EXPLORING POSTPARTUM WEIGHT MANAGEMENT TECHNIQUES TO DECREASE PROPORTION OF OVERWEIGHT AND OBESE WOMEN

by

Melissa Paige Gregory

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This thesis was presented

by

Melissa Gregory

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and approved by

Thesis Advisor: Mark Friedman, PhD, Assistant Professor, Behavioral and Community Health Sciences, Infectious Diseases and Microbiology, Pediatrics, Graduate School of Public Health, University of Pittsburgh

Martha Ann Terry, PhD, Assistant Professor and Director of MPH Program, Behavioral and Community Health Sciences, Graduate School of Public Health, University of Pittsburgh

Michele Levine, PhD, Associate Professor of Psychiatry and Psychology, Department of Medicine, School of Medicine, University of Pittsburgh

Mark Friedman, PhD

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ABSTRACT

Obesity is a major public health problem in the United States. A subgroup of obese individuals with particular health concerns is women of childbearing age. Although there is an extensive amount of research on excessive gestational weight gain and its adverse health effects, there is limited research about weight gain and management during the postpartum period. While weight management interventions have targeted women within the prenatal stage of pregnancy, few have focused on the postpartum period. A focus on the postpartum period is therefore important because 1) a unique opportunity exists during this period to intervene to improve the health of women, and 2) many childbearing women will become pregnant again and so intervening during this period may improve the outcomes of future pregnancies.

This thesis therefore provides data to inform the development of more effective weight management interventions targeting women during the postpartum period. Specifically, this thesis provides preliminary data about overweight and obese postpartum women and their preferences and views surrounding weight management, data that can be used to strengthen the development and implementation of interventions. A sample of postpartum women was assessed to describe their attitudes about and preferences with respect to interventions. Results found that women were most interested in individualized, phone-based interventions that focus on dietary intake and ways to reduce postpartum weight gain. Women were also asked about potential

barriers impacting their ability to complete weight management interventions. Socio-demographic factors were assessed to determine whether these factors were potential predictors of interest. Multigravida and primigravida were the only statistically significant predictors of interest, with women undergoing their second pregnancy being most interested in participating in weight management programs.

Few weight intervention studies have looked into the psychosocial context of women participating in weight management. The findings of this thesis suggest approaches to reduce weight gain postpartum capturing preferences and potential barriers to treatment.

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PREFACE

I would first like to extend genuine appreciation to those who supported me through the process of developing this thesis and over the last three years as I have worked towards completing my MSW/MPH degrees. I am grateful to have had the opportunity to learn and grow from professionals making change in the world. The professors, mentors, and advisors I have had have provided a constant belief in my ability to succeed. Most importantly, I want to thank my committee, especially Michele Levine, for offering me the opportunity to write this thesis and work with her amazing research team.

1.0 INTRODUCTION

1.1 THE PUBLIC HEALTH PROBLEM OF OBESITY

Obesity refers to an excess of body fat, resulting from an imbalance between energy intake and energy expenditure.[1] Obesity is defined as having a body mass index (BMI) greater than or equal to 30 kg/m2.[2] BMI is a person's weight in kilograms divided by the square of height in meters. A high BMI is an indicator of high body fat.

Obesity is a major global public health challenge as 2.8 million people die each year from being overweight and obese.[3] Obesity is a major public health problem because of the health outcomes associated with this condition.[4] Obesity is a risk factor for cardiovascular disease, diabetes, hypertension, kidney disease, obstructive sleep apnea, osteoarthritis, and several forms of cancer (e.g., colon, breast, esophageal, uterine, ovarian, kidney, and pancreatic).[1,5] Obesity is also associated with various psychological problems including mood, anxiety, eating, and personality disorders.[1] People who are obese are more likely to experience negative body image and self-concept.[6,7] Negative body image and dissatisfaction are themselves associated with disordered eating, depression, anxiety, impaired sexual functioning, and poor self-esteem.[7]

It is important to note that many of the psychological outcomes described result, in part, from the stigma and discrimination many overweight and obese people face[7] as these individual face discrimination in a wide range of life domains. These include employment,[7,8] medical and

health care,[8,9] and educational settings.[8] Utilizing a nationally representative sample of 2,290 American adults, Puhl and Brownwell found that weight discrimination is common among Americans, with rates close to the prevalence of race- and age-based discrimination.[8] There was a substantial increase in the odds of weight/height discrimination with increasing obesity and BMI.[10] Acts of prejudice and discrimination have ultimately impacted the work, health, and societal acceptance of individuals who are considered overweight and/or obese.[8]

Obesity results in a unique disease burden on women and is influenced by a variety of biological, hormonal, environmental, and cultural factors.[11] Not surprisingly, more women than men, ages 20 and over, have higher rates of obesity and extreme obesity (36.1 versus 33.5 percent).[12] Similar to the general increase of obesity, there is an increasing rate of obese women in the United States. The prevalence of obesity shows significant variation by racial and ethnic differences.[13] For example, rates of obesity in women ranges from 33.0% in non-Hispanic white women to 46.9% in non-Hispanic black women.[13] Nearly two out of three adult women are classified as overweight (BMI >25) and one in three is obese (BMI>30).[14]

Obesity among women in the United States (U.S.) is associated with various physical and mental health outcomes. Overweight and obesity among women of childbearing age is associated with several chronic diseases later in life, such as type 2 diabetes, hypertension, cardiovascular disease, and breast and endometrial cancers.[15] Obesity among women has been linked to a higher risk of low back pain and knee osteoarthritis.[16] Obesity also negatively affects both contraception and fertility in women of childbearing age, having increased adverse effects on conceiving and delivery.[11,12]

Aside from the adverse physical outcomes, obesity in women has been associated with several adverse psychological problems. Women who are overweight and/or obese are more

likely to experience depression.[16,17] Although many social, psychological, and cultural factors likely contribute to the development of depression in obese women, one explanation is that the stigma toward obese individuals in American society leads to low self-esteem and ultimately depression.[18] As described below, obesity is a major public health problem with respect to pregnant women. This is due to the fact that obesity negatively impacts pregnancy outcomes for both mother and child as well as the outcomes of future pregnancies.

