Mid-west state. Although additional data collections exist (e.g., Time 2 and Time 3), this study is confined to potential variables associated with infant weight gain at birth and prior to receiving the intervention, namely, the effect of individualized, nurse-delivered telephone social support ("Baby BEEP") and eight mailed prenatal smoking cessation booklets containing single lessons or the control group lessons. In the Baby BEEP study, stress was measured at three different occasions during pregnancy. In this current study the stress at a first time point would be used as a study model.

Setting and Participants

Recruitment for the Baby BEEP trial began in January 2002 and continued through October 2005. A purposive sample of women (N = 695) consisted of women attending 21 rural Women Infant and Children Nutritional Supplement (WIC) clinics in a Mid-west state who reported smoking at least 1 cigarette per day, spoke English, were 18 years or older, and who were at 24 weeks gestation or earlier. Pregnant smokers were followed from the time they entered the study until 6-weeks post-delivery. In this study, a sample was selected from the purposive sampling from the original study, Baby BEEP: A Randomized Controlled Trial of Nurses' Individualized Social Support for Poor Rural Pregnant Smokers (Bullock et al., 2009). The participants (N=527) in this current study were pregnant women who completed baseline (Time 1) assessment, have both partner support and non-partner support, delivered a single live baby, and continually reported smoking during pregnancy.

Procedures

WIC personnel in the participating clinics routinely determined the smoking status of all clients. During the study period when a woman reported currently smoking, the WIC staff explained the availability of a smoking cessation study and asked permission to provide her name and telephone number to the Baby BEEP research team. If the woman agreed, a nurse from the research team was assigned to contact her to arrange a face-to-face visit to explain the study and request written consent. The study protocol was approved by the University's Institutional Review Board (IRB) and the IRB of the state health department.

At the recruitment meeting with the woman the nurse explained the study and the consent form. All of the women were also told that they did not have to quit smoking in order to participate. Consenting women were then interviewed and assigned to a study group. There were four different study groups: the control group, the booklets-alone group, the social support-alone group, and social support plus booklets group. At the completion of the baseline assessment interview, the PI prepared the study group assignment into a sealed envelope. The nurse on the research team opened an opaque, sealed envelope for the women within the baseline assessment. Random assignments determined which study group resources the women will be given.

Participants randomized to one of the telephone social support groups (with and without the booklets) were asked for a mutually convenient time for the weekly telephone call. Those assigned to the booklet-only study group were given the first booklet, and the usual care control group was given the Quit Smoking for Good pamphlet from the American Heart Association. All study participants were instructed that a member of the research team would call each month to arrange a monthly saliva sample collection to

measure their exposure to tobacco smoke and that they would be asked the same questions for two more interviews—one at the time of their saliva collection in the 8th month of pregnancy and again 6 weeks after the birth when saliva would be collected again (Bullock et al., 2009).

Instruments Used for Current study

Demographic information. The demographic questionnaire from the Baby BEEP study consisted of common demographic questions concerning maternal age, ethnicity, marital status, educational level, parity, and maternal gestational age. The following instruments would be used at this current study.

Prenatal Psychosocial Profile (PPP). The PPP, developed by Curry et al. (Curry et al., 1998) is composed of three subscales: stress, social support from partner and non-partners, and self-esteem. The PPP contains a total of 44 items. The questions measure maternal psychosocial stress during pregnancy. The PPP stress subscale has been validated for use in pregnant populations. The 11 items on the stress subscale have been selected from the Daily Hassles Scale (Elizabeth Jesse et al., 2003). It is an 11 questions survey for sensitivity and appropriateness using a Likert response scale with possible scores ranging from 11 to 44. The PPP stress subscale includes two items related to financial worries and single items related to family, friends, recent moves, recent losses, problems with work, drug/alcohol use, the current pregnancy, current sexual, emotional and/or physical abuse, and feeling generally overloaded (Curry et al., 1998). Each of the items is a self-report instrument asking about a current stressor or hassle on a four-point scale ranging from 1 (no stress) to 4 (severe stress). The scale's validity and reliability have been supported among ethnically diverse rural and urban pregnant women.

The PPP social support subscale. The 11 items include questions related to sharing similar experiences, helping out in a pinch, toleration ups and downs, and showing interest in daily activities (Lazarus & Folkman, 1984). Women were asked to rank their satisfaction with the support they receive from their partner (if relevant) and others on a 6-point scale ranging from 1 (very dissatisfied) to 6 (very satisfied).

4-Item Perceived Stress Scale (PSS). The 4-item PSS version developed by Sheldon Cohen (Cohen et al., 1983) assesses the degree to which a person feels his or her life to be unpredictable, uncontrollable, and overloaded in the past month. The 4-item PSS is self-report instrument with a five-point scale: 1 = never, 2 = almost never, 3 =sometimes, 4 = fairly often, 5 = very often. It has an alpha reliability coefficient of 0.60 and has been shown to be useful for measuring perceptions of stress. In this present study PSS was modified from five rating scales to four rating scales due to the process of confirmatory factor analysis. All PSS original scales with five rating scales were entered into IBM Statistical Package for Social Sciences (SPSS) software for recoding to new scales with four rating scales. According to the descriptive analysis results, scale 4 and scale 5 showed very close of items' frequency. Therefore, those two scales were collapsed into one scale at 4=fairly often. The new 4-item PSS with 4 rating scale version has been call the modified PSS in this study.

Measurement of Infant Birth Weight. Outcome variable of this study is Infant birth weight obtained using maternal recall in gram.

Plan for Data Analysis

In total, the sample available for this study contained 522 pregnant smokers. This current study used a power analysis with the highest number of predictors at six; an

anticipated medium effect size (f2) of 0.15, and desired statistical power level of 0.8. By using power analysis, the sample size of this study is large enough to obtain a significant relationship between dependent variables and independent variables (MacCallum, Browne, & Sugawara, 1996). Research aims were identified and addressed through data analysis using the IBM Statistical Package for Social Sciences (SPSS) statistics version 19 and AMOS software version 20. Data Analysis strategies included computation of descriptive statistics, Confirmatory factor analysis (CFA), and Multiple linear regression. Descriptive statistical analyses were completed to profile the study sample in terms of participant characteristics, maternal stress and infant weight gain. Continuous variables were summarized with the number of observations, mean, median, standard deviation, and range. The normality of the mean sample distribution of the PPP scale and the internal consistency of the PPP subscales were calculated. Convergent validity was examined by calculating Person correlation between the PPP total and subscale scores. The centering was used to handle a Multicollinearity of Multiple linear regression.

Confirmatory Factor Analysis (CFA) in SPSS AMOS software version 20 techniques were used to examine research aim 1: to present a confirmatory factor analysis of the three-factor model of perceived stress during pregnancy in pregnant smokers. The factor structure of the stress-subscale of PPP and the modified PSS in a sample of pregnant smokers were presented. To examine those relationships of stress construct, CFA techniques were used to exam the validity of the measurement models. The study assessed stress with two different measures stress-subscale of PPP and modified PSS. The model presented in Figure 3 refers to the CFA initial model. This model represents

the hypothesis that the modified PSS are conjectured to load on a latent construct of the stress-subscale of PPP (11 items).

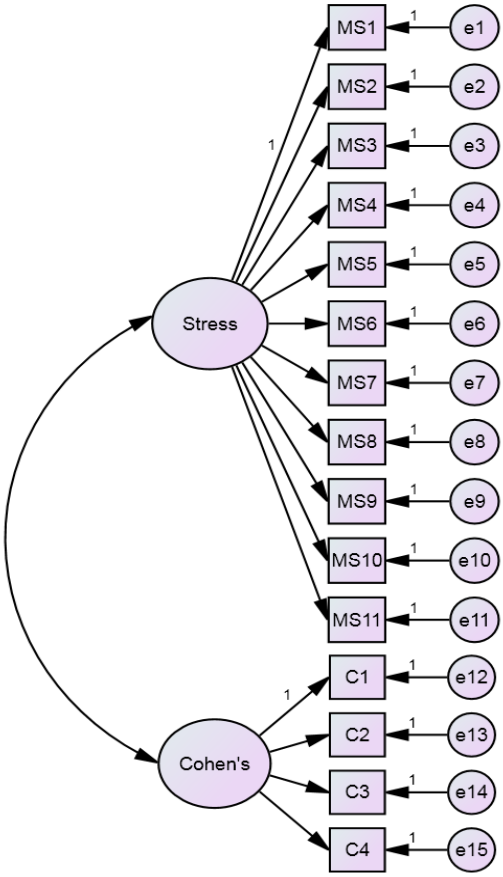

Figure 3 The inital model identification constructs from the PPP stress subscale load onto the modified PSS

Using the factors derived from the two-factor CFA initial model, the relationship between prenatal stress and infant birth weights was explored. Therefore, the model presented in Figure 4 refers to the path model which use maternal stress scales of the CFA model to predict infant birth weight (IBW), while PPP social support from partner subscale and

PPP social support from other people subscale are presented as moderating variables. This model represents research aim 2: to examine the potential moderation role of social support and self-esteem in the relationship between maternal stress and infant birth weight.

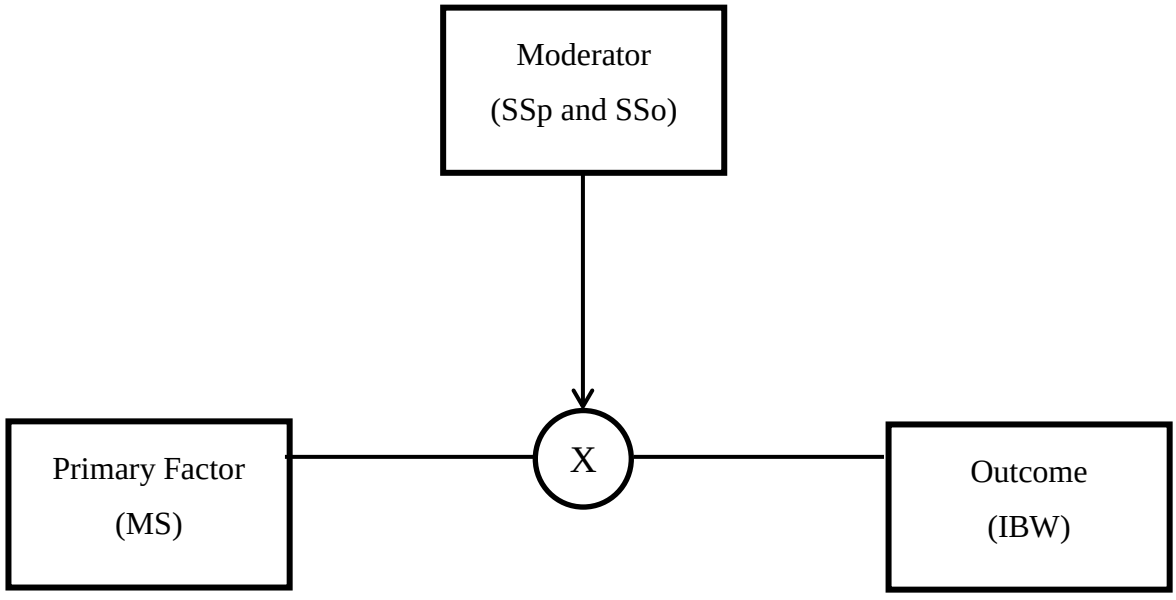

Figure 4 The path model which using MS scales as a primary factor to predict IBW as an outcome variable, while two SS subscales presented as moderator variables.
Abbreviations: MS-maternal stress; SSp-social support from partner; SSo-social support from other people; IBW-infant birth weight

Protection of Human Subjects

This study received approval from the University's Institutional Review Board overseeing protection of human subjects. Dr. Linda Bullock, the principal investigator of the research project, approved access to the database. The data set obtained from the participants was de-identified so there was no contact with the original participants. The

dataset was encoded and saved electronically on a secure server and was password-protected.

