

**Perception of pregnancy risk among women with gestational diabetes and their partners:**

**A mixed methods study**

by

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### Abstract

**BACKGROUND:** Gestational diabetes (GD) is a common complication of pregnancy, impacting 6-7% of pregnancies, yet little is known regarding how women with GD perceive risk during pregnancy. No studies have been conducted regarding the partner's risk perception. There is a gap in pregnancy risk perception research regarding the perspective of the father.

**DESIGN/METHODS:** Partially mixed, sequential, mixed methods. Participants were pregnant women, with an index diagnosis of GD and their male partners, recruited from two Winnipeg hospitals.

**QUANTITATIVE:** Participants (n=214, 107 couples), completed self-report questionnaires. Descriptive statistics, chi square, t tests, Pearson's r, and linear regression were used to analyze data.

**QUALITATIVE:** Participants (n=16; 8 couples), participated in individual semi-structured interviews. Interviews were analyzed using content analysis.

**RESULTS:** Women had significantly higher pregnancy risk perception scores (M 39.0 out of 100, SD 17.3) than men (M 33.6, SD16.6; paired t = 3.2; p = .002). There were unique predictors of risk perception. For women, perceived stress ( $\beta = 0.32$ , p = .001) and pre-pregnancy BMI ( $\beta = 0.19$ , p = .028) were significant predictors ( $R^2 = .36$ ). For men, significant predictors were level of education ( $\beta = 0.31$ , p = .004), risk familiarity ( $\beta = 0.23$ , p = .018), dread ( $\beta = 0.21$ , p = .020), Winnipeg residence ( $\beta = 0.18$ , p = .044), and self-efficacy ( $\beta = 0.17$ , p = .045) ( $R^2 = .30$ ).

Qualitative findings revealed that risk perception was shaped by factors such as simultaneously acknowledging GD risk while minimizing personal risk. Couples viewed differences in risk perceptions as related to personality characteristics, not as a function of gender. Couples agreed

factors such as emotional support, prompt follow-up and personalized dietary plans were important in reducing risk perceptions.

**CONCLUSIONS:** Gender differences exist in level of perceived pregnancy risk and in predictors of perceived risk for women with GD and their partners. Women perceived higher levels of pregnancy risk than men; however, both genders attempted to minimize the degree of personal risk. Identification of the gender specific predictors of GD risk perception may allow healthcare professionals to tailor educational materials and interventions, leading to programs to improve pregnancy outcomes.

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**Dedication**

*Dedicated in loving memory of my father Larry Lennon and my grandparents Theodore and Lydia Schillberg.*

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## Chapter 1: Introduction

Gestational diabetes (GD) occurs when women develop carbohydrate intolerance during the course of pregnancy. Women with GD are unable to compensate for the insulin resistance of pregnancy, which is produced by a combination of hormonal and inflammatory changes (Landon & Gabbe, 2011). GD has been described as the most common complication occurring during pregnancy, although precise rates are difficult to estimate due to differences in diagnostic criteria (Castorino & Jovanovic, 2011). Manitoba has one of the highest rates of GD in the country and these rates are rising. In the five-year period between 1999 to 2004, the rate of GD rose from 2.3% to 3.7% (Aljohani, Rempel, Ludwig, Morris, McQuillen, et al., 2008b). For First Nations women, the rates are considerably higher.

Before continuing with a discussion of the disproportionate burden of GD borne by Indigenous and First Nations women, it is important to define these terms. The following definitions are taken from the Faculty of Health Sciences' *Framework for Research Engagement with First Nation, Metis, and Inuit Peoples*, (nd):

Indigenous populations are communities that live within, or are attached to, geographically distinct traditional habitats or ancestral territories, and who identify themselves as being part of a distinct cultural group, descended from groups present in the area before modern states were created and current borders defined. They generally maintain cultural and social identities, and social, economic, cultural and political institutions, separate from the mainstream or dominant society or culture. (World Health Organization, nd). Indigenous refers to those individuals and groups who share and maintain the traditional cultural and spiritual understandings and world views of their ancestors. That is, "Indigenous" depicts those Peoples who belong to the original

understandings of the various groups. The term “Indigenous” typically relates to the mentality and spirituality of those determined to maintain their original ways; that is, their ways of thinking and being members of the specific Nations into which they were born and to which they belong. (pg.23)

First Nations are the original Peoples of Canada. They are tribally and linguistically diverse Peoples who live throughout all geographic regions of Canada and are the majority of the Indigenous Peoples who have lived on the lands the country. (pg. 21)

The Manitoba First Nations Regional Longitudinal Health Survey (RHS), conducted in 2002-2003, reports that 12% of all First Nations women surveyed reported a diagnosis of GD in at least one pregnancy with an additional three percent reporting a pre-pregnancy diabetes diagnosis (HIRGC, 2006). This rate of prevalence in First Nations women is consistent with that found in an earlier study which reported a 12.8% rate of GD among Cree women in James Bay Ontario (Rodrigues, Robinson, & Gray-Donald, 1999). The 2008-2010 RHS did not report specific rates of GD. However, 16.2% of the population referred to in the RHS reported a diagnosis of diabetes and of these, 5.8% reported having been diagnosed with GD. This does suggest a decline in rates of GD for Indigenous women; however, these results must be interpreted with caution as there were methodological differences between the RHS 2002-2003 and the RHS 2008-2010 (FNIGC, 2012).

More recently, Manitoban researchers conducted a 30-year retrospective examine the associations between GD and FN status on the subsequent risk of Type 2 diabetes in offspring. The study found that 2,9% of pregnancies in the 30-year period were impacted by GD. However, the GD rate for First Nations women was significantly higher at 6.7% (Sellers et al., 2016). In a

related study using the same time period researchers found that First Nations women were 3 times more likely to develop Type 2 diabetes sometime during the 30-year time period than non-First Nation women (Shen et al., 2016). A systematic review of diabetes in pregnancy among Indigenous and Aboriginal women included four studies with a Canadian context. The average reported rate of GD among the Indigenous women in these studies was 11.5% (Porter, Skinner & Elias, 2012).

GD rates are increasing internationally. In the United States, the Centers for Disease Control and Prevention reports a GD rate of between 2–10% (Centers for Disease Control and Prevention, 2011). In Europe, the reported rate is slightly lower at between 2-6% (Buckley et al., 2012), while the rate in Australia is 6% (Chamberlain et al., 2013). There is reason however, to be concerned that rates of GD will not remain stable. The occurrence of GD is linked to obesity, poor eating habits and lack of exercise in pre-pregnancy (Andrews, 2007). Many experts contend that we are in the midst of an “obesity epidemic” which will undoubtedly lead to even greater rates of GD (James, Leach, Kalamara, & Shayeghi, 2001; Katzmarzyk, 2002).

GD is diagnosed based on the results of prenatal screening. The Society of Obstetricians and Gynecologists of Canada (SOGC) recommends screening all pregnant women between 24-28 weeks of gestation, while mothers with one or more risk factors should be screened in the first trimester and then repeated at 24-28 weeks (Berger, Gagnon, & Sermer, 2016). Risk factors for developing GD include Indigenous ethnicity, previous GD, increased parity (Reece, 2008), advanced maternal age and increased pre-pregnancy BMI (Thompson et al., 2008). There is a strong correlation between increased pre-pregnancy BMI and GD (Jaipaul, Newburn-Cook, O'Brien, & Demianczuk, 2009; Langer, Yogev, Most, & Xenakis, 2005). There is evidence to suggest that, for the obese woman in particular, the diabetic state may have existed prior to

pregnancy as undiagnosed Type 2 diabetes (Aljohani, Rempel, Ludwig, Morris, Cheang, et al., 2008a; Chen et al., 2009; Ratner et al., 2008).

GD confers serious long and short-term complications for both mother and infant. Women who are diabetic during pregnancy greatly increase their chances of developing Type 2 diabetes later in life (Reece, 2011). Maternal obstetric risks include increased risk for cesarean or operative vaginal delivery, greater incidence of perineal trauma, post-partum hemorrhage, prolonged hospitalization and risk for infection. Infants of diabetic mothers are often macrosomic, meaning that they are large for gestational age. These infants experience increased rates of birth related injuries and Neonatal Intensive Care Unit admissions (Allen & Armson, 2007; Moore, 2008). Perhaps the most serious outcome related to GD is the high rate of childhood onset of Type 2 diabetes (Nolan, 2013).

Although it is clear that GD is linked to serious complications, little is known about how women with GD perceive their risk during pregnancy and how this perception of risk impacts their behaviors. The role of risk perception is an important issue especially during pregnancy when health behavioral changes have the potential to impact both mother and infant (Bayrampour, Heaman, Duncan, & Tough, 2012b; Czerwinski et al., 2010; Kim et al., 2007). Risk perception is especially germane to GD as this is a disease of self-management where the efficacy of treatment is dependent on the individual's willingness to modify behaviour. The extent to which a woman diagnosed with GD alters diet and exercise patterns is in turn impacted by their degree of risk perception.