1.2 OBESITY AND PREGNANCY

Research has shown that a woman's main child-bearing years (25-34 years) hold the highest risk of weight gain compared with men or women of other age groups.[12,19,20] Not surprisingly, it is estimated that one in five U.S. women is overweight at the start of their pregnancy.[14] There are many risk factors for both mother and child throughout pregnancy but these especially impact women who begin pregnancy with pre-existing excess weight. Although complications during pregnancy are common, obese/overweight women have a greater chance of complications pertaining to their excessive weight before, during and after pregnancy. Miscarriage takes place more often in overweight and obese women, after both natural conception and infertility treatment.[21] The risk of miscarriage in obese women is 25-37% higher compared with lean women.[21] There are also risks for obese/overweight women that occur during pregnancy such as gestational diabetes, pregnancy-induced hypertension, and preeclampsia.[21] Owens and colleagues found a strong association between obesity, macrosomia, and shoulder dystocia.[22] Lastly, obesity impacts delivery and labor during pregnancy. Outcomes include increased rates of cesarean delivery and high birth weight of the baby.[23-25]

Aside from medical and emotional complications, overweight and obesity among mothers is costly to society. Overweight and obese among women are associated with more prenatal fetal tests, obstetrical ultrasonographic examinations, medication use, prenatal visits, and longer hospital stays.[15] Overweight and obese women are more frequently hospitalized, increasing the total cost of obstetrical care, risk for hospital infections, and deep venous thrombosis (DVT) due to prolonged immobilization resulting in many medical complications.[26]

Beyond the immediate risks of pregnancy-related overweight and obesity, pregnancy related weight gain contributes to long-term weight retention in childbearing women.[23,27-29] Research has shown that up to 20% of women retain 10 pounds or more in connection with pregnancy.[30] Postpartum weight retention contributes to female overweight and obesity as two-thirds of women weigh more than their pre-pregnancy weight at six months postpartum.[31] Based on the Institute of Medicine (IOM) guidelines, overweight women are supposed to gain an average of 15-25 pounds and obese women are supposed to gain an average of 11-20 pounds. Aside from the weight gain throughout pregnancy, overweight/obese women have the most difficult time losing the weight retained during the postpartum period.

Obesity has unique implications with respect to the postpartum period. The postpartum period is defined as occurring in or being the period following parturition. Postpartum is recorded as having three different phases within this time period.[32] The first phase of postpartum period is called the initial/acute phase, which is the first six to twelve hours after giving birth. The second phase is the sub-acute postpartum period, which lasts two to six weeks. The last and final phase is the delayed postpartum period, which lasts up to six months. Research has shown that gradual change occurs between the sub-acute and delayed postpartum phase.[32] As expected, the initial/acute phase is most important for creating attachment to child and mother, as well as

orienting the mother to the phase of birth. The sub-acute and delayed postpartum period are important periods and relate to both women's and children's future risk of obesity because this period is a time when the child's behavioral risk factors for obesity are, in part, formed.[30]

This period in a woman's life is ideal for engagement because they are most likely to formulate schedules and change. Research has shown that postpartum women are ready and motivated to lose weight with 80% of overweight and obese women planning to seek weight loss information four months after delivery.[31] Although women are motivated to lose weight during this period, it remains a challenge to intervene, specifically related to diet/exercise associated with weight interventions. There are a number of challenges and barriers that intervening during the postpartum period poses. Challenges interfering with women's abilities to participate in weight loss interventions include lack of time and energy due to demands of a newborn, as well as prioritization of child's care over mother's care during this period of time.[33] Clinicians working with postpartum mothers need to be aware of and sensitive to these challenges while attempting to implement lifestyle behavior change.

1.3 WEIGHT AMONG POSTPARTUM WOMEN

Several studies have evaluated lifestyle and dietary counseling approaches intended to reduce gestational weight gain.[34] A combined dietary and exercise intervention reduced gestational weight gain but also impacted insulin resistance and consequently gestational diabetes mellitus.[35] The combination of exercise plus individualized dietary counseling during pregnancy significantly reduced gestational weight gain.[33,34]

However, few approaches have been successful in reducing postpartum weight retention. Interventions targeting postpartum women have utilized similar behavioral change strategies as with those targeting gestational weight gain. These include providing general information about the consequences of certain behaviors, behavioral goal setting, self-monitoring of behavior, and goal setting.[36]According to Shaw et al., behavior therapy is most commonly used for weight loss as it demonstrates enhancing dietary restraint by providing adaptive dietary strategies and by increasing motivation to be more physically active.[37] Unfortunately, many of the postpartum weight interventions have been unsuccessful. Unique challenges exist with respect to helping these women to prioritize their own health during this transitional period of life.[38]

There are several socio-demographic, behavioral, and psychosocial predictors of weight retention postpartum. However, data about postpartum weight control among women are limited. Some studies have looked at sleep, which is associated with weight status.[39] Lack of sleep among mothers with young infants is common and has been associated with a women's inability to lose weight during the short-term postpartum period.[29] Another behavior associated with weight loss postpartum is breastfeeding. Mothers who breastfeed are more likely to exert more energy through the lactation process than those who do not. Researchers have noted that a higher intensity and longer duration of breastfeeding reduces postpartum weight retention in women with BMI <35 and may facilitate a return to pre-pregnancy weight.[40]

As previously stated, black women are more likely to be overweight/obese than their white counterparts. Also, studies report that black women tend to retain more weight postpartum compared to their white counterparts independent of gestational weight gain.[29] Maternal age is also a predictor of weight retention postpartum. Studies have shown that maternal ages of less than 20 years and greater than 30 or 40 years are associated with higher weight retention.[29]

Based on the National Vital Statistics, the mean age of first birth among women in the United States has increased from 24.9 years in 2000 to 26.3 years in 2014,[41] suggesting that this factor is associated with increased weight retention. These statistics suggest that targeting this specific age range is important when developing effective postpartum weight intervention programs.