CHAPTER 4

Result

Chapter Three addressed the methods used to examine the potential moderation role of social support from partner and other people on the relationship between three components of maternal perceived stress—financial, emotional, and current-pregnancy stress—and infant birthweight of pregnant smokers. This chapter is divided into the following sections: the population from which the sample was drawn, including the criteria for the participants in the study, instruments utilized, and the research analysis.

Sample

Demographic information deemed pertinent was obtained about the participants of this study. The measure included variables to determine the eligibility of a participant, such as enrollment in a Baby BEEP study, and other descriptive information such as maternal age, race/ethnicity, marital status, years of education, and number of cigarettes smoked daily. This questionnaire was used to describe the sample for this research study. Participants were between 18 and 39 years of age, with a mean age of 23.01 years (SD = 4.43). Ninety one percent of the participants were White or European American (n = 475), only 8% were non-white (n = 47). The majority of participants were married (78.4%, n = 409), the rest of them were not married (21.5%, n = 112). Years of education of the study participants was between 7-18 years, with a mean of 11.32 years (SD = 1.65). Approximate sixty two percent (n = 325) reported 10 or less of cigarettes smoked per day, 33% (n = 172) reported 11-20 cigarettes smoking per day, 4.4% (n = 23) reported 21-30 cigarettes smoking per day, and only 2 pregnant women reported more

than 30 cigarettes smoking per day. Infant birthweight of this study participants' offspring was between 426.14 and 4,911.93 grams, with a mean weight of 3,184.37 grams (SD = 558.06). The descriptive statistics of the participants are displayed in Table 1.

Table 1 Demographic Characteristics of Study Sample

Variables	Range	Mean	SD	%/n
Maternal age	18-39	23.01	4.43	-
Race/Ethnicity	(years)			
White or European American		-	-	91%/475
Non-white	-	-	-	8%/47
Marital status	-			
Married		-	-	78.4%/409
Not married	-	-	-	21.5%/112
Education	-	11.32	1.65	-
Number of cigarette smoking/day	7-18 (years)			
10 or less		-	-	62.3%/325
11-20	-	-	-	33.0%/172
21-30	-	-	-	4.4%/23
31 or more	-	-	-	.4%/2
Infant birthweight	-	3,184.37	558.06	-
	426.14-4,911.93 (gram)			

Prenatal Psychosocial Profile (PPP). The PPP, developed by Curry et al. (1998) is composed of three subscales: stress, social support from partner and non-partners, and self-esteem. The PPP contains a total of 44 items. Table 2 shows the possible range that are possible on this instrument, the range of scores (actual range) in this sample of women, the mean score among the women, and the standard deviations for each of the PPP stress items. The overall mean for the stress subscale was 21.53 (SD = 5.0) with higher scores indicating higher stress. The item that pregnant smokers rated as the highest item score was item S2, "Other money worries (e.g., bills, etc…)" with a mean of 2.59

(SD = 1.01) and the lowest item score, item S7, "Current abuse (e.g., sexual, emotional or physical)" with a mean of 1.16 (SD = .53).

Table 2 Range, Mean, and Standard Deviation of PPP stress items (n=522)

Variables	Possible range	Actual range	Mean	SD
Sum of PPP-Stress	**11-44**	**11-40**	**21.53**	**5.00**
MS1. Financial worries (e.g., food, shelter, health care, transportation).	1-4	1-4	2.50	1.00
MS2. Other money worries (e.g., bills, etc.…)	1-4	1-4	2.59	1.01
MS3. Problems related to family (e.g., partner, children, etc…).	1-4	1-4	2.34	1.02
MS4. Having to move, either recently or in the future.	1-4	1-4	1.93	1.04
MS5. Recent loss of loved one (e.g., death, divorce, long distance).	1-4	1-4	1.78	1.08
MS6. Current pregnancy	1-4	1-4	2.06	0.89
MS7. Current abuse (e.g., sexual, emotional or physical).	1-4	1-4	1.16	0.53
MS8. Problems with alcohol and/or drugs.	1-4	1-4	1.24	0.64
MS9. Work problems (e.g., being laid off, etc…)	1-4	1-4	2.12	1.08
MS10. Problems related to friends.	1-4	1-4	1.39	0.70
MS11. Feeling generally "overload".	1-4	1-4	2.45	0.97

Table 3 shows the possible range, actual range, mean, and standard deviations of the PPP social support from partner items. The overall mean for social support from a partner items was 52.17 (SD = 11.83) with higher scores indicating more satisfaction with the support received from the partner. The item that pregnant smokers rated highest was item P 11, "Let's me know that he/she will be around if I need assistance" with a mean of 5.29 (SD = 1.29) and the lowest item score was item P 10, "Says things that make my situation clear and easier to understand" with a mean of 4.26 (SD = 1.46).

Table 3 Range, Mean, and Standard Deviation of PPP social support from partner subscales (n=522)

	Variables	Possible range	Actual range	Mean	SD
Sum of PPP Support from partner		11-66	11-66	52.17	11.83
P1	Shares similar experience with me	1-6	1-6	4.57	1.28
P2	Helps keep up my morale	1-6	1-6	4.76	1.35
P3	Helps me out when I'm in a pinch	1-6	1-6	4.97	1.32
P4	Shows interest in my daily activities and problems	1-6	1-6	4.47	1.44
P5	Goes out of the way to do special or thoughtful things for me	1-6	1-6	4.47	1.64
P6	Allows me to talk about things that are very personal and private	1-6	1-6	5.18	1.34
P7	Let's me know I am appreciated for the things I do for him	1-6	1-6	4.81	1.44
P8	Tolerates my ups and downs and unusual behaviors	1-6	1-6	4.58	1.51
P9	Takes me seriously when I have concerns	1-6	1-6	4.81	1.37
P10	Says things that make my situation clear and easier to understand	1-6	1-6	4.26	1.46
P11	Let's me know that he/she will be around if I need assistance	1-6	1-6	5.29	1.29

Table 4 shows the possible range, actual range, mean, and standard deviations of the PPP social support from other people subscales. The overall mean for social support from other people subscale was 52.65 (SD = 11.48) with higher scores indicating more satisfaction with the support received from other people. The item that pregnant smokers rated highest (see Table 4) was item O 11, "Let's me know that he/she will be around if I

need assistance" with a mean of 5.40 (SD = 1.12) and the lowest item score was item O 5, "Goes out of the way to do special or thoughtful things for me" with a mean of 4.32 (SD = 1.52).

Table 4 Range, Mean, and Standard Deviation of PPP support from other people subscales (n=522)

Variables		Possible range	Actual range	Mean	SD
Sum of PPP Support from other people		11-66	11-66	52.65	11.48
O1	Shares similar experience with me	1-6	1-6	4.53	1.38
O2	Helps keep up my morale	1-6	1-6	4.77	1.27
O3	Helps me out when I'm in a pinch	1-6	1-6	4.98	1.27
O4	Shows interest in my daily activities and problems	1-6	1-6	4.51	1.40
O5	Goes out of the way to do special or thoughtful things for me	1-6	1-6	4.32	1.52
O6	Allows me to talk about things that are very personal and private	1-6	1-6	4.98	1.42
O7	Let's me know I am appreciated for the things I do for him	1-6	1-6	4.80	1.36
O8	Tolerates my ups and downs and unusual behaviors	1-6	1-6	4.64	1.45
O9	Takes me seriously when I have concerns	1-6	1-6	5.01	1.23
O10	Says things that make my situation clear and easier to understand	1-6	1-6	4.71	1.38
O11	Let's me know that he/she will be around if I need assistance	1-6	1-6	5.40	1.12

Table 5 shows the possible range, actual range, mean, and standard deviations of the PSS 4-item version. Before analyzing PSS scored, the original version with 5 rating scales was collapsed to 4 rating scales due to the process of confirmatory factor analysis of perceived stress scale. The overall mean for the PSS 4-item version with 4 rating scales was 10.65 (SD = 3.20) with higher scores indicating higher stress. The item that pregnant smokers rated highest was item PSS 3, "In the past month, how often have you felt that things were going your way?" with a mean of 2.98 (SD = 0.96), and the lowest

item score was item PSS1 “The past month, how often have you felt that you were unable to control the important things in your life?” with a mean of 2.45 (SD = 1.11).

Table 5 Range, Mean, and Standard Deviation of Cohen’s Perceived Stress Scale (PSS) 4-item version (n=522)

Variables		Possible range	Actual range	Mean	SD
Sum of modified PSS version		4-16	4-16	10.65	3.20
PSS1	In the past month, how often have you felt that you were unable to control the important things in your life?	1-4	1-4	2.45	1.11
PSS2	In the past month, how often have you felt confident about your ability to handle personal problems?	1-4	1-4	2.47	1.00
PSS3	In the past month, how often have you felt that things were going your way?	1-4	1-4	2.98	0.96
PSS4	In the past month, how often have you felt difficulties were piling up so high that you could not overcome them?	1-4	1-4	2.74	1.14

Study aim 1: to perform a confirmatory factor analysis (CFA) of perceived stress. AMOS software techniques were utilized to examine the factor structure of the PPP and PSS in a sample of poor rural pregnant smokers. CFA techniques examine the internal reliability of the measurement models used to construct stress relationships. The path models of CFA in AMOS software graphic shows in the figures following:

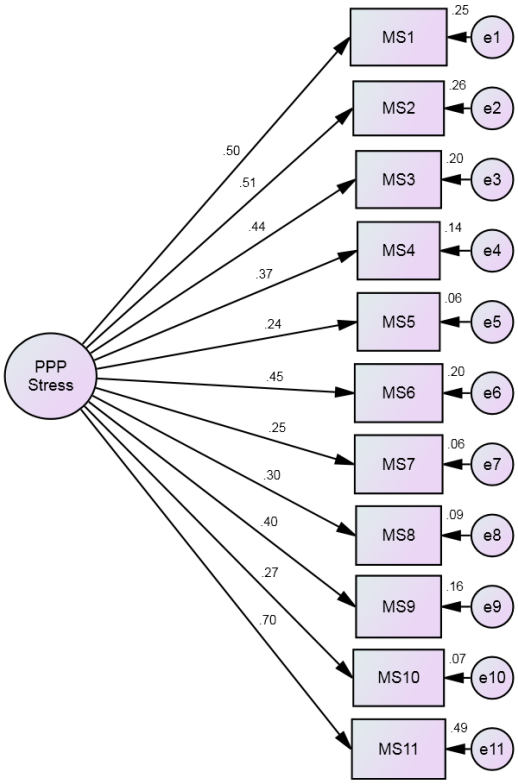

Figure 5 Path model of one-factor confirmatory factor analysis (CFA) of the Prenatal Psychosocial Profile (PPP) 11 items of stress subscale on AMOS software with standardized estimated and standardized error of each item.
The circle labeled “PPP stress” represents the latent variable while the circles labeled “e1” to “e11” are the unique factors—measurement errors—in the variables. The squares labeled “MS1” to “MS 11” represent observed

