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Does Satisfaction with Perinatal Health Care Influence Postpartum Weight Retention?

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Graduate Program in Epidemiology and Biostatistics

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Abstract

The primary aim of this thesis is to identify whether satisfaction with perinatal health care encounters is associated with lower postpartum weight retention (PPWR). PPWR is the difference between postpartum and pre-pregnancy weight. Principal components analysis confirmed the validity of a summed satisfaction score representing six dimensions: information, compassion, competency, privacy, respect and decision-making. Confounders were identified using a directed acyclic graph. Multivariable linear regression models were constructed using blocks, and backwards elimination. Results reflect a mean PPWR of 2.5 kg, and high satisfaction, with more than 90% of respondents being very satisfied or satisfied on each dimension. The multivariable model indicates no significant association between overall satisfaction with care and PPWR. However, individually, higher levels of satisfaction with information provided, and satisfaction with involvement in decision-making had a statistically significant effect on PPWR, with a 0.23 and 0.27 kg reduction for every one unit increase in satisfaction, respectively.

Keywords

Satisfaction with health care; perinatal care; postpartum weight retention; postpartum weight; pre-pregnancy BMI; gestational weight gain; health care delivery.
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CATI</td>
<td>Computer-Assisted Telephone Interview</td>
</tr>
<tr>
<td>DAG</td>
<td>Directed Acyclic Graph</td>
</tr>
<tr>
<td>EGWG</td>
<td>Excess Gestational Weight Gain</td>
</tr>
<tr>
<td>GDM</td>
<td>Gestational Diabetes Mellitus</td>
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<tr>
<td>GWG</td>
<td>Gestational Weight Gain</td>
</tr>
<tr>
<td>HCP</td>
<td>Healthcare Professional</td>
</tr>
<tr>
<td>MES</td>
<td>Maternal Experiences Survey</td>
</tr>
<tr>
<td>NICU</td>
<td>Neonatal Intensive Care Unit</td>
</tr>
<tr>
<td>OBGYN</td>
<td>Obstetrician and Gynecologist</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
</tr>
<tr>
<td>PCA</td>
<td>Principal Components Analysis</td>
</tr>
<tr>
<td>PPWR</td>
<td>Postpartum Weight Retention</td>
</tr>
<tr>
<td>QPP</td>
<td>Quality from the Patient’s Perspective</td>
</tr>
<tr>
<td>RDC</td>
<td>Research Data Centre</td>
</tr>
<tr>
<td>SES</td>
<td>Socioeconomic status</td>
</tr>
<tr>
<td>SOGC</td>
<td>Society of Obstetricians and Gynecologists of Canada</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance Inflation Factor</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WOMBPNSQ</td>
<td>Women’s Views of Birth Postnatal Satisfaction Questionnaire</td>
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Chapter 1 Introduction

Increasing obesity rates, as witnessed within developed countries such as Canada,\(^1\) has lead the World Health Organization (WHO) to identify obesity as a global epidemic.\(^2\) According to the WHO, an overweight body-mass index (BMI) is between 25 to 29.99 kg/m\(^2\), and obesity is defined as a BMI of 30 kg/m\(^2\) or greater.\(^3\) In 2012, 26.9% of Canadian women were classified as overweight, and 18% were classified as obese.\(^4\) The highest increase in obesity rate was found among women between the ages of 20-59 years.\(^5\)

It has been speculated that pregnancy could be contributing to the growing obesity epidemic among women of 20-59 years through two major mechanisms: excessive gestational weight gain and postpartum weight retention (PPWR).\(^6\)–\(^8\) First, excessive weight gain during pregnancy may lead to fetal macrosomia and predisposition of childhood obesity in the offspring.\(^2\) Second, after birth, mothers may retain excess weight, thereby not returning to their pre-pregnancy weight, also known as PPWR.\(^7\) On average, pregnancy increases a woman’s postpartum weight by 0.4-3 kg, compared to non-pregnant controls.\(^9\) Postpartum weight retention is defined as the difference between pre-pregnancy weight and postpartum weight, generally measured at 6 months or more after birth.\(^10\)–\(^12\)

1.1 Trends in Postpartum Weight Retention

Over the last 20 years, there has been an increasing trend in postpartum weight retention.\(^13\) A systematic review of the literature identified a Swedish study conducted in 1995, which indicated that the average postpartum weight retained was 0.5 kg. In 2003, a study from New York revealed that participants retained an average of 1.51 kg at 12 months postpartum.\(^13\) In 2009, a different study found that women retained more weight, an average of 2.45 kg at only 9 months postpartum.\(^13\) On average, women gain 1.5-2.5 kg due to pregnancy, and 20% of women retain 5 kg or more 6 to 18 months after birth.\(^14\) A longitudinal study found that among the women who became obese within two years after birth, only 11% returned to a normal BMI 5 years postpartum.\(^15\)
1.2 Perinatal Health Care Satisfaction

Measuring the level of satisfaction is a common tool used to determine the quality of health care from a patient perspective. Patients who are satisfied with their health care encounters are more compliant and cooperative with their medical regimen. Generally, they have higher adherence to medical advice, self-care, and therefore better health outcomes. From an obstetrics perspective, satisfaction is related to the health and wellbeing of a mother and her unborn child. On the other hand, a comparative review indicated that studies have found an association between dissatisfaction and poorer maternal psychological outcomes, higher rate of subsequent abortions and negative feelings regarding breastfeeding.

Satisfaction with care is a multidimensional concept, influenced by patient and health care variables. Satisfaction can be defined as “a personal evaluation of health care services and providers”. The key word here is personal. An individual’s perception of satisfaction is highly influenced by their own expectations, values, beliefs, past experiences, personality, health status and sociodemographics. There are many external factors that influence a person’s experience with their healthcare professional (HCP), and that may contribute to their perceived satisfaction. It may be difficult to differentiate between satisfaction due to quality of care, and satisfaction due to individual differences such as expectations, perceptions, experiences and criteria for quality assessment. Although satisfaction with care is difficult to define, and in turn, difficult to measure, many tools for measuring satisfaction with health care during the perinatal and postpartum period have been developed and tested.

Pregnancy is regarded as a potential teachable moment, providing healthcare professionals with an opportunity to educate, and motivate their pregnant patients to improve their lifestyle and nutritional behaviours. A teachable moment can be defined as one that integrates an individual’s perception of risks and outcomes, generates an emotional response and creates a new social role for the individual. Women may be more motivated to improve their behavioural habits during pregnancy, because they may put greater value on their actions (such as eating healthy and exercising). They may be more responsive to emotional responses such as fear and excitement, and developing a
new role as a mother in the society may influence women to improve behaviours in order to become a good role model for their child. During pregnancy, women may be more accepting to changing their lifestyle habits for the health benefits of their unborn child. Similar behavioural changes have been seen in women who reduce or stop smoking during pregnancy.

This thesis seeks to evaluate a subjective perspective of an individual’s health care experience. If patients are satisfied with their encounter, whether it is due to quality of care received, or due to individual experiences and perspectives, the importance is that a satisfactory health care encounter may motivate an individual to improve their lifestyle choices, and to reduce their weight retention postpartum.

1.3 Research Objectives

Given the potential contribution of PPWR to obesity, there is an interest to determine risk factors associated with postpartum weight retention, and effective interventions for improving maternal lifestyle choices during pregnancy and postpartum. Due to pregnant women’s frequent contact with their healthcare providers, identifying whether HCPs can influence behaviours may be a step forward for understanding effective counselling and weight management postpartum.

1. **Objective:** The primary objective of the thesis is to determine whether there is an association between satisfaction with health care during pregnancy, labour and birth, and immediately postpartum with postpartum weight retention at 6 months or more.

**Hypothesis:** Satisfaction with health care encounters motivates pregnant patients to improve their nutritional and lifestyle behaviours, thereby meeting optimal gestational weight gain, and retaining less weight at 6 months or more postpartum.

2. **Objective:** Given that satisfaction with information received and satisfaction with involvement in decision-making were frequently cited as the most important aspects of health care encounters, the association between these individual components of satisfaction and postpartum weight retention will be analyzed.
3. **Objective:** To determine whether pre-pregnancy BMI, or gestational weight gain interact in the association between overall satisfaction with care and postpartum weight retention.

Chapter 2 summarizes the literature to provide background information, as well as to identify potential confounders between the association of satisfaction with care and postpartum weight retention. Chapter 3 consists of an analysis plan designed to meet the objectives of this thesis. Chapter 4 and 5 illustrate the results of the study, and discussion, respectively.
Chapter 2 Literature Review

The literature was reviewed to summarize current knowledge, theoretical concepts and gaps between the association of satisfaction with perinatal health care encounters and postpartum weight retention, and to identify potential confounding variables and covariates. This chapter begins by providing a theoretical framework of how health care encounters can influence patient behaviours. Then, it discusses the concept of patient satisfaction, and current findings regarding postpartum weight retention. Next, it summarizes the potential confounders and covariates, and provides a thorough explanation of two important variables, pre-pregnancy BMI and gestational weight gain. Finally, the chapter reviews the literature gaps.

2.1 Literature Review Search Strategy

The literature review was conducted by exploring online databases including PubMed and Embase. The keywords that were used for the searches included pregnancy, postpartum weight retention, and health care satisfaction. Studies conducted in non-OECD countries were eliminated, as well as studies that were not in English. Abstracts were scanned, and selected studies were further evaluated for relevance regarding thesis objectives. Other studies cited in selected papers were scanned and included when appropriate. See Appendix Table A.1 for a summary of relevant studies, which analyzed the potential influences of health care encounters on maternal health outcomes.

2.2 How Can Satisfaction with Health Care Influence Behavioural Changes?

Four approaches can be taken to measure satisfaction with health care: the discrepancy theory which compares expected and perceived health care experience, satisfaction based on health service attributes, which is an economic approach based on expected and perceived utility, and a holistic approach. The holistic approach will predominate for the purpose of this thesis, as it provides a theoretical framework for suggesting that satisfaction with care can influence patient behaviours, taking into consideration various external factors and connections, see Figure 2.1. The framework
incorporates the individual’s characteristics, which may modify their perception of satisfaction (values, beliefs, expectations, experiences, personality, health status and sociodemographics). The model acknowledges the importance of past experiences in a feedback loop, influencing personal characteristics and the current health care experience. The end result of the current encounter is the *behavioural reaction* of the patient, illustrating that a patient’s satisfaction with their health care encounter can influence their behaviours. In the context of perinatal care, behavioural reaction can include motivation to improve lifestyle behaviours for healthy nutrition and exercise postpartum.

Studies have evaluated the effectiveness of interventions to reduce PPWR, focusing on physical and nutritional interventions. Ruchat et al\(^{23}\) assessed the effect of an intervention combining exercise and nutrition, for women with normal pre-pregnancy BMI. The authors found that weight gain during pregnancy was reduced, as well as postpartum weight retention at 2 months.\(^{23}\) A systematic review by Keller, et al\(^{24}\) identified six studies that reported the effectiveness of dietary and physical activity interventions seeking to manage the weight of women in the postpartum period. Most of the studies did not report a significant difference between the control and intervention groups.\(^{24}\) The study which found a significant difference between the intervention and control groups had a 31% total attrition rate, with a greater amount of the control group participants dropping out.\(^{24}\)

Structured diet and physical activity plans have the potential to reduce postpartum weight retention, however it is challenging to keep patients motivated.\(^{25}\) This suggests that it may be more effective to focus on patient motivation, self-efficacy,\(^{26}\) support for the new mother, goal setting with HCPs\(^{24}\) and clear communication.\(^{26}\) It is suggested that the combination of diet, physical activity, support, and motivation may have the greatest effects on weight loss and increased levels of physical activity.\(^{10}\) An important focus of nutritional and physical activity behaviours should be to increase the mother’s self-efficacy.\(^{26}\)

Self-efficacy is defined as an individual’s confidence or perception in their ability to perform a certain behaviour.\(^{27}\) It is a fundamental component in many behavioural
change theories, including *Social Cognitive Theory* and *Theory of Planned Behaviour*. The Social Cognitive Theory identifies three major components of behavioural change: Environment, Personal Factors and Behaviour. It targets six areas for behaviour change: knowledge of health benefits associated with behavioural change, self-efficacy, outcome expectations including self-evaluative outcome, social approval and physical outcomes, setting health goals, and identifying facilitators and barriers to achieving behavioural change. In addition to these factors, one other important component, associated with increased self-efficacy is self-motivation.

Behavioural changes are largely dependent on an individual’s perception of self-efficacy. Pregnancy offers HCPs an opportunity to take on an active role in facilitating behavioural change to reduce PPWR. The delivery of patient-centered care, encompassing high quality information, clear communication, and support can provide patients with a sense of control over their health, and ability to make decisions, thus increasing their personal self-efficacy. Patients who are highly satisfied with their health care encounter have generally reported these dimensions as most important when evaluating their health care experience. Therefore, a patient who is very satisfied with her health care encounter may in turn have more motivation and self-efficacy to improve her lifestyle behaviours, thereby reducing her PPWR. The literature shows that patients who are satisfied with their care are more compliant, have greater self-care and better health outcomes.

### 2.3 Satisfaction with Perinatal Health Care

#### 2.3.1 Dimensions of Satisfaction with Health Care

Satisfaction with health care is a multidimensional concept affected by both patient and HCP characteristics. The various dimensions that construct a patient’s perception with care must be evaluated to accurately represent a health care experience. A systematic review demonstrates that numerous studies have highlighted the importance of communication, patient-physician relationship and having adequate time to ask questions, and to address patient concerns were most important when patients evaluated their satisfaction with care.
The provision of information regarding medical regimen, prognosis, risks factors, and guidelines was one of the most widely cited dimensions of satisfaction with care, and may be the most important component of the patient-physician interaction. Information-giving during a health care encounter is comprised of clear communication, addressing patient needs and concerns, and providing patients with guidance to make informed decisions about their health. In a qualitative study, Swedish women revealed that they believed information-giving regarding physical and mental changes due to pregnancy, mode of delivery and length of visits were the most important aspects of their health care experience. Lack of HCP counselling has been associated with negative birth experiences, and higher levels of dissatisfaction with health care. In addition, inadequate communication between the physician and patient may reduce use of prenatal care.

Supportive patient-physician relationships, reflecting empathy, warmth and friendliness are associated with higher levels of satisfaction, whereas lack of support is associated with negative birth experiences. Most satisfaction with health care questionnaires incorporate a dimension measuring compassion or support from HCP. Patients who feel as though their HCP is not compassionate have lower rates of prenatal care utilization. HCP characteristics are important when assessing satisfaction with health care delivery, including HCP competency, respect and creating a supportive and comforting environment.

Patient characteristics have also been identified as important features of satisfaction with prenatal care, and childbirth experiences, including: patient’s perception of personal control over care, expectation fulfillment, and access to care. However, most patient demographic characteristics such as marital status, age, and income have been weakly associated with health care experiences. Support, information-giving, and involvement in decision making influences a patient’s health care experience, possibly even more evidently than pain during labour and patient sociodemographics. Providing advice to patients early on in their pregnancy pertaining to weight gain, nutrition, smoking, alcohol intake, breastfeeding, and other behaviours resulted in better health outcomes, such as infant birth weight, and meeting optimal
gestational weight gain. It is therefore suspected that HCP advice could have similar effects on maternal behaviours for reducing postpartum weight retention.

### 2.3.2 Challenges of Measuring Satisfaction with Care in Obstetrics

Measuring satisfaction with health care is of great interest to numerous roles in the health care industry, and can drive changes in policy regulations, and guidelines for health care delivery. When satisfaction with care is measured accurately, it may be reflective of the quality of care delivered, and the patient’s health care experience. Satisfaction with care measurements are valuable tools to evaluate health care from the patient’s perspective, and to identify problems and solutions in health care delivery. Satisfaction is difficult to measure, especially in the field of obstetrics.

The literature highlights four major challenges to accurately measure satisfaction with pre and postnatal health care. First, satisfaction with care is a multidimensional concept affected by both patient and health care characteristics, therefore it should be measured through numerous aspects. This leads into the second challenge, distinguishing between satisfaction due to health care delivery, or due to patient characteristics (perceptions, expectations, experiences, or personal criteria for quality assessment). Patients with a poor health status, mental illness, or low quality of life may report lower levels of satisfaction with care. It is reflective of patient expectations, and therefore unknowledgeable patients may have lower expectations, and in turn report higher levels of satisfaction, whereas patients who have higher expectations may report lower levels of satisfaction. A third challenge to measuring satisfaction with care in the prenatal period is timing of the survey delivery. Many emotional changes may occur after the birth of a newborn, which may influence the mother’s perception of the care she received. A mother may feel the halo effect, which is described as an overwhelming feeling of happiness, and gratitude for delivering a healthy baby. Mothers who are under the halo effect may report a higher level of satisfaction, which may be inaccurately reflective of the actual quality of care she received. On the other hand, a mother may be in denial or may have difficulty accepting the changes, thus changing her perception of the care she received. Perception of the health care received may differ after a certain time postpartum, usually declining. The optimal timing for administering
a perinatal satisfaction survey is unknown, however it must carefully be considered during the design stage of the study in order to increase the likelihood of accurately measuring satisfaction with care. Lastly, most women report high levels of satisfaction with care, therefore it may be difficult to distinguish differences in levels of satisfaction, since there may be very little variation. It has been suggested that it may be more important to measure dissatisfaction rather than satisfaction with health care. While other researchers suggest measuring the differences between individuals who reported being Very Satisfied compared to those who merely reported being Satisfied. Generally, most women report a lower level of satisfaction with postpartum care, compared to intrapartum care.

### 2.3.3 Do Medical Complications and Pain Affect Satisfaction with Health Care Delivery?

Pregnancy and labour outcomes such as pain during labour may affect an individual’s perception of satisfaction with their care, however the most influencing factor is the patient-physician relationship, including informational support. A patient’s perception with their health care encounter is not affected by pain, unless expectations for managing pain are unmet. Caregiver support improves a mother’s ability to cope with stress, to have personal control, make decisions regarding her health, as well as increase her self-efficacy. A consistent finding in literature is that personal control and self-efficacy are one of the strongest predictors of satisfaction with care. These findings are reflective of the transition from traditional paternalistic medicine to patient-centered care and autonomy. HCPs’ attitudes and behaviours may have a greater influence on a patient’s perceived satisfaction with care, even when compared to medical interventions. Satisfaction with health care encounters can serve as an important tool for incorporating a patient’s values and individual expectations in health care.

Healthcare practitioners can provide their pregnant patients with support, which may solidify a patient’s self-efficacy, empowerment, and motivation to improve lifestyle habits. A patient who possesses a sense of control and self-efficacy gains empowerment of their own heath, even when expectations are unmet. To optimize
patient health outcomes, it is important for providers to create a trustworthy, empathetic and respectful therapeutic relationship with their patients.\(^{37}\)

### 2.3.4 Tools to Measure Satisfaction with Care

Summated rating scales provide an overall score that encompasses various dimensions of satisfaction. They are frequently utilized when measuring satisfaction with care.\(^{18}\) A critique for this type of measurement is that a single score may mask specific areas of improvement,\(^{44}\) therefore it has been suggested that dimensions should be broken down separately.\(^{30}\) Depending on the purpose of the study, it may be best to evaluate satisfaction as an overall score, but also to individually assess the different dimensions. A few studies have identified reliable, and valid tools for measuring satisfaction with prenatal care, and during labour and birth.

A systematic review identified nine surveys for measuring satisfaction with care during labour and birth, and evaluated their validity and reliability.\(^{16}\) Among these, the authors identify the *Quality from the Patient’s Perspective (QPP) Questionnaire* as most reliable for assessing an extensive understanding of satisfaction with labour and birth health care.\(^{16}\) The different surveys have various levels of validity, and reliability, therefore context, and purpose of the survey should be considered before data collection.

