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**Stressed, Pregnant, and Behind Bars**

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**B.S. Biology, Pennsylvania State University, 2012  
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**A Thesis presented to the Graduate Faculty  
of the College of William and Mary in Candidacy for the Degree of  
Master of Arts**

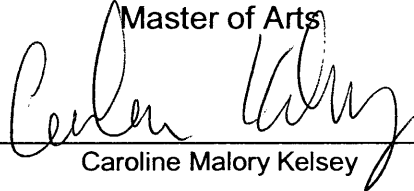
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# APPROVAL PAGE

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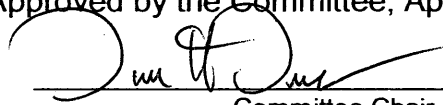
Master of Arts



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Caroline Malory Kelsey

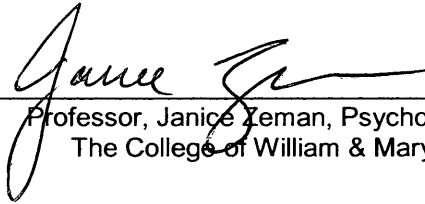
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## COMPLIANCE PAGE

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## ABSTRACT

The number of women of child-bearing age being incarcerated each year is on the rise (Carson, 2014). With that, there is a growing concern of how incarceration impacts the developing child. The present study compared prenatal health behaviors and birth outcomes for women who are pregnant while incarcerated and participate in the Healthy Beginnings Intervention (HB;  $n = 101$ ) to women who are incarcerated at the end of their pregnancy or after the child is born (CJI;  $n = 50$ ). Further, the interaction of group status and stress levels on prenatal health behaviors and birth outcomes was examined. The results support that being in the HB group provided a buffer against the harmful effects of stress on birth outcomes. Implications for policy and intervention are discussed.

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To: Mummy & Papa Morley

Love: Doodle & Cornelia



## Stressed, Pregnant, and Behind Bars

In 2013, over 100,000 women were incarcerated in the United States. This number has continuously grown over the last decade (Carson, 2014). Of the women entering correctional facilities, the majority are of child-bearing age. It is estimated that 6-10% of women are pregnant upon entering a correctional facility; however, that number is likely higher due to lack of standardization for pregnancy identification practices in correctional settings (Clarke & Adashi, 2011; Harrison, Beck, & Adams, 2005). With rates of incarceration of women reaching all-time highs in the United States, the issue of women's health is of great precedence.

The high rates of poor birth outcomes in the US are also of concern. Every year 1 in 9 babies are born prematurely (before 37 weeks gestation), 1 in every 12 are born with low birth weight (less than 5 pounds, 8 ounces), and 1 in every 10 infants are born small for gestational age (birth weight is at or below 10<sup>th</sup> percentile for gestational age) (Martin, Hamilton, & Osterman, 2014). Low birth weight can be caused by premature birth or fetal growth restriction (March of Dimes, 2015). Premature and low birth weight can have serious health and cognitive implications. Health issues specific to prematurity include impaired lung function, hearing loss, intestinal problems, increased susceptibility to infection, and dental problems. Similarly, low birth weight is associated with an increased risk of respiratory distress syndrome, bleeding in the brain, heart problems (e.g., patent ductus arteriosus; PDA), intestinal issues (e.g., necrotizing enterocolitis; NE), diabetes, and obesity (Vohr et al., 2000; March of Dimes, 2015). Further, low birth weight infants are at higher risk for PDA and NE than those of similar birth weight with average gestational age (Mercier et al., 2010).

Children who are born prematurely are also at high risk for intellectual and behavioral problems. Specifically, premature infants are at risk for Autism, internalizing (e.g., anxiety) and externalizing issues (e.g., ADHD), and neurological disorders (e.g., cerebral palsy) (March of Dimes, 2015). A premature or low birth weight infant not only impacts the child's health but also is a cost to society. Behrman and Butler (2007) estimated that the cost of premature births in the United States each year was approximately \$26.2 billion. This number is comprised of costs ranging from medical and health care costs for the baby (\$16.9 billion), labor and delivery costs for the mother (\$1.9 billion), special education (\$1.1 billion), and parents being unable to work (\$5.7 billion). With the high cost to health and society, it is vital to identify risk and protective factors for poor birth outcomes.

Individuals with certain health conditions (e.g., mental illness, substance abuse, infectious disease, and chronic disease) are at a higher risk for becoming incarcerated (James & Glaze, 2006). In addition, persons who are incarcerated are more likely to have experienced financial and social stressors, including homelessness (5-10%), experiencing a form of physical or sexual abuse (10-25%), and unemployment (66-75%) (James et al., 2006). Such stressful experiences could take a toll on the health and development of a developing fetus. The goal of this thesis is to examine how stress experienced before and during pregnancy impacts birth outcomes and how the context of incarceration and intervention influence the relationship between stress, prenatal health behaviors, and birth outcomes.

## **Incarceration and birth outcomes**

Although previous research has examined the relationship between incarceration and birth weight, overall, the findings are inconclusive. Kyei-Aboagye, Vragovic, and Chong (2000) compared the birth weights of 31 prisoners in Massachusetts with both high-risk (e.g., women enrolled in a methadone clinic) and low risk comparison groups (e.g., women in the community). Women incarcerated during pregnancy had significantly higher birth weight infants than the high-risk women and comparable infant birth weights to the low-risk control. Further research supported this relationship by showing that longer incarceration times were positively correlated with longer gestation periods and higher birth weights (Martin, Rieger, Kupper, Meyer, & Qaqish, 1997). However, other research has evidenced negative or null associations between incarceration and birth weight (Bell, Zimmerman, Cawthon, Hueber, Ward, & Schroeder, 2004; Howard, Strobino, Sherman, & Crum, 2010; Mertens, 2008), suggesting that this relationship is moderated by other factors, such as prenatal health behaviors and demographic characteristics (e.g., age and race) of the mother. A review by Knight and Plugge (2005) attributes the disparity in the literature to the comparison group used in the study. Studies that utilize a low risk community sample (e.g., Bell et al., 2004; Mertens, 2008) conclude that incarceration has a negative impact on birth outcomes, whereas, studies that utilize a high risk sample (e.g., Martin et al., 1997) conclude that incarceration promotes positive birth outcomes. Therefore, it is important to utilize a matched control to best understand the impacts of incarceration.

## **Incarceration and prenatal health behaviors**

A majority of incarcerated women engage in negative health behaviors such as smoking, delayed identification of pregnancy, and delayed entry into prenatal care. These behaviors not only impact the mother's health but also the well-being of the developing child (Bell et al., 2004). Further examination between the relationship of incarceration and engagement in health behaviors is needed.

**Incarceration and smoking.** The prevalence of smoking cigarettes is three to four times higher in incarcerated populations than the general population (Cropsey, Eldridge, & Ladner, 2004). Many facilities prohibit smoking during incarceration. Therefore, the time spent incarcerated provides a break from the harms associated with smoking. Cordero, Hines, Shibley, and Landon (1991) discerned that smokers who were incarcerated during pregnancy had a significant, positive correlation between time spent incarcerated and infant birth weight, which was not seen for nonsmokers. Further support for this relationship is inferred by Egley, Miller, Granados, and Ingram-Fogel (1992) where they established that pregnant women in prison had much higher rates of illicit drug and tobacco use than matched controls. Despite the difference in smoking behavior, the women in prison were less likely to deliver prematurely.

However, incarceration does not seem to assist in quitting smoking (Lincoln et al., 2007). A study of 165 inmates, illustrated that of those who were smokers prior to incarceration, upon release 62.7% returned to smoking after the first day, 82.3% returned after the first week, and 96.9% returned to smoking after the first six months. Therefore, incarceration provides a unique time for smokers to be tobacco free, but the benefits are not seen upon release.

**Incarceration and prenatal care.** There is debate about the accessibility and quality of medical care for pregnant incarcerated women. Cordero and colleagues (1991) compared the birth outcomes of women incarcerated in jail compared to women in longer term prison environments. The women in the jail facility started prenatal care later and reported fewer prenatal care visits overall than women held in prison. Other research has compared incarcerated populations to matched controls without incarceration experience and reported both groups of women had similar access to prenatal care (Martin, 1997). However, Bell and colleagues (2004) determined that although women in jail were more likely than women without justice system involvement to have prenatal care, the total number of visits was significantly less in the incarcerated population. Additional consideration needs to be made for the internal barriers to medical care. Women who are incarcerated and have obstetric care on site may still experience difficulty accessing appointments. Such barriers include mandatory head counts where women were unable to leave their cells to make their scheduled doctor's appointment (Mertens, 2008). Ensuring prenatal care is one way in which jail facilities can work to improve birth outcomes for pregnant inmates.

As of 2010, 38 states lacked a state law or a corrections policy mandating prenatal care or even standardizing available care for women (The Rebecca Project, 2010). To date, the only study pertaining to the national standards of care for pregnant women in the justice system was conducted by Ferszt and Clarke (2012). They contacted prisons in all 50 states and 19 completed their survey (38% of the target sample). This study showed that facilities generally did not provide prenatal care for women in correctional facilities, but also the barriers that researchers need to overcome with studying this population. In

terms of identification, 68% of facilities reported conducting pregnancy tests for all women, 79% screen for sexual abuse, and 42% screen all women for substance abuse. Of the participating facilities, 16% did not have an onsite medical provider and 79% did not have an Obstetrician visit bi-weekly.

There are guidelines for pregnancy-related care for incarcerated populations put forth by the American Congress of Obstetricians and Gynecologists (ACOG), National commission on Correctional Health Care (NCCHC) and the American Public Health Association (APHA). Unfortunately, there is no mandatory adherence to these guidelines. If correctional facilities guaranteed a certain level of care, it could be argued that incarceration is beneficial, but it is unclear how many facilities follow these recommendations and create a supportive environment for pregnancy.

Few services and educational support are provided to incarcerated pregnant women (Chambers, 2009). After childbirth, many women are forced to separate from their child. Further, many women do not receive any emotional support to assist in this separation (Fogel, 1993; Kyei-Aboagye et al., 2000). Bell and colleagues (2004) research supports that the assistance set up in jail with case management for pregnancy helps to decrease the odds of preterm labor. To date, few interventions have been done to help pregnant incarcerated women. One of the few studies conducted involved qualitative measures that assessed the effectiveness of providing Doula birth support (Schroeder & Bell, 2005). Overall, incarcerated women enjoyed having the labor support and reported that this program had a positive impact on their labor and delivery; however, no birth outcomes were reported. Further work by Schlafer and colleagues (in prep) has shown instilling the Doula support program significantly increased the birth weights of babies in

the Minnesota prison system. However, this may be limited as many of the interventions studies done are in prison settings and have small sample sizes. Additionally, many of these studies lack an appropriate comparison group. This research aims to examine the efficacy of an intervention with pregnant incarcerated women in addition to refining methodology utilized in previous research in this area.

### **Incarceration as a stressor**

The research on incarceration is equivocal about viewing incarceration as a point of stress or escape from stress. Those who argue incarceration has an additive effect to pre-existing stress cite reasons such as separation from family and added financial burden when unable to work (Fogel & Harris, 1986). Additional research has supported that the separation from family can exacerbate existing health and/ or social issues (Sharp & Marcus-Mendoza, 2001). Other research proposes that incarceration removes women from stress (e.g., homelessness and abuse) and provides a living environment that can be beneficial for the mother and baby's health, such as providing women with steady meals and shelter and prohibiting substance abuse (Elton, 1988).

### **Stress and birth outcomes overview**

Experiencing stress is taxing on ones' resources and may result in a depletion of biological and psychological resources, which increase the risk for disease. Stress can act through direct physiological processes, through inflammatory response or release of stress hormones, such as epinephrine, norepinephrine, and cortisol, which influences the expression of corticotropin-releasing hormone (a component of inducing preterm labor; Hobel, Dunkel-Schetter, Roesch, Castro, & Arora, 1999).

Stress may also have an indirect impact on pregnancy outcomes by influencing prenatal health behaviors (Lobel et al., 2008). Women may engage in smoking to help cope with stress. Smoking during pregnancy is known to reduce fetal growth, and increase preterm delivery, which is attributed to the arterial constriction or hypoxia (Cnattingius, 2004). Women under stress may neglect to identify pregnancy and initiate prenatal care which also has negative impacts on birth outcomes (Brouillette, 1985). One unique prenatal health behavior, which has been given little attention, is pregnancy identification. The timing of pregnancy identification is associated with the timing of other health-related behaviors, and how quickly she seeks health care. This research is the first to our knowledge to utilize pregnancy identification as a prenatal health marker.

Furthermore, the prenatal health behavior and birth outcomes that result from stress exposure may differ based on the type of stressor. Limited research (e.g., Lobel et al., 2008) has examined stressor types simultaneously to give a more complete perspective on this relationship. In this research, four types of stress were explored: food security, intimate partner abuse, emotion support, and general life stress. These stressors were chosen given their high prevalence in incarcerated populations and given the large amount of previous research which has shown the direct impact of these stressors on prenatal health behaviors and birth outcomes.

### **Food Insecurity**

The USDA defines “food insecurity” as not having access to sufficient food for a healthy lifestyle for all household members. In 2013, it was estimated 14.3% of households in the United States were food-insecure. Pregnancy is a time of rapid development which requires higher nutrition and energy intake (Cunningham, Leveno ,



Bloom, Spong, & Dashe, 2014). The inability to meet meet those requirements is a large physical and emotional strain.