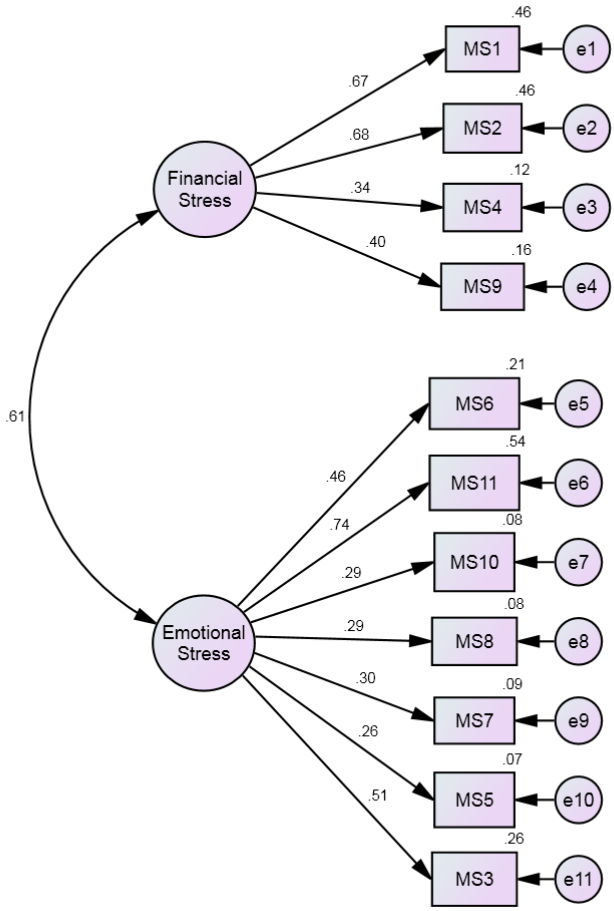

Figure 6 Path model of two-factor confirmatory factor analysis (CFA) of PPP 11 items of stress subscale on AMOS software with standardized estimated and standardized error of each item.

Two circles labeled “Financial Stress” and “Emotional Stress” represent latent variables while the circles labeled “e1” to “e11” are the unique factors—measurement errors—in the variables. The squares labeled “MS1” to “MS 11” represent observed variables which respond to a Likert-scaled item, ranging from 1 (no stress) to 4 (severe stress) on PPP stress subscale. The straight line pointing from a latent variable to the observer variables indicate the causal effect of the latent variable on the observed variables. The curved arrow between latent variables indicates that they are correlated.

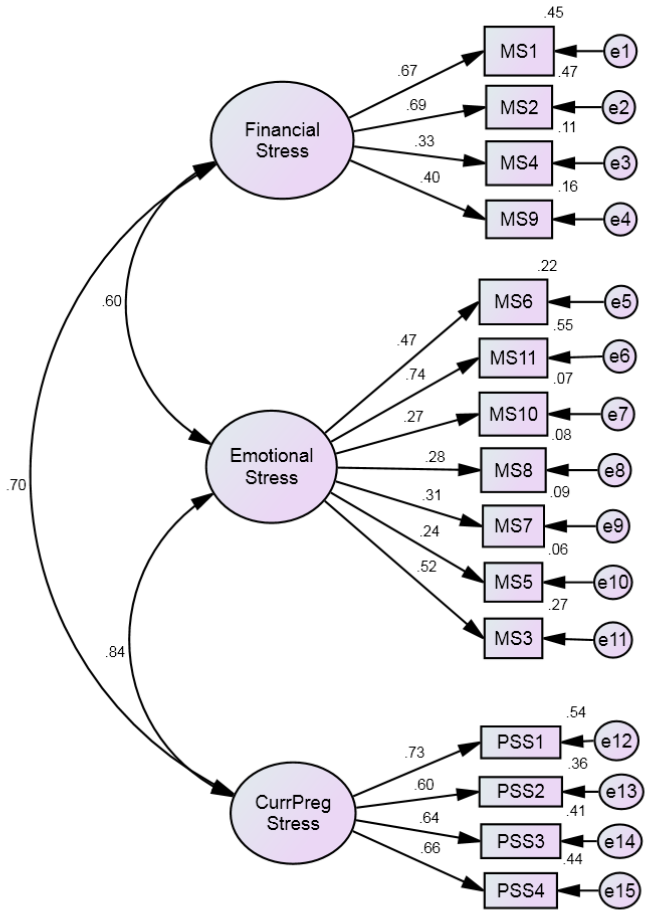

Figure 7 Initial path model of three-factor confirmatory factor analysis (CFA) of the PPP 11 items of stress subscale on AMOS software with standardized estimated and standardized error of each item.
Three circles labeled “Financial Stress”, “Emotional Stress”, and “CurrPreg Stress”—Current-pregnancy Stress—represent latent variables while the circles labeled “e1” to “e15” are the unique factors—measurement errors—in the variables. The squares labeled “MS1” to “MS 11” represent observed variables which respond to a Likert-scaled item, ranging from 1 (no stress) to 4 (severe stress) on the PPP stress subscale. The squares labeled “PSS1” to “PSS 4” represent observed variables which respond to a Likert-scaled item, ranging from 1 (never) to 4 (very often) on Cohen’s Perceived Stress Scale. The straight line pointing from a latent variable to the observer variables indicates the causal effect of the latent variable on the observed variables. The curved arrow between latent variables indicates that they are correlated.

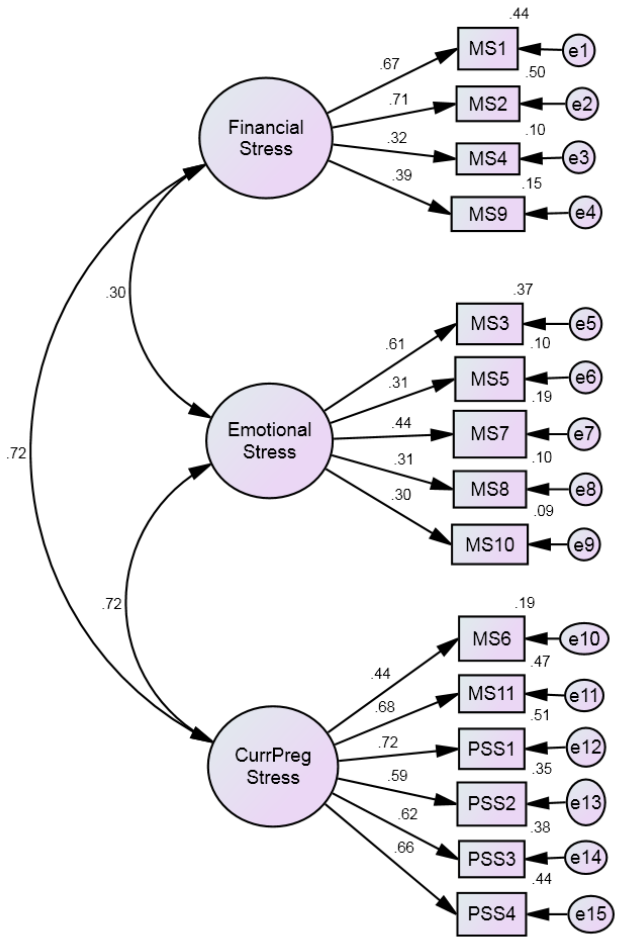

Figure 8 Final path model of three-factor confirmatory factor analysis (CFA) of the PPP 11 items of stress subscale on AMOS software with standardized estimated and standardized error of each item.

Three circles labeled “Financial Stress”, “Emotional Stress”, and “CurrPreg Stress”—Current-pregnancy Stress—represent latent variables while the circles labeled “e1” to “e15” are the unique factors—measurement errors—in the variables. The squares labeled “MS1” to “MS 11” represent observed variables which response to a Likert-scaled item, ranging from 1 (no stress) to 4 (severe stress) on PPP stress subscale. The squares labeled “PSS1” to “PSS 4” represent observed variables which response to a Likert-scaled item, ranging from 1 (no stress) to 4 (severe stress) on Cohen’s Perceived Stress Scale. The straight line pointing from a latent variable to the observer variables indicates the causal effect of the latent variable on the observed variables. The curved arrow between latent variables indicates that they are correlated.

Table 6 shows a various goodness of fit statistics of Model 1—Path model of one-factor CFA with χ^2 is 208.98 $df = 44$, $p < .000$ which is so large that the null hypothesis of a good fit is rejected at the .05 level ($p<.000$). Root Mean Square Error of Approximation (RMSEA) .085 is also large enough to reject the null hypothesis ($p<.000$). Comparative Fit Index (CFI) 0.755 is small. Therefore, this one factor model shows a poor fit and needs to be modified somehow. After modifying the one factor model to the two-factor model based on modification index, the good fitness of two-factor CFA final modification model—Model 2—is showed in Table 7 with χ^2 is 143.94 $df = 43$, $p < .000$, RMSEA = .067, SRMR = .059, and CFI = .850, indicating better fit of two-factor CFA model.

To measure perceived stress level of this study sample, another perceived stress instrument, the 4-item version of Cohen's Perceived Stress Scale (PSS) has been used to assess a stress level of this study sample. To know how PSS load on the two components of PPP, the three-factor CFA model was conducted. Model 3a in Table 7 shows the fit statistics of initial three-factor CFA model with χ^2 is 177.93 $df = 87$, $p < .000$, RMSEA = .045, SRMR = .048, and CFI = .936, indicating just good fit of three-factor CFA model and needs to be modified somehow. The model 3b—the final three-factor CFA model, the overall model fit appears quite good with χ^2 ($df = 87$) decreases down to 154.27, which is too small to reject the null hypothesis of a good fit ($p<.000$). A small RMSEA of .045, a small SRMR of .045, and a large CFI of .953 indicates a good fit of this model (see Table 6).

Table 6 Fit Statistics for Confirmatory Factor Analysis

Model	Fit Statistics							
	χ^2	*df*	χ^2/df	RMSEA	RMSEA 90% CI	SRMR	AIC	CFI
1	208.98	44	4.75	.085	(.070, .100)	.067	252.98	.755
2	143.94	43	3.35	.067	(.055, .079)	.059	189.94	.850
3a	177.93	87	2.05	.045	(.035, .054)	.048	243.93	.936
3b	**154.27**	**87**	**1.77**	**.039**	**(.028, .048)**	**.045**	**220.27**	**.953**

Note. χ^2 = chi-square test; df = degrees of freedom; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean square residual; ACI = Akaike information criterion; CFI = comparative fit index.

Factor loadings from the final three-factor CFA model for this current study appear in Table 8. For this model, each item loaded significantly on its respective factor, .32 to .71 for financial stress, .44 to .72 for current-pregnancy stress; however, the PPPs3 item—the PPP stress subscale (problems related to family) did not load as similarly on its respective factor (.61) as the other items, whose loading ranged from .30 to .44 for emotional stress. Correlation between factors ranged from .30 to .72 (see Table 7).