Risk is generally conceived of as having two components: probability and severity (Henwood, Pidgeon, Sarre, Simmons, & Smith, 2008). Risk is perceived and acted upon in two related yet distinct ways; risk as feelings and risk as analysis (Slovic, Peters, Finucane, &

Macgregor, 2005). Risk as feelings involves a person's rapid, instinctual responses to threat, while risk as analysis involves rational thought, calculation of probabilities and judgement (Slovic, 2005; Slovic, 2010). Risk perception involves the affective process of determining the extent of one's vulnerability to a specific risk as well as the degree of severity of the disease or negative outcome (Slovic, 1987). Risk perception is commonly defined as the probability of harm if no preventative action is taken to ameliorate or eliminate the hazard (Weinstein, Kwitel, McCaul, Magnan, Gerrard, & Gibbons, 2007). Several factors have been shown to influence risk perception, including self-efficacy, sense of personal control, pervasiveness, novelty and past experiences (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Gustafson, 1998; Sjöberg, 2003; Slovic, 1987). Specific to pregnancy related risk perception, studies have demonstrated the importance of factors such as age (Bayrampour et al., 2012b), pregnancy related anxiety (Chuang et al., 2008), being classified as having a "high risk" pregnancy (Gupton, Heaman, & Cheung, 2001) and pregnancy knowledge (Lindgren, Radestad, Christensson, Wally-Bystrom, & Hildingsson, 2010). Demographic factors have also been investigated in studies which examine pregnancy related risk perception. In addition to common demographics such as income, education and marital status, factors such as parity, number of previous pregnancies and the presence of complications in the pregnancy have also been investigated (Gupton et al., 2001; Jasper, Goel, Einarson, Gallo, & Koren, 2001).

Risk perception in pregnant women is a highly complex and nuanced phenomenon influenced by numerous factors. While a wide variety of potential contributors to risk perception have been explored, it is notable that these factors are able to explain only a small amount of the variation found in risk perception scores (Coxon, Scamell, & Alaszewski, 2012). Clearly there are other determinants of risk which remain unexamined. In a review of the methodology of

qualitative studies of risk perception Hawkes & Rowe call for an expansion of the methods and topics included in risk research (2008). A fairly obvious omission in risk perception research involving pregnant women is the perspective of the father and an exploration of his attitudes and beliefs. The role of the woman's partner and his attitudes and beliefs regarding the risks associated with GD is uncertain. No studies were found which examined the risk perceptions of male partners specific to pregnancy.

The importance of including gender in research studies has been highlighted by the Canadian Institute Health Research and the Institute for Gender and Health which promotes the inclusion of sex and gender analysis in all areas of health research (Sharman & Johnson, 2012). This study focuses on gender, which is defined as a socially defined and constantly evolved construct affecting all aspects of experience, including health (Johnson, Greaves & Repta, 2009). Pregnancy based research is, for obvious reasons, focused on women. However, a gap exists regarding a gendered perspective of certain aspects of pregnancy research. The partner of the pregnant woman is largely ignored in the field of pregnancy risk perception. Women diagnosed with GD are given information intended to encourage changes in diet and exercise patterns. A woman's partner exerts a significant influence on the success or failure of these changes. The views, attitudes and beliefs of the partner may play an important role in the ultimate health status of the woman and infant.

**Study Purpose**

The purpose of this study was:

- 1) to determine if gender differences exist in pregnancy risk perception;
- 2) to identify the gender specific predictors of perception of pregnancy risk;
- 3) to determine the factors predictive of discordance in risk perception within the couple;
- 4) to explore how perception of pregnancy risk influences behavior change related to GD.

**Research Questions****Quantitative questions.**

- 1) Are there differences in perception of pregnancy risk between women with GD and their male partners?
- 2) What are the gender-specific predictors of perception of pregnancy risk for pregnant women with GD and their male partners?
- 3) What demographic and psychosocial characteristics of the dyad are associated with discordance in perceived risk scores?

**Qualitative questions.**

- 4) What factors influence the perception of risk in women with GD and their male partners?
- 5) How does gender influence perception of risk in women with GD and their male partners?
- 6) What role do pregnant women diagnosed with GD see their partner as having in aiding their efforts at health behavior change?
- 7) What role do partners see themselves as having in assisting the pregnant woman with health behavior change?

#### 8) What are the information and support needs of women diagnosed with GD and their partners?

The study utilized a mixed method design to obtain an in-depth understanding of how women diagnosed with GD and their male partners conceptualize the risk this diagnosis represents to the health of the woman and the unborn infant. In the quantitative portion of the study, women diagnosed with GD and their male partner completed a series of structured self-report questionnaires to elicit their perception of pregnancy risk (both in general and related to GD) as well as several other demographic and psychosocial characteristics deemed to be conceptually related to risk perception. A description of these questionnaires and the rationale for their selection can be found in Chapter 4. A sub-set of couples who participated in the quantitative portion of the study were purposively selected to participate in semi-structured interviews for the qualitative portion of the study. The original recruitment plan was to selectively recruit couples based on their having either congruent or discordant scores on the measure of risk perception. This plan required modification. Please see Chapter 6 Qualitative Results for details.

#### **Significance of the Study**

Gestational diabetes is a self-managed condition which requires daily attention and responses to a number of complex indicators. The health system can provide education, counseling, and pharmacological treatment, but the essential burden for disease management lies with the pregnant woman. The degree to which GD risks are perceived, understood and able to be mitigated will be shaped by social, cultural, economic, and environmental contexts. As the risks posed by GD are socially situated, it is imperative that understanding of GD management extends beyond an individual woman's biologic and behavioral factors. A significant social relation in this 'risk environment' is that of the intimate partner who is expected to share the

responsibility of caring for the infant once born. The influence of partner and peers is consistently found to have a greater impact on people's everyday behavior than that of health care providers (Croghan, 2005; Geana, Greiner, Cully, Talawyma, & Daley, 2012; Huang et al., 2013; Ondersma, Winhusen, & Lewis, 2010).

This study has the potential to inform clinicians of a potentially important aspect in successful behavioral change; that of the involvement of a woman's partner. Knowledge of the partners' attitudes towards the risk posed by GD may offer insight in the design and implementation of educational material and interventions aimed at modifying diet and exercise habits of women with GD. This study may also identify the partner's unique learning requirements. By involving the woman's partner, health care providers may have a clearer picture of the barriers and enablers of behavioral change. Identification of the gender specific predictors of risk perception related to GD would allow healthcare professionals to tailor educational materials and interventions and may lead to innovative programs which have the potential to improve pregnancy outcomes. Specific and tailored health messages may have the potential to improve rates of beneficial health behaviors during pregnancy, such as regular glucose monitoring and following recommendations for health eating/exercise. These behaviors have the potential to significantly improve neonatal outcomes. The positive impact of tailored health information, such as seeking post-partum glucose screening and persisting with healthy eating and exercise habits, extend the benefits of these tailored messages beyond pregnancy and have the potential to positively impact the entire family unit. Insight into the complex interplay of factors which impact risk perception is needed as rates of GD, obesity and Type 2 diabetes continue to increase in this province.

## Chapter 2: Literature Review

This chapter encompasses a literature review of several concepts. In the first section, the disorder of GD is described, with information provided regarding etiology, incidence rates, diagnosis and risk factors and outcomes for mother and infant. The next section involves risk perception from several perspectives. Risk perception is first discussed as a general concept, including a review of several theories of risk perception. Second, pregnancy specific risk perception is reviewed and lastly, the literature regarding the role of gender in risk perception is examined.

### Gestational Diabetes

GD is one of the most commonly occurring disorders of pregnancy. The adverse effects of diabetes on pregnancy outcomes has been well known since the beginning of the century and the term “gestational diabetes” has been used since the 1950’s (Buchanan & Xiang, 2005). In the 1960’s O’Sullivan proposed criteria for the interpretation of oral glucose tolerance tests (OGTTs) which established statistical cut-off points for the diagnosis of GD (O’Sullivan & Mahan, 1964). The accepted definition for GD is a carbohydrate intolerance of varying severity which is detected or has an initial onset during the course of pregnancy.

**Etiology and pathogenesis.** Changes in carbohydrate and lipid metabolism occur during pregnancy to ensure a continuous supply of nutrients to the growing fetus despite intermittent maternal food intake. A certain degree of insulin resistance is considered to be normal in the second half of pregnancy. This resistance is believed to be due to a combination maternal weight gain and the insulin-desensitizing effect of hormones produced by placental development leading to hypoplasia of pancreatic  $\beta$ -cells (Buchanan & Xiang, 2005; Butte, 2000). GD is a form of

hyperglycemia which results when an insulin supply is inadequate to meet tissue demands for normal glucose regulation (Boden, 1996).

**Incidence.** Precise data on the incidence of GD is lacking. Estimates range from 1% in Croatia (Crnèviç-Orliç et al., 2007) to 18% in India (Seshiah et al., 2007). In less developed countries, the rates are even more difficult to determine as screening for GD is accorded a lesser priority in the face of more serious maternal conditions such as HIV/AIDS (Jiwani et al., 2012). In Canada, GD impacts an estimated 4 - 6.5% of all pregnancies (Public Health Agency of Canada, 2011). Canada does not specifically track rates of GD so more precise figures are unavailable. A study published in 2008 found that the incidence of GD in Manitoba to be an estimated 2.9% of all births occurring in the twenty-year period between 1994-2004. The same study found an increase to 3.7% in the five years between 1999-2004 (Aljohani, et al., 2008b). For First Nations women living in Manitoba, prevalence of GD is three times that of non-Aboriginal women (Aljohani, et al., 2008b).

**Screening for gestational diabetes.** GD is detected by antenatal screening and there are no internationally accepted standards for screening (Jiwani et al., 2012). There are two generally accepted methods of screening for GD. One is a two-step process involving administering a 50mg oral glucose challenge test (OGCT), followed by a 75mg oral glucose tolerance test (OGTT) if 1-hour plasma glucose is between 7.8-11.0 mmol/L. The other method involves administering only the 75 mg OGTT with glucose levels checked at 1 and 2 hours post administration.

The International Association of Diabetes and Pregnancy Study Groups (IADPSG) have recommended criteria for the diagnosis of GD. The IADPSG was formed in 1998 to facilitate

international communication and collaboration between organizations which focus on GD. In 2008, the IADPSG presented the findings of the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO Study Cooperative Research Group) study (International Association of Diabetes: Pregnancy Study Groups Consensus Panel, 2010). The objective of the HAPO study was to clarify associations between maternal glucose levels lower than those diagnostic of diabetes and selected maternal/neonatal outcomes including large for gestational age (LGA), hypoglycemia, primary caesarian section, preeclampsia, birth injuries, NICU admission and preterm birth (HAPO Study Cooperative Research Group, 2002). The HAPO study found support for associations between adverse outcomes and even relatively low levels of maternal insulin resistance, suggesting that the deleterious effects of elevated glucose in pregnancy can occur even in fairly mild cases of GD (Coustan, 2012; Metzger et al., 2008).

