EXPLORING THE ROLE OF BINGE EATING AND PSYCHOLOGICAL CORRELATES IN THE CONTEXT OF EXCESS GESTATIONAL WEIGHT GAIN

by

Brooke Elizabeth Palmer

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Approved by:

_____
Dr. Fary Cachelin

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Dr. Virginia Gil-Rivas

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Dr. Victoria Scott

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Dr. Larissa Huber

ABSTRACT

BROOKE ELIZABETH PALMER. Exploring the role of binge eating and psychological correlates in the context of excess gestational weight gain. (Under the direction of DR. FARY CACHELIN)

Women's health behaviors during pregnancy have long-lasting effects for both mother and child. One common consequence of health-compromising behaviors is excess gestational weight gain (GWG), or gaining more weight than recommended by the Institute of Medicine. Various risk factors for excess GWG span the biopsychosocial spectrum, but one factor that is typically absent from the discussion is binge eating (BE). This study attempted to better understand the experiences of pregnant women who binge eat and explore the connection between BE and excess GWG as well as assess the role of health care providers in the experiences and behaviors of pregnant women. Two hundred and thirty-five women who were pregnant in their third trimester completed an online survey assessing symptoms of BE, body dissatisfaction, dietary restraint, psychological distress, and weight gain. Twenty of those women completed a telephone interview to describe their pregnancy journey and interactions with health care providers. Consistent with hypotheses, quantitative results highlighted that past body dissatisfaction was significantly correlated with current body dissatisfaction ($r = 0.52$, $p < .01$) and that current body dissatisfaction was significantly related to BE frequency independently ($\beta = .02$, $p < .01$) and mediated through dietary restraint (indirect effect = .01) and psychological distress (indirect effect = .02). However, based on logistic regression analyses, BE was not a significantly associated with GWG status in the third trimester of pregnancy as hypothesized, but body dissatisfaction was ($\beta = .03$, $p < .01$; Exp(B) =

1.03). Qualitative results provided examples of relationships among variables and helped provide additional potential pathways between body dissatisfaction and GWG. Women provided descriptions of how their interactions with health care providers may have exacerbated symptoms of body dissatisfaction and psychological distress and how the amount of information they were provided negatively impacted their trajectory of symptoms and outcomes. Results from this study suggest that health care providers should be screening for body dissatisfaction during pregnancy and supporting women by providing referrals for appropriate support. Additional recommendations based on participant feedback are provided.

DEDICATION

This dissertation is the culmination of years of support from my family to pursue higher education as well as the support of my partner and I would like to dedicate this milestone to them. I am eternally grateful to my parents for modeling the traits of responsibility and integrity and always prioritizing my education. You created an environment in which I did not have to choose between pursuing education and sacrificing other goals. This is a privilege and I am committed to use my degree to support others and not make waste of this gift. My partner allowed me to focus on my degree and dissertation in the most practical of ways, from taking care of our dog when I was working late, and also by providing emotional support throughout. Thank you, there is no way to repay you and this dedication is not enough.

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Third, this project would not exist without the willingness and time of the many women who participated in the online survey and telephone interviews. I do not take this lightly and am motivated and heartened by the many participants who acknowledged the need for this very important research.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BE	binge eating
BED	binge eating disorder
BMI	body mass index
BN	bulimia nervosa
GWG	gestational weight gain
IOM	Institute of Medicine
MoBa	Norwegian Mother and Child Cohort Study
OB-GYN	obstetrician-gynecologist
PRAMS	Pregnancy Risk Assessment Monitoring Systems

Chapter 1: Introduction and Review of Literature

Although weight gain is a natural and necessary component of pregnancy that supports fetal growth and development, it is very common for women to gain weight in excess of medical recommendations placing themselves and their children at risk for health complications (Faucher & Barger, 2015). Excess gestational weight gain (GWG) is steadily rising, occurring in roughly 47% of pregnancies in the United States (Deputy, Sharma, & Kim, 2015). Prevalence is even higher for women who are overweight or obese (prevalence rate of 64% in both weight classes compared to 37% in non-overweight women) at the time of conception. Harmful effects of excess GWG include greater risk of developing gestational diabetes in the mother, birthing complications such as higher rates of cesarean section deliveries, and the risk of the child being large for gestational age (Faucher & Barger, 2015; Goldstein et al., 2017). Long-term complications include higher risk for postpartum weight retention and childhood obesity (Haugen et al., 2014; Rasmussen & Yaktine, 2009). Excess GWG is designated as exceeding the Institute of Medicine (IOM)'s recommendations for healthy weight gain during pregnancy (Rasmussen & Yaktine, 2009). In general, women are expected to gain between 11 and 40 pounds depending on their body mass index (BMI; kg/m^2) at the time of conception. Within this range, obese women are recommended to gain less and underweight women more (Rasmussen & Yaktine, 2009).

Various health behaviors and psychosocial factors place women at risk for excess GWG. Examples of poor health behaviors which are risk factors include eating a diet that is high in carbohydrates and fat and engaging in infrequent physical activity (Stuebe,

Oken, & Gillman, 2009). Psychological risk factors include depression, anxiety, stress, body image disturbance, and disordered eating behaviors (Hill et al., 2013; Park et al., 2015). On a social level, individuals with less education and income as well as inadequate social support are at risk for excess GWG (Hartley, McPhie, Skouteris, Fuller-Tyszkiewicz, & Hill, 2015). Additionally, attitudes, beliefs, and knowledge about weight gain during pregnancy will impact behaviors. One example is that adhering to the belief that one is "eating for two" during pregnancy may lead to more weight gain than necessary to support a pregnancy because it leads to eating more frequently and larger quantities of food (Kraschnewski & Chuang, 2014). Lastly, having an incorrect understanding of GWG expectations, or being provided incorrect information by health care providers can also lead to excess GWG (Shulman & Kottke, 2016). Although the aforementioned risk factors seem to describe a cohesive picture of elements that facilitate excess GWG during pregnancy, one behavior in particular has historically been absent from empirical investigations of explanatory models: binge eating (BE).

BE refers to eating an objectively large amount of food within any two-hour period while also feeling out of control during the episode (American Psychiatric Association [APA], 2013). Despite the fact that BE and binge eating disorder (BED) – engaging in frequent BE episodes without compensating for food intake by means of vomiting, laxatives, or excessive exercise – are known to contribute to weight gain, overweight, and obesity in non-pregnant women and is a common disordered eating behavior in pregnant women, there is a dearth of research on the relationship between BE and excess GWG (APA, 2013; Bulik et al., 2007; Easter et al., 2013; Kessler et al., 2013;). Furthermore, the vast majority of interventions developed to prevent or reduce

excess GWG do not include efforts to assess for or curb BE (Agha, Agha, & Sandell, 2014; Yeo, Walker, Caughey, Ferraro, & Asafu-Adjei, 2017) and health care providers report they do not feel competent to assess or treat BE and the related construct of body dissatisfaction (Leddy, Jones, Morgan, & Schulkin, 2009). This study assessed eating behaviors in pregnant women from the community in order to elucidate the possible role of BE as it relates to GWG in the context of common comorbid symptoms of BE such as body dissatisfaction, dietary restraint, and psychological distress. Additionally, this project sought to provide qualitative evidence of how patient-provider interactions impacted women's BE and comorbid symptoms in an effort to improve this experience for women and ultimately prevent excess GWG.

The introduction that follows first provides background and empirical information related to excess GWG, including risk factors and consequences, before incorporating information about BE during pregnancy and the scant results that exist about BE in the context of GWG. The dual pathway model for BE is presented as the theoretical lens through which eating in pregnancy will be assessed as it succinctly describes relationships between constructs of body dissatisfaction, dietary restraint, and psychological distress – factors that have also shown to be related to GWG. Lastly, because health care providers play a pivotal role in educating women about GWG as well as assessing for and treating factors that impact GWG, the role of the provider and potential practice implications are addressed before presenting study hypotheses and aims.

Gestational Weight Gain

Pregnancy is a developmental period considered an opportune moment during which women can change maladaptive health behaviors (Phelan, 2010). Health

behaviors that lead to weight gain during pregnancy, in particular, have received significant attention from the medical and public health fields. So much so, that when the Office of Disease Prevention and Health Promotion (ODPHP) released their Healthy People 2020 objectives to advance health and quality of life for U.S. citizens by 2020, one objective was to improve rates of recommended weight gain during pregnancy and help more women gain weight within recommended ranges (ODPHP, 2016). This objective refers to both inadequate weight gain – gaining below IOM recommendations – and excessive weight gain.

The weight that women gain during pregnancy is comprised of three factors: components related to conception such as the fetus itself and the placenta, biological tissue needed to support the pregnancy such as the uterus and blood, and maternal fat reserves. The first two components make up 70% of the GWG, and maternal fat reserves are thought to account for 30% (Rasmussen & Yaktine, 2009). Weight gain occurs slowly during the first trimester and the majority of weight gain occurs during the second and early third trimesters (Rasmussen & Yaktine, 2009).

In 2009 the Institute of Medicine (IOM) was solicited to re-evaluate recommendations for healthy weight gain during pregnancy. Previous recommendations were established in 1990 (IOM) and therefore did not reflect changes in health trends of women of childbearing age (Rasmussen & Yaktine, 2009). For example, it is presently more common for women to be overweight or obese when they become pregnant than it was when the original recommendations were established and that trend was also reflected in the population prior to developing the 2009 standards. Specifically, according to data from the National Health and Nutrition Examination Survey (NHANES)

administered between 2007-2008, 28.6% of women were considered overweight (BMI ≥ 25 kg/m^2), and 35.5% were obese (BMI ≥ 30 kg/m^2; Flegal, Carroll, Ogden, & Curtin, 2010). This is greater than trends seen in results from the same dataset sampled during the time when the original IOM recommendations were established which demonstrated that 24.8% of the United States' female population were overweight and 25.9% obese (Kuczmarski, Carroll, Flegal, & Troiano, 1997). Rates have remained stable as seen in the 2013-2014 data collection period where 27% of women were overweight and 36.5% obese (Ogden, Carroll, Kit, & Flegal, 2014).

Just as rates of overweight and obesity have increased in the United States, so have rates of excess GWG. Data from the 2012 Pregnancy Risk Assessment Monitoring Systems (PRAMS) and birth certificate research in the United States demonstrated that 47.5% of pregnancies which ended in births from 2012-2013 resulted in excess GWG (Deputy, Sharma, & Kim, 2015). General trends in gaining excessive weight can be extrapolated from Centers for Disease Control and Prevention (CDC) data demonstrating that the percentage of women gaining more than 40 pounds during pregnancy increased from 15% in 1990 to 20% in 2005 (CDC, 2008). Regardless of BMI status, gaining more than 40 pounds is considered excess GWG. Even though experiencing excess GWG does not indicate one is overweight or obese, excess GWG is more common in women who are overweight and obese and leads to postpartum weight retention and increased risk for future weight gain, likely due to metabolic changes and fat mass accrual (Berggren, Groh-Wargo, Presley, Hauguel-de Mouzon, & Catalano, 2016).

IOM recommendations for weight gain during pregnancy are now based on the World Health Organization (WHO) BMI categories as opposed to the previously-used

categories based on Metropolitan Life Insurance tables and they suggest that women who are obese have a more restricted weight gain range. By utilizing the WHO BMI categories, the IOM standardized the approach of assessing GWG. The updated decreased range of weight gain for obese women acknowledges the increase in obesity in the United States (Rasumussen, Catalano, & Yaktine, 2010). Current recommendations advise that women who are underweight (BMI <18.5 kg/m^2) gain between 28-40 pounds; normal weight women (BMI 18.5-24.9 kg/m^2) are recommended to gain between 25-35 pounds; and women who are overweight (25.0-29.9 kg/m^2) and obese (BMI $\geq$ 30 kg/m^2) should gain between 15-25 pounds and 11-20 pounds, respectively (Rasmussen & Yaktine, 2009).

Negative effects of excess gestational weight gain.

Research on short- and long-term consequences of excess GWG has consistently demonstrated negative outcomes for the physical and psychological health of mother and child. For the mother, women who gain excess gestational weight have a higher risk of developing gestational diabetes and gestational hypertension due to metabolic and cardiovascular effects of weight gain (Gaillard et al., 2013; Hedderson, Gunderson, & Ferrara, 2010). Birthing complications related to excess GWG include higher risk of: having a cesarean section delivery, suffering from preeclampsia, or birthing a child that is large for gestational age meaning the child weighs at or above the 90^{th} percentile for gestational age (Johnson et al., 2013). Long-term complications include higher risk for postpartum weight retention as well as long-term weight gain or obesity later in life for the mother as well as higher risks of childhood obesity for the child (Mamun et al., 2010; Rasmussen & Yaktine, 2009). The effects of excess GWG can even influence a child's

cognitive functioning as measured by intelligence testing (Pugh et al., 2015).

Risk factors for excess gestational weight gain.

Although GWG is the direct result of specific health behaviors which promote or prevent weight gain, there are various psychosocial factors which impact the trajectory of behaviors leading to GWG. For example, Hill et al. (2013) proposed one of the most complete models of psychosocial factors that place women at risk for excess GWG. The model accounts for antenatal psychological factors, demographic factors, women's knowledge about GWG, social factors such as social support, health behavior change constructs such as self-efficacy, and maternal health behaviors. After testing the model in a sample of pregnant Australian women (Hill, 2014) and conducting a systematic review of psychosocial correlates of excess GWG, researchers concluded that the most relevant factors predicting GWG are depression, body dissatisfaction, and lack of social support (Hartley et al., 2015). The authors also found an indirect relationship between the constructs of depression and GWG as well as body dissatisfaction and GWG. The relationship between depression and GWG was mediated by self-efficacy and body dissatisfaction was related to less readiness to consume healthy diet (less motivation) and less vegetable intake, and in turn, GWG (Hill, 2014). The review and model did not account for BE, thus there is yet little understanding of the role of BE in the development of excess GWG. However, certain constructs from Hill's (2014) theoretical model overlap with risk factors for incident BED during pregnancy identified in the Norwegian Mother and Child Cohort Study data (MoBa; Magnus et al., 2016) identified by Knoph et al. (2011). Similar risk factors were history of major depression, trait symptoms of anxiety and depression, lack of adequate social support, and poor relationship

satisfaction. If certain risk factors for BED are the same as risk factors for GWG, then BE could be a key risk factor for the development of GWG.

A more recent review of risk factors for GWG was conducted by Samura and colleagues (2016). The authors incorporated additional disciplines into their search, thus expanding the results to include risk factor constructs such as quality and frequency of prenatal care. After reviewing 36 articles, they identified that the largest predictor of excess GWG was pre-pregnancy BMI, suggesting that pre-conception counseling is very important in order to advise women to reach an adequate weight prior to becoming pregnant. Additionally, they reported that women who underestimated their level of obesity were more likely to gain excess weight than women who did not underestimate. The discrepancy between estimated and actual obesity status is used as a marker for body dissatisfaction in some studies (Sui et al., 2013) and supports the relationship between body dissatisfaction and GWG found in Hill's (2014) and Hartley et al.'s (2015) research.

Sociodemographic characteristics related to race/ethnicity and socioeconomic status (SES) can also place women at risk for excess GWG. For example, disparities exist in GWG where low-income women are at higher risk not only for excess GWG but also inadequate GWG (Campbell et al., 2016; Huynh, Borrell, & Chambers, 2014). Additionally, minority status is associated with disparate rates of GWG, where White women are more likely to gain excess weight during pregnancy and African American and Latina women are more likely to gain inadequate amounts of weight during pregnancy (Liu et al., 2014). In a qualitative study with 26 primarily African American women in the United States that solicited information about participants' health behaviors and weight gain, those who were low-income were more likely to describe BE behaviors

than higher income women (Paul, Graham, & Olson, 2013). This trend could be due to stress-related eating behaviors brought on by emotional reactions to scarcity and lacking adequate financial support (Paul et al., 2013).

Differences in GWG based on SES could also potentially be explained by food insecurity. Laraia, Epel, and Siega-Riz (2013) utilized data from the Pregnancy, Infection, and Nutrition Study to highlight how food insecurity, or lacking adequate nutritional resources – which could be seen as a proxy for psychosocial stress – is related to weight gain during pregnancy. Participants identified whether or not they had enough food and completed a survey about their eating behaviors, specifically dietary restraint with the Revised Restraint Scale (RRS; Conway, Reddy, & Davies, 1999). Women self-reported their weight at the beginning of pregnancy and from their last prenatal visit before they gave birth. Results from 1,041 women indicated that women experiencing food insecurity coupled with high dietary restraint were very likely to gain excess weight during pregnancy whereas food insecurity without dietary restraint was predictive of inadequate weight gain. These findings highlight the influence of SES on eating behaviors and weight gain during pregnancy in addition to dieting behaviors and weight and shape concerns.

In conclusion, despite the fact that some of the models of GWG risk factors acknowledge disordered eating (typically assessed in the pre-pregnancy time period) as playing a role in GWG, it is not included in empirical testing of models. This omission is a strong limitation because BED is the most common eating disorder during pregnancy (Bulik et al., 2007). Acknowledging and measuring BE as a risk factor for GWG would have the potential to increase awareness of BE as a problematic health behavior for health

care providers and patients and lead to more prevention, screening, and treatment efforts in the perinatal period.