Table 7 Completely Standardized Factor Loading and Factor Correlations for Model 3b (Final Model)

Item (Perceived Stress) and Factor		Factor		
		Financial Stress	Emotional Stress	Current-pregnancy Stress
1	MS 1	.67	-	-
2	MS 2	.71	-	-
3	MS 4	.32	-	-
4	MS 9	.39	-	-
5	MS 3	-	.61	-
6	MS 5	-	.31	-
7	MS 7	-	.44	-
8	MS 8	-	.31	-
9	MS 10	-	.30	-
10	MS 6	-	-	.44
11	MS 11	-	-	.68
12	PSS1	-	-	.72
13	PSS2	-	-	.59
14	PSS3	-	-	.62
15	PSS4	-	-	.66
Financial Stress		-	-	-
Emotional Stress		.30***	-	-
Current-pregnancy Stress		.72***	.72***	-

Note. MS = Prenatal Psychosocial Profile Stress items; PSS = 4-item version Cohen's Perceive Stress Scale
***$p < .001$

Table 8 displays the correlations, means, standard deviations, and reliability coefficients of the independent and dependent variables. The correlations in Table 8 were used to test the first and second hypotheses.

Hypothesis 1: Given that previous studies (Yu, McElory, Bullock, & Everett, 2011) provide evidence of a relationship among three components of maternal stress, financial, emotional and current-pregnancy stress and IBW:

a) There will be a significance negative correlation between level of financial stress and IBW. As hypothesized, there was a negative correlation between financial stress score and IBW. The correlation was positive, yet small and not statistically significant ($r = .015$, $p < .73$). Therefore, Hypothesis 1a was rejected. According to these findings, there does not seem to be a relationship between financial stress and IBW.

b) There will be a significance negative correlation between level of emotional stress and IBW. As hypothesized, there was a negative correlation between emotional stress score and IBW. The correlation was positive, yet small and not statistically significant ($r = .091$, $p < .03$). Therefore, Hypothesis 1b was rejected. In this sample, pregnant smokers' perceived higher emotional stress during pregnancy tended to deliver higher weight baby.

c) There will be a significance negative correlation between level of current-pregnancy stress and IBW. As hypothesized, there was a negative correlation between current-pregnancy stress score and IBW. The correlation was positive, yet small and not statistically significant ($r = .068$, $p < .12$). Therefore, Hypothesis 1a was rejected. According to these findings, there does not seem to be a relationship between financial stress and IBW.

Hypothesis 2: Given that previous studies provide evidence of a relationship among social support from partner, social support from other people and IBW:

a) There will be a significant positive correlation between social support from partner and IBW. As hypothesized, there was a positive correlation between social support from partner and IBW. The correlation was positive, yet small and not statistically significant ($r = .005$, $p < .90$). Therefore, Hypothesis 2a was rejected. According to these findings, there does not seem to be a relationship between social support from partner and IBW.

b) There will be a significant positive correlation between social support from other people and IBW. As hypothesized, there was a positive correlation between social support from other people and IBW. The correlation was negative, yet small and not statistically significant ($r = -.073$, $p < .10$). Therefore, Hypothesis 2b was rejected. According to these findings, there does not seem to be a relationship between support from partner and IBW.

Table 8 Correlations, Means, Standard Deviations, and Reliability Coefficients of the Measured Variables (n=522)

Variable	1	2	3	4	5	6
1 IBW	-					
2 FSS	.015	-				
3 ESS	.091*	.245**	-			
4 CPSS	.068	.531**	.436**	-		
5 Supp_P	.005	-.144**	-.287**	-.349**	-	
6 Supp_O	-.073	-.136**	-.177**	-.173**	.081	-
M	3,184.37	9.13	7.89	15.16	52.17	52.65
SD	558.66	2.74	2.34	4.24	11.83	11.48
Alpha	-	.57	.44	.79	.93	.93

Note. IBW = Infant Birthweight; FSS = Financial Stress scale; ESS = Emotional Stress scale; CPSS = Current-pregnancy Stress scale; Supp_P = Support from partner; Supp_O = Support from Other people
*p<.05, **p<.01

Hypothesis 3: Social support from partner and other people are expected to significantly moderate the relationship between maternal stress and IBW. Given that

social support from partner and other people have been established as protective factors, this study proposed that social support from partner and other people will have a buffering effect on the relationship between maternal stress and IBW. A series of multiple liner regressions were performed for the initial model without the moderation interaction that followed procedures outlined by Baron and Kenny (1986) and Frazier et al. (2004). Due to the higher significant relationship among independent variables, a Multicollinearity of multiple regressions was used to test the centering of variables. The initial final model (Model 1) was significant parsimonious model at $p < .035$ (see Table 9). From this finding, therefore, demographic variables, married status and a number of cigarettes smoked daily s study sample were controlled for by entering them as a covariate in the moderation regression analysis. Financial stress, current-pregnancy stress, and social support from partner were excluded from the model 1, therefore, only emotional stress and social support from other people were used in the moderation regression analysis.

The final initial parsimonious model (Model 1) was used to develop the moderation regression analysis with an interaction term of variables. As hypothesized, the relationship between perceived emotional stress and IBW will be significantly weaker for pregnant women who report higher satisfaction of support from other people. The interaction term was then created between perceived emotional stress (ESS) and social support from other people (Supp_O), which was entered into the moderation regression analysis model. For this analysis, stepwise hierarchical regression analysis was performed for the moderation analyses that followed procedures outlined by Baron and Kenny (1986) and Frazier et al. (2004). When IBW was regressed onto ESS and Supp_O in the

first step, the regression was significant [F (4,517) = 2.60, p = .035] and accounted for 2.0 % of the variance of IBW. Independently, ESS (β = .088, t = 2.00, p = .05) was a significant predictor of IBW, but Supp_O (β = -.06, t = -1.43, p = .153) was not a significant predictor of IBW. When the ESS x Supp_O interaction term was entered in the second step, model 2 with the interaction term accounted for significantly more variance than just ESS and Supp_O by themselves, R^2 change = .011, p = .017. Individually ESS x Supp_O was significant predictor (β = -.52, t = -2.40, p < .017). This indicates that there is potentially significant moderation between perceived emotional stress and social support from other people on infant birthweight. The data analysis also showed that demographic data, marriage status and number of cigarettes smoked daily could not explain the variances of IBW (see Table 9).

Table 9 Regression analysis of support from partner on the relationship between financial stress and IBW (n=522)

	Model 1				Model 2			
Variables	β	S.E	t	Sig.	β	S.E	t	Sig.
Marriage	.067	44.59	1.53	.12	.07	44.42	1.62	.10
Smoking	-.063	41.13	-1.44	.15	-.07	41.00	-1.55	.12
Emotional stress	.088	10.60	2.00	.05	.52	44.75	2.79	.00
Supp_O	-.064	2.17	-1.43	.15	.28	7.36	1.87	.06
ESS x Supp_O					-.52	.86	-2.39	.02
R square		.020				.030		
R^2 Change		.020				.011		
F Change		2.60				5.72		
Significance		.035				.017		

Note. ESS = Emotional stress; Supp_O = Support from other people

CHAPTER 5

Discussion

Chapter four conveys the results of the statistical analyses conducted to investigate the proposed hypotheses of the current study. A comprehensive discussion of the research findings and the limitations of the investigation will be addressed in this chapter. Lastly, recommendations for future research and implications will be discussed.

Specific Aims:

Aim 1: To present a confirmatory factor analysis of the three-factor model of perceived stress during pregnancy in pregnant smokers.

This present study tested a two-factor and three-factor model of perceived stress and confirmed the best fit model. Theory as well as substantive research studies using perceived stress assessments typically assumes that perceived stress is a single first order construct. This present study used knowledge of the cognitive appraisal and coping process theory (Lazarus & Folkman, 1984) and empirical research (Buckley, Blanchard, & Hickling, 1998; Palmieri & Fitzgerald, 2005; Yu, McElory, Bullock, & Everett, 2011) to postulate the relationship pattern a priori and then tested the hypothesis statistically. To test the hypothesized factor structures, the Prenatal Psychosocial Profile (PPP) stress subscale and modified 4-item Cohen's Perceived Stress Scale (PSS) item covariances and asymptotic covariances were submitted to SPSS Amos software version 20 for a series of confirmatory factor analyses (CFA) using maximum likelihood estimation. Each item was specified to load on a single factor, error covariances were constrained to zero, and factors were allowed to correlate. Models were evaluated with several fit statistics. Chi-

square values assessed the adequacy of a model's fit. Another better index of fit was the root mean square error of approximation (RMSEA) (Bentler, 1990), which measures discrepancy per degree of freedom. The standardized root mean square residual (SRMSR) (Bentler, 1990) measures the discrepancy between fitted and sample correlation matrices. Like the RMSEA, the Akaike information criterion (AIC; Akaike, 1987) attempts to balance goodness of fit and model complexity.

Many types of coping strategies are commonly used to handle the different demands associated with stressors (Lazarus, DeLongis, Folkman, & Gruen, 1985b). Moreover, Lazarus and Folkman (1984) theorized that individual choices of coping strategies, referred to in cognitive appraisal and coping theory as secondary appraisal. Theoretically stress is defined as a person-environment relationship that is evaluated as personally significant and as exceeding a person's resources for coping (Lazarus & Folkman, 1984). In the current study, this process is referred as maternal perceived stress, which is primary appraisal. The component of the cognitive appraisal and coping process in this study model is the subjective appraisal of the particular situation (i.e., pregnancy). It is possible that perceived stress structure varies by the choice of coping strategies involving both emotion-focused coping (i.e. responses that focus on managing emotional responses to stressful events), and problem-focused coping (i.e. responses that focus on changing problematic aspects of stressful event) (Lazarus & Folkman, 1984). Based on the result of the CFA analysis of rural pregnant smokers in this study, Factor1 was called financial stress, Factor 2 was called emotional stress, and Factor 3 was called current-pregnancy stress.

Maternal perceived financial stress was identified as financial difficulties and a strain on family financial resources during pregnancy. Therefore, the financial stress factor consisted of items that measured perceived financial stress (e.g., the PPP stress subscale (see Table 2) item MS1 “Financial worries”, item MS2 “Other money worries”, item MS4 “Having to move, either recently or in the future”, and item MS9 “Work problems). Maternal perceived emotional stress could be identified as emotional response to stressful or potentially stressful events. Therefore, the emotional stress factor measured a respondent’s perception with their emotional response to current pregnancy or emotional problem rather than addressing the characteristics of the emotion itself (e.g., the PPP stress subscale item MS3 “Problems related to family”, item MS5 “Recent loss of loved one”, item MS7 “Current abuse”, item MS8 “Problems with alcohol and/or drugs”, and item MS10 “Problems related to friends”). These two different factors map on to the existing theoretical domains of the cognitive appraisal and coping process, which are problem-focused or emotion-focused.

Moreover, other studies have documented that people tend to use combinations of both problem-focused and emotional-focused coping to combat stressful events (Folkman & Lazarus, 1980). Maternal perceived current-pregnancy stress could be identified as the combination of problem-focused and emotional-focused strategies and/or responses to current pregnancy situations. This was confirmed in model 3b (see Table 6), a final three-factor CFA model, where the overall model fit appears quite good with $\chi 2$ ($df = 87$) decreases down to 154.27. These results are too small to reject the null hypothesis of a good fit ($p<.000$). A small RMSEA of .045, a small SRMR of .045, and a large CFI of .953 also indicates a good fit of this model. Therefore, adding the second order of

perceived stress measure from the modified Cohen's 4-item PSS scale into the first order (PPP), extends support for the three-factor model to an understudied group of rural pregnant smokers. The third extracted factor called current-pregnancy stress factor represents a set of items that captures a stress dimension by tapping the respondent's perception of their stress related to current pregnancy (e.g., item MS6 "Current pregnancy" and item MS11"Feeling generally overloaded" and the PSS item (see Table 5) PSS1 "Unable to control the important things", item PSS2 "Confident about ability to handle personal problems", item PSS3 "Feeling that things were going on way", and item 4 "Could not overcome the difficulties"). The factors were moderately related; problem-focused appraisal was positively correlated with emotions and thoughts (r = .72). Emotional stress was, in turn, positively correlated with financial stress (r = .30).