The findings of the HAPO study prompted the IADPSG to recommend screening all women considered at risk for developing gestational diabetes at the first antenatal visit using the OGTT and revised lower cut-off points. The IADPSG further recommended screening for all pregnant women regardless of risk status a second time at between 24-26 weeks gestation, again using the OGTT (Coustan, Lowe, Metzger, & Dyer, 2010). These recommendations have been endorsed by the American Diabetes Association (Coustan, 2012). However, controversy surrounds this recommendation as it has been pointed out that following such recommendations would lead to a diagnosis of GD in nearly 20% of all pregnancies (Leary, Pettitt, & Jovanovic, 2010). A recent study conducted in Japan retrospectively applied the IADPSG diagnostic criteria to a population of women diagnosed with GD over a four-year period. Applying the IADPSG criteria would increase the prevalence of GD 2.37-fold, as women previously diagnosed with milder abnormalities in glucose levels were then diagnosed as having GD (Fukatsu et al., 2017).

Such a broad definition of GD may lead to an increased medicalization of the state of pregnancy (Saade, 2013).

The Society of Obstetricians and Gynecologists of Canada (SOGC)'s most recent practice guidelines recommend either the one or two step screening process but did not adapt the IADPSG recommendation for lower diagnostic cut-offs. (Berger, et al., 2016). Screening is recommended at between 24-28 weeks gestation for all pregnant women, regardless of presence of risk factors. If there is a high risk of GD based on multiple risk factors, screening should be offered during the first half of the pregnancy and repeated at 24 to 28 weeks gestation if initially normal. Women with multiple clinical risk factors may be screened at any time during pregnancy (Thompson et al., 2013). The SOGC also makes a number of recommendations involving increased prenatal surveillance and offering induction of labour between 38 to 40 weeks' gestation depending on glycemic control and other comorbidities. Breastfeeding is highly recommended for women with GD (Berger et al., 2016). The lack of an internationally acknowledged gold standard for the diagnosis of GD has led to difficulties in generating occurrence rates and hindered the development of a consensus of what exactly constitutes GD (Leary et al., 2010).

**Risk factors.** A Manitoban study has reported risk factors for GD which include maternal age over 35 years, high parity, incidence of GD in a previous pregnancy and Aboriginal ancestry (Aljohani, et al., 2008b). Pre-pregnancy obesity and/or excessive weight gain during pregnancy is a major risk factor for the development of GD in pregnancy (Anderson et al., 2005). The SOGC guideline on obesity in pregnancy specifically mentions the increased risk of GD faced by women with high Body Mass Index (BMI), and postulates that, for these women, the diabetic

state may have preceded pregnancy as undiagnosed Type 2 diabetes which is identified under the scrutiny of pregnancy (Davies et al., 2010).

**Maternal and fetal outcomes.** Gestational diabetes confers major long and short-term health risks to both mother and infant (Horvath et al., 2010; Reece, 2012). GD poses a threat to the health of the infant, beginning with embryonic development and continuing into childhood and early adulthood. According to a recent meta-analysis of 15 years of research, infants of women with GD have a significantly higher rate of major congenital malformations (Balsells, Garcia-Patterson, Gich, & Corcoy, 2012). Specific malformations associated with diabetic pregnancies include anomalies of the cardiovascular system (such as transposition of the great vessels and hypoplastic left ventricle) (Stella et al., 2008), the central nervous system (such as spina bifida and menengomyelocele) (Anderson et al., 2005), musculoskeletal system (such as caudal regression), genitourinary system (such as renal agenesis) (Allen & Armson, 2007) and the gastrointestinal system (such as rectal/anal atresia) (Moore, Bradlee, Singer, Rothman, & Milunsky, 2002).

The pathogenesis of these malformations is not well understood but may be related to multiple pathways including nutritional deficiencies, pre-existing undiagnosed Type 2 diabetes, and toxic metabolites (Allen & Armson, 2007). In addition to issues involving congenital malformations, infants delivered to diabetic mothers have higher rates of traumatic birth injury such as fractures, shoulder dystocia, and brachial-plexus injury, (Hay, 2012; Melendez, Bhatia, Callis, Woolf, & Yoong, 2009; Mitanchez, 2010; Mitanchez, Burguet, & Simeoni, 2014; Zhang, Decker, Platt, & Kramer, 2008). However, care must be taken in interpreting these results as the risks of traumatic injury during birth are related to the state of macrosomia and should not be conflated with diabetes in pregnancy. Babies who are born large for gestational age (LGA) to

non-diabetic mothers are also at risk for birth injury (Henriksen, 2008). More study is needed to clearly explicate the relative risk of GD versus macrosomia in birth injury. A study done in Manitoba found that the effects of GD can persist into the first year of life, with infants delivered of diabetic mothers having higher rates of NICU admission as well as post-neonatal hospital admission (Ruth, Roos, Hildes-Ripstein, & Brownell, 2012).

There is increasing evidence from the field of epigenetics which suggests that metabolic mapping may create a vulnerability for the development of metabolic disease in children born to diabetic mothers (Bouchard, 2013; Lehnen, Zechner, & Haaf, 2013; Lobelo, Boney, Verma, Tucker, & Vohr, 2005; Pinney & Simmons, 2012). These findings provide support for a link between gestational diabetes and later childhood obesity and the development of Type 2 diabetes during childhood (Burguet, 2010; Lobelo et al., 2005; Ross & Desai, 2013; Vrachnis et al., 2012).

Women who are diabetic during pregnancy greatly increase their chances of developing Type 2 diabetes later in life (Reece, 2008). This risk is further increased by obesity, First Nations status and advanced maternal age (Aljohani, et al., 2008a). During the antepartum and intrapartum period, women with GD have a higher incidence of induction of labour, caesarean section and assisted vaginal delivery, as well as increased rates of perineal injury, post-partum haemorrhage and have a greater likelihood of anaesthesia related complications (Henriksen, 2008; Langer et al., 2005; Nelson, Matthews, & Poston, 2010; Reece, 2008; Voldner et al., 2008; Yang, Cummings, O'Connell, & Jangaard, 2006). These complications all have the potential to lead to prolonged hospitalization and the attendant costs to the healthcare system (Chen et al., 2009).

The maternal risk most discussed in the literature is the risk of developing Type 2 diabetes later in life (Aljohani, et al., 2008a; Chasan-Taber et al., 2009; Chen et al., 2009; Crowther et al., 2005; Nelson et al., 2010; Ratner et al., 2008; Reece, 2008; Yang et al., 2006). Estimates of actual occurrence range from 10-70% with risk increasing by 10% per year (Castorino & Jovanovic, 2011; Chasan-Taber et al., 2009; Chen et al., 2009; Ratner et al., 2008). A Canadian retrospective cohort study followed women diagnosed with GD for up to thirteen years and found a 17.9% occurrence rate of Type 2 diabetes (Russell, Dodds, Armson, Kephart, & Joseph, 2008). A review and meta-analysis reviewed the results of studies which examined the occurrence of Type 2 diabetes following GD and reported a relative risk increase of 7.43 among 20 reviewed studies (Bellamy, Casas, Hingorani, & Williams, 2009). Women with GD have an increased risk of developing GD again in a subsequent pregnancy, with several studies reporting a reoccurrence rate of over 40% (Getahun, Fassett, & Jacobsen, 2010; Khambalia et al., 2013).

Studies have also demonstrated that metabolic follow-up during the postpartum period is lacking. A 2014 study conducted at Boston Medical Center found that only 23.4% of women with GD received any kind of glucose testing during the 180-day period following delivery, and of those women who were followed up, only 29% received the recommended OGTT (McCloskey, Bernstein, Winter, Iverson, & Lee-Parritz, 2014). A 2014 Cochrane Review of studies examined the effectiveness of diabetes follow-up reminder systems aimed at women and their healthcare providers and sent by postal service. This review found mainly low-quality studies which were highly influenced by bias, demonstrating poor support for the efficacy of postal reminders (Middleton & Crowther, 2014). Lack of follow-up represents a significant missed opportunity for preventative healthcare. Further, there are studies which examine the extent to which women modify their diet and exercise behaviors following GD. Invariably, these

studies have reported negligible amounts of behavioural change (Harrison, Lombard, Strauss, & Teede, 2013; Harrison, Lombard, & Teede, 2012; Hjelm, Berntorp, Frid, Aberg, & Apelqvist, 2008; Jones, Roche, & Appel, 2009).

In addition to the serious health implications, GD has psychosocial consequences as well. Women with diabetes in pregnancy report lower self-esteem and have diminished confidence in their ability to successfully parent their infant (Lawrence, 2011). Women report feeling as if the focus of their pregnancy is on glycemic control and disease management rather than other aspects of pregnancy. Feelings of guilt and shame compound the negative experience (Anderberg, Berntorp, & Crang-Svalenius, 2009).

Gestational diabetes is a self-managed condition which requires daily attention and responses to a number of complex indicators. The health system can provide education, counseling, and pharmacological treatment, but the essential burden for disease management lies with the pregnant woman. The degree to which GD risks are perceived, understood and able to be mitigated will be shaped by social, cultural, economic, and environmental contexts. As the risks posed by GD are socially situated, it is imperative that understanding of GD management extend beyond an individual woman's biologic and behavioral factors.