Binge Eating and Pregnancy

The lack of attention to BE during pregnancy could be indicative of the belief that BE does not occur during pregnancy, however, that is inaccurate. The MoBa Study, a large-scale longitudinal study of pregnant women from Norway, is a popular dataset for investigating eating disorder symptoms during pregnancy. Data from this initiative have demonstrated that binge-related eating disorders – bulimia nervosa (BN) and BED - occur during pregnancy, sometimes continuing from the pre-pregnancy period and other times developing during pregnancy (Bulik et al., 2007; Easter et al., 2013). In fact, pregnancy may be a vulnerable period for developing BED for certain women (Bulik et al., 2007).

Bulik et al. (2007) analyzed MoBa data from over 40,000 women that were assessed during pregnancy and discovered that 3.5% of participants had BED prior to pregnancy and 0.7% met criteria for BN. Thirty-nine percent of these individuals remitted during pregnancy. Compared to other eating disorders, the course for BED was more likely to continue than remit, and there were more cases of incidence, or new diagnoses, of BED than other eating disorders (Bulik et al., 2007). The authors posited that pregnancy may be a vulnerable time for women to develop BED due to biological changes related to metabolism, appetite, and mood as well as behavioral considerations related to appetite dysregulation which can trigger BE. Additionally, they suggested that psychosocial stressors related to social disadvantage can serve as a trigger for BE.

Knoph et al. (2011) further explored the incidence of BED during pregnancy using the same data-set and investigated associated risk factors for developing BED.

Authors identified psychological (i.e. lifetime history of major depressive disorder and trait anxiety), social (i.e. lack of social support), weight-related factors (i.e. worrying about weight gain during pregnancy), health behaviors (i.e. smoking during pregnancy), and adverse life events (i.e. history of physical or sexual abuse) were associated with onset of BED during pregnancy. Knoph et al. (2013) later analyzed eating, weight, and risk factor data from the MoBa study from over 77,000 women during pregnancy, at 18 and 36 months postpartum, and retrospectively to capture pre-pregnancy status. For BED in particular, BMI and psychological distress were significantly related to the course of the disorder. BMI was positively associated with continuation of the disorder and negatively associated with remission, and greater psychological distress was associated with greater likelihood of maintaining an eating disorder and less likelihood of remitting.

Overall, evidence from large scale studies provides convincing evidence about the prevalence of BE and BED during pregnancy and the factors that make it more likely for women to continue disordered eating behaviors into pregnancy or even develop disordered eating during pregnancy. What is lacking from the research is how BE and BED may lead to weight gain during pregnancy, given the fact that it is clearly linked to weight gain in samples of non-pregnant women.

Binge Eating and Gestational Weight Gain

Some evidence of the link between BE and GWG can be extrapolated from MoBa data. Bulik et al. (2009) reported that compared to non-eating disordered participants, women with BED, bulimia nervosa (BN), and anorexia nervosa (AN) all gained significantly more weight during pregnancy. Specifically, women with BED gained 16.6 kg on average, women with BN gained 16.8 kg, and women with AN gained 17.8 kg

compared to non-eating disordered women who gained an average of 14.9 kg. Data were not analyzed to distinguish if the weight gain was adequate or excessive according to IOM recommendations.

Siega-Riz et al. (2011) did utilize IOM recommendations to assess for excess GWG in women with disordered eating from the MoBa study and found that women with BN or BED were more likely to gain excessive weight (adjusted odds ratios 1.09 (CI: 1.01, 1.18) and 1.11 (CI: 1.08, 1.14) respectively) than women without an eating disorder. Of interest is that researchers controlled for smoking, household income, education level, age, and pregnancy-related health conditions but they did not control for other relevant psychosocial correlates mentioned previously such as psychological distress and body dissatisfaction which are also risk factors for GWG. Additionally, it is difficult to discern if participants were truly experiencing BE because of the method of assessment. The question for BE queries for both diagnostic characteristics of a BE episode in one question. It states "Have you ever lost control while eating and not been able to stop before you have eaten far too much?" (MoBa; Magnus et al., 2016). This form of question addresses a complex behavior with little clarification. Asking about eating "far too much" is also very subjective. The diagnostic criterion of BE is intended to capture eating an objectively large amount of food (APA, 2013). Eating "too much" may not be an objectively large amount of food.

Brazilian researchers (Nunes, Pinheiro, Camey, & Schmidt, 2012) assessed BE and weight gain in 697 low-income pregnant women to understand birth outcomes and utilized a more adequate measure for BE. Participants completed the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994), a popular diagnostic self-

report measure for eating disorders. Researchers also collected outcome data such as maternal weight from birth records in order to calculate GWG. Results demonstrated that women who endorsed BE had significantly more GWG (15.2kg on average) compared to women who did not report BE (13.6kg; $p = 0.017$). Again, similar to most articles based on the MoBa data, analyses did not assess whether or not the weight gain was excessive based on pre-gravid BMI, and relevant psychosocial risk factors were not assessed.

Park et al. (2015) conducted the most relevant study for the purpose of this review because the authors sought to intentionally assess the impact of BE on GWG using a prospective design. Park and colleagues noticed the lack of research addressing BE in the context of GWG and wanted to test if BE predicted excess GWG above and beyond other psychosocial correlates (i.e. dietary restraint, psychological distress, and self-esteem). A total of 525 women in their second trimester completed self-report questionnaires assessing psychological distress, emotional regulation, lifestyle factors, knowledge about health during pregnancy, eating behaviors, and demographic constructs. Researchers were then able to gather GWG data from birth records. Results from logistic regression predicting GWG category of adequate or excessive as the dependent variable revealed that BE was a strong, independent predictor of excess GWG (aRR 6.51, 95% CI 1.03-41.18; Park et al., 2015). However, BE was assessed with only one question that asked about loss of control, and not whether or not participants ate an objectively large amount of food. Therefore, despite the fact that this study was novel for attempting to analyze the role of BE in GWG above and beyond other relevant factors, it was limited methodologically. Also, researchers did not assess for body dissatisfaction.

One additional study, taking place in the United States, assessed BE during

pregnancy and the relationship with GWG (Allison et al., 2012). Participants were 125 overweight or obese African-American pregnant women recruited in their second trimester. Participants completed the EDE-Q to assess BE as well as measures of night eating, sleep, and mood. BE was not common in the sample. Only 1% of respondents endorsed clinical or subclinical BED and results from correlational analyses revealed that BE was not related to GWG, but the behavior of eating due to cravings did significantly predict more GWG when controlling for maternal age, gestational age, pre-gravid BMI, and education (β = 5.1 kg, p = 0.01). While this study did assess psychological distress, it did not include a measure for body dissatisfaction.

Research on constructs that are closely related to BE, such as cravings mentioned in the study above or eating style, can shed more light on the relationship between BE and GWG. Food cravings refer to the intense and/or specific urge to eat a certain food or even a type of food. Cravings are also very hard to resist and they are thought to be precursors to BE and correlate with disordered eating pathology (Chao, Grilo, & Sinha, 2016). A study from Orloff and colleagues (2016) investigated food cravings during pregnancy for high fat foods, sweets, carbohydrates, and fast foods and how the frequency of cravings and the behavior of engaging in cravings related to GWG. Eighty-three women recruited online and in-person in a medical center participated and provided information about cravings and weight gain. Analyses revealed that the frequency with which women have cravings for food was related to risk for excess GWG and in the sample of women recruited online, the behavior of giving in to cravings was also related to excess GWG.

A study from van der Wijden et al., (2014) in the Netherlands demonstrated

relationships between eating style – based on results from the Dutch Eating Behaviors Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) – such as emotional eating, external eating, and restrained eating and the outcome of GWG. Assessments occurred during the second and third trimesters. Results suggested that eating style was not, but pregnancy attitudes were, related to GWG. Pregnancy attitudes referred to a woman's attitude towards health behaviors they should enact during pregnancy. This is interesting because emotional eating and external eating are related to BE in the general population (Leehr et al., 2015), but they did not have a significant relationship with GWG in this specific study (van der Wijden et al., 2014).

A final behavior closely tied to BE is having a sense of loss of control while eating. Kolko, Emery, Marcus, and Levin (2017) investigated loss of control when eating for women in their second trimester who were overweight or obese. Women in the study who reported loss of control when eating also reported clinically significant levels of depressive symptoms as well as elevated stress. Experiencing loss of control was not related to GWG in the study population. However, the authors did not report prevalence of instances in which loss of control was endorsed along with eating an objectively large amount of food. Therefore, we cannot say that these episodes were representative of BE. Additionally, the authors did not account for constructs such as body dissatisfaction that are known to relate to GWG.

Limitations in Literature for Binge Eating and Gestational Weight Gain

In addition to the modest amount of literature on BE during pregnancy along with related constructs, there are other limitations in the extant literature. First, the majority of studies that measure BE take place outside of the United States (Baskin & Galligan,

2019), and very few studies have examined BED and GWG during pregnancy outside of one data set from Norway, the MoBa study. This is a limitation because the United States supports an obesogenic environment, or one that easily contributes to weight gain due to physical spaces that do not encourages physical activity, large portion sizes, and wide availability of calorie-dense food. (Swinburn et al., 2011; Booth, Pinkston, & Poston, 2005). This environment leads to higher risk for beginning pregnancy overweight or obese and even having excess GWG. Also, certain sociocultural beliefs that may increase GWG are more common in the United States, such as "I'm eating for two" (Kraschnewski & Chuang, 2014).

Second, studies to date that have included BE when studying GWG generally have utilized psychometrically-limited forms of measurement that may not be accurately capturing relevant constructs. For example, Park et al. (2015) identified BE with one item that assessed whether or not participants felt they could stop eating once they have started. In any studies referencing the MoBa dataset (Bulik et al., 2007; Bulik et al., 2009; Knoph et al., 2011) the measure of BE utilized was one question that queried if one has "ever lost control while eating and not been able to stop before you have eaten far too much?" This single question attempts to target two complex diagnostic components of a BE episode: eating a large amount of food and experiencing loss of control; hence its validity is questionable and may not accurately represent clinically significant BE.

Third, attempts to include common correlates of BE and GWG that would potentially impact the presentation and intensity of symptoms such as body dissatisfaction, dietary restraint, and psychological distress have not included all constructs in one study. For example, Hill (2014) includes body dissatisfaction and

psychological distress and GWG. Park et al. (2015) did not account for body dissatisfaction when measuring the connection between BE, dietary restraint, and GWG - which is a variable that is known to be related to GWG (Hill, 2014) and one of the most common psychological correlates of obesity (Friedman & Brownell, 2002). To the author's knowledge there are no studies conducted in the United States that investigate BE and GWG nor the relationships amongst variables utilizing the dual pathway theory of disordered eating.

In summary, current evidence supports for the link between BE and GWG, but the evidence is lacking. Not every woman who engages in BE gains excess gestational weight; therefore, other factors impact health behaviors leading to excess GWG. The next section presents the dual pathway theory for developing BE as a way to analyze BE during pregnancy and eventually relate the behavior to GWG. This theory incorporates constructs of body dissatisfaction, dietary restraint, and psychological distress to explain why BE develops.

Theoretical Components of Binge Eating

Researchers have debated the etiological and maintaining factors for eating disorders. Regarding binge-related eating disorders, the dual pathway model summarizes key constructs that promote BE (Stice, Nemeroff, & Shaw, 1996). This model acknowledges that pressure from society to maintain a certain body shape and weight can lead to internalization of these ideals and body dissatisfaction. Being dissatisfied with one's body can then lead to BE via two pathways: negative affect, or experiencing feelings of emotional distress, and dietary restraint. The theory posits that engaging in BE will help to regulate the negative affect, and that dieting (i.e. dietary restraint) is

initiated to try to lose weight or change body shape which can eventually lead to overeating because adhering to a strict dietary regimen is difficult to maintain (Stice, Nemeroff, & Shaw, 1996). Although extensive support exists for this model across a range of populations, there are some concerns. First, evidence from ecological momentary assessment research does not corroborate the theory that engaging in BE will reduce negative affect for those with BED (Haedt-Matt, 2011), and various studies have not supported the restrained eating pathway between body dissatisfaction and BE in certain populations, such as overweight and obese individuals who binge eat (Welsh & King, 2016). Even with the concerns, there is overwhelming evidence that both dietary restraint and negative affect play a role in BE incidence and maintenance. The dual pathway model has not been tested in pregnant populations, yet key aspects of the pregnancy experience support its relevance to explain why BE can develop during pregnancy or continue from the pre-pregnancy time period.

Dual pathway theory and pregnancy.

First, the dual pathway model is based on the understanding that individuals internalize societal pressure to look a certain way and this is no exception for pregnancy. There is pressure from society to engage in certain behaviors or look a certain way in pregnancy and even postpartum. This is made clear from research on body dissatisfaction during pregnancy (Skouteris, Carr, Wertheim, Paxton, & Duncombe, 2005) as well as qualitative studies that have women describe their relationships with their changing bodies (Watson, Broadbent, Skouteris, & Fuller-Tyszkiewicz, 2016). Second, the natural physical changes which occur during pregnancy – weight and shape change – can be an additional stressor and lead to body dissatisfaction or exacerbate body

dissatisfaction for those with a history of such thought patterns. Both of these factors provide potential support for why the dual pathway model would explain BE during pregnancy. The following sections describe how the components of the dual pathway theory not only relate to BE but may also impact GWG.

Dual pathway theory and gestational weight gain: Body dissatisfaction.

According to the dual pathway model of BE, we cannot understand the development of BE without the contribution of body dissatisfaction. Evidence from empirical studies on body image and GWG suggest that body dissatisfaction is related to excess GWG. Studies with overweight and obese pregnant women generally demonstrate that those who are more dissatisfied with body size and shape and/or have more negative attitudes toward weight gain are more likely to gain excess weight (Hartley et al., 2015). Body dissatisfaction refers to the negative evaluation one places on their weight or shape of their body, and higher levels of dissatisfaction are related to disordered eating (Stice, 2002). Body dissatisfaction is thought to predict disordered eating behavior during pregnancy (Gonçalves, Freitas, Freitas-Rosa, & Machado, 2015), but it is unclear if body dissatisfaction leads to BE or BE leads to body dissatisfaction because of weight gain.

Referring back to Hill (2014), 288 pregnant women in their first or second trimester completed questionnaires at two time points to measure psychosocial constructs thought to lead to GWG such as psychological factors of body dissatisfaction and depression, health behavior change constructs of self-efficacy and motivation, and behavioral factors such as physical activity and dietary content. After conducting path analyses, body dissatisfaction was thought to lead to GWG via low motivation levels and in turn, poorer diet. Researchers did not include BE as a variable, so it is unclear if that

would have played a role.

Another method of assessing body dissatisfaction is measuring the discrepancy between one's perceived weight and their actual weight. Herring et al. (2008) demonstrated that when participants incorrectly reported their pre-gravid weight, they were more likely to gain excess GWG. Authors analyzed data from 1835 women in Massachusetts. Participants answered a question about their perceived weight in their first trimester and prenatal medical records were used to calculate GWG. Multivariable logistic regression models revealed that after controlling for demographic variables and pre-gravid BMI, women who were normal weight and reported weighing more than their actual weight along with overweight/obese women who underreported their weight both had significantly higher odds of gaining excess gestational weight (*OR* = 2.0 and 7.6 respectively).

Sui, Turnbull, and Dodd (2013) also highlighted that those who were more dissatisfied with their bodies have more GWG. Researchers analyzed data from 442 women in Australia who were participating in the control arm of a randomized controlled trial to reduce GWG. Women were in their first or second trimester of pregnancy and were overweight or obese. Participants completed a figure rating scale to assess their body image satisfaction. Body dissatisfaction was very common, occurring in 45% of participants and was significantly correlated to GWG.

Dual pathway theory and gestational weight gain: Psychological distress.

Although the dual pathway theory references the construct of negative affect, the construct of psychological distress is closely correlated and more consistent with constructs measured in pregnancy and health. For example, measures of psychological

distress perform similarly to measures of negative affect (Crawford & Henry, 2004). Psychological distress in the form of depression, anxiety, or stress, is related to GWG, although data are equivocal. Kapadia et al.'s (2015) systematic review of psychological predictors of excess GWG analyzed results from 26 different studies and concluded that, in general, affective states (referring to constructs such as stress or depression) were not significantly related to excess GWG. The authors mentioned one study (McAnarney & Stevens-Simon, 1992) which measured depression during pregnancy and did find a relationship, except for severe levels of depression. Similarly, Molyneaux, Poston, and Khondoker (2016) found that antenatal depression is not related to GWG.

On the other hand, Webb, Siega-Riza and Dole (2009) demonstrated that depression was related to excess GWG when the depressive symptoms occurred throughout pregnancy. High levels of depressive symptoms, however, did not have that effect. Authors analyzed data from women in the Pregnancy, Infection, and Nutrition study in North Carolina. Women in their first or second trimester completed self-report questionnaires assessing psychological distress, self-esteem, sense of influence over fetal health, and maternal health behaviors. Similarly, Wright et al. (2013) also identified a relationship between depression and GWG measured as a continuous variable in a sample of low-income Africa American and Latina women in Pennsylvania. Results were, however, tempered by the participant's self-efficacy. Hill (2014) also found that self-efficacy mediated the relationship between depression and the categorical variable of excess GWG.