Based on the result of the best-fitting CFA model, the latent factors of this model were incorporated into a moderation regression analysis to predict outcome variable, which is infant birthweight in rural pregnant smokers. Using the three stress factor scores as predictor variables, in addition to social support as a mediator variable, infant's birthweight of the rural pregnant smokers were entered into the regression model.

Aim 2: To identify the relationship between maternal perceived stress and low birthweight.

Hypothesis 1: I hypothesized that there will be a significant negative correlation between the three different factors of maternal perceived stress (i.e., financial stress, emotional stress, and current-pregnancy stress) and infant birthweight (IBW). As hypothesized, the results in this study show significant correlation between maternal perceived emotional stress and IBW; however the direction was positive. Two other

components of stress—financial stress and current-pregnancy stress were also not significantly correlated with IBW. Therefore, results from this study indicate pregnant women who smoked and perceived higher emotional stress did not deliver lower weight offspring as originally hypothesized. These findings are not consistent with prior research findings that indicated a different relationship between maternal perceived stress and IBW in rural pregnant smokers (Jakab, 2010; Pineles, Park, & Samet, 2014). A difference from the present study to the other studies is that this study is, to our best knowledge, the first to examine the relationship between maternal perceived stress and infant birthweight among rural pregnant smokers using latent construct, multidimensional perceived stress factors (i.e., financial stress, emotional stress, and current-pregnancy stress) that were combined from two different perceived stress instruments (i.e., the Prenatal Psychosocial Profile (PPP) stress subscale and the modified scale of Cohen's Perceived Stress Scale 4-item version).

It is also possible that the higher emotional stress levels do not relate to lower infant birthweight in this study due to the effects of the intervention that women received during the randomized controlled trial of nurses' individualized social support (Bullock et al., 2009). The previous study found an effectiveness of the intervention program given to this group of pregnant women. In the present study, IBW scores were measured after half of the pregnant women randomized to one of the intervention groups received the social support telephone intervention, while perceived stress scores used in this study were measured at the beginning of the study (baseline data). Thus, it is possible that the support intervention reduced the effects of maternal stress in over half of the sample and had an impact on the birthweight of the infants. Therefore, future studies should be

structured to test the effect of the intervention as mediation and/or moderation variables. Another possibility to explain the results of this present study might be related to the common stress emerging during pregnancy. In general, both physical and psychological stresses are common in pregnancy. Maternal prenatal development has been understood in terms of lifespan complexity (Glover & O'Connor, 2006). Few studies measured psychosocial stress at different antenatal time periods found that levels of psychosocial stress more likely change throughout the course of pregnancy (Curry, Campbell, & Christian, 1994; Da Costa, Larouche, Dritsa, & Brender, 1999; Rondo et al., 2003). Thus, perceived emotional stress at the beginning of present study may be appraised as common stress pregnancy, which could negate any negative effects of infant birthweight that was measured at the end of the study.

Furthermore, any one perceived stress scales, by itself, may not be directly associated with IBW. Several studies have been published regarding psychosocial factors that might help buffer the effects of maternal stress during pregnancy (Alderdice & Lynn, 2011; Huizink et al., 2004; Nkansah-Amankra, Luchok, Hussey, Watkins, & Liu, 2010). Psychosocial factors affecting maternal psychological stress are including life events, social support, stress, anxiety; self-esteem, mastery, depression, pregnancy-related anxiety, perceived discrimination, and neighborhood safety during pregnancy have been found to be associated with maternal stress. A number of studies have linked several factors to the association between maternal stress and infant birthweight. For example, studies have found increasing levels of maternal stress were associated with decreasing levels of satisfaction of social support and/or lower self-esteem that resulted in decreasing of birthweight (Dole et al., 2003; Neggers et al., 2006) However, no other studies have

used the multidimensional latent construct of perceived stress that was constructed from two or more validated perceived stress instruments. Overall, current studies (Dole et al., 2003; Holland, Kitzman, & Veazie, 2009; Lobel et al., 2008) regarding maternal stress and infant birthweight are beginning to examine multiple factors that might need to be incorporated together to explore the effects of maternal stress during pregnancy and its impact on infant birthweight. The deeper understanding of the relationship between maternal psychological stress and pregnancy outcomes may contribute to our understanding of the complexity of biological and psychosocial factors impacting pregnant women all around the world. Future studies may need to develop particular stress assessments/measurements that are more specific and able to identify particular types of perceived stress.

Hypothesis 2: This study hypothesized that there will be a significant positive correlation between social support and IBW. As hypothesized, the results in this study shows that neither social support from partner nor from other people was significantly correlated with IBW, indicating that although pregnant smokers reported satisfaction with support from both partner and other people, it does not affect birthweight of mothers' offspring. Theoretically, social support has been considered as a coping resource and may have had an influence on the selection of the type of coping strategies (Lazarus & Folkman, 1984). When women appraise a stressful situation as changeable, they may seek support through their social contacts in order to solve the problem (Cohen, Mermelstein, Kamarck, & Hoberman, 1985). It would be possible to mention that this kind of support could be related to overall well-being as well as better pregnancy outcomes, because it provides a positive effect. Social supports that are appropriate in

frequency, type, and amount may help pregnant women to receive the emotional, psychological, and physical supports that they need. In addition to being a support themselves, nurses and health providers may also be able to assist pregnant women in encouraging them to connect with their existing social support networks or assist them to connect with organizations that may be able to provide necessary support.

Hypothesis 3: Social support was expected to significantly moderate the relationship between maternal perceived stress and IBW. Multiple linear regression was used to identify the associations between the three latent variables constructed from previous confirmatory factor analysis—financial stress, emotional stress, and current-pregnancy stress—and infant birthweight. To estimate the partial associations of interest, six moderation models of infant birthweight were defined and differentiated by a set of explanatory variables that included: financial stress plus social support from partner, financial stress plus social support from other people, emotional stress plus social support from partner, emotional stress plus social support from other people, current-pregnancy stress plus social support from partner, and current-pregnancy stress plus social support from other people. Each model controlled for the variables discussed. As hypothesized, the results show that social support from other people was significant moderation predictor of the relationship between perceived emotional stress and IBW, indicating that satisfaction with higher support from other people could reduce the effects of higher levels of emotional stress on IBW among rural pregnant smokers.

Social support may improve women's sense of well-being and control, which then helps them perceive pregnancy-related changes and other concerns as less stressful (Elsenbruch et al., 2007; Nezlek & Allen, 2006). Theoretically, there is support for both

the direct and indirect effects of stress and social support (Cohen, 1988; Elsenbruch et al., 2007). Generally, social support is considered to have a buffering effect on maternal perceived stress (Cohen & Wills, 1985), resulting in a negative correlation between the two variables. As a result, the moderation regression analysis of this present study was in support of the relationship that maternal perceived emotional stress plus satisfaction with social support from other people was negatively related to infant birthweight. Yu et al. (2011) found that pregnant women received more tangible support from their partners, but more often conceptualize their stressors as emotional. As a result, it is possible that women are more likely to be satisfied with emotional support from others rather than from their partner who feels stress from the financial impact of the pregnancy (Yu et al., 2011).

Considering to the association between maternal perceived stress and social support from other people, in this present study, these supports can reduce the stress level of pregnant smoker. Furthermore, this study also found that, social support from other people moderated the association between prenatal perceived stress and IBW. Thus, additional information for the intervention program to reduce stress providing particular social supports may be a potential pathway through which reducing maternal stress level. According to the result of items correlation between emotional stress and social support from other people, the importance of social support from other people in this study may be the evidence for providing the potential intervention for pregnant smoker in future study. For example, to reduce stress regarding problems related to family (e.g.., partner, children, etc…), the supporters need to help the pregnant smokers out when they are in pinch ($r = -.113$, $p = .01$), tolerate their ups and downs and unusual behaviors ($r = -.109$, p

= .01) and says things that make their situation clear and easier to understand (r = -.100, p = .02). To reduce stress concerning recent loss of loved one (e.g.., death, divorce, long distance), the supporters need to go out of the way to do special or thoughtful things for the pregnant smokers (r = -.124, p = .01), let them know that they are appreciated for the things they do for others (r = -.111, p = .01), and take them seriously when they have concerns (r = -.125, p = .00). To reduce the stress from current abuse (e.g.., sexual, emotional or physical), the supporters may provide help to keep up morale of pregnant smokers (r = -.144, p = .00), show interest in their daily activities and problems (r = -.098, p = .03), go out of the way to do special or thoughtful things for them (r = -.109, p = .01), let them know that they are appreciated for the things they do for others (r = -.093, p = .03), say things that make their situation clear and easier to understand (r = -.133, p = .00), and let them know that they will be around if they need assistance (r = -.106, p = .02). To reduce stress related to problems with alcohol and/or drugs, the supporters can help keep up the morale of pregnant smokers (r = -.105, p = .02) and show interest in their daily activities and problems (r = -.110, p = .01). Finally, to reduce the stress from problems related to friends, the supporters may need to share similar experiences with the pregnant smokers (r = -.203, p = .00), help keep up their morale (r = -.197, p = .00), help them out when they are in pinch (r = -.124, p = .00), show interest in their daily activities and problems (r = -.168, p = .00), go out of the way to do special or thoughtful things for those pregnant (r = -.137, p = .00), let them know that they are appreciated for the things they do for others (r = -.112, p = .01), tolerates their ups and downs and unusual behaviors (r = -.159, p = .00), take them seriously when they have concerns (r = -.143, p

= .00), and say things that make their situation clear and easier to understand (r = -.137, p = .00).

Another potential moderator—social support from partner—was tested, but this variable as a moderator was not supported in this sample of women. The results did not support the hypothesis that the relationship between perceived stress and IBW will be moderated by partner support. However, Yu et al. (2011) found male partners were more likely to provide tangible support, but women more often conceptualize their stressors as emotional. These study findings are evidence that support from a partner was not a potential buffering of stress in this group of women. Furthermore, the present study examined the relationship between perceived stress and pregnancy outcome using a multidimensional latent construct variable derived from two different validated perceived stress assessment instruments. It is possible to infer from the results of this study that different dimensional concepts of perceived stress may be associated with different buffering factors and/or mechanisms. For example in this study, pregnant women who perceived higher level of emotional stress and greater satisfaction with support from other people were less likely to deliver low birthweight infants. Future studies may want to examine how different social networks offering support such as friends, peers, family members, and health care providers impact pregnancy outcomes when assessing for different factors related to perceived stress and different types of social support. Social support is also identified as a multidimensional construct, and researchers have attempted to differentiate the various types of social support such as emotional support, instrumental support, informational support, and tangible support (Schaefer et al., 1981; Zimet et al., 1988). As a result of this present study, futures studies may want to identify

different categories of social support (emotional, instrumental, informational and/or tangible) that pregnant women need from partners and/or other people to adequately reduce stress during pregnancy.