Smith\(^{46}\) developed, and confirmed the validity, and reliability of a postnatal questionnaire, *Women’s views of Birth Postnatal Satisfaction Questionnaire (WOMBPNSQ)*. The tool was developed using principal components analysis, and consists of multiple concepts, such as support, expectations, and pain during/after labour.\(^{46}\)

The *Women’s View of Birth* questionnaire was developed through previous knowledge and qualitative interviews. Using principal components the authors identified 11 dimensions, including information-giving, competent and access to health care.\(^{30}\) *The Newcastle Satisfaction with Nursing Scale* is a validated tool for measuring satisfaction with nursing care within the pregnant population.\(^{29}\) The tool utilizes a 5-point likert scale ranging from *not at all satisfied* to *completely satisfied*.\(^{29}\)
A developed and tested tool for assessing the quality of prenatal care in a Canadian context, *Quality of Prenatal Care Questionnaire (QPCQ)* was developed.\(^{31}\) Although quality and satisfaction with care have been used interchangeably, the quality of health care and satisfaction with health care delivery should be considered as separate entities when evaluating health care.\(^{31}\) However, the quality questionnaire encompasses similar aspects important for patient satisfaction. This multidimensional tool, includes common satisfaction constructs: information-giving, guidance, adequate time to address concerns/questions, approachability, availability and support/respect provided.\(^{31}\)

Qualitative studies are valuable for evaluating patient experiences, providing supplemental understanding to how a patient evaluates their health care, and other aspects that are not captured by a quantitative survey. Qualitative information may be especially important when developing a quantitative survey for satisfaction with care measurement. A qualitative study interviewed 827 Swedish women to understand their experience with prenatal midwifery care further emphasized the importance of patient-centered care, keeping patients informed, and supportive relationships.\(^{33}\)

### 2.4 Satisfaction with Care from Different HCPs

According to a study by McDonald et al,\(^ {47}\) there is no significant difference between the counselling provided by midwives, family practitioners or OBGYNs. However, other studies report a higher patient satisfaction level for those receiving care from a midwife,\(^ {16}\) or nurse,\(^ {32}\) rather than from a physician. Harvey et al\(^ {48}\) reported higher levels of satisfaction and better birth experiences under the care of a midwife. These findings may suggest that midwives communicate better, and have more time to allocate to the care of patients, therefore providing greater support and more personalized care. The findings could also suggest that most women whose primary care provider is a physician (OBGYN or family doctor) may be belong to a high risk population for adverse pregnancy outcomes. If the latter is the case, women receiving care from an OBGYN would not necessarily have lower levels of satisfaction when their expectations are met, and if they receive adequate information in regards to the progress of their pregnancy.
2.5 Postpartum Weight Retention

It is unclear as to how much weight is considered high weight retention in the postpartum period, or the ideal postpartum time for women to return to their pre-pregnancy weight. One study identifies weight retention greater than 5 kg at 6 months postpartum as high retention. Most studies assess weight retention at 6 months or more postpartum. It is advisable for women to return to their pre-pregnancy weight at 1 year postpartum, in order to reduce long-term weight retention due to pregnancy. Participants in a qualitative study associated postpartum weight loss at 5 years with higher self-esteem, more positive health behaviours, increased motivation and higher exercise self-efficacy.

A US study followed a group of women (N=484) for 15 years, collecting data during pregnancy, at 6 months, 4, 10 and 15 years postpartum. Results indicated that there was a significant increase in average BMI of the participants from the first prenatal visit to 15 years postpartum. A second prospective cohort study conducted by Amorim et al in Sweden (N=483) measured participants at 6 months, 1 year and 15 years postpartum, and collected past weight measures using medical records. The study identified that only about 15%, and 33% of women returned to their pre-pregnancy weight, at 6 months and 1 year postpartum, respectively.

Postpartum weight retention at 1 year after pregnancy has been identified as a strong predictor of long-term weight retention due to pregnancy. A large prospective cohort study identified postpartum weight retention at 1 year, and excessive gestational weight gain as the primary predictors of long-term weight retention, regardless of pre-pregnancy BMI.49

A large prospective cohort study (N=2 731) sought to identify whether childbearing was associated with long-term obesity. The researchers matched parous and nulliparous participants, and found no significant difference in obesity incidence and prevalence, based on parity. Although the findings generate critical thinking for understanding the relationship between pregnancy-related weight gain, and long-term weight retention, the premise of this thesis is not to analyze whether pregnancy is related
to long term obesity, but rather if health care encounters can influence mothers to reduce their weight retention postpartum. These concepts could be considered as separate, but interconnected components for understanding the association between weight gain due to pregnancy and long-term weight retention.

2.6 Potential Confounders and Covariates

A directed acyclic graph (DAG) was developed during the literature review to capture a comprehensive understanding of the pathways leading from satisfaction with health care encounters to postpartum weight retention, see Figure 2.2. A DAG is a theoretical diagram, which can be used to identify potential confounding variables within a causal relationship between an exposure and outcome. The graph is constructed by finding causal associations between the study variables and by creating pathways through the use of arrows. A thorough search of the literature helped identify important variables to be included in the DAG, potential confounders, and their relationships with each other.

2.6.1 Pre-Pregnancy BMI

Overweight and obese women are at high risk of adverse health outcomes for themselves and their fetus, including gestational diabetes mellitus (GDM), stillbirth, miscarriage, C-section delivery, neural defects, and neonatal intensive care (NICU) admissions. In addition, the in utero environment may have future health effects for the infant in childhood and adulthood, including hypertension, obesity and glucose intolerance. Proper weight counselling, and support is especially important within this subgroup of patients. Ideally, women should aim to have a healthy BMI before pregnancy as this would reduce complications, however this may not be feasible for certain women.

During pregnancy, obese women are more vulnerable to psychological stress, such as anxiety, low self-esteem, stigmatization and depression, and are less satisfied with their body shape. This subgroup of women may have increased anxiety due to body weight changes, and fear of labour complications, body dissatisfaction, or not being able to engage in motherly undertakings such as breastfeeding.
Pre-pregnancy BMI and Satisfaction with Health Care Encounters

There are inconsistent findings regarding the association between maternal weight and a patient’s obstetrics health care experience. A longitudinal cohort study (N=919) conducted in Sweden compared participants with a BMI $\geq 30$ kg/m$^2$, and those with a BMI $< 30$ kg/m$^2$. They found that satisfaction with care from healthcare providers did not differ between the two groups. The authors suggest that the indifference of satisfaction with care may be due to HCPs’ reluctance to discuss weight management with their obese patients, and to focus more on the health of the fetus. An Australian study found that pre-pregnancy BMI was associated with more negative experiences of maternal care during pregnancy, and postpartum, but not during labour and birth. The differences in the findings may be due to cultural differences of the practicing providers.

HCPs face major challenges when providing care for their obese/overweight pregnant patients. Some providers may believe that their advice for appropriate gestational weight gain will not increase the likelihood that their obese patients meet the optimal guidelines. Some obese patients indicate that they would rather have their HCPs share the excitement of their pregnancy rather than focus on weight gain. These are challenging issues because high pre-pregnancy BMI, and excessive gestational weight gain (EGWG) are risk factors for many negative health outcomes. Pregnant patients, in particular obese pregnant patients, must be well informed of the consequences that may arise due to their weight, but they must also feel respected and comfortable with their healthcare providers. The fine line between these two aspects may be especially challenging for healthcare providers, and may in turn affect a patient’s perception of their satisfaction with care.

Pre-Pregnancy BMI and PPWR

Pre-pregnancy BMI is one of the most widely cited, and likely one of the two most important predictors of postpartum weight retention, with gestational weight gain (GWG) being the second. Although many studies have found an association between pre-pregnancy BMI and postpartum weight retention, the direction of effect is unclear. Certain studies indicate that there is a positive association between the variables. A
longitudinal study found that women who had higher pre-pregnancy weight were more likely to have greater adiposity at 16 years after the index pregnancy. A study by Shrewsbury et al (N=2745) found a positive association, although not statistically significant, between pre-pregnancy weight and PPWR. Overweight and obese women had a mean PPWR of 3.2 kg, whereas underweight and normal weight women had an average PPWR of 2.3 kg.

A prospective cohort study conducted by Siega-Riz et al identified a negative association between pre-pregnancy weight, and weight retention of 1-10 pounds, at 12 months postpartum. Compared to normal weight women, underweight women had a significant two times higher risk of retaining 1-10 pounds postpartum, overweight women had a 10% lower risk of retaining 1-10 pounds, although not statistically significant and obese women had a non-significant 30% lower risk of retaining 1-10 pounds 12 months postpartum.

Among obese women, Bogaerts et al found a negative association between obesity level and PPWR. Women who were in the obesity class I retained more weight postpartum compared to women who were in the morbidly obese category. This may be because women who are morbidly obese before pregnancy are already at a heavy weight, and their weight may not fluctuate throughout their pregnancy, therefore not much additional weight would be retained postpartum. Among obese women, weight loss before pregnancy would be ideal to reduce fetal and maternal health complications, however when this is not possible, it is important for HCPs to emphasize the importance of preventing EGWG. Although studies show some inconsistencies for the association between pre-pregnancy weight and PPWR, it is widely known that on average, women with higher pre-pregnancy BMI are more likely to gain above GWG recommendations, and that GWG is associated with PPWR. A Canadian study identified pre-pregnancy BMI to be associated with GWG compliance, but not with PPWR women who had a BMI<25 kg/m² had increased compliance with GWG guidelines, however they did not have a lower PPWR at 6 weeks.
The mixed findings in regards to the association between pre-gravid weight, and weight retention after birth may indicate that attitudes, and behaviours have the potential to change postpartum, whether it is to improve health behaviours, or for the mother to put less importance on her own health after the infant’s birth.

2.6.2 Maternal Age

Maternal Age and Satisfaction with Health Care

Maternal age has been positively associated with satisfaction with care, not only in obstetrics, but among the general patient population.\(^6^8\) In obstetrics, older mothers tend to have higher levels of satisfaction with antenatal care,\(^1^3,1^8,6^9\) whereas Peterson et al\(^2^9\) found that age is not significantly associated with health care satisfaction. In a prospective cohort study, women under the age of 25 years reported lower levels of satisfaction with health care during the intrapartum period.\(^3^4\) Greater satisfaction with care within the older patient population may be influenced by parity. Since older mothers tend to be multiparas, they may report higher levels of satisfaction due to increased knowledge of the pregnancy process and realistic expectations, as well as a greater sense of control over their care.\(^1^8\)

Maternal Age and Postpartum Weight Retention

In general, studies indicate that women who are older tend to gain less weight during pregnancy\(^6^3,6^5,7^0\) and retain less weight during the postpartum period. Siega-riz et al\(^6^2\) found that women who were over the age of 25 years had a 50% lower risk of retaining more than 10 pounds compared to younger women, at 12 months postpartum. The association between age, and weight management may be influenced by other factors such as increased parity.

2.6.3 Income

Income and Satisfaction with Health Care

Income may have a weak association with health care satisfaction, although only a limited number of studies have found a significant association. A systematic review
found that out of 14 studies, 9 reported no association between income and health care satisfaction, whereas others reported higher income associated with higher levels of satisfaction on some dimensions. A study by Rubio et al found that female outpatients who had an income <$10,000 were significantly less satisfied with their health care experience compared to those who had an income ≥$10,000. In addition, a study of individuals living in countries of the European Union, found that those with higher income per capita had greater patient satisfaction levels.

**Income and Postpartum Weight Retention**

Begum et al found that income was significantly associated with postpartum weight retention. Women who were in the low-income group were more likely to retain more weight after pregnancy, compared to women in higher income groups. Hernandez et al did not find a significant association between transitioning to a higher BMI category (compared to remaining at the same BMI category 5 years after the index pregnancy), when comparing women within the household poverty group with women above the household low-income group.

**2.6.4 Education**

**Education and Satisfaction with Health Care**

Education level attainment may have a weak association with a patient’s satisfaction with maternal care however this relationship is still unclear. A systematic review conducted by Birton et al identified certain studies which found a weak negative association between educational status and satisfaction with care after or before the perinatal period, while there have been mixed findings of this association during the pregnancy period.

A study conducted in Sweden found that women who had a lower educational attainment (less than elementary school) were more likely to be dissatisfied with intrapartum and postpartum care. Goodman et al found that higher levels of education were associated with higher levels of satisfaction during childbirth. On the contrary, Smith et al found that there was a negative correlation between a woman’s educational
attainment level and her satisfaction with labour. Consistently, Britton et al\textsuperscript{18} found that low levels of education are associated with higher levels of satisfaction with care during the perinatal period.

**Education and Postpartum Weight Retention**

Raffensperger et al\textsuperscript{74} found that education was the strongest predictor of diet quality, even when compared to income and race, however the literature shows conflicting results for the association of educational level attainment and PPWR. Hernandez et al\textsuperscript{73} found that there was a 48% significantly lower odds of transitioning from the overweight to obese category (rather than remaining overweight), among women who had a high school diploma or more, compared to women who had less than a high school diploma. A study in the UK utilized educational attainment as a measure of socioeconomic status (SES).\textsuperscript{9} Shrewsbury et al\textsuperscript{9} used education level as an indicator for socioeconomic status, because they believed that weight-related practices and attitudes is more likely influenced by knowledge rather than financial status. In addition, they argue that education is a more stable measure of SES, since finances are subject to greater change.\textsuperscript{9} The results indicated that there was a significant difference between SES and median PPWR. Women who belonged to the median and lower SES group retained a median of 3.2 kg, whereas those belonging to the higher SES group retained only 1.8 kg.\textsuperscript{9}

On the other hand, a 21-year cohort study (N=2055) in Australia conducted by Mamun et al\textsuperscript{75} indicates that there is a positive correlation between education level and PPWR, whereas a prospective cohort study of women living in Alberta\textsuperscript{66} (N=571) indicates that there is no association between educational level attainment and PPWR.

### 2.6.5 Marital Status

**Marital Status and Satisfaction with Health Care**

Marital status, among other sociodemographic characteristics has very little effect on a patient’s satisfaction with health care.\textsuperscript{40}
Marital Status and Postpartum Weight Retention

A study by Hernandez\textsuperscript{73} did not find an association between marital status, and transitioning to a higher BMI category 5 years postpartum. However, marital status was associated with adherence to GWG recommendations. Certain studies have found that women who were unmarried were less likely to meet the GWG recommendations\textsuperscript{12,65,76} and GWG is strongly associated with PPWR\textsuperscript{7,9,11,22,50,51,63,65,66}.

2.6.6 Parity

Parity and Satisfaction with Health Care

Multiparous women generally report higher levels of satisfaction compared to primiparous women\textsuperscript{18,44,69} possibly due to a greater sense of control over their prenatal care.\textsuperscript{18} Within the multidimensional WOMBPNSQ satisfaction questionnaire, parity was significantly associated with three components: partner support, social support and medical care.\textsuperscript{46} An older study by Seguin et al\textsuperscript{32} found no association between parity and satisfaction with care.

Parity and Postpartum Weight Retention

Generally, women gain the most weight during their first pregnancy\textsuperscript{30} and subsequent pregnancies increase their postpartum weight.\textsuperscript{73} Increased parity is associated with higher obesity rates.\textsuperscript{77} Compared to primiparous women, women who had previous pregnancies are 1.95 times more likely to transition from normal weight to obese rather than to remain in the normal weight category.\textsuperscript{73} Bogaerts et al\textsuperscript{78} studied inter-pregnancy weight gain in a cohort study. Mothers who retained their weight from previous pregnancies were at higher risk of retaining additional weight after their next birth.

2.6.7 Ethnicity

Ethnicity and Satisfaction with Health Care

Sociodemographics such as ethnicity have very minimal effects on satisfaction with obstetrics health care, whereas the quality of caregiver relationship, and support provided overcome the effect of these factors.\textsuperscript{18}
Ethnicity and Postpartum Weight Retention

Women of different ethnicities have various body shapes, and cultural norms that influence their perception of their own bodies and weight. Certain studies indicate that there might be an association between ethnicity and weight retention, while others have shown no difference.

2.6.8 Gestational Weight Gain

GWG is the total weight gained during pregnancy, or the difference between a woman’s weight at the end of her pregnancy and her weight at the beginning of her pregnancy. Gestational weight gain guidelines provided by the Society of Obstetricians and Gynecologists of Canada (SOGC), were adopted from the 2009 Institute of Medicine guidelines. Recommendations are made based on the pre-pregnancy BMI of the mother by monthly and trimester optimal weight gain. The greater the mother’s pre-pregnancy BMI, the greater her risk for complications and the less weight she is recommended to gain during pregnancy. Underweight women (BMI<18.5 kg/m²) are advised to gain between 12.5 to 18 kg, normal weight women (BMI 18.5-24.9 kg/m²) between 11.5 to 16 kg, overweight women (BMI 25-30 kg/m²) are recommended to gain 7 to 11.5 kg, and obese women (BMI>30) are advised to gain 7 kg. The GWG guidelines were developed to target five important labour and birth outcomes: infant birth weight, C-section birth rate, preterm birth, postpartum weight retention and childhood obesity. According to a Canadian population-based cohort study conducted by Crane et al, only 30.6% of women gained within the recommended GWG guidelines, 17.1% gained below the recommendations, and 52.3% of women gained above recommendations.

Gestational Weight Gain and Satisfaction with Health Care

The literature does not indicate an association between satisfaction with perinatal care and gestational weight gain, however there is a body of literature suggesting that HCP weight gain counselling can influence actual GWG. As information received during the health care encounter is an important component of satisfaction with care, advice and
satisfaction are likely closely related. Women who received advice from their health care practitioner about appropriate gestational weight gain are two times more likely to meet the SOGC recommendations, compared to those who do not received advice from their HCP.  

Most HCPs (67%) believe that their advice influences a patient’s weight gain during pregnancy, however advice for weight gain, and less commonly, accurate advice is only provided by a limited number of HCP. A study by Cogswell, et al reported that 29% of patients received no advice for gestational weight gain, and among those that received advice, 14% were advised to gain less than the SOGC guidelines and 22% were advised to gain more. It is essential to educate providers about GWG guidelines, and their importance for optimal health outcomes of the mother and infant. Women who receive advice about breastfeeding, alcohol, smoking, drugs, diet, vitamin/mineral supplements and weight gain tend to have better outcomes, than those who do not receive advice. Information about weight is equally important, as women who receive weight gain advice are more likely to improve their dietary and physical activity habits, whereas lack of counselling results to inappropriate gestational weight gain. Educating a future mother about her dietary behaviour is an important contributor to optimizing the health outcomes of the mother and her future child.

**Gestational Weight Gain and Postpartum Weight Retention**

Numerous studies have shown that GWG and postpartum weight retention are associated, and that EGWG may be the strongest predictor of long-term obesity due to pregnancy, as well as transitioning to a higher BMI category postpartum.

A systematic review conducted by Siega-Riz et al looked at the association between GWG and PPWR at several time-points (short, medium and long-term). Studies that were included in the review evaluated PPWR over a wide range of time, from several days to 15 years after birth. Among the studies that evaluated medium and long-term (six months or more postpartum) PPWR, the results indicated that GWG was significantly associated with PPWR. Women who gained EGWG had greater PPWR, regardless of
their pre-pregnancy BMI, with the greatest effect among women who were underweight before conception. A study conducted in a group of women from Alberta also found that EGWG is associated with a significantly higher PPWR, regardless of pre-pregnancy BMI. Participants who met the GWG recommendations retained an average of 3.3 kg, whereas those who gained above the recommendations retained 5.9 kg.

In 2010, Mamun et al lead a research study following participants for 21 years postpartum. They identified GWG as an independent predictor of obesity at 21 years postpartum, regardless of pre-pregnancy BMI. EGWG increased the odds by 2 times, and by 4 times greater for being overweight, and obese at 21 years postpartum, respectively, in both the adjusted and unadjusted analysis. A second longitudinal cohort study found that the odds of being overweight or obese at 16 years postpartum were 3.19 higher among women who gained above the gestational weight recommendations, compared to women who gained within the recommended range. Another study, found that EGWG was associated with transitioning to a higher BMI category 5 years postpartum. Women who were normal weight before pregnancy and who gained above the GWG recommendations were significantly 2.39 times more likely to transition to the overweight BMI group (rather than to remain in the normal weight group), compared to women who met the GWG recommendations. Women who were overweight before pregnancy had a significantly 1.79 times greater risk of transitioning to the obese BMI category (rather than remaining in the overweight category), when gaining above the recommendations, compared to women who gained optimal weight during pregnancy.