### **Risk Perception**

This section of the literature review will examine risk perception in general, followed by a specific discussion of literature on risk perception in pregnancy. Risk is ubiquitous in modern society. The eminent German sociologist Ulrich Beck coined the neologism "Risk Society", in his book *Risk Society: Toward a New Modernity*, to provide a characterization of the dominant theme or spirit of an age, what Germans call its zeitgeist. Beck's "Risk Society" is just such a

label; its intent is to underscore his position that society, in this era of advanced modernity, is dominated by the ubiquity of risks, not only as the dominant consciousness of the age but also as the challenge that threatens to overwhelm societies. Beck argued that, while humans have always faced certain level of risk, such as natural disasters, these have usually been perceived as produced by non-human forces (Beck, 1992). In modern society, the majority of risks faced by populations are manufactured risks. Manufactured risks are characterized by a high degree of personal agency, both in producing and mitigating these risks (Giddens, 1999). Beck and other risk writers have identified health related risks as prime examples of manufactured risks, citing examples such as cancer caused by exposure to environmental toxins (Beck, 1992; Slovic, 1987). Prior to the risk society, questions of personal responsibility were reserved for individuals whose actions had clearly jeopardized their health status, for example alcoholics and opium addicts (Alaszewski, 2006). Personal agency is now a major factor in discourse regarding health and health risk (Clarke, 2009).

Risk perception as a concept contains both the presence of some hazard or danger, either actual or implied, combined with awareness of its existence (Wildavsky & Dake, 1990). It has been defined as “one’s expectancy about the probability of an event occurring” (Weinstein et al., 2007, p. 147), or equated with “beliefs about potential harm” (Brewer et al., 2007, p. 136). These two conceptualizations highlight an important duality regarding risk perception. Perception of risk goes beyond objective rational calculations regarding statistical, Bayesian-type probabilities which weigh the impact of a variety of risk situations (Horlick-Jones & Prades, 2009). There is also an affective quality to risk perception, one that involves feelings and beliefs regarding personal susceptibility (Sjöberg, 2000). Theoretical models of health behaviour focus on these subjective assessments regarding risk in an attempt to understand how people make decisions

that affect health and wellbeing (Brewer et al., 2007). Two methods of understanding risk perceptions have dominated the health care literature, psychometrics and cognitive heuristics.

**The psychometric paradigm.** This model created a taxonomy for hazards which can be used to understand why people perceive some risks to be inherently “riskier” than others (Fischhoff et al., 1978). The psychometric paradigm takes a social constructionist view of risk. Individuals construct their own set of meanings regarding risk situations. Appraisal of the danger of each risk situation represents involves a complex interplay of personality, experiential and cultural factors (Loewenstein, Weber, Hsee, & Welch, 2001). The psychometric paradigm is an attempt to account for these antecedents which largely involve mechanisms for assessing the severity of a risk. Nine conditions were found to mitigate the personal perception of a situation as constituting risk. These include the characteristics of *voluntariness*: the ability to choose whether or not one is exposed to risk lessens the perception of severity, *immediacy of anticipated potential effect*: if the effect will occur immediately, the risk is seen as more serious, *extent of personal risk knowledge*: does the individual possess sufficient knowledge regarding the situation, *extent of scientific risk knowledge*: to what extent are the risks understood by the scientific community, *control*: if exposed to the risk, can an individual, by virtue of personal skill or diligence, mitigate the consequences of exposure, *newness*: are the risk novel or familiar, novel risks are seen as more dangerous, *dreadfulness*: does the risk invoke feelings of dread, *catastrophic potential*: risks that have the potential to kill or harm large numbers of people at one time are seen as more serious and finally *severity of consequences*: situations which could result in death are perceived as the most risk laden (Fischhoff et al., 1978).

While the psychometric paradigm has been extensively used in risk perception research, it is not without its limitations. Testing of the psychometric paradigm has found that these

characteristics are highly inter-related (Boholm, 1998; Sjöberg, 2000, 2003; Slovic, 1992; Slovic, Finucane, Peters, & Macgregor, 2004), and only explain approximately 20% of the variance of perceived risk (Sjöberg, 1996). Due to the inter-related nature of the psychometric variables it can be difficult to operationalize these constructs in a research study (Boholm, 1998; Sjöberg, 1996).

**Cognitive heuristics.** While many theories have linked risk perception to health behaviour change, research has not supported this association (Fishbein & Yzer, 2003; Sirur, Richardson, Wishart, & Hanna, 2009). Rather, research into risk perception has found that individuals employ several psychological mechanisms when deciding how to respond to risk (Brown, 2005; Brown & Morley, 2007). A rationalistic definition of risk perception assumes that if an individual has sufficient knowledge regarding a hazard that person will alter their behaviour to ameliorate their degree of exposure (Green, 2009). This is clearly not the case, as the example of smoking indicates. The risks of smoking are well known to both experts and lay persons, yet large numbers of people continue to use tobacco. The explanation for this apparent contradiction lies in how people actually think about risk. Risk perception involves feelings, attitudes and beliefs (Henwood et al., 2008). Research has demonstrated that knowledge of statistics and probabilities does not account for variation in risk perception (Barilli et al., 2010; Krewski et al., 2012). Rather, people make decisions based on cognitive heuristics - a type of mental shortcut (Tversky & Kahneman, 1974).

A heuristic is a mental guideline that is an easily accessible cognitive framework formed by knowledge, experience and beliefs (Boholm, 1998). Inherent in most heuristics is a method for the individual to acknowledge risk yet downplay the extent to which they are personally

susceptible (Denscombe, 2010). This has been referred to in the literature as comparative or unrealistic optimism (Adriaanse et al., 2008; Brown & Morley, 2007).

Availability and representativeness are two cognitive heuristics frequently cited in risk perception research (Boholm, 1998). Availability heuristics refer to the relative ease or difficulty with which a person can think of examples of a specific risk situation. Representativeness refers to the degree of risk a person feels they face as compared to a typical individual who has developed the condition in question (Tulloch & Lupton, 2003). Both of these heuristic mechanisms create a sense of vulnerability, which an important affective aspect to the definition of risk perception (Younge, Salem, & Bybee, 2010).

**Risk perception in pregnancy.** Although it is clear that GD is linked to serious complications, little is known about how women with GD perceive their risk during pregnancy and how this perception of risk impacts their behaviors. There have been studies which examine risk perception with a specific focus on GD. However, these studies focus on women with a history of GD who are at risk of developing GD again in a subsequent pregnancy (Kim et al., 2007; Razee et al., 2010; Zera, Nicklas, Levkoff, & Seely, 2013). Studies of women currently diagnosed with GD focus on topics such as lived experiences (Evans & O'Brien, 2005), beliefs about health and illness (Hjelm et al., 2008), or how information regarding lifestyle information is perceived (Lindmark, Smide, & Leksell, 2010).

The role of risk perception is an important issue especially during pregnancy when health behavioral changes have the potential to impact both mother and infant (Bayrampour et al., 2012b; Czerwinski et al., 2010; Kim et al., 2007). Risk perception in pregnancy is a topic that has generated a great deal of interest. A recent concept analysis found that risk perception in

pregnancy influences women's affective state and has an impact on decision-making about pregnancy and childbirth (Lennon, 2016). The manner in which pregnant women conceptualize risk, how women respond to communications regarding pregnancy risk and to what extent these thoughts and beliefs impact health behaviors are all important topics for consideration. Risk perception in pregnancy is a complex phenomenon as it involves not only the individual woman, but the unborn infant as well. Adding to the complexity is the need to consider the partner's perspective on potential risk, as partners have an obvious investment in the pregnancy. Partners may have considerable influence over the health behaviors of the pregnant woman and thus his beliefs regarding risk should also be considered.

The risk society thesis has influenced modern views on the state of pregnancy. In the first half of the 20<sup>th</sup> century pregnancy was seen as a natural state and some degree of maternal/neonatal morbidity and mortality was anticipated (Carolan, 2009; Coxon et al., 2012; Enkin, 1994). As medical care advanced, mortality and morbidity decreased, particularly in developed countries, to the point where the death of a mother in childbirth has become a rare event, and the death of a fetus or infant is usually attributed to a specific cause (Hofberg & Brockington, 2000; Jordan & Murphy, 2009). Pregnancy has thus become a state where increased medical surveillance has been deemed both necessary and desirable (Possamai-Inesedy, 2006 #260).

Despite the increasing safety of childbearing, and consistent with Beck's views on manufactured risk, pregnant women are exposed to the view that childbearing and childbirth are intrinsically dangerous. Activities such as antenatal screening and genetic testing are not without their own attendant risks, yet are recommended to ameliorate risk (Carolan, 2009; Coxon et al.,

2012; Robinson, Pennell, McLean, Oddy, & Newnham, 2011). Women with specifically diagnosed disorders of pregnancy such as GD have additional recommendations made for them to alter health behaviors such as diet, exercise, medication compliance and blood glucose testing. Women often express feeling that they must comply with recommendations made to them by their healthcare provider in order to protect not only their own health, but most importantly, the health of their infant (Atkinson & Farias, 1995; Carolan, 2009; Handwerker, 1994; Lee, Ayers, & Holden, 2012; Robinson et al., 2011).

The focus is not solely on the woman; expectant fathers are increasingly seen as having an active role in pregnancy (Alio, Salihu, Kornosky, Richman, & Marty, 2010). Given the increasingly medicalized view of pregnancy and the social pressure for women to act in a manner that reduces these perceived risks, it becomes increasingly important to understand the factors that influence both a pregnant woman's and an expectant father's perceptions of risk.

**Factors impacting the perception of pregnancy risk.** Pregnancy is a unique state and thus the influences on risk perception must be examined separately. Pregnancy not only involves the health and well-being of the woman but also the unborn infant, the woman's partner, other children, extended family and the general community. While some of the factors influencing risk perception have been discussed in the previous section, others are specific to pregnancy or have different meanings within the context of pregnancy.

