PSYCHOLOGICAL CONSTRUCTS AND MATERNAL WEIGHT GAIN

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Abstract

Maternal weight gain within the Institute of Medicine’s (IOM) weight gain recommendations is associated with more favorable outcomes. Despite these recommendations, research indicates that only 30-40% of women gain within IOM recommendations. The purpose of this study was to investigate the relationship between psychological constructs of self-efficacy, self-esteem, body image, and social support and maternal weight gain.

Using an exploratory survey design, data were collected from pregnant women living in a rural island community during their third trimester of pregnancy. Survey tools were used to measure the association between the demographic variables of age, education, and ethnicity, and the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain. Descriptive statistics, correlations, and ordinal logistic regression were conducted to answer research questions one and two.

There were 64 adult female participants between the ages of 19 and 40 years. All participants had a high school education or higher. This sample of women was multiethnic, with a majority represented by Native Hawaiians and Asians. In this study, the demographic variables of age, education, and ethnicity did not have a significant effect on maternal weight gain. When the psychological constructs were placed in the ordinal logistic model, self-esteem and social support were not significant, but self-efficacy and body image had a statistically significant negative effect on maternal weight gain based on IOM recommendations.

These findings indicate different approaches may be necessary to help pregnant women gain adequate weight during pregnancy. Understanding the relationship between psychological constructs related to poor maternal weight gain may help health care professionals as they provide counseling, education, and preventative health care to pregnant women.
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Chapter 1: Introduction to the Study

Chapter one describes the purpose and background of the study, provides a statement of the problem, the significance of the study, and summary.

Studies support a strong association between low maternal weight gain and low birth weight (Helms, Coulson, & Galvin, 2006; Hickey, 2000; Institute of Medicine, 1990; Kanadys, 2007; Mobasheer & Golalipour, 2007; Sekiya, Anai, Matsubara, & Miyazaki, 2007; Strauss & Dietz, 1999; Voigt, Heineck, & Hesse, 2004). Maternal weight gain within the Institute of Medicine’s (IOM) weight gain recommendations is associated with more favorable outcomes than weight gain below recommendations (Hickey, 2000; Strauss & Dietz, 1999; Valero De Bernabe et al., 2004). Despite these recommendations, research indicates that only 30-40% of women gain within IOM recommendations, and approximately 25% of women gain less than recommended (Minnesota Department of Health (DOH), 2004; Reinold, Dalenius, Smith, Brindley & Grummer-Strawn, 2009). Because of the health implications associated with poor maternal weight gain, weight gain less than recommended during pregnancy requires further investigation.

Pregnancy and Maternal Weight Gain

Pregnancy is a period of transition when the female body undergoes many rapid physical changes over 40 weeks. It involves significant weight gain and body changes moving a woman further away from the ideal body size. Maternal weight gain is related to infant birth weight; poor maternal weight gain is associated with increased immediate and long term health problems for the infant. Because of these problems, it is very important to help promote appropriate weight gain during pregnancy.

Maternal Weight Gain. There has been much controversy and changes in maternal weight gain recommendations over the past 60 years. During the first half of the 20th century, the recommendation was to restrict weight gain during pregnancy. In 1966, the textbook ‘Williams Obstetrics’ recommended weight gain of 15 pounds to prevent toxemia, difficult births, and maternal obesity (Eastman & Hellman, 1966). This restriction of weight gain was challenged in the 1960s when experts recognized high rates of infant mortality, disability, and mental retardation with low birth weights. A review of scientific evidence by the National Academy of Sciences in 1970 was then followed by
new recommendations for pregnancy weight gain of 9.0-11.4kg (19.8-25 pounds). In
1990, the Institute of Medicine made the following optimal weight gain recommendations
based on pre-pregnancy Body Mass Index (BMI); 28-40 pounds for BMI less than 19.8,
25-35 pounds for BMI of 19.8-26, and 15 pounds for high BMI of 26.1-29 (Abrams,
Altman, & Pickett, 2000). Since then, the IOM has reexamined those guidelines and are
now making the following recommendations for weight gain based on pre-pregnancy
BMI; 28-40 pounds for BMI less than 18.5, 25-35 pounds for BMI 18.5-24.9, 15-25
pounds for BMI 25-29.9, and 11-20 pounds for BMI greater or equal to 30 (Institute of
Medicine, 2009).

According to the 2010 Pregnancy Nutrition Surveillance System (PNSS), only
30.6% of pregnant women surveyed gained within IOM weight gain recommendations,
and approximately 21.5% of the women gained less than the IOM maternal weight gain
recommendations (Daleniuk, Brindley, Smith, Reinold, and Grummer-Strawn, 2012). Bish
et al. (2009) evaluated data from the 2003 Behavioral Risk Factor Surveillance System
(2835 pregnant women) and found the number of women trying to lose weight during
pregnancy doubled between 1989 and 1991. In another retrospective data analysis
looking at 1,463, 936 births in North Carolina from 1988 to 2003, Helms et al. (2006)
also found more women had inadequate maternal weight gain in North Carolina than
previously (from 7.3% in 1988 to 10% in 2000). Research also indicates that some
women intentionally attempt to lose weight (7.5%) or maintain (34.3%) their pre-
pregnant weight during pregnancy (Bish et al., 2009).

A study by Skouteris, Carr, Wertheim, Paxton, & Duncombe (2005) found most
women appeared to adapt to their changing body during pregnancy. However, women felt
less fat and less attractive in late pregnancy than before they became pregnant, and
women that were most dissatisfied with their body before pregnancy continued to feel
that way during pregnancy. These findings suggest the changes in body shape and size
during pregnancy may not be welcomed by all women.

**Infant Birth Weight.** Perinatal morbidity and mortality are more frequent in low
birth weight infants than in normal birth weight infants (IOM, 1990; Valero de Bernabe
et al., 2004). The definition of “low birth weight” refers to any baby born under 2500
grams. Following this definition, most premature (prior to 37 weeks gestation) infants
fall into the low birth weight category because they are smaller than term babies. Another classification of birth weight is, (a) small for gestational age, (b) appropriate for gestational age, or (c) large for gestational age. This classification which was first published in 1967 takes into account both birth weight and gestational age (Philip, 2005). Premature infants born under 2500 grams are considered low birth weight, however, they may be classified as appropriate for gestational age (depending on gestational age and weight). However, a term infant born less than 2500 grams would be considered low birth weight and small for gestational age, because a term infant should weigh more than 2500 grams.

Besides prematurity, there are numerous risk factors which may contribute to low birth weight. In a review by Valero de Bernabe et al. (2004), risk factors for having a low birth weight infant identified in research include: genetic and environmental factors, maternal age (below 19 and over 35), ethnicity, marital status, educational level, socioeconomic level, pre-existing diseases (e.g., autoimmune, renal, and genitourinary diseases, hypertension, and diabetes), obstetrical history, placental causes, infection, bleeding, anemia, fetal congenital anomalies, weight gain and maternal nutrition.

In reviewing risk factors associated with having a low birth weight infant, maternal nutrition and weight gain are modifiable behavioral factors which can influence birth weight outcomes. Pregnant women can promote optimal health related to preexisting diseases (monitor blood glucose levels, take medications needed to control blood pressure and other health problems), however, maternal diet and weight gain are the only modifiable behavioral factors (given the necessary resources) a pregnant woman may have complete control over. Adequate maternal weight gain is very important because of the association between low maternal weight gain and low birth weight (Hickey, 2000; Institute of Medicine, 1990; Mobasheri & Golalipour, 2007; Sekiya et al., 2007; Strauss & Dietz, 1999; Voigt et al., 2004), and less optimal fetal outcomes (Strauss & Dietz, 1999; Valero De Bernabe et al., 2004).

**Maternal Weight Gain and Birth Weight – Hawai‘i.** Hawai‘i is comprised of a chain of 132 islands. Most people think of eight main islands when thinking of Hawai‘i, as the other 124 islands cover approximately 3 square miles and are uninhabited (NETSTATE.COM, 2011). The total population in Hawai‘i in 2010 was 1,360,301
According to the Hawai‘i State Department of Health’s Vital Statistics Report for 2009, there were 18,891 births in the state of Hawai‘i in 2009 (State of Hawai‘i, 2011).

The island with the greatest land mass is the Hawai‘i Island, also called Hawai‘i County. In 2010, the total population in Hawai‘i county was 185,079, indicating an increase of 24.5% over the previous 10 years (State of Hawai‘i, Department of Business, Economic Development and Tourism, 2013). The city of Hilo is the second largest city in the state of Hawai‘i and is located on the eastern side of Hawai‘i Island. Hawai‘i Island had a total of 2342 births in 2009; 1129 births were in Hilo, and 1213 births in the rest of Hawai‘i county (State of Hawai‘i, 2011). The Hilo Medical Center is located in Hilo, and is the largest hospital on Hawai‘i Island, averaging about 1200 births a year (Christina Ranan, personal communication, October 7, 2011). There are eight physicians that work in offices and clinics in Hilo which provide prenatal care and deliver babies at the Hilo Medical Center (Christina Ranan, personal communication, October 7, 2011).

The 2010 PNSS (Dalenius et al., 2012) reported the national percent of pregnant women gaining less than the IOM weight gain recommendations was 21.5%. A summary of national data (CDC, 2010) on maternal weight gain revealed Asian/Pacific Islanders (API) had the highest percent of weight gain less than IOM recommendations: Asian/Pacific Islander-26.6%; Black, not Hispanic-23.7%; Hispanic-23.4%; American Indian/Alaskan Native-20.6%; multiple races-19.2%; white, not Hispanic-18.7%; all other/unknown-20.9. According to this same data set, 18.9% of pregnant women surveyed in Hawai‘i gained less than recommended.

According to the CDC (Martin et al., 2011), 8.16% of babies in the United States were born at a low birth weight in 2009. Hawai‘i State had a rate of 8.4% which is close to the national average. However, one of the Healthy People 2020 objectives (MICH-8.1) is to reduce the number of low birth weights to 7.8% percent (USDHHS, 2011).

It is important to keep in mind that birth weights reported in these data tables are adjusted for gender, but standardized according to babies born to white mothers. Research suggests that mean birth weights may vary according to ancestry, culture and ethnicity, and maternal height and weight. According to Fuentes-Afflick and Hessol
(1997), the risk for low birth weight among Asian women may be influenced by national origin. These authors evaluated 272,960 California birth certificates from births which occurred in 1992; 50,094 were Asian births and 221,866 white births. They found low birth weights among Cambodian, Filipino, Indian, Japanese, Laotian, and Thai women were higher than among Chinese, Korean, and Vietnamese women. These study findings are interesting, as they demonstrate that although many studies combine these races/ethnicities, and group them into one category, there are differences within this group. These studies do not provide an explanation for these differences, however, it could be postulated there is a genetic difference between races/ethnicities which affect birth weight. Another study by Fuentes-Afflick, Hessol, and Perez-Stable (1998) did not find a difference between birth weights of children born to foreign-born or U.S.-born Asian women, and stated both groups had similar risk factors associated with low birth weight (primiparity, adequate prenatal care, premature gestation, older maternal age). In contrast to the study by Fuentes-Afflick et al. (1998), a systematic literature review by Urquia et al. (2010) looking at 24 studies involving more than 30 million singleton births found foreign born migrant women (except Hispanic women) were more likely to have a low birth weight infant than white women. This study found birth weights are not uniform and are dependent on maternal race/ethnicity, migrant status, and region of origin. The World Health Organization (WHO, 2003) recommends that a “reference distribution for birth weight should be developed for different populations and ethnic groups based on observations of low-risk healthy pregnant women and their fetuses and neonates” (WHO, 2006). As of this date, specific birth weight tables have not been developed for all the different race/ethnicity groups. Although there is an association between maternal weight gain and birth weight, the scope of this study will be focused on the mother.

**Significance of the Study**

The state of pregnancy is a time associated with great changes in the female body size and shape. A study by Skouteris et al. (2005) indicates that changes in weight and shape may not be welcomed by all pregnant women. During this transitional period in a woman’s life, feelings related to self and physical changes may emerge and influence women’s intentions to gain or lose weight during pregnancy.
Maternal weight gain concerns may be related to overall weight gain concerns evident among non-pregnant populations. A strong correlation has been found between weight gain concerns and disordered eating behaviors among various populations. Studies show support that poor self-efficacy (Bardone-Cone, Abramson, Vohs, Heatherton, & Joiner, 2006; Berman, 2006; Etringer, Altmaier, & Bowers, 1989), poor self-esteem (Daley, Jimerson, Heatherton, Metzger, & Wolfe, 2008; Mintz & Betz, 1988; Neumark-Sztainer, Wall, Story, & Sherwood, 2009), and poor body image or body dissatisfaction (Bener & Tewfik, 2006; Brannan & Petrie, 2008; Mintz & Betz, 1988; Neumark-Sztainer, Wall, Story, & Perry, 2003; Stein & Corte, 2007; Stice, 2001) are risk factors for eating disorders. Another study found social support can have a strong influence on dieting (Anderson, Winett, & Wojcik, 2007). Other studies found positive self-efficacy is associated with improved nutrition among men (Anderson et al., 2007; Annesi & Gorjala, 2010; Hofstetter, Sallis, & Hovell, 1990), women (Anderson et al., 2007; Annesi & Gorjala, 2010; Gutiérrez-Doña, Lippke, Renner, Kwon, & Schwarzer, 2009; Hofstetter et al., 1990), female athletes (Abood, Black, & Birnbaum, 2004), adolescents (Long & Stevens, 2004), and children (Geller, Dzewaltowski, Rosenkranz, & Karteroliotis, 2009).

Great emphasis is placed on appearance, weight, and the pressure to stay thin (Haas & Gregory, 2005; Owen & Laurel-Seller, 2000; Rodin, 1993; Wiseman, Gray, Mosimann, & Ahrens, 1992). Increased weight concerns during pregnancy may influence a woman’s adherence to weight gain recommendations. Perhaps the same psychological factors associated with abnormal eating habits among non-pregnant populations also affect women’s intentions to gain or lose weight during pregnancy. Understanding whether these psychological constructs may influence a woman’s decision to gain the recommended amount of weight during pregnancy may have implications for nursing practice.

Inadequate maternal weight gain is associated with low birth weight, and low birth weight is associated with poor perinatal outcomes (Helms et al., 2006; Hickey, 2000; Mobasher & Golalipour, 2007; Reinold et al., 2009; Sekiya et al., 2007; Strauss & Dietz, 1999; Valero De Bernabe et al., 2004; Voigt et al., 2004). Research also shows support for an association between low birth weight and adult disease later in life.
(Christian P., Stewart C.P., 2010; Kanaka-Gantenbein C., 2010; Nguyen, L.T., Muhlhausler, B.S., Botting, K.J., & Morrison, J.L., 2010; Reuda-Clausen, C. F., Morton, J. S., & Davidge, S. T., 2011; University of Adelaide, 2011). Although maternal weight gain within IOM recommendations is associated with better pregnancy outcomes (Beyerlein, Lack, & von Kries, 2010; Vesco et al., 2011), more women are gaining inadequate amounts of weight during pregnancy than previously (Helms et al., 2006; Minnesota DOH, 2004; Wells & Murray, 2003). Studies also indicate that some women intentionally attempt to lose weight (7.5%), or maintain (34.3%) their pre-pregnancy weight during pregnancy (Bish et al., 2009). These statistics are significant and warrant an investigation of possible modifiable behavioral risk factors for inadequate weight gain during pregnancy.

Summary

Humans are complex beings with multidimensional characteristics, a composite of their genetic makeup and experiences from various environments, cultures, and belief systems. All these factors affect an individual’s perceptions and decisions in relation to health. It is important that health care providers understand whether personal modifiable factors are associated with poor maternal weight gain. Understanding factors that influence maternal weight gain can help health care professionals identify strategies necessary to promote better prenatal care and optimize outcomes. For example, nurses working in healthcare settings which provide prenatal care can provide education and counseling to women that are not gaining enough weight during pregnancy. This nutritional counseling as an early intervention can improve pregnancy outcomes which have implications for the immediate and long term health of newborns.

Maternal health nursing is unique as care is provided to two individuals at once; the pregnant woman and developing fetus. Maternal physical and psychological well being should always be considered when providing care to a pregnant woman. Nurses working in this area must be aware of health behaviors that could impact pregnancy outcomes. Maternal health education should include awareness and identification of poor maternal weight gain, and interventions to help women improve nutrition and promote appropriate weight gain during pregnancy.
Although much research has shown better outcomes for babies born to mothers who gain within IOM recommendations, some women continue to gain less weight than recommended. More research is needed to better understand psychological factors which may influence weight gain during pregnancy. The purpose of this study is to examine whether a relationship exists between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain based on IOM recommendations.
Chapter 2: Review of the Literature

Chapter two begins with a discussion on psychological constructs related to dieting and weight behaviors among non-pregnant populations. This is followed by a review of the literature on psychological constructs related to pregnancy outcomes of maternal weight gain and birth weight. Studies reviewed for this paper were published between 1990 and 2013. The databases utilized for this review include EBSCOhost, OVID, PubMed, Science Direct, and CINHL.