Level of education also plays a role in weight retention among women as this relates to knowledge of dietary intake and the health of various foods.[28] The role of hospital dieticians and nutritionists is in part to deliver diet-related information including explanation of caloric intake. These professionals have struggled to communicate this information in a way that is effective with different subgroups of women. Postpartum is a challenging time because women are used to a stringent diet during pregnancy (deli meats, uncooked fish, and unpasteurized milk). However, postpartum women are exposed to their physicians and dieticians less frequently during the postpartum period. Therefore, postpartum women receive less guidance as compared to their care during pregnancy.

Further analyses of women's preferences and barriers in implementing weight intervention programs are important to address this growing public health challenge. Given the lack of data about postpartum women and weight reduction, the aims of this thesis are to:

1. Identify and predict potential barriers postpartum women might encounter during integration of weight management intervention programs,
2. Describe an ideal program format for delivering weight management content during postpartum sessions,
3. Capture overall topics and goals postpartum women are most interested in throughout weight management interventions, and,
4. Capture demographic differences that may be possible predictors of interest.

2.0 METHODS

Data for this thesis were collected as part of the Longitudinal Eating Assessment during Pregnancy (LEAP) study. The LEAP study (PRO11070083B, PI Michele Levine) is a NIH funded study with the goal of recruiting 250 overweight/obese women within 12-20 weeks of their pregnancy and following them longitudinally to six-months postpartum. The main study goal is to examine the relationship between loss of control (LOC) and excessive gestational weight gain (eGWG). Participants are assessed at six different time points beginning at the start of pregnancy to the postpartum period. It should be noted that the LEAP study continues to recruit individuals.

For this thesis, data collection was implemented during the final assessment of the LEAP study, which occurred during the six-month postpartum time period. Data collection began August 15, 2013 (date of first postpartum assessment for weight management information), and ended on December 31, 2015 (last postpartum assessment). Participants were the first one hundred women who came for their final assessment and responded to a questionnaire about weight management. These one hundred women were recruited from venues throughout the City of Pittsburgh providing a more comprehensive data sample.

The data were extracted from a questionnaire that all LEAP study participants complete. The primary source of data is questions asked as part of the Weight Management Intervention Questionnaire. This questionnaire includes questions about program delivery and topic

preference, as well as potential barriers to receiving weight management interventions (see section below for more information about the questionnaire).

Demographic data were also collected. The demographic form found in Appendix B includes questions about current economic status, employment, relationship status, and race and ethnicity during the six-month postpartum assessment. Demographic information is collected from LEAP participants at three different time points: baseline assessment (between 12-20 weeks of pregnancy), T5 assessment (right before delivery, third trimester), and T6 assessment (six months postpartum). For this paper, demographic data were utilized from the final T6 assessment. Samples of the Weight Management Intervention Form and Demographic form can be found in the Appendix A and B.

Completed questionnaires were given to the LEAP study coordinator who separated the forms into categories of participants interested or non-interested in participating in weight management. Data were extracted and manually entered into an Excel spreadsheet with respondents' answers to the questionnaires. Responses were recorded as 'yes' answers displayed by 1 and 'no' answers displayed as 0. Women's' responses were recorded in the Excel document by their unique study identification number; therefore their names were not listed.

After the first one hundred responses were recorded, the Excel databases were compiled into a larger SPSS software program for further analyses. Women's responses to weight management were linked to their answers on their demographic forms through use of their unique study ID number. Chi-square and frequency analyses were completed through using SPSS. Any missing data were recorded as missing and not included in the SPSS analyses.

2.1 RECRUITMENT AND STUDY POPULATION

Most LEAP study participants were recruited from a previous smoking cessation study. Participants were also recruited using Port Authority Transit bus advertisements and Internet advertisements. Most participants came from urban areas, as the LEAP study was conducted in the City of Pittsburgh. Demographic summary data are captured in Table 1 highlighting differences between women who selected whether or not they were interested in participating in weight management six-months postpartum.

Table 1: LEAP Participant Demographic Information

	Weight Management Groups	
Demographic Factors	Interested in WM[1] (n)	Not Interested in WM (n)
Race, Caucasian	21	23
Race, African American	28	25
Race, Other or Multiple	3	4
In a relationship	40	44
Post-high school education	33	33
Full Time Employment	18	19
Part Time Employment	8	12
Income, <$50K	41	39
Income, >$50K	11	13

Table 1 Continued		
Clinical Factors		
Parity, 1 live birth	14	27
2 or more live births	38	26
Postpartum Weight, <200 lbs.	21	26
Postpartum Weight, >200 lbs.	31	26

[1] WM: Weight Management

In summary, women completing their final assessment within this time period were African American (49%), Caucasian (44%), Bi-racial (6%), and Native American (1%). This sample is reflective of the overall LEAP sample with respect to racial and ethnicity. Women participating in LEAP were also of lower socioeconomic status. These demographic factors will be discussed further in the results section below.

2.2 STUDY DESIGN

The study design for this master's thesis is a within group assessment. A single cross-sectional assessment was implemented. The first one hundred participants of the LEAP study were included.