**Medical risk.** Medical risk is perhaps the most straight forward factor which influences a pregnant woman's assessment of risk. There are a variety of biomedical tools available to assist practitioners in determining a woman's probability of developing a complication during her pregnancy and/or delivery. These tools are models of statistical probability derived from

population-based epidemiology. While these tools are widely used, they may not be an accurate reflection of the true level of risk faced by a woman during the course of pregnancy (Jordan & Murphy, 2009). A systematic review of scoring tools used to predict the risk of preterm birth found the tools had poor predictive ability and generally resulted in increased interventions for women labelled at risk, with no measurable improvements in outcomes (Honest, Bachmann, Sundaram, Gupta, Kleijnen, & Khan, 2004).

Medical risk is generally communicated using statistical probabilities. There has been considerable research focussed on the ability of the lay public to understand numerical risk information. Several studies have demonstrated that pregnant women often have difficulty accurately assessing numerical probability (Czerwinski et al., 2010; Darbyshire, Collins, McDonald, & Hiller, 2003; Georgsson Öhman, Grunewald, & Waldenström, 2009; Harrison et al., 2013). This difficulty is not specific to women. A qualitative study examining father's reactions to the detection of "soft markers" during routine ultrasound found that men report feeling frustrated with their difficulty in understanding the implications of complex probability estimations. These fathers report that they felt the need to regain some degree of control over the situation by gaining an understanding of numerical estimates (Åhman, Lindgren, & Sarkadi, 2012).

An additional issue with the use of scoring tools to determine the extent of medical risk involves a discordance between the objective tool derived risk score and a woman's own subjective assessment of her degree of risk. Several studies conducted with pregnant women have found that women who were assigned a high-risk label by healthcare providers disagreed with the level of risk ascribed to their pregnancy (Corbin, 1987; Heaman, 1992a; Headley, 2009; White, 2008), or more specifically, the risk ascribed by nurses to the health of the mother (Gray,

2006). Other studies have found congruence in the risk assessments of women and their care providers (Bayrampour, Heaman, Duncan, & Tough, 2013; Patterson, 1992). A recent quantitative analysis of seven studies which examined the risk perceptions of women whose pregnancies had been labelled as “high risk” found inconsistencies between women’s perceptions and those of healthcare professionals. Although most women in these studies rated their risk as higher than that of women with uncomplicated pregnancies, these women were unlikely to view their risk as severe (Lee et al., 2012).

Although women may not always agree with the degree of risk ascribed to their pregnancy, there is clear evidence which demonstrates that the existence of medical conditions does influence a woman’s pregnancy risk perception. In studies examining risk perceptions of nulliparous women and women with a complicated versus uncomplicated pregnancy there was an association found between bio-medically determined risk scores and scores on the risk perception instrument (Bayrampour et al., 2013; Gupton et al., 2001). Medical risk was found to be a significant predictor of risk perceptions among nulliparous women. However, this variable only predicted a small amount of variance in the overall model (Bayrampour et al., 2013). Similarly, in the study examining complicated and uncomplicated pregnancies, medical risk score was found to be the strongest predictor of perceived risk for both groups of women (Gupton et al., 2001). Another study compared the risk perceptions of older and younger nulliparous women and found that while medical risk score had a moderately strong positive correlation ( $r = 0.41$ ) with risk perceptions in younger nulliparous women, there was no significant association found in older women (Bayrampour et al., 2012b). Clearly, objective biomedical risk does play a role in pregnant women’s risk perception; however, there are other important factors.

A final point regarding medical risk involves the implications of having a pregnancy labelled as “high risk”. The very nature of pregnancy can be altered by the application of this label, from a joyous, hopeful time to one of stress, worry and fear. A recent meta-synthesis reviewed 6 qualitative studies of risk perception in pregnancy. This review generated a number of findings regarding the consequences a high-risk label. Women used a number of sources to determine their own personal estimations of risk, from professionals to family and friends. Women strive to find normalcy and positive aspects to the diagnosis, such as increased access to medical care. The manner in which a woman develops an emotional connection to the developing impact is impacted by a high-risk label. Many women reported feeling fearful of becoming too attached to the infant if the outcome of the pregnancy is uncertain.

**Demographic and psychosocial factors.** Demographic and psychosocial factors also contribute to the formation of a woman’s perception of risk, although their impact tends to depend on the nature of their interactions with other variables. Most studies on risk perception in pregnancy include demographic characteristics such as maternal age, gestational age, parity, ethnicity, education level, income, marital status and BMI. Other studies include questions regarding pregnancy specific health behaviors such as attendance at prenatal classes (Gupton et al., 2001; Heaman, Beaton, Gupton, & Sloan, 1992), the number of interactions with a healthcare provider (Chuang et al., 2008; Gray, 2006) and the type of prenatal care provider (Kim et al., 2007; Stahl & Hundley, 2003). General health behavior questions included smoking and drug use (Chuang et al., 2008; Kim et al., 2007), as well as level of physical activity and consumption of fruits and vegetables (Kim et al., 2007). There are also studies which examined the influence of the social determinants of health. In most cases the focus was on the impact of poverty as a risk factor, although studies did examine the influence of factors such as low health literacy

(Oza-Frank, Conrey, Bouchard, Shellhaas, & Weber, 2018; Reid, Anderson, Cormack, Reid, & Harwood, 2018) and food insecurity (Laraia, Siega-Riz, & Gundersen, 2010; Vogel, Anderson, Raine, & Clandinin, 2001). Social determinants of health are contextual factors which can be difficult to measure. Often, researchers select qualitative methods to explore the social determinants of health and additional quantitative work is needed at the policy level (Low, Low, Baumler, & Huynh, 2005).

**Age.** The only demographic factor consistently found to be associated with risk perception was maternal age, which was found to interact synergistically with other factors such as gestational age and anxiety (Bayrampour et al., 2013), being labelled as a high risk pregnancy (Stahl & Hundley, 2003), ethnicity (as an interaction with biomedical risk score in women with complicated pregnancies), (Gupton et al., 2001), and increased BMI in women at risk for developing gestational diabetes (Kim et al., 2007).

**Education.** Some studies reported contradictory findings in regard to education. While most studies found no relationship between education and risk perception, women who felt the risk associated with amniocentesis or chorionic villus sampling was low were better educated than women who perceived the risk associated with these procedures as high (Kolker & Burke, 1993). In contrast, women with lower education were significantly more likely to rate their risk of developing diabetes as high (Kim et al., 2007).

**Stress.** Demographic factors are not the only individual characteristics which impact perceived risk during pregnancy. Psychosocial factors such as antepartum stress also influence risk perception in pregnancy. A study of hospitalized pregnant women found that these women reported experiencing more stressful life events than women who were not in hospital (Mercer &

Ferketich, 1988). A later study conducted with women hospitalized for elevated blood pressure found that, while women in hospital did not report experiencing more stressful life events, they did display more manifestations of stress such as mood disturbances and signs of depression (Heaman, 1992a).

Managing other aspects of their lives in conjunction with a complicated pregnancy is another common experience which adds to stress (Lee, Ayers, & Holden, 2014). The implications of these findings are especially salient for GD. Women who are overweight or obese report feeling responsible for the condition and feel tremendous guilt for potentially jeopardizing the health of their infant (Grohmann et al., 2013). Additionally, the variations in screening procedures and indeed the absence of conventionally held diagnostic criteria for GD have created a situation where women may be labelled as high risk by virtue of a diagnosis of GD; a diagnosis made in the absence of best practice evidence (Saade, 2013).

Perhaps the greatest evidence of the impact of stress can be found in qualitative literature. A consistent finding in qualitative studies which examine various aspects of risk perception in pregnant women is that any condition occurring during pregnancy induces stress and fear. Specific to GD, a recent meta-synthesis of qualitative studies which examined the perceptions of women with GD found a main theme entitled “emotional response”, which was characterized by expressions of negative emotions such as shock and fear, reports of greatly increased stress levels and coping mechanisms such as denial and anger (Parsons, Ismail, Amiel, & Forbes, 2014).

***Self-efficacy.*** Self-efficacy has been found to influence the risk perceptions of women with a history of, or are at risk of developing, GD. Perceived self-efficacy refers to “people’s beliefs about their capabilities to exercise control over their own level of functioning and over

events that affect their lives” (Bandura, 1991, p. 257). Women with this diagnosis receive recommendations from their healthcare providers to alter lifestyle habits and, depending on the severity of the disease, to monitor blood glucose levels closely and to take medications. The degree to which women feel they are capable to carry out these recommendations is, in part, dependant on their sense of self-efficacy. In studies which focus on women with a previous diagnosis of GD, self-efficacy has been shown as a key factor in predicting the adoption of physical activity and/or healthy eating habits (Kim, McEwen, Kieffer, Herman, & Piette, 2008; Koh, Miller, Marshall, Brown, & McIntyre, 2010; Smith, Cheung, Bauman, Zehle, & McLean, 2005; Symons Downs & Ulbrecht, 2006; Zehle, Smith, Chey, McLean, Bauman, & Cheung, 2008). Only one study was found which examined the role of self-efficacy in women with a current diagnosis of GD. Diabetic women in this Iranian study were found to have low levels of self-efficacy (Bastani & Zarrabi, 2010). However, these results are difficult to interpret as it is unclear whether this group was compared to other groups of pregnant women or to women in general and the self-efficacy measure used was specific to Iranian women and thus may not be generalizable to other populations of pregnant women.