Social Pressures to be Thin

Physical attractiveness is highly valued and related to status and influence in America (Haas & Gregory, 2005). The media has a great influence on dictating standards of beauty and tends to focus on the young and thin representing physical attractiveness. Over the past 50 years, the ideal feminine body size has gotten thinner (Owen & Laurel-Seller, 2000; Rodin, 1993; Wiseman et al., 1992), making it very hard for women to obtain this idealized body size. For some women, this may contribute to poor self-esteem, body dissatisfaction, and unhealthy eating disorders (Daley et al., 2008; Rodin, 1993; Annus, Smith, & Masters, 2008; Chen & Jackson, 2009; Dalley, Buunk, & Umit, 2009; Grabe, Ward, & Hyde, 2008; Halliwell & Dittmar, 2004; Hamilton, Mintz, & Kashubeck-West, 2007; McElhone, Kearney, Giachetti, Zunft, & Martinez, 1999; Wood & Petrie, 2010).

Psychological Constructs Related to Weight Behaviors

Dieting and weight loss behaviors are prevalent among many groups of people (Jacob, 2001; McElhone et al., 1999; Mintz & Betz, 1988; Viner et al., 2006). Some factors associated with unhealthy weight related behaviors include poor self-efficacy (Bardone-Cone et al., 2006; Berman, 2006; Etringer et al., 1989), poor self-esteem (Daley et al., 2008; Mintz & Betz, 1988; Neumark-Sztainer et al., 2009), body dissatisfaction (Bener & Tewfik, 2006; Boivin, Polivy, & Herman, 2008; Brannan & Petrie, 2008; Stein & Corte, 2007; E. Stice, 2001; E. Stice, Mazotti, Weibel, & Agras, 2000), and poor social support (Juda, Campbell, & Crawford, 2004).

Self-efficacy. Self-efficacy is a person’s self-evaluation of their ability to perform behaviors and achieve a specific outcome within a given situation (Bandura, 1997). It is associated with effort and motivation, correlates with self-esteem, depressive thinking
and anxiety, and is an important determinant of behavior (Bandura, 1986, 1989). Self-efficacy differs in different situations and refers to one’s capability to organize and execute a specific course of action within a specific situation. Albert Bandura outlined the processes and influence of self-efficacy on behavior. He noted that positive self-efficacy was associated with high goal setting and the increased likelihood to visualize success. He also found individuals with low self-efficacy were more likely to visualize failure. According to Albert Bandura (1986), positive self-efficacy and the belief that one can successfully accomplish a specific behavior, is a major determinant of the choice of activity, the amount of effort expended in the behavior, and length of time efforts will persist.

Studies support the relationship between poor self-efficacy and unhealthy weight related behaviors. Etringer et al. (1989) investigated cognitive function among 23 nonbulimic and 18 bulimic women, and found bulimic women had a lower sense of general self-efficacy. Bardone-Cone et al. (2006) found that overweight women with high levels of perfectionism reported the most number of weeks of binge eating only if they also had a low sense of self-efficacy. A study conducted by Pinto, Heinberg, Coughlin, Fava, and Guarda (2008) on 104 females in an inpatient behavioral eating disorders program, found higher levels of self-efficacy was related to shorter hospitalization and less self-reported eating disorder psychopathology. Another study on 116 women (Pinto, Guarda, Heinberg, & Diclemente, 2006) also found patients with anorexia nervosa and bulimia nervosa reported lower levels of self-efficacy compared to patients in partial remission. Berman, (2006) also found lower eating self-efficacy was associated with greater disordered eating thoughts and behaviors among 219 men and women.

Many tools have been developed to measure self-efficacy. Some studies use surveys to measure general self-efficacy (Bardone-Cone et al., 2006), while others measure specific self-efficacy, including; self-regulatory efficacy (Anderson et al., 2007), eating self-efficacy (Berman, 2006), weight/shape self-efficacy (Cain, Bardone-Cone, Abramson, Vohs, & Joiner, 2008), positive mood self-efficacy (Chang, Nitzke, Brown, & Baumann, 2011), weight control self-efficacy (Dennis & Goldberg, 1996), maternal parental self-efficacy (Leahy-Warren, McCarthy, & Corcoran, 2011; Linde, Rothman,
Baldwin, & Jeffery, 2006), smoking cessation, exercise, and diet self-efficacy (Meland, Maeland, & Laerum, 1999).

**Self-esteem.** Self-esteem is different than, but related to self-efficacy, and refers to the “subjective self evaluation of worth” (Bandura, 1986). According to Brown, Dutton, and Cook (2001), self-esteem refers to “a general fondness or love for oneself” which is developed early in life and is relatively enduring across time and situations. Global self-esteem refers to an overall evaluation of self-worth and is associated with psychological well-being. Beneath the overall domain of global self-esteem are more specific domains of self-esteem related to beliefs about personal abilities and attributes (Brown et al., 2001). Brown et al. (2001) distinguish the difference between global self-esteem and other terms like self-evaluations and feelings of self-worth which have also been used to refer and/or equate with self-esteem. Self-evaluations or self-appraisals refer to the way people appraise specific abilities or characteristics. Feelings of self-worth are positive momentary emotional states. Subjective self evaluation is influenced by cultural values, and based on whether personal attributes are culturally deemed as having positive or negative value, based on a comparison of personal and social roles and identity, and the reactions of others (Solomon, Greenberg, & Pyszczynski, 1991).

Weight concerns affect many people and can impact self-esteem. Internalization of the thin ideal and the belief that benefits will occur with weight loss are associated with low self-esteem and unhealthy eating behaviors (Annus et al., 2008; Boivin et al., 2008; Halliwell & Dittmar, 2004). Studies also indicate poor self-esteem is a risk factor for eating disorders (Daley et al., 2008; Mintz & Betz, 1988; Neumark-Sztainer et al., 2009). The study by Daley et al. (2008) looking at self-esteem among 20 women with bulimia, 20 women that had recovered from bulimia nervosa, and 42 women with no history of an eating disorder, found that individuals with a history or current bulimia nervosa had lower self-esteem than women with no history of an eating disorder. Another study by Mintz and Betz (1988) investigating the prevalence of eating disordered behaviors among 682 college women, found a high percentage of women engaged in extreme dieting behaviors like laxative use, diet pills, or self induced vomiting (2% engaged daily; 8% weekly; 19% monthly). Mintz and Betz (1988) also found that women with eating disorders have lower self-esteem than women without an eating
disorder. Neumark-Sztainer et al. (2009) attempted to identify predictors for disordered eating among 412 overweight adolescents (180 males, 232 females), and found that higher self-esteem was associated with a lower prevalence of disordered eating among women.

**Body image.** Body image represents a person’s subjective experience with their body and how they organize that experience. According to Grabe et al. (2008), “body image concerns are multidimensional and include thoughts, feelings, and behavioral responses related to one’s body. Psychological determinants of body image focus on the body, including attractiveness and self worth, as well as a pressure to succeed (McElhone et al., 1999; Rodin, 1993). Body dissatisfaction refers to a negative subjective evaluation of one’s physical body (Brannan & Petrie, 2008; Grabe et al., 2008; Stice & Whitenton, 2002).

Some identified risk factors related to body dissatisfaction include expectancies: the belief for positive rewards with weight loss, and internalization: internalizing beliefs and attitudes of the thin ideal (Annus et al., 2008; Boivin et al., 2008; Halliwell & Dittmar, 2004). Studies indicate that poor body image, or body dissatisfaction is related to eating pathology and unhealthy weight loss behaviors (Brannan & Petrie, 2008; Mintz & Betz, 1988; Stice, 2001). Brannan and Petrie (2008) investigated the relationship between body dissatisfaction and disordered eating among 398 undergraduate women, and found body dissatisfaction was strongly related to eating pathology. Mintz and Betz (1988) found that among 682 women at the Ohio State University, only 33% reported “normal eating habits” (other categories included: chronic dieters, bingers, purgers, subthresholds, bulimics), and women with eating disorders had lower levels of overall self-esteem, body image, and beliefs about attractiveness than women with normal eating habits. Stice (2001) also found that body dissatisfaction prospectively predicted increased dieting among 231 adolescent girls from two private high schools in northern California.

**Social support.** Social support refers to support provided by others in the context of interpersonal relationships and is viewed as an important aspect of well being (Cooke, Rossmann, Hamilton, & Patterson, 1988). According to the SCT, the environment, person, and behavior are constantly changing and influencing each other. The
“environment” consists of factors external to the person, as people exist and interact within a series of relationships (family and community). Structural elements in the form of social relationships are often referred to as a network (family, friends, and connections to professional organizations). These social relationships provide connections to people (formally and informally) which demonstrate models for behavior and feedback which influence the way people think and behave. Actions between individuals are affected and determined by social norms and cultural influence, as appropriate actions are taken in an effort to achieve a specific goal (VonDras & Madey, 2004). According to Bandura, “physically rewarding experiences often occur in conjunction with expressions of interest and approval of others” (Bandura, 1986, p. 235). People interact with others based on how they expect other people to behave, and personal relationships play an important part on identity, social norms and attitudes, decision making, and coping.

According to Winemiller, Mitchell, Sutliff, and Cline (1993), the concept of social support is multi-faceted, complex, difficult to conceptualize, and many researchers do not clearly define the theoretical perspectives of social support when doing research. Social theories differ on operational definitions ranging from psychological to economical aspects of social support (Hupcey, 1998). Studies investigating the relationship between social support and health outcomes define and assess social support in different ways. Some researchers have emphasized the importance of structural social support, which refers to the amount of supportive resources available, while others have focused on functional social support, which refers to actual or perceived emotional and instrumental support (Dobkin, De, Paraherakis, & Gill, 2002).

Studies indicate that social support has a strong influence on dieting, health behaviors, and disordered eating behaviors (Anderson et al., 2007; Bodell, Smith, Holm-Denoma, Gordon, & Joiner, 2011; Juda et al., 2004). Anderson et al. (2007) found social support indirectly (mainly self-efficacy) contributed to healthier nutrition among 712 churchgoers in southwestern Virginia. Juda et al. (2004) found that undergraduate women (n=102) who perceived greater amounts of social support from their family and romantic partners reported lower levels of disordered eating attitudes. In another study investigating the relationship between social support, negative life events, and disordered eating, Bodell et al. (2011) found that low social support and a greater number of
negative life events predicted increased bulimic symptoms among 270 female undergraduates.

Social support has indications for application to health and well being. Numerous social support measures have been developed and used in studies examining the relationship between social support and health outcomes (US Department of Health and Human Services (USDHHS), nd.). According to Broadband, Gehlbach, Gruy, and Kaplan (1988), the quality of social support, or functional support, is a stronger predictor of health outcomes than other types of social support. Four types of functional support are frequently used in research including: emotional, instrumental, informational, and appraisal support (Langford, Bowsher, Maloney, & Lillis, 1997; Sherbourne and Stewart, 1991). Emotional support involves the ability for people within the social network to meet emotional needs like caring, affection, and validation of feelings. Informational support refers to support in terms of capacity for knowledge and how to behave in situations. Appraisal support refers to social exchanges that promote positive self-evaluations like constructive feedback, affirmation and social comparison. Instrumental or tangible support refers to actual helping or supporting behaviors. According to Pachana, Smith, Watson, McLaughlin, and Dobson (2008), instrumental and emotional support are studied more than other types of social support.

Psychological Constructs Related to Maternal Weight Gain

A narrative approach was used to review psychological constructs (self-efficacy, self-esteem, body image, and social support) related to pregnancy outcomes (maternal weight gain and fetal birth weight). The narrative approach allows the use of different methodologies to study an identified problem (Aranda & Knight, 1997; Dilworth-Anderson, Williams, & Gibson, 2002). Studies reviewed for this paper were published between 1990 and 2013. The databases utilized for this review include EBSCOhost, OVID, PubMed, Science Direct, and CINHL. The main keywords included pregnancy, maternal body image, (low) maternal weight gain, body image, low birth weight, self-esteem, self-efficacy, and social support. References mentioned in the research studies investigating maternal weight gain were also examined. A total of 85 studies were reviewed, and 16 were used for this review. Only studies that investigated the constructs of self-efficacy, self-esteem, body image and social support, and their relationship to
pregnancy weight gain (poor maternal weight gain and low birth weight) were included in this review. This paper is organized to look at each of the constructs and their relationship to maternal weight gain.

A descriptive summary of studies is presented in Appendix A, and a discussion of the findings is provided. The following section will discuss these studies based on findings of self-efficacy, self-esteem, body image, and social support and the pregnancy outcomes of maternal weight gain and birth weight. Study results will be presented in terms of study design, purpose, theory, sample, measures and salient findings.

**Self-efficacy and pregnancy outcomes.** Self-efficacy is a person’s self evaluation of their ability to perform behaviors and achieve a specific outcome within a given situation (Bandura, 1977). It is associated with effort and motivation, and correlates with self-esteem, depressive thinking and anxiety, and is an important determinant of behavior (Bandura, 1986, 1989).

**Purpose.** Two studies (Olson & Strawderman, 2003; Wright, Bilder, DeBlasis, Mogul, Rubin, & Shea, 2013) were found that looked at the relationship between self-efficacy and gestational weight gain (see Table A1). These studies sought to investigate whether the psychological factors of locus of control, self-efficacy, and attitudes towards weight gain in pregnancy, feelings about motherhood, career orientation, and social support were related to gestational weight gain.

**Research Design.** Two methods of data collection were used for this study by Olson and Strawderman (2003). Questionnaires were mailed to women during mid-pregnancy, and obstetrical records were reviewed after delivery. The study by Wright et al. (2013) used surveys collected by community health workers that provided monthly home visits to 101 postpartum women.

**Sample.** Olson and Strawderman (2003) had a sample size of 622 pregnant women which were recruited from clinics in Upstate New York. Wright et al (2013) had a sample size of 101 low income post partum women living in an urban part of Pennsylvania. The majority of women in the study by Wright et al. (2013) were of Black (66%) and Hispanic (22%) ethnicity.

**Measures.** According to Olson and Strawderman (2003), survey items used to measure self-efficacy were reported to have validity and reliability by Kendall, Olson, C.
and Frongillo (2001). The self-efficacy items evaluated in the study by Kendall et al. included two items reflecting control of food intake, two addressing confidence about getting regular exercise after pregnancy, three related to confidence about returning to pre-pregnancy weight and shape, and one related to food intake. Wright et al. (2013) developed five items to measure self-efficacy for healthy eating drawing from the theory of planned behavior and Bandura’s theory of perceived self-efficacy.

**Salient Findings.** Only variables that were related to inadequate or excessive weight gain were retained and reported in the study by Olson and Strawderman (2003). A backward elimination scheme was used to reduce factors not significant at the P<.05 level. Feelings about motherhood, career orientation, and social support were related to gestational weight gain; but self-efficacy, locus of control, and attitudes toward weight gain in pregnancy were not significant, and no further discussion was reported in the discussion and conclusion section (Olson & Strawderman, 2003). The study by Wright et al. (2013) looked at psychosocial factors (i.e. weight locus of control, self-efficacy for healthy eating, and perinatal depression) associated with maternal weight gain and found higher locus of control and self-efficacy were associated with lower maternal weight gain. No other studies emerged investigating self-efficacy and maternal weight gain.

**Self-esteem and pregnancy outcomes.** Weight gain and associated body changes during pregnancy may be of great concern for some women, especially among those with poor self-esteem. Investigating whether personal adaptive resources like self-esteem affects pregnancy outcomes is important. The following studies looked at the relationship between self-esteem and the pregnancy outcomes of maternal weight gain and birth weight.

**Purpose.** Four studies (see Table A2) were found that investigated the psychological construct of self-esteem and its relationship to maternal weight gain and birth weight (Cameron et al., 1996; Hickey, Cliver, Goldenberg, McNeal, & Hoffman, 1995; Neggers, Goldenberg, Cliver, & Hauth, 2006; Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999). All four studies examined the relationship between weight gained during pregnancy and psychological well-being. The purpose of the study by Cameron et al. (1996) was to investigate whether greater weight gain during pregnancy contributed to higher levels of depressive symptomatology for women with lower self-esteem. This
study also attempted to identify whether depressive symptomatology would be more pronounced in later pregnancy, and more prevalent among European American women than African American women. Hickey et al. (1995) examined the association of psychosocial well-being (depression, trait anxiety, stress, mastery, self-esteem, and social support) with low maternal weight gain among pregnant women. Neggers et al. (2006) sought to evaluate the relationship between pregnancy outcomes, psychosocial profiles, and maternal health practices. Rini et al. (1999) examined the relationship between prenatal stress, personal resources (including self-esteem), the sociocultural context, and gestational age and weight at birth.

**Research design.** All four studies used a prospective design and quantitative approach to examine this relationship. Participants for all studies were in their second or third trimester of pregnancy. Women were recruited at the clinics where they received prenatal care. Neggers et al. (2006) used questionnaires for data collection at 22-23 weeks gestation. Cameron et al. (1996) collected information through questionnaires and interviews at two meetings during the second and third trimester. Hickey et al. (1995) used scales to measure trait anxiety, self-esteem, mastery, and depression at 24-26 weeks gestation, and scales measuring social support and stress at 30-32 weeks gestation. Rini et al. (1999) collected data and conducted interviews two weeks apart during the early part of the third trimester.