Low levels of physical activity, high fat and sugar intake, and a low fiber diet have increased the risk of excessive weight gain during pregnancy. Targeting GWG during pregnancy is important because it will improve the maternal nutritional and physical activity behaviours of mothers during pregnancy, potentially reducing PPWR and decreasing levels of psychological distress, therefore influencing maternal behaviours. Some pregnant women have the belief that weight gain during pregnancy is inevitable, therefore putting greater emphasis on managing their weight postpartum. The importance of weight gain during pregnancy must be emphasized to pregnant patients, as GWG is highly correlated with weight retention postpartum.
2.6.9 Mode of Delivery

Mode of Delivery and Satisfaction with Health Care

It is suggested that women who had a C-section delivery evaluate their satisfaction with care on the basis of different factors, compared to women who had vaginal deliveries. Higher levels of satisfaction among women who had a C-section delivery are associated with better explanations of the delivery process. As previously mentioned, information-giving, and clear communication are crucial components of satisfaction with care.

Mode of Delivery and Postpartum Weight Retention

Some evidence suggests that women who had a C-section delivery may have higher risks of retaining more weight postpartum, compared to women who had a vaginal delivery. Women who had a C-section delivery may be less likely to exercise after birth, and therefore may have a higher weight retention. In addition, excessive weight gain during pregnancy may increase the risk of C-section delivery, and women who have high weight gain during pregnancy are at higher risk of PPWR, therefore weight gain during pregnancy may have a stronger effect on PPWR, than mode of delivery on PPWR.

2.6.10 Infant in the NICU

Infant in the NICU and Satisfaction with Health Care

Mothers whose infant was hospitalized, or those who gave birth to a preterm infant may more likely to report lower levels of satisfaction, due to increased stress for their child’s health. Consistent with another study by Waldenstrom et al women whose newborn was transferred to the NICU after delivery reported lower levels of satisfaction with care, possibly related to fear of their infants health, rather than reflective of the health care they received.
Infant in the NICU and Postpartum Weight Retention

Stress due to infant hospitalization is associated with increased weight retention of greater than 10 pounds at 12 months postpartum. Women whose infants were hospitalized after coming home had a 1.8 times higher risk of retaining 1-10 pounds at 3 months postpartum, compared to women whose infants were not hospitalized.

2.6.11 Breastfeeding Duration

Breastfeeding and Satisfaction with Health Care

Breastfeeding is shown to be positively associated with certain components of satisfaction with care measurement tool, WOMBPNSQ. Greater satisfaction may be due to support, and information provided to women regarding breastfeeding, as well as encouragement to breastfeed.

Breastfeeding and Postpartum Weight Retention

It is recommended for a mother to breastfeed her infant for 6 months or more, in order to increase the likelihood of optimal health outcomes for herself and her infant. Systematic reviews of the literature have shown inconsistent results between the association of breastfeeding and postpartum weight retention. Certain studies found no association between breastfeeding duration and PPWR, whereas other studies found a negative association. Siega-Riz et al identified that breastfeeding for 6 months or more is associated with returning back to pre-pregnancy weight or weight loss postpartum.

Generally, obese women have lower rates of breastfeeding due to increased difficulties for lactation. Lactation may be more difficult for obese women due to lower levels of prolactin response. Breastfeeding has been associated with body image satisfaction. Women who are unsatisfied with their body image are less likely to breastfeed, and may be less likely to return to their pregravid weight.

Overall, there may be a weak association between breastfeeding and postpartum weight loss, however given the positive health benefits of breastfeeding for the infant,
including growth, immunity and cognitive development,\textsuperscript{85} it is highly recommended for women to breastfeed their infant, for at least 6 months.\textsuperscript{82}

2.6.12 Social Support

Social support can be defined as the provision of emotional, informational or tangible resources or advice from others to the receiver\textsuperscript{86} These can include, knowledge, advice, coping strategies or nurturance.\textsuperscript{86}

Social Support and Satisfaction with Health Care

Lack of social support is associated with dissatisfaction of perinatal care\textsuperscript{18} and intrapartum care.\textsuperscript{34}

Social Support and Postpartum Weight Retention

A conceptual model incorporating how the psychological distress (depression, anxiety and stress) of the mother can influence maternal behaviours, and how social support influences maternal psychological distress was constructed.\textsuperscript{14} Support from family and friends have been shown to reduce the negative effects of psychological distress, influencing maternal behaviours.\textsuperscript{14} Women who are vulnerable to psychological and weight-related illnesses, such as obese women\textsuperscript{11} are more likely to retain more weight postpartum. Psychological support for pregnant women, especially those who are most vulnerable to negative health outcomes is especially important, and has the potential to reduce PPWR,\textsuperscript{11} as well as to counteract the negative effects of psychological distress.\textsuperscript{14} In addition, social support can directly influence maternal behaviours to reduce PPWR.\textsuperscript{14} Helping patients to gain greater control, encourage their participation in decision-making, and increasing their self-efficacy can reduce their anxiety and depression, whereas unmet expectations may increase these factors.\textsuperscript{18}

2.6.13 Smoking Status

Smoking Status and Satisfaction with Health Care

Smoking status is not associated with perinatal health care satisfaction.\textsuperscript{34}
Smoking Status and Postpartum Weight Retention

The literature did not indicate an association between smoking and postpartum weight retention. However, smoking during the gestational period has been associated with increased risk of EGWG, as well as increased risk of offspring obesity.\(^{19}\)

\subsection*{2.6.14 Postpartum Maternal Mental Health}

\subsubsection*{Maternal Mental Health and Satisfaction with Health Care}

Certain studies had identified depression as a predictor for satisfaction with care. Britton et al\(^ {18}\) found that maternal psychological health, including depression is associated with lower levels of satisfaction with perinatal care. During the postpartum period, higher postnatal depression scores are significantly associated with lower levels of satisfaction.\(^ {39}\) It is difficult to determine whether higher levels of depression are due to unsatisfactory perinatal care, or whether rating perinatal care as unsatisfactory is due to poor mental health.\(^ {18}\)

\subsubsection*{Maternal Mental Health and Postpartum Weight Retention}

Mental health, including anxiety, depression and body image\(^ {14}\) during pregnancy is a crucial determinant of health outcomes for both infant and mother.\(^ {87}\) Women who have high levels of anxiety during pregnancy are more likely to retain more weight postpartum.\(^ {11,14}\) A model proposed by Phillips et al\(^ {14}\) indicates that pre-pregnancy BMI and GWG are predictors for psychological distress, and psychological distress may result to higher PPWR.

A mother with a positive body image is more likely to reduce her weight postpartum.\(^ {14}\) Body dissatisfaction is related to poorer mental health, including depressive symptoms, relationship may be bidirectional, poor body dissatisfaction may contribute to poor mental health, and vice versa.\(^ {13}\) A systematic review by Phillips et al\(^ {14}\) indicates that some research studies found no association between stress and PPWR, whereas other studies show a correlation between the variables. To date, the true effect of psychological factors and weight gain during pregnancy is still unknown.
2.7 Differences with Health Care Experience and PPWR due to Pre-pregnancy BMI

There is speculation to believe that the strength of association between satisfaction with care and PPWR may vary between pre-pregnancy BMI groups. This could suggest that pre-pregnancy BMI can have an interactive effect in the association between satisfaction with care and PPWR. Overweight and obese pregnant women may have different health care experiences compared to normal weight women. A qualitative study (N=16) by Lindhardt, et al.\textsuperscript{55} sought to understand the health care experiences of obese pregnant women.\textsuperscript{55} Two major themes emerged from the study: 1) feeling blamed, embarrassed, and stigmatized and 2) receiving limited information and advice. These themes are common within the literature, especially among obese patients.\textsuperscript{59} An Australian study also found that women who had higher BMIs felt stigmatized, and felt as though their HCPs assumed that they were less healthy and less self-disciplined than their normal weight counterparts.\textsuperscript{59}

A 15-year prospective cohort study, found that the highest weight retention occurred among participants who were obese at their first prenatal visit. Obese women had an average annual increase of 2.3 pounds, up to 15 years postpartum, in comparison to normal weight participants who gained an average of 1.2 pounds per year.\textsuperscript{51} The higher the participant’s BMI at the first measurement, the higher their annual average weight retained.\textsuperscript{51} Since overweight and obese women are at greater risk for retaining more weight postpartum, and may have different health care experiences, they may need additional support and motivation to influence their postpartum nutritional and physical activity behaviours. Therefore, the strength of association between satisfaction with care and PPWR may be weaker among women who are overweight or obese, because other external factors may contribute more strongly to the outcome. Women who are at a normal BMI may have greater confidence and ability to reduce their PPWR regardless of their health care experience. They may have higher satisfaction levels, better nutritional habits, and therefore would rely less on the influence of their HCP.
2.8 Pre-pregnancy BMI & GWG Adherence

The association between pre-pregnancy BMI, gestational weight gain, and PPWR is well known and widely cited in literature. Women who are classified as overweight, or obese before pregnancy are more likely to gain above the gestational weight gain recommendations and in turn, they are less likely to return to their pre-pregnancy weight at 6 months or more postpartum. A study conducted in a group of women from Alberta, also found that EGWG is associated with higher PPWR, but that differences between pre-pregnancy BMI existed. After adjustment, the odds of gaining more weight among women who were in the pre-pregnancy obese category was 6.5 times significantly higher, and among overweight women, the odds was 5.5 times significantly higher, when compared to normal weight women. Among obese women, GWG was a significant predictor for PPWR (5 kg or more) at 6 months postpartum. Women who are in a higher pre-pregnancy BMI category are more likely to gain EGWG during pregnancy, and in turn, are may be more likely to retain more weight postpartum.

Excessive gestational weight gain most commonly occurs within the subgroup of women that are overweight or obese before conception. Bogaerts et al. found that overweight and morbidly obese mothers are 3.5 times, and 3.7 times more likely to exceed weight gain recommendations, compared to their normal weight counterparts, respectively. Consistent with a cross-sectional study conducted by Kowal et al. found that overweight/obese women are 3 times more likely to gain above recommendations, compared to normal weight women. Negative health benefits are further accentuated among mothers with a high pre-pregnancy BMI and gestational weight gain. The risk of midlife obesity increases among participants who exceeded gestational weight recommendations, were obese before pregnancy, or retained excess weight postpartum.

2.8.1 GWG Advice from HCP

The characteristics of mothers who meet their recommended gestational weight may differ in both nutritional behaviours and health care experiences. This could suggest a potential interactive effect of GWG in the association between satisfaction with care and PPWR. The challenges and barriers for HCPs in terms of providing weight
counselling to their pregnant patients, as well as incorporating weight gain guidelines into their clinical practice are unknown. To date, there is only one registered clinical trial that will randomize Canadian family physicians into an intervention group (physicians who received GWG guidelines training) versus physicians who did not receive training. The primary outcome that will be evaluated is whether patients meet their optimal gestational weight gain. This study will provide an understanding of whether information giving in regards to GWG guidelines can improve weight management during pregnancy. Frequent contact with HCPs can give HCPs an opportunity to improve the health behaviours of the mother during pregnancy, yet there is limited research seeking to identify how HCPs can provide their patients with gestational weight gain counselling, and which methods are effective.

Most healthcare providers do not advise patients on weight gain during pregnancy, or their recommendations are not in accordance to GWG guidelines. Obese and overweight women are usually advised to gain above the guidelines. In fact, women who were overweight/obese had an odds ratio of 18.7 times higher for receiving recommendations above GWG guidelines compared to normal weight women. Similar findings were seen in a study by Stotland et al (N=1198) illustrating that half of the participants who had a BMI over 26 were advised to gain more than the recommended GWG. This may be because HCPs are providing the same gestational weight gain recommendations to all their patients, regardless of their pre-pregnancy BMI.

The literature indicates that high gestational weight gain, as well as failure to return to pre-pregnancy weight at about 1 year postpartum is associated with long-term weight retention. Studies illustrate an association between excessive weight gain and pre-pregnancy obesity/overweight BMI with postpartum weight retention. In addition, the health care experiences of women who are overweight or obese before conception, or who exceed GWG recommendations may be different compared to women who are normal weight or meet their optimal weight gain during pregnancy.
2.9 Gaps in Literature

Research in the area of weight retention postpartum, has been focused to identify risk factors for negative health outcomes, to determine effective interventions for weight management during pregnancy, as well as to understand the challenges of weight counselling for patients and their support systems, including healthcare providers.

Most of the literature consists of studies aimed to identify risk factors and health outcomes of the mother and fetus, few studies focus on health care encounters. A systematic review was conducted to identify studies that have looked at the barriers and facilitators of weight management from the healthcare provider’s perspective. The authors found no such study, other than a currently registered randomized controlled trial in Nova Scotia. The need to determine the influence that HCPs can have on their pregnant patients for better lifestyle choices has been raised by several authors. Britton suggests that future studies should identify the impact a positive health care encounter can have on objective outcomes, as well as the future health behaviours of the parents and infant. In addition, Goodman et al also suggest that researchers should identify the association between components of satisfaction and future mothering activities.

Satisfaction with health care encounters is widely studied, and has shown potential to quantify the patient’s perceived quality of care, to highlight potential areas of improvement, and to be associated with patient regimen compliance and health outcomes. To date, no study has analyzed the association between the satisfaction with obstetrics health care, and weight retention postpartum. Certain studies have identified the experiences of obese women with their healthcare providers, others have developed or evaluated satisfaction measurement tools explored the influence of different components of care, and the identified the association between patient characteristics and satisfaction with care, as well as patient characteristics and postpartum weight retention. Identifying the influence of HCPs on weight counselling postpartum, and other health behaviours will bridge a gap to better understand whether HCPs can influence patients in making better lifestyle choices, and to identify effective roles HCPs can undertake to achieve these goals.
Figure 2.1 Holistic Model of Satisfaction with Health Care

This model illustrates how satisfaction with health care encounters can influence patient behaviours, taking in consideration the various other factors that influence this pathway.
Figure 2.2 Directed Acyclic Graph

The directed acyclic graph illustrates the possible pathways between satisfaction with health care encounters and PPWR, based on the literature review. Note: there is no significance in the location of boxes representing the potential confounding variables.
Chapter 3 Methods

This chapter describes the theoretical and statistical approaches taken to achieve the thesis objectives: 1) determine the effect of overall satisfaction with perinatal health care on postpartum weight retention among Canadian mothers, 2) identify the effect of two separate dimensions of satisfaction with perinatal health care (satisfaction with information received and satisfaction with decision making) on postpartum weight retention, and 3) identify whether pre-pregnancy BMI or gestational weight gain interact in the relationship between overall satisfaction and postpartum weight retention. Analyses were conducted using SAS version 9.3.

The first section of the chapter, section 3.1 highlights important aspects of the survey, the survey’s sampling strategy and weighing. Section 3.2 describes the exclusion criteria for the study population, and summarizes the population using a flow diagram. Section 3.3 illustrates a modified directed acyclic graph that was used to guide the main analysis, separating the variables into three groups: pre-pregnancy, pregnancy and postpartum variables. Section 3.4 summarizes the re-coding of the variables used for analyses. Finally, the last section of this chapter describes univariable and multivariable analyses conducted to answer the research objectives. It begins by describing the linear assumption diagnostic tests, followed by descriptive statistics, univariable and multivariable regression for analyzing the effect of overall satisfaction with care on PPWR. The methods for building a final model to answer the primary objective are described, followed by the multivariable regression analyses for determining the effect of two individual dimensions of satisfaction on PPWR, and ending with a description of the interaction analyses.

3.1 Data Source

The Canadian Perinatal Surveillance System of the Public Health Agency of Canada developed the survey What Mothers Say: The Canadian Maternity Experiences Survey (MES) to capture the experiences of mothers during pregnancy, labour and birth and shortly postpartum. This cross-sectional survey was administered via a computer-
assisted telephone interview (CATI) at five to fourteen months postpartum, between 2006 and 2007.

The MES is an excellent source for describing the sociodemographics of Canadian mothers, labour and birth experiences and certain postpartum behaviours such as smoking and depression. The survey is especially important as it incorporates mothers’ experiences with their health care encounters, providing information for improving health care services by informing policy and developing maternity guidelines. Among other important findings, the MES indicates that mothers have an average of about 13 prenatal visits, which is much greater than the recommended number of visits (about three to four visits). Another interesting finding was that the majority of mothers (about 90%) initiated breastfeeding, however only about 16% exclusively breastfed their infant for 6 months, which is the recommended breastfeeding time. The MES was identified to be an excellent data source to analyze the thesis’ research questions, as the intention was to understand health care experiences and maternal behaviours in the postpartum period. Approval was obtained from the Research Data Center (RDC) at Western University to obtain access to the MES, see Appendix B Figure B.1 for approval.

3.1.1 Maternal Experiences Survey Sample

Women were selected using stratified random sampling. Stratified random sampling provides an accurate representation of the population based on important variables, and allows underrepresented groups to be oversampled. Data gathered by the 2005 Canadian Census provided information to create a sampling frame for the MES, including mothers who had a singleton birth from all Canadian provinces and territories. Mothers were initially stratified by province or territory of residence and maternal age <20 years or ≥20 years. Mothers who were 20 years or older were further stratified in more specific age categories (20-29 years and ≥30 years or greater) as well as their province of residence. Among the more populated provinces, the mothers were then stratified by whether they were residing in a census-metropolitan area and by the number of children present in their household. The number of mothers who were under the age of 20 years was too small to be further stratified in most provinces, except for Ontario and Quebec where mothers were stratified by either living in a census-metropolitan area or
not. Taking into consideration a response rate of 70% and 75% from residents living in provinces and territories, respectively, a total sample of 8,542 mothers was randomly selected.94

Mothers were eligible to complete the MES survey if they met the following criteria: gave birth to a singleton baby, maternal age 15 years and over, living with their baby at the time of the interview, and not living in a First Nations reserve or institution.95 Of the identified eligible women, 6,421 participants completed the interview, a response rate of 78%. Weights were assigned based on sampling design, by dividing the Census design weight with the probability of selection from the stratified sampling frame. Weights were also assigned for non-response and for those participants whose eligibility could not be determined.94

3.1.2 Survey Weighing

Weights were assigned based on strata from the sampling frame including: maternal age, first language, place of residence, marital status, number of adults in household, other children in household and baby gender. The survey sample was found to be representative of the target population, women who recently gave birth before the 2006 Census, representing a total of 76,508 Canadian women.95

3.2 Study Population

A priori exclusion criteria were identified based on findings in the literature to isolate a sample that would most accurately investigate the thesis objectives. There were five initial exclusion criteria: 1) time postpartum, 2) pre-term birth, 3) pregnant at the time of the interview, 4) language barrier for receiving health care, 5) maternal age. The first three exclusion criteria were applied to reduce the effect of time on the mother’s weight throughout the course of the pregnancy or postpartum, (ie. factors that affect the outcome, postpartum weight retention). Mothers who were interviewed at 6 months or less postpartum were excluded from the analyses, because this would not give them enough time to return to their pre-pregnancy weight. Only full term births were included (37 weeks or more) to illustrate the effect of full term pregnancy on weight gain. Women who were pregnant at the time of the interview were excluded because their weight post-
pregnancy would not illustrate attempts for returning to their pre-pregnancy weight. Next, participants were excluded based on their ability to receive health care. Participants who felt that they could not communicate with their HCP due to a language barrier were excluded since their satisfaction levels were most likely influenced by the language rather than the actual care received. Finally, to reduce the effect of age on weight change, women who were under the age of 19, and over the age of 39 were excluded.

The *a priori* exclusion criteria resulted in a total of 4,580 participants. Secondary exclusion criteria removed respondents who had missing or implausible values for the exposure, outcome, or gestational weight gain variables. Participants who were missing pre or post pregnancy weight variables, or had an implausible BMI, outside the range 14 kg/m$^2$ to 48 kg/m$^2$ were excluded. Participants who did not answer one or more of the six satisfaction questions were excluded, because it would not be possible to compute an overall satisfaction score to represent all six dimensions. Respondents who had an implausible gestational weight gain (ie. above or below 2 standard deviations from the mean) were excluded. After the exclusion criteria was applied, the total study population consisted of 4,110 participants for analyses. See Figure 3.1 for a flow chart illustrating how each exclusion criterion was applied.

### 3.3 Modified Directed Acyclic Graph

The DAG from *Chapter 2* was modified to create a DAG consisting of only confounding variables available in the MES dataset, see Figure 3.2 at the end of this chapter for the modified DAG. A total of 3 variables were removed from the original version: presence of gestational diabetes, maternal diet and physical activity.