**Food insecurity and prenatal health behaviors.** Being food insecure means that a basic need is not being met. Consequently, optimizing other health behaviors could be low priority for these women. Evidence for this is supported by the positive relation that exists between food insecurity and smoking rates in low-income families (Armour, Pitts, & Lee, 2001). This is especially concerning because these families have limited resources, and the resources they do have are spent on cigarettes. To date, there is no known literature on how food insecurity impacts pregnancy identification and obtaining prenatal care. However, support can be gleaned from other work, such as a review by Young, Wheeler, McCoy, and Weiser (2014) where food insecurity impaired the initiation and adherence to treatment for individuals living with HIV and AIDS.

**Food insecurity and birth outcomes.** Additionally, food insecurity has been implicated with negative birth outcomes. In study by Borders, Grobman, Amsden, and Holl (2007) food insecure mothers were three times more likely to have a low birth weight baby than food secure mothers. Supplementary evidence of the impact of food security on birth outcomes is illustrated in instances of famine. Studies of the Dutch famine (December 1944-April 1945), established that women who were pregnant, and especially women later in their pregnancy (second or third trimester) during the famine, had shorter gestation periods and lower birth weight babies compared to women who were pregnant in times surrounding the famine (Painter, Roseboom, & Bleker, 2005). In contrast, other researchers have failed to support that food insecurity impacts birth outcomes (Laraia, Siega-Riz, & Craig, 2004). These differences may be due to contextual

differences across the samples used. Further research needs to be done to understand how maternal food insecurity is impacting women's engagement with health behaviors and the well-being of the child.

### **Intimate Partner Violence**

One stressor in particular that is harmful to the mother and baby's health is Intimate Partner Violence (IPV, hereafter referred to as abuse). More than 2 million women or 2.1% of women of child bearing age are physically or sexually assaulted each year in the United States (Tjaden & Thoennes, 2000). Moreover, 75% of these attacks are from an intimate partner, meaning a current or former spouse. To further illuminate the gravity of this situation, it is important to note that abuse experienced around the time of pregnancy is a leading cause of maternal death in United States (Horon, 2005).

**Abuse and prenatal health behaviors.** Experience of abuse during pregnancy can have a detrimental effect on prenatal health behaviors. Physical abuse during pregnancy has been associated with a significant increased rate of smoking during pregnancy. Further, research supports that physical abuse is correlated with decreased rates of reducing and quitting smoking (Bailey & Daugherty, 2007). Cha and Masho (2014) used a national sample of the Pregnancy Risk Assessment Monitoring system to support that women who experience abuse prior to pregnancy were 30% more likely to have inadequate prenatal care. There is evidence to suggest that abused women may delay initiation of prenatal care and miss scheduled appointments because the abuser does not allow the woman to leave the house or denies access to transportation (Currey et al., 1998). Conversely, studies of women in an abusive relationship may express physical health needs and ultimately utilize health care services (e.g., emergency department and

department of health clinics) more frequently than pregnant women who are not abused (Bloom, Curry, & Durham, 2007).

**Abuse and birth outcomes.** Abuse experienced before and during pregnancy can have negative effects on birth outcomes. A meta-analysis by Murphy, Schei, Myhr, and DuMont (2001) illustrated that women experiencing abuse during pregnancy were 1.4 times more likely to give birth to a low birth weight infant compared to women who did not report a history of abuse. Research in low income samples of women supports the relationship between abuse and birth weight even when considering other risk factors such as substance abuse, depression, and PTSD (Rosen, Seng, Tolman, & Mallinger, 2007).

### **Emotion support**

Emotion support is a voluntary act of positive provision from one individual (the donor) to another individual (recipient) (Logsdon & Koniak-Griffin, 2005). The person providing emotion support can be anyone close to the recipient, including a family member, friend, partner, or other. Further, emotion support can take on different forms ranging from social to instrumental assistance. John Cassel, in his seminal paper, proposed that social relationships have a positive effect on physical health (Cassel, 1976). Since then, specific research has emerged on the importance of emotion support on prenatal health and birth outcomes.

**Emotion support and prenatal health behaviors.** Emotion support can play a vital role in encouraging engagement in prenatal health behaviors. In a study of 99 smokers who were trying to quit, participants who had higher levels of emotion support smoked significantly less at the second time point (approximately 17 days after baseline;

Lüscher et al., 2015). However, other studies have evidenced emotion support increases smoking behavior (Coleman, Ryan, & Williamson, 1989) or has no relationship at all (Casper & Hogan 1999). These studies may have found differing results due to different conceptualization of emotion support. Webster and colleagues (2000) studied 2,127 women in an Australian hospital clinic and found that women with low levels of emotion support, defined as having help and support from friends and partner, delayed entry to prenatal care and reported lower levels of health during pregnancy.

**Emotion support and birth outcomes.** The buffering effect of emotion support has the potential to enhance birth outcomes. Nuckolls, Cassel, and Kaplan (1972) in a study of military wives, showcased that women with low emotion support and high levels of life stress exhibited an increased risk for pregnancy complications. Emotion support has a more pronounced impact on birth outcomes in mothers that smoke compared to mothers who did not smoke during their pregnancy (Eisenbruch et al., 2006).

### **General life stress**

**General life stress and prenatal health behaviors.** General life stress refers to events such as moving or a death in the family, which may be unexpected, that can cause tension. General life stress, has shown to be positively related to negative health behaviors (e.g., smoking) and negatively related to positive health behaviors (e.g., obtaining prenatal care; Lobel et al., 2008). In a study of pregnant women who were current, former, and never-smokers, current smokers had significantly more daily stress and significantly more severe levels of stress than never-smokers. Further, Norwegian mothers (N = 71,757) who had high relationship discord and negative life events were less likely to quit smoking during pregnancy (Hauge, Torgersen, & Vollrath, 2012). The

two studies highlight that general life stress is significantly related to smoking behavior during pregnancy. Further, women who report more life stress are more likely to delay entrance to and receive inadequate prenatal care (Sable & Wilkinson, 1999).

**General life stress and birth outcomes.** A large epidemiological study in North Carolina (N = 1962) supports a positive correlation exists between stressful life events and preterm birth (Dole, Savitz, Hertz-Picciotto, Siega-Riz, McMahon, & Buekens, 2003). In this study, women were recruited prenatally that asked if a list of 39 positive and negative life events had occurred during their pregnancy. The total number of negative valence stress items was predictive of preterm birth. In a review by Hoffman and Hatch (1996), only 1 of the 11 studies supported that stressful life events are positively correlated with preterm labor. Other studies since then have found small associations (Whitehead, Hill, Brogan, & Blackmore-Prince, 2002). The range of findings may be due to the lack of consideration for the interaction between stress, host, and environment (Hogue, Hoffman, & Hatch, 2001).

### **Summary**

Limited research has examined the impact of stress on prenatal health behaviors and birth outcomes in the context of incarceration. It is known that incarcerated populations are at high risk for poor outcomes and experience high levels of stress. Further, stressors such as food insecurity, abuse, emotion support, and life stress have been shown to have a negative impact in adherence to health guidelines for pregnancy.

### **The Current Study**

The William and Mary Healthy Beginnings (HB) intervention works with pregnant incarcerated women. As part of the intervention, prenatal vitamins and

pregnancy tests to increase identification of pregnancy are provided to the jail. In addition, the HB team provides nutrition counseling, which helps women to make healthy eating choices during their pregnancy. Finally, the HB intervention works to provide re-entry support through making referrals to community partners and helping with social services applications.

This research aims to answer the question of how the context of incarceration and intervention impacts prenatal health behaviors (e.g., smoking, obtaining prenatal care, and pregnancy identification) and birth outcomes (e.g., birth weight, weeks gestation, low birth weight, preterm, small for gestational age, and NICU admittance). We also compared women participating in HB to women who did not receive an intervention, were incarcerated late in their pregnancy, and after they have given birth. We also tested the efficacy of the HB intervention. Moreover, this study informs the current research on the impact of stress on prenatal health behaviors and birth outcomes. Specifically, this research is one of the few studies to examine multiple types of stressors simultaneously. Further, many studies have looked at smoking and prenatal care initiation, but few studies have used pregnancy identification as a marker of prenatal health. A final goal was to examine the interaction between stress and incarceration on prenatal health and birth outcomes.

## **Hypotheses**

**Hypothesis 1: Women who were in HB compared to the Criminal Justice Involvement (CJI) group will have better prenatal health behaviors: smoke less, identify pregnancy earlier, and initiate prenatal care earlier. Further, women in HB compared to the CJI will have better birth outcomes: higher birth weights, longer**

**weeks gestation, and less admittance to NICU.** The Healthy Beginnings group has two fundamental differences from the comparison group, they were incarcerated during their pregnancy and they participated in an intervention. Being incarcerated during pregnancy removes you from engaging in smoking. Further, many jails provide some level of prenatal care, and as part of the intervention, the jails were given pregnancy tests to increase identification. For many women, jail may provide a more stable living situation than what they had, and therefore, these conditions could improve their birth outcomes.

**Hypothesis 2: Women with higher levels of stress (food insecurity, low emotion support, abuse, and general life stress) will have worse prenatal health behaviors: smoke more, identify pregnancy later, and initiate prenatal care later. Further, women with higher levels of stress will have worse birth outcomes: lower birth weights, shorter weeks gestation, and more admittance to NICU.** Stress has shown to significantly increase smoking and delay entrance to prenatal care. Further, stress has been implicated to impact birth outcomes. Specific stressors (food insecurity, low emotion support, abuse, and general life stress) were examined for their prediction of prenatal health behaviors and birth outcomes, but no significant difference in impact of stressors was predicted.

**Hypothesis 3: Interactive effects of group and stress levels are expected to occur in predicting prenatal health behaviors and birth outcomes.** Being incarcerated may remove women from the impact of stress experienced outside of incarceration. Therefore, a significant interaction between stress and group was predicted, such that the HB group would be buffered from the impact of stress on prenatal health behaviors and

birth outcomes. Specific stressors were examined, but no significant differences between stressor types were expected.

**Hypothesis 4: Women who are incarcerated longer and incarcerated at an earlier trimester will have better prenatal health behaviors and birth outcomes. Further, there will be a significant 3 way interaction between stress, trimester at incarceration, and length of incarceration on prenatal health behaviors and birth outcomes.** Previous research has shown a positive correlation between incarceration length and birth outcomes. Further, the earlier the women are incarcerated, the earlier they may obtain a pregnancy test and prenatal care. Finally, being incarcerated longer and earlier may remove women from stress for a longer and a more critical period which may promote prenatal health behaviors and birth outcomes.

## Method

### Participants

Participants for the current study included a sample of HB participants who completed the intake and postpartum information and a sample of CJI participants (see Table 1 for demographic information). The HB group participated at four time points: Intake ( $n = 169$ ), Nutrition Class ( $n = 148$ ), Post-counseling ( $n = 116$ ), and Postpartum ( $n = 101$ ). Participants who completed the postpartum interview were compared to those who did not. Women who completed the postpartum interview were more likely to have obtained prenatal care at the time of intake,  $\chi^2(1, N = 151) = 11.04, p < .01$ , and there was a trend that women who completed the postpartum interview reported smoking more at 3 months prior to pregnancy,  $t(167) = -1.67, p = .10$ . No other differences were found amongst study variables.



The HB women who completed the postpartum interview were used in the subsequent analyses ( $n = 101$ ). HB women were racially diverse (53.8 % non-white) and many have not completed high school or their GED (29%). Further, a large portion of the HB women were not married (89.3%), were unemployed (43.2%), and were without health insurance (47.3%). Similarly, the CJI group ( $N = 50$ ) were very racially diverse (46.0% non-white) and many have not completed high school or their GED (32%). Significantly more CJI women were not married (94%), employed (34%), and had health insurance (88%) compared with HB. There were no significant differences between jail facilities women were recruited from on study variables.

### **Procedure**

Participants were recruited from seven county jails in the mid-Atlantic region. For the HB group, researchers were provided a list of pregnant women from the medical staff at the jail facility. The researchers would then ask all eligible women if they wish to participate in the study. Incentives and services provided for participating included: a \$25 gift card was given for completion of intake and additional \$25 for the completion of postpartum interviews, prenatal vitamins were provided to mothers for the entirety of her pregnancy, nutrition counseling was provided, diapers were sent once the baby was born, and the woman received assistance with social service application and referrals to community partners.

The CJI women were either pregnant and incarcerated during their third trimester or had a baby within the 1.5 years of being incarcerated. Participants were recruited by researchers by making announcements to the women's housing unit asking, "if anyone has had a child within the last 18 months?" Women were then asked if they wished to

participate in the study. As an incentive for participating women received a package of diapers and a letter was sent home to caregivers to complete. If the caregiver participated, they received a \$5 gift card.

### **Measures**

Four stress variables were used in the present study: Food insecurity, Abuse, Emotion support, and general life stress. Food Insecurity was calculated based on responses to a 5- item scale developed by the USDA (Gary, Nord, Price, Hamilton, & Cook, 2000). Each item was answered based on whether a given event had occurred at any point over the last year (e.g., “The food that we bought just didn’t last, and we didn’t have money to get more”) and response “True” (1) or “False” (0). Responses were totaled to create a score from 0-5 with 0 representing no food insecurity and 5 representing the greatest amount of food insecurity. Sixty-seven percent of participants received a score of 0 and 32.4% endorsed at least one item receiving a score from 1-5 (range: 0-5). This measure had very good internal reliability ( $\alpha = .85$ ).