**Poverty.** While income is included in most GD studies, poverty as a district contextual factor, is often over looked. Poverty is a social determinant of health and as such, has an effect on all aspects of the lives of individuals, families, communities and populations (Mikkonen & Raphael, 2010). There are important differences between poverty and income. Income of course, is defined by the “amount of money or commodity earned from work or investments, preferably on a regular basis” (Reference List). Poverty however, is a relative concept, best measured by decomposable metrics rather than by a finite number (Foster, Greer, & Thorbecke, 1984). In developed countries, researchers generally examine relative poverty, which means having less

than others in society (Hagenaars, 2017). In the literature on GD and relative poverty, many studies are qualitative and seek to elucidate the experiences of women previously diagnosed with GD, with the goal of improving pregnancy outcomes. For example, a recent US study conducted focus group interviews with an ethnically diverse population of underprivileged women with a history of GD ( Oza-Frank, Conrey, Bouchard, Shellhaas, & Weber, 2018). The women identified issues such as communication problems, overly directive healthcare providers, barriers related to transportation, food and medication costs. Although the women in this study expressed interest in receiving more actionable advice for managing GD and for preventing T2DM postpartum, few women reported changing behaviors due to barriers related to competing demands Oza-Frank et al, 2018).

Studies which examine the impact of poverty and its relationship to GD among Indigenous women are complicated by the intersectoral effects of overlapping issues such as poverty, social exclusion, healthcare inequality and colonization (Porter, Skinner, & Ellis, 2012; Sellers et al., 2016). A study conducted in New Zealand examined the perspectives of Māori women diagnosed with Type 2 diabetes and had a history of GD (Reid, Anderson, Cormack, Reid & Harwood, 2018) The study utilised a Kaupapa Māori research methodology which critiques socio-political systems that create inequities for Māori, by rejecting victim blaming and deficit theories (Barnes 2000). The cumulative effects of deprivation and living with GD compounded the complexities of participant' lives including perceptions of powerlessness and mental health deterioration. The participants also discussed numerous missed opportunities to expand their knowledge of GD management (Reid et al., 2018). More studies are required which examine the associations between poverty and GD management. The use of decomposed

measures of poverty allows for fluidity in measurement versus a ridged indicator such as income and has the potential to further understanding of this association.

**The psychometric paradigm in pregnancy risk perception.** The psychometric paradigm has been applied in research investigating the factors associated with risk perception in pregnant women. In research on pregnancy risk perception, two psychometric principles are particularly pertinent: the degree of dread associated with the risk and the amount of knowledge held regarding the risk (Carolan, 2013).

*Dread.* For pregnant women, dread is generally focused on concerns involving the well-being and safety of the infant (Enkin, 1994). In studies with pregnant women the psychometric property of dread can be operationalized in hypothesis regarding a woman's perceived degree of personal control, and anxiety (Chuang et al., 2008). The findings of studies examining perceived control suggest that this is a complex contributor to risk perception. In a study which compared the risk perception of younger women with women of advanced maternal age, a questionnaire was used to assess the degree of perceived control in these two groups of women. Maternal age was found to impact the relationship between perceived control and risk perception. Younger women's internal perceived control scores had a significant negative correlation with their risk perception scores ( $r = -0.32$ ). There was no significant relationship found between perceived control and risk perception in older women (Bayrampour et al., 2012b). A later study replicated the finding that maternal age mediated the impact of perceived control on risk perception (Bayrampour et al., 2013). Other studies have found that taking immediate action, such as engaging in antenatal screening, or planning to change health behavior; both of which may help a woman feel more in control of her current situation, are associated with lower pregnancy risk perception (Kim et al., 2007; Searle, 1996).

*Anxiety.* Anxiety is another construct often used to operationalize dread (Bayrampour, Ali, McNeil, Benzies, MacQueen, & Tough, 2016). Studies which compare women classified as high risk and low risk in their pregnancy have consistently found that labelling a woman's pregnancy as "high risk" is associated with greater anxiety (Gupton et al., 2001; Heaman et al., 1992b; Heaman & Gupton, 2009; White, McCorry, Scott-Heyes, Dempster, & Manderson, 2008). What is less clear is the direction of the association; it is unclear as to whether anxiety is a predictor of risk perception, or if perceiving one's risk as high contributes to feelings of anxiety. The question of whether anxiety is a predictor, or an outcome of risk perception remains an area in need of further research.

Anxiety has been shown to be a very strong predictor of pregnancy risk perception in a study involving nulliparous women (Bayrampour et al., 2013), as well as exerting a negative influence over a woman's ability to comprehend numerical risk generated by antenatal serum screening (Czerwinski et al., 2010). In some studies, anxiety interacts with other factors such as advanced maternal age (Bayrampour et al., 2012b), pregnancy complications (Gupton et al., 2001), and measurements of maternal attachment (White et al., 2008) resulting in an increased perception of risk.

A Canadian study examined the predictors of risk perception in nulliparous women. Variables included anxiety, risk knowledge, health factors, perceived internal locus of control, medical risk and gestational age. Several of these variables were found to be significantly independently predictive of increased pregnancy risk. Pregnancy related anxiety was found to be the strongest independent predictor of increased risk perception, accounting for 30% of the variance within the model. When the effect of maternal age was controlled for, it was found that, at the same level of anxiety, older women perceived their risk as higher than younger women

(Bayrampour et al., 2013). This supports the hypothesis that anxiety functions as a predictor of pregnancy risk perception.

An earlier study also found a strong association between anxiety and risk perception in pregnancy. Gupton et al, examined the predictors of pregnancy risk perception in complicated and uncomplicated pregnancies (2001). Predictor variables in this study included the biomedical risk score, various psychosocial characteristics, social supports, state anxiety and demographic/obstetrical factors. Anxiety and risk perception were found to have a significant positive correlation for all women in the study and was the second strongest predictor of perception of pregnancy risk. Combined with biomedical risk, state anxiety accounted for 31% of the variance in the perception of risk scores (Gupton et al., 2001).

**Worry.** In some studies, the construct of worry was assessed. Worry can be seen as related to anxiety as both describe a negatively oriented sense of preoccupation. Worry was significantly positively correlated with an increased perceived risk of developing breast cancer (Gerend, Aiken, West, & Erchull, 2004). In a study of pregnant women undergoing ultrasound screening for Down's syndrome, worry for the baby was significant even when the objective medical risk was low (Georgsson Öhman et al., 2009).

The deleterious effects of anxiety/worry can be seen very clearly in qualitative studies. Fear of the unknown was a major factor in the increased risk perceptions of women with complications of pregnancy, and many women reported feeling anxious and fearful for the well-being of their infant (Heaman, Gupton, & Gregory, 2004). Women with gestational diabetes also report feelings of anxiety, particularly centering on feelings of guilt if they are not strictly compliant with disease self-management (Evans & O'Brien, 2005). For pregnant women with a

chronic illness, anxiety permeates their pregnancy and even those with stable illnesses report a constant, often debilitating state of anxiety (Corbin, 1987). Anxiety and worry regarding the health of the infant was reported as a major factor in a woman's decision to have a hospital versus a home birth (Shepherd McClain, 1983).

***Risk knowledge.*** According to the psychometric paradigm, risk knowledge is an important feature in determining the degree to which a situation is determined to be "risky". If an individual has greater personal knowledge regarding the risk, that risk is seen as more familiar and therefore, less threatening (Fischhoff et al., 1978). Studies of risk perceptions in pregnant women have not provided strong support for this assertion. In a study involving the women of advanced maternal age (AMA), Bayrampour et al. did not find a significant association between AMA risk knowledge and risk perception scores (2013). These results must be interpreted with caution as to the importance of risk knowledge. Maternal age is an unmodifiable factor and as such women may have a tendency to down-play the extent to which their age places them at risk for pregnancy complications. As previously discussed, unrealistic optimism permits the simultaneous acknowledgement of risk and the minimization of personal applicability.

The effect of knowledge regarding a modifiable risk factor has been explored in studies which examine the perceptions of women with a history of GD. These studies have also found no clear associations between diabetes risk knowledge and risk perception and/or behavioral change. Kim and colleagues found no significant association between knowledge of diabetes risk factors and estimations of the likelihood of developing diabetes in the future (Kim et al., 2007). These findings were replicated in a qualitative study of Swedish women which found that women believed GD to be a transient state which immediately resolved post-partum. Although

women in this study were able to articulate risk factors for the development of Type 2 diabetes later in life, they did not feel these factors applied to them (Hjelm et al., 2008).

While there is evidence that risk knowledge may not impact risk perception in women with a history of GD, there is reason to believe risk knowledge may impact the risk perceptions of women currently pregnant with GD. A recent meta-synthesis of qualitative studies regarding the perceptions of women with a history of GD found that fear for the infant was the most often cited reason for making behaviour change during pregnancy (Parsons et al., 2014). This finding suggests that, for women who are currently pregnant, motivation to protect the health of the infant may impact the effect risk knowledge has on risk perception.

**Cognitive heuristics in pregnancy risk perception.** The two types of heuristics are particularly relevant to the concept of risk in pregnancy for a number of reasons. The availability heuristic refers to the ability of a woman to easily recall other risk situations similar to her own. In women diagnosed with GD this could be reflected by the number of other women the person knows who have also been diagnosed. Representativeness refers to how alike or dissimilar the woman feels she is to the “typical “woman with the diagnosis. A recent study examining the predictors of risk for nulliparous women operationalized the availability heuristic by including a question exploring the number of friends/family members with a pregnancy-related illness, while representativeness was determined by asking how alike they felt they were to a woman of the same age who developed a pregnancy complication. After controlling for the effects of maternal age, availability became significantly correlated with perception of pregnancy risk (Bayrampour et al., 2013).