Anxiety related to pregnancy or generalized can also impact weight, although the construct is not commonly measured in empirical research. Webb et al. (2009) did in fact

measure anxiety in their sample and found a moderate relationship between anxiety and GWG, similar to the pattern of results with depression and GWG, where anxiety was related to excess GWG. Matthews (2015), in a cross-sectional study collected survey data from women in the United States who were at least 8 weeks pregnant and assessed health behaviors, psychological distress, and weight gain. Correlational analyses yielded a significant positive relationship between anxiety and GWG but only in the first trimester ($r = .34$, $p < .01$). Conversely, research presented in Hartley's systematic review (2015) suggested that there is no link between anxiety and GWG.

A third facet of psychological distress, stress, has been researched in the greater context of eating behaviors as well as GWG (Paul et al., 2013; Thomas et al., 2014). In non-pregnant populations, stress is a risk factor for weight gain, overweight, and obesity because it may lead to emotional eating or trigger a chronic cortisol response which has metabolic implications such as increased appetite and changes in where fat is stored in the body (Block, He, Zaslavsky, Ding, & Ayanian, 2009). Stress is sometimes related to excess GWG dependent on maternal pre-gravid BMI (Deputy, Sharma, Kim, & Hinkle, 2015; Kubo et al., 2017). More evidence for the link between stress and GWG comes from intervention and focus group research. Interventions that target stress during pregnancy have demonstrated moderate results in decreasing excess GWG when compared to women in control groups (Bogaerts et al., 2012) and focus groups of low-income pregnant women revealed that reducing stress would likely help women to prevent excess GWG (Thomas et al., 2014). Sources of stress can come from SES disadvantage, discrimination, relationships, or even pregnancy-related stress.

While evidence of psychological distress is equivocal in terms of GWG, it is

strongly associated with body dissatisfaction and BE in other populations and signals a poorer prognosis in individuals with BED or BN (APA, 2013). So much so that interventions for eating disorders also target these constructs to improve patient outcomes.

Dual pathway theory and gestational weight gain: Dietary restraint.

Research on how dietary restraint relates to GWG consistently supports the relationship that past and present dietary restraint correlates with more weight gain during pregnancy. Mumford, Siega-Riz, Herring, and Evenson (2008) analyzed data from over 1200 pregnant women and observed that women who reported histories of restrained eating and dieting patterns gained more weight overall and were more likely to gain above recommendations that women who did not engage in restraint behaviors past or present. This is also true in research that investigated how food insecurity and dietary restraint may interact to impact GWG (Laraia, Epel, & Siega-Riz, 2013). Heery, Wall, Kelleher, and McAuliffe (2016) assessed dietary restraint and history of dieting behaviors in pregnant women and prospectively measured GWG investigating correlates and pathways. They found that while dietary history and dieting behaviors in the pre-pregnancy period were correlated with higher pre-pregnancy BMIs, and more GWG, they did not predict excess GWG status and did not relate to GWG through the pathway of increased food intake as hypothesized.

Practice Implications: Role of Provider

Despite evidence of the potential dangers of BE, body dissatisfaction, dietary restraint, and psychological distress in the context of GWG and pregnancy outcomes, women are not receiving adequate care for their distressing symptoms. In a 2007-2008

survey of Fellows of the American College of Obstetricians and Gynecologists, less than half of the respondents said that they assess a patient's eating disorder history, body image concerns, BE, or purging (Leddy et al., 2009). It was clear that almost all physician-respondents understood the potential negative consequences of eating disorders, but they did not think their training was adequate to diagnose or treat them.

Stengel, Kraschnewski, Hwang, Kjeulff, and Chuang (2012) interviewed overweight or obese women after pregnancy about their experiences with their providers. Twenty-four women provided feedback and qualitative analysis revealed that based on participant's memory of patient-provider interactions, their health care providers were not communicating sufficient amounts of information related to GWG or health behaviors related to weight such as physical activity and even, at times, giving inappropriate information. For some participants the lack of relevant information underscored their body dissatisfaction and even contributed to psychological distress due to feeling upset with their providers and themselves. In cases of individuals predisposed to disordered eating and according to the dual pathway theory, this chain of events may have initiated or encouraged disordered eating behaviors.

Although women report receiving insufficient information from health care providers about GWG, they acknowledge how improvements can be made. Nikolopoulos, Mayan, Maclsaac, Miller, and Bell (2017) conducted focus groups with 26 postpartum women to discuss their perceptions of information they received from health care providers related to GWG. Themes related to communication between patient and provider highlighted that women were not satisfied with the information they received and believed the conversations about weight gain and were very important to have.

Women said they felt confused about how much weight they could gain during pregnancy which also had emotional consequences. Participants described feeling frustrated or ashamed if they felt they gained too much weight. Despite frustration with health care, women were able to suggest ways to improve. For example, they suggested for providers to ask about women's comfort levels with having discussions about weight and also to start the conversations early in pregnancy.

There is currently an opportunity to shift the culture surrounding disordered eating and weight gain in pregnancy by reevaluating patient-provider interactions and the state of our interventions for disordered eating during pregnancy and GWG. The results of this study may help to start this culture shift. By first highlighting the prevalence of BE during pregnancy and how the relationships between body dissatisfaction, dietary restraint, and psychological distress influence development of GWG, this study will be able to establish a clear area for provider assessment and intervention to best support women and their children. Then, qualitative data from pregnant women who engage in BE that assesses GWG as well as how health care provider interactions influence their experience will allow researchers to identify directions for future research and practice implications.

Summary

This study was designed to better understand the experiences of pregnant women who binge eat and how the behavior may or may not impact GWG. Specifically, it aims to fill the gap in the literature by assessing how BE relates to GWG for women based on its relationship with theoretically-supported constructs of body dissatisfaction, dietary restraint, and psychological distress while using more sophisticated methodology than

existing research. By conducting this study, the contribution to the literature is threefold: it assessesthe potential contribution of BE as a novel risk factor for GWG; it assesses these risk factors for GWG within the United States – an obesogenic country; and it utilizes reliable diagnostic tools that have been validated in pregnant women to measure the variables of interest. Results can be used to inform interventions for pregnant women and screening protocols in obstetrics and gynecology clinics and other locations where women seek prenatal services.

Study Aims

AIM 1. In order to fill the gap in the literature related to the role of BE and GWG, this study sought to assess the relationship between BE frequency, body dissatisfaction, dietary restraint, psychological distress and GWG based on the dual-pathway theory of BE.

Aim 1a. Assess the relationship between past and current body dissatisfaction and the constructs of dietary restraint, psychological distress, BE, and GWG.

Hypothesis 1. There would be a significant positive association between history of body dissatisfaction and current body dissatisfaction.

Hypothesis 2. The relationship between current body dissatisfaction and BE would be fully mediated by dietary restraint behaviors and psychological distress. Further, it was expected that the pathway via psychological distress would exhibit a stronger relationship than the restraint pathway due to the fact that restraint is less common in pregnancy because of dietary requirements to support fetal growth. See Figure 1 for a visual depiction of relationships between constructs.

Hypothesis 3. When accounting for body dissatisfaction past and current, dietary restraint, and psychological distress, the frequency of BE would significantly be associated with GWG status in participants.

AIM 2. Understand women's lived experiences with BE, body dissatisfaction, dietary restraint, and GWG and how interactions with prenatal health service providers affect their experiences.

Aim 2a. Gain a better understanding of the information women receive from prenatal health service providers related to GWG recommendations, disordered eating, and body image, as well as their attitudes towards the information.

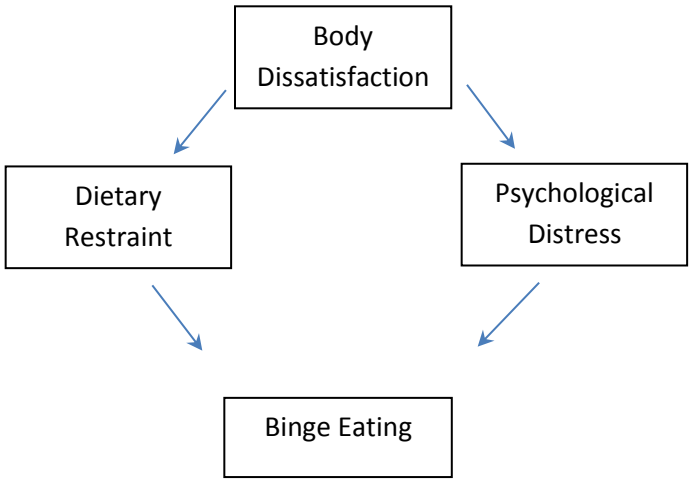

Figure 1. Model Based on Dual Pathway Theory for BE to Guide Study Hypotheses

Chapter 2: Methods

Participants

The current project recruited women (N = 259) of reproductive age (18-45) in their third trimester of pregnancy. Women had no prior live births in order to control for the fact that excess GWG risk increases with each live birth and were pregnant with only one fetus (Waring, 2013). Gestational age of the fetus was limited to the third trimester to ensure as much as possible that gestational weight gain had occurred at the time of data collection. Additionally, per American Academy of Pediatrics (AAP) and American College of Obstetricians and Gynecologists (ACOG) recommendations (AAP & ACOG, 2013), prenatal visits become more frequent during the end of pregnancy. Ideally, this allowed for participants to have a more accurate memory of their current weight to report for the survey and also allowed them to more accurately provide information about their interactions with health care providers. Geographic location of participants was limited to the southeastern United States as states in this region typically have higher rates of overweight and obesity (CDC, 2019). Specific inclusion and exclusion criteria was as follows:

Inclusion criteria: Age 18-45, first pregnancy, at least 28 weeks into pregnancy or more to ensure third trimester status, endorsement of BE, comfort communicating in English.

Exclusion criteria: under the age of 18 or over the age of 45, greater than first pregnancy, first or second trimester of pregnancy, multiple fetal pregnancy, medical or psychiatric condition which would affect ability to participate in surveys such as cognitive dysfunction or schizophrenia, lack of BE, lack of

comfort communicating in English.

Design

The present study utilized a mixed-methods research design to address hypotheses based on the research questions and aims as well as investigate the participants' experiences of living with BE during pregnancy and how their interactions with health care providers influenced their thoughts, emotions, and behaviors. The online survey provided a cross-sectional approach to detect relationships amongst the variables of BE, dietary restraint, body dissatisfaction, psychological distress and GWG. The semi-structured interview allowed for a systematic approach to gather additional information and extend research questions, highlighting nuanced descriptions of participant experiences and drawing conclusions between reported experiences and interactions with health care providers.

Procedure

Recruitment.

Recruitment was completed through online methods such as posting to interest groups related to pregnancy and birthing on Facebook and other online forums. Announcements highlighted the nature of the study – research on pregnancy, eating, and body image – and mentioned that compensation would be provided. In order to restrict the region of participants, websites were chosen that targeted audiences in the southeastern United States.

Online survey.

Women completed a brief screening procedure to ensure eligibility for the online survey and were informed that screening information would be confidentially recorded

by study staff regardless of eligibility. If eligible, they were directed to a description about the study consistent with institutional review board regulations for informed consent. If participants indicated they agreed to participate, they were directed to the remainder of the survey. This served as informed consent from participants. If ineligible, women were directed to the end of the survey and thanked for their time.

Average completion time of the survey was 35.6 (*SD* = 55.58) minutes. The high standard deviation was likely due to the fact that some participants returned to the survey hours, or even days, after initiating participation. Participants were offered the opportunity to enter a drawing for one of five $40 Target gift cards. If they wished to enter, they provided a form of contact (i.e. phone number or email address) in order to alert them if they win and arrange delivery of the gift card.

In order to ensure that participants were supported if they endorsed significant psychological distress or disordered eating behaviors, researchers included a list of national electronic and telephone resources at the end of the survey. This list included a link to the National Eating Disorders Association website as well as the National Alliance on Mental Illness website and Helpline and National Suicide Prevention Lifeline. If participants responded to a clinically significant level of psychological distress during the survey, they were directed to this list prior to continuing with the rest of the survey and they were reminded that their participation was voluntary.

Semi-structured interview.

In order to achieve Aim 2, women who reported at least four episodes of BE in the previous 28 days on the disordered eating measure were offered the opportunity to participate in a 30- to 40-minute telephone interview for a $15 Target gift card. By only

inviting women who reported four episodes of BE, this allowed researchers to interview women with a clinically significant level of BE which is consistent with disordered eating diagnoses (APA, 2013). If women were interested in participating, they were prompted to enter their contact information for their desired means of communication. Participants were contacted within one week to schedule the interview. All interviews were audio-recorded.

Data Management and Confidentiality

Participants only provided identifying information if they were interested in participating in the drawing for a gift card, or if they wanted to complete the telephone interview. After participants completed the survey they were assigned a study identification number and any data downloaded was organized using the ID number, not the identifying information.

The master list of participant names and ID numbers was kept by the principal investigator (PI) in a password-protected file, on a password-protected computer in a locked office. When women were eligible to receive a gift card they communicated their mailing address directly to the principal investigator who wrote the address on the envelope and did not store the information. All audio files were uploaded to a password-protected drive and labeled with the participant's ID number. They were immediately deleted off of the recording device after upload. Interviews were transcribed manually verbatim by the PI.

Measures

Dependent variable.

Gestational weight gain status. GWG status was determined with self-reported

height and current weight along with weight at the time of conception. The calculation utilized in this study is based on a formula originally created by Bodnar, Siega-Riz, Arab, Chantala, and McDonald (2004) which accounts for a woman's expected GWG based on pre-gravid BMI and the fetus' gestational age at the time they report their current weight. See below for a summary of the formula:

Expected GWG =

Recommended first-trimester total weight gain (.5kg for obese range, 1 kg for overweight, and 2 kg for normal weight/underweight)

+

[(Gestational age at weight measurement – 13 weeks) x Recommended rate of gain in second and third trimester (also based on pre-gravid BMI)].

In order to assess if participants gain within the IOM recommended ranges or not, prior to having reached full gestation, cut points were calculated for inadequate, adequate, and excessive weight gain by dividing the lower and upper limits of each weight gain range based on BMI status by the expected weight gain at 40-weeks' gestation and then multiplying by 100. Each participants' total weight gain was then divided by expected weight gain for their current gestational age and multiplied by 100 creating a ratio of current to expected weight gain. This ratio percentage was compared to the ranges previously created in order to determinate weight gain status based on pre-pregnancy BMI category. Each participant was then categorized as gaining adequate GWG or below (GWG = 0) or excess GWG (GWG = 1). The adequate GWG and below GWG were grouped together because the main goal of this study was to understand what factors may be associated with excess GWG. See Appendix B for an example of how GWG status was calculated.

Independent variables.

***Screening procedure*.** Screening was conducted via a brief series of questions assessing participant's number of live births, gestational age to determine pregnancy trimester, and whether or not they were diagnosed with a condition which could interfere with survey completion. Potential presence of BE was assessed by asking participants if they ever ate large amounts of food, which was clarified as an amount of food that others would also think is large. Examples of objectively large amounts of foods were not provided during the screening process but were provided later in the survey before respondents answered questions related to BE.

***Demographics*.** Participants reported their age, relationship status, race/ethnicity, annual income, employment status, highest education level attained, and insurance status.

Health status and history. Participants indicated if they had been diagnosed with any chronic illness and then if they had been treated by a health care provider for their illness within the past year.

Pregnancy, health behaviors, and current weight. Participants reported relevant pregnancy information such as when they first attended a prenatal medical appointment, whether the pregnancy was planned, and whether or not they plan to breastfeed. In this block of questions, participants provided their current height and weight as well as their pre-gravid weight. Research has demonstrated that self-report of pre-gravid weight is variable. For example, women tend to underreport their pre-gravid weight and over-report their GWG; however, these differences have not been shown to bias relationships between weight gain and birth outcomes (Headen, Cohen, Mujahid, & Abrams, 2017).

Eating behaviors. The Eating Disorders Examination-Questionnaire (EDE-Q;

Fairburn & Beglin, 1994) is a 33-item self-report measure that was created based on the diagnostic interview – the Eating Disorder Examination (Fairburn & Cooper, 1993). This questionnaire provides a brief, yet comprehensive method to measure core eating disorder psychopathology. Instructions were included that were developed by Goldfein, Devlin, and Kamenetz (2005) which provided examples of BE in order to aid in participant's understanding of the construct as it can be frequently misinterpreted by lay audiences. Adding the brief example set has led to improvements in the performance of the EDE-Q when compared to an interviewer-led version of the measure, thus suggesting more diagnostic accuracy (Golfein et al., 2005). Focusing on the previous 28 days, questions assess frequency of BE, vomiting, laxative and diuretic misuse, and excessive exercise. The EDE-Q also measures objective overeating (eating a large amount of food without a sense of loss of control), and subjective binge eating (eating a normal amount of food while experiencing sense of loss of control). As previously mentioned, a score of 4 objective binge episodes or more in the past 28 days is considered clinically significant and was used to recruit women for the telephone interview.