### 3.4 Data Coding

#### 3.4.1 Exposure Variable

A pilot study was conducted by MES investigators to determine the effectiveness of using this survey instrument for reporting perinatal health policies and practices within the Canadian context.$^{96}$ The satisfaction questions were evaluated in the pilot study.
asking the participants about their satisfaction on six dimensions: 1) information received, 2) compassion, 3) competency, 4) concern of patient privacy and dignity, 5) respect and 6) personal involvement in medical decision-making. During the pilot study, each of these questions were asked three times for three distinctive time periods: pregnancy, labour and birth, and shortly postpartum. The answers were found to be redundant when asked for each time point. The satisfaction questions were therefore re-worded for the administration of the MES to combine the three time periods for each satisfaction question, creating a total of 6 questions.96

The exposure variable for the primary objective is overall satisfaction with health care encounters, during pregnancy, labour and birth, and postpartum. The original MES survey does not have an overall measure of satisfaction including all 6 dimensions. It asks respondents to reflect on their satisfaction with their health care experience in 6 separate questions:

“Thinking back to your entire pregnancy labour and birth, and immediate postpartum experience. Overall, how satisfied or dissatisfied were you with: 1) the information given to you by your healthcare providers, 2) the compassion and understanding shown by your healthcare providers, 3) the competency of healthcare providers, 4) the concern of your healthcare providers for privacy and dignity 5) the respect shown to you by your healthcare providers 6) your involvement in decision making with your healthcare providers.”

The possible responses for each satisfaction dimension were: very satisfied (coded as 1), satisfied (coded as 2), neither satisfied nor dissatisfied (coded as 3), dissatisfied (coded as 4) and very dissatisfied (coded as 5). Respondents who answered don’t know or refusal were excluded from the sample. The responses were re-coded to allow for higher satisfaction scores to represent higher satisfaction levels (ie. Very satisfied was coded as 5, rather than 1, satisfied was coded as 4 rather than 2, etc.).

The satisfaction questions from the MES were not tested for validity or reliability, however the questions encompass most of the previously cited important aspects of measuring satisfaction with care.
Principal Components Analysis

Principal components analysis (PCA) is used to reduce the data’s dimensionality, while retaining as much of the variation as possible. In other words, PCA allows the data’s variability to be summarized by reducing the number of original variables. PCA can be conducted using covariance or correlation matrices. Correlation matrices are standardized scores, utilized when the variables in the PCA are measured with different units, providing equal weight to each variable. Covariance matrices are used when the units of measurement are equal for each variable. The six satisfaction questions have a common unit as they are all measured on a 5-point Likert scale (very satisfied to very dissatisfied). Therefore, eigenvalues from the covariance matrix would be preferred over those of the correlation matrix, because it would be unnecessary to standardize the values. In addition, values from the covariance matrices allow for easier statistical interpretation to the population, than those of correlation matrices. The means and standard deviations of each satisfaction variable was similar, therefore interpretations based on the standardized correlation matrix would ultimately lead to the same conclusions. PCA was conducted using the SAS function PRINCOMP for the six dimensions of satisfaction with health care questions. A summed satisfaction scale was created by adding the individual scores of each question to represent an overall satisfaction with health care score during pregnancy, labour and birth, and shortly postpartum for the six dimensions. A higher overall satisfaction score represents a higher level of satisfaction, whereas a lower overall satisfaction score represents lower satisfaction. The overall satisfaction score variable was named SATSUM, a continuous variable ranging from 6 to 30.

3.4.2 Outcome Variable

The outcome variable of the thesis objectives is postpartum weight retention, defined as the difference between postpartum and pre-pregnancy weight in kg. The postpartum weight retention variable was coded as a continuous variable under the name PPWR. The PPWR variable was created by subtracting the respondent’s self-reported weight at the time of the interview, with her pre-pregnancy weight in kg.
3.4.3 Confounding Variables

The following section discusses how each confounding variable from the modified DAG (Figure 3.2) and additional important variables were coded for analyses. Variables are separated in 3 groups: pre-pregnancy, pregnancy and postpartum variables.

3.4.3.1 Pre-pregnancy Variables

Maternal Age

Participants were asked their age at the time of the interview. The maternal age variable was continuous, ranging from 19 to 39 years due to pre-established inclusion criteria. Participants who were missing this variable were excluded from the analysis due to inability to determine whether the participants met the initial inclusion criteria.

Household Income

Participants were asked to identify their total household income within the last 12 months. The MES categorized household income responses in 11 groups: 1) under $10k, 2) $10k to less than $15k, 3) $15k to less than $20k, 4) $20k to less than $30k, 5) $40k to less than $50k, 6) $50k to less than $60k, 7) $60k to less than $80k, 8) $80k to less than $100k, 9) $100k to less than $150k, 10) $150k to less than $200k, 11) ≥$200k, and missing. For analysis, the household income variable was dichotomized: total household income 1) <$30k and 2) ≥$30k. The low income cut-off is approximately $30 000 for Canadian residents, providing justification for an appropriate cut-off of the income variable.

Education Level

The MES recorded the participants’ highest educational level, and categorized their responses in 8 groups: 1) no post-secondary certificate or diploma, 2) trade certificate/diploma, 3) non-university certificate or diploma from a college, 4) CEGEP, 5) school of nursing, etc., 6) university certificate below bachelor’s degree, 7) bachelor’s degree, and 8) university degree or certificate above bachelor’s degree. For this study, categories were collapsed in 3 groups: 1) high school graduate or less, 2) educational
attainment above high school graduate but below a bachelor’s degree, and 3) Bachelor’s
derg or higher. Don’t know or refusal responses were coded as missing for the
analysis.

Marital Status

Participants were asked their current marital status, categorized in 7 groups: 1) 
mari ed, 2) common law, 3) widowed, 4) separated, 5) divorced, 6) single or 7) never
married. The categories were collapsed in 3 groups: 1) married, 2) common law, and 3) 
widowed/single/separated/divorced. Don’t know responses were coded as missing. These
categories are consistent with a previously conducted pilot study for the Maternal
Experiences Survey.96

Parity

Participants were asked how many times they have given birth to a live baby
(including the infant from the index pregnancy). This variable was originally coded as a
categorical variable, indicating the exact number of live births for each participant. For
analyses, the variable was dichotomized into 1) primiparous, representing women who
have only given birth to the baby of the index pregnancy, and 2) multiparous,
representing women had given more than one live birth. These categories are consistent
with previous studies including a MES pilot study96 and similar studies evaluating weight
gain during pregnancy.12,76

Pre-pregnancy BMI

The MES coded the participants’ pre-pregnancy BMI as a continuous variable,
which was derived by dividing the participant’s self-reported weight in kg, by their height
squared in meters. To account for an underestimation of self-reported BMI, a validated
correction factor developed from the 2005 Canadian Community Health Survey was
used.99 Researchers conducted a study to validate this sex-specific correction factor by
comparing self-reported height and weight with their actual measured counterparts. The
authors conclude that this correction factor can reduce self-reported bias by providing a
more accurate estimate of overweight and obesity prevalence among Canadians. The
authors recommend that researchers conducting obesity studies use this correction factor as it is more accurate than relying on self-reported values. Two BMI variables were created with the correction factor: a categorical variable and a continuous variable. The following correction factor was used: $\text{BMI}_{\text{with correction factor}} = (-0.12) + (1.05*\text{BMI}_{\text{self-reported}})$, see Appendix C for a sample calculation. Participants with missing pre/post pregnancy weight values, as well as implausible BMI values (ie. BMI<14 kg/m$^2$ or BMI>48 kg/m$^2$) were excluded from the analysis.

A pre-pregnancy BMI categorical variable with the correction factor was created, by categorizing individuals into 5 groups: underweight (BMI<18.5 kg/m$^2$), normal weight (BMI 18.5 to 25 kg/m$^2$), overweight (BMI 25 to 30 kg/m$^2$), obese class I (BMI 30 to 35 kg/m$^2$), or obese class II and III (35 kg/m$^2$+).

Aboriginal Status

MES participants were asked their first identified ethnicity, and categorized in 14 groups: 1) British Isles, 2) French, 3) Aboriginal, 4) North American, 5) Caribbean, 6) Latin/Central/South American, 7) European, 8) African, 9) Arab, 10) West Asian, 11) South Asian, 12) East and Southeast Asian, 13) Oceania, or 14) other. Participants were dichotomized 2 groups: 1) Aboriginal and 2) non-Aboriginal.

3.4.3.2 Pregnancy Variables

Gestational Weight Gain

Mothers reported their total weight gain during pregnancy, gestational weight gain. Participants who reported implausible GWG (2 standard deviations from the mean in both the upper and lower values), as well as those who were missing GWG variables were excluded from the analysis.

Gestational weight gain was categorized according to the most current GWG guidelines, by pre-pregnancy BMI in 3 groups: inadequate GWG, met, or exceeded GWG recommendations. The GWG recommendations are as follows: underweight pre-pregnancy BMI, between 12.5 to 18 kg; normal pre-pregnancy BMI, between 11.5 to 16
kg; overweight pre-pregnancy BMI between 7 to 11.5 kg; and obese class I, II or III pre-pregnancy BMI 7 kg\(^1\) see Appendix Table A.2. Mothers who were within the recommended GWG for their pre-pregnancy BMI category were categorized in the optimal GWG group, those who exceeded the recommendations were categorized as excessive GWG, and those who gained below the recommended range were categorized as inadequate GWG.

**Mode of Delivery**

Participants were asked if they had a vaginal or caesarean birth, this variable was kept dichotomous: *vaginal delivery* or *cesarean delivery*.

**Type of Healthcare Provider**

Participants were asked what type of healthcare professional provided them with the most care throughout their pregnancy: *Obstetrician*, *Gynecologist*, *OBGYN*, *Family Doctor*, *General Practitioner*, *Doctor*, *Midwife*, *Nurse/Nurse Practitioner*, or *Other*. Participants who answered *Doctor* were asked a follow up question: *What type of doctor was this?* Possible answer choices include: *Obstetrician*, *Gynecologist*, *Family Doctor*, *General Practitioner*, or *Other Doctor*. These two questions were used to create one overall categorical variable with the following categories: *OBGYN*, *Family doctor*, *Midwife*, *Nurse*, or *Other*. *Don’t know* and *Refusal* responses were coded as missing.

**3.4.3.3 Postpartum Confounding Variables**

**Infant in the NICU**

Participants were asked:

*“Immediately after birth, was (baby) admitted to the intensive care or special care unit?”*

3 possible answer choices were given: 1) *yes*, 2) *no*, or 3) *don’t know*. The variable was kept as a dichotomous variable, and *don’t know* responses were coded as missing for the analysis.
Breastfeeding Duration

The MES investigators asked the participants:

“Are you still breastfeeding, even if occasionally?”

The 4 categories were: 1) yes, 2) no, 3) valid skip, or missing. Participants who were in the valid skip category had previously said they did not, or did not try to breastfeed their baby even for a short period of time. The selected study population only included participants who were at 6 months or more postpartum, therefore making it possible to categorize the breastfeeding variable into 3 groups: 1) breastfeeding for 6 months or more (answered yes), 2) breastfeeding for less than 6 months (answered no) and 3) never breastfed (valid skip). Not stated responses for either breastfeeding question were coded as missing. The cutoff point of 6 months or more was used to categorize the breastfeeding variable because it is recommended for mothers to breastfeed their infant for a minimum of 6 months.\(^\text{82}\)

Postpartum Social Support Availability

The MES categorized frequency of social support received postpartum in 5 groups: 1) none of the time, 2) little of the time, 3) some of the time, 4) most of the time, 5) all of the time. These categories were retained for analysis.

Postpartum Smoking Status

The survey recorded the postpartum smoking frequency of respondents in the 3 categories: 1) daily, 2) occasionally, and 3) not at all. Participants were dichotomized into 1) smokers if they answered daily or occasionally, and 2) non-smokers, if they responded not at all. Don’t know responses were coded as missing.

Postpartum Depression

Postpartum depression was evaluated using the validated and reliable 10-item Edinburgh Postnatal Depression Scale. Participants were asked the following questions:
“During the past 7 days, 1) you have been able to laugh and see the funny side of things, 2) you have looked forward with enjoyment to things, 3) you have blamed yourself unnecessarily when things went wrong, 4) you have felt anxious or worried for no good reason, 5) you have felt scared or panicky for no good reason, 6) things have been getting on top of you, 7) you have been so unhappy that you have had difficulty sleeping, 8) you have felt sad or miserable, 9) you have been so unhappy that you have been crying, 10) the thought of harming yourself has occurred to you.”

Participants were given four answer choices that allowed them to indicate the frequency at which, or if they had the aforementioned feelings. Each response was scored as 0, 1, 2 or 3, with 3 being the response for the highest risk of depression. The MES provides a summed overall score of the depression scale for respondents who answered all 10 items. Scores were dichotomized into 1) not depressed (score under 13), and 2) depressed (score of 13 or more). These categories are consistent with previously established cut-offs.100

Time Postpartum

Participants were asked their baby’s age at the time of the interview. The variable was reported using 16 categories: 1) 5-5.5 months, 2) 5.5-6 months, 3) 6-6.5 months, 4) 6.5-7 months, 5) 7-7.5 months, 6) 7.5-8 months, 7) 8-8.5 months, 8) 8.5-9 months, 9) 9-9.5 months, 10) 9.5-10 months, 11) 10-10.5 months, 12) 10.5-11 months, 13) 11-11.5 months, 14) 11.5-12 months, 15) 12-13 months, and 16) 13 months to 15 months. Respondents from the first two categories (6 months or less) were excluded from the analysis due to pre-established exclusion criteria. The remaining categories were re-coded to represent the midpoint from each range (ie. Category 3 originally represented 6 to 6.5 months postpartum, and was re-coded as 6.25 months). Participants who did not state their baby’s age were excluded from the analysis, due to inability to determine whether they met the initial inclusion criteria. This variable was used to represent time postpartum.
Postpartum BMI

The categorical and continuous postpartum BMI variables were coded using the same method as the pre-pregnancy BMI variables, see *Pre-pregnancy BMI* above.

### 3.5 Data Analysis

Following variable recoding, and extraction of the study sample based on the exclusion criteria, descriptive, univariable and multivariable analyses were conducted using a normalized weight. Data was analyzed using a complete case analysis, therefore depending on which variables were being analyzed certain observations with missing values were excluded, leading to variations in sample size for multivariable models with different confounders and covariates. A normalized weight variable was derived by dividing the survey weight variable by the average weight of the selected sample (new weight included participants who met the inclusion criteria only). It should be noted that the addition of the weight variable may slightly influence the results, given that the sample size varies depending on which variables were analyzed. A two-tailed p-value < 0.05 was considered statistically significant. As per regulations of the Research Data Centre, only weighted and rounded results were released.

#### 3.5.1 Linear Regression Diagnostics

Several statistical diagnostics were conducted to analyze the assumptions of linear regression analysis. The assumption of homoscedasticity, states that the variances of the dependent variable should be equally distributed. Using the SAS function PROC GPLOT, a scatter plot of the residuals and predicted value of PPWR in the univariable model was computed. The residuals were distributed in a cone shape, suggesting heteroscedasticity of the variances. In the multivariable model, the residual plot illustrated less concern of heteroscedasticity, with most data points residing towards the middle of the graph. Adjusting for all potential confounders in the multivariable model may have reduced the variability of the residuals, as illustrated in the residual plots. To analyze the possible effect of heteroscedasticity on the main association, the SAS function ACOV was used under the MODEL statement for PROC REG. Under the assumption of heteroscedasticity, the p-values of the regression test statistics were
slightly larger compared to those under the assumption of homogeneity, however they generally lead to consistent conclusions of statistical significance. The normality assumption was tested by analyzing a quantile-quantile (Q-Q) plot and a histogram. The Q-Q plot had a curved pattern, indicating that the data has skinny tails at both ends of the distribution, with a longer tail on the left side. Due to RDC regulations, residual and Q-Q plots could not be released and presented in this thesis.  

Collinearity between the confounding variables was analyzed by assessing the variance inflation factor (VIF) and Pearson’s correlation coefficients. The VIF for all variables were approximately 1, indicating no multicollinearity, see Appendix Table B.1. Generally a VIF greater than 4 is considered high multicollinearity. In addition, Pearson’s correlation coefficients were under 0.5, further confirming low multicollinearity between the variables. Maternal age, and educational level had the highest correlation coefficient, possibly because mothers who are older are more likely to have obtained a higher educational level.

3.5.2 Descriptive Statistics

Descriptive statistics was conducted using univariate analysis to describe the study population based on important characteristics. Frequencies were obtained for categorical variables. Means and standard deviations of continuous variables were determined.

3.5.3 Univariable Regression Analysis

Univariable regression analysis was conducted to determine the relationship between satisfaction scores and each confounding variable, on the outcome, PPWR.

3.5.4 Multivariable Regression Analysis

Multivariable linear regression analysis was used to identify whether there is an association between overall satisfaction score and PPWR. The multivariable model was constructed using blockwise model building, with backwards elimination at a 0.2 level of significance. The SAS function SELECTION=BACKWARD SLSTAY=0.2 was coded in the model statement to remove confounders that were not statistically significant for each
model. Confounding variables were identified from the modified directed acyclic graph, and grouped into three time blocks: pre-pregnancy, pregnancy and postpartum variables, see Figure 3.2. The first block consisted of the pre-pregnancy variables: income, education, parity, pre-pregnancy BMI, marital status, aboriginal status and maternal age. The second block, was made up of pregnancy and labour/birth variables: gestational weight gain and method of delivery. The last block included postpartum variables: infant in the NICU, breastfeeding duration, support from family/friends, smoking status, mental health postpartum and postpartum time. As each block was added, variables with p-values greater than 0.2 were removed from the model, regardless of which block they belong to, beginning with the variable containing the highest p value. Adjusted model 1 contains the first block, pre-pregnancy variables, which were all significant at a 0.2 level. The second block, containing pregnancy variables was added in the next model, and method of delivery was not statistically significant, therefore eliminating the variable in the 2nd multivariable model. Subsequently, the final block was added, containing postpartum variables. The variable infant admitted to the NICU was eliminated first, and smoking status second. Thus, a total of 3 confounding variables were eliminated at a 0.2 level of significance in the following order: method of delivery, NICU admission, and smoking status.

3.5.5 Analyses for Satisfaction with Information Received and Satisfaction with Decision-Making Dimensions

Univariable analysis of the individual effects of satisfaction with information received, and satisfaction decision-making and PPWR were conducted. These two dimensions were selected because the literature suggests they are the most important aspects of a patient’s evaluation of their health care.

The satisfaction with information received and satisfaction with involvement in decision-making variables each ranged from a score of 1-5, 5 indicating the highest level of satisfaction. Multivariable linear regression models analyzing the individual effects of satisfaction with information received, and satisfaction with decision-making were constructed. Models were built using the same blocks, with backwards-stepwise
elimination as described in section 3.5.4 for the association between overall satisfaction and postpartum weight retention.

### 3.5.6 Interaction Analysis

The effect of overall satisfaction with health care on PPWR may vary between patients who have a different pre-pregnancy BMI. The literature suggests that obese pregnant patients may experience their health care encounter differently than normal weight patients. It has been suggested that these differences may occur due to poor physician-patient interactions, specifically a lack of communication and respect.\(^5\) According to the holistic model of satisfaction with care,\(^\text{17}\) patient characteristics impact an individual’s evaluation of their health care, which in turn impacts their behavioural reaction, see Figure 2.1. There may be varying magnitudes of the association between health care satisfaction and PPWR, among women belonging to the different pre-pregnancy BMI categories, because they may experience their health care differently, and they may have different challenges to weight loss in the postpartum period. Pre-pregnancy BMI was analyzed to determine whether it is an effect measure modifier between the relationship of overall satisfaction with care and PPWR. Pre-pregnancy BMI was treated as a continuous variable for the interaction analysis.