**Sample.** Sample sizes ranged from 132 to 3149. Cameron et al. (1996) collected data using questionnaires and conducted interviews on 132 African American and European American women recruited from three obstetric clinics for low income women in a mid-sized Midwestern city. Hickey et al. (1995) collected data on 536 black women and 270 white women receiving prenatal care operated by the University of Alabama at Birmingham. Rini et al. (1999) used questionnaires and conducted interviews on 230 Hispanic and non-Hispanic White women receiving prenatal care at a southern California medical center and an affiliated low risk birthing center. Neggers et al. (2006) collected information through the use of questionnaires and included 3,149 predominantly African-American, low income women who received care in the Jefferson County Department of Health.
**Measures.** Measures included questionnaires on demographic information and previously developed scales and surveys. The studies by Cameron et al. (1996), Hickey et al. (1995), and Rini et al. (1999) used the Rosenberg Self-Esteem Scale to evaluate self-esteem. Rini et al. (1999) used the English version (cronbach alpha = .89) and Spanish version (cronbach alpha = .59) of the Rosenberg scale. Neggers et al. (2006) used a previously developed 28 item scale evaluating psychosocial status which included the measurement of various traits, including self-esteem.

**Salient findings.** Cameron et al. (1996) found pregnancy weight gain was negatively related to psychological well-being among European American women with lower self-esteem. This association between higher pregnancy weight gain and psychological well-being among European American women was not found among African American women in this study. Self-esteem was negatively related to pregnancy weight gain among African American women, indicating a greater acceptance of weight gain among African Americans. Hickey et al. (1995) found that lower self-esteem among white women was associated with lower maternal weight gain, however, this association was not found among black women in their study. Neggers et al. (2006) found women with lower psychosocial status (one of the traits used to analyze psychosocial status was self-esteem) had an increased risk of having a low birth weight infant and preterm delivery compared to women with high psychosocial status. Rini et al. (1999) found higher scores on self-esteem, optimism, and mastery were associated with giving birth to larger babies even after controlling for psychosocial stress, length of gestation, marital status, maternal age, income, education, ethnicity, and parity.

**Body image and pregnancy outcomes.** Body image is a real concern for some pregnant women. Poor pregnancy body image may influence health behaviors and affect pregnancy outcomes. Three qualitative studies (Chang, Chao, & Kenney, 2006; Fairburn & Welch, 1990; Johnson, Burrows, & Williamson, 2004) and three quantitative studies (Dipietro, Millet, Costigan, Gurewitsch, & Caulfield, 2003; Duncombe, Wertheim, Skouteris, Paxton, & Kelly, 2008; Mehta, Siega-Riz, & Herring, 2011) were identified which investigated the relationship between body image and maternal weight gain (see Table A3).
**Purpose.** The purpose of the study by Chang et al. (2006) was to explore body image and body satisfaction among Taiwanese women during their third trimester of pregnancy. Fairburn and Welch (1990) examined pregnant women’s eating habits and attitudes towards shape and weight during pregnancy. Johnson et al. (2004) attempted to gain a better understanding on how body changes associated with pregnancy affect primigravidas.

The quantitative study by Dipietro et al. (2003) examined women’s psychosocial characteristics and their relationship to weight gain behavior and attitudes during pregnancy. The study by Duncombe et al. (2008) investigated how women felt about their body changes throughout pregnancy and whether body image is related to well-being and health behaviors. Mehta et al. (2011) examined the relationship between body image and maternal weight gain.

**Research design.** Three qualitative studies used a semi-structured interview format (Chang et al., 2006; Fairburn & Welch, 1990; Johnson et al., 2004), and three quantitative studies collected surveys to investigate body image concerns during pregnancy (Dipietro et al., 2003; Duncombe et al., 2008; Mehta et al., 2011).

The qualitative studies used an inductive interview approach to better understand the phenomenological experience of pregnant women. Chang et al. (2006) and Johnson et al. (2004) evaluated data from an interview conducted during the third trimester of pregnancy. Fairburn and Welch (1990) used a retrospective design and interviewed participants within three days after delivery.

DiPietro et al. (2003) used psychosocial data collected in a larger cross-sectional, observational parent study of serial fetal assessments during the second half of pregnancy. Duncombe et al. (2008) used a prospective design collecting data through the use of questionnaire/survey tools at seven to eight week intervals during the third trimester of pregnancy. Mehta et al. (2011) collected data through questionnaires, prenatal charts, and phone interviews.

**Sample.** The qualitative studies described the lived experience of the participants with sample sizes ranging from 6-50 participants. Johnson et al. (2004) had a sample size of six primigravida women between 33-39 weeks gestation that worked at, or had some connection to a higher educational institution. Chang et al. (2006) interviewed 18
Taiwanese women between 29-39 weeks gestation receiving prenatal care at a medical center clinic in Taipei, Taiwan. Fairburn and Welch (1990) interviewed 50 primigravida inpatients on the postnatal ward at John Radcliff Hospital in Oxford that had given birth within the past three days.

The quantitative studies had larger sample sizes ranging from 130-1254 participants. Dipietro et al. (2003) had a sample size of 130 nonsmoking healthy women with uncomplicated singleton pregnancies. Duncombe et al. (2008) recruited participants through newspaper advertisements, newsletters, websites or offices, and had a sample size of 158 pregnant women from Melbourne and regional Victoria, Australia, with a few participants from other states within Australia. Mehta et al. (2011) recruited 1254 women receiving prenatal care from the University of North Carolina hospitals.

**Measures.** Chang et al. (2006) conducted interviews to gather data with a face-to-face conversational style using questions that had been developed previously in pilot interviews. Fairburn and Welch (1990) conducted interviews which were semi-structured and pre-coded. Johnson et al. (2004) conducted interviews that were semi-structured using a facilitatory interview style.

Quantitative studies utilized previously developed survey tools. Dipietro et al. (2003) evaluated pregnancy body image using the Pregnancy and Weight Gain Attitude Scale (PWGAS) which was verbally administered at 36 weeks gestation. Duncombe et al. (2008) used the Body Attitudes Questionnaire (BAQ), the Contour Drawing Rating Scale (CDRS) and Pregnancy Figure Rating Scales (PFRS) to evaluate body image. The Beck Depression Inventory (BDI) Short Form was also used to measure depression scores, and the Dutch Eating Behavior Questionnaire-Restraint (DEBQ) was used to assess food restriction for weight reasons. Mehta et al. (2011) used questionnaires which asked about health behaviors, diet, physical activity, and psychosocial and psychological factors. Body image was assessed using the Body Image Assessment for Obesity (BIA-O).

**Salient findings.** A common finding in the qualitative studies was that many of the pregnant women had concerns over the weight gain and were unhappy with their body during pregnancy (Chang et al., 2006; Fairburn & Welch, 1990; Johnson et al., 2004). Another finding was a greater tendency to diet among those with a negative body
image during pregnancy (Fairburn & Welch, 1990). Chang et al. (2006) found that Taiwanese women struggled with conflicting reactions to their pregnant bodies and conflicting concern for “their body” versus their “baby’s body”. One woman described herself as feeling “so swollen and fat…I look ugly, and it doesn’t matter whether I wear makeup or not”. Fairburn and Welch (1990) interviewed 50 pregnant women in England and found that 40% were afraid they may gain too much weight and 72% were afraid they would not return to their pre-pregnancy weight. This study also found that almost 30% of the women in their group disliked the change in the appearance of their stomach, and women who dieted during their pregnancy reacted more negatively to their body shape changes than non-dieters. Johnson et al. (2004) found that most women reported some dissatisfaction with their body compared with their pre-pregnant body. They also found the dissatisfaction varied throughout pregnancy, indicating that the lived experience changes during pregnancy and is more complex than the usual measure of satisfaction/dissatisfaction.

Findings of quantitative studies indicated that pregnant women with body image concerns were more likely to diet during pregnancy. Many women in the study by Dipietro et al. (2003) had negative attitudes about body image during pregnancy, and ‘women who gained more weight were more likely to express negative body image attitudes’. In that study, 21% of the women endorsed one or more weight restricting behaviors, and among those that gained the recommended amount of weight, 37% were worried about getting fat at the end of the pregnancy, and 14% felt their weight made them unattractive. In that same study, 11% of the women that gained less than the recommended amount of weight thought the weight made them unattractive. Duncombe et al. (2008) found that body image remained relatively stable throughout pregnancy, but women with the most body concerns reported a greater tendency toward dieting during pregnancy. Mehta et al. (2011) found women with poor body image combined with lower education, lower income, or increasing BMI, were more likely to gain outside of IOM maternal weight gain recommendations.

**Social support and pregnancy outcomes.** Social support can be an important resource for pregnant women and influence them to engage in positive health behaviors which may impact pregnancy outcomes. It has been shown that for some women the
most common normative influence during pregnancy was from the woman’s husband or fiancé (Symons Downs & Hausenblas, 2004).

**Purpose.** This review found two qualitative studies (Chang et al., 2006; Thornton, Kieffer, Salabarria-Pena, Odoms-Young, Willis...Salinas, 2006) and six quantitative studies (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993; Dipietro et al., 2003; Elsenbruch et al., 2007; Feldman, Dunkel-Schetter, Sandman, & Wadhwa, 2000; Hickey et al., 1995; Olson & Strawderman, 2003) which looked at the influence and impact social support had on pregnant women and maternal weight gain and birth weight (see Table A4).

The qualitative study by Chang et al. (2006) was done to develop a clearer understanding of the physical and emotional changes Taiwanese women experience during pregnancy. Thornton et al. (2006) investigated the influence of social support on diet, weight, and physical activity beliefs and behaviors among pregnant and postpartum women.

Collins et al. (1993) examined the effects of prenatal social support on birth outcomes and maternal depression among economically disadvantaged women. DiPietro et al. (2003) examined psychosocial characteristics and their relationship to weight gain behavior and attitudes during pregnancy. The study by Elsenbruch et al. (2007) looked at the effects of social support during pregnancy on psychological variables, smoking behavior, and pregnancy outcomes in a sample of women in Germany. Feldman et al. (2000) examined the extent to which social support predicts birth weight while taking into account relations between sociodemographic and obstetric variables and birth weight. Hickey et al. (1995) examined the association of psychosocial well-being (depression, trait anxiety, stress, mastery, self-esteem, and social support) with low maternal weight gain among pregnant women. The study by Olson and Strawderman (2003) examined psychosocial variables to predict gestational weight gain using an index of social support.

**Research design.** Chang and Chao (2006) used a qualitative design and a phenomenological method of data analysis evaluating data obtained from an interview that was conducted during the third trimester of pregnancy. Thornton et al. (2006) analyzed data obtained from semi-structured interviews with five pregnant and five
postpartum women (and interviews with 10 people the women identified as influencing their nutritional diet, weight, and physical activity).

Six studies used a quantitative approach to investigate the influence of social support on pregnancy outcomes (Collins et al., 1993; DiPietro et al., 2003; Elsenbruch et al., 2007; Feldman et al., 2000; Hickey et al., 1995; Olson & Strawderman, 2003). DiPietro et al. (2003) conducted an analysis of psychosocial data collected at three out of six prenatal visits collected during the second half of pregnancy in a larger study. Collins et al. (1993) analyzed a subset of data from a prospective study investigating psychosocial factors in pregnancy in which women were interviewed on multiple occasions throughout pregnancy. Elsenbruch et al. (2007) analyzed data obtained on pregnancy outcomes from medical records and completed questionnaires completed by women in their first trimester. Feldman et al. (2000) investigated psychosocial factors in pregnancy collected from medical records, an interview, a questionnaire completed during the third trimester, and birth outcomes (birth weight and gestation). Hickey et al. (1995) collected surveys measuring social support and stress at 30-32 weeks gestation. Olson and Strawderman (2003) analyzed data collected through questionnaires completed during mid-pregnancy and obstetrical records after delivery.

**Sample.** Sample sizes ranged from 18 to 896 participants. The smallest sample was a qualitative study by Chang and Chao (2006) which consisting of 18 Taiwanese women between 29-39 weeks gestation receiving prenatal care at a medical center clinic in Taipei, Taiwan. The qualitative study by Thornton et al. (2006) interviewed 10 dyads (10 women and 10 people the women identified as influencing their nutritional diet, weight, and physical activity). The quantitative studies consisted of larger sample sizes ranging from 129 to 896 women. Collins et al. (1993) had a sample size of 129 English or Spanish speaking women that entered the study at 15 weeks or less gestation and delivered at the study hospital. DiPietro et al. (2003) had a sample size of 130 nonsmoking healthy women with uncomplicated singleton pregnancies. The study by Feldman et al. (2000) consisted of 247 adult women in the third trimester of pregnancy between 18 and 40 years of age receiving care at a university-affiliated prenatal clinic and birth center. Hickey et al. (1995) collected data on 536 black women and 270 white women receiving prenatal care operated by the University of Alabama at Birmingham.
Olson and Strawderman (2003) had a sample size of 622 pregnant women which were recruited from clinics in Upstate New York. Elsenbruch et al. (2007) had the largest sample size of 896 pregnant women that were recruited in their first trimester by obstetricians in private practice in Berlin.

**Measures.** Chang and Chao (2006) conducted face-to-face interviews in a conversational style using a phenomenological method of data analysis to analyze the transcripts and identify the importance of social support for pregnant women. An interview guide was developed through a series of pilot interviews with 10 women who were asked to discuss physical and emotional changes experienced during pregnancy. Thornton et al. (2006) used semi-structured interview guides to elicit beliefs and attitudes about weight, pregnancy related weight gain, nutritional diet and physical activity; and factors influencing eating and physical activity patterns, including personal, family, and community barriers.

Two studies developed survey tools to measure social support. Collins et al. (1993) developed a measure of social support that had four sections (material aid, assistance with tasks, advice or information, listening while one expresses beliefs or feelings), and other scales to assess baby’s father support, health care provider support, and network resources. Instruments were translated in a forward and backward fashion and developed so they yielded equivalent meaning in Spanish and English. Olson and Strawderman (2003) created an index of social support by averaging the responses to two questions on a questionnaire asking about the frequency of receiving help from relatives and the number of people the woman could call upon if help was needed.

Other studies utilized survey tools had been used in previous studies. DiPietro et al. (2003) measured social support using an 18 item scale specific to pregnancy at 28 weeks. Elsenbruch et al. (2007) measured social support using a 22-item version of the social support questionnaire ‘Fragebogen zur sozialen Unterstutzung’, F-SozU-22. Feldman et al. (2000) measured social support using the Interpersonal Support Evaluation List, a seven item family support scale, and an eight item baby’s father support scale taken from a study of pregnant teens. Hickey et al. (1995) used the Maternal Social Support Scale which measures the personal perception of help with daily tasks,
satisfaction with relationships, availability of emergency help, and degree of community involvement.

**Salient findings.** Studies in this review found a positive relationship between social support and birth weight; women with more social network resources delivered babies with a higher birth weight (Collins et al., 1993; Feldman et al., 2000), and women who perceived they had poor social support during pregnancy had babies with significantly reduced birth weight compared to mothers who felt they had good social support (Elsenbruch et al., 2007). Hickey et al. (1995) found that lower social support among white women was associated with lower maternal weight gain, however, this association was not found among black women in their study. Thornton et al. (2006) found informational and emotional support of husbands was the most important influence on participants’ weight, eating, and physical activity practices. Studies also found social support was important to pregnant women’s well-being and pregnant women were comforted by signs of support (Collins et al., 1993; Chang et al., 2006).

One study did not find an association between social support and how women felt about the weight gained or the changing body size and shape (DiPietro et al., 2003). Another unexpected finding was that women with greater partner social support had a higher negative pregnancy body image (DiPietro et al., 2003). Another study by Olson and Strawderman (2003) found that low social support among low normal and obese BMI was associated with more weight gain, but high BMI women with low social support gained less weight than women with high BMI weight and average or high social support.

**Summary**

There were sixteen studies from peer-reviewed journals that were used for this literature review analysis based on the psychological constructs (self-efficacy, self-esteem, body image, and social support) and their relationship to low maternal weight gain and birth weight. Four studies utilized a qualitative design (Chang et al., 2006; Fairburn & Welch, 1990; Johnson et al., 2004; Thornton et al., 2006) and twelve studies used a quantitative design (Cameron et al., 1996; Collins et al., 1993; Dipietro et al., 2003; Duncombe et al., 2008; Elsenbruch et al., 2007; Feldman et al., 2000; Hickey et al.,
Sample sizes in the qualitative studies ranged from 6 to 50 participants. Studies using a quantitative design had larger sample sizes ranging from 129-3149 participants. Only one study used a conceptual framework to guide their study (Olson & Strawderman, 2003).