A review of psychometric data on the EDE-Q demonstrates that overall test-retest reliability ranged from .51 for number of BE episodes in past 28 days and .84 for number of days with a BE episode in the past 28 days (Berg, Peterson, Frazier, & Crow, 2011). Internal consistency of the subscales ranged from α = 70-.93. The EDE-Q has been used with pregnant women to assess for disordered eating psychopathology (Easter et al., 2015; Gonçalves et al., 2015). Chronbach's α for the total scale for this study was .93 indicating that the measure had excellent reliability.

Dietary restraint. The restraint subscale of the EDE-Q was used to assess dietary

restraint. It consists of questions such as "Have you been consciously trying to restrict the amount of food you eat to influence shape or weight?". The mean for all items in the subscale was calculated and higher scores on the subscale indicate higher levels of dietary restraint. Reliability was fair for the restraint subscale in the current sample (α = .71).

Body dissatisfaction. The Body Attitudes Questionnaire (BAQ; Ben-Tovim & Walker, 1991) was used to assess participant's attitudes towards their body shape and size. This measure originally contained 44 items, but 28 were used for this study because they are most relevant to pregnant women and represent four subscales: feeling fat, salience of weight and shape, strengths and fitness, and feeling attractive. Participants were asked to read statements about how they have been feeling in the past month such as "I feel fat when I can't get clothes over my hips" or "I spend a lot of time thinking about my weight" and respond to how much they agree from 1 (definitely disagree) to 5 (definitely agree). Higher scores reflect stronger feelings on all scales. The BAQ is commonly used in research with pregnant women (Bagheri et al., 2013; Clark, Skouteris, Wertheim, Paxton, & Milgram, 2009; Sweeney & Fingerhut, 2013). Ben-Tovim and Walker (1991) highlighted strong internal consistency (α = .87 for full scale) as well as stable test-retest scores (r = .64-.91 for different subscales over four-weeks). Similar strength of this measure has been demonstrated in samples with pregnant women by Skouteris and colleagues (2005; α = .70-.88 for subscales). Scores for the attractiveness and strength subscales were reversed-scored and a total score was calculated for use in data analysis. Reliability analysis revealed good reliability for the scale total in the current sample (α = .81).

***History of body dissatisfaction*.** Additionally, participants completed the BAQ retrospectively to calculate a pre-pregnancy body dissatisfaction score. They were prompted to think about the time during which they became pregnant and answer the same questions. This method was used in Skouteris et al. (2005). Assessing performance of the measure in the current sample for past body dissatisfaction suggested good reliability (α = .80).

Psychological distress. The Depression, Anxiety, and Stress Scale (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998) assesses symptoms that respondents may have experienced within the previous seven days. Each scale consists of seven items with four response options: 0 (did not apply to me at all) to 3 (applied to me much, or most of the time). The measure demonstrates excellent internal consistency (α = .93 for total score; Henry & Crawford, 2005). The DASS-21 has been used in perinatal populations and has demonstrated good reliability (Miller, Pallant, & Negri, 2006). Anxiety and stress subscales has demonstrated good internal validity for pregnant women as well α = .74-.85 (Hill, 2014). For this study, a general psychological distress score was calculated by summing all of the responses and multiplying the sum by two. Based on reliability analysis for the current sample, scores on the DASS-21 demonstrated excellent reliability (α = .95)

Semi-structured interview.

Questions were designed to solicit information from women about their eating behaviors, body image, and GWG during their pregnancy. Additionally, they were prompted to discuss their interactions with prenatal health service providers with a specific focus on what information they received about GWG, their perception of the

information, and how the information they did or did not receive affected their health behaviors. Additional questions assessed whether or not health care providers provided resources for patients who exhibited signs of disordered eating or body dissatisfaction. Questions are based on previous qualitative research from Stengel et al. (2012), Olander et al. (2011), and Duthie, Drew, and Flynn (2013). See Appendix B for the detailed interview schedule.

All interviews were conducted by one doctoral-level graduate student. They were audio-recorded with the participant's permission, and were later transcribed by the interviewer.

Plan of Analysis

An a priori statistical power analysis was conducted prior to data collection. Using G*Power 3.1.9.2 software (Faul, 2014), the large sample approximation was used as proposed by Demidenko (2007) to estimate power for the logistic regression analyses. Given that the baseline probability of developing excess GWG is approximately 50%, in order to detect an odds ratio of 1.5 with a power of 80%, the sample size would need to be 217. The total sample size for the study was 235.

Data from this study were analyzed by both quantitative and qualitative methods in order to address each aim.

Quantitative analysis.

Data management. Data were collected via an online survey posted on www.qualtrics.com. They were exported and uploaded into IBM's SPSS Statistical Software, version 24 (IBM, 2016). From there, the principal investigator assessed the quality of the data by looking for missing data and outliers by calculating descriptive

statistics and the ranges of responses. Data from 14 participants were removed using listwise deletion due to missing data, invalid responses, or endorsing values that presented as outliers compared to the larger dataset. Five individuals were missing one item on either the BAQ or the DASS-21. For each case, the mean of the remaining items on the scale to which the missing value belonged was substituted. Relevant measure totals were computed and GWG status was calculated using the formula described previously. After assessing the normality of distribution for the continuous variables, episodes of objective overeating and objective binge episodes demonstrated positive skew and kurtosis (skew = 1.98 and 2.78; kurtosis = 3.57 and 8.46) thus violating assumptions of normality. No other variables violated assumptions of normality. Researchers utilized a square root transformation for these variables to normalize the distribution and the results were successful. Skewness and kurtosis were then .64 and .59 for episodes of objective overeating and .79 and .82 for objective binge episodes. The transformed variables were used in all data analysis.

Preliminary analyses. Means and standard deviations were calculated for all continuous variables. Frequencies for categorical variables such as education level and marital status were counted and interdependence among categorical variables examined by X^2 analysis. Prior to testing hypotheses, a variable for GWG was coded based on below adequate/adequate GWG and excess GWG. *T*-tests were conducted to determine which variables significantly discriminated adequate and below GWG from excess GWG. These variables, and those from X^2 analyses were used in the first step of logistic regression models.

Hypothesis testing.

Hypothesis 1. Bivariate correlation analyses were used to assess the relationship between pre-pregnancy body dissatisfaction and current body dissatisfaction.

Hypothesis 2. Multiple regression analyses assessed the mediating effects of dietary restraint and psychological distress on the relationship between body dissatisfaction and BE frequency. This was done utilizing Hayes (2017)'s PROCESS procedure syntax to allow for bootstrapping in order to identify indirect effects via path analyses.

Hypothesis 3. Logistic regression was used to assess the unique effects of BE frequency on GWG status while holding constant relevant variables such as pre-pregnancy BMI, dietary restraint, body dissatisfaction, psychological distress, and other psychosocial variables deemed significant based on preliminary analyses. Status of GWG was dichotomized as exceeding or not exceeding GWG recommendations (0 = not exceeding GWG recommendations, 1 = exceeding GWG recommendations) and was regressed onto the independent variables. Step 1 included independent variables, and step 2 added BE frequency. The Hosmer-Lemeshow's goodness of fit tests were used to indicate model fit and the Wald chi-square statistics were used to interpret odds-ratios statistical significance along with the use of 95% confidence intervals.

Qualitative analysis. Content analysis drove the process of qualitative analysis because it allows one to interpret the content of participant responses in a systematic manner (Hsieh & Shannon, 2005). Specifically, we used a conventional content analysis approach to understand women's experiences related to the variables of interest and how their interactions with providers impacted their pregnancy journey.

After cleaning the qualitative data, the PI and a graduate-level research assistant first read the responses for 20% of interviews multiple times in order to identify tentative labels by open coding based on responses that represented main thoughts and/or concepts (Patton, 2002). This process revealed preliminary categories. After reaching consensus on labels and preliminary categories, the PI continued to engage in open-coding to establish the detailed coding manual complete with higher order themes, categories, sub-categories, and descriptions. This was done by drawing connections between initial codes and grouping them into larger categories and themes. The research assistant then utilized the codebook to code an additional 20% of interviews in order to assess interrater reliability as well as adjust coding further. There were 6 discrepancies in coding which were resolved via discussion and returning to participant data and interview notes. The inter-rater reliability before resolving discrepancies was $\kappa = .89$.

Both the PI and the research assistant engaged in frequent reflection of how their assumptions impacted coding in order to minimize researcher and analyst bias. First, prior to conducting interviews, the PI – a female who does not have children – reflected on her own experiences with the constructs being analyzed. While she has significant content knowledge, she has not been pregnant or had disordered eating. During interviews she was careful to not as leading questions consistent with her content knowledge. Additionally, notes were recorded during and after each interview to facilitate additional reflection throughout the process. The research assistant who helped with coding is a female who has an infant child. She engaged in reflection before and after each transcript she coded to reduce bias and any concerns were discussed amongst the two coders. Finally, bias was minimized during the validation process when

discrepancies arose in coding interviews based on the coding manuals. Discussion was used to resolve discrepancy.

NVivo 11 qualitative software was utilized to complete analyses and identify additional potential themes (QSR International, 2016). Interview transcripts along with coding were uploaded and analyzed to identify additional connections between themes, categories, and even sub-categories. NVivo allows researchers to identify nodes and provides a hierarchical structure of codes. This was helpful to further understand frequency of codes amongst all interviews and how they relate to one another.

Data integration.

An essential aspect of conducting mixed-methods research is the integration quantitative and qualitative data. The process of data triangulation was used to establish a sort of convergent validity between the results from quantitative analyses and the lived experiences of participants with the constructs (Bazeley, 2009). Triangulation is another way to reduce bias in coding by comparing results to an additional data source (Farmer, Robinson, Elliott, & Eyles, 2006). For the purposes of this study, triangulation was utilized to validate the quantitative results. Specifically, the summary of quantitative results that describe relationships amongst variables of BE, dietary restraint, body dissatisfaction, psychological distress, and GWG was compared to the results of qualitative coding in order to identify similarities.

CHAPTER 3: Results

This study sought to explore how BE impacts GWG while considering related factors of body dissatisfaction, dietary restraint, and psychological distress. To do this, data were collected over the course of eight months from August 2018 to March 2019. A total of 689 women accessed the survey and 422 (61%) met inclusion criteria and began the questionnaires while 249 completed the survey. Participants suspended participation at various points throughout the survey with no clear pattern. The most common reasons that participants were ineligible were: not having reached third trimester of pregnancy (44% of ineligible participants), participants had already given birth (29%), or they did not endorse BE (22%). Data from 14 were removed during data cleaning yielding a total sample for analysis of 235.

Participant Characteristics

Participants included in analyses were 27.96 years old on average (*SD* = 5.85), and were primarily from the states of Florida (19%), North Carolina (19%), and Virginia (16%). Most were in a relationship (67%), working full or part-time (57%), and self-identified as White (66%). See Table 1 for additional demographic characteristics.

Many of the women (59%) were planning for their pregnancies and engaging in behaviors such as taking prenatal vitamins, consulting with their health care providers, and tracking ovulation. Women reported being diagnosed with gestational diabetes (9%) and hypertension (5%) during pregnancy. Additional information about pregnancy-related questions is in Table 2.

Regarding variables related to analyses, participants' self-reported height and weight at the time of conception yielded an average BMI of 27.87 (*SD* = 6.99), and they

engaged in objective overeating 6.72 times (*SD* = 7.29) in the previous 28 days and 4.35 (*SD* = 6.19) episodes of objective BE in the same time period. Twenty percent (*n* = 47) said that they felt they had an eating problem currently, and 15% (*n* = 36) said they wanted help for an eating problem. Some women reported additional disordered eating symptoms such as losing control over eating but not eating an objectively large amount of food (40%), inducing vomiting to compensate for binge eating (9.8%), taking laxatives to affect weight or shape (5.1%), taking diuretics to control weight or shape (2.1%), and vigorously exercising to control weight or shape (18.3%). A total of 17 participants (7.2%) reported having received treatment for an eating disorder in the past.

Results from other measures revealed that participants reported mild levels of depression and stress and moderate levels of anxiety. They reported moderate to moderately high levels of body dissatisfaction in the past and present, respectively. Additional information can be found in Table 3.

Table 1

Participant Demographics

		M/%	*SD*/*n*
Age		27.96	5.85
Race/ethnicity	White	65.6	154
	Black	12.8	30
	Asian	8.1	19
	Hispanic/Latina	8.1	19
	American Indian or Alaskan Native	1.3	3
	Mixed Race	4.3	10
Relationship Status	Single	13.1	73
	Married or living as married	67.2	158
	Separated, divorced	1.7	4
Employment Status	Full time	43.4	102
	Part time	13.6	32
	Unemployed	39.1	92
	Other	3.8	9
Education	Below high school grad	6.0	14
	High school grad	14.0	33
	Some college	31.5	74
	4-year college graduate	24.7	58
	More than 4-year college	23.8	56
Household income	Less than $25000	29.8	70
	25000-49999	24.7	58
	50000-99999	29.8	70
	100,000+	15.7	15.7

Table 2

Pregnancy Characteristics

		%	*n*
Pregnancy Intention	Intended pregnancy	58.7	138
	Unintended pregnancy	41.3	97
Pregnancy Reaction	Wanted to be pregnant later	33.2	78
	Wanted to be pregnant sooner	26.4	62
	Wanted to be pregnant then	26.8	63
	Didn't want pregnancy then/ever	3.8	9
	Wasn't sure	9.8	23
Pregnancy Diagnoses	None	63.4	149
	Depression	12.8	30
	Gestational diabetes	8.9	21
	High blood pressure	5.1	12
	Other (i.e anemia, hyperemesis gravidarum)	6.8	19
Planning to Breastfeed	Yes	93.2	219
	No	6.8	16

Table 3

Participant Characteristics

	M/%	SD/n
Pre-Pregnancy BMI	27.87	6.99
Underweight	4.3	10
Normal	40.0	94
Overweight	23.0	54
Obese	32.8	77
Objective overeating	6.72	7.29
Binge eating	4.35	6.19
Restraint	1.27	1.24
Psychological distress	43.07	26.85
Depression	12.75	10.38
Anxiety	12.60	9.14
Stress	17.73	9.85
Current body dissatisfaction	90.56	18.91
Past body dissatisfaction	83.09	20.23
Weight gain (pounds)	27.66	14.20
GWG category		
Below/Adequate	37	87
Excess	63	148

Note. Objective overeating, binge eating, and restraint were measured by the EDE-Q. Objective overeating and binge eating represents frequency of episodes for the past 28 days. Range for restraint is 0-6 where 6 is the highest level of restraint. Psychological distress was measured by DASS-21. Range of 0 to 126 where higher scores indicate more distress. Body dissatisfaction measured by the BAQ. Range = 28-140 where higher scores indicate more dissatisfaction.

Preliminary Analyses

Categorical demographic variables were analyzed to assess interdependence amongst variables as well as with the outcome variable of GWG. Results suggest that relationships among variables were as expected (i.e. participants who were married had higher income levels than those who were single likely because they have multiple earners in one household). For variables of interest, i.e. gaining excess weight, there were no significant differences based on demographic variables. However, individuals who endorsed any BE, regardless of frequency, were more likely to be married than single (X^2 (1, N = 235) = 4.45, $p < .05$), earn a higher income (X^2 (3, N = 235) = 15.99, $p < .01$), have higher levels of education, (X^2 (4, N =*235)* = 14.77, $p < .01$), and identify as White vs. person of color (X^2 (1, N = 235) = 4.59, $p < .05$).

Results from *t*-tests revealed that, as expected, BMI was significantly different based on GWG category, t = -2.00, df = 233, p = .046. Based on these results, BMI is the only variable that was be included in the first steps of analyses.

Hypothesis Testing

Hypothesis 1. Results of correlation analyses revealed that past body dissatisfaction was significantly and positively associated with current body dissatisfaction (r = .52, $p < .001$). See Table 4 for results of correlation analyses.

Table 4

Correlation Analyses

	1	2	3	4	5	6	7	8	9
1. Age	-								
2. BMI	.02	-							
3. OO	-.08	.10	-						
4. OBE	.001	.13*	.78**	-					
5. GWG	-.04	-.20**	.06	-.03	-				
6. Restraint	.07	-.02	.35**	.41**	-.07	-			
7. DASS-21	-.29**	.04	.41**	.55**	.08	.32**	-		
8. BAQ Past	.11	.35**	.09	.25**	-.10	.18**	.28**	-	
9. BAQ Current	-.07	.31**	.42**	.55**	.-.01	.42**	.52**	.52**	-

Note. OO = objective overeating episode frequency, OBE = objective binge episode frequency, DASS-21 = Depression, Anxiety, and Stress Scale-21, BAQ = Body Attitudes Questionnaire. *p<.05, **p<.01.

Hypothesis 2. Parallel mediation analyses were conducted in SPSS to assess the indirect effects of body dissatisfaction on BE frequency during the previous 28 days as mediated through dietary restraint and psychological distress. Results indicated that body dissatisfaction was indirectly related to BE through its relationship with psychological distress and dietary restraint. In step 1 of the mediation model, dietary restraint was regressed onto body dissatisfaction and the coefficient value was significant, $b = .03$, $t(231) = 6.9$, $p < .001$. This indicates that as body dissatisfaction scores for participants increased, so did their dietary restraint scores. Control constructs of past body dissatisfaction was non-significantly associated with BE and pre-pregnancy BMI was significantly associated with lower frequency of BE, where $b = -.03$, $t(231) = -2.66$, $p < .01$. Psychological distress was then regressed onto body dissatisfaction and yielded a significant relationship, where greater body dissatisfaction was associated with greater psychological distress ($b = .77$, $t(231) = 8.26$, $p < .001$). Based on the R^2 value, the entire model accounted for 43% of the variance of BE frequency. See Figure 2 for additional details.