2.3 MATERIALS

Participants completed the Weight Management Interest Form during the final six-month postpartum assessment. This three-page, 20-question form is given to all participants. A sample of this questionnaire can be found in the Appendix A. The front page of the Weight Management Interest Form ask participants to fill in their name, whether or not they are interested in participating in weight management, and the best days/times for completing weight management groups. Although the questionnaire asks about group or individual counseling, all participants are notified that the LEAP study is offering only individual weight management counseling. Research staff notify women that the information is being collected to determine the best way to approach weight management intervention techniques.

The second page of the weight management questionnaire asks women about their preferences with respect to weight management interventions such as types of therapy and how the intervention is to be conducted (phone, text, email). Research has shown that a variety of different weight management topics have been included in different programs. In order to identify which topics are most desired, women were offered a range of choices. For example, the questionnaire was able to capture whether participants were more interested in learning about physical activity or eating healthier. Another component asks about how participants preferred to be contacted for weight management.

The LEAP study asks women to choose between individual or group approaches and whether they are more interested in treatment and intervention being delivered electronically, via email, phone, or text. Some research has shown that weight management conducted online is more effective than traditional in-person settings.[27] Another component are the goals participants are interested in reaching through weight management programs. The questionnaire is set up to

capture whether patients are interested in returning to their pre-pregnancy weight or a new weight goal during the postpartum period.

The third and final page of the weight management questionnaire asks women about potential barriers impeding their ability to participate in the weight management intervention. As documented in the literature, there are many individualized potential barriers that impair their ability to participate in programs and interventions, specifically related to health.[33] Barriers included are childcare, transportation, financial struggles, schedule conflicts, time of day offered, and lack of overall motivation to lose weight. Aside from the list of barriers the LEAP study team provided, participants identified other potential barriers. In this section, women are able to better categorize the reasons why they would not meet their health and weight management goals are unable to be obtained (for women not interested) or why they could potentially with not participate in the program (for women who already marked their interest).

3.0 RESULTS

3.1 DEMOGRAPHIC DATA

As displayed in Table 1.0 (pg. 11), participants varied with respect to wanting weight management during their postpartum period. Women were of diverse backgrounds, races, and socioeconomic status. The demographic table below displays a brief overview of the women that the LEAP study staff followed from twenty weeks of pregnancy to six months postpartum.

As previously noted, most LEAP participants had completed postgraduate schooling with some college and or technical school. Table 2 displays the educational levels and participants' interest in weight management intervention at the six-month postpartum visit.

Table 2: Education

		Interest in WM		
		No	Yes	Total
Education	Grade School	6	3	9
	High School/GED	12	16	28
	Some College/Tech School	18	22	40
	Four Year College	7	4	11
	Post-Graduate School	7	5	12
Total		50	50	100

Table 3 presents income levels and interest in weight management among LEAP participants in this sample during their six-month postpartum visit.

Table 3: Income

		Interest in WM		Total
		No	Yes	
Income	< $10,000	16	22	38
	$10,001-$20,000	11	5	16
	$20,001-$30,000	7	8	15
	$30,001-$40,000	2	3	5
	$40,001-$50,000	1	1	2
	$50,001-$60,000	5	4	9
	$70,001-$80,000	1	1	2
	$80,001-$90,000	1	4	5
	$90,001-$10,000	1	1	2
	>$100,000	5	1	6
Total		50	50	100

Table 4 presents information on women's current relationship status at the time of the six-month postpartum assessment and interest in weight management. The data did not take into account how long the women were with their significant others.

Table 4: Relationship Status at Six-Months Postpartum

		Interest in WM		
		No	Yes	Total
Relationship	Single/No Relationship	9	12	21
	In Relationship- living apart	5	4	9
	In Relationship-living together	21	17	38
	Married	15	15	30
	Separated	0	2	2
Total		50	50	100

Table 5 presents data on the number of pregnancy women had during their postpartum assessment. Primigravida is whether or not it was their first pregnancy. Multigravida was defined as at least their second pregnancy. Data did not capture whether the subsequent pregnancy was their second or beyond.

Table 5: Number of Pregnancy

	Interest in WM (n)		Total
	No	Yes	
Primigravida	27	14	41
Multigravida	23	36	59

Table 6 further presents women's employment status during the six-month LEAP assessment. There was an even split with half of the women working full-time during the six-month postpartum assessment or not currently working.

Table 6: Employment Status at Six-Months Postpartum

		Interest in WM		
		No	Yes	Total
Employment	Full Time	19	18	37
	Part Time	11	7	18
	Not working for pay	18	18	36
	Leave of Absence	0	2	2
	Maternity Leave- plan to return	1	1	2
	Maternity Leave- no return	0	2	2
	Disabled	1	2	3
Total		50	50	100

3.2 PROGRAM DELIVERY

Modern technological advances have provided additional formats with respect to how behavioral interventions can be implemented. The LEAP study provides interventions through group sessions, individual sessions with a coach/counselor, text, phone calls, and/or online through website sources. The 100 women who completed the Weight Management Interest Forms reported being most interested in talking to a counselor or coach for individualized weight management treatment. Out of the 100 responses received, 81% were interested in receiving information through individualized weight management counseling with a coach or clinician. Women were also interested in talking on the phone (76%) and receiving information online (75%). Other formats, as shown in Table 7, were of less interest.

Table 7: Weight Management Program Interests

	Total	Interested in Intervention
	(% Yes)	(% Yes)
Participate in a group with others	71% (N=67)	91% (N=48)
Talk with a counselor or coach	81% (N=78)	96% (N=51)
Receive information via online	75% (N=73)	90% (N=48)
Receive information via phone	76% (N=74)	88% (N=47)
Receive information via text	64% (N=62)	76% (N=39)

Figure 1 depicts the above preferences taking into account whether women were or were not interested in participating in a weight management intervention.