Self-efficacy is a person’s self evaluation of their ability to perform behaviors and achieve a specific outcome within a given situation (Bandura, 1977). It is associated with effort and motivation, and correlates with self-esteem, depressive thinking and anxiety, and is an important determinant of behavior (Bandura, 1986, 1989). Two studies (Olson & Strawderman, 2003; Wright et al., 2013) looked at the relationship between self-efficacy and gestational weight gain. Wright et al. (2013) found a significant association between self-efficacy and maternal weight gain, but Olson and Strawderman (2003) did not find a significant association. No other studies investigating the relationship between self-efficacy and pregnancy outcomes of maternal weight gain and birth weight were identified in the literature.

In contrast to the limited studies on self-efficacy and maternal weight gain, many studies on non-pregnant populations show support for a relationship between self-efficacy and disordered eating (Berman, 2006; Pinto et al., 2006; Pinto et al., 2008) and weight related behaviors (Chang et al., 2011; Linde et al., 2006).

Self-esteem refers to how an individual feels about one’s self. There were no qualitative studies on self-esteem and pregnancy weight gain, but there were three qualitative studies that looked at the relationship between body image and pregnancy weight gain (Chang et al., 2006; Fairburn & Welch, 1990; Johnson et al., 2004) and one investigating the relationship between social support and pregnancy weight gain (Chang et al., 2006). There were two quantitative studies that looked at the relationship between self-esteem and pregnancy weight gain (Cameron et al., 1996; Hickey et al., 1995), and two quantitative studies examined the relationship of self-esteem and birth weight (Neggers et al., 2006; Rini et al., 1999).

Studies indicate that pregnancy weight gain is negatively related to psychological well being and weight gain is a concern for some women (Cameron et al., 1996; Chang et al., 2006; Hickey et al., 1995; Johnson et al., 2004). Research on self-esteem suggests
that weight gained during pregnancy is negatively associated to psychological well-being among women with lower self-esteem (Cameron et al., 1996). Other studies found positive self-esteem was associated with higher birth weights (Neggers et al., 2006; Rini et al., 1999). One study (Hickey et al., 1995) found higher self-esteem was associated with higher maternal weight gain among white women, however, this association was not found among the black women.

Studies on non-pregnant populations have found a negative association between self-esteem and eating disorders (Button, Loan, Davies, & Sonuga-Barke, 1997; Croll, Neumark-Sztainer, Story, & Ireland, 2002; Daley et al., 2008; Gila, Castro, Gómez, & Toro, 2005; Mintz & Betz, 1988; Stein & Corte, 2007; Stice & Whitenton, 2002). These studies show that poor self-esteem is associated with dieting and weight behaviors.

Body image is a personal perception of the physical self and influenced by internal and external factors. Many women expressed dissatisfaction with their appearance during pregnancy and were concerned about weight gain and body shape changes (Chang et al., 2006; Fairburn & Welch, 1990; Johnson et al., 2004). Poor pregnancy body image was also related to more weight restrictive behaviors and less weight gain (DiPietro et al., 2003; Fairburn & Welch, 1990). The study by DiPietro et al. (2003) found that many women had negative attitudes about maternal weight gain and 21% of women dieted during pregnancy. Duncombe et al. (2008) reported body dissatisfaction predicted more dieting behavior during pregnancy. Mehta et al. (2011) found women with poor body image (combined with either lower education, lower income, or increasing BMI) were more likely to gain outside of IOM recommendations. Other research also indicates more women are gaining inadequate amounts of weight during pregnancy than previously (Helms et al., 2006; Minnesota DOH, 2004; Wells & Murray, 2003).

In contrast to the limited number of studies looking at pregnant women and body image, there are many studies on non-pregnant populations investigating the association between poor body image and increasing weight concerns (Chen & Jackson, 2009; McElhone et al., 1999; Moor, Vartanian, Touyz, & Beumont, 2004; Stice, 2001), and disordered eating and dieting behaviors (Brannan & Petrie, 2008; Neumark-Sztainer et al., 2003; Neumark-Sztainer, et al. 2009). Much current research is being conducted to
examine the affects of media and the negative impact media has on body image (Annus et al., 2008; Dalley, et al., 2009; Grabe et al., 2008; Groesz, Levine, & Murnen, 2002; Halliwell & Dittmar, 2004; Hamilton et al., 2007; Posavac, Posavac, & Posavac, 1998; Stice et al., 2000).

Studies on social support and pregnancy outcomes had mixed findings (Chang et al., 2006; Collins et al., 1993; Dipietro et al., 2003; Elsenbruch et al., 2007; Feldman et al., 2000; Hickey et al., 1995; Olson & Strawderman, 2003). The qualitative study by Thornton et al. (2006) found social support from husbands had the greatest influence on weight, nutritional diet, and physical activity. The study by DiPietro et al. (2003) did not find any association between social support and the PWGAS, nor between PWGAS and actual weight gained. Another study found mixed results on the association between social support and maternal weight gained based on maternal BMI (Olson & Strawderman, 2003). However, three studies found that women with more social support gave birth to infants of higher birth weight (Collins et al., 1993; Elsenbruch et al., 2007; Feldman et al., 2000). One study (Hickey et al., 1995) found that higher social support was associated with higher maternal weight gain among white women, however, this association was not found among the black women in this study.

Studies on non-pregnant populations lend support to a positive relationship between social support and positive health and nutrition among adult men and women (Anderson et al., 2007; Broadhead, Gehlbach, de Gruy, & Kaplan, 1988) and a negative relationship between social support and disordered eating among non-pregnant women (Juda et al., 2004).

The studies in this review provide support for an association between the psychological constructs of self-efficacy, self-esteem, body image, and social support and pregnancy outcomes. However, there is limited understanding regarding how these psychological constructs influence pregnant women with concerns about weight gain during pregnancy.

Comprehensive multidisciplinary prenatal services can improve pregnancy outcomes. Medicaid covers health services (other than prenatal care) which promote positive weight gain during pregnancy. A study by Ricketts, Murray, and Schwalberg (2005) found women enrolled in the Colorado Prenatal Plus Medicaid Program, a
multidisciplinary prenatal program aimed at addressing specific identified risk factors, had improved weight gain. Women in this study also had less low birth weight infants compared to women with less than 10 Prenatal Plus visits or women that did not complete the program. Medicaid covers health services (other than prenatal care) which promote positive weight gain during pregnancy. A report by Ranji, Salganicoff, Stewart, Cox, and Doamekpor (2009) presented a summary of prenatal services covered by Medicaid; which vary from state to state. In this study, surveys were sent to Medicaid programs in 51 jurisdictions, and responses were received from 43 states and Washington, District of Columbia (D.C.); Hawai‘i did not respond to this survey. According to this survey, Medicaid covers nutrition and psychosocial counseling for pregnant women in 38 states and D.C., prenatal care coordination and case management in 37 states, and home visiting are covered in 41 states and D.C.

“Centering Pregnancy” is a program which used a group model to provide comprehensive prenatal care to pregnant women. Prenatal health assessment, education, and support are provided in a group facilitated by a care provider. A “Centering Pregnancy” site is located at the North Hawai‘i Community Hospital, which is located fifty miles from Hilo. There are no other comprehensive prenatal programs on Hawai‘i Island that addresses the psychological constructs and weight gain during pregnancy. However, there are health services other than prenatal care, which aim to improve maternal weight gain and pregnancy outcomes on Hawai‘i Island. One program is the Special Supplemental Nutrition Program for Women, Infants, and Children, commonly called the WIC program. The WIC program is a federally funded program which provides nutritious foods to supplement diets, information on healthy eating, and health care referrals (United States Department of Agriculture (USDA, 2011). Another program that provides education and referrals to pregnant teens, Hawaiian, Pacific Island, Filipino, and Hispanic women is the Malama Perinatal Program (Family Support Hawai‘i, 2011).

Conceptual Framework

The conceptual framework that will be used to guide this study is based on Albert Bandura’s (1986) social cognitive theory (SCT). Some basic assumptions of the SCT related to how people acquire and maintain behaviors include the model of triadic
reciprocity. This model posits that personal, environmental, and behavioral factors influence each other in a bidirectional and reciprocal manner. These three factors continually influence each other; as behaviors influence, and are influenced by personal and environmental factors. Learning can occur throughout the process of reciprocal interaction without causing an immediate change in behavior. According to Bandura, “after standards and self-reactive functions are developed, behavior usually produces two sets of consequences: self-evaluative reactions and social effects. These two sources of consequences may operate as complementary or opposing influences on behavior” (Bandura, 1991, p.21). People possess personal agency which is influenced and influences actions and behaviors, as the reciprocal interaction is continually evaluated by personal agency to determine subsequent behavior (Bandura, 1989).

Following the tenets of triadic reciprocity, individuals are viewed both as products and producers of their environment and social systems. Some factors in the environment which influence behavior include feedback (personal responses and reactions) and modeling (observable behaviors). These external (to self) influences are then evaluated, and influence the personal agency which guides subsequent behavior. Following the framework of the SCT, a better understanding of how individuals cognitively process and interpret environmental influences and outcomes can help us predict human behavior. The conjecture that maternal diet and nutrition behaviors are influenced by environment in the form of social support, and personal perceptions of self-efficacy, self-esteem, and body image will be used to guide this study. This is an appropriate framework for this study investigating the relationship between psychological constructs of self-efficacy, self-esteem, body image and social support, and weight gain during pregnancy.

According to Albert Bandura (2001), people are proactive in their development, and what they think, believe, and feel affects their behavior. Figure 1 applies Albert Bandura’s model of triadic reciprocity to demonstrate the relationship between the psychological factors of self-efficacy, self-esteem, body image and social support and maternal weight gain. This figure depicts the relationship between the environmental factor of social support, and personal factors of self-efficacy, self-esteem, and body image which continually influence each other. These factors also influence maternal diet
and nutrition and resulting maternal weight gain, which reciprocally influences environmental and personal factors.

Figure 1 shows Albert Bandura’s model of triadic reciprocity (personal, environmental, and behavioral factors influence each other in a bidirectional and reciprocal manner) that has been tailored to show the relationship between the psychological constructs of self-efficacy, self-esteem, body image and social support and maternal weight gain.
Chapter Three: Methodology

Chapter three presents the methodology which was used to conduct the research study. This chapter includes the purpose of the study, research questions and hypotheses, research design, measurements, data collection, data analysis, time frame, and protection for human subjects.

Purpose of the Study

The purpose of this study was to examine whether a relationship exists between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain based on IOM recommendations.

Specific Aim 1. This study was an investigation of factors which may influence maternal weight gain of ethnically diverse pregnant women living in a rural island community.

Research Question 1. Is there an association between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community?

Hypothesis 1. There is a significant association between the psychological constructs of self-efficacy, self-esteem, body image, and social support on maternal weight gain among ethnically diverse pregnant women living in a rural island community.

Specific Aim 2. This study was an investigation of the relationship between selected demographic variables of age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

Research Question 2. What is the relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community?

Hypotheses 2. There is a significant relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social
support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

**Research Design**

The research design was an exploratory survey using data collection through convenience sampling to address the research study aims. Study aims were the investigation of the relationship between selected demographic variables of age, education and ethnicity, the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain based on IOM recommendations of ethnically diverse pregnant women living in a rural island community.

**Setting.** Data were collected at physician offices and prenatal classes on Hawai‘i Island.

**Study sample.** The target population for enrollment in this study included ethnically diverse pregnant women living on Hawai‘i Island.

**Inclusion criteria.** Inclusion criteria for this study included the following: (a) English speaking; (b) women between 19 and 40 years of age; (c) pregnancy of 37 or more weeks’ gestation. The decision to include women of 37 or more weeks gestation allowed for collection of weight during the time considered “full term” pregnancy.

**Sample size.** The Proc Power Procedure was used to determine sample size based on information obtained from studies which provided the distribution (mean and distribution) of a predictor variable and estimated odds ratio of change in the outcome variable from the predictor variable. A review of the literature on studies investigating psychological constructs of self-efficacy, self-esteem, body image, and social support (predictor variables) on maternal weight gain (outcome variable) revealed one study with reported numerical findings for distribution of the predictor variables of self-esteem and social support, and the odds ratio for low maternal weight gain (Hickey et al., 1995). Hickey et al. (1995) found lower levels of social support and self-esteem among white women was associated with increased adjusted odds ratio for low maternal weight gain; 7.2 for low self esteem and 1.5 for low social support. The analysis in Figure 2 was conducted using the findings for low social support and low self-esteem.
Figure 2. Proc Power Procedure: Self-esteem and Social Support

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<td>Method</td>
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Proc Power Procedure for determination of sample size based on estimated odds ratio of low maternal weight gain with low self-esteem and low social support.

A review of the literature on studies investigating the psychological construct of self-efficacy on health behaviors revealed 24 studies, and only one study with reported numerical findings for distribution of the predictor variable of higher self-efficacy and the odds ratio for meeting resistance training guidelines. Plotnikoff, Trinh, Courneya, Karunamuni, and Sigal (2011) found higher levels of self-efficacy (n = 244 adults) was associated with increased adjusted odds ratio (4.36) for resistance training. The analysis in Figure 3 was also conducted to determine sample size based on self-efficacy findings.
Based on the predictor variable of social support (see Figure 2), the highest number of 48 was selected as the sample size needed for this study. Taking into consideration the possibility of a drop-out rate of 15% to 20%, the number increased to 60 participants needed for this study. The findings on self-efficacy and resistance training (see Figure 3) indicated 52-55 participants would be needed for this study. This study closed after the recruitment of 64 participants.

Measurements

Questionnaires used for data collection included the following: demographic information on the characteristics of the participants; self-reported pre-pregnancy weight and maternal weight at time of survey completion; and survey tools measuring self-
efficacy, self-esteem, body image, and social support. Participants completed surveys before delivery at 37 or more weeks’ gestation.

**Demographic information.** Demographic questions included: height, pregravid and current weight, age, education, and ethnicity (Appendix B). Self-reported height and pregravid weight for each participant was used to calculate BMI. These calculations were then used to determine IOM weight gain recommendations (28-40 pounds for BMI less than 18.5, 25-35 pounds for BMI 18.5-24.9, 15-25 pounds for BMI 25-29.9, and 11-20 pounds for BMI greater or equal to 30 (Institute of Medicine and National Research Council of the National Academies, 2009) for each participant. Pregravid weight was subtracted from the current weight to determine total maternal weight gained.

**Age.** The scope of this study was an investigation of the pregnancy experience of adult women. This study invited women that were 19 to 40 years of age and at least 37 weeks gestation to participate. According to Erikson’s Stages of Psychosocial Development, the young adult includes individuals between the ages of 19 to 40 years of age (Cramer, Flynn, & LaFave, 1997). Pregnancy in women below age 19 and over age 40 is associated with increased health risks to the mother and baby (low birth weight, preterm delivery, and pregnancy induced hypertension). Therefore, women below 19 and over 40 years of age were not included in this study (Valero de Bernabe et al., 2004; London, Ladewig, Ball, & Bindler; 2007).

**Education.** Participants were asked their highest level of education completed. Studies have identified higher education is associated with positive maternal weight gain and higher birth weights (Valero de Bernabe et al., 2004). Participants were allowed to select from the following choices: less than high school graduate, high school graduate or GED, some college or technical school, college or post-college graduate.

**Ethnicity.** In 1997, the National Institute of Health (NIH, 2001) published revised standards for a minimum set of five racial groups for race/ethnicity classification to include: American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, and White. The Asian category consisted of people having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent. The Native or Pacific Islander category included people with origins from any original peoples of Hawai‘i, Guam, Samoa, or other Pacific islands.
Hawai‘i County has a diverse ethnic population. According to the U.S. Census Bureau, Hawai‘i County has a 34.5% white population, 0.7% Black population, 0.6% American Indian and Alaska Native population, 22.2% Asian, 12.4% Native Hawaiian and Other Pacific Islander (US Census Bureau, 2011). In addition, 29.2% of the population on Hawai‘i Island report two or more races, 11.8% reported Hispanic or Latino origin (US Census Bureau, 2011). Based on the diverse demographics and large percentage of Asian population on Hawai‘i Island, participants in this research were able to select from the following race/ethnicity groups on the demographic form: African American, Hispanic, Caucasian (white), Japanese, Chinese, Filipino, Korean, Hawaiian, Samoan, Micronesian, Marshallese, American Indian or Alaskan Native, and other. Participants were not restricted to select one group, and were given the opportunity to write down the ethnicity they most identified with. In addition, participants were asked for their place of birth, and number of years living in the United States.

**Self-efficacy.** Questionnaire items to measure self-efficacy (Appendix C) were taken from the following; two items were taken from a study by Hofstetter et al. (1990), and four items were taken from a study by Kendall et al. (2001). Items taken from Hofstetter et al. (1990) are specific to diet (nutrition) self-efficacy. Items taken from Kendall et al. (2001) were evaluated for self-efficacy related to diet (nutrition), and how sure an individual was about being able to lose weight postpartum. The six items which measure self-efficacy have a cronbach’s alpha of 0.85 (Kendall et al., 2001). Answer responses were on a likert scale with a choice of five answers ranging from very sure to very unsure (6 = poor self-efficacy; 30 = high self-efficacy). This tool was used based on the premise that pregnant women who have higher weight self-efficacy would feel more confident in their ability to gain within IOM recommendations during pregnancy, would be able to lose the excess weight after delivery, and have optimal maternal weight gain. The estimated time required to complete this scale was 5 minutes.