Hayes' (2017) PROCESS macro Version 3 was implemented to calculate indirect effects. A 95% bias-corrected confidence interval based on 5,000 bootstrap samples indicated that the indirect effect of body dissatisfaction through psychological distress (0.02), was above zero (CI: 0.007 to 0.021). The indirect effect for restraint was 0.01 (CI: .001 to .011) indicating that psychological distress accounted for a larger proportion of the indirect effect based on relative size. Lastly, looking at the total standardized indirect effect value (.27), the effect size was small to moderate.

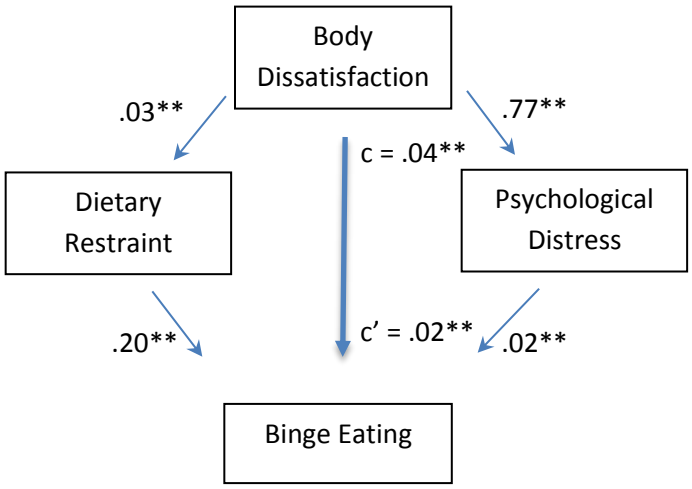

Figure 2. Parallel Mediation Analysis Results

Hypothesis 3. Finally, results from logistic regression analyses highlighted the unique effect of BE frequency and its association with GWG status (see Table 5). Based on results from model fit indicators, the model demonstrated adequate performance throughout the steps indicating that the group of independent variables was more accurate at classifying GWG category than chance. Of the variables included in the model, only current body dissatisfaction made a unique contribution to classifying GWG status.

Table 5

Results of Logistic Regression Analyses Classifying GWG Status

	IV	*B*	SE	Exp(B)	95% CI
Step 1					
	Constant	-1.30	.80	0.25	
	BMI	.02	.02	1.02	.98-1.07
	BAQ Past	-.01	.01	0.99	.97-1.01
	BAQ Current	.03**	.01	1.03	1.01-1.05
	DASS	-.002	.01	1.00	.99-1.01
	Restraint	-.21	0.3	0.81	.63-1.04
Model fit:	X^2 (df)	11.55(5)*			
	Pseudo R^2	.07			
	PAC	61.7%			
Step 2					
	BMI	.02	.02	1.02	0.98-1.07
	BAQ Past	-.01	.01	0.99	0.97-1.00
	BAQ Current	.03**	.01	1.03	1.01-1.06
	DASS	.001	.01	1.00	0.99-1.01
	Restraint	-.18	.13	0.84	0.65-1.08
	Binge eating	-.19	.14	0.83	0.63-1.09
	Constant	-1.55	.82	0.21	
Model fit:	X^2 (df)	13.35(6)*			
	Pseudo R^2	.08			
	PAC	62.1%			

Note. *p <.05. **p < .01. The dependent variable in this analysis is GWG category where 0 = below adequate/adequate GWG and 1 = excess GWG. Pseudo R^2 refers to Nagelkerke R^2 value. PAC = Percentage accurately classified. Hosmer and Lemeshow tests for the first step of the model: X^2= 3.8 (8), where p = .90. Hosmer and Lemeshow tests for second step of the model: X^2 = 10.80 (8), where p = .21.

Post-Hoc Analyses

One critique of the dual pathway theory is that it may not apply to individuals who are overweight and obese. Because the results from hypothesis 2 suggested that the model performed similarly to pregnant women as it did for non-pregnant women in assessed factors related to BE, post-hoc analyses were conducted to assess how the model performed in participants based their pre-pregnancy weight. Specifically, post-hoc *t*-tests

were conducted to assess for differences in body dissatisfaction, dietary restraint, psychological distress, and BE based on pre-pregnancy BMI status (normal weight vs. overweight/obese). There were no significant differences in dietary restraint ($t(233) = .33$, $p = .74$), BE ($t(233) = 1.17$, $p = .24$), or psychological distress ($t(233) = 1.37$, $p = .17$) based on BMI status. There was, however, a significant difference in body dissatisfaction scores where normal weight participants reported (M = 86.64, *SD* = 19.91) lower dissatisfaction compared to overweight/obese participants (*M* = 93.66, *SD* = 17.54; $t(233) = -2.87$, $p < .05$).

Additionally, given that the results from hypothesis 3 demonstrated that BE was not significantly associated with GWG status when holding constant related variables of body dissatisfaction, dietary restraint, and psychological distress, post-hoc logistic regression analyses were conducted to include disordered eating behaviors of objective overeating and subjective BE. Inclusion of these behaviors improved the model fit (pseudo R^2 for step 1 = .11 and step 2 = .12 compared to .07 and .08 in the original model) and highlighted the fact that while frequency of BE was still not related to GWG status, both objective overeating and subjective BE were. Of note, with each episode of objective overeating a participant reported, the odds that they would be in the excess GWG category increased by 48% and with each subjective BE episode, the odds of being in the excess GWG category decreased by 8%. It is interesting that although the frequency of BE episodes did not significantly predict GWG status, the result was trending towards significance ($p < .10$) and engaging in BE decreased the odds of belonging to the excess GWG group by 29%. See Table 6 for complete results.

Table 6

Post-hoc Logistic Regression Analyses Classifying GWG Status Including Objective Overeating and Subjective BE

	IV	*B*	SE	Exp(B)	95% CI
Step 1					
	Constant	-1.68	.84	0.19	
	BMI	.02	.02	1.02	0.98-1.07
	BAQ Past	-.01	.01	1.03	0.97-1.01
	BAQ Current	.03*	.01	1.03	1.01-1.05
	DASS	.001	.01	1.00	0.99-1.02
	Restraint	-2.40	.13	0.78	0.61-1.02
	Objective overeating	.19	.14	1.20	0.91-1.59
	Subjective BE	-.09**	.03	0.91	.85-.98
Model Fit:	X^2 (df)	10.15(7)**			
	Pseudo R^2	.07			
	PAC	66.1%			
Step 2					
	Constant	-2.13	.88	0.12	
	BMI	.02	.02	1.02	0.97-1.07
	BAQ Past	-.01	.01	0.99	0.98-1.01
	BAQ Current	.03**	.01	1.03	1.01-1.06
	DASS	.004	.01	1.00	0.99-1.02
	Restraint	-.22	.13	0.81	0.62-1.05
	Objective overeating	.40*	.20	1.48	1.02-2.16
	Subjective BE	-.09*	.03	0.92	.86-.98
	Binge	-.35	.20	0.71	.48-1.05
	X^2 (df)	22.17(8)**			
	Pseudo R^2	.12			
	PAC	66.1%			

Note. * = $p < .05$. ** = $p < .01$. Hosmer and Lemeshow test for the first step of the model: $X^2 = 10.99$ (8), where $p = .20$. Pseudo R^2 refers to Nagelkerke R^2 value. PAC = Percentage accurately classified. Hosmer and Lemeshow tests for second step of the model: $X^2 = 4.18$ (8), where $p = .84$.

Qualitative Analysis

Qualitative analyses were conducted to address the second aim of this project which was to better understand pregnant women's eating behaviors (including BE and dietary restraint), body dissatisfaction, psychological distress, and GWG and how their interactions with prenatal health service providers relate to BE symptoms and behaviors.

Of the 235 survey participants, 83 (35%) were eligible to participate in the telephone interview of which 42 expressed interest to participate on the survey. After attempting to contact participants to schedule the interview, 26 responded to emails or phone calls from the PI and 20 participants completed the interview. The remaining potential participants were lost to follow-up. See Table 7 for descriptive information of the women who completed interviews.

Conventional content analysis revealed that codes were readily grouped into eight major themes based on interviews and research questions. The themes were: (1) body image, (2) eating behaviors, (3) gestational weight gain, (4) psychological distress, (5) health behaviors, (6) patient and provider impact on pregnancy experience related to eating behaviors, body image, and psychological distress, (7) ideal support for women struggling with eating behaviors, body image, or psychological distress, and (8) psychosocial influences on women's eating, body image, and psychological distress during pregnancy. See Table 8 for description of each theme and relevant categories and subcategories. Of note, use of symbols in the table indicate the quantitative hypotheses which relate to relevant qualitative themes. See Appendix C for detailed coding structure.

Table 7

Description of Participants Who Completed the Telephone Interview

	M/%	*SD/N*
Age	29.45	5.08
BMI	28.06	7.48
OBE	6.35	6.13
DASS-21	42.6	21.78
BAQ Current	99.80	11.31
Restraint	2.10	1.38
GWG Status		
Adequate	40.0%	8
Above	60.0%	12
Race/ethnicity		
White	78.9%	15
Black	10.5%	2
Asian	10.5%	2
Relationship		
Married	75.0%	15
Single	20.0%	4
Separated	5.0%	1
Education		
Some college	40.0%	8
College grad	35.0%	7
College +	25.0%	5
Income		
< $25,000	20.0%	4
$25,000-$49,999	25.0%	5
$50,000-$99,999	45.0%	9
$100,000+	10.0%	2

Note. BE and restraint were measured by the EDE-Q. Binge eating represents frequency of episodes for the past 28 days. Range for restraint is 0-6 where 6 is the highest level of restraint. Psychological distress was measured by the DASS-21. Range of 0 to 126 where higher scores indicate more distress. Body dissatisfaction was measured by the BAQ. Range = 28-140 where higher scores indicate more dissatisfaction.

Theme I: Body image.

All participants were asked to describe their initial reactions to the changes that had occurred in their bodies during pregnancy (i.e. shape and weight) up until the time of the interview. Follow-up questions encouraged them to elaborate on topics such as how the reality of physical changes compared to their expectations, descriptions of their emotional reactions to changes, and descriptions of behavioral changes to compensate for physical changes. Five categories emerged from the data; how reality compared to their expectations, experiencing a sense of loss of control, gaining acceptance of physical changes, experiencing ambivalence to physical changes, and experiencing body dissatisfaction. Body dissatisfaction was the most common response; almost all (80%) of the interviewees endorsed current body dissatisfaction during pregnancy which was organized into three categories: past body dissatisfaction related to current body dissatisfaction, negative self-directed cognitions, and engaging in behaviors to compensate for body dissatisfaction. Examples of negative self-directed cognitions were descriptions of decreased confidence or self-esteem. For example, participant P213 said that: "I'm disgusted with myself…it's just not something I'm used to seeing, my belly is quite large. So I guess I feel a little insecure about it". Examples of behavior change due to body dissatisfaction were increased self-monitoring behaviors and avoidance of social situations or intimacy. Participant P167 said that "I have even gotten to the point where I won't change clothes around him no more and we've been together over 15 years" and participant 250 noted that:

> "I don't want to be in public, I don't want people asking me, you know, it's kind of a sensitive time anyways when people are giving you a lot of attention and strangers too and I told my husband the other day 'if I could just stay in the house for the last two months I would"

Theme II: Eating behaviors.

Codes based on descriptions of eating behaviors during pregnancy were grouped into categories describing behaviors of overeating, BE, night eating, and compensatory behaviors for problematic eating. Additional categories were designated that highlighted factors which influenced eating behaviors identified by participants. These included pregnancy-specific factors such as dietary limitations and having a guideline for calorie intake, social considerations for eating behaviors such as comments from friends and family, medical considerations such as feeling nauseous, and specific BE-related influences such as having cravings, engaging in restriction, being around certain types of food or locations or people, eating in response to emotions, and beliefs that one can eat more during pregnancy.

Participants reported that trying to avoid cravings or urges actually led them to eat more, which is consistent with the dual pathway model for BE. Participant P217 said that "when I'm craving something, especially if I try to avoid it, I just eat like everything". Participant P226 reported a similar pattern: "third trimester it's been more challenging to resist cravings and if something tastes good I want to eat more of it than I probably should". Also, restraint and limitations placed upon women from other individuals led to overeating and BE:

> (P110): "And then all this stuff recently about 'what I'm eating' and 'how much I'm eating' and all that…recently my fiancé went out of town….and I bought a bunch of junk food and I ate it all…there wasn't anyone to answer to. He's a chef and he's taken a great responsibility for how much I'm eating, what I'm eating, when I'm eating. It's really stressful, I'm not used to anybody lording anything over me…when he's not around…I make bad choices because I can."

Theme III: Gestational weight gain.

Participant's responses to questions about their experiences with GWG and

information they received about GWG revealed five categories of responses. First, almost all participants presented information about GWG in a narrative format identifying the trajectory of their weight gain throughout pregnancy. The most prevalent path was how women who had significant nausea initially maintained their weight, or even lost weight, then they gained weight rapidly when they began to feel well. The second category captured descriptions of the information participants received from health care providers as well as their reaction to said information ranging from disbelief of recommendations to acceptance. Participant knowledge and understanding of GWG was assessed and subcategories from this category included their descriptions of the amount of information they received, whether or not they decided to seek additional information, and having a personal goal for GWG that conflicted with the "official" recommendation from their health care provider. The final two categories described participants' reactions to weight gain overall and their descriptions of what factors led to excess GWG, prevented excess GWG, or could have prevented excess GWG. Participants generally had a negative reaction (85%) to their weight gain. Participant P135 noted that "I can't even look at a scale…it feels so bad" in reaction to her weight gain. P213 said that she felt

> Ashamed. Terrible. Because I know that I have more weight to gain as it [the fetus] gets bigger. Again, my expectation was 10-15 pounds and I know that's probably unrealistic, but that's what I thought…To me, I was always kind of closer to being overweight rather than being where I should be. So I didn't really want to gain too much more weight. I kind of wanted to stabilize, so I do, I feel kind of ashamed and embarrassed by it really.

When women were asked about what factors led to their excess weight gain, 72% identified their eating behaviors as one of the primary factors. This included BE and other behaviors. For example, P110 identified BE fueled by nutrition deficits and the

cognition that she can eat more when she is pregnant:

> [The] biggest contribution [to excess GWG] was that I slipped...well I didn't know how much iron I needed and so that...and the time where I was eating everything, just everything, and not knowing what my nutrient level needed to be. That was the biggest contributor. My second biggest contributor was that 'I'm pregnant I can eat what I want to', you know 'I'm eating for two' stigma.

Of note, and consistent with quantitative findings, it was not always the BE behaviors described as the main contributor to excess GWG. Some women talked about eating more snacks or an extra serving of food as contributing to weight gain, and not BE. P109 said:

> I've been really laissez-faire or lackadaisical with snacking. One of my friends told me 'oh my provider recommended, or said, I could have an ice cream treat in the evening because it has good protein', so then I was like 'oh, then I can have ice cream' and now I have a scoop of ice cream every evening.

Theme IV: Psychological distress.

While there was not a specific question assessing for psychological distress, all participants mentioned experiencing distress at some point during pregnancy. When looking at the descriptions of psychological distress, three subcategories were identified: pregnancy-related psychological distress, such as stress about preparing for birth or pregnancy; shape and weight-related psychological distress, such as the fear and shame of gaining too much weight; and provider-related psychological distress, such as women feeling badly about not meeting provider recommendations or being made to feel judged during health care visits. An example of shape and weight-related distress comes from P250 who said that "I would say it hasn't been a positive experience from a mental health perspective and thinking about my body image". P257 highlighted anxiety as her emotional response:

> I can really get anxiety about it sometimes, because of what I just said. I'm

> anxious about the weight I'm gaining and whether or not I'll be able to get down to a healthy weight after so much struggle in the past.

P128 noted that meeting with a provider made her feel badly about herself:

> she was showing me the growth chart, like where I should be and she said 'you're not even on the chart, because you're like way up here' and she told me 'you have to cut back' and it just felt so bad. I don't think she was trying to be mean, but it was...I was really feeling down about myself and she wasn't supportive.

Participants also spontaneously described various behaviors and cognitions that served as coping mechanisms for their distress in both adaptive and maladaptive ways. Adaptive coping strategies were defined as thoughts and behaviors that were helpful to the participant and led to positive or healthy outcomes such as seeking support to manage distress or seeking additional information. For example, participant P239 said that "I've been trying to look up additional information or write down my questions for my OB when I get stressed and it helps calm me down because I know I won't forget". Maladaptive coping strategies were those that could have had negative effects such as avoiding tasks, isolating oneself, or overeating.

Theme V: Health behaviors.

Throughout discussions of participants' interpretations of changes in weight, shape, and eating as well as provider recommendations, many participants described how their attitudes towards health behaviors impacted their experiences. For example, many participants referenced how engaging in physical activity helped to protect them against gaining too much weight, or others said that their aversion to physical activity prevented a healthier pregnancy. P135 noted changing behaviors to have a healthier pregnancy: "I was never one to diet or to go exercise…But, I have started going on walks and I've jogged. Walking daily, jogging maybe twice a week."