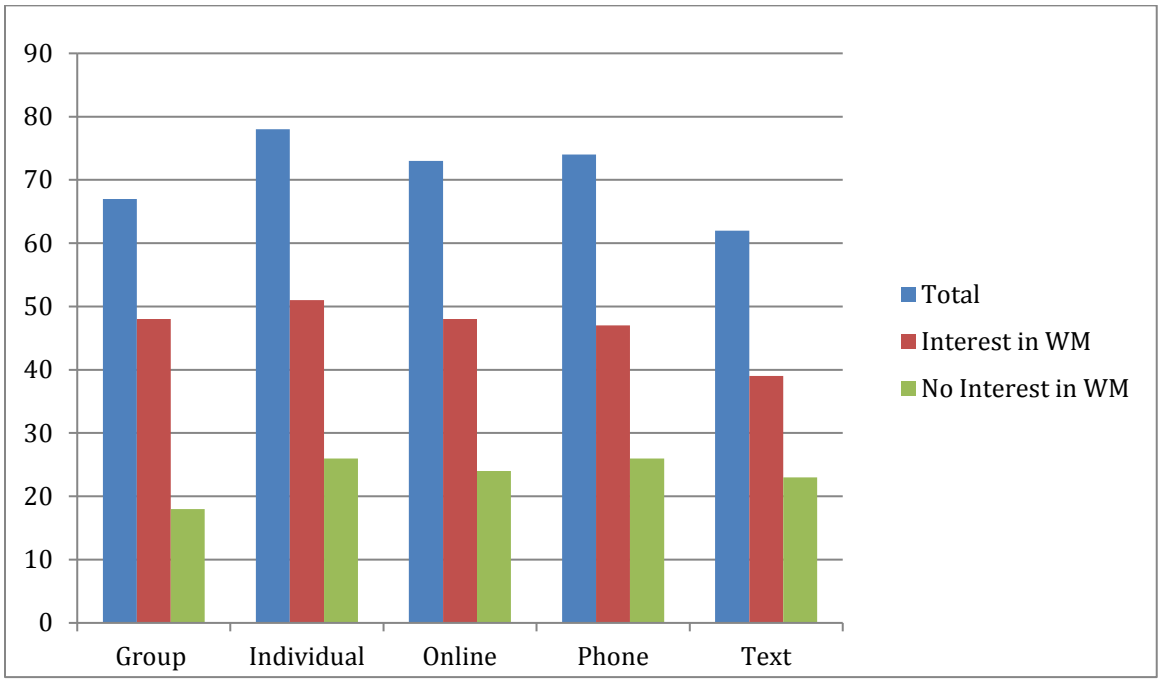

Figure 1. Overall Interest in Weight Management

3.3 WEIGHT MANAGEMENT TOPIC AND GOALS

This section discusses the preferences of participants with respect to program structure, format, and topic. As shown in Table 8, women reviewed six topics that could be included as part of a weight management intervention. Participants were most interested in learning about "healthy eating" as part of such an intervention.

Table 8: Program Topics Preference

	Total	Interested in Intervention
	(% Yes)	(% Yes)
Nutrition during pregnancy	72% (N=70)	90% (N=48)
Stress management skills	66% (N=64)	84% (N=45)
Healthy eating skills during pregnancy	81% (n=78)	100% (N=53)
Skills/Ways to lose weight	73% (N=71)	94% (N=50)
Relationship between eating and mood	66% (N=64)	73% (N=38)
Postpartum lifestyle behaviors	73% (N=71)	92% (N=49)

Figure 2 depicts overall program topic preference based on responses from women interested and not interested in receiving weight management intervention postpartum.