In a similar manner, another patient characteristic that may effect the association between satisfaction with care on PPWR is GWG. Patients who have optimal, inadequate and excessive GWG may perceive their health care experience differently, and therefore may have different behavioural reactions. Gestational weight gain was treated as a categorical variable, with the following groups: optimal GWG, excessive GWG and inadequate GWG. Optimal GWG was treated as the reference group. A multiple partial F-test was conducted to determine the significance of the categorical variable GWG (2 degrees of freedom). Multiple partial F tests are used when testing the significance of a group of variables,\(^\text{105}\) in this case the three dummy variables for the levels of GWG. Interaction was assessed in the final multivariable model. Statistical significance for each interaction term was set at a two-tailed p-value<0.05.
Solid lines represent participants that were included in the analyses, and dashed lines are those that were excluded. The first five exclusion criteria were established based on findings in the literature. Mothers who were interviewed at less than 6 months postpartum were excluded because they would not have had sufficient time to return to their pre-pregnancy weight. Next, participants were excluded in the following order: \(^a\)pre-term births (under 37 weeks of gestation), \(^b\)pregnant at the time of the interview, \(^c\)language barrier to receiving health care, and \(^d\)maternal age below 19, over 39 years, or missing. Next, participants were excluded due to missing or out of range values. \(^e\)BMI values below 14 kg/m\(^2\) or above 48 kg/m\(^2\), and \(^f\)gestational weight gain below or above 2 standard deviations from the mean were considered implausible. \(^g\)Gestational Weight Gain, \(^h\)Postpartum Weight Retention.

Figure 3.1 Study Sample Flow Chart
Figure 3.2 Modified Directed Acyclic Graph

The modified directed acyclic graph illustrates the pathways from satisfaction with health care to postpartum weight retention, with variables available from the MES. The shaded grey areas represent different times throughout the course of the pregnancy, from lightest to darkest grey areas (left to right): pre-pregnancy variables, pregnancy variables and postpartum variables.
Table 3.1 Recoded Variables

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Survey Question(s)</th>
<th>Survey Coding</th>
<th>Re-coding for Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Satisfaction with Perinatal Care</td>
<td>Overall, how satisfied or dissatisfied were you with: 1) the information given to you by your healthcare providers, 2) the compassion and understanding shown by your healthcare providers, 3) the competency of healthcare providers, 4) the concern of your healthcare providers for privacy and dignity 5) the respect shown to you by your healthcare providers 6) your involvement in decision making with your healthcare providers.</td>
<td>Categorical Variable (for each question): Very Satisfied, Somewhat satisfied, Neither satisfied nor dissatisfied, Somewhat dissatisfied, very dissatisfied</td>
<td>Continuous variable, overall summated score for all six dimensions.</td>
</tr>
<tr>
<td>Postpartum Weight Retention</td>
<td>Weight at time of interview, pre-pregnancy weight</td>
<td>Continuous variable, kg</td>
<td>(Weight at time of interview) – (Pre-pregnancy Weight)</td>
</tr>
<tr>
<td>Maternal Age</td>
<td>Age of mother at time of interview</td>
<td>Continuous variable</td>
<td>Continuous variable</td>
</tr>
<tr>
<td>Income</td>
<td>Income of all household members in past 12 months</td>
<td>Categorical variable: &lt;10K, 10 to &lt;15K, 15 to &lt;20K, 20 to &lt;30K, 30 to &lt;40K, 40 to &lt;50K, 50 to &lt;60K, 60 to &lt;80K, 80 to &lt;100K, 100 to &lt;150K, 150 to &lt;200K, $200 ≤</td>
<td>Dichotomous variable: Under 30K, 30K or more</td>
</tr>
<tr>
<td>Education Level</td>
<td>A) Did you receive any other education (other than a high school diploma) that could be counted towards a degree, certificate, or diploma from an educational institution?</td>
<td>Dichotomous variable: Yes, No</td>
<td>Categorical variable: High school graduate or less, Below Bachelor Degree, University Certificate</td>
</tr>
<tr>
<td></td>
<td>B) What is the highest degree, certificate or diploma you obtained? Respondents who answered yes to question A.</td>
<td>Categorical variable: No post-secondary certificate or diploma, Trade certificate/diploma, Non-university certificate or diploma from a college, CEGEP, school of nursing, etc., University certificate below bachelor’s degree.</td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Survey Question(s)</td>
<td>Survey Coding</td>
<td>Re-coding for Analysis</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------</td>
<td>---------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Bachelor’s degree, University degree or certificate above bachelor’s degree</td>
<td>Bachelor’s degree, University degree or certificate above bachelor’s degree</td>
<td>Bachelor’s degree, University degree or certificate above bachelor’s degree</td>
<td>Bachelor’s degree, University degree or certificate above bachelor’s degree</td>
</tr>
<tr>
<td>Parity</td>
<td>How many times have you given birth to a live baby? (Including current birth)</td>
<td>Continuous variable</td>
<td>Dichotomous variable: Primiparous, Multiparous</td>
</tr>
<tr>
<td>Pre-Pregnancy BMI</td>
<td>BMI of mother before pregnancy</td>
<td>Continuous variable</td>
<td>Continuous variable, with BMI correction factor</td>
</tr>
<tr>
<td>Aboriginal Status</td>
<td>What is your 1st identified ethnic identity?</td>
<td>Categorical variable: British Isles, French, Aboriginal, North American, Caribbean, Latin/central/south America, European, African, Arab, West Asian, South Asian, East and southeast Asian, Oceania, Other</td>
<td>Dichotomous: Aboriginal, non-Aboriginal</td>
</tr>
<tr>
<td>Mode of Delivery</td>
<td>Did you have a vaginal or cesarean birth?</td>
<td>Dichotomous variable: Vaginal, Cesarean</td>
<td>Dichotomous variable: Vaginal, Cesarean</td>
</tr>
<tr>
<td>Gestational Weight Gain</td>
<td>Weight gained by mother during pregnancy (kg)</td>
<td>Continuous variable, kg</td>
<td>Categorical: inadequate GWG, optimal GWG, excessive GWG</td>
</tr>
<tr>
<td>Infant in the NICU</td>
<td>Immediately after birth, was (baby) admitted to the intensive care or special care unit?</td>
<td>Dichotomous variable: Yes, No</td>
<td>Dichotomous variable: Yes, No</td>
</tr>
<tr>
<td>Breastfeeding Duration</td>
<td>A) Did you breastfeed or try to breastfeed ^baby’s name even if only for a short time?</td>
<td>Dichotomous variable: Yes, No</td>
<td>Categorical variable: Never breastfed, breastfed for less than 6 months, breastfed for 6 months or more</td>
</tr>
<tr>
<td></td>
<td>B) Are you breastfeeding, even if occasionally? All respondents who answered yes to question A.</td>
<td>Dichotomous variable: Yes, No</td>
<td>Categorical variable: Never breastfed, breastfed for less than 6 months, breastfed for 6 months or more</td>
</tr>
<tr>
<td>Postpartum Support Availability</td>
<td>Postpartum, how often was support available to you when you needed it?</td>
<td>Categorical variable: none of the time, little of the time, some of the time, most of the time, all the time</td>
<td>Categorical variable: none of the time, little of the time, some of the time, most of the time, all the time</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Survey Question(s)</td>
<td>Survey Coding</td>
<td>Re-coding for Analysis</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Smoking Postpartum</td>
<td>At the present time, do you smoke cigarettes daily, occasionally, or not at all?</td>
<td>Categorical variable: Daily, occasionally, not at all</td>
<td>Dichotomous variable: Smoker, non-smoker</td>
</tr>
<tr>
<td>Postpartum Depression</td>
<td>Edinburgh Postnatal Depression Scale Score. Calculated for respondents who answered all the scale items.</td>
<td>Continuous variable</td>
<td></td>
</tr>
<tr>
<td>Time Postpartum</td>
<td>Age of baby at time of interview</td>
<td>Categorical variable, months</td>
<td>Continuous variable, months</td>
</tr>
<tr>
<td>Postpartum BMI</td>
<td>Current BMI of mother</td>
<td>Continuous variable</td>
<td>Continuous variable, with BMI correction factor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Categorical variable: Underweight, normal weight, overweight, obese class I, obese class II and III</td>
<td></td>
</tr>
<tr>
<td>Overall labour/birth experience</td>
<td>Overall, would you describe the experience of labour and birth as…</td>
<td>Categorical variable: Very negative, somewhat negative, neither negative nor positive, somewhat positive, very positive</td>
<td>Categorical variable: Very negative, somewhat negative, neither negative nor positive, somewhat positive, very positive</td>
</tr>
<tr>
<td>Healthcare Practitioner Type</td>
<td>A) From which type of healthcare provider did you receive most care? Respondents who had prenatal care visits</td>
<td>Categorical variable: Obstetrician, Gynecologist, OBGYN, Family Doctor, General Practitioner, Doctor, Midwife, Nurse/Nurse Practitioner, Other</td>
<td>Categorical variable: OBGYN, Family doctor, Midwife, Nurse, Other Doctor</td>
</tr>
<tr>
<td></td>
<td>B) What type of doctor was this? All respondents who had a prenatal care visit, and responded Doctor to question A.</td>
<td>Categorical variable: Obstetrician, Gynecologist, Family Doctor, General Practitioner, Other Doctor, Valid Skip</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 4 Results

The first section of chapter 4 summarizes descriptive characteristics of the study population, starting with potential confounders and covariates, followed by the exposure and outcome variables. Section 4.2 presents the correlations and principal components analysis between the six dimensions of satisfaction. The results from linear regression model building are presented in sections 4.3 and 4.4 for univariable and multivariable regression models of the main association, and univariable and multivariable regression models of two individual dimensions of satisfaction, respectively. Findings for the interaction analyses of pre-pregnancy BMI, and gestational weight gain individually, on the main associations are presented in section 4.5. Tables summarizing the findings of each section are found in the final section of the chapter.

4.1 Sample Description

The study population consists of 4,110 women who gave birth to a singleton baby 6 to 15 months postpartum. Perinatal care was most commonly received from obstetricians/gynecologists (57.6%) and family physicians (34.6%). Table 4.1 provides means and standard deviations for continuous variables, and percentages for categorical variables. In addition, Tables 4.2, 4.3, and 4.4 summarize descriptive statistics for the individual dimensions of satisfaction, and adherence to gestational weight gain guidelines, respectively.

4.1.1 Covariates and Confounding Variables

The mean maternal age of the participants in the study was 30 years old, with an average pre-pregnancy BMI of 25 kg/m². Most of the mothers had a household income above $30,000 (86%) and an educational level attainment greater than a high school diploma (63%). The majority of the mothers were married (68%) or in a common law relationship (25%), and did not identify as Aboriginal (97%). The population consisted of about half primiparous (45%) and multiparous (55%) mothers.
Throughout the gestational period, only 16% of the mothers met their recommended GWG based on their pre-pregnancy BMI, and more than half, approximately 55%, gained above their weight gain recommendations. When the sample was separated in BMI groups: underweight, normal, overweight and obese class I, and obese class II and III, the group with the highest percentage of mothers gaining above the GWG recommendations, was among those who were obese class I (87%), and obese class II/III (75%). The majority of underweight mothers gained within the optimal GWG. Among the normal weight mothers, 37% gained within the recommended range, 40% above, and 23% below the recommendations, see Table 4.3. The majority of the mothers (76%) had a vaginal delivery.

The population’s average postpartum BMI increased slightly to 26 kg/m\(^2\) at 6 months or more after giving birth. About 10% of infants were admitted to the NICU after birth. Most mothers tried to breastfeed their infant (91%), with 47% who breastfed for 6 months or more. Approximately 9% of mothers smoked, even occasionally postpartum, and 6.6% of mothers had signs of postpartum depression (score $\geq 13$) according to the 10-item Edinburgh Postnatal Depression Scale, see Table 4.1.

### 4.1.2 Exposure and Outcome Variables

The average overall satisfaction score with health care encounters was 27.81 (SD 3.28) out of a maximum score of 30. Only about 1% of respondents reported being very dissatisfied on any satisfaction dimension, with HCP concern for privacy having the highest percentage, 1.2%. Overall, the study population was very satisfied with each of the six dimensions of satisfaction with care, with 60% or more of respondents answering very satisfied on any of the 6 dimensions. The average weight retention at 6 to 15 months postpartum, was 2.5 kg (SD 5.57), see Table 4.1. 63% of the population retained some weight postpartum, see Table 4.4.

### 4.2 Correlation & Principal Components Analysis Between the Six Satisfaction Dimensions

The six satisfaction dimensions were strongly correlated, with correlation coefficients between 0.35 and 0.64. The lowest correlation was between the satisfaction
with information provided, and satisfaction with compassion dimensions, and the highest
correlation was between satisfaction with respect shown, and concern for privacy, see
Appendix B Table B.2. The results for the PCA indicated that the first principal
component had an eighenvalue greater than 1, explaining 58% of the variation, while the
other components had eighenvalues below 1, see Appendix B Table B.3. This indicates
that most of the variation can be explained by the first principal component. The first
principal component had loading factors ranging from 0.37-0.49 for each of the six
satisfaction variables, see Appendix Table B.4. These loading factors correspond to the
amount of weight that each variable contributes to the first principal component, and
generally only variables with loading factors of 0.3 or greater are included, as they
considerably contribute to the component. Large loading factors contribute more
weight than small loading factors, however given that these weights are approximately
equal, summing the individual scores to create one overall satisfaction variable is
appropriate.

4.3 Univariable and Multivariable Analysis

Results from the univariable and multivariable analyses of overall satisfaction
with health care, and the potential confounders and covariates on PPWR are presented in
Table 4.5. Univariable analysis indicates that all pre-pregnancy variables are associated
with PPWR at a 0.05 significance level. Among the pregnancy variables, GWG was
significantly associated with PPWR, but not mode of delivery. Postpartum variables that
were significantly associated with PPWR, in the univariable model were: breastfeeding
duration and smoking.

Variables were added in three blocks: pre-pregnancy, pregnancy and postpartum
variables. As each block was added in the model, confounding variables were backward
eliminated at a 0.2 significance level, beginning with the variable with the highest p
value. This step was repeated until all confounders in the final model were significant. As
each block was added to the model, the direction of the main effect, overall satisfaction
with health care score, on PPWR retained its negative association, however decreased in
magnitude. The p-value increases towards non-significance, possibly because the
additional variables are more strongly associated with postpartum weight retention.
compared to satisfaction with care. The first multivariable model indicates that on average, when adjusting for all pre-pregnancy variables, there is a significant 0.061 kg decrease in PPWR, for every one-unit increase in overall satisfaction. The second model decreases slightly in effect, but remains statistically significant. On average, for every one unit increase in overall satisfaction score, there is a 0.058 kg decrease in PPWR, adjusting for pre-pregnancy and pregnancy variables. Adding the final block (postpartum variables) decreases the magnitude of effect, and the p-value is not statistically significant. As each block is added to the model, the R² value increases from 0.035 to 0.106, and the sample size decreases slightly from 3815 to 3786 observations. The decrease in sample size is due to the use of a complete case analysis.

4.4 Individual Dimensions of Satisfaction and PPWR

The individual satisfaction dimensions: satisfaction with information received and satisfaction with personal involvement in decision making were analysed to determine their individual effects on PPWR. The results are summarized in tables 4.6 and 4.7 for satisfaction with information received, and with involvement in decision-making, respectively.

4.4.1 Satisfaction with Information Received

Univariable analysis indicates that there is a negative and significant, but small association between satisfaction with information received and PPWR. As satisfaction with information received increases by one unit, PPWR decreases by 0.33 kg. As each block was added to the multivariable models, the effect measure remains negative, but decreases in magnitude and the p value increases. The final model, adjusting for significant pre-pregnancy, pregnancy and postpartum confounders, indicates that on average, for every one unit increase in satisfaction with information received, there is a significant 0.23 kg decrease in PPWR.

4.4.2 Satisfaction with Decision Making

Univariable analysis between a patient’s satisfaction with their involvement in decision-making, and PPWR, indicates a significant negative association. As satisfaction
with involvement in decision-making increases by one unit, PPWR decreases by 0.36 kg. Multivariable analyses, show a significant decreasing magnitude of effect as each block of variables are added. The final model, controlling for pre-pregnancy, pregnancy and postpartum variables, indicates that PPWR significantly decreases by 0.27 kg, for every one-point increase in satisfaction with decision-making.

### 4.5 Interaction Analysis

Results of the interaction analyses are presented in Table 4.8. The possibility for interaction was tested in the final multivariable model for the effect of overall satisfaction on PPWR, adjusted for significant pre-pregnancy, pregnancy and postpartum confounders at a 0.2 level. There is no evidence to suggest that gestational weight gain, or pre-pregnancy BMI may interact in the association between overall satisfaction with care and PPWR. The greater F value for the GWG variable could imply that GWG may have a stronger interactive effect in the association between satisfaction with care and PPWR, compared to pre-pregnancy BMI.
### Table 4.1 Sample Characteristics: Pre-pregnancy, Pregnancy and Postpartum Variables

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>N</th>
<th>Mean (SD)</th>
<th>Percent</th>
<th>Number of Missing Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Variables of Interest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL SATISFACTION WITH CARE</td>
<td>4110</td>
<td>27.81 (3.28)</td>
<td>---</td>
<td>0</td>
</tr>
<tr>
<td>POSTPARTUM WEIGHT RETENTION (kg)</td>
<td>4110</td>
<td>2.5 (5.57)</td>
<td>---</td>
<td>0</td>
</tr>
<tr>
<td><strong>Potential Confounders &amp; Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Age (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 K or More</td>
<td>3360</td>
<td>30 (4.56)</td>
<td>---</td>
<td>85.5% 180</td>
</tr>
<tr>
<td>Under 30 K</td>
<td>570</td>
<td>---</td>
<td></td>
<td>14.5%</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor degree or higher</td>
<td>1000</td>
<td>---</td>
<td></td>
<td>24.4% 20</td>
</tr>
<tr>
<td>Below Bachelors degree, above high school diploma</td>
<td>1570</td>
<td>---</td>
<td></td>
<td>38.4%</td>
</tr>
<tr>
<td>High school diploma or less</td>
<td>1520</td>
<td>---</td>
<td></td>
<td>37.2%</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>2780</td>
<td>---</td>
<td></td>
<td>67.6% 0</td>
</tr>
<tr>
<td>Common Law</td>
<td>1020</td>
<td>---</td>
<td></td>
<td>24.8%</td>
</tr>
<tr>
<td>Widowed/Single/Separated/Divorced</td>
<td>310</td>
<td>---</td>
<td></td>
<td>7.54%</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primiparous</td>
<td>1850</td>
<td>---</td>
<td></td>
<td>45.1% 10</td>
</tr>
<tr>
<td>Multiparous</td>
<td>2250</td>
<td>---</td>
<td></td>
<td>54.9%</td>
</tr>
<tr>
<td>Pre-pregnancy BMI (kg/m²)</td>
<td>4110</td>
<td>25.22 (4.97)</td>
<td>---</td>
<td>0</td>
</tr>
<tr>
<td>Pre-pregnancy BMI, by category</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight (&lt;18.5 kg/m²)</td>
<td>120</td>
<td>---</td>
<td></td>
<td>2.9%</td>
</tr>
<tr>
<td>Normal weight (18.5-24.9 kg/m²)</td>
<td>2240</td>
<td>---</td>
<td></td>
<td>54.5%</td>
</tr>
<tr>
<td>Overweight (25-29.9 kg/m²)</td>
<td>1090</td>
<td>---</td>
<td></td>
<td>26.5%</td>
</tr>
<tr>
<td>Obese Class I, II and III (&gt;30 kg/m²)</td>
<td>660</td>
<td>---</td>
<td></td>
<td>16.1%</td>
</tr>
<tr>
<td>1st Identified Aboriginal Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Aboriginal</td>
<td>3880</td>
<td>---</td>
<td></td>
<td>97.0% 110</td>
</tr>
<tr>
<td>Aboriginal</td>
<td>120</td>
<td>---</td>
<td></td>
<td>3.00%</td>
</tr>
<tr>
<td>Gestation Weight Gain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive GWG</td>
<td>2250</td>
<td>---</td>
<td></td>
<td>54.7%</td>
</tr>
<tr>
<td>Optimal GWG</td>
<td>660</td>
<td>---</td>
<td></td>
<td>16.1%</td>
</tr>
<tr>
<td>Inadequate GWG</td>
<td>1200</td>
<td>---</td>
<td></td>
<td>29.2%</td>
</tr>
<tr>
<td>Type of Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>3110</td>
<td>---</td>
<td></td>
<td>75.7% 0</td>
</tr>
<tr>
<td>Cesarean Section</td>
<td>1000</td>
<td>---</td>
<td></td>
<td>24.3%</td>
</tr>
<tr>
<td>Type of Healthcare Professional Who Provided Most Care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetrician/Gynecologist</td>
<td>2350</td>
<td>---</td>
<td></td>
<td>57.6% 30</td>
</tr>
<tr>
<td>Family Physician</td>
<td>1410</td>
<td>---</td>
<td></td>
<td>34.6%</td>
</tr>
<tr>
<td>Nurse</td>
<td>270</td>
<td>---</td>
<td></td>
<td>6.6%</td>
</tr>
<tr>
<td>Midwife</td>
<td>20</td>
<td>---</td>
<td></td>
<td>0.49%</td>
</tr>
<tr>
<td>Other</td>
<td>30</td>
<td>---</td>
<td></td>
<td>0.74%</td>
</tr>
<tr>
<td>Newborn in Neonatal Intensive Care Unit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>390</td>
<td>---</td>
<td></td>
<td>9.5% 10</td>
</tr>
<tr>
<td>No</td>
<td>3710</td>
<td>---</td>
<td></td>
<td>90.5%</td>
</tr>
<tr>
<td>Breastfeeding Duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Breastfed</td>
<td>370</td>
<td>---</td>
<td></td>
<td>9.00% 10</td>
</tr>
<tr>
<td>Under 6 months</td>
<td>1800</td>
<td>---</td>
<td></td>
<td>43.9%</td>
</tr>
<tr>
<td>6 months or more</td>
<td>1930</td>
<td>---</td>
<td></td>
<td>47.1%</td>
</tr>
<tr>
<td>Postpartum Support Availability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>40</td>
<td>---</td>
<td></td>
<td>1.00%</td>
</tr>
</tbody>
</table>
### Table 4.2 Individual Dimensions of Satisfaction with Perinatal Health Care