**Self-esteem.** Survey questions from the Rosenberg Self-Esteem Scale (Morris Rosenberg Foundation, n.d.) were used to measure self-esteem (Appendix D). The Rosenberg’s Self-Esteem Scale is a scale developed by Dr. Rosenberg and is widely used to measure self-esteem in social science research (Rosenberg, 1989). It was designed as a 6-item Guttman scale (statements represented a continuum of self-worth statements) with
10 questions ranging from strongly agree (1) to strongly disagree (4). Five items in this survey were reverse coded (questions #31, 33, 34, 37, and 40) to be consistent with other questions and so that higher scores indicated higher self-esteem (10 = low self-esteem; 40 = high self-esteem). Fischer and Corcoran (1994) reported the guttman scale had a reproducibility coefficient of 0.92. Many other studies have also demonstrated reliability of the Rosenberg scale for measuring self-esteem ranging from an alpha of 0.70 to 0.89 (Cameron et al., 1996; Rini et al., 1999). Time required to complete this survey was estimated at 10 minutes.

**Body image.** The four items used in this study to measure body image (Appendix E) were taken from the PWGAS, and was identified by DiPietro et al. (2003) as highly associated with negative pregnancy body image. Item response options were on a 5 point scale ranging from strongly agree to strongly disagree (4=negative body image; 20=positive body image). Kendal et al. (2001) evaluated these items individually and found they have a cronbach’s alpha ranging from 0.75-0.83. Estimated time required to complete this survey was 5 minutes.

**Social support.** Survey questions from the Duke-UNC Functional Social Support Questionnaire (Appendix F) was used to measure a person’s perception of the degree of social support they received (Broadhead et al., 1988) This survey contained eight items with response options ranging from 1 (much less than I would like) to 5 (as much as I would like). The highest possible score from this survey was 40 (8 = low perceived social support; 40 = high perceived social support). This questionnaire has a Cronbach’s alpha of 0.70 for affective support and 0.79 for confident support (Bovier, Chamot, & Perneger, 2004). The estimated time required to complete this survey was 5 minutes (Broadhead et al., 1988).

**Data Collection**

**Training.** The principal investigator (PI) identified and trained eight office staff and two childbirth educators that assisted with survey distribution and collection. Nurses and receptionists from two participating physician offices, and two childbirth educators assisted in this research study. The research purpose, aims, goals, and protocol for survey distribution and collection (including issues of confidentiality, IRB consent form, and participation in research) were reviewed with all staff assisting with survey distribution.
Recruitment. Participants for this study were recruited (invitation from staff, flyers) at two obstetrician offices and at prenatal classes in Hilo. Women aged 19-40 years, and at least 37 weeks of pregnancy were eligible to participate in this survey. Office staff working at the clinics invited eligible women to participate. The office staff were given a written script to read for recruitment of women into the study (see Appendix G), and were provided information on the purpose, aims, and goals of this research. Interested participants were asked by the office staff or PI to complete the consent form (see Appendix I), demographic form (see Appendix B), and surveys (see Appendix C, D, E, F). After each participant completed the survey, the participant placed the completed survey in the attached envelope, sealed it, and placed the survey in a secured box which was kept near the nurse’s station. The researcher also requested to place informational flyers (see Appendix H) in two physician offices that did not want their staff assisting with survey distribution. The principal investigator’s (PI) contact information was provided on the flyer with instructions to call regarding interest in participation. The PI was called by two women that had been recruited at the prenatal classes, and the investigator met with the participants at a place convenient for the participant.

Protocol. Data were collected from women at physician offices and prenatal classes on the Hawai‘i Island. Prior to data collection, the research proposal was submitted to the Institutional Review Board (IRB) for the University of Hawai‘i at Mānoa. The PI received verbal approval from each of the obstetricians. After receiving IRB and physician approval, the PI requested assistance for survey distribution from office staff and childbirth educators. The researcher also requested to place informational flyers (see Appendix H) in clinics and physician offices that did not want staff assisting with survey distribution. These flyers provided information about the research purpose, criteria for participation, and researcher contact information. Interested participants contacted the PI directly by email or phone to participate, and with any questions or concerns regarding the research study.

After a potential “participant” was identified by staff or PI based on her age and gestation, the pregnant woman was invited to participate. If the pregnant woman was interested in participating, she was given the survey packet. The survey packet included information about the research purpose, consent form (and duplicate copy), the
demographic form, survey, and an envelope. After the participant agreed to participate in
the study, the office staff or PI reviewed that the consent form had been signed, and gave
her a ten dollar gift certificate to show appreciation for participation. If the participant
chose to withdraw from the study at anytime, she was allowed to keep the gift certificate.
After the participant had completed the survey, the participant received a copy of the
consent form, and placed the other signed consent form, demographic form, and survey in
the envelope, and sealed it. The participant then placed the sealed envelope in a secured
box which was kept near the nurse’s station. The envelopes were collected by the PI and
placed in a locked file in the PI’s office. The consent forms were kept separately from
the coded demographic forms and surveys in the locked file.

To insure quality control, the same questionnaires/surveys were used and
completed by all participants. The surveys were distributed and collected by the same
office staff employed at the obstetrician offices and health clinics, or by the PI.

Data Analysis

SPSS version 19 was used for statistical analysis of data obtained on completed
participant surveys. The first step in examining the relationship between the
psychological constructs of self-efficacy, self-esteem, body image, and social support and
maternal weight gain was to calculate the measures of central tendency for each of the
demographic variables of age, previous pregnancies, place of birth and years living in the
U.S., height, pre-pregnancy weight, pre-pregnancy BMI, current weight, and pregnancy
weight gain. The frequencies were then calculated for the categorical demographic
variables of education and ethnicity.

Weight gained during pregnancy was then compared to IOM recommendations
(based on pre-pregnancy BMI) to determine if the woman had gained less than, within, or
more than IOM pregnancy weight gain recommendations. Frequencies were then
calculated for education and ethnicity for each of the outcome variables of weight gain
below, within, and above IOM recommendations.

Specific Aim 1: This study was an investigation of factors which may influence maternal
weight gain of ethnically diverse pregnant women living in a rural island community.
Research Question 1: Is there a relationship between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community?

Hypothesis 1: There is a significant relationship between the psychological constructs of self-efficacy, self-esteem, body image, and social support on maternal weight gain among ethnically diverse pregnant women living in a rural island community.

To address specific aim 1, each of the predictor variables of self-efficacy, self-esteem, body image, and social support were scored and the measures of central tendency such as the mean, median, and standard deviations were calculated. The frequencies were then calculated for each outcome variable of maternal weight gain below recommendations, within recommendations and above recommendations. Pearson product-moment correlation was conducted to examine any correlation between total maternal weight gain and self-efficacy, self-esteem, body image and social support. In addition, a Spearman’s rank-order correlation was then conducted to examine any correlation between maternal weight gain within each of the weight gain categories (below, within, and above IOM recommendations) and self-efficacy, self-esteem, body image and social support.

Specific Aim 2: This study was an investigation of the relationship between selected demographic variables of age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain of ethnically diverse pregnant women living in a rural island community.

Research Question 2: What is the relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community?

Hypotheses 2: There is a significant relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

The results of the Pearson’s product-moment correlation were examined to identify multicollinearity by determining whether there were any correlations greater than
0.7 (Field, 2005) between the psychological constructs of self-efficacy, self-esteem, body image, and social support. The ordinal logistic regression was done to derive the actual equation for the relationship between the predictor variables of age, education, ethnicity, self-efficacy, self-esteem, body image and social support and maternal weight gain based on IOM recommendations.

**Time Frame**

This was an eighteen month research proposal. The timetable (see Figure 4) for implementation of the study incorporates sufficient time for IRB approvals, recruitment of participants, and evaluation of results. Participants were women who agreed to participate in this study during their third trimester of pregnancy and who delivered a healthy newborn at term.

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<th>Figure 4. Timetable for Research Study</th>
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<td>Data Analysis</td>
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<td>Dissemination</td>
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**Protections for Human Subjects**

The research proposal was submitted to the Institutional Review Board of the University of Hawai‘i at Mānoa for approval before data collection began. In addition, verbal approval was obtained from prenatal class educators and obstetricians that provide prenatal care to women in Hilo.
According to the Department of Health and Human Services SF424 guidelines (USDHHS, 2011), this Human Subjects Research falls under Exemption 2 and Exemption 4. This research study used surveys to collect data. Confidentiality was maintained throughout the research process. The participants placed the completed survey in a locked box where they remained until they were collected by the PI. All research records were kept in a locked file in the investigator's office for the duration of the study. Only PI, PI supervisor (dissertation committee chair), and a method and content expert who was a member of the dissertation committee had access to the data. In order to maintain confidentiality, once surveys were removed from the secured box, all personal identifying information (e.g., consent form) was removed from each demographic form and survey, and a code number was assigned. The consent forms were removed and placed in a separate locked file from the surveys. The consent forms were only viewed to ensure that each subsequent completed survey was from a different participant. All personal information will be destroyed upon completion and publication of the research study.

**Data and Safety Monitoring**

A number of data and safety monitoring safeguards were in place. Participants placed completed surveys in a sealed envelope prior to placing in a locked box which was kept at the clinic’s reception desk. When the PI collected the surveys from the clinics, the consent forms were kept in a separate locked file than the completed surveys. As more surveys were collected, the PI checked against prior received consent forms to guarantee that all new surveys were from new participants. If a participant had already completed and submitted another survey, the second survey was destroyed and shredded in a secure area. Any changes in study protocol were reported to the University of Hawai‘i at Mānoa’s Committee on Human Studies Program and there were no incidences which required UHM Human Studies intervention. The PI reported and updated the Advisor as to the progress of the data collection, storage, entry, and analysis on a monthly basis.

**Benefits**

The participants did not receive direct benefits from this study during this current pregnancy. The data collected from this study may help to better understand whether the
psychological constructs of self-efficacy, self-esteem, body image, and social support contribute to maternal weight gain within IOM recommendations. This information may help guide prenatal care and benefit the participant in a future pregnancy. All participants received a $10 gift certificate to show appreciation for participating in the study.

**Procedures for Protecting and Minimizing Potential Risks**

Packets which described this study were given to participants. These packets contained Confidentiality Agreements and Consent Forms. A consent form (Appendix I) outlined the research aims, procedure, and provided the PI contact information. These were signed by all participants prior to participation in this research study, and a copy was given to each participant. The risks to the participants were minimal, and included loss of privacy, however, this risk was greatly reduced as the surveys and consent forms were coded.

**Summary**

This study was an investigation of factors which may influence maternal weight gain of ethnically diverse pregnant women living in a rural island community. The research proposal was submitted to the Institutional Review Board of the University of Hawai‘i at Mānoa for approval before data collection. Descriptive analysis was conducted on each of the demographic variables of age, education, and ethnicity. Three major data analyses (Pearson product-moment correlation coefficient, Spearman’s rank-order correlation, and ordinal logistic regression) were conducted based on the two research aims, questions, and hypotheses addressed by this study.
Chapter 4: Results

Chapter 4 presents the participant demographics and descriptive analysis of the independent and dependent measures. Results addressing the two research questions are also presented in this chapter.

Demographic Information

Surveys were collected from 64 women who were pregnant at 38 weeks or more gestation. Participant demographics are presented in table 1 (continuous data) and table 2 (categorical data). Table 1 shows that the sample population consisted of women between 19 and 40 years of age, with a mean of 28.6 years, and standard deviation of 5.16. The number of previous pregnancies ranged from 0 (women who had never had any previous pregnancies) to 5 (women who had 5 previous pregnancies at 38 weeks gestation or more), with a mean of 1.0. Most participants were born in the state of Hawai‘i. Thirty seven (58%) were born on Hawai‘i Island and nine (14%) were born on the other Hawaiian Islands. Thirteen (20%) were born in the other 49 states (U.S.) and five (8%) were born outside of the U.S. The mean number of years living in the U.S. for all the women was 27.0 years, ranging from 4-40 years, and a standard deviation of 6.69. Pre-pregnancy weight ranged from 96 – 290 pounds, with a mean weight of 146.6 and standard deviation of 35.41. The pre-pregnancy BMI ranged from 18.3-46.8 for this sample population, with a mean of 26.0. A majority of 33 (52%) women began this current pregnancy in the normal BMI range of 18.5-24.9. The next largest category was 19 (30%) women with a BMI of 30 or higher. Eleven women (17%) had a pre-pregnancy BMI of 25-29.9, and only 1 (2%) participant had a BMI less than 18%. Current weight of the participants ranged from 108-301 ($\bar{x}$=175.1), with a total pregnancy weight gain mean of 29.4 (range -11.6 to 75 pounds).
Table 1

Summary of Demographics (Continuous Data)

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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawai‘i Island</td>
<td>37 (58%)</td>
<td>20 - 40</td>
<td>27.9</td>
<td>5.08</td>
</tr>
<tr>
<td>Neighbor Islands</td>
<td>9 (14%)</td>
<td>10 - 37</td>
<td>25.8</td>
<td>7.53</td>
</tr>
<tr>
<td>United States (not including Hawai‘i)</td>
<td>13 (20%)</td>
<td>21 - 36</td>
<td>28.4</td>
<td>4.79</td>
</tr>
<tr>
<td>Outside United States</td>
<td>5 (8%)</td>
<td>4 - 39</td>
<td>17.4</td>
<td>13.50</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>4 - 40</td>
<td>27.0</td>
<td>6.86</td>
</tr>
<tr>
<td>Height</td>
<td>64</td>
<td>58 - 68</td>
<td>62.9</td>
<td>2.28</td>
</tr>
<tr>
<td>Pre-pregnancy Weight</td>
<td>64</td>
<td>96 - 290</td>
<td>146.6</td>
<td>35.41</td>
</tr>
<tr>
<td>Pre-pregnancy BMI (recommended maternal weight gain)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 18.5 (28-40)</td>
<td>1 (2%)</td>
<td></td>
<td>18.3</td>
<td></td>
</tr>
<tr>
<td>18.5-24.9 (25-35)</td>
<td>33 (52%)</td>
<td>18.6 - 24.4</td>
<td>21.5</td>
<td>1.62</td>
</tr>
<tr>
<td>25-29.9 (15-25)</td>
<td>11 (17%)</td>
<td>25.1 - 29.3</td>
<td>26.9</td>
<td>1.47</td>
</tr>
<tr>
<td>Over 30 (11-20)</td>
<td>19 (30%)</td>
<td>30.2 - 46.8</td>
<td>33.8</td>
<td>3.76</td>
</tr>
<tr>
<td>Current Weight</td>
<td>64</td>
<td>108 - 301</td>
<td>175.1</td>
<td>33.20</td>
</tr>
<tr>
<td>Pregnancy Weight Gain</td>
<td>64</td>
<td>-11.6 - 75</td>
<td>29.4</td>
<td>15.19</td>
</tr>
</tbody>
</table>

A summary of the demographic categorical data can be found in Table 2. The educational level was well distributed between the 64 women, with 20 having a high school diploma or GED, 20 having some college or tech school education, and 24 with a college or post graduate degree. For purposes of this study, all Hawaiian, part Hawaiian, and Pacific Islanders were categorized in the Hawaiian/Pacific Islander (HPI) group. The sample for this study consisted of 30 (47%) HPIs, 22 (34%) Asians, eight (12%) Whites, and four (7%) other race/ethnicities. The 30 women in the HPI category consisted of 29 Hawaiian/part Hawaiians and one Micronesian participant. The 22 women in the Asian ethnic group consisted of seven Japanese, two Chinese, eleven Filipinos, one Korean, and one Vietnamese participant. The four women in the “other race/ethnicity” consisted of one Black and three Hispanic women.
Table 2
Summary of Demographics (Categorical Data)

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>% of Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>64</td>
<td>100</td>
</tr>
<tr>
<td>High School or GED</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td>Some College or Tech School</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td>College or Post Grad</td>
<td>24</td>
<td>38</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>64</td>
<td>100</td>
</tr>
<tr>
<td>Native Hawaiian or Other Pacific Islander</td>
<td>30</td>
<td>47</td>
</tr>
<tr>
<td>Asian</td>
<td>22</td>
<td>34</td>
</tr>
<tr>
<td>White</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Other Race/ethnicity</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

The IOM recommends that pregnant women with a pre-pregnancy BMI less than 18.5 should gain between 28 to 40 pounds, women with a BMI of 18.5-24.9 should gain between 25 to 35 pounds, women with a BMI of 25-29.9 should gain between 15 and 25 pounds, and women with a BMI of 30 or more should gain between 11 to 15 pounds. In order to determine the amount of weight each participant should gain based on IOM recommendations, each participant was placed into pre-pregnancy BMI groups. Weight gained during pregnancy was then calculated by subtracting pre-pregnancy weight from the current weight. For our sample, the amount of weight gained during pregnancy was then compared with IOM recommendations based on pre-pregnancy BMI. Table 3 shows that in our sample population, 11 (17%) gained less than IOM recommendations, 23 (36%) gained within IOM recommendations, and thirty women (47%) gained above IOM recommendations.
Table 3
Maternal Weight Gain Based on IOM Recommendations

<table>
<thead>
<tr>
<th>Measure</th>
<th>Below Recommendations</th>
<th>N</th>
<th>% of Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Gain per IOM Recommendations</td>
<td>Within Recommendations</td>
<td>23</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Above Recommendations</td>
<td>30</td>
<td>47</td>
</tr>
</tbody>
</table>

When comparing weight gain among women by education level (see Appendix; Table J1), the highest number of women with a high school diploma (or GED) and women with a college or post graduate degree gained above recommendations, followed by a smaller number of women gaining within recommendations, and the smallest number of women gained less than recommended. Weight gain by ethnicity can be found in Table J2 (see Appendix). The HPI and White categories had the highest percent of women gaining above recommendations, followed by women gaining within recommendations, and the smallest percent of women gaining below IOM recommendations. The Asians had the largest percent of women gaining within IOM recommendations, followed by women gaining above recommendations, and smallest percent of women gaining below IOM recommendations. There was one Black/African American woman who gained within IOM recommendations. There were three Hispanic women in this study with one woman gaining below recommendations, and two women gaining above recommendations. With the exception of the one Black woman in this study, the Asian women had the highest percent at 55% (12/22) of women gaining within recommendations, followed by the HPIs at 30% (9/30), and the Whites at 12% (1/8).