All other measures came from the Pregnancy Risk Assessment Monitoring System (PRAMS; CDC, 2012). Abuse was measured by asking during the 12 months before pregnancy with your new baby or during your pregnancy, “did your (husband/ partner/ ex-husband/ ex-partner/ other) push, hit, slap, kick, choke, or physically hurt you in any way?” If the woman responded “yes” to any of those 6 questions, they were put in the abuse category (1); if no was answered to all the questions they were put in the no abuse category (0). Seventy-four percent of participants did not endorse an abuse item and received a score of 0, and 26% of participants reported at least one form of abuse and received a score of 1.

Emotion support was measured using a 4-item scale that asked questions pertaining to being able to get help if needed (e.g., “Someone to help me if I were sick and needed to be in bed”). Responses included “yes” (1) and “no” (0). The sum score was used in the subsequent analyses. The average score on emotion support was a 3.2 (SD = 1.23) with 6.1% of participants not endorsing any emotion support items and receiving a score of 0 (range: 0-4). This measure had very good internal reliability ( $\alpha = .77$ ).

General life stress was measured using a 12-item scale that asked if events happened to them in the previous 12-months such as, “I got separated or divorced from my husband or partner.” Responses included “yes” (1) and “no” (0). The sum score was used in the subsequent analyses. The average score reported was a 5.00 (SD = 2.7; range: 0-12). Many researchers have used the sum score to represent cumulative risk (Hosler, Nayak, & Radigan, 2011; Liu & Tronick, 2013). This measure had acceptable reliability ( $\alpha = .66$ ).

Prenatal health behavior outcome variables in this study are smoking, weeks pregnant at identification, and prenatal care obtainment. Smoking was measured by asking, “In the 3 months before you got pregnant, how many cigarettes did you smoke on an average day?” Responses were coded on a 0-6 scale (0 = didn’t smoke then and 6 = 41 cigarettes or more). Pregnancy identification (PI) was measured by asking, “How many weeks or month pregnant were you when you were sure you were pregnant?” Prenatal care obtainment was similarly measured by asking, “How many weeks or months pregnant were you when you had your first visit to prenatal care?” Responses were coded for the weeks listed and whether the participant did (1) or did not (0) attend prenatal care.

Birth outcome variables of interest were birth weight, weeks' gestation, low birth weight, preterm, small for gestational age (SGA), and admittance to the NICU. Birth weight was measured by asking the participant how much the infant weighed at birth. Responses were reported in ounces. LBW was calculated based on reported birth weight, if the infant was reported as weighing less than 917 ounces were considered LBW (1) and infants above 917 ounces were considered not-LBW (0). Weeks' gestation was calculated based on the participants expected due date and when the participant gave birth. Preterm was calculated based on weeks' gestation; if the infant was born 37 weeks or earlier they were considered preterm (1), and infants born after 37 weeks were considered not preterm (0). Small for gestational age was calculated based on if the infant was a low birth weight given the gestation period (1) or not a low birth weight given the gestation age (0). Admittance to the NICU was measured by asking the mothers if their child went to the Neonatal Intensive Care Unit. Responses were coded as "Yes", the baby was admitted to the NICU (1), or "No", the baby was not admitted to the NICU (0).

## **Results**

### **Plan of analysis**

Prior to conducting hypothesis testing, preliminary analyses were conducted to examine the potential main effects of race, education, and age. These analyses were used to determine whether race, education, and age should be treated as control variables during hypothesis testing. A series of correlations, independent samples t-tests, and chi-square analyses were conducted to determine whether there were main effects of group (HB and CJI) or stress (food insecurity, abuse, emotion support, and general life stress) on prenatal health behaviors (smoking, PI, and prenatal care), and birth outcomes (birth

weight, weeks gestation, LBW, Preterm, SGA, and NICU). Subsequent analyses examined interaction effects between group and stress using linear regression analyses. When significant interactions were found, independent t-tests and partial correlations were conducted to examine the different patterns of relations between HB and CJI with high and low levels of stress. In addition, more specific analyses were done utilizing just the HB participants. The main effects of weeks gestation and trimester were examined by using a series of correlations, ANOVAs, and ANCOVAs when the outcome of interest was continuous, and chi-squares and binary logistic regression, when the outcome of interest was dichotomous. Finally, 2 and 3 way interactive effects of trimester, length of incarceration, and stress variables on prenatal health behavior and birth outcomes were assessed by using linear and binary logistic regression.

### **Preliminary Analyses**

Preliminary analyses were conducted to examine potential main effects of race, age, and education. In addition, a correlation analysis between all study variables was conducted and the results are presented in Table 2.

**Race differences.** Using independent samples t-tests, no significant race differences were found for PI, birth weight, and weeks' gestation. There were significant effects of race on cigarettes smoked  $t(204) = 4.36, p < .001$ , with non-white women being more likely to smoke than white women, and weeks initiated prenatal care  $t(155) = 1.99, p = .05$ , with non-white women initiating care later than white women, however there were no significant differences by race for obtaining prenatal care,  $\chi^2(1, N = 151) = 3.50, ns$ . In addition, using chi-square tests, no significant race differences were observed for the following birth-related variables: infant born preterm, LBW, SGA, and admittance

to the NICU. Therefore, race was used as a covariate when examining cigarettes smoked and weeks along at initiation of prenatal care.

**Educational differences.** Using Pearson product moment correlations, no significant relations were found between education and smoking, PI, weeks along at initiation of prenatal care, birth weight, and weeks gestation. Using a binary logistic regression, no significant differences were found for prenatal care, preterm, LBW, SGA, and NICU for education. Therefore, education will not be examined during hypothesis testing.

**Age differences.** Using Pearson product moment correlations, no significant relations were found between age and number of cigarettes smoked, weeks sure pregnant, PI, and birth weight. There was a significant correlation between age and weeks gestation  $r(138) = -.17, p = .05$ , such that older women were more likely to have shorter gestational periods. Using a binary logistic regression, no significant age differences were found for obtaining prenatal care, SGA, and NICU for age. However, there were significant differences by age and preterm births, Wald (1) = 5.44,  $p = .02$ , and age and LBW, Wald (1) = 5.731,  $p = .02$ , such that with each year the probability of having a preterm baby increases by 11%, and the probability of having a low birth weight baby increases by 10%. Therefore, age was used in analyses examining weeks gestation, preterm, and LBW.

**Hypothesis 1: a) Women who were in HB compared to the CJI women will smoke less, identify pregnancy earlier, and initiate prenatal care earlier.**

Group differences between HB and CJI on prenatal health behaviors are presented in Table 3. Because maternal race was significantly related to smoking and weeks

pregnant at initiation of prenatal care it was used as a control variable in these analyses. To examine the relation between smoking at three months prior to pregnancy and group membership an ANCOVA was performed. There was a significant difference between groups after accounting for race, such that the CJI ( $M= 3.2$ ) group reported smoking more than the HB group ( $M = 2.5$ ),  $F(1,135) = 4.28, p = .04, d = -0.49$ . The HB women were interviewed at intake (average of 15.8 weeks gestation) and were an average of 7 weeks pregnant at identification of pregnancy. At the time of intake, most HB women (83.2%) had received prenatal care, which they reported began at 10.59 weeks gestation.

Comparatively, women in CJI group were interviewed at postpartum and reported identifying pregnancy around 8 weeks gestation. Of those who had received care (96%) it was an average of 11.18 weeks along in pregnancy upon obtaining care. There was a significant difference between groups for obtaining prenatal care such that the HB group was less likely to have gone to prenatal care compared to CJI,  $\chi^2(1, N = 151) = 5.00, p = .03, d = -0.43$ . There were not significant differences found using a t-test amongst groups on PI and weeks pregnant when obtaining prenatal care.

**Hypothesis 1: b) Women in HB compared to CJI will have better birth outcomes: higher birth weights, longer week's gestation, and less admittance to NICU.**

Group differences between HB and CJI on birth outcomes were examined and presented in Table 3. To examine the relations between group and birth weight, a t-test was conducted. There was a trend such that HB ( $M = 110.31$ ) participants reported that their newborns had higher birth weights than CJI ( $M = 104.15$ ) participants,  $t(149) = 1.75, p = .08, d = 0.29$ . There was no significant difference seen between groups on

weeks gestation using linear regression. Further, when testing dichotomous birth outcomes where age was a covariate a binary logistic regression was used. No significant differences between groups were seen for preterm and low birth weight. Further, no significant differences were seen after conducting a chi-square analysis between groups on SGA and NICU.

**Hypothesis 2: a) Women with higher levels of stress (food insecurity, low emotion support, abuse, and general life stress) will have worse prenatal health behaviors.**

A partial correlation was conducted to assess the relation between food insecurity and smoking while controlling for the influence of race, the results were significant,  $r(94) = .21, p = .05$ , suggesting greater food insecurity was associated with more smoking. Further, there was a significant relation between food insecurity and weeks along at prenatal care,  $r(90) = .23, p = .02$ , such that food insecurity was associated with receiving prenatal care later in pregnancy. There was not a significant correlation between food insecurity and time of PI,  $r(104) = .12, p = .22$ . The relation between food insecurity and whether or not a woman had prenatal care was assessed using a binary logistic regression. There was a trend such that higher levels of food insecurity predicted lower levels of initiation of prenatal care,  $\text{Wald}(1) = 2.86, p = .09$ , such that with each unit increase in food insecurity, the odds of obtaining prenatal care decrease by 30%. No significant relations were observed between abuse and any of the prenatal health behaviors (smoking, PI, weeks along at prenatal care, and any prenatal care). Similarly, emotion support did not significantly correlate with any of the prenatal health behaviors (see Table 2).



The relation between life stress and smoking was assessed using a partial correlation controlling for race. The results indicated that an increase of life stress correlated with an increase of smoking,  $r(130) = .20, p = .02$ . When using a partial correlation, life stress was not related to prenatal care initiation. Further, after assessing with binary logistic regression there were not significant relations of life stress with PI, prenatal care initiation or any prenatal care.

**Hypothesis 2: b) Women with higher levels of stress will have worse birth outcomes.**

No significant main effects for food insecurity, abuse, and life stress were found for any of the birth outcomes. However, using a binary logistic regression controlling for age, emotion support significantly predicted preterm infants such that the less emotion support was associated with increased chance that an infant would be preterm, Wald (1) = 7.38,  $p < .01$ . With each unit increase of emotion support, infants were 54% less likely to be preterm.

**Hypothesis 3: a) Interactive effects of group and stress levels are expected to occur in predicting prenatal health behaviors.**

Using a linear regression,  $F(4, 92) = 7.18, p < .001$ , a significant trend between group and food insecurity on cigarette smoking was found,  $t(92) = -1.80, p = .08$ , (see Table 4 and Figure 1). Follow-up partial correlation test controlling for race showed a significant association between smoking and food insecurity in the HB group,  $r(58) = .31, p = .01$ , but no relation in the CJI group,  $r(29) = .01, p = .95$ . The interaction tested with a linear regression between group and food insecurity was not significantly related to PI and weeks along at prenatal care. Similarly, the interaction tested with a binary

logistic regression between group and food insecurity was not significantly related to obtaining prenatal care.

A linear regression was conducted,  $F(4, 130) = 9.20, p < .001$ , and revealed a significant interaction between group and abuse on smoking after controlling for the influence of race,  $t(130) = -3.68, p < .001$  (see Table 5 and Figure 2). Follow-up linear regression test controlling for race showed a significant positive association between abuse experience and smoking in the HB group,  $t(97) = 2.90, p < .01$ , but a significant negative relation in the CJI group,  $t(32) = -3.45, p < .01$ . The interaction between group and abuse was not significantly related to PI, weeks along at prenatal care, and obtaining prenatal care.

The interaction between group and emotional support was not significantly related to any of the prenatal health behaviors.

A linear regression revealed a significant interaction between group and life stress on smoking after controlling for race  $F(4, 128) = 10.07, p < .001, t(128) = -3.60, p < .001$  (see Table 6 and Figure 3). Follow-up partial correlation test controlling for race showed a significant association between smoking and life stress in the HB group,  $r(91) = .34, p = .001$ , and a significant negative relation in the CJI group,  $r(31) = -.44, p < .01$ . The interaction between group and life stress was not significantly related to PI, weeks along at prenatal care, and had prenatal care.

**Hypothesis 3: b) Interactive effects of group and stress levels are expected to occur in predicting birth outcomes.**

There was a significant interaction between group and food insecurity on birth weight,  $F(3, 104) = 2.61, p = .06, t(104) = -1.95, p = .05$  (see Table 8 and Figure 4).

Follow-up Pearson product moment correlation test showed food insecurity and birth weight was not significantly correlated in the HB group,  $r(61) = .18, p = .16$  and CJI group,  $r(43) = -.19, p = .20$ . Similarly, there was a significant interaction between group and food insecurity on weeks gestation,  $F(4,91) = 2.85, p = .03$ , after controlling for the effects of age,  $t(4,91) = -2.0, p = .01$  (see Table 9 and Figure 5). Follow-up partial correlation test controlling for age showed a positive trend between food insecurity and weeks gestation in the HB group,  $F(50) = .37, p = .06$ , but a negative trend in the CJI group,  $r(40) = -.27, p = .09$ . In addition, using binary logistic regression, there was a significant interaction between group and food insecurity on LBW, Wald (1) = 3.13,  $p = .08$  (see Table 11 and Figure 6). Follow-up binary logistic regression showed no relation between food insecurity and LBW in the HB group, Wald (1) = 1.46,  $p = .23$  and in the CJI group, Wald (1) = 2.09,  $p = .16$ . There was a significant interaction between group and food insecurity on NICU, Wald (1) = 4.45,  $p = .04$  (see Table 11 and Figure 7). Follow-up binary logistic regression showed no relation between food insecurity and NICU in the HB group, Wald (1) = 2.06,  $p = .15$  and a positive association in the CJI group, Wald (1) = 4.17,  $p = .04$ . There were no further significant interactions between food security and group on preterm, SGA, and NICU.