<table>
<thead>
<tr>
<th>Satisfaction Variable</th>
<th>Very Satisfied, Score=5 (%)</th>
<th>Satisfied Score=4, (%)</th>
<th>Neither Satisfied, nor dissatisfied Score=3, (%)</th>
<th>Dissatisfied Score=2, (%)</th>
<th>Very Dissatisfied, Score=1 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Provided</td>
<td>2590 (63.17)</td>
<td>1220 (29.76)</td>
<td>150 (3.66)</td>
<td>110 (2.68)</td>
<td>30 (0.73)</td>
</tr>
<tr>
<td>HCP Compassion</td>
<td>2730 (66.42)</td>
<td>1070 (26.03)</td>
<td>160 (3.89)</td>
<td>110 (2.68)</td>
<td>40 (0.97)</td>
</tr>
<tr>
<td>HCP Competency</td>
<td>3200 (78.05)</td>
<td>720 (17.56)</td>
<td>70 (1.71)</td>
<td>70 (1.71)</td>
<td>40 (0.97)</td>
</tr>
<tr>
<td>Respect Shown</td>
<td>3290 (80.05)</td>
<td>650 (15.82)</td>
<td>80 (1.95)</td>
<td>60 (1.50)</td>
<td>30 (0.73)</td>
</tr>
<tr>
<td>HCP concern for patient privacy</td>
<td>3150 (76.64)</td>
<td>710 (17.27)</td>
<td>110 (2.68)</td>
<td>90 (2.19)</td>
<td>50 (1.22)</td>
</tr>
<tr>
<td>Patient involvement in decision making</td>
<td>3020 (73.48)</td>
<td>870 (21.17)</td>
<td>100 (2.43)</td>
<td>90 (2.19)</td>
<td>30 (0.73)</td>
</tr>
</tbody>
</table>

*Note: results were rounded to nearest ten, therefore total sample size for each satisfaction dimension may not equal 4110.*
## Table 4.3 Adherence to GWG Guidelines, by Pre-pregnancy BMI

<table>
<thead>
<tr>
<th>Pre-pregnancy BMI</th>
<th>Inadequate GWG (%)</th>
<th>Optimal GWG (%)</th>
<th>EGWG (%)</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>30 (27.27)</td>
<td>50 (45.45)</td>
<td>30 (27.27)</td>
<td>110 (100)</td>
</tr>
<tr>
<td>Normal Weight</td>
<td>510 (22.67)</td>
<td>840 (37.33)</td>
<td>900 (40.00)</td>
<td>2 250 (100)</td>
</tr>
<tr>
<td>Overweight</td>
<td>50 (4.59)</td>
<td>270 (24.77)</td>
<td>770 (70.64)</td>
<td>1 090 (100)</td>
</tr>
<tr>
<td>Obese Class I</td>
<td>40 (8.89)</td>
<td>20 (4.45)</td>
<td>390 (86.67)</td>
<td>450 (100)</td>
</tr>
<tr>
<td>Obese Class II and III</td>
<td>40 (20.00)</td>
<td>10 (5.00)</td>
<td>150 (75.00)</td>
<td>200 (100)</td>
</tr>
</tbody>
</table>

## Table 4.4 Pre and Post Pregnancy Weight Differences

<table>
<thead>
<tr>
<th>Weight Difference</th>
<th>Number of respondents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same</td>
<td>700 (17.03)</td>
</tr>
<tr>
<td>Lost weight</td>
<td>830 (20.20)</td>
</tr>
<tr>
<td>Retained weight</td>
<td>2580 (62.77)</td>
</tr>
</tbody>
</table>
### Table 4.5 Univariable and Multivariable Regression Models of Overall Satisfaction with Health Care on PPWR

<table>
<thead>
<tr>
<th>Variables</th>
<th>Univariable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effect Size (95% Confidence Interval)</td>
<td>$R^2 = 0.0347$</td>
<td>$R^2 = 0.0965$</td>
<td>$R^2 = 0.1058$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$N = 3815$</td>
<td>$N = 3815$</td>
<td>$N = 3786$</td>
</tr>
<tr>
<td>Overall Satisfaction with Perinatal Care</td>
<td>-0.065* (-0.116, -0.014)</td>
<td>-0.061* (-0.113, -0.009)</td>
<td>-0.058*(-0.109, -0.007)</td>
<td>-0.046 (-0.099, 0.006)</td>
</tr>
<tr>
<td>Pre-pregnancy Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Age (years)</td>
<td>-0.114**(0.150, -0.077)</td>
<td>-0.037 (-0.081, 0.007)</td>
<td>-0.031 (-0.074, 0.011)</td>
<td>-0.028 (-0.071, 0.014)</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 K or Greater</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Under 30 K</td>
<td>1.321** (0.847, 1.794)</td>
<td>0.843** (0.299, 1.387)</td>
<td>0.956** (0.429, 1.483)</td>
<td>0.995** (0.466, 1.524)</td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor Degree or Higher</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Below Bachelors Degree</td>
<td>0.614** (0.231, 0.998)</td>
<td>0.673** (0.273, 1.072)</td>
<td>0.582** (0.195, 0.969)</td>
<td>0.496** (0.105, 0.887)</td>
</tr>
<tr>
<td>High School Diploma or Lesser</td>
<td>1.522** (1.090, 1.955)</td>
<td>1.188** (0.683, 1.692)</td>
<td>1.048** (0.559, 1.537)</td>
<td>0.917** (0.422, 1.409)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Common Law</td>
<td>0.439*(0.047, 0.830)</td>
<td>-0.036 (-0.443, 0.371)</td>
<td>-0.08 (-0.474, 0.315)</td>
<td>-0.165 (-0.561, 0.232)</td>
</tr>
<tr>
<td>Widowed/Separated/Divorced</td>
<td>0.664*(0.027, 1.301)</td>
<td>-0.735 (-1.499, 0.028)</td>
<td>-0.911*(-1.650, -0.172)</td>
<td>-1.006** (-1.747, -0.265)</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primiparous</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Multiparous</td>
<td>-0.749** (-1.084, -0.413)</td>
<td>-0.648** (-1.000, -0.296)</td>
<td>-0.382*(-0.725, -0.040)</td>
<td>-0.421*(-0.765, -0.077)</td>
</tr>
<tr>
<td>Pre-Pregnancy BMI (kg/m²)</td>
<td>-0.122** (-0.156, -0.089)</td>
<td>-0.122** (-0.156, -0.088)</td>
<td>-0.2** (-0.234, -0.165)</td>
<td>-0.210** (-0.244, -0.175)</td>
</tr>
<tr>
<td>Aboriginal Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Aboriginal</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Aboriginal</td>
<td>1.317** (0.323, 2.311)</td>
<td>1.183* (0.153, 2.213)</td>
<td>1.377** (0.380, 2.374)</td>
<td>1.348** (0.349, 2.347)</td>
</tr>
<tr>
<td>Pregnancy Variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>Reference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cesarean Section</td>
<td>0.249 (-0.140, 0.638)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variables</td>
<td>Effect Size (95% Confidence Interval)</td>
<td>Univariable</td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>Effect Size (95% Confidence Interval)</strong></td>
<td></td>
<td></td>
<td>$R^2 = 0.0347$</td>
<td>$R^2 = 0.0965$</td>
</tr>
<tr>
<td><strong>Variables</strong></td>
<td></td>
<td>$N = 3815$</td>
<td>$N = 3815$</td>
<td>$N = 3786$</td>
</tr>
<tr>
<td>Gestational Weight Gain</td>
<td>Inadequate</td>
<td>$-1.625^{**}(-2.131, -1.119)$</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Met</td>
<td>Reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exceeded</td>
<td>$1.580^{**}(1.206, 1.954)$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postpartum Variables</td>
<td>Infant in the NICU</td>
<td>No</td>
<td>Reference</td>
<td>0.221 (-0.348, 0.789)</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>Reference</td>
<td>0.221 (-0.348, 0.789)</td>
<td>---</td>
</tr>
<tr>
<td>Breastfeeding Duration</td>
<td>6 Months or more</td>
<td>Reference</td>
<td>0.866**(0.516, 1.216)</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Under 6 months</td>
<td>Reference</td>
<td>0.970**(0.367, 1.574)</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Not at all</td>
<td>Reference</td>
<td>0.970**(0.367, 1.574)</td>
<td>---</td>
</tr>
<tr>
<td>Postpartum Support Availability</td>
<td>None of the Time</td>
<td>1.905**(0.235, 3.575)</td>
<td>0.629 (-1.161, 2.419)</td>
<td>0.629 (-1.161, 2.419)</td>
</tr>
<tr>
<td></td>
<td>Little of the Time</td>
<td>-0.4676 (-1.338, 0.403)</td>
<td>-0.410 (-1.305, 0.485)</td>
<td>-0.410 (-1.305, 0.485)</td>
</tr>
<tr>
<td></td>
<td>Some of the Time</td>
<td>-0.0023 (-0.595, 0.590)</td>
<td>-0.086 (-0.676, 0.505)</td>
<td>-0.086 (-0.676, 0.505)</td>
</tr>
<tr>
<td></td>
<td>Most of the Time</td>
<td>0.1599 (-0.209, 0.529)</td>
<td>0.358 (-0.003, 0.718)</td>
<td>0.358 (-0.003, 0.718)</td>
</tr>
<tr>
<td></td>
<td>All the Time</td>
<td>Reference</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>Smoking Postpartum</td>
<td>Non-Smoker</td>
<td>Reference</td>
<td>0.681**(0.227, 1.133)</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Smoker</td>
<td>0.681**(0.227, 1.133)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Postpartum Depression</td>
<td>Not Depressed</td>
<td>Reference</td>
<td>0.532 (-0.145, 1.210)</td>
<td>Reference</td>
</tr>
<tr>
<td></td>
<td>Depressed</td>
<td>Reference</td>
<td>0.532 (-0.145, 1.210)</td>
<td>Reference</td>
</tr>
<tr>
<td>Time Postpartum (months)</td>
<td></td>
<td></td>
<td>$-0.177 (-0.378, 0.023)$</td>
<td>$-0.309^{**}(-0.506, -0.111)$</td>
</tr>
</tbody>
</table>

Shaded areas represent variables that have not yet been added.

--- represents variables that were removed from the model using stepwise backwards elimination at a 0.2 significance level.

*significant at p<0.05, ** significant at p<0.01
### Table 4.6 Univariable and Multivariable Analysis for Satisfaction with Information Received and PPWR

<table>
<thead>
<tr>
<th>Model</th>
<th>Effect Size</th>
<th>P Value</th>
<th>95% Confidence Interval</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univariable</td>
<td>-0.33</td>
<td>0.003</td>
<td>-0.55, -0.11</td>
<td>4110</td>
</tr>
<tr>
<td>1 Model 1</td>
<td>-0.29</td>
<td>0.011</td>
<td>-0.52, -0.07</td>
<td>3815</td>
</tr>
<tr>
<td>2 Model 2</td>
<td>-0.26</td>
<td>0.019</td>
<td>-0.48, -0.04</td>
<td>3815</td>
</tr>
<tr>
<td>3 Model 3</td>
<td>-0.23</td>
<td>0.045</td>
<td>-0.45, -0.01</td>
<td>3786</td>
</tr>
</tbody>
</table>

1 Model 1: Maternal age, Income, Education, Marital status, Parity, Pre-pregnancy body mass index, Aboriginal status
2 Model 2: Model 1 & Gestational weight gain
3 Model 3: Income, Education, Marital Status, Parity, Pre-pregnancy body mass index, Aboriginal status, Gestational weight gain, Breastfeeding duration, Postpartum support, Postpartum depression, Time postpartum

### Table 4.7 Univariable and Multivariable Analysis for Satisfaction with Decision Making and PPWR

<table>
<thead>
<tr>
<th>Model</th>
<th>Effect Size</th>
<th>P Value</th>
<th>95% Confidence Interval</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univariable</td>
<td>-0.36</td>
<td>0.003</td>
<td>-0.60, -0.12</td>
<td>4110</td>
</tr>
<tr>
<td>1 Model 1</td>
<td>-0.32</td>
<td>0.009</td>
<td>-0.56, -0.08</td>
<td>3815</td>
</tr>
<tr>
<td>2 Model 2</td>
<td>-0.31</td>
<td>0.009</td>
<td>-0.54, -0.08</td>
<td>3815</td>
</tr>
<tr>
<td>3 Model 3</td>
<td>-0.27</td>
<td>0.025</td>
<td>-0.51, -0.04</td>
<td>3786</td>
</tr>
</tbody>
</table>

1 Model 1: Maternal age, Income, Education, Marital status, Parity, Pre-pregnancy body mass index, Aboriginal status
2 Model 2: Model 1 & Gestational weight gain
3 Model 3: Model 2 & Breastfeeding duration, Postpartum support, Postpartum depression, Time postpartum

### Table 4.8 Two-way Interaction Analysis of Pre-Pregnancy BMI, and GWG Between the Association of Overall Satisfaction with Health Care and PPWR in the Final Multivariable Model

<table>
<thead>
<tr>
<th>Interaction Variable</th>
<th>Degrees of Freedom</th>
<th>F value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Pregnancy BMI*Overall Satisfaction Score</td>
<td>1</td>
<td>0.53</td>
<td>0.4661</td>
</tr>
<tr>
<td>Gestational Weight Gain*Overall Satisfaction Score</td>
<td>2</td>
<td>2.41</td>
<td>0.0901</td>
</tr>
</tbody>
</table>
Chapter 5 Discussion

This final chapter discusses the significance of the study findings bringing results together in the context of the literature and public health implications. The chapter begins by discussing the main findings, starting with the individual exposure and outcome variables, satisfaction with health care and PPWR. Next, it discusses the association between the two variables, as well as the effect of significant confounders on PPWR, and the association between the individual dimensions of satisfaction with care: information received and decision-making on PPWR. The following section of the chapter highlights strengths and limitations of the study. Implications and recommendations for future studies are discussed in the final section.

5.1 Main Findings and Consistency with the Literature

5.1.1 Satisfaction with Perinatal Health Care

Overall satisfaction with health care during pregnancy, labour and birth, and postpartum reflected that most of the respondents were very satisfied or satisfied, with very little variation in level of satisfaction between the 6 dimensions and between the respondents. High satisfaction levels are consistent with previous findings in health care.40,107

It has been suggested that studies focus on the dissatisfied population in order to identify potential reasons for dissatisfaction.108 Others authors suggest identifying the differences between individuals who report being satisfied rather than very satisfied.45 These may be plausible suggestions for improving the understanding of health care satisfaction measures, however other factors must be taken into consideration. First, focusing on patients who report dissatisfaction on most of the dimensions would dramatically reduce the sample size. In the current study, less than 3% of the participants reported being dissatisfied or very dissatisfied on any dimension. In addition, this may be a specific subgroup of the population, perhaps individuals who are more demanding or have unrealistic expectations, or those who had a poor health care experience due to other factors. This is likely to reflect findings for a particular subgroup of the population, and
may not be reflective of the quality of health care received. Focusing only on the
dissatisfied subgroup could lead researchers to disregard relevant information from
patients who have reported being satisfied. Williams et al\textsuperscript{108} looked at the consistency
between reported satisfaction levels and qualitative interviews of patient experiences.
They found that patients who reported being satisfied still recalled their negative
experiences in the qualitative interview.

Second, analyzing participants who were \textit{satisfied} vs. \textit{very satisfied} may not
necessarily suggest that these differences in satisfaction arise due to a lower level of
satisfaction. Certain individuals may not want to rate all the satisfaction dimensions as
\textit{very satisfied}, and therefore may choose \textit{satisfied} for one or two questions without a true
reason. A study analyzing the differences between patients who are \textit{satisfied} compared to
those who are \textit{very satisfied} found that certain patients may distinguish between the two
options, however that they have different meanings.\textsuperscript{45} Certain patients describe being
\textit{satisfied} with their care as receiving average care, whereas other patients felt that this
meant their care was not optimal.\textsuperscript{45} The true meaning of the options on a Likert scale,
may vary depending on the patient’s expectations and previous experiences. It may be
more relevant to identify problem areas in health care delivery by looking at those who
answered \textit{very satisfied} or \textit{satisfied} on most of the dimensions, and \textit{dissatisfied} or \textit{very
dissatisfied} on others.

Quantitative measures of satisfaction may not accurately reflect actual
experiences. A study by Williams et al\textsuperscript{108} found that there were inconsistencies between
reported satisfaction levels and a patient’s actual experience. In addition, high satisfaction
levels may not equate to high levels of quality of care, therefore qualitative studies will
provide context to the quantitative measures.\textsuperscript{40} As shown by the holistic model, patient
characteristics are an important component of understanding the way patients evaluate
their care\textsuperscript{17}. It is therefore important to take into consideration patient values in order to
fully understand their health care experience.\textsuperscript{108} Combining a qualitative component with
a quantitative evaluation of care may help researchers understand the experiences of the
perinatal patient population and put their responses into context.
5.1.2 Postpartum Weight Retention

The average postpartum weight retention was 2.5 kg (SD 5.57) consistent with previous findings. A PPWR under 5 kg at 6 months postpartum is considered low PPWR. The sample analysed to generate these results is representative of the Canadian population, and indicates that there is very low PPWR. However, currently there is a great amount of research that has been conducted to identify risk factors and effective interventions for reducing postpartum weight retention, and ultimately in hopes of reducing obesity rates. Although PPWR is low, a great proportion of the population was either overweight or obese before pregnancy, therefore returning to their overweight or obese BMI would not indicate a healthy weight postpartum. This could imply that pregnancy itself is not associated with greater maternal weight postpartum. In fact, a recent longitudinal study comparing U.S women who had one child with those who did not have children did not find an association between pregnancy and obesity. This could indicate that women should be targeted early on, before their pregnancy to maintain a healthy weight. Even so, the opportunity for HCPs to influence during the pregnancy period and postpartum should not be undermined. Perhaps overweight, and obese mothers should be further supported in the postpartum period, and the focus should be on achieving a healthy weight, rather than returning to their pre-pregnancy weight.