Overall, the pattern of findings via the correlation analyses suggests pregnant smokers experience high emotional stress, but is not likely to deliver low birthweight offspring. The findings also indicate that pregnant women with higher levels of emotional stress who report higher level of support satisfaction from other people are less likely to deliver low birthweight offspring. As mentioned earlier, it may be that perceived social support, in some forms, comes with negative consequences that negate possible buffering effects. These findings suggest that interventions for rural pregnant smokers may be better directed toward support from other people rather than support partner. Examining different sources and different kinds of support in other groups of pregnant women will be conducted in future studies.

Findings from this present study of American pregnant women could be applicable to pregnant women in other countries including developing countries. For example, Thailand reported few previous studies (Chumnijarakij et al., 1992; Tuntiseranee, Olsen, Chongsuvivatwong, & Limbutara, 1999; Viengsakhone, Yoshida, & Sakamoto, 2010) assessing the maternal risk factors for low birthweight (LBW) newborns. Those studies revealed that there are many factors, including socioeconomic factors and factors related to the pregnancy, as well as psychosocial factors associated with the incidence of LBW. However, the two main maternal risk factors for delivering a LBW newborn in Thailand includes teenage pregnancy and no prenatal care visits (less than 4 visits) (Anchaleechamailorn, 2010; Chumnijarakij et al., 1992; Itsaranuluck, 2006;

Nuchprayoon, Chumnijarakij, & Chotiwan, 1992). Other risk factors includes low family income, low education, maternal hard labor such as agricultural work that may relate to decreased and/or constant need for food intake during pregnancy and results in lower maternal hematocrit when nutritional status is not maintained (Itsaranuluck, 2006; K. M. Paarlberg et al., 1999; Ponglopisit, 2010). These risk factors related to LBW in Thailand should be considered for developing local strategies useful in the field of maternal and child health care. These could include health educational tools for pregnant women and marital counseling to prevent the delivery of a LBW infant. It can also be used to keep the public informed about maternal risk factors for delivering a LBW newborn. , Providing health knowledge to school girls how nutrition is associated with growth development would be a specific example of an intervention to prevent risk of malnutrition in teenage pregnancies. Moreover, health educational intervention programs could then be tested by moderation and/or mediation analysis models.

Several important limitations emerged from this present study. First, the generalizability of study findings may be limited by the study population of poor rural pregnant smokers. Future studies need to be replicated using a more diverse sample of pregnant women and post-partum mothers. Second, a factor analysis was conducted to construct a more comprehensive, multi-dimensional variable for perceived stress. To measure perceived psychological stress, there is no single instrument that incorporates what we believe to be all of the crucial components needed for adequate measuring of this variable. Third, according to the moderation regression analysis social support from other people could explain only 1% of variances of IBW. Future studies may need to test

moderating and/or mediating roles of other factors associated with the relationship between perceived stress and IBW.

In conclusion, many research studies have indicated stress during pregnancy is inherent in pregnant women, and that social support can be an important buffer to the perceived stress. However, there is a lack of research looking at social support as a buffer to perceived stress in rural low-income pregnant smokers with pregnancy outcome measures such as infant birthweight. Therefore, the present study examined the relationship between three components of maternal perceived stress (i.e., financial stress, emotional stress, and current-pregnancy stress) and IBW among poor rural pregnant smokers, in an attempt to identify whether social support from partner and social support from other people are protective factors of the stress and how that relates to IBW. As the result of the present study, social support from other people was most beneficial in moderating the negative impact of perceived emotional stress on IBW. Testing moderation and/or mediation models of risk factors of LBW will be examined in future studies. Furthermore, future studies may be needed to evaluate the effectiveness of psychological interventions that can improve maternal supports and improve fetal well-being. Moreover, qualitative inquiries of individual factors affecting low birthweight should be conducted examining the responses to stress experiences before and during pregnancy. In-depth qualitative studies should be utilized to hear the individual life event and particular stress experiences in mothers who delivered a low birthweight infant.

REFERENCES

Adams, S. S., Eberhard-Gran, M., Hofoss, D., & Eskild, A. (2011). Maternal emotional distress in pregnancy and delivery of a small-for-gestational age infant. *Acta Obstetricia et Gynecologica Scandinavica, 90*(11), 1267-1273.

Alderdice, F., & Lynn, F. (2011). Factor structure of the Prenatal Distress Questionnaire. *Midwifery, 27*(4), 553-559. doi: 10.1016/j.midw.2010.05.003

Anchaleechamailorn, P. (2010). Factors related to low birth weight newborns at Chaoprayayommaraj Hospital, Suphanburi Province. *Nursing Journal of the Ministry of Public Health*, 9.

Apter-Levy, Y., Feldman, M., Vakart, A., Ebstein, R. P., & Feldman, R. (2013). Impact of maternal depression across the first 6 years of life on the child's mental health, social engagement, and empathy: the moderating role of oxytocin. *American Journal of Psychiatry, 170*(10), 1161-1168.

Austin, M. P., & Leader, L. (2000). Maternal stress and obstetric and infant outcomes: epidemiological findings and neuroendocrine mechanisms. *Australian & New Zealand Journal of Obstetrics & Gynaecology, 40*(3), 331-337.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238.

Bittoun, R., & Femia, G. (2010). Smoking cessation in pregnancy. *Obstetric Medicine: The Medicine of Pregnancy, 3*(3), 90-93. doi: 10.1258/om.2010.090059

Blake, K. V., Gurrin, L. C., Evans, S. F., Beilin, L. J., Landau, L. I., Stanley, F. J., & Newnham, J. P. (2000). Maternal cigarette smoking during pregnancy, low birth weight and subsequent blood pressure in early childhood. *Early Human Development, 57*(2), 137-147. doi: http://dx.doi.org/10.1016/S0378-3782(99)00064-X

Bodecs, T., Horvath, B., Szilagyi, E., Gonda, X., Rihmer, Z., & Sandor, J. (2011). Effects of depression, anxiety, self-esteem, and health behaviour on neonatal outcomes in a population-based Hungarian sample. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 154*(1), 45-50. doi: http://dx.doi.org/10.1016/j.ejogrb.2010.08.021

Borders, A. E. B., Grobman, W. A., Amsden, L. B., & Holl, J. L. (2007). Chronic Stress and Low Birth Weight Neonates in a Low-Income Population of Women. *Obstetrics & Gynecology, 109*(2, Part 1), 331-338 310.1097/1001.AOG.0000250535.0000297920.b0000250535.

Brown, J. D., & Dutton, K. A. (1995). The thrill of victory, the complexity of defeat: Self-esteem and people's emotional reactions to success and failure. *Journal of Personality and Social Psychology, 68*(4), 712-722. doi: 10.1037/0022-3514.68.4.712

Brown, M. A. (1986). Social Support During Pregnancy: A Unidimensional Or Multidimensional Construct? *Nursing Research, 35*(1), 4-9.

Bryant Borders, A. E., Grobman, W. A., Amsden, L. B., & Holl, J. L. (2007). Chronic stress and low birth weight neonates in a low-income population of women. *Obstetrics & Gynecology, 109*(2), 331-338.

Buckley, T. C., Blanchard, E. B., & Hickling, E. J. (1998). A confirmatory factor analysis of posttraumatic stress symptoms. *Behaviour Research and Therapy, 36*(11), 1091-1099.

Bullock, L., Everett, K., Mullen, P., Geden, E., Longo, D., & Madsen, R. (2009). Baby BEEP: A Randomized Controlled Trial of Nurses' Individualized Social Support for Poor Rural Pregnant Smokers. *Journal of Maternal and Child Health, 13*(3), 395-406. doi: 10.1007/s10995-008-0363-z

Carissa, L., Ambalavanan, N., Chakraborty, H., Wingate, M. S., & Carlo, W. A. (2013). Extremely Low Birth Weight and Infant Mortality Rates in the United States. *Pediatrics*. doi: 10.1542/peds.2012-2471

Carolan-Olah, M., & Barry, M. (2013). Antenatal stress: An Irish case study. *Midwifery*. doi: 10.1016/j.midw.2013.03.014

Chumnijarakij, T., Nuchprayoon, T., Chitinand, S., Onthuam, Y., Quamkul, N., Dusitsin, N., . . . Sukomol, P. (1992). Maternal risk factors for low birth weight newborn in Thailand. *Journal of the Medical Association of Thailand= Chotmaihet thangphaet, 75*(8), 445-452.

Class, Q. A., Lichtenstein, P., Langstrom, N., & D'Onofrio, B. M. (2011). Timing of prenatal maternal exposure to severe life events and adverse pregnancy outcomes: a population study of 2.6 million pregnancies. *Psychosomatic Medicine, 73*(3), 234-241.

Clay, O. J., Roth, D. L., Wadley, V. G., & Haley, W. E. (2008). Changes in social support and their impact on psychosocial outcome over a 5-year period for African American and White dementia caregivers. *International Journal of Geriatric Psychiatry, 23*(8), 857-862. doi: 10.1002/gps.1996

Cobb, S. (1976). Presidential Address-1976. Social support as a moderator of life stress. *Psychosomatic Medicine, 38*(5), 300-314.

Cohen, S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health psychology, 7*(3), 269.

Cohen, S. (2004). Social relationships and health. *American Psychologist, 59*(8), 676.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior, 24*(4). doi: 10.2307/2136404

Cohen, S., Kessler, R. C., & Gordon, L. U. (1997). Strategies for measuring stress in studies of psychiatric and physical disorders *Measuring stress: A guide for health and social scientists* (pp. 122–148). New York: Oxford University Press.

Cohen, S., & McKay, G. (1984). Social support, stress and the buffering hypothesis: A theoretical analysis. *Handbook of psychology and health, 4*, 253-267.

Cohen, S., Mermelstein, R., Kamarck, T., & Hoberman, H. M. (1985). Measuring the functional components of social support *Social support: Theory, research and applications* (pp. 73-94): Springer.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin, 98*(2), 310.

Collins, N. L., Dunkel-Schetter, C., Lobel, M., & Scrimshaw, S. C. (1993). Social support in pregnancy: psychosocial correlates of birth outcomes and postpartum depression. *Journal of Personality and Social Psychology, 65*(6), 1243.

Conde-Agudelo, A., Althabe, F., Belizán, J. M., & Kafury-Goeta, A. C. (1999). Cigarette smoking during pregnancy and risk of preeclampsia: A systematic review. *American Journal of Obstetrics & Gynecology, 181*(4), 1026-1035. doi: http://dx.doi.org/10.1016/S0002-9378(99)70341-8

Copper, R. L., Goldenberg, R. L., Das, A., Elder, N., Swain, M., Norman, G., . . . Johnson, F. (1996). The preterm prediction study: Maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks' gestation. *American Journal of Obstetrics & Gynecology, 175*(5), 1286-1292.