The interaction between abuse and group did not significantly predict any of the birth outcome variables.

Using linear regression, there was a significant interaction between group and emotion support on birth weight,  $F(3, 144) = 3.06, p = .03, t(144) = 1.79, p = .08$  (See Table 10 and Figure 8). Follow-up Pearson's product moment correlation test showed no

relation between emotion support and birth weight in the HB group,  $r(98) = -.03, p = .74$  but a positive trend in the CJI group,  $r(46) = .28, p = .06$ .

Using binary logistic regression the interaction of group and emotion support significantly predicted admittance to NICU, Wald (1) = 4.65,  $p = .03$  (See Table 11 and Figure 9). Follow-up binary logistic regression showed no relation between emotion support and NICU in the HB group, Wald (1) = .95,  $p = .33$  and a negative association in the CJI group, Wald (1) = 5.55,  $p = .02$ . There was no significant relation between group and emotion support for the other birth outcome variables.

There was a significant interaction seen using linear regression,  $F(3,141) = 3.899, p = .01$  between group and life stress on birth weight,  $t(141) = -2.78, p < .01$  (See Table 10 and Figure 10). Follow-up Pearson's product moment correlation test showed no relation between life stress and birth weight for the HB group,  $r(92) = .11, p = .28$  but a significant negative relation in the CJI group,  $r(46) = -.34, p = .02$ . Similarly, using binary logistic regression there was a significant relations between the interaction of group and life stress on LBW whilst controlling for age, Wald (1) = 5.00,  $p = .03$  (See Table 11 and Figure 11). Follow-up binary logistic regression showed no relation between life stress and LBW in the HB group, Wald (1) = 2.00,  $p = .16$ , but a positive trend in the CJI group, Wald (1) = 3.47,  $p = .06$ . There were no further significant interactions between group and life stress on birth outcomes.

**Hypothesis 4) a) There will be a significant effect of weeks incarcerated and trimester incarcerated on prenatal health behaviors in the HB group.**

An Anova controlling for race showed a significant difference across trimester incarcerated in the HB group for the weeks along at first prenatal visit,  $F(2, 78) = 7.16, p$

< .001 (see Figure 12). A post-hoc Tukey test showed that there was a significant difference between first and third trimester  $p < .01$ , and second and third trimester  $p < .01$ . There was not a significant relation between trimester incarcerated and smoking.

Trimester incarcerated was significantly related to PI, such that women who were incarcerated earlier tended to identify pregnancy earlier,  $F(2, 93) = 9.92, p < .001$  (see Figure 13). A post-hoc Tukey test showed that there was a significant difference between first and second  $p < .01$ , and second and third trimester  $p < .01$ . However, the amount of time spent incarcerated was not significantly related to weeks along at PI. Neither incarceration time nor trimester at incarceration were significantly related to obtaining prenatal care.

**Hypothesis 4: b) There will be a significant effect of length of incarcerated and trimester incarcerated on birth outcomes. There will also be significant interactive effects between stress, incarceration length, and trimester incarcerated on birth outcomes.**

Trimester of incarceration was not significantly related to any of the birth outcomes. Length of incarceration had a trend such that the longer the incarceration the less likely the infant would be preterm, Wald (1) = 2.84,  $p = .09$ . Therefore, with every week of incarceration HB women had a 9% decrease in the probability of having a preterm infant. However, length of incarceration was not significantly related to any of the other birth outcomes.

There were no significant two-way interactions between length of incarceration and trimester incarcerated on prenatal health behaviors or birth outcomes. Furthermore, there were no significant three-way interactions between stressor type (food security,

abuse, emotion support, and life stress), length of incarceration, and trimester on prenatal health behaviors or birth outcomes.

### **Discussion**

The current study was the first to examine whether incarceration is protective for prenatal health behaviors and birth outcomes because it alleviates the effect of outside stressors. The results of this study highlight how stress, incarceration, and the interactive effects of those variables impact birth outcomes for incarcerated women. More specifically, the relation between length and trimester of incarceration on prenatal health behaviors and birth outcomes was examined. Finally, this thesis also provides support for the positive impact of interventions in jailed populations.

### **Group Findings**

There were significant differences seen between smoking behavior reported three months prior to pregnancy, such that the CJI group reported higher levels of smoking than HB. Further, it is important to note the HB women may have received the benefit of having a break from smoking behavior during pregnancy which was not reaped by the CJI group (Lincoln et al., 2007). This benefit may have contributed to HB women having higher birth weights compared to the CJI group. Such logic would mirror the findings of Cordero (1991) where the benefit of incarceration on birth outcomes was seen by women who smoke. Further, our studies mirror previous studies which have showed the smoking rates of this population to well exceed the national norm (Lincoln et al., 2007). Being pregnant and incarcerated provides added incentive to quit smoking. In addition, there have been many successful interventions which have reduced smoking rates in pregnant women (Lumley et al., 2009). Incarceration provides a unique opportunity for

intervention. Considering the high cost to society of preterm and low birth weight babies, investing in an intervention that provides support and assistance with quitting may be worthwhile. Specifically, there was a trend ( $p = .09$ ) such that smoking reported at 3 months prior to pregnancy in the HB and CJI women increased the likelihood of the infant being admitted to the NICU.

The observed group differences for birth weight supports that incarceration has a positive impact on birth weight. However, it seems as though an improvement of prenatal health behaviors is not the reason. Unlike previous findings which show that prenatal care access may be better in jails than for matched controls, we found that the HB women were less likely to have obtained prenatal care. This finding may be attributed to the timing of the interview. HB women were interviewed on average 16 weeks gestation compared to women in the CJI group where the majority were interviewed at postpartum.

Another contributing factor to HB women having higher birth weights is their participation in the Healthy Beginnings intervention. These women were provided with extra services ranging from prenatal vitamins to nutrition counseling and re-entry support. Therefore, we attribute this finding to the synergistic effects of the intervention and incarceration on birth weight. Further, we are unable to disentangle which part of the program is benefitting the women.

It was surprising that there was not a difference between the groups in timing of pregnancy identification. As part of the HB program, jails are provided with pregnancy tests to increase the identification and therefore identify pregnancy earlier. One reason HB women were not identifying pregnancy earlier than the CJI women is that the jail facilities were not pregnancy testing all women. Instead, some facilities may only be

testing women who are requesting a pregnancy test or come in already knowing that they are pregnant. Therefore, we would not expect significant differences in the timing of pregnancy identification.

### **Stress Findings**

The current findings did not support our hypothesis that stress levels would have a direct impact on prenatal health behaviors and birth outcomes. Previous research on abuse, emotion, support, and life stress have indicated that increased stress levels contribute to a decreased engagement in prenatal health behaviors (e.g., Bailey et al., 2007; Webster, 2000). One reason that the relation was not found between stress and prenatal health behavior may be because the HB group was incarcerated during their pregnancy and may be removed from the effects of this stressor, therefore, it is best to interpret the interactive effects. A second reason for the lack of main effect of stress on prenatal health behaviors is that these women exhibit such a high level of hardship and strain, it is possible that the analyses conducted were not sensitive enough to detect the relationship.

The one stressor which had a main effect on weeks along at pregnancy identification and delayed entrance to prenatal care was food insecurity. The impact of food insecurity may be attributed to a basic need not being met. This finding goes back to the fundamental psychological principle outlined by Maslow's (1945) hierarchy of needs, where in order to take care of higher order needs such as caring for another through making healthy choices the fundamental needs such as food must first be met. Further, this follows a similar pattern to the line of work regarding food insecurity and adherence to treatment for HIV, where patients high on food insecurity were more delayed and did



not follow procedures for treatment as compared to food secure patients (Young, Wheeler, McCoy, & Weiser, 2014). Additionally, the results add to previous findings where groups with higher levels of food insecurity report higher levels of smoking (e.g., Armour et al., 2001). Engagement in smoking may be a coping mechanism for dealing with the stress at hand. However, this is especially concerning because the money these women appear to be spending their money on cigarettes rather than nutrition for themselves and their baby.

### **Interaction between stress and group**

Previous literature has not specifically examined how incarceration may provide a respite from various stressors. The hypothesis that there is a significant interaction between stress and group for prenatal health behaviors was not supported for access to prenatal care and pregnancy identification. Further, there was a significant interaction between stress and group for smoking but it was in the opposite direction than predicted. Women in the HB group who were under higher levels of stress smoked more than the lower stress groups. Interestingly, the opposite or no relation was true for the CJI group. One reason for the results may be the timing of the smoking behavior. The question asks about smoking three months prior to pregnancy. Therefore, the effects of incarceration for the HB women would not serve a buffering effect. CJI women, may have misreported as they were recounting smoking behavior from almost two years prior. Further research is needed to clarify this finding.

In addition, many researchers have failed to support a relation between incarceration and positive birth outcomes (Bell et al., 2004; Howard et al., 2010; Mertens, 2008). The present findings not only provide further evidence that women who are

incarcerated have higher birth weights, it identifies a potential mechanism. When examining the relation between group status, food insecurity, and birth outcomes, it was supported that women in the HB condition, contrasting to the CJI, experienced higher levels of food insecurity had higher birth weights and weeks gestation than women in the lower food insecurity group. This contributes to the theory put forth by Elton (1988) where incarceration may be protective in that it provides stable living conditions (e.g., food sources). Similarly, the pattern exists such that in higher levels of food insecurity HB participants had less instance of low birth weight and NICU admittance compared to the high food insecurity individuals in the CJI group. The impact of life stress and emotion support on birth weight and other birth outcome indicators are similarly buffered by being in the HB group as compared to the CJI group. In addition, these findings may be explained in part by the contributions of the HB program. Women who were in HB were given high quality prenatal vitamins for the entirety of their pregnancy. The provision of vitamins could help stave off the harmful effects of not being able to have adequate food supply (Williams & Livestrong, 2011). In addition, being part of the program provides a form of emotion support. A trained RN met with the women a minimum of four times. During each session, women could ask health or general questions. Furthermore, women were encouraged to call and solicit services at any time during their pregnancy.

Interestingly, abuse did not follow the same pattern as the other stressors. Globally, the impact of abuse was not seen to have a major effect on prenatal health or birth outcomes. This contradicts previous research which maintains that being in an abusive relationship may be prohibitive to one seeking the help and therefore can be

detrimental to the women's health and the health of the baby (Curry et al., 1998). The reason the effects may not be seen in this sample is because these women are serving relatively short sentences. And, the fear of knowing they will shortly return to an abusive situation may maintain the stress level. Further, there are ways through visiting and phone calls that the relationship between the abuser and the victim of abuse can be sustained in a jail setting. Finally, the measure of abuse is not specific in that it does not identify the severity, repetitive nature of abuse, or differentiate the type of abuse experienced. This specification may be important in determining if it is a specific type of abuse which has an impact on birth outcomes. Therefore, one should interpret these results with caution.

#### **Length of incarceration and Trimester findings**

Previous research has shown mixed results for length of incarceration and birth outcomes (Bell et al., 2004; Howard, 2010). The present study found that the trimester a women is incarcerated has important implications, such that women entering jail earlier in their pregnancy tend to identify pregnancy earlier and get prenatal care earlier. Many of the HB women (27%) are obtaining prenatal appointments in their second trimester. Having access to prenatal care early in a pregnancy is crucial to receiving health and lifestyle guidelines for a healthy pregnancy and identifying any major complications (Mayo Clinic, 2012). This finding uncovers a failure in the system to provide easy and quick access to prenatal care in correctional facilities. Further, it has important implications for policy to streamline intake and medical process in the facilities. Upon identifying pregnancy a prenatal health appointment should be made available that week. In addition, internal barriers for these women such as not being able to go to an

appointment because of head count should be minimized (Mertens, 2008). Beyond just receiving care, it is important to consider the quality of care received. Many women's definition of care consists of an appointment confirming pregnancy. If we had asked about specific types of test received, e.g., diabetes screen, infectious disease screen, and ultrasound, we may have seen significant differences between the groups. Ferszt and colleague (2012) exposed the inconsistency of quality and quantity of services provided by prison facilities. Future research needs to further examine the quality of care obtained in jail facilities and the impact this is having on the developing child.

In terms of birth outcomes, there was only a trend such that longer incarceration may be protective from having an infant who is preterm. This finding further supports the hypothesis that incarceration and being a part of an early intervention may serve protective function against poor birth outcomes. One reason for the mixed findings in previous research may be the use of differing birth outcome variables. Many studies only examine one or two birth outcomes at a time (e.g., birth weight and weeks gestation). It may be important to report on a series of birth outcomes to gain a fuller perspective on the relation between incarceration and birth outcome. Reporting on poor birth outcomes such as low birth weight, preterm, and infants who are admitted to the NICU are of particular interest given the increased risk for negative health consequences for the infant. In addition, poor birth outcomes are estimated to cost \$26.2 billion annually to the United States, and it is in the interest of policy makers to implement programs to reduce this deficit (March of Dimes, 2015)

There were no significant three way interactions such that trimester and length of incarceration moderated the relationship between stress and birth outcomes. Therefore,

looking globally at the results it seems that incarceration during pregnancy and being in the Healthy Beginnings Program is not changing women's prenatal health behaviors but is having a significant positive impact on birth outcomes.