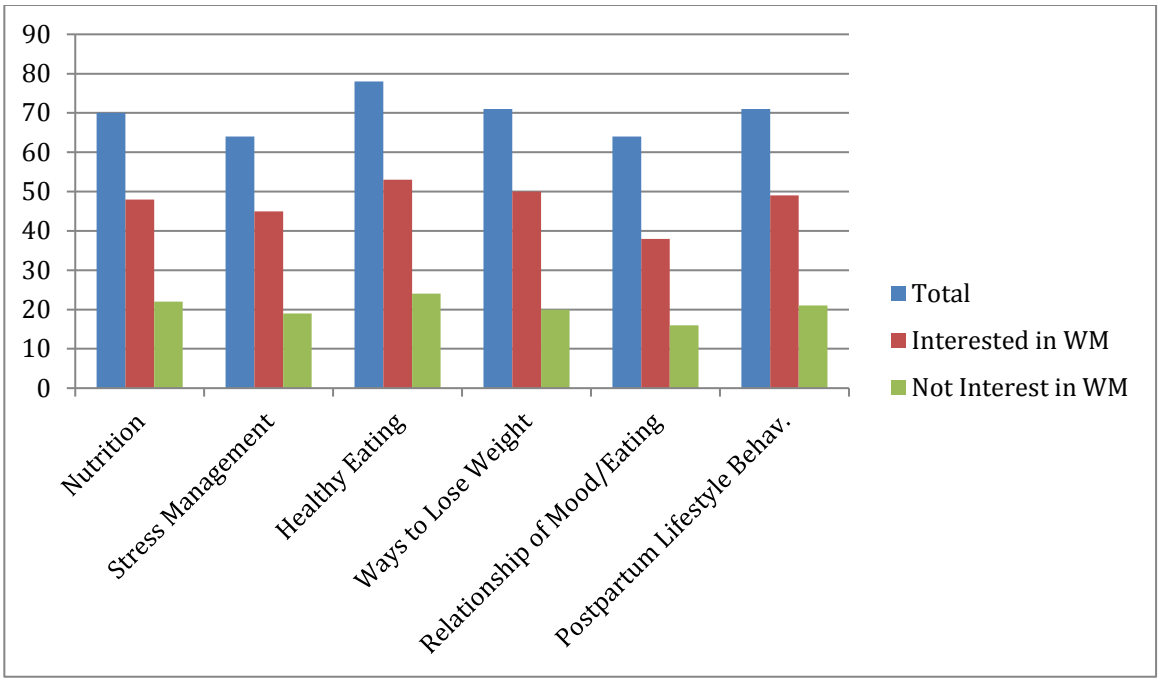

Figure 2. Weight Management Topic Preference

3.4 POTENTIAL BARRIERS

This section describes potential obstacles to participating in a weight management program. Participants were presented with a list of six barriers they might face when attempting to complete the program. Table 9 displays participants' responses about potential barriers to completing a weight management program. Women were prompted to list any other barriers that would interfere with completing the program. Only five participants supplied "other" answers, which included lack of finances to support healthy lifestyle, conflicting work schedule, and inability to prioritize program and other responsibilities. Coincidently, many women who

answered “no” to interest in participating in weight management did not list any barriers to participating in weight management programs.

Table 9: Barriers to Weight Management Intervention

Barriers to Weight Intervention	Number of participants responding yes
Childcare	55
Transportation	32
Money	38
Time of day	57
Schedule	75
Motivation	26

3.5 RELATIONSHIP BETWEEN VARIABLES AND INTEREST IN THE WEIGHT MANAGEMENT PROGRAM

Differences in demographic variables were compared between women who were and were not in weight management. Independent samples t-tests and chi-square analyses were used to assess differences in demographic, pregnancy factors, and health factors to determine if specific demographic variables would be indicators of participation and interest.

As highlighted in the table below, of the 100 women enrolled and completing the LEAP Weight Management Interest Form, demographic factors did not significantly differ based on overall interest in participation. Race (p>.74), employment (p>.32), income (p>.53), education (p>.83), and relationship status (p>.56) were not statistically significant for the two categories of women. Women were weighed at two separate time points in the LEAP study, at the baseline visit >20 weeks of pregnancy and at six-months postpartum. Women weighing in at their final assessment were categorized in weight groups as greater than 200 pounds and less than 200 pounds. These weight categories were not statistically significant (p>.32) as well in either category of interest or not interest.

The only demographic factor that was statistically significant was whether or not their pregnancy was nulliparous or not. Women who were having a multigravida pregnancy (second or third) were more likely to be interested in participating in a weight management program.

Table 10: Potential Predictors of Weight Management Interest

Demographic Factors	No WM	WM	p
% Black (n)	46% (23)	52% (26)	0.74
% Employed (n)	55% (30)	46% (25)	0.32
% Income ≤ $30,000 (n)	49% (34)	51% (35)	0.53
% Education ≤ high school degree (n)	49% (18)	52% (19)	0.83
% Single (n)	43% (9)	57% (12)	0.56
Pregnancy Factors			
% Multigravida (n)	66% (27)	34% (14)	**0.008**
Health Factors			
% T6 weight >200 lbs. (n)	55% (30)	46% (25)	0.32

4.0 DISCUSSION

4.1 DISCUSSION ON FINDINGS

This master's thesis has four specific aims: (1) to identify the most ideal program format for delivery of weight management during postpartum sessions, (2) to capture topics and goals postpartum women are most interested in having in weight management interventions, (3) to identify potential barriers postpartum women might encounter to participating in weight management programs, and (4) to identify racial and socio-economic differences that may be possible predictors of interest.

The LEAP study's pilot weight management program found that half of the LEAP participants (N=50) expressed interest in the weight management program. Women were most interested in talking individually with a counselor or coach about weight management techniques. The second most popular program delivery method was receiving information and coaching on the phone (77%, N=74). Receiving information over the phone is distinguished from having conversations online to implement the program. Surprisingly, the least desired program format was receiving information via text messages.

The data displaying program topic and interests (Table 3) address the second aim by introducing pilot data about overall topics and goals women were interested in receiving throughout the course of their postpartum weight management. The most popular topic women

were most interested in was healthy eating skills during pregnancy, with 81% (N=78) expressing interest in learning about healthy eating skills during pregnancy. One hundred percent (N=54) of the women who were interested in enrolling into the pilot study were interested in receiving more information regarding this topic. Another common topic of interest was skills and strategies to lose weight and postpartum lifestyle behaviors. Most women, both among those interested and uninterested in weight management programs, expressed interest in weight loss skills (73%, N=71) and postpartum lifestyle behaviors (73%, N=71). Interestingly, neither of these is a primary preventive strategies, but instead about losing weight after having gained it.

Another aim of this master's thesis is to identify potential barriers postpartum women might encounter during the integration of a weight management program. As highlighted in Table 2, the biggest barrier expressed amongst LEAP participants in the six-month postpartum period related to their schedules. Most of the women in the LEAP study come from lower socioeconomic statuses and have variable work schedules and availability. The second most important barrier noted was "time of day". Time of day had to do with when research study staff were able to deliver weight management intervention and when most participants were available. The LEAP study staff work a normal 8am-5pm workday. The third most significant barrier was childcare access. This goes hand in hand with the LEAP participants' concerns over time of day and schedule. Most of the LEAP mothers that clinicians assess in their six-month assessment are primarily single, living alone, with multiple children. Schedule, time of day, and childcare all play a major role in the implementation of weight management programs.