Corning, A. F. (2002). Self-esteem as a moderator between perceived discrimination and psychological distress among women. *Journal of Counseling Psychology, 49*(1), 117-126. doi: 10.1037/0022-0167.49.1.117

Crawford, J. T., Tolosa, J. E., & Goldenberg, R. L. (2008). Smoking Cessation in Pregnancy: Why, How, and What Next??? *Journal of Clinical Obstetrics and Gynecology, 51*(2), 419-435. doi: 10.1097/GRF.0b013e31816fe9e9

Curry, M. A., Burton, D., & Fields, J. (1998). The prenatal psychosocial profile: A research and clinical tool. *Research in Nursing & Health, 21*(3), 211-219. doi: 10.1002/(SICI)1098-240X(199806)21:3<211::AID-NUR4>3.0.CO;2-K

Curry, M. A., Campbell, R. A., & Christian, M. (1994). Validity and reliability testing of the Prenatal Psychosocial Profile. *Research in Nursing & Health, 17*(2), 127-135.

D'Anna-Hernandez, K. L., Hoffman, M. C., Zerbe, G. O., Coussons-Read, M., Ross, R. G., & Laudenslager, M. L. (2012). Acculturation, maternal cortisol, and birth outcomes in women of Mexican descent. *Psychosomatic Medicine, 74*(3), 296-304.

Da Costa, D., Larouche, J., Dritsa, M., & Brender, W. (1999). Variations in stress levels over the course of pregnancy: factors associated with elevated hassles, state anxiety and pregnancy-specific stress. *Journal of Psychosomatic Research, 47*(6), 609-621.

Da Costa, D., Larouche, J., Dritsa, M., & Brender, W. (2000). Psychosocial correlates of prepartum and postpartum depressed mood. *Journal of Affective Disorders, 59*(1), 31-40.

DiPietro, J. A. (2004). The Role of Prenatal Maternal Stress in Child Development. *Current Directions in Psychological Science, 13*(2), 71-74.

Dole, N., Savitz, D. A., Hertz-Picciotto, I., Siega-Riz, A. M., McMahon, M. J., & Buekens, P. (2003). Maternal stress and preterm birth. *The American Journal of Epidemiology, 157*(1), 14-24.

Dominguez, T., Schetter, C., Mancuso, R., Rini, C., & Hobel, C. (2005). Stress in african american pregnancies: testing the roles of various stress concepts in prediction of birth outcomes. *Annals of Behavioral Medicine, 29*(1), 12-21. doi: 10.1207/s15324796abm2901_3

Dunkel Schetter, C. (2011a). Psychological Science on Pregnancy: Stress Processes, Biopsychosocial Models, and Emerging Research Issues. *Annual Review of Psychology, 62*(1), 531-558. doi: doi:10.1146/annurev.psych.031809.130727

Dunkel Schetter, C. (2011b). Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. *Annual Review of Psychology, 62*, 531-558.

Dunkel Schetter, C., & Tanner, L. (2012). Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. *Current Opinion in Psychiatry, 25*(2), 141-148 110.1097/YCO.1090b1013e3283503680.

Edwards, C. H., Cole, O. J., Oyemade, U. J., Knight, E. M., Johnson, A. A., Westney, O. E., . . . Westney, L. S. (1994). Maternal stress and pregnancy outcomes in a prenatal clinic population. *Journal of Nutrition, 124*(6 Suppl), 1006S-1021S.

Elizabeth Jesse, D., Seaver, W., & Wallace, D. C. (2003). Maternal psychosocial risks predict preterm birth in a group of women from Appalachia. *Midwifery, 19*(3), 191-202.

Elsenbruch, S., Benson, S., Rücke, M., Rose, M., Dudenhausen, J., Pincus-Knackstedt, M. K., . . . Arck, P. C. (2007). Social support during pregnancy: effects on maternal depressive symptoms, smoking and pregnancy outcome. *Human Reproduction, 22*(3), 869-877.

Etzion, D. (1984). Moderating effect of social support on the stress–burnout relationship. *Journal of Applied Psychology, 69*(4), 615-622. doi: 10.1037/0021-9010.69.4.615

Folkman, S., & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior*, 219-239.

Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology, 48*(1), 150.

Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology, 50*(5), 992.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology, 51*(1), 115.

George, L. K., Blazer, D. G., Hughes, D. C., & Fowler, N. (1989). Social support and the outcome of major depression. *The British Journal of Psychiatry, 154*(4), 478-485. doi: 10.1192/bjp.154.4.478

Glazier, R., Elgar, F., Goel, V., & Holzapfel, S. (2004). Stress, social support, and emotional distress in a community sample of pregnant women. *Journal of Psychosomatic Obstetrics & Gynecology, 25*(3-4), 247-255.

Glover, V. (2007). The Effects of Maternal Anxiety or Stress during Pregnancy on the Fetus and the Long-Term Development of the Child. *Nutrition and Health, 19*(1-2), 61-62. doi: 10.1177/026010600701900207

Glover, V., & O'Connor, T. (2006). Maternal anxiety: Its effect on the fetus and the child. *British Journal of Midwifery, 14*(11), 663-667.

Harley, K., & Eskenazi, B. (2006). Time in the United States, social support and health behaviors during pregnancy among women of Mexican descent. *Social Science & Medicine, 62*(12), 3048-3061.

Heaman, M. I. (2005). Relationships between physical abuse during pregnancy and risk factors for preterm birth among women in Manitoba. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 34*(6), 721-731.

Heinrichs, M., Baumgartner, T., Kirschbaum, C., & Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biological psychiatry, 54*(12), 1389-1398.

Hisham, T. J., & Moawed, S. A. (2000). The relation of low birth weight to psychosocial stress and maternal anthropometric measurements. *The Saudi Medical Journal, 21*(7), 649-654.

Hobel, C. J. (2004). Stress and Preterm Birth. *Clinical Obstetrics & Gynecology, 47*(4), 856-880.

Hoffman, S., & Hatch, M. C. (1996). Stress, social support and pregnancy outcome: a reassessment based on recent research. *Paediatric and Perinatal Epidemiology, 10*(4), 380-405. doi: 10.1111/j.1365-3016.1996.tb00063.x

Hogan, B. E., Linden, W., & Najarian, B. (2002). Social support interventions: Do they work? *Clinical Psychology Review, 22*(3), 381-440. doi: http://dx.doi.org/10.1016/S0272-7358(01)00102-7

Holland, M. L., Kitzman, H., & Veazie, P. (2009). The effects of stress on birth weight in low-income, unmarried black women. *Women's Health Issues, 19*(6), 390-397.

House, J. S. (1981). *Work stress and social support*: Addison-Wesley Longman, Incorporated.

House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science, 241*(4865), 540-545.

House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual review of sociology, 14*(1), 293-318.

Huizink, A. C., Mulder, E. J., & Buitelaar, J. K. (2004). Prenatal stress and risk for psychopathology: specific effects or induction of general susceptibility? *The Psychological Bulletin, 130*(1), 115-142. doi: 10.1037/0033-2909.130.1.115

Itsaranuluck, S. (2006). Low birth weight newborn: Health issue in Thailand. *Journal of Public Health and Development, 1*(1), 13.

Jacobson, D. E. (1986). Types and Timing of Social Support. *Journal of Health and Social Behavior, 27*(3), 250-264. doi: 10.2307/2136745

Jakab, Z. (2010). Smoking and pregnancy. *Acta Obstetricia et Gynecologica Scandinavica, 89*(4), 416-417. doi: 10.3109/00016341003732349

Khashan, A. S., McNamee, R., Abel, K. M., Pedersen, M. G., Webb, R. T., Kenny, L. C., . . . Baker, P. N. (2008). Reduced infant birthweight consequent upon maternal exposure to severe life events. *Psychosomatic Medicine, 70*(6), 688-694.

Krabbendam, L., Smits, L., de Bie, R., Bastiaanssen, J., Stelma, F., & van Os, J. (2005). The impact of maternal stress on pregnancy outcome in a well-educated Caucasian population. *Paediatric and Perinatal Epidemiology, 19*(6), 421-425.

Latendresse, S. J., Rose, R. J., Viken, R. J., Pulkkinen, L., Kaprio, J., & Dick, D. M. (2008). Parenting mechanisms in links between parents' and adolescents' alcohol use behaviors. *Alcoholism: Clinical and Experimental Research, 32*(2), 322-330.

Lau, Y. (2013). The Effect of Maternal Stress and Health-Related Quality of Life on Birth Outcomes Among Macao Chinese Pregnant Women. *The Journal of Perinatal & Neonatal Nursing, 27*(1), 14-24 10.1097/JPN.1090b1013e31824473b31824479.

Lazarus, R. S. (1991). Cognition and motivation in emotion. *American Psychologist, 46*(4), 352-367. doi: 10.1037/0003-066X.46.4.352

Lazarus, R. S. (1998). The stress and coping paradigm. *Fifty Years of the Research and Theory of RS Lazarus: An Analysis of Historical and Perennial Issues*, 182-220.

Lazarus, R. S. (2000). Toward better research on stress and coping. *American Psychologist, 55*(6), 665-673. doi: 10.1037/0003-066X.55.6.665

Lazarus, R. S., DeLongis, A., Folkman, S., & Gruen, R. (1985a). Stress and adaptational outcomes: The problem of confounded measures. *American Psychologist, 40*(7), 770-779. doi: 10.1037/0003-066X.40.7.770

Lazarus, R. S., DeLongis, A., Folkman, S., & Gruen, R. (1985b). Stress and adaptational outcomes: The problem of confounded measures.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*: Springer Publishing Company.

Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of personality, 1*(3), 141-169.

Lazarus, R. S., & Launier, R. (1978). Stress-related transactions between person and environment. *Perspectives in interactional psychology, 287*, 327.

Lee, B. E., Ha, M., Park, H., Hong, Y. C., Kim, Y., Kim, Y. J., & Ha, E. H. (2011). Psychosocial work stress during pregnancy and birthweight. *Paediatric and Perinatal Epidemiology, 25*(3), 246-254. doi: 10.1111/j.1365-3016.2010.01177.x

Leserman, J., Li, Z., Hu, Y. J., & Drossman, D. A. (1998). How multiple types of stressors impact on health. *Psychosomatic Medicine, 60*(2), 175-181.

Li, C. Q., Windsor, R. A., Perkins, L., Goldenberg, R. L., & Lowe, J. B. (1993). The impact on infant birth weight and gestational age of cotinine-validated smoking reduction during pregnancy. *Jama, 269*(12), 1519-1524.

Lincoln, K. D. (2000). Social support, negative social interactions, and psychological well-being. *Social Service Review, 74*(2), 231-252.

Lobel, M., Cannella, D. L., Graham, J. E., DeVincent, C., Schneider, J., & Meyer, B. A. (2008a). Pregnancy-specific stress, prenatal health behaviors, and birth outcomes. *Health psychology, 27*(5), 604.

Lobel, M., Cannella, D. L., Graham, J. E., DeVincent, C., Schneider, J., & Meyer, B. A. (2008b). Pregnancy-specific stress, prenatal health behaviors, and birth outcomes. *Health psychology, 27*(5), 604-615. doi: 10.1037/a0013242

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, 1*(12), 130-149.

Martin, J. A., Hamilton, B. E., Ventura, S. J., Osterman, M. J. K., & Mathews, T. J. (2013). Births: Final data for 2011 (Vol. 26): National vital statistics reports.

Martins, M., Peterson, B., Almeida, V., Mesquita-Guimarães, J., & Costa, M. (2014). Dyadic dynamics of perceived social support in couples facing infertility. *Human Reproduction, 29*(1), 83-89.