### **Strengths and Limitations**

Inherent in all studies are their strengths and their weaknesses. One of the greatest strengths of this study is the sample size and richness of the data set. Many studies of incarcerated populations are limited by access to the population and have less than 40 participants in their study (e.g., Kyei- Aboagye et al., 2000). If the studies are of a larger scale (e.g., Howard et al., 2010), then the study is a secondary analysis of records. The studies utilizing records are more descriptive in nature and limits researchers to examining variables readily available to the public (e.g., race, age, and birth weight). Therefore, researchers are unable answer specific questions about mechanism.

This is the first study to utilize a comparison group that was recruited from the same jail facilities as the pregnant group of interest. The majority of studies use a comparison group which is a high risk community sample without contact with the criminal justice system (e.g., Cropsey, 2004; Kyei-Aboagye et al., 2000, Martin, 1997). Having a closer matched sample provides strength to testing the impact of incarceration during pregnancy. However, it is important to note the confound that the CJI group is interviewed at postpartum as compared to the HB group who is interviewed during their pregnancy. This inhibits proper analysis for obtaining prenatal care and may introduce variability in the ability to remember certain details (e.g., amount smoked per day 3 months prior to pregnancy).

Despite the strength in our comparison group, we are still unable to parcel out the effects of incarceration during pregnancy from the impact of the program. These characteristics are both nested within the HB group. Further, the components of the intervention are unable to be disentangled. Future, research should examine which part of the HB program is benefitting the women. This research would help to further streamline the services and improve the cost to benefit ratio, making the services even more appealing to policy makers.

An additional limitation is the lack of variability in incarceration time and trimester. Many of the HB women were in their second or third trimester. It may be that jails are not identifying women earlier in their pregnancy. Further, many of the women who are in jail for a short time do not complete the intervention and in turn, the postpartum interview. Therefore, we do not have birth outcome information for all HB participants. This variability would help to increase ability to understand how the timing of pregnancy and the length of incarceration impact birth outcomes.

Another constraint of the study is the time frame associated with the study variables. When asking about smoking behavior, we ask about the three months prior to pregnancy. Therefore, the assumption must be made that smoking behavior is relatively consistent over time. Further, many of the stress variables ask about the last 12 months (food insecurity and general life stress) and not specifically about the stress experience occurring during pregnancy. Future studies should work to differentiate stress experiences prior and during pregnancy when examining the birth outcomes.

Additionally, when examining abuse we were limited in the questions we could ask. We did not ask about the severity or longevity of the abuse women experienced.

These nuances can have an important effect on the impact abuse has on prenatal health behaviors and birth outcomes. Future research should ask more specific questions in order to examine how the gravity of the abuse experienced impacts these outcomes.

### **Conclusion**

Understanding influences of birth outcomes is of vital importance. The cost to society and the child are too great to go ignored. This research examines an extremely at risk group of individuals who are incarcerated and the recipients of an intervention in comparison to a group incarcerated late in their pregnancy or after the child is born. The results support that incarceration and provision of an intervention improves birth outcomes. More specifically, being in the HB group provided a buffer against the harmful effects of stress on birth outcomes.

Table 1.

## Participant characteristics by group

Characteristic	HB <sup>a</sup> (n = 101)	CJI <sup>b</sup> (n = 50)	Statistic
Mean Age (years)	25.8	27.3	$t(149) = -1.79, p = .08$
Race (% not white)	45.5%	46.0%	$\chi^2(1, N = 151) = .96, p = .33$
Education Level (% did not graduate high school)	29.0%	32.0%	$t(146) = .15, p = .88$
Employment (% Employed)	59.4%	34.0%	$\chi^2(1, N = 151) = 8.64, p < .01$
Health Insurance (% with Health Insurance)	50.4%	88.0%	$\chi^2(1, N = 151) = 21.09, p < .01$
WIC (% received WIC) <sup>c</sup>	30.0%	48.0%	$\chi^2(1, N = 151) = 4.69, p = .03$
Marital status (% Married)	8.9%	6.0%	$\chi^2(5, N = 151) = 2.20, p = .82$
First Time Mothers	26.0%	26.7%	$\chi^2(1, N = 151) = .00, p = .92$
Mean Number of Previous Live Births	1.55	1.54	$t(149) = .06, p = .95$

Note: <sup>a</sup> Heathy Beginning <sup>b</sup> Criminal Justice Involvement <sup>c</sup> Received Women Infant's Children

Social Services



Table 2.  
Bivariate Correlation between Group, Stress, Prenatal Health Behaviors, and Birth Outcomes

Group	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	M (SD)
1. Group (1 = HB, 2 = CJJ)																
2. Food Insecurity																
3. Abuse (0 = No abuse, 1 = abuse)																
4. Emotion Support																
5. General Life Stress																
<b>Prenatal Health Behaviors</b>																
6. Smoking																
7. Pregnancy Identification																
8. First Prenatal Care Visit																
9. Had Prenatal Care																
<b>Birth Outcomes</b>																
10. Birth Weight (ounces)																
11. Weeks Gestation																
12. LBW*																
13. Preterm (<37 weeks gestation)																
14. SGA*																
15. NICU*																

Note: \*Low Birth Weight\* Small for Gestational Age\* admitted to the Neonatal Intensive Care Unit. \*p < .10. \*\*p < .05. \*\*\*p < .01. Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day).

Table 3.

## Participant Prenatal Health Behaviors and Birth Outcomes by Group

Characteristic	HB (n = 101) M (SE)	CJI (n = 50) M (SE)	<i>p</i>
<b><u>Prenatal Health Behaviors</u></b>			
Smoking 3 months before pregnancy	2.50 (.17)	3.20 (.27)*	.04 <sup>a</sup>
Weeks along at pregnancy identification	7.03 (.41)	8.08 (.80)	.20 <sup>b</sup>
Weeks along at first prenatal care	10.59 (.62)	11.18 (.81)*	.57 <sup>c</sup>
Had prenatal Care	83.2%	96.0%	.03 <sup>d</sup>
<b><u>Birth Outcomes</u></b>			
Birth weight (ounces)	110.31 (1.9)	104.15 (3.2)	.08 <sup>e</sup>
Weeks gestation	38.87 (.26)	38.47 (.37)**	.38 <sup>f</sup>
LBW	.15 (.04)	.19 (.05)**	.52 <sup>g</sup>
Preterm	.13 (.04)	.17 (.05)**	.48 <sup>h</sup>
SGA	15.6%	10.4%	.39 <sup>i</sup>
NICU	15.2%	22.0%	.31 <sup>j</sup>

Note: \* race used as a covariate \*\* age used as a covariate, <sup>a</sup> ANCOVA used,  $F(1, 135) = 4.28$  <sup>b</sup> t-test  $t(146) = -1.29$  <sup>c</sup> ANCOVA  $F(1, 129) = .33$  <sup>d</sup> Chi-square  $\chi^2(1, N = 151) = 5.00$  <sup>e</sup> t-test  $t(149) = 1.75$  <sup>f</sup>

ANCOVA,  $F(1, 136) = .78$  <sup>g</sup> Binary logistic regression, Wald (1) = .42 <sup>h</sup> binary logistic regression Wald (1)

= .50 <sup>i</sup> chi-square,  $\chi^2(1) = .73$  <sup>j</sup> chi-square,  $\chi^2(1) = 1.03$

Table 4.

*Regression Analyses Predicting Smoking behavior by Interaction of Group and Food Insecurity*

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Demographic variables</i>			.11**
Race (1 = White, 2 = Non-white)	-1.17 (.29)	-.33	
<i>Step 2: Group</i>			.03*
Group (1 = HB, 2 = CJI)	.66 (.32)	.17	
<i>Step 3: Stress</i>			.07*
Food Insecurity	.22 (.36)	.19	
<i>Step 4: Interactive effect of group and stress</i>			.03 <sup>t</sup>
Group x Food Insecurity	-.39 (.22)	-.52	

*Note.* <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day) <sup>b</sup> Race was coded as 1 = White, 2 = Non-white, Group was coded as 1 = HB, 2 = CJI ; <sup>t</sup>  $p < .10$ . \* $p < .05$ . \*\* $p < .01$ ; All data are from the last step of the regression model.

Table 5.

## Regression Analyses Predicting Smoking behavior by Interaction of Group and Abuse

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Demographic variables</i>			.11**
Race (1 = White, 2 = Non-white)	-1.17 (.29)	-.33	
<i>Step 2: Group</i>			.03*
Group (1 = HB, 2 = CJI)	.66 (.32)	.17	
<i>Step 3: Stress</i>			.00
Abuse (0 = No Abuse, 1 = Abuse)	.50 (.33)	.12	
<i>Step 4: Interactive effect of group and stress</i>			.08**
Group x Abuse	-2.79 (.76)	-.89	

Note. <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day) <sup>b</sup> Race was coded as 1 = White, 2 = Non-white, Group was coded as 1 = HB, 2 = CJI ; <sup>t</sup>  $p < .10$ . \* $p < .05$

\*\* $p < .01$ ; All data are from the last step of the regression model.

Table 6.

## Regression Analyses Predicting Smoking behavior by Interaction of Group and Life Stress

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Demographic variables</i>			.11**
Race (1 = White, 2 = Non-white)	-1.17 (.29)	-.33	
<i>Step 2: Group</i>			.03*
Group (1 = HB, 2 = CJI)	.66 (.32)	.17	
<i>Step 3: Stress</i>			.04*
General Life Stress	.13 (.05)	.19	
<i>Step 4: Interactive effect of group and stress</i>			.07**
Group x General Life Stress	-.47 (.13)	-1.00	

*Note.* <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day) <sup>b</sup> Race was coded as 1 = White, 2 = Non-white, Group was coded as 1 = HB, 2 = CJI; <sup>t</sup>  $p < .10$ . \* $p < .05$ . \*\* $p < .01$ ; All data are from the last step of the regression model.

Table 7.

## Binary Logistic Regression Analysis predicting had Prenatal Care

	B	SE B	Wald	df	Exp (B)
<b>Stress Variable</b>					
Food Insecurity	-0.27	0.16	2.86 <sup>t</sup>	1	0.77
Emotion Support	0.17	0.18	0.92	1	1.19
General Life Stress	-0.10	0.09	1.19	.1	0.91
<b>Stress by group interaction</b>					
Food Insecurity x Group		1986.51	0.00		0.00
	13.91				
Abuse x Group	-0.94	1.57	0.36	1	0.39
Emotion support x group	0.17	0.49	0.11	1	1.18
General Life Stress x Group	-0.67	0.42	2.47	1	0.51

Note. <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day) <sup>b</sup> Race was coded as 1 = White, 2 = Non-white, Group was coded as 1 = HB, 2 = CJI ; <sup>t</sup>  $p < .10$ . \* $p < .05$ .

\*\* $p < .01$ ; All data are from the last step of the regression model.

Table 8.

## Regression Analyses Predicting Birth weight by Interaction of Group and Food Insecurity

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Group</i>			.02 <sup>t</sup>
Group (1 = HB, 2 = CJI)	-6.16 (3.51)	-.14	
<i>Step 2: Stress</i>			.02
Food Insecurity	.05 (1.33)	.00	
<i>Step 3: Interactive effect of group and stress</i>			.03*
Group x Food Insecurity	-5.15 (2.64)	-.57	

Note. <sup>t</sup> $p < .10$ . \* $p < .05$ . \*\* $p < .01$ ; All data are from the last step of the regression model.

Table 9.

## Regression Analyses Predicting Weeks gestation by Interaction of Group and Food Insecurity

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Demographic variables</i>			.03*
Age	-.08 (.04)	-.17	
<i>Step 2: Group</i>			.00
Group (1 = HB, 2 = CJI)	-.40 (.45)	-.08	
<i>Step 3: Stress</i>			.02
Food Insecurity	-.16 (.19)	-.09	
<i>Step 4: Interactive effect of group and stress</i>			.06*
Group x Food Insecurity	-.91 (.37)	-.78	

Note. Group was coded as 1 = HB, 2 = CJI; <sup>†</sup>  $p < .10$ . \* $p < .05$ . \*\* $p < .01$ ; All data are from the last step of the regression model.



Table 10.

## Regression Analyses Predicting Birth weight by Interaction of Group and Emotion Support

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Group</i>			.02 <sup>t</sup>
Group (1 = HB, 2 = CJI)	-6.16 (3.51)	-.14	
<i>Step 2: Stress</i>			.02
Emotion Support	1.63 (1.36)	.10	
<i>Step 3: Interactive effect of group and stress</i>			.02 <sup>t</sup>
Group x Emotion Support	4.85 (2.71)	.53	

Note. <sup>t</sup>  $p < .10$ . \* $p < .05$ . \*\* $p < .01$ ; All data are from the last step of the regression model.

Table 11.

## Regression Analyses Predicting Birth weight by Interaction of Group and General Life Stress

	B (SE)	$\beta$	$\Delta R^2$
<i>Step 1: Group</i>			.02 <sup>t</sup>
Group (1 = HB, 2 = CJI)	-6.16 (3.51)	-.14	
<i>Step 2: Stress</i>			.01
General Life Stress	-.40 (.66)	-.05	
<i>Step 3: Interactive effect of group and stress</i>			.05**
Group x General Life Stress	-4.25 (1.52)	-.79	

Note. <sup>t</sup> $p < .10$ . \* $p < .05$ . \*\* $p < .01$ ; All data are from the last step of the regression model.