Another category was identified that captured participants' descriptions of motivations to make health behavior change during pregnancy related to eating, weight, and shape. Some women said that they attempted to make positive health behavior changes in order to protect the health of the baby and themselves. Others said that they engaged in positive health behaviors to influence childbirth, and some admitted that they made changes to impact their shape and/or weight.

Theme VI: Patient and provider interactions.

To provide context for what categories and sub-categories related to patient-provider interactions were prevalent, the majority (80%) of participants were meeting regularly with an obstetrician-gynecologist (OB-GYN), while the remaining had their health care managed by certified midwives. Some women who saw OB-GYN providers also met with a midwife or doula at times, or even a nutritionist. Almost all women were provided with weight gain recommendations by a health care provider (80%), and of the 16 participants whose providers gave them a range, seven had received information about weight gain ranges that did not coincide with the IOM recommendations based on their pre-pregnancy BMI. However, some of the ranges provided were similar. For example, one woman was told she should gain between 20-25 pounds and based on her pre-gravid BMI her recommended weight gain range was 15-25 pounds. Of the four women who were not told a weight gain range by the provider, three reported that they thought they should gain an amount of weight that fell outside of the recommended range for their BMI, meaning they exhibited an incorrect understanding of appropriate GWG.

Based on responses to questions about participants' interactions with health care providers, five categories were identified; the role of assessment, information and

resources provided, descriptions of interpersonal interactions, descriptions of patient and provider roles, and specific ways to improve the experience for pregnant women in the future. All participants said that assessment of concerns related to eating, weight, and body image was insufficient, some saying they were never assessed in these domains. They also described a general lack of resources provided about eating concerns, weight gain, and body image. Participant P032 highlighted that she had the assumption that her provider did not care if women had concerns about body image saying:

> "I guess some people kind of pass it off as being 'it's not that big of a deal', but I think for me it feels like a really big deal. I wish there is, now that we're talking about it, I wish there would be more of a support or an understanding of how it it's going to be".

P135 also reflects on wanting more emphasis on women's concerns about changes in their bodies:

> "I wish he would have talked about...the fact that it's normal to feel this way. To kind of feel like you're losing control of your body in a way. But that it's important to remember that you're not doing this for yourself, you need to gain weight and do what you can to make sure that the baby is healthy. I wish that that was stressed more because that's what helps me get through it."

Participants reported positive and negative reactions to interactions around topics of eating, weight gain, and body image, with some participants saying that they felt supported if they had concerns and others saying they felt judged. A nuanced view of the data suggested that gender played a role in these interactions, where participants with male providers said that they felt more judged because it was a male and would have preferred a woman. Additionally, some participants said they felt comforted when they had a provider who had given birth themselves and could talk about the pregnancy experience. P032 had a negative encounter with a male provider telling her she gained too much weight: "it felt very judgmental. And the fact that he was a man didn't help.

Because all the women have told me otherwise". P237 also felt judged when talking about overeating and weight with their provider "It was a little nerve wracking just because I feel like everyone is judging me".

The way that participants understood the role of the patient and provider also influenced how they interacted with the provider around these topics. For example, some participants did not think that their primary provider was the right person to discuss concerns about eating, shape, or weight. The final category captured participants' recommendations for how health care providers can better support women during pregnancy when they have concerns about eating, weight, and/or shape. They suggested that there should be more frequent screening throughout pregnancy to assess for concerns, increased effort for provider to normalize women's concerns, integrate a focus on women accessing social support to manage concerns, and changes in staffing such as hiring an additional provider to meet with women during office visits if they have concerns.

Theme VII: Ideal support for women.

When asked to think about who the ideal person would be to support women during pregnancy if they have concerns with their eating, body image, or psychological distress, participants mainly identified the OB-GYN or primary health care provider. P019 highlighted that this approach could reach the most women: "I think for so many the OB-GYN is all they see…from an equitable perspective I don't know who else should be doing that besides the OB-GYN". Some women also identified another health care provider, such as a specialist in the setting. P172 summarized:

> I think that it would be beneficial or, it would give a better experience if you went and you saw your doctor but they also have someone there to give you info

> and talk with you about your eating habits. Or about your exercise level and things. I don't really know who or what type of profession that would go with but to have an extra person there to give you a little bit more in depth info other than what your doctor briefly says would be more beneficial.

A few participants said that having a non-health care provider would be very important too, such as a friend who has already been pregnant and delivered.

Theme VIII: Psychosocial influences.

The final theme encompasses descriptions of the psychosocial factors related to eating, body image, and psychological distress during pregnancy. Many participants identified how media gave them a false understanding of pregnancy and how they thought they would react to physical changes. They also said that engaging with media and social media facilitated comparisons of themselves to other women in an unhelpful way. P135 identified with this concept:

> Okay so when you go to social media or some people you see on the TV, like she's 25 weeks pregnant and they post their body and it's like 'What? She doesn't even look pregnant' you know. It makes you feel like 'oh my gosh, I'm so fat, look at that'. Like 'she doesn't look pregnant'. I think that even as a society it doesn't always feel good to other people. It's not always positive or it depends on the person, because like I said, she's 25 weeks and there is not even nothing showing and here you are you're like blowing up.

The role of family was discussed frequently as a source of setting expectations for pregnancy. Participants also reported efforts to increase their understanding of pregnancy actively (i.e. looking up information online or joining online communities) and passively through other prenatal service providers such as educational classes and prenatal yoga.

Table 8

Qualitative Themes, Categories, and Subcategories

Theme Category	Subcategory
Body Image	
Reality vs. Expectations (20/20)	-
Loss of Control (6/20)	-
Body Acceptance (4/20)	-
Ambivalence (8/20)	Rationalizing changes for health of baby (7/8)
	Body appreciation (4/8)
Body Dissatisfaction (BD; 16/20)	Self-directed evaluation based on BD (12/16)**
	Behaviors in response to BD (14/16)
	History of BD related to current BD (6/16)*
Eating Behaviors	
Pregnancy Factors (7/20)	Dietary limitations (5/7)**
	Guidelines for calorie intake (4/7)**
Night Eating (3/20)	-
Overeating/BE (20/20)	Negative reactions to overeating/BE (17/20)
	Loss of control (7/20)
Influences for Overeating/BE	Social factors (6/20)
(20/20)	Location factors (8/20)
	Type of food (5/20)
	Emotions (6/20)**
	Cognitions (7/20)
	Craving or indulging (15/20)
	Restriction past and present (13/20)**
	Grazing (6/20)
Social Considerations (8/20)	-
Medical Considerations (11/20)	-
Compensatory Behaviors (6/20)	-
GWG	
Trajectory of GWG (15/20)	Nausea at first, increased weight gain later (8/15)
Info from Provider (20/20)	Reaction to information (17/20)‡
	Amount of information (7/17)
Understanding of GWG (17/20)‡	Seeking additional information (15/17)
	Personal vs. official GWG range (5/17)
Reaction to GWG (20/20)	Negative (17/20)
	Acceptance (3/20)
Factors Influencing GWG	Factors that led to excess GWG (12/14)
(14/20)***	Factors that prevented excess GWG (6/14)
	Factors that could have prevented excess GWG (7/14)
Psychological Distress	
Descriptions (17/20)	Pregnancy-related (5/20)

	Shape and weight-related (14/20)**
	Provider-related (7/20)†
Coping (12/20)	Adaptive (helpful) coping skills (7/12)
	Maladaptive (unhelpful) coping skills (9/12)
Health Behaviors	
Attitudes Re: Physical Activity (13/20)	-
Attitudes Re: Stress Mgmt. (6/20)	-
Motivation for Behavior Change (18/20)	Health of mother and/or baby (11/18)
	Delivery and postpartum (6/18)
	Shape and weight (7/18)
Patient/Provider Interactions	
Assessment (20/20)†	-
Information and Resources (20/20)‡	Clarity of information (5/20)
	Implementation (11/20)
Interactions (20/20)	Reactions to conversations (19/20)‡
	Gendered factors (5/20)†
	Personal experiences of provider (4/20)†
Roles (13/20)	Scope of provider role (7/13)†
	Patient role (6/13)†
	Passive patient approach (5/13)†
	Active patient approach (2/13)†
Improvements (18/20)	Standardized screening (7/18)
	Normalize concerns (8/18)
	Focus on social support (4/18)
	Staffing (7/18)
Ideal Support for Women	
Health care-Specific (20/20)	-
Non-Health care (4/20)	-
Psychosocial Influences	Misleading (6/8)
Media (8/20)	Facilitating comparisons (6/8)
	-
Family (10/20)	-
Additional Sources of Info (15/20)	Level of information (13/13)
Other Prenatal Services (13/20)	Social support function (3/13)

Note. Numbers in parentheses indicate the number count of participants out of the total number who endorsed that particular thematic category or subcategory. * = Related to hypothesis 1. ** = Related to hypothesis 2. *** = Related to hypothesis 3. † = Related to Aim 2. ‡ = Related to Aim 2a.

Data Integration

Results from quantitative analyses were supported by results from qualitative interviews, yet because of the low sample size of interview participants, comparisons must be interpreted with caution. Relevant qualitative codes are identified based on relationship with quantitative hypotheses in Table 7. For example, although history of body dissatisfaction was not directly assessed with a standardized question within the interview, all women who reported past body dissatisfaction endorsed current body dissatisfaction, consistent with quantitative results from hypothesis 1. In relation to hypothesis 2 and the dual pathway theory of BE, participants described clear relationships between restraint behaviors leading to overeating and BE. They also described experiencing psychological distress related to body image concerns and engaging in BE to cope with psychological distress. Lastly, when asked about what factors led to or prevented excess GWG, less than half of participants (45%) acknowledged that overeating/BE was a factor. Many acknowledged additional factors such as physical activity or quality of diet that may have moved them from the adequate to excess GWG category. This corresponds to the results from logistic regression analyses from hypothesis 3 which demonstrated that frequency of BE was not significantly associated with GWG status above and beyond factors of body dissatisfaction, dietary restraint, and psychological distress suggesting that other dietary factors had stronger relationships with GWG status than BE.

CHAPTER 4: Discussion

Exceeding the amount of recommended weight gain during pregnancy can have negative effects on both mother and child. In the United States, excessive gestational weight gain has been increasing over time leading to new efforts and interest in preventing and reducing this problem. While interventions and medical recommendations exist to curtail rates of excess GWG, traditionally, the behavior of BE is not included as an intervention target and is also not assessed or addressed by health care providers during pregnancy. The current study aimed to assess how BE in pregnant women related to GWG while controlling for relevant variables of body dissatisfaction, dietary restraint, and psychological distress. Additionally, qualitative data were collected to better understand women's appreciation of these behaviors and to gauge how health care provider interaction may or may not influence trajectory and outcome of BE and GWG. The current chapter discusses implications of the results presented in chapter three. First, global information about the participants will be presented, then results from each hypothesis will be discussed by integrating the results into existing literature and providing possible explanations for findings. Research and clinical implications will then be addressed before closing the chapter with a discussion of study strengths, limitations, and ideas for future directions in research.

Sample Characteristics

The majority of participants in the study were classified as being above GWG recommendations (63%) based on pre-gravid BMI which is greater than the national average of 47% (Deputy et al., 2015). The higher rates may be due to the fact that the participant population endorsed some form of overeating or BE which may have inflated

the rates of overweight and obesity and in turn, GWG. Additionally, it may be a reflection of the region from which participants were sampled. All participants were from the southeastern United States, a region that encompasses seven of the top 10 states with the highest obesity rates (CDC, 2019). While detailed regional data of GWG is not available in all states sampled, according to Deputy et al. (2015), pregnancies end in excess GWG in at least 45% and above of pregnancies in the majority of states included in this sample. Of note, the states with the highest rates of obesity and overweight (West Virginia and Mississippi) were not included in the state-level data for excess GWG previously mentioned.

Women who initiated pregnancy in the obese and overweight range were more likely to gain weight in excess than women who were normal weight or underweight, consistent with national data (Deputy et al., 2015). Interestingly, women in the overweight category were the most likely to gain excess GWG (74%) versus adequate weight (26%), more so than obese women where the rate was 68% excess GWG to 33% adequate GWG. National datasets have shown that the prevalence of excess GWG is around 64% for both BMI groups suggesting that overweight and obese women in the present sample may have had additional risk factors for gaining excess weight during pregnancy (Deputy et al., 2015). Detailed state-level data is not available to ascertain how rates of GWG in the current study compare to national trends based on pre-pregnancy BMI status.

When reflecting on the risk factors mentioned in the introductory chapter, while the current sample follows the pattern that overweight and obese women are at greater risk for excess GWG, the effects of demographic characteristics such as race/ethnicity,

income, or employment did not relate GWG. Various studies highlighted how not earning enough money or not having sufficient social support increased pregnant women's risk for developing excess GWG (Campbell et al., 2016; Hill et al., 2013; Paul et al., 2013). This may be explained by the fact that there was less variability in demographic variables than other studies given the fact that the sample was primarily White, working part or full-time, and in a relationship indicating they have some social support.

Regarding eating behaviors, the average number of objective binge episodes for the previous 28 days was 4.35 (*SD* = 6.19) in the current sample. This compares to existing literature where rates of BE taken from the EDE-Q for pregnant women with a suspected eating disorder diagnosis was 6.0 (*SD* = 8.8) and those without a suspected eating disorder diagnosis had an average of 0.4 episodes (*SD* = 2.3; Pettersson et al., 2016). Diagnostically, women in this study endorsed symptoms consistent with BED (25%) and BN (14%). Of note, 26% of the study population did not report episodes of objective BE, meaning they engaged in objective overeating but did not endorse a sense of loss of control along with overeating.

Aim 1: BE, Dietary Restraint, Body Dissatisfaction, Psychological Distress, and GWG within Dual Pathway Theory of BE

The dual pathway theory of BE was used as a roadmap upon which to base hypotheses given that it is well-validated in non-pregnant populations to understand how BE may develop (Stice et al., 1996), and given the fact that many aspects of pregnancy can also breed a similar psychosocial context for which the theory applies. Based on the dual pathway theory and the prescribed relationships illustrated in Figure 1, results

supported all hypotheses except hypothesis 3, where frequency of BE was not a significantly related to GWG status while holding constant variables of body dissatisfaction, dietary restraint, and psychological distress.

Aim 1, hypothesis 1: Body dissatisfaction past and current.

Because binge-related eating disorders have high incidence rates during pregnancy, it was thought that experiencing body dissatisfaction prior to pregnancy may be a precursor to development of disordered eating symptoms during pregnancy or maintain existing symptoms. Using correlational analyses, participants' scores on a measure retrospectively assessing body dissatisfaction at the time they became pregnant were significantly correlated to dissatisfaction during pregnancy suggesting that the way participants viewed and evaluated their bodies before pregnancy influenced how they viewed their body during pregnancy. Overall, the scores from pre-pregnancy to current body dissatisfaction increased for most women indicating that by the third trimester, participants were more dissatisfied with their bodies than they were prior to pregnancy.

These results coincide with existing research. Body dissatisfaction as a personal characteristic has been found to be very stable over adulthood for women based on extensive literature reviews documenting rates of body dissatisfaction over different developmental periods (Tiggeman, 2004). This may explain why participants' pre-pregnancy levels were so highly correlated to current levels of body dissatisfaction. These results are similar to results from Skouteris et al.'s (2005) prospective study that assessed women's body dissatisfaction prior to pregnancy using the same measure as the current study, and also found that past body dissatisfaction was a significant predictor of body dissatisfaction during pregnancy.

Results from hypothesis 1 highlight the need to assess for- and even provide support for - pre-existing body image concerns as they can place women at risk to potentially develop further disordered cognitions related to body image and even increased psychological distress, dietary restraint, and BE frequency, as is suggested by the other results from this study.

Aim 1, hypothesis 2. Body dissatisfaction and BE frequency.

The second hypothesis is unique because it is the first example of applying the dual pathway theory of BE to a pregnant population. Consistent with empirical evidence of the dual pathway model, it was hypothesized that there would be a full mediation, thus when allowing for variance to exist between dietary restraint and psychological distress with BE, body dissatisfaction would no longer be significantly related to BE frequency. Results provided partial support for the hypothesized relationships.

Body dissatisfaction was significantly related to psychological distress and dietary restraint such that increases in body dissatisfaction were associated with greater psychological distress and dietary restraint. Similarly, both psychological distress and dietary restraint mediated the relationship between body dissatisfaction and BE frequency. Interestingly, results also showed that body dissatisfaction had a direct relationship with the frequency of BE even after allowing for indirect pathways via dietary restraint and psychological distress. This finding goes against the hypothesized relationship and indicates a partial mediation. Overall, the hypothesis was supported. The dual pathway theory may be an appropriate way to understand the development and/or maintenance of BE during pregnancy and the more significant relationships seem to be via body dissatisfaction and psychological distress.