Lastly, racial and socio-economic differences that may be possible predictors of interest were analyzed. The only statistically significant factor was whether or not women were nulliparous. It is important to note the importance that birth order might have on women. Based

on previous literature of weight management interventions during the postpartum period,[23,29,42] few studies have noted differences based on order of pregnancy. There is an array of reasons why women might be more open to weight management based on being a first time mother. Being a first-time mother is a barrier to overcome in itself, and offering weight management at this time may be overwhelming. Another reason why women who underwent previous pregnancies were more interested in weight management could be they were aware of excessive weight gained throughout their first or current pregnancies. It would be beneficial to further examine reasons why women are interested in weight management interventions based on pregnancy order.

4.2 IMPLICATIONS OF FINDINGS

Obesity and its related chronic conditions prove to be one of the leading causes for preventable death in America.[5] Obesity in pregnancy is unique in the sense that it impacts both the lives of the child and the mother. Given that during pregnancy there are adverse consequences of overweight for both mother and child, pregnancy has become an emerging priority area for interventions that address the obesity epidemic.[43] Pregnancy is a unique period in life where women are more willing to change behavior for the health of their child; therefore, implementing interventions during this time may produce better outcomes.[44,45] Researchers have argued that education and awareness building may be adequate for the general population, but overweight and obese people are considered a higher risk group requiring individual skills training and education.[46] The specifics of individual skills training and education delivery are still unknown

for working with overweight/obese pregnant women. The data collected provides preliminary data on methods and procedures to move forward.

A substantial amount of research has shown that physicians are less likely to discuss weight management techniques with overweight/obese patients due to their own comfort level and other personal factors.[23] A study done by Kominiarek et al. found that only 9% of participants reported that their physician talked to them about weight related issues.[23] Increasing the ability of physicians to discuss these issues could impact obesity rates.

Regardless of increasing awareness of excessive gestational weight gain and its health implications, clinical studies of interventions to reduce excessive gestational weight gain still appear to be in their infancy. Thangaratinam found that compared with physical activity and a mixed approach, dietary interventions were associated with the greatest reduction in weight gain in pregnancy.[25] Researchers concluded that dietary interventions are effective, safe, and potentially cost effective.[25]

Other groups of researchers have determined that physical activity has been shown to have a protective effect against excessive maternal weight gain, development of gestational diabetes during pregnancy, and other physiological parameters (i.e., glycemic control, stroke volume).[47] Haakstad and corresponding authors found that regular exercise during pregnancy did not affect gestational age under a supervised structured exercise program but produced a protective effect on overall health.[48] Research reported that it is important to monitor activity levels during pregnancy, especially in the later terms of pregnancy.[43]

Although more research about the impact of obesity and excessive gestational weight gain is needed, more weight management interventions are needed to decrease the proportion of overweight/obese postpartum women. This master's thesis provides preliminary data on the

interests, as well as barriers for weight management during pregnancy. As highlighted in the results section, half of the six-month postpartum women were interested in a weight management program, which provides important data about developing successful weight management intervention techniques.

Addressing barriers to weight management interventions provides a different perspective about obesity and excessive gestational weight gain by identifying potential barriers to seeking weight management interventions. These barriers address psychosocial factors that may impact treatment. Based on the Health Belief Model (HBM), factors such as perceived susceptibility, barriers, and severity are important with respect to women trying to change health behaviors.[49] Identifying potential barriers provides a stepping stone to increasing their adherence to weight management interventions. Often, physicians give women suggestions at their prenatal and postnatal visits, but little is done to promote accessible interventions. Weight interventions have been tested within this particular population, as well as the general population, yet obesity rates continue to rise. Many factors such as transportation, limited financial means, and limited support systems are overlooked. As noted previously, many physicians feel uncomfortable talking about weight with their patients and discussing psychosocial barriers might produce further discomfort. These data suggest how weight management interventions could be adapted to include these key factors for women within the postpartum stage.

4.3 LIMITATIONS OF STUDY

As with any study, there are a number of different limitations associated with this study. This study lacks a control group thus limiting conclusions. All of the participants that completed the

weight management form are already overweight (BMI>25) at the beginning of their pregnancy thus limiting generalizability. Data was extracted from the first 100 women completing the study. It is possible that including data about the remaining women could provide additional information. Further, the study subsample of women (n=100) is relatively small again limiting the generalizability of the study results. Another limitation is that the women who expressed interest in weight management interventions did not follow through to completion of the intervention. It will be important to investigate the preferences and interests of women who are interested in weight management interventions and who complete such interventions in their entirety. It will be important to understand the reason why women are interested in these programs do not follow-up.

Another limitation of the data used for this master's thesis is the time frame in which women are seen. Some women appear for services beyond the six month time frame and were thus not included in these analyses. As pregnancy and postpartum is a hectic time of life for most women, this specific time frame may not be beneficial for women to actively seek weight management. Most research has shown that successful weight management should occur sooner in the postpartum period than six months after.

5.0 CONCLUSION

5.1 POTENTIAL USES OF THE FINDINGS

Reviews of weight intervention techniques among pregnant women have been undertaken[24,25,50] and demonstrate that interventions typically do not sufficiently take into account women's interests and preferences. The findings of this thesis will support clinicians to take into account such preferences to develop for more successful interventions. For example, the findings of this study suggest that a substantial proportion of women are not receptive to interventions postpartum and will therefore need to be targeted during pregnancy or prior to conception. This research suggests ways to make interventions more comprehensive by increasing the focus on the postpartum period. Healthy lifestyle changes will include incorporating more nutritionally balanced diets, as well as emphasizing physical activity. Education about exercise during pregnancy, healthy eating, and stress maintenance is essential to mothers and their offspring.