Table 12.

## Binary Logistic Regression Analysis predicting Low Birth Weight, Preterm, and admittance to the NICU

Stress Variable	LBW <sup>a</sup>				Preterm				NICU <sup>b</sup>						
	B	SEB	Wald	df	Exp (B)	B	SEB	Wald	df	Exp (B)	B	SEB	Wald	df	Exp (B)
Food Insecurity	0.03	0.16	0.03	1	1.03	-0.04	0.21	0.03	1	0.96	0.07	0.16	0.19	1	1.07
Emotion Support	-0.09	0.18	0.29	1	0.91	-0.43	0.18	5.74*	1	0.65	-0.21	0.16	1.70	1	0.81
General Life Stress	-0.03	.09	.11	1	0.97	.02	0.09	0.05	1	1.02	0.07	0.09	0.64	1	1.07
<b>Stress by Group interaction</b>															
Food Insecurity x Group	0.71	0.40	3.13 <sup>c</sup>	1	2.03	0.67	0.72	0.85	1	1.95	1.13	0.33	4.47*	1	3.08
Abuse x Group	0.76	1.17	0.42	1	2.13	1.08	1.26	0.74	1	2.94	0.98	1.19	0.68	1	2.68
Emotion Support x Group	-0.45	0.39	1.31	1	0.64	-0.18	0.36	0.25	1	0.83	-0.87	.40	4.65	1	0.42
General Life Stress x Group	.50	0.22	1.36 <sup>c</sup>	1	1.65	0.23	0.21	1.19	1	1.26	0.22	0.20	1.26	1	1.25

Note: <sup>a</sup>Low Birth Weight, <sup>b</sup>Admittance to the Neonatal Intensive Care unit. <sup>c</sup> $p < .10$ , \* $p < .05$ . Group was coded as 1 = HB, 2 = CJI

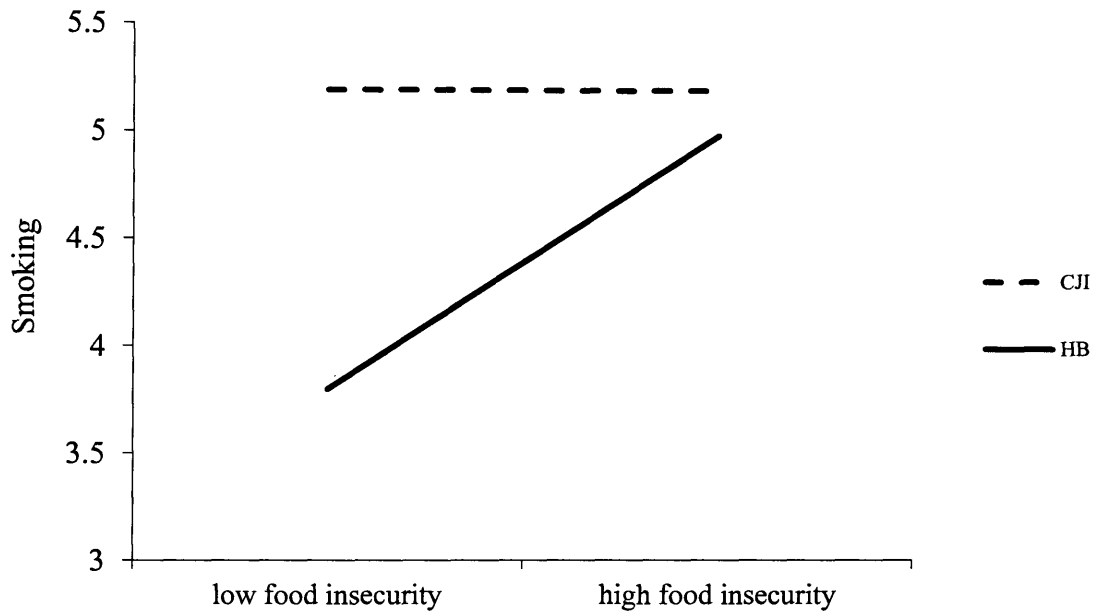


Figure 1. The Interaction of Food Insecurity and Group on Smoking. <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day). A linear regression controlling for race was conducted,  $F(4, 92) = 7.18, p < .001, t(92) = -1.80, p = .08$ . Follow-up partial correlation test controlling for race showed a significant association between smoking and food insecurity in the HB group,  $r(58) = .31, p = .01$ , but no relation in the CJI group,  $r(29) = .01, p = .95$ . Graph illustrates 1 SD above and below mean for food insecurity.

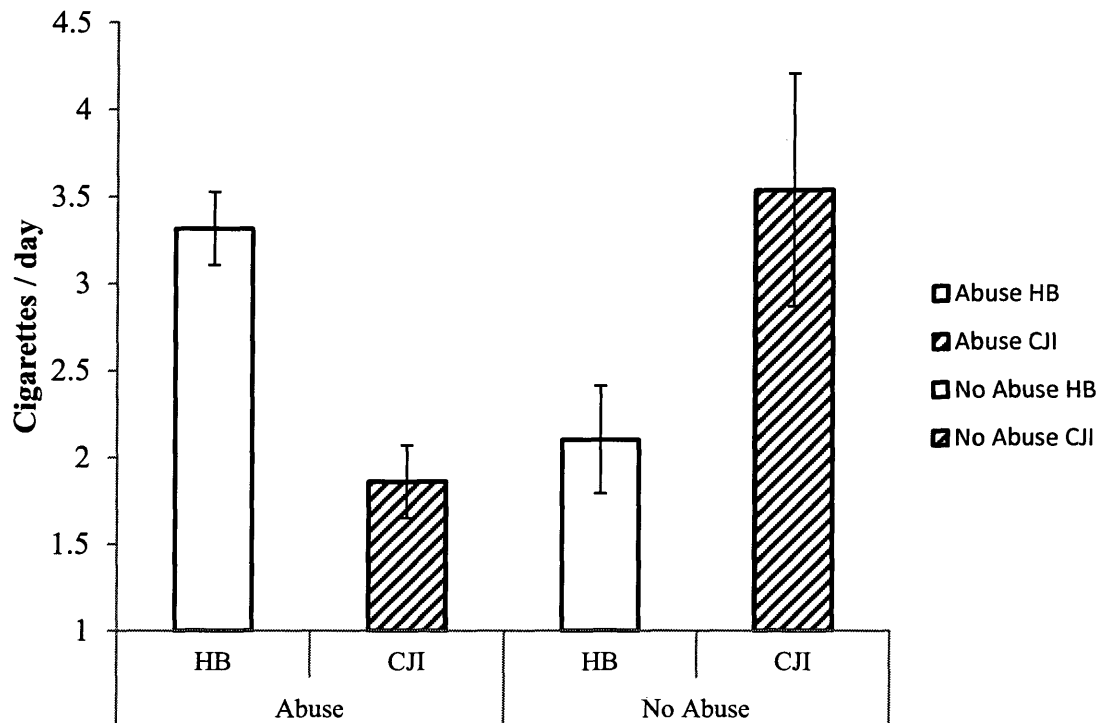


Figure 2. The Interaction of Abuse and Group on Smoking. <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day). A linear regression controlling for race was conducted,  $F(4, 130) = 9.20, p < .001, t(130) = -3.68, p < .001$ . Follow-up linear regression test controlling for race showed a significant positive association between abuse experience and smoking in the HB group,  $t(97) = 2.90, p < .01$ , but a significant negative relation in the CJI group,  $t(32) = -3.45, p < .01$ .

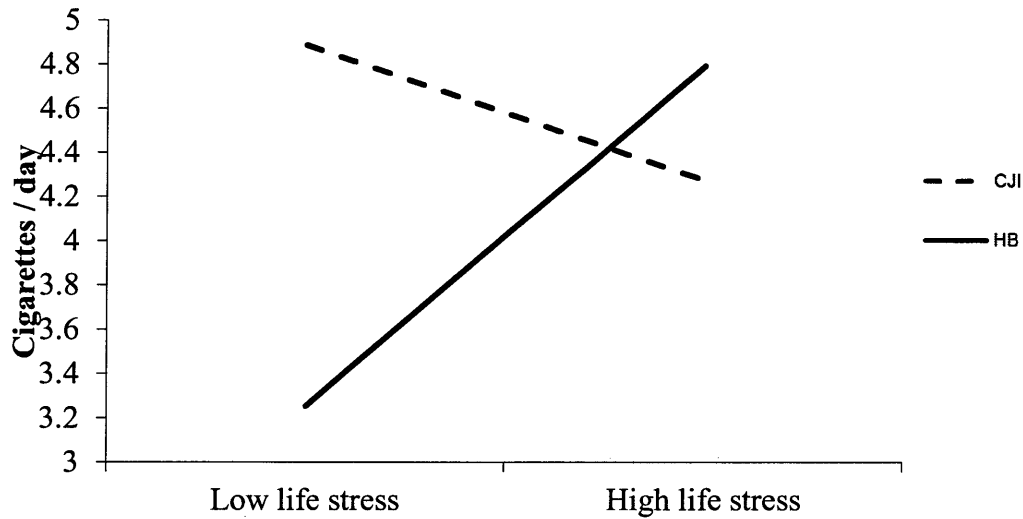


Figure 3. The Interaction of General Life Stress and Group on Smoking. <sup>a</sup>Smoking in the three months prior to pregnancy was coded on a scale of 0 (Never smoked) to 6 (41 or more cigarettes a day). A linear regression controlling for race was conducted,  $F(4, 128) = 10.07, p < .001, t(128) = -3.60, p < .001$ . Follow-up partial correlation test controlling for race showed a significant positive association between smoking and life stress in the HB group,  $r(91) = .34, p = .001$ , and a significant negative association in the CJI group,  $r(31) = -.44, p < .01$ . Graph illustrates 1 SD above and below mean for life stress.

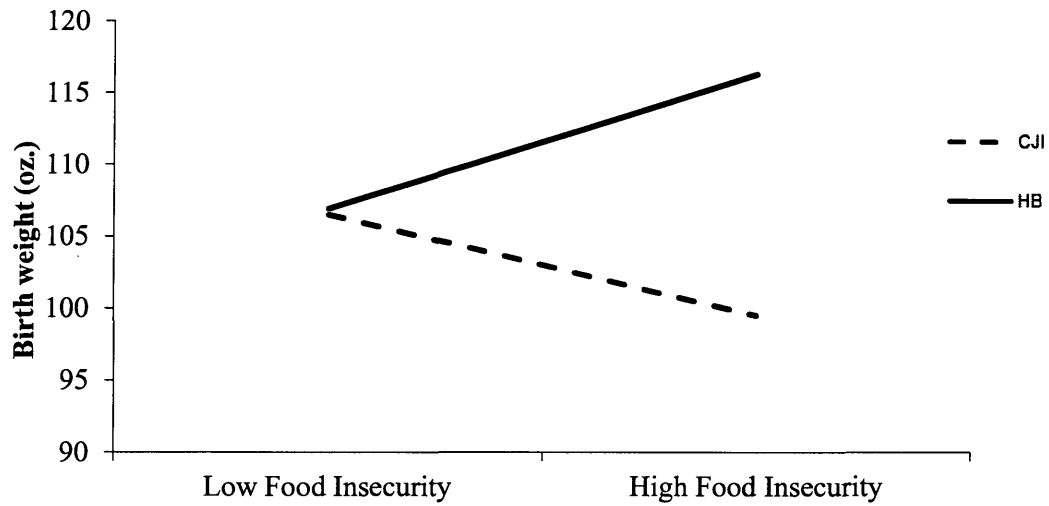


Figure 4. The Interaction of Food Insecurity and Group on Birth Weight. A linear regression was conducted,  $F(3, 104) = 2.61, p = .06, t(104) = -1.95, p = .05$ . Follow-up Pearson product moment correlation test showed that food insecurity and birth weight were not significantly correlated in the HB group,  $r(61) = .18, p = .16$  and CJ group,  $r(43) = -.19, p = .20$ . Graph illustrates 1 SD above and below mean for food insecurity.

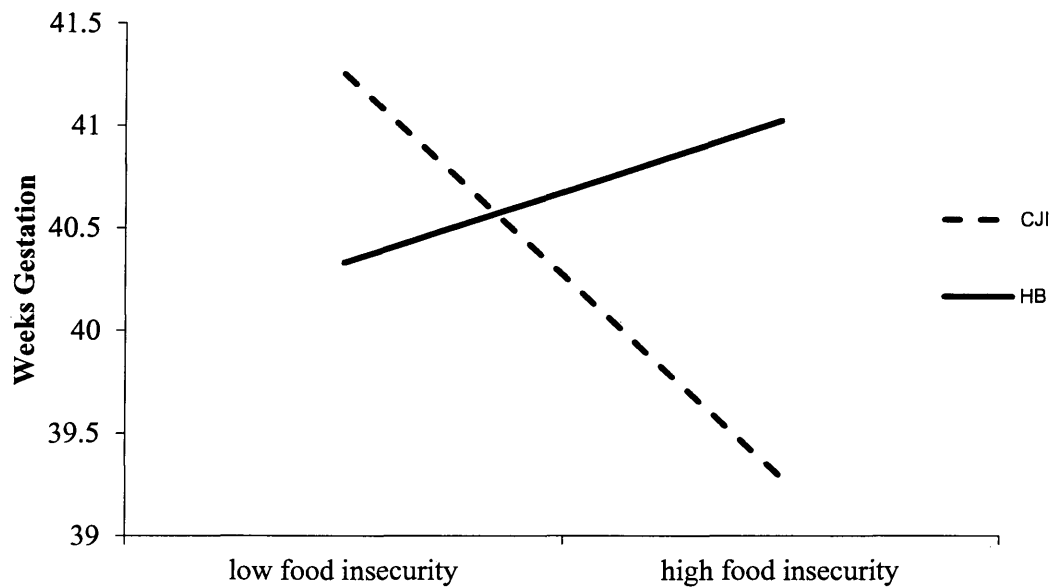


Figure 5. The Interaction of Food Insecurity and Group on Weeks Gestation. A linear regression was conducted controlling for age,  $F(4,91) = 2.85, p = .03, t(4,91) = -2.0, p = .01$ . Follow-up partial correlation test controlling for age showed a positive trend between food insecurity and weeks gestation in the HB group,  $F(50) = .37, p = .06$ , but a negative trend in the CJI group,  $r(40) = -.27, p = .09$ . Graph illustrates 1 SD above and below mean for food insecurity.