Potential explanations for this finding may be that health behaviors, cognitions, and attitudes that explain BE and overeating may be more tied to body dissatisfaction than to psychological distress and thus independently lead to BE when controlling for psychological distress. For example, based on the results, women who are dissatisfied with their bodies are also experiencing negative emotions that lead to BE, but the dissatisfaction may also lead to BE due to a sense of intentionally giving in to the body changes and eating more when women feel that they have decreased control over their bodies during pregnancy. This sentiment was supported by qualitative results describing ways in which women reacted to body dissatisfaction. Many participants described feeling that they have lost control over managing their size and shape and that they "gave in" to the loss of control with their eating as opposed to trying to impose structure and restraint.

Additionally, the partial mediation result suggests that there are likely additional mediators of the relationship between body dissatisfaction and BE. An example of potential mediators comes from Hartley et al.'s (2015) systematic review of risk factors for GWG where higher body dissatisfaction was related to decreased readiness to consume a healthy diet and less vegetable intake and in turn greater GWG. The lack of motivation to consume a healthy diet could also be a risk factor for frequency of BE in pregnancy, although BE was not measured in the proposed model by Hartley et al. (2015), because highly palatable, energy dense foods are the most common trigger of BE and types of cravings (Chao et al., 2016). Data from the current study support this potential explanation.

The fact that body dissatisfaction had a stronger indirect effect on frequency of

BE via psychological distress compared with dietary restraint is consistent with existing literature as well as qualitative results from this study. Welsh and King (2016) demonstrated that in a sample of individuals who engaged in BE, the pathway from dietary restraint to BE was only significant in participants with normal weight when compared to overweight/obese participants. They concluded that the traditional dual pathway model might not apply to overweight or obese individuals possibly because those who are overweight and obese gain more weight from BE and do not restrict at other times, or they may have greater negative affect because of their higher weight status and thus, eat more, creating a cycle of weight gain. This pattern of results, however, does not apply to results from the current study. Post-hoc analyses suggest that based on weight status of normal weight vs. overweight/obese participants, there was not a significant difference in dietary restraint behaviors suggesting that both groups engaged in restraint at similar rates. Results also highlight that no differences were found in frequency of BE or psychological distress, but there was a significant difference between body dissatisfaction where normal weight participants reported lower mean scores of body dissatisfaction and overweight/obese participants reported greater body dissatisfaction.

The weaker pathway via dietary restraint may in fact reflect that restriction during pregnancy is less common because women must consume calories to support fetal growth and they are encouraged to increase their dietary intake. It may also reflect the way restraint was measured. One of the items assessing dietary restraint asks the question "have you had a definite desire for your stomach to be flat?" which is not feasible during pregnancy and thus may not have been a true reflection of restraint as it would be in non-

pregnant samples. This could have suppressed the actual rates of restraint in participants and led to weaker relationships between body dissatisfaction and dietary restraint as well as dietary restraint and BE. This also suggests that care needs to be taken when measuring constructs related to disordered eating cognitions and behaviors in pregnancy.

Aim 1, hypothesis 3: BE, psychological correlates, and GWG.

The third hypothesis aimed to provide a novel contribution to the literature by analyzing BE and GWG within the context of relevant correlates of body dissatisfaction, dietary restraint, and psychological distress. Many studies have alluded to a possible connection (Gonçalves et al., 2015; Park et al., 2015; Schumacher, 2018), but have not included all the relevant constructs using validated measures.

Results revealed that after controlling for pre-pregnancy BMI, past body dissatisfaction, current body dissatisfaction, dietary restraint, and psychological distress, frequency of BE did not add a meaningful amount of variance to the model, nor did it allow the model to accurately categorize GWG status. The only significant variable associated with accurate classification of GWG status in both steps of the model was current body dissatisfaction.

This finding is in direct contrast to results from Park et al. (2015) who found that BE was a strong, independent predictor of excess GWG increasing the odds of gaining excess weight over six times. The discrepancy between results could be attributed to Park et al.'s (2015) methodology. They controlled for dietary restraint, self-esteem, social desirability, amount of planned GWG, beliefs about how GWG affects fetal development, and attitude toward the statement about "I'm eating for two". Controlling for variables that assessed for participants' knowledge about GWG as well as adherence

to social norms of eating for two may have allowed for the variance of BE as a predictor of GWG to be more easily detected. However, it should be noted that the measurement of BE in the Park et al. (2015) study may not be an actual representation of BE because they did not utilize a standardized assessment tool that included assessing for eating an objectively large amount of food. They primarily assessed for losing control while eating. Therefore, they may have been seeing the effect of loss of control with eating in relation to GWG as opposed to actual BE.

Although the current results contradict Park et al.'s (2015) results, they do support results from Allison et al. (2012) which was also conducted in the United States. Allison et al. (2012) recruited overweight African-American women to assess how eating behaviors related to GWG. In their sample, very few participants engaged in BE, and they did not find a relationship with GWG. Perhaps, the difference between Park et al. (2015) and Allison et al. (2012) could be due to cultural differences between Canada and the United States. Canadian rates of overweight and obesity are lower than the United States perhaps suggesting a less obesogenic environment which may help increase health behaviors and decrease both BE and GWG (Organization for Economic Cooperation and Development [OECD], 2017).

The significant relationship between body dissatisfaction and whether a woman gains within the recommended weight gain range or above supports the results from Hartley et al. (2015) which also recognized body dissatisfaction as a major risk factor for GWG. Similarly, Roomruangwong, Kanchanatawan, Sirivichayakul, and Maes (2017) found that body dissatisfaction predicted amount of weight gain during pregnancy and even had consequences for postpartum weight retention when body dissatisfaction had

decreased.

If frequency of BE does not significantly lead to gaining excess weight during pregnancy, but body dissatisfaction does, it begs the question of what behavioral pathways link body dissatisfaction to weight gain? As previously stated, Hartley et al. (2015) found that body dissatisfaction led to decreased motivation to eat healthy foods in addition to decreased vegetable intake, suggesting that there are dietary effects of body dissatisfaction in addition to dietary restraint mentioned in hypothesis 2. Results from qualitative studies suggest that one aspect associated with body dissatisfaction during pregnancy was the sense of being out of control with the weight and shape changes occurring and feeling distressed (Hodgkinson, Smith, & Wittkowski, 2014). Participants in the current study reported this during interviews and associated the sense of loss of control not only with their body but with their eating. Perhaps, experiencing decreased control over what happens physically can lead to increased chaotic or disordered eating behaviors apart from frequency of BE, and thus, excess GWG.

Additionally, literature related to other types of eating behaviors during pregnancy may shed more light onto the reasons why frequency of BE did not uniquely contribute to GWG status in the current study. For example, many women described indulging in foods they typically avoid, or giving into cravings as common behaviors that may or may not lead to BE, but frequently occur. Research on cravings during pregnancy suggests that the more cravings women report (regardless of whether or not they give in), the more they are at increased risk for excess GWG (Orloff et al., 2016). Taking the theory of cravings and weight gain further, Blau, Orloff, Flammer, Slatch, and Hormes (2018) demonstrated that craving frequency mediated the relationship between GWG and

eating styles such as emotional eating. This suggests that giving into cravings may be due to eating in response to emotions. On a similar note, Plante and colleagues (2019) found that women who practiced more intuitive eating, and eating for physical reasons as opposed to emotional reasons were more likely to stay within recommended ranges for GWG.

Results from the qualitative data in this study reflected similar patterns in eating style and weight gain. When women hypothesized about the reasons they may have gained excess weight during pregnancy, some women identified their binge episodes, while others talked about "giving in" to cravings and indulging in food that they did not think was healthy. In a separate line of questioning, women also described various types of overeating in addition to BE such as eating to cope with difficult emotions.

The current study did not include additional measures of eating style, but did assess objective overeating episodes as well as subjective BE. Results from post-hoc analyses of the logistic regression to classify GWG status, suggested that when including objective overeating and subjective binge episodes, the model accounted for more variance for accurately classifying GWG status. Both objective overeating and subjective BE significantly were related to increased likelihood of excessive GWG status, where objective overeating was associated with increased odds of excess GWG and subjective BE was associated with decreased odds of excess GWG. This result conflicts with results from Kolko et al. (2017) and Micali, Essimii, Field, and Treasure (2018). Kolko et al. (2017) analyzed loss of control when eating and GWG. Researchers found that experiencing loss of control with eating was not related to GWG in their study population, and even though loss of control may be distressing, it does not necessarily

lead to eating more or eating more, consistently. Micali et al. (2018) assessed loss of control over eating and GWG overall as opposed to adequate vs. excess GWG. They found that women who reported loss of control gained more weight on average than women who did not report loss of control. Neither of these studies reported the amount of food that women ate when endorsing loss of control so we cannot say whether they were assessing objective BE or subjective BE.

Aim 2: Lived Experiences of Participants and Interactions with Health Care Providers

Themes were identified that allowed for additional understanding of how women experience perinatal BE, body image, weight gain, and psychological distress, and also how health care providers may factor into the equation. Participants identified various factors that influenced overeating or BE which are consistent with BE triggers for non-pregnant women such as environmental and social factors, the type of food they're eating, eating in response to emotions, failed attempts at limiting the amount of food one eats, and the role of certain beliefs about eating during pregnancy and being able to eat more. Interesting responses were found related to pregnancy-specific experiences such as having and/or giving into cravings which led to overeating or BE and grazing throughout the day in response to increased hunger or trying to manage nausea.

Consistent with a meta-synthesis from Vanstone, Kandasamy, Giacomini, DeJean, and McDonald (2017) of over 40 qualitative studies about women's experiences and perceptions of weight gain during pregnancy, indulging in foods was identified as a barrier to maintaining healthy weight as well as cravings. What is novel about the results from this study is it adds the perspective of how specific recommendations from

pregnancy can create a sense of restriction or avoidance that can exacerbate pre-existing disordered eating cognitions and behaviors or lead to the development of these patterns. Pregnancy comes with many rules that women are expected to follow regarding their eating and other health behaviors so for someone that may have a history of fluctuating between extreme restriction and giving in to urges, this may place them at risk for developing or continuing BE during pregnancy.

Finally, the provider's role also influenced how women described their eating behaviors, body image, weight gain, or psychological distress. This manifested as descriptions of feeling judged by providers or feeling uncomfortable when having conversations about weight and shape, participant remarks about the lack of information or assessment provided, and participants stating that they did not feel confident or able to bring up issues of weight or shape given the sense of time pressure during the visit or lack of clarity in patient and provider roles. Participants then provided recommendations about how to improve the experience with providers and they suggested that they would have preferred more information about what to expect during pregnancy in terms of body changes, weight gain and eating.

Results from analyses of participants' interactions with their health care providers echoed results from Vanstone et al. (2017) who found a similar theme of feeling judged by providers. Duthie et al. (2013)'s qualitative study of women's interactions with providers also suggested that providers initiate difficult conversations as opposed to waiting for a patient to do so. Given the approach of this study and the dual pathway model for BE development, feeling judged by providers when having conversations about weight and shape could feed into a woman's body dissatisfaction level and increase her

distress or even restraint and ultimately BE.

Aim 2a: Information Received from providers.

When looking at the information that women received from their providers about topics like disordered eating, body image concerns, weight gain, and psychological distress, qualitative results suggested that the information was very limited. First, almost half of the women who were told about recommended GWG received incorrect information. They also received no information about body image concerns or BE when they all, by nature of being invited to participate in the interview, were living with disordered eating behaviors.

Regarding participant attitudes towards the information or utility of the information, women said that they found the information they did receive largely unhelpful because it was very general and not tailored to their experiences. Related to weight gain recommendations specifically, some women reported not finding the recommendations realistic, feeling afraid of the amount of weight gain in the recommendations, and describing a sense of failure if they would not stay within the range. They did, however, say they received varying degrees of nutrition information which was helpful, and many women said that they did make changes to their health behaviors based on provider recommendations suggesting that if providers were to assess for body dissatisfaction or disordered eating and make recommendations for intervention, that women would be likely to adhere to said recommendations.

Results from aim 2a reflect a larger pattern where there appears to be a discrepancy between what women want in their patient-provider relationship in terms of interaction, information, and support and what is occurring in the exam rooms. For

example, consistent with this study, there have been multiple studies reporting that women feel they lack consistent and clear information about what to expect during pregnancy for eating, weight, and shape, and would like more support around this (Nikolopoulous et al., 2017). They also want the provider to approach conversations around these topics and would appreciate a non-judgmental stance. Results from a survey of obstetricians who described their typical recommendations for managing GWG as well as the barriers they perceive to helping women follow recommendations, demonstrated the discrepancy from the provider perspective (Timmerman, Walker, & Brown, 2017). Providers said that the main "major barriers" to patients achieving adequate GWG is that the patients are not interested in changing behaviors, they have a high relapse rate for weight management behaviors, and the patients cannot afford to access referrals. They highlighted lack of appropriate educational materials and community resources as a moderate barrier, and the fact that the topic is "too complex to handle" as a small barrier. On a heartening note, most respondents (82.5%) did not identify with the assumption that talking about GWG is not part of their role indicating that providers feel a duty to work with women to support adequate GWG. The interventions they say they use were primarily educational and focused on dietary recommendations and physical activity recommendations. They did not identify intervention targets of body dissatisfaction or disordered eating, which is what the participants in our study say they would have wanted.

Implications

Results from this study have implications for how we understand BE and GWG during pregnancy, and also how we measure, screen for, and treat BE and GWG in

research and medical settings.

The study shows that many women engage in BE during pregnancy and that the behavior is closely tied to body dissatisfaction, dietary restraint, and psychological distress. However, frequency of BE was only one facet of ways in which participant's eating behavior changed. When thinking about problematic, or even disordered eating behaviors during pregnancy, and how we measure it within research studies, using measures that can capture the range of eating patterns is necessary. The EDE-Q used in this study captured objective BE, objective overeating, and subjective BE but missed out on quantitative means to measure cravings, indulging in foods, grazing, and night eating that also may have impacted GWG status.

In relation to GWG and risk factors, the results highlight that body dissatisfaction is a significant correlate of excessive GWG, and that while BE is still a piece of the puzzle and potentially a consequence of body dissatisfaction, it may not be as pertinent to discussions of risk factors as hypothesized in this study. Therefore, models of risk factors for GWG that guide future research and clinical work should continue to include body dissatisfaction but may not need to include BE. However, additional research on other disordered eating behaviors may shed light on important risk factors seen in post-hoc analyses such as objective overeating.

Clinically, the current results have various implications. First, health care providers commonly do not assess for disordered eating and body dissatisfaction, yet women identify that they believe providers should and that they would appreciate open and honest discussions about their concerns. Health care providers could implement brief and regular screening measures at prenatal visits to assess for concerns and ultimately

refer to additional providers when appropriate. There are single-item screeners that can be useful and not burden either patients or providers such as the VA binge eating screener (Dorflinger, Ruser, & Masheb, 2017), or targeted questions about concerns with changes in weight and shape could be used as well. If a woman is identified as engaging in BE or dealing with body dissatisfaction results indicate that women would prefer to have honest conversations about their concerns, and then referral to a professional would be ideal. Some women suggested that including an additional employee in the clinic to help address positive screens or concerns that arise during visits could be beneficial. This reflects existing models of collaborative care where integrating mental health professionals in primary care and obstetrician settings has demonstrated positive outcomes in patient care in terms of reducing depression and improving health outcomes (Cox et al., 2017; LaRocco-Cockbrun et al., 2014). The same model would apply nicely to support women dealing with disordered eating behaviors and body dissatisfaction while they are in clinic.

Results from this study also have implications in the training of obstetricians and certified midwives. Participants expressed a desire to engage in more conversations about these topics and research indicates that providers do not feel comfortable doing so, thus, additional training during medical school or residency would help providers be prepared for meeting this challenge.

Lastly, the results from this study have significant implications for developing interventions to prevent or treat excess GWG and even body dissatisfaction or disordered eating. Any efforts to address GWG would be most effective if they incorporate approaches designed to decrease or prevent body dissatisfaction as well as disordered

eating behaviors. Cognitive and behavioral interventions are the gold standard for targeting disordered eating behaviors and cognitions including traditional therapeutic approaches and more recent approaches of acceptance and commitment therapy (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012; Pearson, Follete, & Hayes, 2012). Existing interventions designed to improve dietary quality and increase physical activity would benefit from including CBT or ACT components to augment outcomes. Also, many women felt that they did not have enough information about weight gain and changes in weight and shape during pregnancy. Interventions designed to increase awareness of pregnancy-related changes that address changes openly and honestly, without distortion from media as mentioned by study participants, would also help women feel comfortable with the experience and potentially decrease body dissatisfaction and even GWG.

Strengths and Limitations

The current project comes with various strengths and limitations. One strength is the use of established measures that have been previously validated in pregnant populations. Some literature referenced in the review used less-than-optimal measures to assess key constructs thus decreasing validity of results. Psychometrically, all measures demonstrated good to excellent reliability within the sample. Another strength is that because of the mixed methods design, quantitative results were validated via qualitative interviews on an individual level, and overall quantitative results from the group were validated via triangulation of results. The large sample size of the study is an additional strength and allowed for analyses to be sufficiently powered to detect significant results.