5.1.3 Satisfaction with Overall Perinatal Health Care and PPWR

The main objective of this thesis was to determine whether satisfaction with health care encounters could influence maternal lifestyle behaviours to reduce postpartum weight retention. A holistic model, see Figure 2.1, illustrates the mechanism in which satisfaction with health care encounters can influence patient behaviours. The patient’s health care experience is screened based on their personal characteristics (values, beliefs, expectations, previous experiences, personality, health status and sociodemographics). The patient then assesses their satisfaction with the experience, a measurement that can vary depending on the assessment tool. Finally, their satisfaction with the experience may influence their behavioural reaction, which in turn creates a feedback loop to health care experience and individual characteristics.
Certain components from this model were taken into consideration when analyzing the relationship between satisfaction and PPWR, including patient sociodemographics and mental health status. Many other components of the model such as patient expectations, and past experiences were not available in the MES survey. Nonetheless, a directed acyclic graph was constructed through a comprehensive review of the literature in order to identify variables that may confound the relationship between the main variables.

Satisfaction with care has been shown to be associated with patient compliance and better health outcomes. The aim of this study was therefore to determine whether patient satisfaction could influence maternal health behaviours, by reducing PPWR. The multivariable regression analysis indicates that overall satisfaction with care does not have a significant effect on postpartum weight retention. As previously seen in the literature, satisfaction with care is difficult to measure, and given the limited data gathered by the MES, the measure was not tested for validity or reliability. In addition, although satisfaction may be associated with better patient compliance to medical regimen, behavioural habits and social norms are difficult to change. There are numerous dietary, and physical activity interventions seeking to change the behaviours of individuals, however these changes are very difficult, and even more challenging to maintain. Nonetheless, positive patient-physician interactions, a supportive environment and patient autonomy are becoming increasingly important for improving a patient’s health care experience, in hopes of reaching better health outcomes.

The final multivariable regression model, retaining all potential confounding variables at a 0.2 level of significance consisted of pre-pregnancy variables (maternal age, income, education, marital status, parity, pre-pregnancy BMI and aboriginal status), one pregnancy variable (gestational weight gain), and postpartum variables (breastfeeding duration, postpartum support, postpartum depression and time postpartum). Mode of delivery, infant in the NICU and smoking postpartum were non-significant, and therefore removed from the final model. Previous findings have found weak, or no association between these variables and satisfaction with care, as well as with PPWR.
Overall, the study population had high levels of satisfaction with health care, and low PPWR at 6 months or more. The low variability among participants regarding satisfaction with health care, and the lack of clinical significance between the association of satisfaction with care and PPWR restricts the thesis’ findings to very modest conclusions.

### 5.1.4 Significant Confounders and Covariates

The variables that had a significant magnitude of effect at a 0.05 significance in the final multivariable model, were: income, education, parity, pre-pregnancy BMI, aboriginal status, gestational weight gain, breastfeeding duration and time postpartum. These variables will be discussed below in the context of the current literature.

**Education & Income**

This study’s findings indicate that mothers with lower socioeconomic status (SES), including lower education and income level, had higher PPWR. In the literature, the association between SES and PPWR is unclear, however most studies were consistent with our findings. Education had a slightly larger magnitude of effect on PPWR compared to income, consistent with previous findings by Shrewsbury et al.\(^9\)

**Parity**

Parity had a significant negative association with PPWR, indicating that women who were multiparous had lower PPWR compared to women who were primiparous. In contrast, other studies found that parity and maternal weight have a positive association,\(^77\) and that they are more likely to transition to a higher BMI category postpartum.\(^73\) Discrepancies in findings may be due to variations for analyzing the parity variable as either categorical or continuous. Our findings could suggest that women who are multiparous have a greater sense of control\(^18\) due to past pregnancy experiences, and therefore can manage their weight more efficiently. However, it is important to note that women gain most of their weight in their first pregnancy,\(^30\) therefore, even though multiparous women had lower PPWR compared to primiparous women, their pre-pregnancy weight may have been greater to begin with.
**Pre-Pregnancy BMI**

The findings indicate that pre-pregnancy BMI and PPWR are negatively associated. That is, participants who were overweight or obese pre-pregnancy may have retained less weight postpartum. However they may still be in an unhealthy weight group at their postpartum weight, so retaining less weight may not imply that they have a healthier weight postpartum. Numerous studies have found a significant association between pre-pregnancy BMI and PPWR, however the direction of effect is unclear, suggesting that all women should be counseled on weight management postpartum, regardless of their pre-pregnancy BMI.

**Aboriginal Status**

This study indicates that there is a significantly higher PPWR among aboriginals, compared to non-aboriginals. Other studies have found conflicting findings between ethnicity and PPWR. This may be due to differences in classifying ethnicity, depending on the cultural context of the study. MES participants were grouped into aboriginal and non-aboriginals to highlight the findings in a Canadian context. Cultural differences may arise due to differences in body shape and social norms regarding weight during pregnancy, or cultural specific diet. However, only 3% of the study population were first identified aboriginals, therefore it is possible that the small group of aboriginal individuals may not be representative of most aboriginal women. In addition, the statistical significance between the two groups could be due to the weighting of the aboriginal status variable.

**Gestational Weight Gain**

The study indicates that there is a positive association between GWG and PPWR. Excessive GWG has the highest magnitude of effect on PPWR, and increases as other confounders were added in the final model. Participants who gained below their recommended weight during pregnancy had significantly lower weight retention compared to those who met their optimal weight. However, it is important to note that these guidelines were created to optimize infant and maternal health outcomes. Although
the study focuses on PPWR, gaining below the recommended weight may not be beneficial for the health of the mother or infant. Gestational weight gain was one of the most commonly cited variable found to be associated with PPWR\textsuperscript{109}. Numerous studies including longitudinal studies\textsuperscript{60,66} and a systematic review\textsuperscript{80} were conducted to research the relationship between gestational weight gain with short and long-term weight retention. Consistent with our findings, other studies indicate that high GWG is associated with high PPWR.

**Breastfeeding Duration**

Women who did not breastfeed at all, or those who breastfed for less than 6 months had a significantly higher PPWR compared to women who breastfed for more than 6 months. Women who did not breastfeed at all had the highest PPWR compared to those who breastfed for 6 months or more. There are inconsistent findings regarding breastfeeding duration and PPWR in the literature. Most studies found either a negative association,\textsuperscript{61} or no association between breastfeeding duration and PPWR.\textsuperscript{66,83}

**Time Postpartum**

Time postpartum was significantly associated with PPWR in the final multivariable model. As time postpartum increases, PPWR decreases. This association makes sense intuitively, as it takes some time for new mothers to return to their pre-pregnancy weight.

**5.1.5 Individual Effects of Satisfaction with Information Received, and Satisfaction with Involvement in Decision-Making on PPWR**

The results indicate that patients who have a higher level of satisfaction with information received and involvement in decision-making have significantly lower PPWR. In particular, satisfaction with decision-making had the greatest magnitude of effect on PPWR, compared to overall satisfaction and satisfaction with information received only. The findings may suggest that satisfaction with decision-making is the most influential aspect of health care for maternal behaviours. Providing patients with the ability to make informed decisions regarding their health represents patient autonomy.
This increases a patient’s self-efficacy, and control, two important factors associated with behavioural change,\textsuperscript{28} therefore providing the mother with confidence to manage her weight postpartum. Consistent with previous findings, a systematic review found numerous studies which state that patients’ perception of control and self-efficacy may be the strongest predictors of health care satisfaction, especially during the perinatal period.\textsuperscript{18}

Many studies have found that patients value a supportive patient-physician relationship. This includes clear communication,\textsuperscript{29} receiving information regarding their health,\textsuperscript{18} having time to ask questions\textsuperscript{34} and having their concerns addressed.\textsuperscript{30} The literature suggests that patient satisfaction with information received from a HCP, and patient involvement in decision-making are the most important dimensions when patients evaluate their maternal health care experience.\textsuperscript{32} Patient information received, and the ability to make decisions are two closely related concepts, reflecting a patient’s ability to make informed decisions about their health. The patients must first receive high quality, and clear information from their provider, and then they will have the knowledge to advocate for their health.

It is possible that other pre-pregnancy patient characteristics, such as personal self-efficacy, confidence, personality type, and previous knowledge have stronger influences on a patient’s ability to improve their lifestyle behaviours. Therefore, individuals who already feel more in control of their health may have lower PPWR, regardless of their health care experience. It may be easier for someone who has previous knowledge and confidence in their ability to make decisions to have higher levels of satisfaction due to their personality, rather than due to the actual health care delivered. The association between satisfaction with decision-making and PPWR may be weaker among individuals who initially have lower confidence in their ability to make behavioural changes, and therefore these individuals may need additional support.

### 5.2 Strengths

The study has several strengths that should be noted. First, analyses were conducted using a large and representative national sample, making the findings
generalizable to the Canadian population. Second, to the best of our knowledge, these research objectives are novel, in that this association has not yet been analysed in the Canadian context. The research questions reflect current issues regarding weight retention after pregnancy, and understanding influences of HCPs on the health of their pregnant patients. Third, although the satisfaction variable was not tested for validity and reliability, the individual questions were analyzed using PCA to form a comprehensive and unidimensional measure, while incorporating multidimensional aspects of satisfaction with care. Finally, the association between the main variables was analyzed by adjusting for variables identified through the construction of a DAG, providing theoretical justification for the chosen confounders.

5.3 Limitations

Study limitations include the use of secondary data, therefore the questionnaire does not directly reflect the research objectives. The MES gathers general information regarding maternal health care experiences from a representative sample of mothers who recently gave birth. This leads to the following issues specific to this study. First, satisfaction with care questions were not from a validated and reliable measurement tool, and therefore we cannot be certain it is an accurate reflection of patient satisfaction. Nonetheless, the satisfaction questions administered in the MES are reflective of most concepts that were commonly found in literature, and a PCA analysis was conducted to evaluate the six dimensions. Secondly, the variables for analysis were limited. Certain important variables identified in the original DAG were not available in the dataset, including: diabetes, physical activity and diet. These are important variables for researching weight gain, however controlling for other variables in the DAG likely reduced the confounding effects of the missing variables. Thirdly, consistent with other self-reported data, social desirability bias may have reduced the accuracy of the data. These are of greater concern among more sensitive topics, such as those regarding weight, height, smoking, alcohol use, etc. In order to reduce the possibility of bias regarding self-reported weight and height, a BMI correction factor was implemented, see Appendix C for a sample calculation. The limitation of this correction factor should be mentioned, as it has been found to be most reliable for overweight or obese adults, while
overestimating the BMIs of normal weight adults. Regardless of this downside, the authors still suggest that using this correction factor for obesity studies is more beneficial than relying on self-reported height and weight.99 Mothers were asked questions about their pregnancy, labour and birth, and postpartum experience at 6 months or more postpartum. It is likely that recall bias may reduce the accuracy of the data. Previous studies have mentioned the challenge of determining the best time to measure satisfaction with perinatal care with the highest level of accuracy.18 Lastly, analyzes and conclusions of the results are limited due to the cross-sectional design of the MES. Temporality cannot be truly established, therefore the results are purely associations, and should not be misinterpreted as causal.

5.4 Implications and Future Directions

The main findings indicate no statistically significant, or clinically significant association between overall satisfaction with care and PPWR. As the overall satisfaction score can range from 6-30, the patients who are very satisfied (a score of 30), compared to those who are very dissatisfied (a score of 6) with their health care encounter, would only have a 1 kg reduction in PPWR. This indicates a negligible association between satisfaction with health care experiences and PPWR. Although there was a statistically significant association between the two individual dimensions of satisfaction (information received and involvement in decision making) on PPWR when adjusting for all potential confounders, the magnitude of effect is not clinically significant. Increasing satisfaction of information received, or decision-making from the lowest to highest score (4 point increase) reduces PPWR by less than 1 kg.

The small effect sizes could suggest that high weight retention is more strongly influenced by other factors, rather than satisfaction with health care. It has been suggested that women who have higher decision authority in the workplace have lower obesity rates.110 This association could be translated to the thesis’ findings in the sense that women who are normal weight may have different characteristics in terms of taking control of their behaviours and personality traits that decrease their likelihood of becoming overweight or obese. In addition, pre-pregnancy BMI and GWG may be
stronger predictors of PPWR, suggesting that it would be more effective to target patients at risk for overweight or obesity before their first prenatal health care encounter.

Although the thesis findings do not support the theory that satisfactory experiences influence a patient’s health behaviours, pregnancy has been identified as a teachable moment, and may be an important opportunity for HCPs to understand the challenges of their patients regarding weight gain, and to provide them with the knowledge and support needed to achieve a healthy weight. Further, HCPs may be able to utilize this teachable moment to indirectly influence the weight trajectory of the infant, by emphasizing the importance of healthy nutritional behaviours to mothers.

Future studies should aim to identify reliable and validated tools for measuring satisfaction with care, and to further determine its influence on maternal health behaviours. Qualitative measures may prove to be highly valuable for gathering a comprehensive understanding of how to measure health care experiences by giving the quantitative measures context of patient values and experiences. Lastly, given the high proportion of pre-pregnancy overweight and obese women, it may be more important to research the influence of health care experiences on facilitating maternal health habits to assist the mother with tools to achieve a healthy weight, rather than to return to her pre-pregnancy weight.
References


75. Mamun A, Kinarivala M, O’Callaghan M, Wiliams G, Najman J, Callaway L. Associations of excess weight gain during pregnancy with long-term maternal obesity,


Appendices

Appendix A: Literature Review

Table A.1 Literature Review Summary of Relevant Studies

<table>
<thead>
<tr>
<th>Topic</th>
<th>Study Type/ Sample Size</th>
<th>Analysis/ Methods</th>
<th>Relevant Findings</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with HC encounters and outcomes among women with high BMI</td>
<td>Longitudinal Cohort Study, N=919 women</td>
<td>Binary logistic regression Measure of Satisfaction: very satisfied, satisfied, mixed, dissatisfied and very dissatisfied Measure was dichotomized into satisfied or less than satisfied.</td>
<td>The study compared high vs. lower BMI groups of women. High BMI group, more likely to: be older, less educated, greater fear of childbirth and negative attitudes, greater birth complications compared to normal BMI No difference in birth experience or satisfaction with care. This may be due to HCPs hesitancy to discuss weight changes. HCPs need more guidance/training for providing care to their obese pregnant patients. HCPs should provide a respectful and supportive environment.</td>
<td>Hildingsson I, Thomas J. Perinatal outcomes and satisfaction with care in women with high body mass index. <em>J Midwifery Womens Health</em>. 2012;57(4):336-344.</td>
</tr>
<tr>
<td>Satisfaction in</td>
<td>Systematic Review</td>
<td>Identified articles</td>
<td>Satisfied patients are more compliant, cooperative,</td>
<td>Crow, R., Gage, H.,</td>
</tr>
<tr>
<td>Topic</td>
<td>Methodology</td>
<td>Main Findings</td>
<td>References</td>
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<tr>
<td>Comparing satisfaction with care in the intrapartum and postpartum period</td>
<td>Longitudinal cohort study N=2 686 women</td>
<td>Logistic Regression Analysis More women were dissatisfied with their postpartum care, rather than their intrapartum care. Certain demographic factors were associated with lower satisfaction: younger age group, lower education, single marital status and low support. Smoking and parity was not associated with satisfaction. Emotional support may be the most important aspect for evaluating care.</td>
<td>Waldenström U, Rudman A, Hildingsson I. Intrapartum and postpartum care in Sweden: women’s opinions and risk factors for not being satisfied. <em>Acta Obstet Gynecol Scand.</em> 2006;85(5):551-560.</td>
<td></td>
</tr>
<tr>
<td>Dimensions of satisfaction with maternal care</td>
<td>Cross-sectional study N=938 women</td>
<td>Factor analysis, step-wise multiple regression models 5 dimensions to satisfaction with care: delivery, medical care, nursing care, information and decision-making, and clinical setting. Education level may have a weak association with</td>
<td>Seguin L, Therrien R, Champagne F, Larouche D. The components of women’s satisfaction with maternity</td>
<td></td>
</tr>
<tr>
<td>Study Title</td>
<td>Design</td>
<td>Sample Size</td>
<td>Analysis Method</td>
<td>Summary</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
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<tr>
<td>Stratified women by mode of delivery: vaginal and C-section.</td>
<td>Literature Review</td>
<td>N/A</td>
<td>Most important factors are decision-making and information received. Timing and validity of survey are important to consider. Generally high satisfaction scores.</td>
<td>Most studies found high and undifferentiated levels of satisfaction. Difficult to distinguish between differences in patient expectations, perceptions, or actual quality of care. Influence of caregiver’s attitudes and behaviours have shown to be more important than medical interventions and pain. Patients sense of control, self-efficacy, and decision-making Expectations, quality of phys-patient relationship, support from HCP, and involvement in decision making are most important.</td>
</tr>
<tr>
<td>Medical Advice, Personal Target and Actual Gestational Weight Gain</td>
<td>Cross-sectional study</td>
<td>N = 2,237 women</td>
<td>Multiple Logistic Regression</td>
<td>HCP advice for GWG recommendations is inconsistent with IOM recommendations. No advice from the HCP, women were likely to gain above IOM recommendations. HCP advice strongly associated with target weight gain and actual GWG.</td>
</tr>
<tr>
<td>Gestational Weight Gain Advice from HCP</td>
<td>Cross-Sectional Study</td>
<td>N = 401 women</td>
<td>Multivariable Logistic Regression</td>
<td>41.7% received weight gain advice from practitioner Among those that received advice, 85% were told to gain within their GWG recommendations. Compared to normal weight women, overweight/obese women, significantly higher odds (OR=18.7) of receiving advice to gain above their recommended weight. Overweight women report a higher ideal GWG than their actual recommended weight.</td>
</tr>
<tr>
<td>HCP counseling for optimal GWG</td>
<td>Prospective Cohort Study</td>
<td></td>
<td>Multivariate logistic regression</td>
<td>Pre-pregnancy BMI is the strongest predictor of target weight gain.</td>
</tr>
<tr>
<td>Qualitative study, obese pregnant women and HC encounters</td>
<td>Qualitative study, in person interviews N=16 women</td>
<td>Phenomenological approach</td>
<td>2 main themes: 1) Women felt blamed by their HCPs, embarrassed. 2) Lack of information and advice, humiliation, stigma, inconsistent advice from HCP. Need better communication between HCP and obese patients to help obese mothers manage their weight during pregnancy. Psychological aspects are important, especially among obese women, including: vulnerability, anxiety, mental health problems.</td>
<td>Lindhardt CL, Rubak S, Mogensen O, Lamont RF, Joergensen JS. The experience of pregnant women with a body mass index &gt;30 kg/m² of their encounters with healthcare professionals. <em>Acta Obstet Gynecol Scand</em>. 2013;92(9):1101-1107.</td>
</tr>
<tr>
<td>Interventions to change HCP behaviours for patient weight management</td>
<td>Systematic Review</td>
<td>Electronic databases, trial registers and citation searching</td>
<td>Most studies focus on changing behaviours of patients, not HCP. No studies that intervened at the HCP level to reduce barriers for improving weight gain counseling was found. One registered RCT aims to determine the effect of receiving GWG recommendations based on IOM guidelines on GWG.</td>
<td>Heslehurst N, Crowe L, Robalino S, Sniehotta FF, McColl E, Rankin J. Interventions to change maternity healthcare professionals behaviours to promote weight-related support for obese pregnant women: a systematic review. <em>Implement Sci</em>. 2014;9(1):97.</td>
</tr>
<tr>
<td>OBGYN recommendations to their obese patients</td>
<td>Cross-sectional study N = 58 HCP</td>
<td>Multivariable linear regression</td>
<td>67% of HCP believe that their advice influences actual GWG of their patients. 40% believe that obese patients have the motivation to change their habits. HCP confidence regarding their knowledge and belief that obese patients can reduce complications through weight management were associated with adherence to the IOM guidelines.</td>
<td>Herring S, Platek D, Elliot P, Riley L, Stuebe A, Oken E. Addressing Obesity in Pregnancy: What Do Obstetric Providers Recommend? J Women's Heal. 2010;19(1):65-70.</td>
</tr>
<tr>
<td>Association between GWG and PPWR</td>
<td>Literature Review N/A</td>
<td>Pregnancy is a teachable moment, more likely to change behaviour. GWG is the strongest predictor of postpartum weight retention, positive association. Combination of weight gain monitoring, diet, physical activity and behavioural counselling may help women achieve optimal GWG. HCP: inconsistent (or no) advice, rely on their personal experience rather than guidelines</td>
<td>Phelan S. Pregnancy: A “teachable moment” for weight control and obesity prevention. Am J Obstet Gynecol. 2010;202(2):1-16.</td>
<td></td>
</tr>
</tbody>
</table>
### Table A.2 Gestational Weight Gain Recommendations, by Pre-pregnancy BMI Group

<table>
<thead>
<tr>
<th></th>
<th>Inadequate GWG (kg)</th>
<th>Optimal GWG (kg)</th>
<th>Excessive GWG (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight (BMI &lt; 18.5)</td>
<td>&lt; 12.5</td>
<td>12.5 – 18</td>
<td>&gt; 18</td>
</tr>
<tr>
<td>Normal weight (18.5 &lt; BMI &lt; 24.9)</td>
<td>&lt; 11.5</td>
<td>11.5 - 16</td>
<td>&gt; 16</td>
</tr>
<tr>
<td>Overweight (25 &lt; BMI &lt; 29.9)</td>
<td>&lt; 7</td>
<td>7 - 11.5</td>
<td>&gt; 11.5</td>
</tr>
<tr>
<td>Obese Class I, II and III BMI ≥ 30</td>
<td>&lt; 7</td>
<td>7</td>
<td>&gt; 7</td>
</tr>
</tbody>
</table>
Appendix B: Data Analysis

Figure B.1 Research Data Centre Contract

<table>
<thead>
<tr>
<th>Co-investigators</th>
<th>Institution</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>University of Western Ontario</td>
<td>Martha Karen Campbell.</td>
</tr>
<tr>
<td></td>
<td>University of Western Ontario</td>
<td>Neil Klar.</td>
</tr>
</tbody>
</table>

(WHEREAS Statistics Canada requires the services of the Principal Investigator to undertake statistical research and analysis on (Maternity Experiences Survey (2005)) to fulfill its mandate under the Statistics Act;

AND WHEREAS to perform these services and to have access to confidential information, the Principal Investigator and the Co-investigators must become "Deemed Employees" of Statistics Canada and are required to take the Oath of Secrecy;

AND WHEREAS Statistics Canada wishes to make clear the terms and conditions under which access to the microdata will be granted;

NOW THEREFORE the Parties agree as follows:

SERVICE PROVIDED BY PRINCIPAL INVESTIGATOR

1. (1) The Principal Investigator will carry out the research project set out in Appendix "A" and provide the report described under "Proposed
Project ID number: 14-SSH-UWO-4019

Output*.