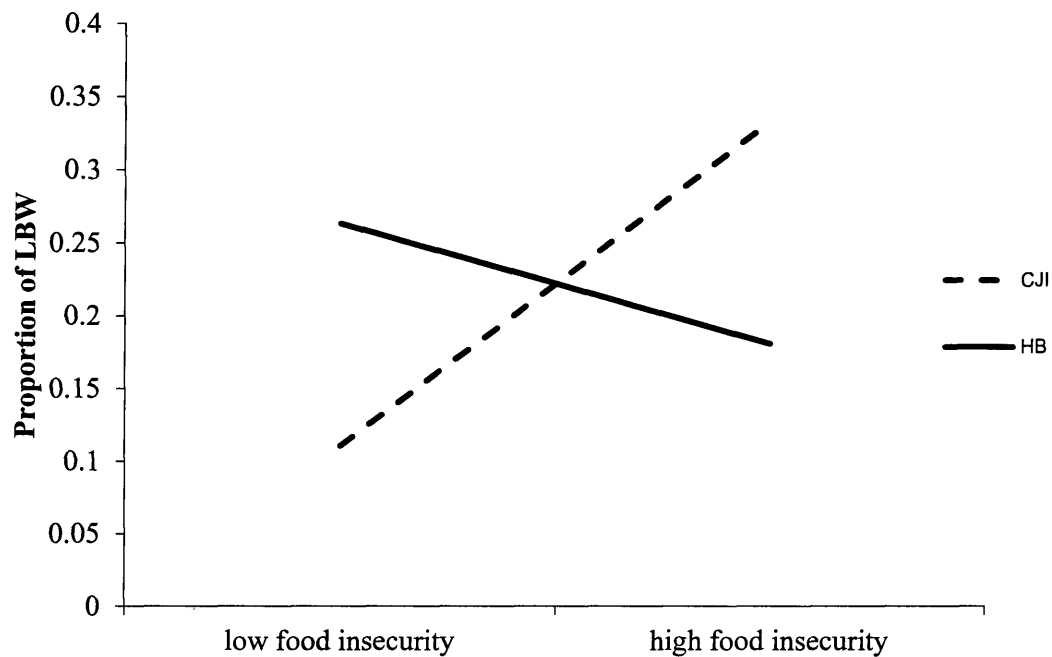


Figure 6. The Interaction of Food Insecurity and Group on LBW. A binary logistic regression was conducted controlling for age, Wald (1) = 3.13,  $p = .08$ . Follow-up binary logistic regression showed no relation between food insecurity and LBW in the HB group, Wald (1) = 1.46,  $p = .23$  and in the CJI group, Wald (1) = 2.09,  $p = .16$ . Graph illustrates 1 SD above and below mean for food insecurity.

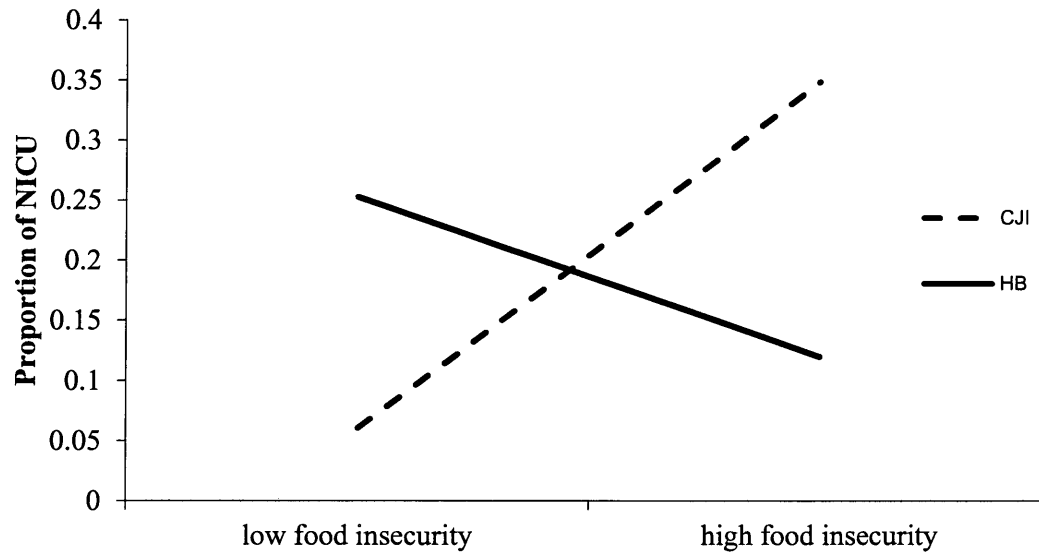


Figure 7. The Interaction of Food Insecurity and Group on NICU Admittance. A binary logistic regression was conducted controlling for age, Wald (1) = 4.45,  $p = .04$ . Follow-up binary logistic regression showed no relation between food insecurity and NICU in the HB group, Wald (1) = 2.06,  $p = .15$  and a positive association in the CJI group, Wald (1) = 4.17,  $p = .04$ . Graph illustrates 1 SD above and below mean for food insecurity.

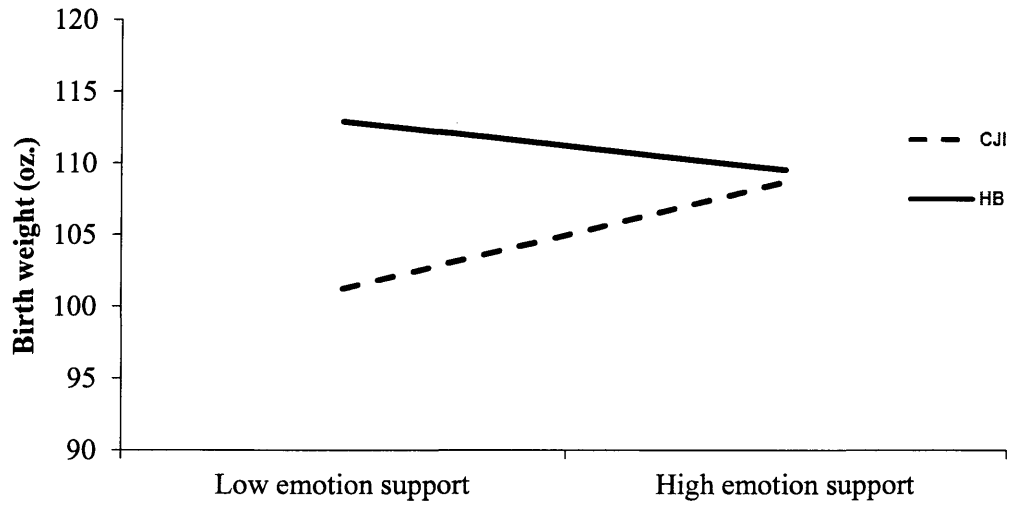


Figure 8. The Interaction of Emotion Support and Group on Birth Weight. A linear regression was conducted,  $F(3, 144) = 3.06, p = .03, t(144) = 1.788, p = .08$ . Follow-up Pearson's product moment correlation test showed no relation between emotion support and birth weight in the HB group,  $r(98) = -.03, p = .74$  but a positive trend in the CJI group,  $r(46) = .28, p = .06$ . Graph illustrates 1 SD above and below mean for emotion support.

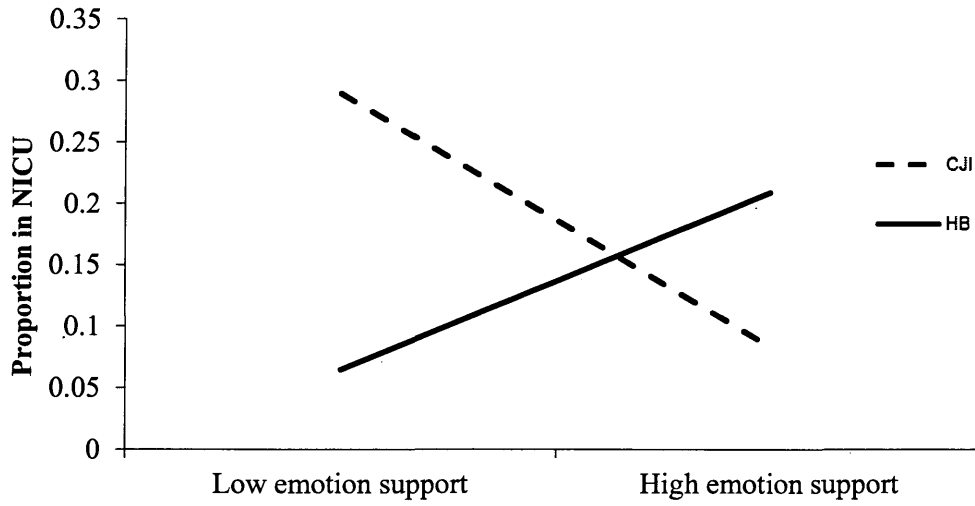


Figure 9. The Interaction of Emotion Support and Group on admittance to NICU. A binary logistic regression was conducted controlling for age, Wald (1) = 4.65,  $p = .03$ . Follow-up binary logistic regression showed no relation between emotion support and NICU in the HB group, Wald (1) = .95,  $p = .33$  and a negative association in the CJI group, Wald (1) = 5.55,  $p = .02$ . Graph illustrates 1 SD above and below mean for emotion support.

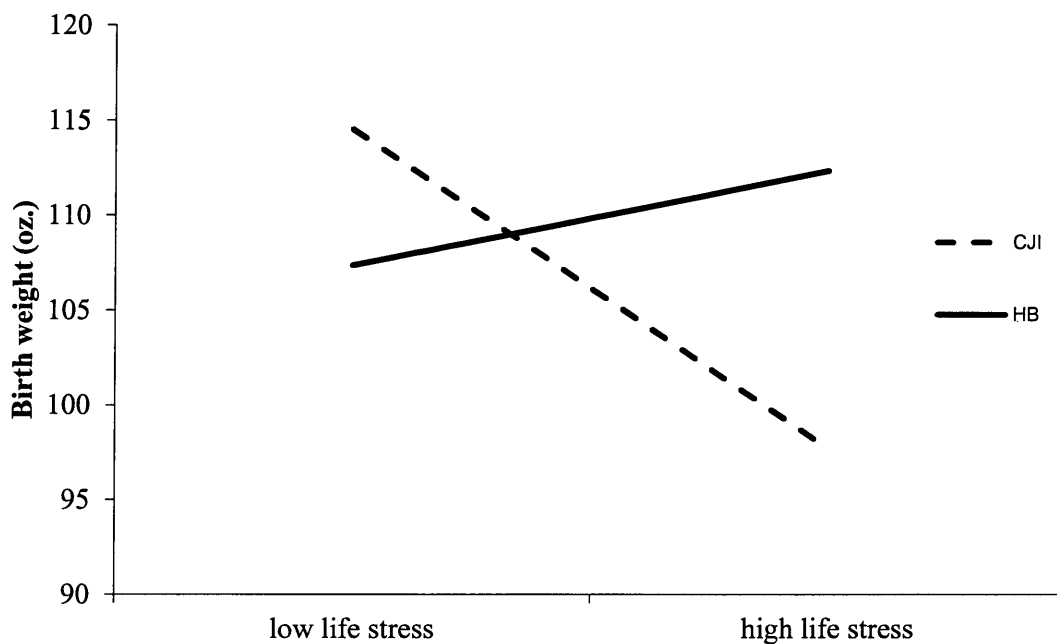


Figure 10. The Interaction of General Life Stress and Group on Birth Weight. A linear regression was conducted,  $F(3,141) = 3.899, p = .01, t(141) = -2.78, p < .01$ . Follow-up Pearson's product moment correlation test showed no relation between life stress and birth weight for the HB group,  $r(92) = .11, p = .28$  but a significant negative relation in the CJI group,  $r(46) = -.34, p = .02$ . Graph illustrates 1 SD above and below mean for life stress.