The availability heuristic also applies regarding a woman's own past obstetrical/health experiences. The past experience of delivering a preterm/low birth weight infant or an infant with a birth defect was found to be the most significant predictor for women when estimating their risk of these outcomes (Chuang et al., 2008). In a study examining women's risk perceptions related to breast cancer, heart disease and osteoporosis, Gerend and colleagues asked participants how many media communications they had seen in the past three months and to rate their perceived similarity to a woman who has developed each of the three diseases (Gerend et al., 2004). In this study, perceived similarity to other women who have developed any of the three diseases was the strongest correlate with perceived susceptibility (Gerend et al., 2004). In an Australian study examining women's beliefs about antenatal screening and perception of pregnancy risk, the likelihood that a woman will express anxiety over the possibility of delivering an infant with abnormalities increased nearly two and a half times when women knew someone who had a baby with abnormalities (Searle, 1996).

The impact of availability on risk perception also emerged in qualitative findings in which a woman's personal/familial health and obstetrical history influenced risk perception (Heaman et al., 2004). Women were more likely to view group B streptococcus (GBS) infection as a serious risk if they personally knew another woman whose infant had become ill or died from GBS sepsis (Darbyshire et al., 2003). The significance of real life experiences of risk was highlighted in another study which examined the risk perceptions of woman of advanced maternal age. Women in this study often recalled the experiences of friends or family members when assessing their own degree of risk (Bayrampour, Heaman, Duncan, & Tough, 2012a).

When incorporating questions to determine the impact of availability, caution should be taken to differentiate between having an acquaintance with the illness and having a biological family member with the illness. If the sense of availability stems from a family member, it may become confounded with genetic susceptibility (Gerend et al., 2004).

In the current age of modern communication women have vastly expanded social networks. The degree to which women can share experiences of pregnancy may increase the extent to which psychometrics and cognitive heuristics impact risk perception (Larsson, 2009). The manner in which women use the internet and social networks to seek out information regarding pregnancy and share their experiences with others is a nascent aspect of pregnancy risk perception research and is deserving of further investigation.

### **Gender and Risk Perception**

It is well established in the risk perception literature that there are clear gender-based differences. In social research in general it has been convincingly demonstrated that gender makes a difference and studies which omit gender overlook an important aspect of the object of study. In studies which incorporate gender as a level of analysis, men have been consistently found to rate risks as less severe compared to women. Men and women report being worried about the same sorts of things; however, women generally worry a bit more (Gustafson, 1998). In the area of risk perception related specifically to diabetes, a recent study supported the assertion that women tend to rate risk higher than men. In this study, women with Type 2 diabetes consistently assessed their risk of developing cardiovascular disease as higher than their male counterparts, even when their actual biomedical risk factors were equal or even lower (Homko et al., 2010).

The nature of the risk being investigated also impacts gendered risk perception. A review of studies which examined gender-based differences found that women expressed higher concerns over risk from technology and environmental hazards such as pollution and ozone depletion, while men expressed greater concern regarding economic threats such as unemployment or stock market crashes (Davidson & Freudenburg, 1996). This same review also found that the methods used to explain risk perception may function differently for men and women; the cognitive heuristic of availability was consistently found to be more salient for women than for men (Davidson & Freudenburg, 1996). Montgomery, Erblich, DiLorenzo, & Bovbjerg (2003), reported that while a family history of breast or colon cancer, heart disease or diabetes affected the perceived risk of the disease for both genders; having a friend diagnosed with the disease only contributed to perceived risk of developing these diseases among women, not among men.

Cutter and colleagues point out that in some psychometrically based risk perception studies, the types of risks presented are reflective of predominately male experiences, such as hunting, participation in contact sports or motorcycling. The authors suggest that these risks are more familiar to men and thus may be perceived as less risky (Cutter, Tiefenbacher, & Solecki, 1992). Characterizing some risks as inherently feminine or masculine however, must be undertaken with extreme caution to avoid oversimplification of gender roles, if not outright gender stereotyping. It is also worth noting that many of these studies pre-date modern communication methods and may now lack relevance to the realities of the “global village”.

A more useful perspective involves questioning the assumption that men and women do indeed worry about the same things and that the differences in these perceptions can be

expressed in quantitative terms. There has been some qualitative work on gendered risk perception which serves to highlight that while men and women may worry about similar risks, the meaning ascribed to the risks are quite different (Gustafson, 1998). Perhaps the best example of this is crime. While both genders express concerns over being the victim of a crime, for women, the possibility of sexual assault represent the greatest risk, while for men it is the potential for physical violence (Stanko, 1995).

### **Gender in Pregnancy Risk Perception**

No studies were found which specifically examined the male perception of the risk associated with gestational diabetes. A thorough literature search found only one study which included the perspective of the partner. Keely and colleagues examined the perspectives, attitudes and health behaviours of pregnant women with a BMI  $\geq 40$ . This qualitative study included the woman's partner to determine what impact (if any) the partner's perspectives had on the woman's attitudes and health behaviours (Keely, Cunningham-Burley, Elliott, Sandall, & Whittaker, 2017).

This study is the first to examine male pregnancy-related risk perception. However, there are studies which investigate the impact of partner beliefs and attitudes. Over the past two decades there has been increasing interest in the role of paternal involvement in a number of aspects of pregnancy. There is now abundant support for the notion that paternal involvement reduces adverse pregnancy outcomes such as preterm birth, low birth weight and infant mortality (Alio, Kornosky, Mbah, Marty, & Salihu, 2010; Alio, Mbah, et al., 2011; A. P. Alio et al., 2010; Gaudino, Jenkins, & Rochat, 1999; Ghosh, Wilhelm, Dunkel-Schetter, Lombardi, & Ritz, 2010; Ngui, Cortright, & Blair, 2009). Maternal health behaviors have been found to be significantly influenced by paternal attitudes and beliefs. Partner support has been consistently identified as a

significant positive predictor for smoking cessation or reduction during pregnancy and postpartum (Appleton & Pharoah, 1998; Cohen & Lichtenstein, 1990; Gage, Everett, & Bullock, 2007; Martin, McNamara, Milot, Halle, & Hair, 2007; McBride et al., 2004). Women with an involved partner were 1.5 times more likely to begin prenatal care in the first trimester as compared to women with uninvolved partners (Martin et al., 2007). Unmarried women with an unintended pregnancy were found to be at greater risk of having inadequate prenatal care and delivering a preterm infant. This risk was increased when the partner was unaware of the pregnancy (Hohmann-Marriott, 2009). Clearly the influence of the partner has a significant impact on the health and well-being of pregnant women (Alio et al., 2010). The body of literature regarding the importance of paternal participation in pregnancy and childbirth lends support to the assertion that the partner's perceptions of pregnancy risk require scholarly examination.

### **Summary**

This literature review has demonstrated that there is a great deal of scholarly work being conducted in the area of risk perception. Yet significant gaps remain. There is a lack of knowledge regarding how women with GD in their current pregnancy think about the risk diabetes poses to themselves and to their infant. How individuals conceptualize threats to health status and how those feelings translate (or fail to translate), into behavioral change is clearly an important topic for health researchers. Specific to pregnancy, there exists the need to maintain a balance between informing women and their families of complications in pregnancy and the growing tendency to treat pregnancy as an illness for some women.

The second literature gap identified involves a gendered understanding of pregnancy risk perception. The role of the father is beginning to emerge as key in many health promoting

behaviors during pregnancy. Yet health researchers and educators understand very little regarding the manner in which men conceptualize risk in the context of pregnancy. The goal of this study is to begin to fill these research gaps by exploring the phenomenon through a mixed methods study.

### **Chapter 3: The Research Scaffold**

This chapter begins with a section on the research scaffolding and the guiding frameworks used. This chapter describes the theoretical foundation for this study, provides rationale for its selection and examines the epistemological, philosophical, and theological and methodological underpinnings of this mixed methods dissertation. In a mixed-methods design, clarity is essential as it is often the case that the methods being applied in the study have quite divergent philosophical foundations.

#### **Research Scaffold and Guiding Framework**

**Epistemology.** Epistemology can be generally defined as the branch of science which studies the nature of knowledge (Carter & Little, 2007). The purpose of epistemological clarity is to justify the validity of the knowledge sought in the research project. The researcher's worldview underpins all aspects of scholarly inquiry, from which questions are given priority, what values are espoused, who participates and what methods are selected (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005).

Both the qualitative and quantitative portions of this dissertation propose to investigate perceptions, beliefs and attitudes using different methodologies. These are highly personal, individualistic properties. These factors are influenced by a myriad of factors including life experience, personality characteristics and cultural background. Each person will have a different set of thoughts to share and all contributions will be equally valued.

It is important at this stage of the research scaffold to clarify what is meant by the term "methodology". Method and methodology are often used interchangeably in the literature; however, their meanings are quite different (Wilkins & Woodgate, 2008). Methodology is

related to the theoretical perspective and is thus often embedded in an epistemology. Giddings & Grant (2007), refer to methodology as a “thinking tool” which guides the choice of method. In contrast, methods are the “doing tools” and the same method may be utilized as a data gathering device for a multitude of methodologies (Giddings & Grant, 2007; Wilkins & Woodgate, 2008). In this dissertation study, the methodological “thinking tools” involve a post-positivist epistemological standpoint.

Post-positivism adapts a realist view which asserts that, while there may be one discrete reality, our imperfect human senses cannot completely perceive it (Clark, 1998; Crotty, 1998). Thus, reality may be perceived differently by various individuals. Observation is maintained as the source for knowledge acquisition (Allen, Benner, & Diekelmann, 1986). However, for post-positivism, observation may take a variety of forms and include consideration of data obtained through interviews or focus groups (Clark, 1998). Post-positivism also includes an element of social constructivism. Constructivism holds that individuals create their own reality (Appleton & King, 2002). While a post-positivist orientation holds that there is apprehendable truth, the position acknowledges the socially constructed nature of truth.