One interesting finding is that with the exception of the category of BMI less than 18.5 (which contained one participant), total mean weight gained during pregnancy decreased as pre-pregnancy BMI increased (see Table J3). Mean weight gain for women with a BMI of 18.5-24.9 was 36.5 pounds (recommended 25-35 pounds), mean weight gain for women with a BMI of 25-29 was 27.2 pounds (recommended 15-25 pounds),
and mean weight gain for women with a BMI greater or equal to 30 was 19.1 pounds (recommended 11-20 pounds). When comparing maternal weight gain based on pre-pregnancy BMI, excluding the category of BMI less than 18.5 (which contained one participant), each of the other three BMI categories (BMI 18.5-24.9; BMI 25-29.9; BMI greater or equal to 30) had the smallest percent of women gaining below IOM recommendations, and the highest percent of women gaining above IOM recommendations (see Table J4).

Table 4

<table>
<thead>
<tr>
<th>Measure</th>
<th>Below IOM Recommendations</th>
<th>N</th>
<th>M</th>
<th>Mdn</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Within IOM Recommendations</td>
<td>23</td>
<td>24.8</td>
<td>24.0</td>
<td>3.32</td>
</tr>
<tr>
<td></td>
<td>Above IOM Recommendations</td>
<td>29</td>
<td>23.1</td>
<td>23.0</td>
<td>4.10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>63</td>
<td>24.1</td>
<td>24.0</td>
<td>3.63</td>
</tr>
<tr>
<td>Self-esteem</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below IOM Recommendations</td>
<td>10</td>
<td>33.6</td>
<td>34.5</td>
<td>4.17</td>
</tr>
<tr>
<td></td>
<td>Within IOM Recommendations</td>
<td>22</td>
<td>34.8</td>
<td>35.0</td>
<td>4.48</td>
</tr>
<tr>
<td></td>
<td>Above IOM Recommendations</td>
<td>30</td>
<td>34.3</td>
<td>35.0</td>
<td>4.10</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>62</td>
<td>34.4</td>
<td>35.0</td>
<td>4.20</td>
</tr>
<tr>
<td>Body Image</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below IOM Recommendations</td>
<td>11</td>
<td>14.5</td>
<td>15.0</td>
<td>4.48</td>
</tr>
<tr>
<td></td>
<td>Within IOM Recommendations</td>
<td>22</td>
<td>15.7</td>
<td>16.0</td>
<td>3.80</td>
</tr>
<tr>
<td></td>
<td>Above IOM Recommendations</td>
<td>30</td>
<td>12.8</td>
<td>13.0</td>
<td>4.33</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>63</td>
<td>14.1</td>
<td>15.0</td>
<td>4.32</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below IOM Recommendations</td>
<td>11</td>
<td>34.9</td>
<td>37.0</td>
<td>6.36</td>
</tr>
<tr>
<td></td>
<td>Within IOM Recommendations</td>
<td>23</td>
<td>37.4</td>
<td>40.0</td>
<td>3.64</td>
</tr>
<tr>
<td></td>
<td>Above IOM Recommendations</td>
<td>30</td>
<td>36.3</td>
<td>38.5</td>
<td>5.65</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>64</td>
<td>36.5</td>
<td>39.0</td>
<td>5.15</td>
</tr>
</tbody>
</table>
Descriptive data for the frequencies, mean, median, and standard deviation for the psychological constructs of self-efficacy, self-esteem, body image and social support within each weight gain category are included in Table 4. When comparing construct scores by weight gain categories, women with weight gain below recommendations had higher mean self-efficacy scores compared to women that gained within and above IOM recommendations. Mean self-efficacy scores decreased from “weight gain below” (25.4 ± 2.20) to “weight gain within” (24.8 ± 3.32), to “weight gain above” recommendations (23.1 ± 4.10). Women with weight gain within recommendations had higher mean scores in self-esteem, body image, and social support than women that gained below and above IOM recommendations. Mean self-esteem scores decreased from “weight gain within” (34.8 ± 4.48), to “weight gain above” (34.3 ± 4.10), to “weight gain below” (33.6 ± 4.17). Mean body image scores decreased from “weight gain within” (15.7 ± 3.80), to “weight gain below” (14.5 ± 4.48), to “weight gain above” (12.8 ± 4.33). Mean social support scores decreased from “weight gain within” (37.4 ± 3.64) to “weight gain above” (36.3 ± 5.65), to weight gain below” (34.9 ± 636).

**Research Question 1**

Is there an association between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community?

**Hypothesis 1.** There is an association between the psychological constructs of self-efficacy, self-esteem, body image, and social support and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

A Pearson's product-moment correlation was conducted to determine if there is a relationship between total weight gained during pregnancy and any of the psychological constructs of self-efficacy, self-esteem, body image and social support (see Table 5). No statistically significant correlation was found between total weight gain and self-efficacy, self-esteem, body image, and social support for all the women.
Table 5
Pearson Correlation Between Individual Psychological Constructs and Total Weight Gained for all Women

<table>
<thead>
<tr>
<th>Total Weight Gained</th>
<th>Self-efficacy</th>
<th>Self-esteem</th>
<th>Body Image</th>
<th>Social Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>-.13</td>
<td>-.01</td>
<td>-.14</td>
</tr>
<tr>
<td>p (2-tailed)</td>
<td>.322</td>
<td>.916</td>
<td>.282</td>
<td>.911</td>
</tr>
<tr>
<td>N</td>
<td>64</td>
<td>63</td>
<td>62</td>
<td>63</td>
</tr>
</tbody>
</table>

A Spearman’s rank-order correlation (see Table 6) was conducted to determine any correlation between the psychological constructs (continuous variables) and the three weight gain categories below, within, and above IOM recommendations (ranked categorical variables). The Spearman’s rank order correlation analysis found a statistically significant negative association ($r_s = -0.26, p<.05$) between self-efficacy and maternal weight gain. The Spearman’s rank-order correlation coefficient found highest to lowest self-efficacy scores correlated with weight gain below, followed by weight gain within, and weight gain above IOM recommendations.

Additional tests were also conducted to determine if any trends could be identified for maternal weight gain. Because of the small sample size, survey responses for each of the constructs were collapsed so the responses were positive, neutral, or negative to achieve more power. No statistical significant difference was found between the means of self-efficacy, self-esteem, body image, and social support scores between the three categories of maternal weight gain when an ANOVA was conducted using the collapsed data. Each of the individual construct survey questions was also examined for any existing trends with each BMI group and each weight gain categories below, within, and above IOM recommendations. No significant trends were identified.
Table 6
Spearman's Correlation Between Self-efficacy, Self-esteem, Body Image, and Social Support and Maternal Weight Gain Based on IOM Recommendations

<table>
<thead>
<tr>
<th>Weight Gain Per IOM Recommendations</th>
<th>Self-efficacy</th>
<th>Self-esteem</th>
<th>Body Image</th>
<th>Social Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Gain Per IOM Recommendations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.1000</td>
<td>-.260*</td>
<td>.025</td>
<td>-.238</td>
</tr>
<tr>
<td>p (2-tailed)</td>
<td>.040</td>
<td>.849</td>
<td>.061</td>
<td>.744</td>
</tr>
<tr>
<td>N</td>
<td>64</td>
<td>63</td>
<td>62</td>
<td>63</td>
</tr>
<tr>
<td>Total Self-efficacy</td>
<td>-.260*</td>
<td>1.000</td>
<td>.453**</td>
<td>.293*</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.040</td>
<td>.000</td>
<td>.021</td>
<td>.533</td>
</tr>
<tr>
<td>p (2-tailed)</td>
<td>.63</td>
<td>.61</td>
<td>.62</td>
<td>.63</td>
</tr>
<tr>
<td>N</td>
<td>63</td>
<td>61</td>
<td>62</td>
<td>61</td>
</tr>
<tr>
<td>Total Self-esteem</td>
<td>.025</td>
<td>.453**</td>
<td>1.000</td>
<td>.448**</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.849</td>
<td>.000</td>
<td>.000</td>
<td>.001</td>
</tr>
<tr>
<td>p (2-tailed)</td>
<td>.62</td>
<td>.61</td>
<td>.62</td>
<td>.61</td>
</tr>
<tr>
<td>N</td>
<td>62</td>
<td>61</td>
<td>62</td>
<td>61</td>
</tr>
<tr>
<td>Total Body Image</td>
<td>-.238</td>
<td>.293*</td>
<td>.448**</td>
<td>1.000</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.061</td>
<td>.021</td>
<td>.000</td>
<td>.082</td>
</tr>
<tr>
<td>p (2-tailed)</td>
<td>.63</td>
<td>.62</td>
<td>.61</td>
<td>.63</td>
</tr>
<tr>
<td>N</td>
<td>63</td>
<td>62</td>
<td>61</td>
<td>63</td>
</tr>
<tr>
<td>Total Social Support</td>
<td>.042</td>
<td>.080</td>
<td>.429**</td>
<td>.221</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.744</td>
<td>.533</td>
<td>.001</td>
<td>.082</td>
</tr>
<tr>
<td>p (2-tailed)</td>
<td>.64</td>
<td>.63</td>
<td>.62</td>
<td>.63</td>
</tr>
<tr>
<td>N</td>
<td>64</td>
<td>63</td>
<td>62</td>
<td>63</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed)
Research Question 2

What is the relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community?

Hypotheses 2. There is a significant relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

A correlation matrix using Pearson product-moment correlation analysis was conducted to examine the relationship between the ordinal predictor variables of self-efficacy, self-esteem, body image, and social support (see Table 7). A significant positive correlation was found between self-efficacy and self-esteem (r=0.45, p<.001), self-efficacy and body image (r = 0.33, p<.01), self-esteem and body image (r=.47, p<.001), self-esteem and social support (r=.31, p<.05). None of the psychological predictor variables had correlations greater than 0.7, which satisfied the assumptions regarding multicollinearity for the ordinal logistic regression analysis (Field, 2005).

Because none of the relationships were highly correlated, an ordinal logistic regression analysis was then conducted to analyze the predictive relationship between age, education, ethnicity, self-efficacy, self-esteem, body image and social support, and the outcome of maternal weight gain per IOM recommendations. The data were then analyzed for any missing data and four surveys were identified with missing data on the surveys. The missing data were replaced with the overall mean score. The data were also reanalyzed using the SAS statistical program. The logistic analysis using the SAS program had no warnings present in the output.
Table 7

Pearson Correlation of Psychological Constructs to Test Assumptions for OLR

<table>
<thead>
<tr>
<th></th>
<th>Self-efficacy</th>
<th>Self-esteem</th>
<th>Body Image</th>
<th>Social Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>.45**</td>
<td>.33**</td>
<td>-.03</td>
</tr>
<tr>
<td>$p$ (2-tailed)</td>
<td>.000</td>
<td>.009</td>
<td>.815</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>63</td>
<td>61</td>
<td>62</td>
<td>63</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>.45**</td>
<td>1</td>
<td>.47**</td>
<td>.31*</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.000</td>
<td>.000</td>
<td>.015</td>
<td></td>
</tr>
<tr>
<td>$p$ (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.480</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>61</td>
<td>62</td>
<td>61</td>
<td>62</td>
</tr>
<tr>
<td>Body image</td>
<td>.33**</td>
<td>.47**</td>
<td>1</td>
<td>.09</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.009</td>
<td>.000</td>
<td>.480</td>
<td></td>
</tr>
<tr>
<td>$p$ (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.480</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>62</td>
<td>61</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Social Support</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-.03</td>
<td>.31*</td>
<td>.09</td>
<td>1</td>
</tr>
<tr>
<td>$p$ (2-tailed)</td>
<td>.815</td>
<td>.015</td>
<td>.480</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>63</td>
<td>62</td>
<td>63</td>
<td>64</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

The Goodness-of-fit for the model of age, education, ethnicity, self-efficacy, self-esteem, body image, and social support on maternal weight gain is found in Table 8. The goodness-of-fit showed a significant value greater than .05, indicating a good fit to the model (Deviance = 106.27, $p$=.53).
Table 8

Goodness-of-fit for Age, Education, Ethnicity, Self-efficacy, Self-esteem, Body Image and Social Support on Maternal Weight Gain per IOM Recommendations

<table>
<thead>
<tr>
<th></th>
<th>$x^2$</th>
<th>Df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined (age, education, ethnicity, self-efficacy, self-esteem, body image, social support)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson</td>
<td>123.22</td>
<td>108</td>
<td>.150</td>
</tr>
<tr>
<td>Deviance</td>
<td>106.267</td>
<td>108</td>
<td>.529</td>
</tr>
</tbody>
</table>

The Cox and Snell R-square value indicates how well the study model fits the data. According to Cox and Snell R-square, 23% of the variance of maternal weight gain is explained by the model of age, education, ethnicity, and the psychological constructs of self-efficacy, self-esteem, body image, and social support.

The parameter estimates for the effects of age, education, ethnicity and the constructs of self-efficacy, self-esteem, body image and social support on maternal weight gain per IOM guidelines are shown in Table 9. Weight gain above recommendations ($2 =$ weight gain above recommendations) was used as the reference. Weight gain within ($1 =$ weight gain within recommendations) and weight gain below ($0 =$ weight gain below recommendations) were the intercepts used in the ordinal logistic model.
Table 9
Parameter Estimates for Age, Education, Ethnicity, Self-efficacy, Self-esteem, Body Image and Social Support on Maternal Weight Gain per IOM Recommendations

<table>
<thead>
<tr>
<th></th>
<th>Estimated log Odds</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.003</td>
<td>.066</td>
<td>.002</td>
<td>1</td>
<td>.964</td>
<td>[-0.132, 0.126]</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>-.196</td>
<td>.094</td>
<td>4.322</td>
<td>1</td>
<td>.038</td>
<td>[-0.380, -0.011]</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>.135</td>
<td>.089</td>
<td>2.295</td>
<td>1</td>
<td>.130</td>
<td>[-0.040, 0.309]</td>
</tr>
<tr>
<td>Body Image</td>
<td>-.149</td>
<td>.072</td>
<td>4.270</td>
<td>1</td>
<td>.039</td>
<td>[-0.291, -0.008]</td>
</tr>
<tr>
<td>Social Support</td>
<td>.004</td>
<td>.054</td>
<td>.006</td>
<td>1</td>
<td>.940</td>
<td>[-0.101, 0.110]</td>
</tr>
<tr>
<td>High School/GED</td>
<td>-.077</td>
<td>.799</td>
<td>.009</td>
<td>1</td>
<td>.923</td>
<td>[-1.643, 1.489]</td>
</tr>
<tr>
<td>Some College</td>
<td>-.732</td>
<td>.675</td>
<td>1.174</td>
<td>1</td>
<td>.279</td>
<td>[-2.055, 0.592]</td>
</tr>
<tr>
<td>College/Post Graduate</td>
<td>0 a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaiian/Pacific islander</td>
<td>-1.281</td>
<td>.955</td>
<td>1.798</td>
<td>1</td>
<td>.180</td>
<td>[-3.152, .591]</td>
</tr>
<tr>
<td>Asian</td>
<td>-1.801</td>
<td>.975</td>
<td>.3410</td>
<td>1</td>
<td>.065</td>
<td>[-3.712, .110]</td>
</tr>
<tr>
<td>Black/African American or Hispanic White</td>
<td>-2.474</td>
<td>1.356</td>
<td>3.327</td>
<td>1</td>
<td>.068</td>
<td>[-5.132, .185]</td>
</tr>
<tr>
<td>White</td>
<td>0 a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reference for maternal weight gain is “Weight Gain Above IOM recommendations”.
a. This parameter is set to zero because it is redundant.