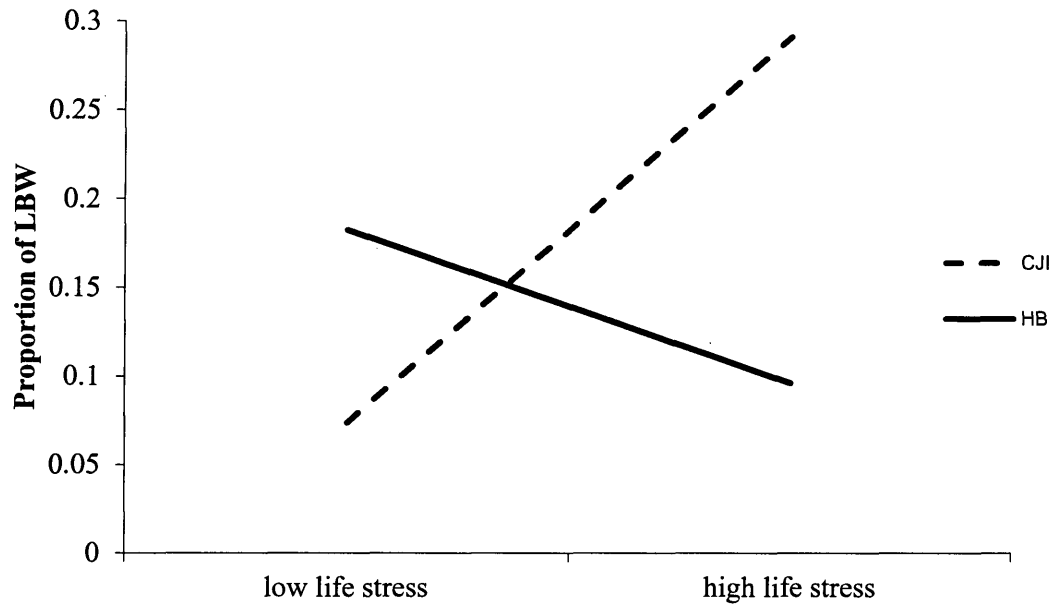


Figure 11. The Interaction of General Life Stress and Group on LBW. A binary logistic regression was conducted controlling for age, Wald (1) = 5.00,  $p = .03$ . Follow-up binary logistic regression showed no relation between life stress and LBW in the HB group, Wald (1) = 2.00,  $p = .16$ , but a positive trend in the CJI group, Wald (1) = 3.47,  $p = .06$ . Graph illustrates 1 SD above and below mean for life stress.

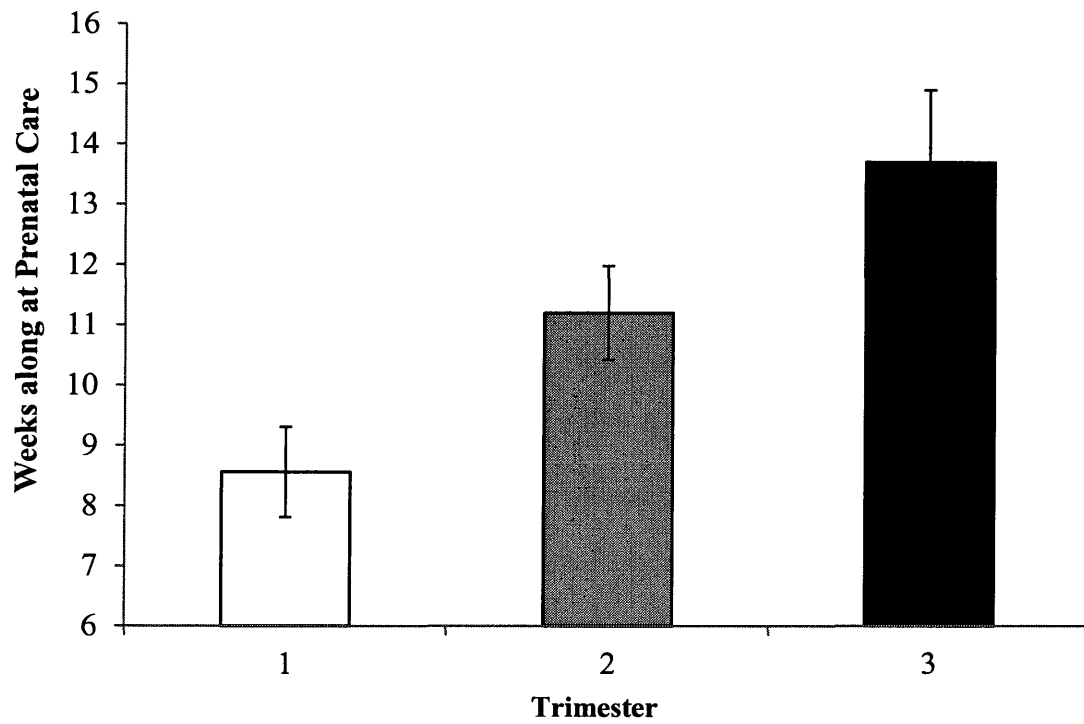


Figure 12. Trimester at Incarceration and Weeks Along at Prenatal Care. There were significant differences across trimester,  $F(2, 78) = 7.16, p < .001$ . A post-hoc Tukey test showed that there was a significant difference between first and third trimester  $p < .01$ , and second and third trimester  $p < .01$ .

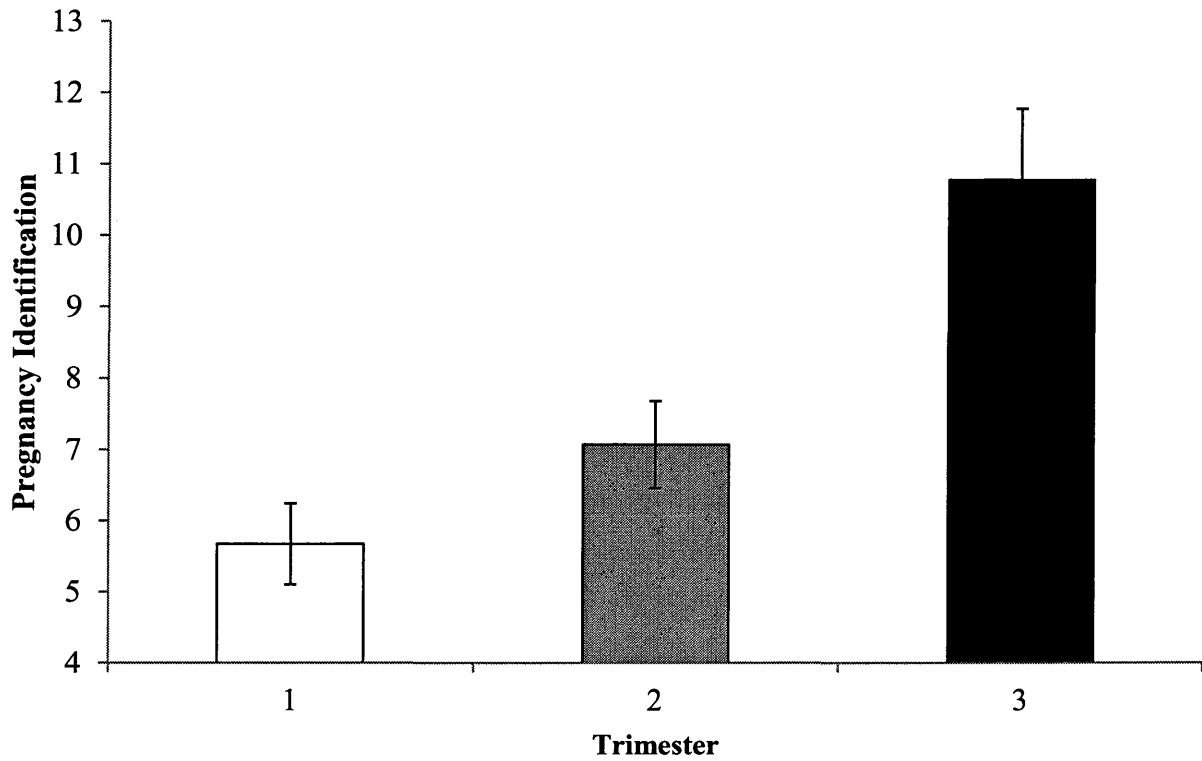


Figure 13. Trimester at Incarceration and Pregnancy Identification. There were significant differences across trimester,  $F(2, 93) = 9.92, p < .001$ . A post-hoc Tukey test showed that there was a significant difference between first and second  $p < .01$ , and second and third trimester  $p < .01$ .



### **Demographic Questions**

*To begin, we'd like to learn a little more about you.*

What is your age (in years): \_\_\_\_\_

What is your date of birth \_\_\_\_ / \_\_\_\_ / \_\_\_\_

What best describes your marital status:

SINGLE, never been married      MARRIED      DIVORCED      WIDOWED

LEGALLY SEPERATED      COHABITATING

OTHER (please describe): \_\_\_\_\_

What is your race:

White      Black      Asian      Native American

Other (please describe): \_\_\_\_\_

Are you Hispanic:

YES      NO

Which of these best describes your current level of education?

8<sup>th</sup> grade or less    Some High School      High School Graduate  
Working on GED      Completed my GED      Some College      College  
Graduate

Completed Trade or Technical School      Some education after College

Masters Degree    Doctorate Degree (e.g., MD, Ph.D., JD)      Still Attending

What is the last grade level you have completed in a school setting?

\_\_\_\_\_

What are the approximate dates of your current incarceration?

This sentence began: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ This sentence is expected to end: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Were you employed at all over the last year?      YES      NO

Did you participate in the following programs in the last year? If so, please indicate about how much you received and for how long.

Program	Amount or Yes/No	Time Frame (per week/month/year?)
WIC (Women, Infant, Children Program)		

### **Food Insecurity**

***Pregnancy can be a difficult time for some women. The next questions are about things that may have happened before and during your most recent pregnancy.***

Thinking about the last 12 months, are the following statements true or false for your situation. These things could have happened at any point over the last year.

- a. “The food that we bought just didn’t last, and we didn’t have money to get more.”

TRUE FALSE

- b. “We couldn’t afford to eat balanced meals.”

TRUE FALSE

- c. “We cut the size of meals, or had to skip meals, because there wasn’t enough money for food.”

TRUE FALSE

- d. “I ate less than I felt I should because we didn’t have enough money for food.”

TRUE FALSE

- e. “I was hungry but didn’t eat because we didn’t have enough money for food.”

TRUE FALSE

**Abuse**

During the 12 months before you got pregnant with your new baby, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any way?

- No  
 Yes

During the 12 months before you got pregnant with your new baby, did an ex-husband or ex-partner push, hit, slap, kick, choke, or physically hurt you in any way?

- No  
 Yes

During the 12 months before you got pregnant with this baby, did anyone else physically hurt you in any way?

- No  
 Yes

During this pregnancy, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any way?

- No  
 Yes

During this pregnancy, did an ex-husband or ex-partner push, hit, slap, kick, choke, or physically hurt you in any way?

- No  
 Yes

During this pregnancy, did anyone else physically hurt you in any way?

- No  
 Yes

**Emotion Support**

For this pregnancy, will you have had the kinds of help listed below if you needed them? For each one, circle Y (Yes) if you would have had it or circle N (No) if not.

- a. Someone to loan me \$50. . . . . N Y  
 b. Someone to help me if I were sick and needed to be in bed. . . . . N Y  
 c. Someone to take me to the clinic or doctor's office if I needed a ride . . . . . N Y  
 d. Someone to talk with about my problems. . . . . N Y

**General Life Stress**

This question is about things that may have happened during the previous 12 months. For each item, circle Y (Yes) if it happened to you or circle N (No) if it did not.

- a. A close family member was very sick and had to go into the hospital . . . . . N Y
- b. I got separated or divorced from my husband or partner . . . . . N Y
- c. I moved to a new address . . . . . N Y
- d. I was homeless . . . . . N Y
- e. My husband or partner lost his job. . . . . N Y
- f. I lost my job even though I wanted to go on working . . . . . N Y
- g. I argued with my husband or partner more than usual. . . . . N Y
- h. My husband or partner said he didn't want me to be pregnant. . . . . N Y
- i. I had a lot of bills I couldn't pay . . . . . N Y
- j. I was in a physical fight . . . . . N Y
- k. My husband or partner or I went to jail. . . . . N Y
- l. Someone very close to me had a problem with drinking or drugs. . . . . N Y
- m. Someone very close to me died . . . . . N Y
- n. It hasn't been safe around where I live . . . . . N Y

### **Prenatal Health Behaviors**

***The next questions are about the prenatal care you received during your most recent pregnancy.***

Prenatal care includes visits to a doctor, nurse, or other health care worker before your baby was born to get checkups and advice about pregnancy.

How many weeks or months pregnant were you when you were sure you were pregnant?  
(For example, you had a pregnancy test or a doctor or nurse said you were pregnant.)

Weeks \_\_\_\_\_ OR Months \_\_\_\_\_ OR I don't remember

How many weeks or months pregnant were you when you had your first visit for prenatal care? Do not count a visit that was only for a pregnancy test or only for WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children).

Weeks \_\_\_\_ OR Months \_\_\_\_\_

I didn't go for prenatal care

***The next questions are about smoking cigarettes around the time of pregnancy.***

Have you smoked any cigarettes in the past 2 years?

No

Yes

In the 3 months before you got pregnant, how many cigarettes did you smoke on an average day? (A pack has 20 cigarettes.)

41 cigarettes or more

21 to 40 cigarettes

11 to 20 cigarettes

6 to 10 cigarettes

1 to 5 cigarettes

Less than 1 cigarette

I didn't smoke then

## Birth Outcomes

What is the baby's birth date?

Month \_\_\_ Day \_\_\_ Year 20 \_\_\_

What was your baby's weight at birth? \_\_\_\_\_ lbs./oz.

When was your baby due?

Month \_\_\_ Day \_\_\_ Year 20 \_\_\_

***The next questions are about the time since your new baby was born.***

After your baby was born, was he or she put in an intensive care unit?

- No
- Yes

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