As previously stated, few clinical studies have looked at interventions to effectively reduce excessive gestational weight gain. As findings are mixed with respect to the relative effectiveness of dietary or lifestyle interventions, it is important to look at other factors that influence women's weight gain. To develop an effective weight management program, it is essential to look at what women want in a program and what they are willing to do. The second arm of this study provides preliminary data and information that can be useful in developing

weight management programs that women will not only be interested in, but also complete to maintain a healthy weight throughout pregnancy.

Another key strength of this paper is the proportion of minorities within the study sample. Existing research has shown that African American women have higher BMIs compared to their Caucasian counterparts.[13,20] African American women could benefit from postpartum lifestyle interventions, especially when taking the findings of this study into account. Randomized clinical trials are needed to provide further guidance for this vulnerable population.[42]

Lastly, this paper was one of the first to capture barriers to accessing weight management interventions. Participants were asked to identify potential barriers with accessing weight management. Although specific barriers such as money and financial resources could not easily be addressed in a weight management program, there are tangible barriers that could be resolved. As noted in the results section, schedule, time of day, and lack of childcare were the three top barriers listed. These findings could provide a framework when developing new weight management implementation techniques. For example, offering weight management at times/days most convenient for women during this period of life could increase the chances of women actively participating. Often, women are on unpredictable sleep and work cycles during the postpartum phase and implementing a program with more flexibility could be beneficial to decreasing rates of obesity amongst postpartum mothers and their children.

Another modifiable barrier to increase access to weight management intervention is the lack of childcare. Many participants noted that the lack of childcare would decrease their ability to participate in a weight management intervention. It would be helpful for future studies and intervention to take this aspect into consideration and partner with childcare services to increase adherence to the program. Taking initiatives to reduce the burden and barriers women experience

in agreeing to and completing weight management intervention could increase participation and success in weight management intervention techniques.

This research could be the stepping-stone toward creating healthy lifestyle interventions for women who enter pregnancy overweight and obese. Although a large amount of epidemiological data exist suggesting that excessive pregnancy weight is associated with adverse outcomes for mother and infant, few weight interventions have been successful in reducing weight retention postpartum. We may be able to provide more detailed insight on weight intervention strategies that have a higher success rate by determining participant preferences and interest.

APPENDIX A: LEAP WEIGHT MANAGEMENT INTEREST FORM

The LEAP Study Weight Management Group

Now that you have completed the study we would like to know if you are interested in participating in a brief weight management program at no cost to you. If so, please provide us with the following information.

Name: _____

Would you be interested in meeting in person with a group?

☐ Yes ☐ No

If yes, what days or times would be best?

_____

_____

Would you be bringing any children with you?

☐ Yes ☐ No

If yes, please list ages:

_____

_____

In addition, we are trying to gather information about the ways in which a weight management program could be most helpful to you after having a baby. Please answer the following questions on the next **two** pages. You answers will not determine the quality of treatment program you get.
Please answer the following questions by circling yes or no:

1. Would you participate in a group with other women designed to help you manage your weight? Yes No

2. Would you talk one on one with a coach or counselor about issues related to weight? Yes No

3. Would you find it helpful to talk about issues related to weight Yes
No
without leaving home?

4. Would you find it helpful to talk about issues related to weight Yes
No
over the phone?

5. Would you find it helpful to discuss issues related to weight over the internet on a secure website? Yes No

6. Would you find it helpful to discuss issues via text message? Yes No

7. Would you like information on nutrition? Yes No

8. Would you like information on managing stress? Yes No

9. Would you like information on healthy eating? Yes No

10. Would you like to talk about how to lose weight? Yes No

11. Would you like help returning to your pre-pregnancy weight? Yes No

12. Would you like information about the relationship between feelings and eating? Yes No

13. Would you like information on exercising or staying active now that your baby is here? Yes No

Listed below are several situations that often make it difficult for mothers of young children to participate in programs. Please tell us if any of the following would be a factor that would keep you from participating in a program designed to help you manage your weight after the birth of a baby:

1. Lack of childcare Yes No
2. Lack of transportation Yes No
3. Lack of money for transportation Yes No
4. Time of day Yes No
5. Schedule conflicts Yes No
6. Lack of motivation to manage weight Yes No
7. Other, please specify: _____

_____

_____

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APPENDIX B: LEAP DEMOGRAPHIC FORM

1. What is the highest level of formal education you have completed (circle one)?

1. Grade school or some high school (did not graduate)
2. High school graduate/GED or equivalent
3. Some college/technical school
4. 4-year college graduate (e.g. B.A., B.S.)
5. Post-graduate degree (e.g. M.A., Ph.D., LL.B.)

2. What is your total family income before taxes from all sources within your household in the last year? (circle one)

1. Less than $10,000
2. $10,000 to $20,000
3. $20,001 to $30,000
4. $30,001 to $40,000
5. $40,001 to $50,000
6. $50,001 to $60,000
7. $60,001 to $70,000
8. $70,001 to $80,000
9. $80,001 to $90,000
10. $90,001 to $100,000
11. Greater than $100,000

3. Are you currently in a relationship? (circle one)

1. No
2. Yes

If yes, are you: (circle all that apply)

1. Married How long? _____
2. Separated How long? _____

3. Living together How long? _____
4. Living apart How long? _____

4. What is your current employment status?

1. Full-time (35 hours or more per week) for pay

2. Part-time for pay

3. Not working for pay

4. Leave of Absence

5. Maternity leave

a. plans to return

b. no plans to return

6. Other (Specify):_____

5. What is your current health insurance status?

1. Provided by employer

2. Medicare/Medicaid

3. Personal Policy (I buy my own health insurance)

4. No Health Insurance

6. Number of members in household not including yourself: _____

7. Please list **all** individuals living in your household and their ages and relationship to you.

Please list their height and weight. (**If you are unsure, list your best guess**):

Relationship to you	DOB	Height	Weight	Sex

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