Both self-efficacy and body image had a statistically significant ($p<.05$) negative effect on maternal weight gain based on IOM recommendations. Higher self-efficacy total scores corresponded to weight gain within and below recommendations (estimated log Odds = -.196, 95% CI: -0.38, -0.011, $p=0.04$). Meanwhile, higher body image total scores corresponded to weight gain within or below recommendations (estimated log Odds = -.149, 95% CI: -0.291, -0.008, $p=0.04$). These findings indicate that higher self-efficacy and body image scores were related to more weight gain below and within recommendations, than weight gain above IOM recommendations.
Summary

This chapter presented two research questions and the results based on data collected from 64 women that were pregnant at 38 or more weeks’ gestation. The first research question examined the association between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain for women living in a rural island community. There was no significant association between total maternal weight gain and psychological constructs of self-efficacy, self-esteem, body image and social support based on the Pearson’s product-moment correlation analysis. Spearman’s rank-order correlation found women with weight gain above IOM recommendations had the lowest self-efficacy scores, followed by higher scores for women with weight gain within IOM recommendations, and women with weight gain below IOM recommendations had the highest self-efficacy scores (p=.04).

An ordinal logistic regression analysis was conducted to address the second research question which sought to determine the relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain among ethnically diverse pregnant women living in a rural island community. Of the seven predictor variables, self-efficacy (p=.04) and body image (p=.04) were statistically significant. The data indicates that both higher self-efficacy scores and positive body image predicted lower maternal weight gain based on IOM recommendations. None of the other variables were found to have a significant effect on maternal weight gain based on IOM recommendations.
Chapter 5: Discussion

This chapter presents a discussion of the two research questions and results based on data collected from pregnant women in a rural island community in Hawai‘i. Also included are the limitations and implications for future research, practice, and education.

Demographics, Pre-pregnancy BMI and Total Weight Gain, IOM Weight Gain

There were 64 adult female participants between the ages of 19 and 40 years. All participants had a high school education or higher. This sample of women was multiethnic, with a majority represented by Native Hawaiians and Asians.

The category of women with a pre-pregnancy BMI $\geq 30$ had a lower mean weight gain compared to the category of women with a pre-pregnancy BMI between 25-29.9. The category of women with a pre-pregnancy BMI between 25-29.9 had a lower mean weight gain than the category of women with a pre-pregnancy BMI between 18.5-24.9. This finding is similar to other studies in the literature that found higher pre-pregnancy BMI associated with lower maternal weight gain (Copper, DuBard, Goldenberg & Oweis, 1995; Heude, 2012). However, the negative association found in this study is in contrast to other studies that found higher pre-pregnancy BMI associated with higher maternal weight gain (Strychar et al., 2000; Weisman et al., 2010; Fraser et al., 2011; Olson and Strawderman, 2003). These differences may be explained by the sample populations being studied. The populations with the same associations between BMI and maternal weight gain as this study looked at predominantly black women (Copper et al., 1995) and women living in France (Huede, 2012). The study findings in contrast to this study looked at women living in different regions of the United States (Olson and Strawderman, 2003; Weisman et al., 2010) and different countries (Strychar et al., 2000; Fraser et al., 2011). The women in the study by Olson and Strawderman (2003) were predominantly white women from upstate New York, and the women in the study by Weisman et al. (2010) were from Central Pennsylvania. The study by Strychar et al. (2000) was conducted in Quebec and had no Black, Asian, or Hispanic women. The study by Fraser et al. (2011) was conducted in the United Kingdom. This current study had a diverse ethnic sample which was different than populations in the previously mentioned studies.
The amount of weight the women in this study gained was compared with IOM maternal weight gain recommendations based on their pre-pregnancy BMI. In this sample, there were a small number of women with weight gain below IOM maternal weight gain recommendations (inadequate weight gain) versus women with weight gain above IOM recommendations (excessive weight gain). These findings are similar to other studies which found most pregnant women do not gain within IOM recommendations (Dalenius et al., 2012; Mehta et al., 2011; Olson & Strawderman, 2003; Wells, Schwalberg, Noonan, and Gabor, 2006; Caulfield, Witter & Stoltzfus, 1996; Weisman et al, 2010; Webb et al., 2009). Data from the 2011 PNSS found that out of 953,682 women surveyed, 21% of women had inadequate weight gain and 48% of women had excessive weight gain (CDC, 2012). Only 31% of women had weight gain within IOM maternal weight gain recommendations (adequate weight gain).

In this study, Asians had the highest percent of women with adequate weight gain (n=12; 54%) followed by the NPI, other, and White categories, respectively (see Table J2). A study by Stotland et al. (2008) also found Asian women were most likely to have adequate weight gain. This finding is also consistent with the 2011 PNSS (CDC, 2012) which reported the aggregated category of API women having the highest percent of adequate weight gain (41%) compared to other ethnicity categories (28-33%). In this study, the White category had the highest percent of excessive weight gain (n=6; 75%). This finding was similar to the 2011 PNSS, which reported White and “Multiple Races” had the highest percent of excessive weight gain compared to the other ethnic groups.

**Research Question 1**

The first research question of this study was to determine whether there was an association between the psychological constructs of self-efficacy, self esteem, body image and social support and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

Utilizing the Spearman’s Rank Order Correlation analysis, there was a significant negative relationship between self-efficacy and maternal weight gain based on IOM recommendations. This finding indicates women with high self-efficacy scores had inadequate weight gain and women with the low self-efficacy scores had excessive weight gain based on IOM recommendations. This finding is similar to a study by Wright
et al. (2013) which found higher self-efficacy for healthy eating was associated with lower maternal weight gain among 101 low income women. However, a study by Olson and Strawderman (2003) did not find any association between self-efficacy and maternal weight gain. No other studies were found investigating the relationship between self-efficacy and maternal weight gain.

**Research Question 2**

The second research question of this study was to determine the relationship between age, education and ethnicity, psychological constructs of self-efficacy, self-esteem, body image and social support and maternal weight gain among ethnically diverse pregnant women living in a rural island community.

Utilizing the ordinal logistic regression analysis, the demographic variables of age, education, and ethnicity did not have a significant effect on maternal weight gain. Other studies in the literature that did not find associations between individual variables of age, education, or ethnicity and maternal weight gain were Weisman et al. (2010), Herring et al. (2012), and Strychar et al. (2000). In contrast, Olson and Strawderman (2003) found age (greater than 40 years) associated with higher maternal weight gain. Caulfield et al. (1996), Wells et al. (2006), and DiPietro et al. (2003) found women with higher education were more likely to have adequate weight gain compared to women with lower education. Wells et al. (2006) found Hispanic women were more likely to have inadequate weight gain compared to Non-Hispanic White and Black women, and Caulfield et al. (1996) found Black women were more likely to have inadequate weight gain compared to White women.

When the psychological constructs were placed in the ordinal logistic model, the psychological constructs of self-esteem and social support did not have a significant effect on maternal weight gain. However, the ordinal logistic regression analysis found the psychological constructs of self-efficacy and body image had a statistically significant negative effect on maternal weight gain based on IOM recommendations.

A significant association was found between high self-efficacy and inadequate weight gain among women in this study. Self-efficacy is a person’s belief in their ability to do what is necessary to accomplish a specific outcome. Two other studies in the literature also explored the relationship between self-efficacy and maternal weight gain.
(Wright et al., 2013; Olson and Strawderman, 2003). The study by Wright et al. (2013) analyzed psychosocial factors (i.e. weight locus of control, self-efficacy for healthy eating, and perinatal depression) associated with maternal weight gain and found high self-efficacy associated with lower maternal weight gain. Olson and Strawderman (2003) did not find self-efficacy significantly associated with maternal weight gain. In contrast to the limited studies on pregnant populations, many studies among non-pregnant populations have explored the effects of self-efficacy on weight gain. These studies found increased self-efficacy associated with better nutrition and weight control (Elfhag & Rossner, 2005; Linde et al., 2006; Linde et al., 2004; Stretcher et al., 1986; Texeira et al., 2005). Other studies (Hagler et al., 2007; Long and Stevens, 2004; Schwarzer & Renner, 2000; Chang et al., 2011) found higher self-efficacy associated with healthier diets (increased fruits and vegetables, lower fat and higher fiber intake) and healthy weight management behaviors (increased low-fat and low calorie foods). These studies found higher self-efficacy associated with improved nutrition and weight control among non-pregnant populations. Based on these findings on self-efficacy, it would seem pregnant women with higher self-efficacy would have weight gain within IOM recommendations. It is unclear why higher self-efficacy was associated with inadequate weight gain for women in these studies. Future research should continue to examine why women with higher self-efficacy have inadequate maternal weight gain.

This current study also found lower self-efficacy associated with excessive weight gain. This finding was similar to the study by Wright et al. (2013), which also found a significant relationship between lower self-efficacy and higher maternal weight gain. In non-pregnant populations, lower self-efficacy was also associated with increased food intake and weight gain (Hinton, 2001). Toray and Cooley (1997) found lower self-efficacy associated with more weight fluctuations (associated with overeating and binging behaviors) among college students. Borrelli and Mermelstein (1998) found lower self-efficacy associated with greater likelihood of weight gain among participants in a smoking cessation program. Similar to this current study, these studies on non-pregnant populations found lower self-efficacy associated with excessive weight. These findings indicate increasing self-efficacy among pregnant women with excessive weight gain may help them gain within IOM recommendations.
This current study found positive body image associated with inadequate weight gain. In contrast to the limited studies on self-efficacy during pregnancy, there were many studies found in the literature investigating body image during pregnancy. Many studies found pregnant women adjusted to the body changes and their body image remained stable during pregnancy (Duncombe et al., 2008; Kamysheva et al., 2008; Skouteris et al., 2005). Other studies found body image improved during pregnancy (Fairburn and Welch, 1990; Loth et al., 2011). A qualitative study by Johnson et al. (2004) found the varied and complex feelings expressed about body changes during pregnancy were a reflection of women’s personal and lived experiences. These studies indicate women that have positive body image prior to pregnancy continue to have positive body image during pregnancy. It is unclear why women with positive body image had inadequate weight gain in this present study, and more research needs to be done investigating this relationship.

This current study also found negative body image associated with excessive weight gain. Another study by Dipietro et al. (2003) found women with excessive weight during pregnancy were more likely to have a negative body image. Mehta et al. (2011) also found women with negative body image (combined with lower education, lower income, or increasing BMI) were more likely to have excessive or inadequate weight gain. For women with negative body image and excessive weight gain, improving body image may help improve weight gain outcomes.

In summary, this study found both self-efficacy and body image were significantly related to maternal weight gain. While lower self-efficacy and negative body image predicted excessive weight gain, higher self-efficacy and positive body image predicted inadequate weight gain. These findings indicate different approaches may be necessary to help pregnant women gain adequate weight during pregnancy.

Limitations

There may be a number of limitations to this study that deserve mention. The results may be limited due to a small sample size and could be improved with a larger sample and equal representation in each ethnic category. There were very few Hispanics and Blacks, and no American Indians who participated in this study. Despite the sample size limitation, this study has portrayed valuable information about ethnicities and
maternal weight gain. Another possible method that could be used to compare differences in maternal weight gain between ethnicities is through review of large data sets. In this rural island community, obstetricians send all prenatal records (for women that are 36 weeks gestation) to the hospital. These records then become part of the hospital medical record. Some information included in the medical records which could be analyzed include pre-pregnancy weight, total weight gained, ethnicity, age, education, and birth weight.

Another possible limitation in this study is that it relied on self-reported weight which may not be accurate. Although a study by Huber (2007) found women underreported their weight, a study by Cameron et al. (1996) found maternal self-reported weight was accurate when compared to prenatal clinic chart weights. Because surveys in this study were collected in prenatal clinics where weights are monitored as part of prenatal care, it is possible that the self-reported weights were accurate in this study. Another method to collect weights is through a review of prenatal records or hospital medical records. Information obtained from hospital records could be used in conjunction with completed surveys and personal interviews.

**Implications for Nursing Research**

Inadequate and excessive maternal weight gain is associated with poor pregnancy outcomes, and continues to be a problem for a significant number of women. The findings in this study, along with limited and inconclusive results of earlier studies, indicate a need for continued research in the investigation of factors associated with maternal weight gain below and above IOM recommendations.

In this study, higher self-efficacy was associated with inadequate maternal weight gain. This finding was surprising, given that higher self-efficacy in the literature is associated with better nutrition and weight management. It would seem that pregnant women with high self-efficacy would feel they are able to do what is needed to eat healthy and control their weight, and have weight gain within IOM recommendations. These findings indicate more research is needed to investigate knowledge related to weight gain recommendations for pregnant women. Studies in the literature found healthcare provider recommendations were associated with weight gain intentions and actual weight gained during pregnancy (Phelan et al., 2011; Tovar, Guthrie, Platek,
Stuebe, Herring & Oken, 2011; Cogswell, Scanlon, Fein, & Schieve, 1999; Bish et al., 2009). Other studies found a significant number of women (60%) report not receiving weight gain advice from their health care provider, or reported incorrect advice about weight gain (Olson & Strawderman, 2003; Stotland et al., 2005). Future research on maternal weight gain should investigate weight gain recommendations received from healthcare providers. These findings may help us better understand why women with high self-efficacy have inadequate weight gain during pregnancy.

This study also found low self-efficacy associated with excessive weight gain. Due to the limited research findings in this area, more research is needed to determine the generalizability of these findings. However, these findings indicate improving self-efficacy could help pregnant women with excessive weight gain. A study by Shin et al. (2011) found nutritional counseling improved self-efficacy among non-pregnant women with excessive weight. Although this study indicates nutritional counseling improves self-efficacy among non-pregnant women, more research is needed to identify effective strategies to improve self-efficacy among pregnant women.

Another finding in this study was an association between positive body image and inadequate weight gain. This finding was surprising and not well understood. Based on findings in the literature which found body image remains stable, and women adjust to the changes associated with pregnancy, it would seem women with positive body image would follow IOM recommendations and have adequate weight gain. Future qualitative research may help us better understand this association. Research conducted on larger samples and different ethnic populations may help to determine the generalizability of these findings. Future studies can also identify other moderating and mediating factors that affect this relationship between high body image and inadequate maternal weight gain.

This study found poor body image associated with excessive weight gain among pregnant women. Studies in the literature indicate body image remains relatively stable during pregnancy, and women who start their pregnancy with a negative body image are more likely to continue having body image concerns throughout the pregnancy. Previous studies found cognitive behavioral therapy (CBT) effective for improving body image among non-pregnant populations even without weight loss (Rosen, Orosan & Reiter,
1995; Bacon et al., 2002). More research is needed to identify whether CBT can improve body image among pregnant women with excessive weight gain.

The findings and implications found in this study lend support to the theoretical framework (Albert Bandura’s SCT) used to guide this study. Perhaps maternal weight gain could be better understood and amenable to interventions if conceptualized in terms of a psychosocial model which recognizes the effects of psychological constructs and social support on maternal weight gain. In this study, the psychological constructs of self-efficacy and body image was associated with maternal weight gain. Although weight gain goals and intentions were not investigated in this study, other studies (Tovar et al., 2011; Cogswell et al., 1999) have found healthcare provider weight gain recommendations associated with weight gain goals, intentions, and maternal weight gain. The adapted model at the completion of this study (see Figure 5) depicts how personal factors of self-efficacy and body image, and the environmental factor of social support (healthcare provider weight gain recommendations) influence weight gain goals and intentions. These affect maternal diet and nutrition, and the outcome of maternal weight gain below, within, and above recommendations.
This model adapts Albert Bandura’s model of triadic reciprocality (personal, environmental, and behavioral factors influence each other in a bidirectional and reciprocal manner). In this adaptation of the model, the psychological constructs of self-efficacy and body image and healthcare provider support influence weight gain intentions, diet and nutrition. These factors all contribute to maternal weight gain.
Implications for Nursing Practice

The findings in this study have possible implications for nursing practice. A theoretical framework was used to guide this study, and the preliminary results support the use of SCT to better understand maternal weight gain. Identifying risk factors associated with inadequate or excessive maternal weight gain will help healthcare professionals provide prenatal care that optimizes outcomes. Results of this study suggest that self-efficacy and body image have an affect on maternal weight gain. In terms of promoting adequate weight gain during pregnancy, different approaches are implicated for nurses caring for women with high versus low self-efficacy, and positive versus negative body image.

Finally, the findings of this study could be incorporated into existing prenatal programs and utilized by other healthcare providers working in programs to promote pregnancy outcomes. The “CenteringPregnancy” uses a group model to provide health assessment, education, and support to pregnant women. This is an optimal venue to implement educational strategies to help women with inadequate and excessive maternal weight gain. The WIC (Women, Infants and Children) program is another venue in which healthcare providers could educate a large number of pregnant women to promote weight gain within recommendations. The findings in this study contribute to the body of knowledge to help improve health care for pregnant women, but further research with a larger sample size is needed.