(2) It is understood that this is a contract for the performance of a service and the Principal Investigator and Co-investigators are engaged for the sole purpose of providing that service.

CONDITIONS OF ACCESS TO THE MICRODATA

2. The Principal Investigator and the Co-investigators must undergo an enhanced reliability check satisfactory to Statistics Canada and take the oath/affirmation of secrecy, pursuant to Subsection 6(1) of the Statistics Act, in order to obtain access to the non identifiable microdata file required to perform the analysis pursuant to this contract.

3. (1) Access to the non identifiable microdata file (no names, addresses or identifying numbers) and associated documentation shall be provided on Statistics Canada premises, which includes Headquarters and the Statistics Canada Regional Offices during normal hours of operation, Monday to Friday, and the Research Data Centres.

(2) The Principal Investigator and Co-Investigators will be provided with the necessary computing facilities, software and documentation as is reasonably necessary to complete the research and analysis pursuant to this contract.

DEPARTMENTAL REPRESENTATIVE

4. The Director of the Microdata Access Division is the designated Statistics Canada representative responsible for the administration of this contract.

LIMITATIONS ON USES OF THE MICRODATA FILE AND PROPOSED OUTPUT

5. (1) No person engaged in the course of carrying out this contract may use any of the information gained by accessing the confidential data for any other purpose except that which was agreed upon in this contract.

(2) Access to the microdata file is being provided for the statistical and research purpose outlined in the proposal attached as Appendix A and the microdata file shall not be used for any other purposes without the prior written consent of Statistics Canada.

(3) The Principal Investigator and the Co-investigators shall not disclose any of the information from the individual records obtained or produced pursuant to this contract to anyone other than current Statistics Canada employees involved in the review or evaluation of any aspect of the research project.

(4) The Principal Investigator and the Co-investigators shall ensure that no attempts are made to link the microdata file to any other files in order to relate the particulars to any identifiable individual person, business or organization.
The Proposed Output must meet the requirements of both peer and institutional review prior to being released by Statistics Canada, for example, in one of its publications or in a research paper.

Thereafter, the Principal Investigator may, subject to subsection 6(5), carry out a secondary analysis, but such analysis shall be based solely on the approved "Proposed Output" produced pursuant to this contract and be related to the analytical work undertaken to produce the "Proposed Output".

The Principal Investigator agrees to work with Statistics Canada in trying to meet the requirements of peer and institutional review required for the publication or research paper.

In the event that Statistics Canada decides not to publish the "Proposed Output", Statistics Canada will give the Principal Investigator written notice to this effect within thirty days of having made the final decision.

Subject to subsections 6(5) and 10(2), in the event Statistics Canada notifies the Principal Investigator in writing that the proposed output will not be published, the Principal Investigator may:

(a) Publish the "Proposed Output" elsewhere, and/or

(b) Use the "Proposed Output" for purposes of the attainment of an educational degree.

OWNERSHIP

6.

1. The microdata file and related documentation shall at all times be and remain the sole and exclusive property of Statistics Canada, it being mutually agreed that this contract pertains to the use of the microdata file and related documentation to produce a "Proposed Output" for Statistics Canada and that nothing contained herein shall be deemed to convey any title or ownership interest in the microdata file or the related documentation to the Principal Investigator or the Co-investigators. The computer equipment provided for use by the Principal Investigator and the Co-investigators must never be removed from the premises of Statistics Canada or the Research Data Centre and remains the sole and exclusive property of the access facility.

2. Statistics Canada reserves the right to publish in whole or in part, to publish an amended version or not to publish at all, as Statistics Canada deems appropriate, the "Proposed Output" produced by the Principal Investigator pursuant to this contract.

3. Copyright in the "Proposed Output" produced by the Principal Investigator pursuant to this contract shall vest in Her Majesty the Queen in Right of Canada. The Principal Investigator shall provide to Statistics Canada at the completion of the contract or at such other time as Statistics Canada may require a written permanent waiver of
Moral rights from every author who contributed to the aforementioned material.

(3) Statistics Canada (Her Majesty the Queen in Right of Canada) hereby grants to the Principal Investigator a non-exclusive license to use, reproduce, publish and distribute the "Proposed Output" for any purpose, including, without limitation, research, teaching and publication in any medium. Copyright in any subsequent work produced by the Principal Investigator using the "Proposed Output" shall vest in the Principal Investigator.

(4) Releases of the "Proposed Output" may be considered by Statistics Canada in consultation with the Principal Investigator.

(5) In publishing the "Proposed Output" elsewhere, using the "Proposed Output" in the attainment of an educational degree or carrying out any secondary analysis, any reports, documents, or materials which are subsequently prepared by the Principal Investigator which use, incorporate or are in any way based on any material produced under this agreement, shall prominently display the following notice:

"The research and analysis are based on data from Statistics Canada and the opinions expressed do not represent the views of Statistics Canada."

CONFLICT OF INTEREST

7.

(1) All persons engaged in the course of carrying out this contract shall conduct themselves in accordance with the principles and spirit of the Values and Ethics Code for Deemed Employees.

Andrea Bente

Martha Karen Campbell

Neil Klar

(2) Should a conflict exist prior to the commencement of this contract or be acquired or develop during the life of this contract, the person with the conflict engaged in carrying out this contract shall be responsible for discussing the conflict with the Director of the Division sponsoring the project or the Manager of the Research Data
Project ID number: 14-SSH-UWO-4019

Centre Project and, should it be determined that a conflict exists, for completing the Confidential Report as required by the Values and Ethics Code for Deemed Employees

(3) No person engaged in the course of carrying out this contract may use any of the information gained by accessing the confidential data for any other purpose except that which was agreed upon in this contract.

(4) Notwithstanding subsection (3), it is understood that the principles of the Values and Ethics Code for Deemed Employees were not meant to prohibit the persons engaged in this contract from accomplishing any secondary analysis as permitted by the contract.

SECURITY REQUIREMENTS

8.

(1) Any material to be removed from the Statistics Canada premises by the Principal Investigator or Co-investigators must first be screened by Statistics Canada to ensure that there is no risk of disclosure of confidential information or information that may lead to the identification of an individual person, business or organization. It is the responsibility of the Principal Investigator or Co-investigators to take all precautions to avoid disclosure of confidential information or information that may lead to the identification of an individual respondent. The Principal Investigator or Co-investigators may remove summary files, tabulations and analytical output under the terms of this subsection.

(2) The Principal Investigator and the Co-investigators shall not remove any of the original data set or copies of subsets of the microdata file or any confidential sensitive statistical information provided pursuant to this contract from the premises of Statistics Canada.

(3) The Principal Investigator and the Co-investigators shall be provided with copies of all relevant Statistics Canada policies related to confidentiality, privacy and security and the standard operating procedures of the appropriate access facility and shall acknowledge in writing their compliance with all of the policies and operating procedures.

TERM

9. This contract comes into force when signed by both parties and shall continue in force until 2015-09-30 unless revoked or terminated at an earlier date.

TERMINATION

10.

(1) Where the Principal Investigator is in default in carrying out any of its obligations under this Contract, Statistics Canada may, upon giving written notice to the Principal Investigator, terminate the Contract immediately.

(2) The Contract may, by providing 30 days written notice, be terminated
Project ID number: 14-SSH-UWO-4019

by mutual written consent between the Principal Investigator and Statistics Canada.

(3) Any notice to be given to Statistics Canada or the Principal Investigator shall be sent by registered mail to:

Director, Microdata Access
Andreas Bente
University of Western Ontario

(4) Any notice shall be deemed to be effective on the day it is received at the address set out above.

PENALTIES

11. (1) As a Deemed Employee of Statistics Canada, the Principal Investigator and the Co-Investigators are subject to all the applicable penalties provided for in the Statistics Act for contravention of any of the confidentiality provisions and is liable on summary conviction to any of the applicable fines or imprisonment terms.

(2) Subsection 11(1) survives indefinitely the completion of this contract or the termination of this Agreement pursuant to subsections 10(1) or 10(2).

AMENDMENT

12. No amendment to this contract shall be valid unless it is reduced to writing and signed by the Parties hereto.

CONSIDERATION

13. The Parties agree that consideration for this agreement shall be the mutual promises and covenants of the Parties included in this contract.

ENTIRE AGREEMENT

14. This contract constitutes the entire agreement between the Parties listed below and Statistics Canada with respect to the subject matter described herein and supersedes all previous negotiations, communications and other agreements on the same issue with Statistics Canada unless they are specifically incorporated by reference in this contract.

IN WITNESS WHEREOF, this Agreement has been executed in duplicate on behalf of Statistics Canada and the Principal Investigator by:
Project ID number: 14-SSH-UWO-4019

FOR STATISTICS CANADA:

Witness Date

Director of the Microdata Access Division
(as described in paragraph 4 above)

FOR THE PRINCIPAL INVESTIGATOR:

Witness Date Andrea Banta

Witness Date Martha Karen Campbell

Witness Date Neil Klar
Appendix "A"

Research Proposal Title

Submitted By: Andreea Bente

Proposal

Detailed description of the proposed research.

Data Requirements

List of files, additional data fields or variables required for the analysis.

| Survey description |
| Maternity Experiences Survey (2006) |

Proposed Output

Indicate the type of output to be generated from the list below (delete those which do not apply)

- Peer-reviewed journal article: A journal article authored by the Principal Investigator for a peer-reviewed journal.
- Book or Book chapter: A book or book chapter authored by the Principal Investigator.
- Thesis or Dissertation: A graduate level thesis or dissertation.
- Commissioned Report: A commissioned report authored by the Principal investigator for __________ (insert name of commissioner and proposed title of the report).

Completion Date

Do not use June 30th or Dec 31st. 2015-09-30

Research Location

Indicate where the Co-investigator is to be located for purposes of this project.
Project ID number: 14-SSH-UWO-4019

<table>
<thead>
<tr>
<th>Contact Name</th>
<th>EDC</th>
</tr>
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<tbody>
<tr>
<td>Andreea Bente</td>
<td>UWO - University of Western Ontario</td>
</tr>
<tr>
<td>Martha Karen Campbell</td>
<td>UWO - University of Western Ontario</td>
</tr>
<tr>
<td>Neil Klar</td>
<td>UWO - University of Western Ontario</td>
</tr>
</tbody>
</table>

Source of Funding

List any agencies which may be providing funds related to this project.

None
**Table B.1 Variance Inflation Factors for Main Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variance Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Satisfaction with Care</td>
<td>1.08</td>
</tr>
<tr>
<td>Maternal Age</td>
<td>1.40</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
</tr>
<tr>
<td>30 K or Greater</td>
<td>1.31</td>
</tr>
<tr>
<td>Under 30 K</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Bachelor Degree or Higher</td>
<td></td>
</tr>
<tr>
<td>Below Bachelors Degree</td>
<td>1.39</td>
</tr>
<tr>
<td>High School Diploma or Less</td>
<td>1.70</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td></td>
</tr>
<tr>
<td>Common Law</td>
<td>1.15</td>
</tr>
<tr>
<td>Widowed/Separated/Divorced</td>
<td>1.31</td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
</tr>
<tr>
<td>Primiparous</td>
<td></td>
</tr>
<tr>
<td>Multiparous</td>
<td>1.14</td>
</tr>
<tr>
<td><strong>Pre-Pregnancy BMI</strong></td>
<td>1.15</td>
</tr>
<tr>
<td><strong>Aboriginal Status</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Aboriginal</td>
<td></td>
</tr>
<tr>
<td>Aboriginal</td>
<td>1.05</td>
</tr>
<tr>
<td><strong>Mode of Delivery</strong></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td></td>
</tr>
<tr>
<td>Cesarean Section</td>
<td>1.05</td>
</tr>
<tr>
<td><strong>Gestational Weight Gain</strong></td>
<td></td>
</tr>
<tr>
<td>Inadequate</td>
<td>1.32</td>
</tr>
<tr>
<td>Met</td>
<td></td>
</tr>
<tr>
<td>Excessive</td>
<td>1.45</td>
</tr>
<tr>
<td><strong>Infant in the NICU</strong></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.03</td>
</tr>
<tr>
<td><strong>Breastfeeding Duration</strong></td>
<td></td>
</tr>
<tr>
<td>6 months or more</td>
<td></td>
</tr>
<tr>
<td>Under 6 months</td>
<td>1.19</td>
</tr>
<tr>
<td>Not at all</td>
<td>1.19</td>
</tr>
<tr>
<td><strong>Postpartum Support Availability</strong></td>
<td></td>
</tr>
<tr>
<td>None of the Time</td>
<td>1.03</td>
</tr>
<tr>
<td>Little of the Time</td>
<td>1.09</td>
</tr>
<tr>
<td>Some of the Time</td>
<td>1.13</td>
</tr>
<tr>
<td>Most of the Time</td>
<td>1.13</td>
</tr>
<tr>
<td>All the Time</td>
<td></td>
</tr>
<tr>
<td><strong>Smoking Postpartum</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Smoker</td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>1.24</td>
</tr>
<tr>
<td><strong>Postpartum Depression</strong></td>
<td></td>
</tr>
<tr>
<td>Not Depressed</td>
<td></td>
</tr>
<tr>
<td>Depressed</td>
<td>1.07</td>
</tr>
<tr>
<td><strong>Time Postpartum</strong></td>
<td>1.03</td>
</tr>
</tbody>
</table>
Table B.2 Correlation coefficients between the 6 dimensions of satisfaction with health care

<table>
<thead>
<tr>
<th></th>
<th>SATINF</th>
<th>SATCOMP</th>
<th>SATCOMPT</th>
<th>SATPRIV</th>
<th>SATRESP</th>
<th>SATDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SATINF&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1.00</td>
<td>0.57</td>
<td>0.46</td>
<td>0.35</td>
<td>0.42</td>
<td>0.45</td>
</tr>
<tr>
<td>SATCOMP&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.57</td>
<td>1.00</td>
<td>0.58</td>
<td>0.47</td>
<td>0.60</td>
<td>0.49</td>
</tr>
<tr>
<td>SATCOMPT&lt;sup&gt;3&lt;/sup&gt;</td>
<td>0.46</td>
<td>0.58</td>
<td>1.00</td>
<td>0.42</td>
<td>0.54</td>
<td>0.46</td>
</tr>
<tr>
<td>SATPRIV&lt;sup&gt;4&lt;/sup&gt;</td>
<td>0.35</td>
<td>0.47</td>
<td>0.42</td>
<td>1.00</td>
<td>0.64</td>
<td>0.44</td>
</tr>
<tr>
<td>SATRESP&lt;sup&gt;5&lt;/sup&gt;</td>
<td>0.42</td>
<td>0.60</td>
<td>0.54</td>
<td>0.64</td>
<td>1.00</td>
<td>0.53</td>
</tr>
<tr>
<td>SATDM&lt;sup&gt;6&lt;/sup&gt;</td>
<td>0.45</td>
<td>0.49</td>
<td>0.46</td>
<td>0.44</td>
<td>0.53</td>
<td>1.00</td>
</tr>
</tbody>
</table>

1. Satisfaction with information provided
2. Satisfaction with compassion shown by the HCP
3. Satisfaction with competency of the HCP
4. Satisfaction with concern of patient privacy and dignity
5. Satisfaction with respect shown
6. Satisfaction with personal involvement in medical decision-making

Table B.3 Principal components analysis between the 6 dimensions of satisfaction with health care

<table>
<thead>
<tr>
<th>Principal Component</th>
<th>Eigenvalue</th>
<th>Proportion of the Variance Explained</th>
<th>Cumulative Variance Explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.80</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td>2</td>
<td>0.40</td>
<td>0.13</td>
<td>0.71</td>
</tr>
<tr>
<td>3</td>
<td>0.28</td>
<td>0.09</td>
<td>0.80</td>
</tr>
<tr>
<td>4</td>
<td>0.27</td>
<td>0.09</td>
<td>0.89</td>
</tr>
<tr>
<td>5</td>
<td>0.21</td>
<td>0.07</td>
<td>0.95</td>
</tr>
<tr>
<td>6</td>
<td>0.14</td>
<td>0.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table B.4 Loading factors of first principal component from the principal components analysis

<table>
<thead>
<tr>
<th>Satisfaction Variable</th>
<th>First Principal Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with information received</td>
<td>0.42</td>
</tr>
<tr>
<td>Satisfaction with compassion of HCP</td>
<td>0.49</td>
</tr>
<tr>
<td>Satisfaction with competency of HCP</td>
<td>0.38</td>
</tr>
<tr>
<td>Satisfaction with concern shown for privacy and dignity</td>
<td>0.39</td>
</tr>
<tr>
<td>Satisfaction with respect shown</td>
<td>0.38</td>
</tr>
<tr>
<td>Satisfaction with involvement in decision-making</td>
<td>0.38</td>
</tr>
</tbody>
</table>
Appendix C: Calculation

C.1 Sample Calculation for BMI Correction Factor

If BMI reported by the participant was 25 kg/m²:

\[ \text{BMI with correction factor} = (-0.12) + (1.05 \times \text{BMI self-reported}) \]

\[ \text{BMI with correction factor} = (-0.12) + (1.05 \times 25) \]

\[ \text{BMI with correction factor} = (-0.12) + 26.25 \]

\[ \text{BMI with correction factor} = 26.13 \]
Andreea Bente Curriculum Vitae

Postsecondary Education and Degrees

University of Ottawa, Ottawa, ON
2009-2013 B.H.Sc

Western University, London, ON
2013-2015 MSc Epidemiology and Biostatistics

Honours and Awards

Western Graduate Research Scholarship
2013-2015

Renewable Admission Scholarship
2009-2010

Education Bursary
2009-2010

Related Work Experience

Graduate Teacher Assistantship
Western University
2015

Canadian Society of Epidemiology and Biostatistics Student Representative
Western University
2014-2015

Research Assistant
University of Ottawa
2012-2013

Publications


Poster Presentations