Limitations include the use of self-report measures for the online survey, the

retrospective approach to collecting past body dissatisfaction, and the cross-sectional nature of the study. All information from the online study relied on self-report and thus trusted that participants provided honest responses. Research suggests that self-report assessment of key variables in this study may demonstrate small errors (i.e. misrepresentations of weight and height), however rates of error are not enough to skew results and is considered an appropriate way to measure health behaviors during pregnancy (Headen et al., 2017). The fact that the construct of past body dissatisfaction was based on participants' memory introduces potential bias in the responses due to the effects of discrepancy between memory and actual events (Van den Berg & Walentynowicz, 2016). Attempts to manage bias were made by including very specific references to the time frame to which questions applied and comparing results of the retrospective information to the same construct assessed in the present to validate results. Because the correlation between past body dissatisfaction and current body dissatisfaction was significant, this decreases concern that the retrospective result was invalid. Finally, the cross-sectional nature of this study is a limitation to the research question because analyses were unable to model causal relationships among variables and determine ordering effects of how one construct may affect another.

Despite the limitations, the current project significantly contributes to the literature by investigating novel relationships amongst variables that impact the women and their health behaviors and body image during pregnancy. Additionally, using a mixed methods approach allowed for the triangulation, and thus validation, of findings from quantitative results and also expanded results to shed light on additional experiences of women who engage in BE during pregnancy. Ideally future research can work to

expand upon these results and address the limitations.

Future Directions

Future research would ideally investigate relationships between disordered eating behaviors and other problematic eating behaviors mentioned in this study such as dietary restraint, indulging in cravings, grazing, and night eating. These behaviors may have significant implications for GWG. Methodologically, a longitudinal study design would help to extend the literature about the dual pathway theory and model the sequence of experiences related to body dissatisfaction, dietary restraint, psychological distress, and BE. Additionally, a longitudinal approach that assesses GWG at multiple time points could demonstrate important relationships between health behaviors throughout pregnancy and the weight gain trajectory, thus highlighting additional intervention points.

Additional qualitative work similar to this project but with providers instead of patients would be a welcomed addition to the current results. Women reported that they are not assessed for body dissatisfaction or BE and that they have negative interactions with health care providers. In order to have a balanced understanding of patient-provider interactions, the provider's point of view is necessary before moving forward with additional clinical recommendations.

Lastly, studies in the future that address clinical applications based on results are important. Implementation studies of screening practices in prenatal health service clinics is a key area to begin this work in order to improve access to appropriate care for women suffering from disordered eating and body dissatisfaction. Studies of intervention development is another future clinical direction. Future studies that develop pregnancy-specific interventions for GWG that include BE and body dissatisfaction as targets should

occur to achieve this.

Conclusions

The present study investigated relationships between variables of BE frequency, body dissatisfaction, dietary restraint, and psychological distress during pregnancy to evaluate how they impact GWG. Additionally, patient-provider interactions were assessed to understand how they influence women's experiences during pregnancy. Results indicated that body dissatisfaction was significantly related to frequency of BE during pregnancy and that BE above and beyond the covariates mentioned did not reliably categorize participant's GWG status of adequate/below GWG vs. excess GWG while body dissatisfaction did. Qualitative results offered additional explanations for why women gain excess gestational weight. Qualitative data highlighted that feeling judged by health care providers can contribute to body dissatisfaction and psychological distress and that not having enough information or opportunities to discuss concerns was a barrier to managing modifiable disordered cognitions and behaviors and achieving appropriate GWG. Results have implications for how we understand disordered eating during pregnancy, how we measure disordered eating, and how we assess and treat disordered eating and cognitions during pregnancy to prevent GWG. Future research would be beneficial to provider further assessment of eating styles and patterns during pregnancy and their relationship with GWG, to implement screening procedures in clinics for body dissatisfaction and disordered eating behaviors, and to develop appropriate interventions to prevent GWG that address body dissatisfaction and disordered eating and thus improve the health of pregnant women and their children.

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APPENDIX A: FORMULA AND EXAMPLE FOR CALCULATING EXCESS GWG BASED ON GESTATIONAL AGE

The formula is as such:

Excepted GWG =
recommended first-trimester total weight gain (.5kg for obese range, 1 kg for overweight, and 2 kg for normal weight/underweight) + [(gestational age at weight measurement – 13 weeks) x recommended rate of gain in second and third trimester (also based on pre-gravid BMI)].

Example:

If a woman reported her weight gain of 11 kg at 37 weeks of pregnancy and her pre-gravid BMI was overweight, the calculation would be as such:

1kg +[24 x .28 kg/week] = Therefore her expected weight gain is 6.72 kg (or 14.82 pounds).

Calculating the ratio of actual weight gain vs. expected weight gain – 11kg/6.72 – 1.63

Calculating the range for weight gain:

So if adequate weight gain for an overweight woman is 7 – 11.5 kg, we would calculate the range using the first formula:
1kg + [27 x .28kg/week] = 8.56 kg is the expected weight gain

7/8.56 and 11.5/8.56 and multiply by 100 to get a range of adequate weight gain of 82%-129%

For our imaginary woman who has gained 11 kg at 37 weeks gestational age, we would then calculate total weight gain (11kg) by expected (6.72) = 1.63 x 100 = 164%

164% is greater than 129% (the high end of the adequate range) indicating that this participant has gained excess weight for her current gestational age.

APPENDIX B: INTERVIEW SCHEDULE

Body Satisfaction	How have you been feeling about the changes which have occurred to your body during pregnancy? How have the changes compared to your expectations? How have these changes affected you mentally and emotionally? What about behaviorally?
Binge Eating	What have you noticed about your eating behaviors during your pregnancy? How are your eating behaviors similar or different to your behaviors prior to your pregnancy? What are the situations in which you overeat?
GWG	How do you feel about the amount of weight you have gained during your pregnancy?
Communication about GWG and health behaviors	Please identify your prenatal health service providers (profession) _____ What has/have your provider(s) or told you about… 1. Recommended weight gain during pregnancy? 2. Eating behaviors during pregnancy, specifically overeating or binge eating? 3. Attitudes towards your body size and shape during pregnancy?
Experience with health care provider	How would you describe your experience of discussing issues of weight and shape and eating with your provider?
Attitudes of health care provider recommendations	What do you think about your health care providers' recommendations for pregnancy health and weight gain? What suggestions do you have to improve this experience?
Knowledge of GWG and health behaviors during pregnancy	What is your understanding of how much weight you should gain during pregnancy? 1. Do you think that you have gained excess weight during pregnancy? a. If yes, why do you think that you have gained excess weight and could anything have been done to help you prevent this? b. If no, what helped you avoid this?
Interventions utilized	What resources did your health care provider or OB/GYN

	provide to you about weight gain, eating behaviors, or body image during pregnancy?
Behavioral influence of health care provider information	How has advice from your provider changed your behaviors such as eating behaviors, physical activity, etc.
Alternative Sources of Information	Have you sought prenatal services from providers not already included in previous questions? (I.e. midwife, doula, etc)? If so, have they provided you with information about weight gain, eating behaviors, or body image during pregnancy? With whom would be the ideal person to have these conversations? Or where?
Psychosocial Beliefs of GWG	What ideas do you have about how much weight women should gain during pregnancy? What messages do you get from your family? Society? Etc.

APPENDIX C: DETAILED CODES AND DESCRIPTIONS

Theme I: Body Image		
Category	Subcategory	Description
Reality vs. Expectations	-	Descriptions of how the reality of changes occurring in women's bodies compared to their expectations; including changes that met expectations and changes that differed from expectations
Loss of Control	-	Descriptions of loss of control related to women's bodies at any point in pregnancy
Body Acceptance	-	Descriptions of women who have gained acceptance that their bodies change
Ambivalence	-	Descriptions of ambivalent reactions to bodily changes during pregnancy including reactions that changed throughout the course of pregnancy, or reactions held at the same time
	Body appreciation	Descriptions of ambivalence that recognize the amazing aspect of women's bodies during pregnancy
	Rationalizing body changes for baby health	Descriptions of ambivalence that recognize changes in one's body is necessary to support growth of the fetus
Body Dissatisfaction	-	Descriptions of BD throughout pregnancy
	Self-directed cognitions in response to BD	Descriptions of BD that reflect a negative belief about one's sense of self such as decreased self-esteem, feeling insecure, feeling unattractive, etc.
	Behaviors in response to BD	Descriptions of behaviors enacted in direct response to BD such as avoiding certain things, wearing different clothes, etc.
	History of BD related to current BD	Descriptions of past experiences with body dissatisfaction as well as descriptions of how past BD may affect current dissatisfaction

Theme II: Eating Behaviors		
Category	Subcategory	Description
Pregnancy-related factors affecting eating behaviors	-	Descriptions of how aspects unique to pregnancy affect eating behaviors
	Dietary limitations for healthy pregnancy	Descriptions of how recommendations for foods to avoid during pregnancy affect eating behaviors
	Guidelines for calorie intake	Descriptions of how calorie intake recommendations during pregnancy affect eating behaviors
Night Eating		Descriptions of eating behaviors that occur after women have gone to sleep and they wake up and eat
Overeating/Binge eating		General descriptions of overeating or BE that occurs during pregnancy
	Reactions to Overeating/BE	Descriptions of how women feel about their overeating or BE including emotional and self-evaluative descriptions
	Loss of control	Descriptions of the experience of loss of control related to overeating/BE during pregnancy
Influences for overeating/binge eating		General descriptions of factors that influence overeating or BE
	Social factors	Descriptions of how presence or absence of others impacts overeating or BE
	Location and Environmental Factors	Descriptions of how certain locations or environments influence overeating or BE
	Type of food	Descriptions of how specific foods impact overeating or BE
	Emotions	Descriptions of how emotional experiences, of any kind, can affect overeating or BE
	Cognitions	Descriptions of how various thoughts and beliefs influence overeating or BE
	Craving or indulging	Descriptions of how the experience of having cravings for certain foods or indulging in certain foods affects overeating or BE
	Restriction	Descriptions of how restriction, past or present, impacts overeating or BE
	Grazing	Descriptions of how eating food over an extended period of time impacts overeating or BE
	Other	Descriptions of how any other factors led to

		overeating or BE during pregnancy
Social considerations with eating during pregnancy	-	Descriptions of how others or environments affect eating in general during pregnancy, not overeating or BE
Medical aspects and eating behaviors	-	Descriptions of how medical factors related to pregnancy may impact eating behaviors during pregnancy
Compensatory behaviors for eating	-	Descriptions of compensatory behaviors used to mitigate effects of eating during pregnancy; overeating/BE or otherwise

Theme III: Gestational Weight Gain		
Category	Subcategory	Description
Trajectory of weight gain during pregnancy		Descriptions of the sequential events impacting women's weight gain during pregnancy
	Nausea at first, increased weight gain later	Descriptions of women having nausea and not gaining or losing weight initially then gaining excess weight later
Information provided by health care provider about GWG		Descriptions of the recommendations for GWG that women received from a health care provider
	Reaction to information	Descriptions of women's reactions to recommendations for GWG from health care providers
Understanding and Knowledge of GWG		Descriptions of how women understand how GWG is calculated, why it's important to know, etc.
	Amount of information	Descriptions about the amount of information women have related to GWG; i.e. sufficient information, inadequate information, etc.
	Behaviors to seek additional information	Descriptions of what women have done to seek additional information on this topic outside of health care provider information
	Personal vs. official GWG recommendations	Descriptions of how some women may have a personalized weight gain goal for themselves that differs from the health care provider recommendation
Reaction to weight gain		Descriptions of women's reactions to the amount of weight they have gained during pregnancy, including emotional reactions, evaluative statements, etc.
	Negative	Descriptions of women's reactions to weight gain that reflected a negative evaluation
	Acceptance	Descriptions of women's reactions to weight gain that reflected acceptance of the changes
Factors that influenced weight gain		General descriptions of factors identified by participants that influenced weight gain in any way
	What factors led to excess GWG	Descriptions of factors that led to actual excess GWG
	What factors	Descriptions of factors that prevented

	prevented excess GWG	excess GWG for participants and help maintain adequate weight gain
	What could have prevented excess GWG	Descriptions of identified behaviors or factors that could have prevented excess GWG for women who have gained too much

Theme IV: Psychological Distress		
Category	Subcategory	Description
Descriptions		Descriptions of psychological distress for women that may or may not be captured by other themes such as body image or GWG
	Pregnancy-related	Descriptions of psychological distress that result from pregnancy-related factors (not shape and weight) such as financial concerns, medical factors, etc.
	Shape and weight-related	Descriptions of psychological distress that results from shape and weight-related topics such as worry about returning to prepregnancy weight, worrying about finding clothes that fit, etc.
	Provider-related	Descriptions of psychological distress that result from health care providers, either interactions with providers, recommendations, etc.
Coping		General descriptions of coping with psychological distress including motivation to cope, consequences of not coping, etc.
	Adaptive coping skills	Descriptions of adaptive coping skill sin response to psychological distress such as active coping, seeking support, seeking information, etc.
	Maladaptive coping skills	Descriptions of maladaptive coping skills in response to psychological distress such as avoidance, overeating, or isolation

Theme V: Health Behaviors		
Category	Subcategory	Description
Attitudes towards Physical Activity	-	Descriptions of women's attitudes towards physical activity during pregnancy; i.e. ambivalence, benefits, negative consequences
Attitudes towards Stress Management	-	Descriptions of women's attitudes towards stress management as a health behavior during pregnancy; i.e. ambivalence, benefits, negative consequences
Motivation for Health Behavior Change		General descriptions of women's motivations to make health behavior changes during pregnancy (i.e. physical activity, dietary, stress management)
	Health of Mother and/or Baby	Descriptions of motivations to make health behavior changes in pregnancy in order to directly affect the health of the mother or baby
	Delivery and Postpartum	Descriptions of motivations to make health behavior changes in pregnancy in order to directly affect the delivery or postpartum process
	Shape and Weight	Descriptions of motivations to make health behavior changes in pregnancy to directly influence the woman's shape or weight

Theme VI: Patient Experiences with Provider		
Category	Subcategory	Description
Assessment		Descriptions of if/how symptoms of disordered eating, BD, or psychological distress was assessed, this also includes descriptions of lack of assessment
Interactions		General descriptions of patient-provider interactions throughout pregnancy related to topics of eating, weight, body image, and psychological distress
	Reactions to conversations	Descriptions of how women evaluated their interactions with providers surrounding issues of disordered eating, BD, or psychological distress including positive and negative reactions and evaluations
	Gendered factors	Descriptions of how the provider's gender impacted their interactions around disordered eating, BD, or psychological distress
	Personal experiences of provider	Descriptions of how the provider's stated personal experiences with pregnancy influenced the participant's interactions
Information and resources provided		General descriptions of information and/or resources provided or not provided related to disordered eating, weight, BD, or psychological distress during pregnancy
	Clarity of information	Descriptions of level of clarity of information provided
	Implementation	Descriptions of if/how women act upon information, recommendations, or resources provided by health care providers
Roles		General descriptions of the roles of patients and providers in the pregnancy context
	Scope of provider role and what provider addresses	Descriptions of how women understand the range of topics that health care providers may or not address during visits
	Patient role	General descriptions of the patient's role in health care provider relationships during pregnancy
	Passive patient approach	Descriptions of passive patient behaviors or approaches in patient-provider relationships
	Active patient approach	Descriptions of active patient behaviors or approaches in patient-provider relationships
Improvements to Experience		General descriptions of how to improve the experience of patient-provider interaction during pregnancy in relation to topics of eating, weight,

		body image, and psychological distress
	Standardized approach to screening	Descriptions of how to standardize the screening process for concerns related to eating, weight, body image, or psychological distress so it is the same for all patients, as well as descriptions of when to screen, how often, etc.
	Normalize concerns	Descriptions of desire for providers to normalize or validate patients' concerns related to eating, weight, body image, or psychological distress as well as descriptions of how to do this and what providers can do or say
	Focus on social support	Descriptions of the desire for providers to encourage women to seek social support as well as for providers to provide social support connection within the health care setting
	Staffing	Descriptions of how staffing changes can improve this experience

Theme VII: Ideal Support		
Category	Subcategory	Description
Health care-specific	-	Descriptions of individuals in the health care setting that can best support women when they have concerns related to eating, weight, body image, or psychological distress
Non-health care	-	Descriptions of individuals outside of the health care setting that can best support women when they have concerns related to eating, weight, body image, or psychological distress

Theme VIII: Psychosocial Influences for Women's Experiences with Eating, Body Image, and Psychological Distress		
Category	Subcategory	Description
Media		General descriptions of how media exposure impacts pregnant women's experiences and expectations related to eating, weight, body image, or psychological distress
	Misleading women	Descriptions of how media can mislead or misrepresent the pregnancy experience related to eating, weight, body image, or psychological distress
	Facilitating comparisons	Descriptions of how media facilitates comparisons between women related to eating, weight, body image, or psychological distress and how this impacts pregnant women's experiences and expectations during pregnancy
Family		Descriptions of how family influences women's experiences and expectations for pregnancy in relation to eating, weight, body image, or psychological distress
Additional Sources of Pregnancy Information		Descriptions of where women seek information about pregnancy experiences related to eating, body image, and psychological distress and how they integrate that information
Other prenatal services		General descriptions of the role of prenatal services outside of traditional health care providers. This may include classes women attend, health services, etc.
	Level of information	Descriptions of how much information women receive from these sources in relation to eating, weight, body image, or psychological distress
	Social support function	Descriptions of how these sources provide – or could provide - social support around concerns related to eating, weight, body image, or psychological distress