Implications for Nursing Education

An important component of nursing education is teaching students the various roles and responsibilities of healthcare providers. Nurses have an important role in promotion of health as they provide patient care, help clients care for themselves through patient education, and provide comprehensive care through collaboration with other healthcare professionals. The role of the nurse in health promotion is being current with best practices identified through research. The findings in this study increase the body of knowledge related to maternal weight gain. This study has identified risk factors associated with inadequate and excessive maternal weight gain, which are both associated with poor pregnancy outcomes. Nursing educators need to emphasize the importance of providing holistic
personalized quality care which includes patient assessment of the psychological factors that may affect physical health.

Nurses have an important role as patient educators. Patient education is an important component of prevention and promotion of health. Nurses can provide nutritional counseling and appropriate weight gain recommendations as part of prenatal care. Providing patient education is important, however, it is also important that clients get motivated to change unhealthy behaviors. Interprofessional collaborative practice among healthcare providers promotes comprehensive care through sharing of expertise from different disciplines. The findings in this study have implications for healthcare providers from different disciplines. The physician often gives information regarding weight gain recommendations. The dietician can help with nutritional counseling. The social worker can assist with identifying any personal concerns and help with counseling. These providers all have an important role and work together to provide support through assessments, education, counseling, and promotion of health for optimal weight gain during pregnancy. Nursing students must be taught good communication skills to work collaboratively with other healthcare providers to provide a holistic individualized model of care to patients.

**Conclusion**

In conclusion, this exploratory study found significant preliminary results which can be used to build future studies in this area of research. In this study, there was a negative relationship between self-efficacy and maternal weight gain. Specifically, higher self-efficacy was associated with inadequate maternal weight gain, and lower self-efficacy was associated with excessive maternal weight gain. It was unclear why women with high self-efficacy had inadequate weight gain. The association between low self-efficacy and excessive weight gain indicates improved self-efficacy may help women with excessive weight gain. These findings indicate more research is needed to understand the relationship between self-efficacy and maternal weight gain. Future research in this area with larger sample sizes and different ethnic populations may also help determine the generalizability of these findings.

In addition, this study also found a relationship between body image and maternal weight gain. Specifically, positive body image was associated with inadequate weight
gain and negative body image was associated with excessive weight gain. The finding of an association between positive body image and inadequate weight gain indicates more research is needed to understand why these women had inadequate weight gain. The association found between negative body image and excessive weight gain indicates a need for effective strategies to improve body image. Further studies in this area need to explore and validate that this association is evident based on different populations. Subsequent studies utilizing a theoretical framework to guide interventions need to be tested for effectiveness based on behavioral change and maternal weight gain.
References


Dalley, S. E., Buunk, A. P., & Umit, T. (2009). Female body dissatisfaction after exposure to overweight and thin media images: The role of body mass index and


**Appendix A: Studies on Psychological Constructs and Maternal Weight Gain**

Table A1

Studies on Self-efficacy and Pregnancy Outcomes

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Research Design</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wright et al. (2013).</td>
<td>101 postpartum women living in urban Pennsylvania competed surveys.</td>
<td>Higher self-efficacy for healthy eating associated with lower maternal weight gain.</td>
</tr>
</tbody>
</table>
Table A2

Studies on Self-esteem and Pregnancy Outcomes

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Research Design</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hickey et al., (1995)</td>
<td>Clinics operated by University of Alabama at Birmingham. 536 Black women 270 White women</td>
<td>Poor self-esteem was associated with low maternal weight gain among white women. There was no association between self-esteem and maternal weight gain among black women.</td>
</tr>
<tr>
<td>Neggers et al., (2006).</td>
<td>Jefferson County Health Department. 3149 predominantly African American low income women</td>
<td>Women with low psychosocial status (including self-esteem) had increased risk of having LBW infant and PTD.</td>
</tr>
<tr>
<td>Rini et al., (1999).</td>
<td>Southern California medical center. 120 Hispanic and 110 White women</td>
<td>Personal resources (self-esteem, optimism, and mastery) were associated with higher birth weight infants (for gestation).</td>
</tr>
</tbody>
</table>
Table A3

Studies on Body Image and Pregnancy Outcomes

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Research Design</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chang et al., (2006).</td>
<td>Taipei, Taiwan. 18 Taiwanese women between 21-45 years old. Interviewed during third trimester.</td>
<td>Approximately half the women expressed dissatisfaction with overall appearance.</td>
</tr>
<tr>
<td>Dipietro et al., (2003)</td>
<td>130 women with low risk, normal pregnancy. Surveys completed at 36 weeks gestation.</td>
<td>Women who gained more weight were more likely to express negative body image attitudes. Women who under-gained had least negative attitudes</td>
</tr>
<tr>
<td>Duncombe et al. (2008)</td>
<td>Australia. 158 pregnant women completed surveys during the 1st, 2nd, and 3rd trimester of pregnancy.</td>
<td>Body image remained relatively stable during pregnancy and women appeared to adapt to pregnancy changes.</td>
</tr>
<tr>
<td>Fairburn and Welch, (1990).</td>
<td>John Radcliffe Hospital in Oxford. 50 postpartal women.</td>
<td>40% were afraid they might gain too much weight during pregnancy. Women who had dieted in past reacted more negatively to change in shape.</td>
</tr>
<tr>
<td>Johnson et al., (2004).</td>
<td>6 primigravida. Worked at, or had connection with institute of higher education.</td>
<td>Women were generally negative or ambivalent about their changing body.</td>
</tr>
<tr>
<td>Mehta et al. (2011).</td>
<td>1254 women. 16 years or older. Less than, or equal to 20 weeks gestation on 2nd prenatal visit. Patient at University of North Carolina hospital.</td>
<td>Body image associated with maternal weight gain. Women with poor body image combined with either lower education, lower income, or increasing BMI were more likely to gain outside of IOM recommendations.</td>
</tr>
</tbody>
</table>
Table A4

Studies on Social support and Pregnancy Outcomes

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Research Design</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chang et al., (2006).</td>
<td>Taipei, Taiwan. 18 Taiwanese women in third trimester.</td>
<td>Social support important to pregnant women’s well-being.</td>
</tr>
<tr>
<td>Collins et al., (1993).</td>
<td>California. Larger 129 English or Spanish speaking women, entered study at 15 weeks or less gestation.</td>
<td>Positive association between social network resources and BW (for gestation).</td>
</tr>
<tr>
<td>DiPietro et al., (2003).</td>
<td>130 nonsmoking healthy pregnant women, predominantly non Hispanic white.</td>
<td>No association between PWGAS and general social support.</td>
</tr>
<tr>
<td>Hickey et al., (1995)</td>
<td>Clinics operated by University of Alabama at Birmingham. 536 Black women 270 White women</td>
<td>Lower social support was associated with lower maternal weight gain among white women. This association was not found among black women in this study.</td>
</tr>
<tr>
<td>Olson and Strawderman (2003).</td>
<td>Upstate New York. 622 women mailed questionnaire at mid-pregnancy.</td>
<td>Mixed results. Effect of low social support on maternal weight gain varied by maternal BMI.</td>
</tr>
<tr>
<td>Thornton et al. (2006)</td>
<td>Urban Detroit. 10 women and 10 people who influenced them were interviewed.</td>
<td>Informational and emotional support of husbands was the most important and consistent influence on weight, eating, and physical activity practices.</td>
</tr>
</tbody>
</table>
Appendix B: Demographic Form

Direction: Please fill in your answer to the following questions.

1. What is your age? ____
2. How tall are you? ____
3. Is this the first time you have been 37 or more weeks pregnant? ____
   If no, how many other times have you been 37 or more weeks pregnant? ____
4. How much did you weight before you got pregnant with this pregnancy? ____
5. How much do you weight now? ____

Direction: Please place an ‘X’ indicating the highest level of education you completed?

6. Less than high school graduate ____
7. High school graduate or GED ____
8. Some college or technical school ____
9. College or post-college graduate ____

What is your ethnicity? Direction: Please place an ‘X’ before the answer that best describes you.

10. African American ____
11. Hispanic ____
12. Caucasian (white) ____
13. Japanese ____
14. Chinese ____
15. Filipino ____
16. Korean ____
17. Hawaiian ____
18. Samoan ____
19. Micronesian ____
20. Marshallese ____
21. American Indian or Alaskan Native ____

22. Please write which one ethnicity do you mostly associate yourself with?

________________________________________________
Directions: Please write your answer in the space provided for questions 23 and 24.

23. Place of birth.
________________________________________________

24. How many years have you been living in the United States?
________________________________________________
Appendix C: Self-efficacy Survey

Direction: Please read each statement carefully and place an ‘X’ in the column that is closest to your situation. Give only ONE answer per STATEMENT.

<table>
<thead>
<tr>
<th>How sure are you that you are able to:</th>
<th>Very sure</th>
<th>Sure</th>
<th>Neither sure nor unsure</th>
<th>Unsure</th>
<th>Very unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. Eat balanced meals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Eat foods that are good for you and avoid foods that are not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Eat foods that are good for you even when family and social life takes a lot of time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After delivery</strong>, how sure are you that you can:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Fit into your regular clothes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Take off any extra weight you gain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Get back in shape</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D: Self-esteem Survey

Direction: Below is a list of statements dealing with your general feelings about yourself.

Please read each statement carefully and place an ‘X’ in the column that is closest to your situation. Give only ONE answer per STATEMENT.

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. On the whole, I am satisfied with myself.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. At times I think I am no good at all.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. I feel I have a number of good qualities.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. I am able to do things well as most other people.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. I feel I do not have much to be proud of.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. I certainly feel useless at times.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. I feel that I’m a person of worth.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. I wish I could have more respect for myself.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. All in all, I am inclined to think that I am a failure.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. I take a positive attitude toward myself.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix E: Body Image Survey

Direction: Please read each statement carefully and place an ‘X’ in the column that is closest to your situation. Give only ONE answer per STATEMENT.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>41. I worry that I may get fat during this pregnancy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. I am embarrassed at how big I have gotten during this pregnancy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. The weight I gain during pregnancy makes me feel unattractive.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. I’m embarrassed whenever the nurse weighs me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix F: Social Support Survey

**Direction:** Please read each statement carefully and place an ‘X’ in the column that is closest to your situation. Give only ONE answer per STATEMENT.

<table>
<thead>
<tr>
<th>Statement</th>
<th>As much as I would like</th>
<th>Almost as much as I would like</th>
<th>Some, but would like more</th>
<th>Less than I would like</th>
<th>Much less than I would like</th>
</tr>
</thead>
<tbody>
<tr>
<td>45. I have people who care what happens to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. I get love and affection.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. I get chances to talk to someone about problems at work or with my housework.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. I get chances to talk to someone I trust about my personal or family problems.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. I get chances to talk about money matters.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. I get invitations to go out and do things with other people.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. I get useful advice about important things in life.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. I get help when I am sick in bed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix G: Invitation to Participate Script

Office Staff: Would you like to participate in a study about weight gain during pregnancy? It’s voluntary and all you would need to do is complete a survey that will take approximately 20 minutes to complete. You will be given a $10 gift certificate to show appreciation for participating.

If the woman would like more information:

Office Staff: Here is a copy of the flier, consent form, and survey for you to review, and then you can let me know if you’d like to participate. (Office staff gives the woman the sample packet containing a flyer, consent form, and survey to review).

If the woman agrees to participate:

Office Staff: Here is your gift certificate, the consent form and survey. After you complete the consent form and survey, please place it in the envelope, seal it, and place it in this box at the nurse’s station. (Office staff hand over the gift certificate, and survey with attached consent form and envelope).
Appendix H: Flyer

You are being invited to participate in a research study.

What is the purpose of this study?
This is a study looking at maternal weight gain.

Why have I been selected?
You have come into the clinic today for prenatal care and are between 19 and 40 years of age, and at least 37 weeks gestation.

What would I have to do to be in this study?
You will have to circle or place an X on questions or statements in a survey. It will take about 20 minutes.

Is there any benefit to me?
The study will provide no real benefits to you. You will receive a $10 gift card as a way to thank you for participating in the study.

Are there any risks?
There are no real risks except you may feel uncomfortable answering some questions.

Who will see my answers on the Survey?
The only person who will see the answers will be the person doing the research, Joan Thompson.

What if I change my mind about being in the study?
You can withdraw from the study at any time. It will not affect your health care services in any way.

What do I do now if I want to be in the study?
Just let the clinic staff know, and they will give you a survey to complete. You may also contact Joan Thompson at 756-0205, or via email at jniaukea@hawaii.edu.
Psychological Constructs and Maternal Weight Gain

Appendix I: Consent Form

AGREEMENT TO PARTICIPATE IN
Psychological Constructs and Maternal Weight Gain

Investigator: Joan Thompson, PhD Doctoral Candidate, University of Hawai‘i at Mānoa (UHM), School of Nursing and Dental Hygiene
Cellular number: 808 756-0205
Email: jniaukea@hawaii.edu

Dissertation Advisor: Dr. Merle Kataoka-Yahiro, Associate Professor, UHM, School of Nursing and Dental Hygiene, Webster 409
Phone: 956-5329

Purpose: The purpose of this study is to examine whether a relationship exists between the psychological constructs of self-efficacy, self-esteem, body image and social support, and maternal weight gain.

Benefits: The results of this study may increase my understanding of psychological constructs related to maternal weight gain. Although I may not receive direct benefits from this study, this information may benefit women who become pregnant in the future. I understand that I will receive $10.00 for my participation whether or not I complete the study.

Project Description: During this visit, I was provided written information about this research study. I was also provided the contact information for the principal investigator, and the option to meet with and speak with her with any questions or concerns. I understand that I will be completing a written survey that will take approximately 25 minutes to complete.

Risks: I understand that participating in this research project involves psychological risks that include time spent, and loss of privacy. I am aware that I will be filling out a demographic form and written survey. If for any reason I feel the need for more information or assistance, the researcher from the project will meet with me to answer any questions that I may have. I understand that the consent form will be removed from the demographic form and survey and stored in a locked file in a secure place. I further understand that the results may be used for research purposes and may be published, but any information that could result in my identification will remain confidential to the extent allowed by law.

Voluntary Right to Withdraw: I understand that my participation is voluntary. I understand that if I choose not to participate in this study at any time, it will not affect my relations with my health care provider or birth educator. I understand that I may refuse to participate and withdraw from the project at any time. If I have any questions, I understand that I can contact Joan Thompson at 756-0205.
If I cannot obtain satisfactory answers to my questions or have comments or complaints about my treatment in this project, I understand that I can contact the Committee on Human Studies.
Phone: 956-5007, or email: uhirb@hawaii.edu

I certify that I have read and that I understand the information, that I have been given satisfactory answers to my questions concerning the project procedures and other matters and that I have been advised that I am free to withdraw my consent and to discontinue participation in the project anytime without prejudice.

I herewith give my consent to participate in this project with the understanding that such consent does not waive any of my legal rights, nor does it release the principal investigator(s) or the institution or any employee or agent thereof from liability for negligence.

I have received a copy of this consent form.

_______________________________________________
Individual Participant Name (Print Name)

_____________________________________
Signature of Individual Participant (or authorized legal representative, if appropriate)

Date_______________________________________
Appendix J: Maternal Weight Gain Tables

Table J1

Maternal Weight Gain Based on IOM Recommendations by Education

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>% of Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High School or GED</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td><strong>Some College</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td><strong>College or Post Graduate Degree</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>100</td>
</tr>
</tbody>
</table>
Table J2

Weight Gain Based on IOM Recommendations by Ethnicity

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>% of Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Hawaiian or other Pacific Islander</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below recommendations</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>16</td>
<td>53</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Asians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below recommendations</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>12</td>
<td>54</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100</td>
</tr>
<tr>
<td>Black or African American</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below recommendations</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Hispanic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below recommendations</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>
Table J3

Pre-pregnancy BMI and Total Weight Gained During Pregnancy

<table>
<thead>
<tr>
<th>BMI Level</th>
<th>N</th>
<th>M</th>
<th>Range</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI less than 18.5</td>
<td>1</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI 18.5-24.9</td>
<td>33</td>
<td>36.5</td>
<td>11.8-75</td>
<td>11.79</td>
</tr>
<tr>
<td>BMI 25-29.9</td>
<td>11</td>
<td>27.2</td>
<td>0-48</td>
<td>14.00</td>
</tr>
<tr>
<td>BMI over 30</td>
<td>19</td>
<td>19.1</td>
<td>-11.6-51</td>
<td>15.25</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>29.4</td>
<td>-11.6-75</td>
<td>15.20</td>
</tr>
</tbody>
</table>
### Table J4

Maternal Weight Gain Based on IOM Recommendations by BMI

<table>
<thead>
<tr>
<th>Measure</th>
<th>N</th>
<th>% of Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMI less than 18.5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>BMI 18.5-24.9</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>5</td>
<td>15.2</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>12</td>
<td>36.4</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>16</td>
<td>48.5</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>BMI 25-29.9</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>1</td>
<td>9.1</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>4</td>
<td>36.4</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>6</td>
<td>54.5</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>BMI over 30</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Gain Below Recommendations</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td>Weight Gain Within Recommendations</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td>Weight Gain Above Recommendations</td>
<td>8</td>
<td>42.1</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
</tr>
</tbody>
</table>