McElroy, J. A., Bloom, T., Moore, K., Geden, B., Everett, K., & Bullock, L. F. (2012). Perinatal mortality and adverse pregnancy outcomes in a low-income rural population of women who smoke. *Birth Defects Research Part A: Clinical and Molecular Teratology, 94*(4), 223-229. doi: 10.1002/bdra.22891

Naughton, F. O. (spring 1997). Stress and Coping. from http://www.csun.edu/~vcpsy00h/students/coping.htm

Neggers, Y., Goldenberg, R., Cliver, S., & Hauth, J. (2006). The relationship between psychosocial profile, health practices, and pregnancy outcomes. *Acta Obstetricia et Gynecologica Scandinavica, 85*(3), 277-285.

Neuling, S. J., & Winefield, H. R. (1988). Social support and recovery after surgery for breast cancer: frequency and correlates of supportive behaviours by family, friends and surgeon. *Social Science & Medicine, 27*(4), 385-392.

Nezlek, J. B., & Allen, M. R. (2006). Social support as a moderator of day-to-day relationships between daily negative events and daily psychological well-being. *European Journal of personality, 20*(1), 53-68.

Nkansah-Amankra, S., Luchok, K. J., Hussey, J. R., Watkins, K., & Liu, X. (2010). Effects of maternal stress on low birth weight and preterm birth outcomes across neighborhoods of South Carolina, 2000-2003. *Maternal & Child Health Journal, 14*(2), 215-226.

Norbeck, J. S., & Tilden, V. P. (1983). Life stress, social support, and emotional disequilibrium in complications of pregnancy: A prospective, multivariate study. *Journal of Health and Social Behavior, 24*(1), 30-46. doi: 10.2307/2136301

Nuchprayoon, T., Chumnijarakij, T., & Chotiwan, P. (1992). Prediction of low birth weight outcome in Thailand: multiple regression analysis. *Journal of the Medical Association of Thailand= Chotmaihet thangphaet, 75*(10), 578-583.

Paarlberg, K. M., Vingerhoets, A. J., Passchier, J., Dekker, G. A., Heinen, A. G., & van Geijn, H. P. (1999). Psychosocial predictors of low birthweight: a prospective study. *The British Journal of Obstetrics and Gynaecology 106*(8), 834-841.

Paarlberg, K. M., Vingerhoets, J. J. M., Passchier, J., Dekker, G. A., Heinen, A. G. J. J., & van Geijn, H. P. (1999). Psychosocial predictors of low birthweight: a prospective study. *BJOG: An International Journal of Obstetrics & Gynaecology, 106*(8), 834-841. doi: 10.1111/j.1471-0528.1999.tb08406.x

Palmieri, P. A., & Fitzgerald, L. F. (2005). Confirmatory factor analysis of posttraumatic stress symptoms in sexually harassed women. *Journal of Traumatic Stress, 18*(6), 657-666.

Pearlin, L. I. (1989). The sociological study of stress. *Journal of Health and Social Behavior*, 241-256.

Pickett, K. E., Wilkinson, R. G., & Wakschlag, L. S. (2009). The psychosocial context of pregnancy smoking and quitting in the Millennium Cohort Study. *Journal of Epidemiology & Community Health, 63*(6), 474-480. doi: 10.1136/jech.2008.082594

Pineles, B. L., Park, E., & Samet, J. M. (2014). Systematic Review and Meta-Analysis of Miscarriage and Maternal Exposure to Tobacco Smoke During Pregnancy. *American Journal of Epidemiology*. doi: 10.1093/aje/kwt334

Ponglopisit, S. (2010). Maternal Risk Factors of Low Birth Weight Infant at Thoen Hospital, Lampang. *Lampang Medical Journal, 30*(3).

Rahman, A., Iqbal, Z., & Harrington, R. (2003). Life events, social support and depression in childbirth: perspectives from a rural community in the developing world. *Psychological medicine, 33*(07), 1161-1167.

Roesch, S. C., Schetter, C. D., Woo, G., & Hobel, C. J. (2004). Modeling the types and timing of stress in pregnancy. *Anxiety, Stress & Coping, 17*(1), 87-102. doi: 10.1080/1061580031000123667

Rondo, P., Ferreira, R., Nogueira, F., Ribeiro, M., Lobert, H., & Artes, R. (2003). Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *European Journal of Clinical Nutrition, 57*(2), 266-272.

Rothberg, A. D., Shuenyane, E., Lits, B., & Strebel, P. M. (1991). Effect of stress on birth weight in two Johannesburg populations. *South African Medical Journal. Suid-Afrikaanse Tydskrif Vir Geneeskunde, 79*(1), 35-38.

Ruiz, R., & Avant, K. C. (2005). Effects of Maternal Prenatal Stress on Infant Outcomes: A Synthesis of the Literature. *Advances in Nursing Science, 28*(4), 345-355.

Ruiz, R., & Fullerton, J. (1999). The measurement of stress in pregnancy. *Nursing & Health Sciences, 1*(1), 19-25.

Russell, D., & Taylor, J. (2009). Living alone and depressive symptoms: the influence of gender, physical disability, and social support among Hispanic and non-Hispanic older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 64*(1), 95-104.

Sable, M. R., & Wilkinson, D. S. (2000). Impact of perceived stress, major life events and pregnancy attitudes on low birth weight. *International Family Planning Perspectives, 32*(6), 288-294.

Schaefer, C., Coyne, J. C., & Lazarus, R. S. (1981). The health-related functions of social support. *Journal of Behavioral Medicine, 4*(4), 381-406.

Seeman, T. E. (1996). Social ties and health: The benefits of social integration. *Annals of epidemiology, 6*(5), 442-451.

Selye, H. (1973). The Evolution of the Stress Concept: The originator of the concept traces its development from the discovery in 1936 of the alarm reaction to modern therapeutic applications of syntoxic and catatoxic hormones. *American scientist, 61*(6), 692-699.

Shea, A. K., & Steiner, M. (2008). Cigarette Smoking During Pregnancy. *Nicotine & Tobacco Research, 10*(2), 267-278. doi: 10.1080/14622200701825908

Sheehan, T. J. (1998). Stress and low birth weight: a structural modeling approach using real life stressors. *Social Science & Medicine, 47*(10), 1503-1512.

Sheldon, C., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior, 24*(4), 385-396. doi: 10.2307/2136404

Shumaker, S. A., & Brownell, A. (1984). Toward a theory of social support: Closing conceptual gaps. *Journal of social issues, 40*(4), 11-36.

Stansfeld, S., Rael, E., Head, J., Shipley, M., & Marmot, M. (1997). Social support and psychiatric sickness absence: a prospective study of British civil servants. *Psychological medicine, 27*(1), 35-48.

Talge, N. M., Neal, C., Glover, V., the Early Stress, T. R., Prevention Science Network, F., Neonatal Experience on, C., & Adolescent Mental, H. (2007). Antenatal maternal stress and long-term effects on child neurodevelopment: how and why? *Journal of Child Psychology and Psychiatry, 48*(3-4), 245-261. doi: 10.1111/j.1469-7610.2006.01714.x

Taylor, G., McNeill, A., Girling, A., Farley, A., Lindson-Hawley, N., & Aveyard, P. (2014). Change in mental health after smoking cessation: systematic review and meta-analysis. *British Medical Journal, 348*. doi: 10.1136/bmj.g1151

Thoits, P. A. (1995). Stress, coping, and social support processes: Where are we? What next? *Journal of Health and Social Behavior*, 53-79.

Thompson, M. P., Kaslow, N. J., Kingree, J., Rashid, A., Puett, R., Jacobs, D., & Matthews, A. (2000). Partner violence, social support, and distress among inner-city African American women. *American journal of community psychology, 28*(1), 127-143.

Torche, F. (2011). The effect of maternal stress on birth outcomes: exploiting a natural experiment. *Demography, 48*(4), 1473-1491.

Tuntiseranee, P., Olsen, J., Chongsuvivatwong, V., & Limbutara, S. (1999). Socioeconomic and work related determinants of pregnancy outcome in southern Thailand. *Journal of Epidemiology & Community Health, 53*(10), 624-629.

Valero De Bernabe, J., Soriano, T., Albaladejo, R., Juarranz, M., Calle, M. E., Martinez, D., & Dominguez-Rojas, V. (2004). Risk factors for low birth weight: A review. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 116*(1), 3-15. doi: 10.1016/j.ejogrb.2004.03.007

van den Berg, G., van Eijsden, M., Vrijkotte, T. G. M., & Gemke, R. J. B. J. (2012). Educational Inequalities in Perinatal Outcomes: The Mediating Effect of Smoking and Environmental Tobacco Exposure. *PLoS ONE, 7*(5), e37002. doi: 10.1371/journal.pone.0037002

Viengsakhone, L., Yoshida, Y., & Sakamoto, J. (2010). Factors affecting low birth weight at four central hospitals in vientiane, Lao PDR. *Nagoya journal of medical science, 72*(1-2), 51-58.

Vitaliano, P. P., Scanlan, J. M., Zhang, J., Savage, M. V., Brummett, B., Barefoot, J., & Siegler, I. C. (2001). Are the salutogenic effects of social supports modified by income? A test of an" added value hypothesis". *Health psychology, 20*(3), 155.

Wadhwa, P. D., Entringer, S., Buss, C., & Lu, M. C. (2011). The contribution of maternal stress to preterm birth: issues and considerations. *Journal of Clinics in Perinatology, 38*(3), 351-384. doi: 10.1016/j.clp.2011.06.007

Wardlaw, T., Blanc, A., Zupan, J., & Åhman, E. (2004). *Low Birthweight: Country, regional and global estimates.* New York: WHO, Publications Retrieved from http://www.childinfo.org/files/low_birthweight_from_EY.pdf.

Weinstock, M. (2005). The potential influence of maternal stress hormones on development and mental health of the offspring. *Brain, Behavior, and Immunity, 19*(4), 296-308. doi: http://dx.doi.org/10.1016/j.bbi.2004.09.006

Wethington, E., & Kessler, R. C. (1986). Perceived support, received support, and adjustment to stressful life events. *Journal of Health and Social Behavior*, 78-89.

WHO. (2013). Care of the preterm and/or low-birth-weight newborn. from http://www.who.int/maternal_child_adolescent/topics/newborn/care_of_preterm/en/

Wright, M. O. D., Fopma-Loy, J., & Fischer, S. (2005). Multidimensional assessment of resilience in mothers who are child sexual abuse survivors. *Child Abuse & Neglect, 29*(10), 1173-1193. doi: http://dx.doi.org/10.1016/j.chiabu.2005.04.004

Younger, J. B., Kendell, M. J., & Pickler, R. H. (1997). Mastery of stress in mothers of preterm infants. *Journal for Specialists in Pediatric Nursing, 2*(1), 29-35.

Yu, M., McElory, J. A., Bullock, L. F., & Everett, K. D. (2011). Unique perspectives of women and their partners using the Prenatal Psychosocial Profile Scale. *Journal of Advanced Nursing, 67*(8), 1767-1778.

Zhu, P., Tao, F., Hao, J., Sun, Y., & Jiang, X. (2010). Prenatal life events stress: implications for preterm birth and infant birthweight. *American Journal of Obstetrics & Gynecology, 203*(1), 34.e31-34.e38.

Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The Multidimensional Scale of Perceived Social Support. *Journal of Personality Assessment, 52*(1), 30-41. doi: 10.1207/s15327752jpa5201_2

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