One of the rationales commonly used for the use of a mixed methods study is triangulation of data sources. Triangulation occurs when more than one method is used as part of the validation process, ensuring that explained variance is due to the underlying characteristic being examined and not as a consequence of the method being applied (Campbell & Fiske, 1959). Specifically, this dissertation used between methods methodological triangulation (multiple methods used in the same study combining qualitative and quantitative approaches) (Denzin, 1978). Triangulation of results from divergent methods will represent a confirmation of

the veracity of the knowledge claims made in this research project, which is consistent with the post-positivist notion that replication equates to truth.

**Philosophical Orientation.** There are many reasons researchers choose to utilize a mixed methods design. Perhaps the most fundamental question facing scientists considering mixed methods involves the philosophical assumptions underpinning qualitative and quantitative research and the implications of combining the two. If these foundations are not carefully examined there is the risk that research becomes guided by unexamined values and ideas, resulting in incoherent, compromised results (Sale, Lohfeld, & Brazil, 2002; Yanchar & Williams, 2006). A coherent study or program of research is based upon critical examination of assumptions which are well developed, open to discussion, defensible and modifiable. Some authors suggest that mixed methods propose an “anything goes” position which is not reflective of these criteria for coherence (Guba & Lincoln, 2005; Sale et al., 2002; Yanchar & Williams, 2006).

The notion that qualitative and quantitative research cannot be combined due to inherent contradictions intrinsic to the philosophical underpinnings of the two approaches has been termed the incompatibility thesis (Howe, 1988). While a full discussion of this thesis is beyond the scope of this chapter, the generally accepted response to this criticism is the compatibility thesis, which advances the view of paradigm as a shared belief system held within a community of practice. Further, the compatibility thesis asserts that qualitative and quantitative are broad categories of methods, and not methodologies or paradigms (Arcidiacono & De Gregorio, 2008; Bergman, 2010; Denzin, 2010; Freshwater, 2006; Giddings & Grant, 2006; Giddings & Grant, 2007; Sandelowski, 2000b; Wilkins & Woodgate, 2008). The varying methods applied by mixed

methods research studies are often framed within the specific philosophical position of pragmatism.

**Pragmatism in mixed methods.** The most common philosophical approach seen in mixed methods research is pragmatism (Creswell & Plano-Clark, 2007; Tashakkori & Creswell, 2007). Pragmatism was developed in the 1870's by mathematician Charles Sanders Peirce, along with psychologists John Dewey, William James and social psychologist George Herbert Mead (Feilzer, 2010; Haig, 2005). Pragmatism is valued by mixed methods researchers for its position on the nature of truth. Rather than making metaphysical claims regarding the nature of truth, the pragmatist asks what difference it makes to accept a proposition as true or untrue: what James termed the "cash value" of an expression (James, 1995).

Pragmatism applies an abductive form of reasoning which moves in a cyclical, iterative fashion between induction and deduction. Abductive reasoning involves reasoning from phenomenon that are understood to be the effects of some other, unknown causal mechanism. These assumptions are then used to develop explanations for what the causal mechanism may actually be (Haig, 2005). The supposed causal mechanism must not only be sufficient to explain the observed phenomenon, it must be the most likely. Pragmatism then extends abductive reasoning a step further by contending that the source of the causal mechanism must make some sort of difference in the actions resulting from it to matter (Haig, 2005; Hannes & Lockwood, 2011). If the action is the same, independent of the cause, then the cause is less important. This is the basis for the pragmatic maxim.

The pragmatic rule or maxim states that the current meaning of a truth claim is determined by the expression or practical consequence of the belief in that claim and how that

belief impacts the individual in the course of their life (James, 1995). In this perspective, truth is outcome oriented, rather than a stagnant property. Framed within this dissertation process, a pragmatic philosophical stance would assert that it would need to make a difference if men and women perceived the risk of GD differently. The impact of pragmatism on the research process is that it places a fundamental importance on the research question. The nature of the question being asked drives the selection of methods (Feilzer, 2010; Howe, 2011).

### **Guiding Frameworks**

Both a conceptual and a theoretical framework were used to guide this study. A conceptual framework is composed of discrete concepts which are gleaned from the literature as being relevant to the issue in question. Conceptual frameworks are typically uniquely developed for each individual study. A theoretical framework contains a specific theory. Theories are defined as “a systematic explanation of an event in which concepts and constructs are identified and relationships are proposed, and predictions made” (McEwen & Wills, 2011, p. 22). Unlike conceptual frameworks, theories are existing entities which have been previously developed and have explicit relationship determined amongst their components. Often there are computational rules as to how the various components within the theory are to be combined. Due to the complex and nuanced nature of risk perception and to the nascent topic of gendered pregnancy risk perception it was felt that the study would benefit from both a specifically developed conceptual framework drawn from the literature and from the structure of an existing theory.

### **Conceptual Framework**

A conceptual framework was developed to guide the selection of variables to be considered in the study. This framework also assisted in the interpretation of the results. Risk

perception is pregnancy is a highly complex phenomenon which is impacted by a myriad of personal, social, bio-medical and contextual factors. Given that the area of gendered risk perception in pregnancy is not well explored, a conceptual framework is important to ensure the most empirically valid variables were selected. Based on the review of the existing literature regarding pregnancy specific and general risk perception, as well as those studies which focused on risk perception in pregnant women with a history of GD, a conceptual framework based on the psychometric paradigm was designed. Due to the complexity and multi-dimensional nature of the phenomenon of gendered pregnancy risk perception other concepts were added to the psychometric paradigm to create the framework.

The psychometric properties included in the conceptual framework are risk familiarity and dread. In addition to these two concepts three additional variables have been identified in the literature as being particularly salient to pregnancy related risk perception. These concepts include the cognitive heuristics of availability and representativeness, perceived stress and self-efficacy. Given that this is a study whose participants are involved in an intimate relationship it is hypothesized that the quality of the relationship may impact risk perception. There is empirical support for the assertion that the quality of the intimate relationship between a pregnant woman and her partner impacts factors such as anxiety (Gourounti, Anagnostopoulos, & Sandall, 2014). Therefore, the final concept in this framework is satisfaction with the intimate relationship.

### **Theoretical Framework**

Many theories have been proposed to explain the adoption of health protective behaviors. The theory selected to guide this study is Protection Motivation Theory (PMT). PMT is the most recently developed theoretical model of behavioral change and was developed by cognitive psychologist Ronald Rogers as an extension of several models termed “expectancy-value”

theories. The central principal in these theories is that the tendency to act in a certain fashion is a result of the expectancy that a given action will result in a consequence. The value of that consequence is thought to impact the behaviour (Ogden, 2003). These theories postulate that fear (or threat) inducing communication creates a cognitive mediational process which ultimately impacts behaviour or attitude (Rogers, 1975). PMT was revised in 1983 to include the dimension of self-efficacy (Maddux & Rogers, 1983).

PMT involves the use of fear appeals as an attempt to motivate behaviour change. A fear appeal is a communication which describes negative or undesirable consequences that may result from a failure to adopt the recommendations of the communicator (Rogers, 1975). PMT contains three components, within each are several concepts. The first component involves the sources of information regarding the fear appeal. Two sources are specified, environmental and interpersonal. According to PMT, sources of information lead to the next component of the theory, cognitive mediating processes.

The four cognitive variables in PMT are: 1) *perceived severity*: the magnitude of the noxiousness of the threat, 2) *perceived vulnerability*: the probability that the threat will occur, 3) *perceived response efficacy*: the belief in the ability of available response options to decrease or eliminate the threat and 4) *perceived self-efficacy*: the belief in one's own personal ability to successfully perform the suggested response option.

The cognitive variables are further organized into two cognitive mediating processes. Threat appraisal is informed by severity and vulnerability and forms a person's perception of their own degree of risk. Coping appraisal is determined by perceptions of response and self-

efficacy and mediates an individual's ability to cope with or even avert the threat. The threat and coping combine to form a variable termed protection motivation.

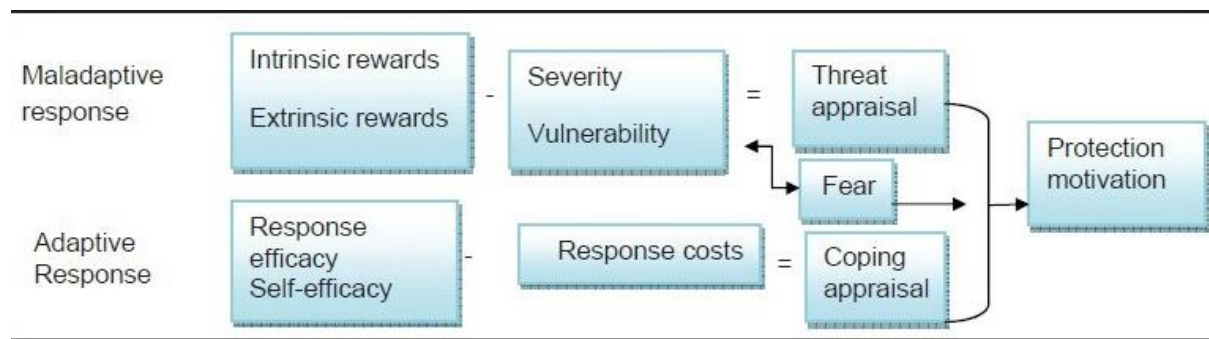
Protection motivation is described as an intervening variable that has the typical characteristics of a motive: it arouses, directs and sustains activity. It arises from the cognitive appraisal of an event which is noxious, likely to occur and for which there exists an effective response that the individual feels personally capable of performing. Protection motivation then leads to the final component where the individual adapts a coping mode, either adaptive or maladaptive. Fear is seen as a possible result of strong threat appraisals. The theory also includes variables to represent the potential response costs associated with the coping appraisal and how estimations of those costs can be mediated by adequate self-efficacy (Maddux & Rogers, 1983; Prentice-Dunn & Rogers, 1986; Rogers, 1975).

PMT is unique in its inclusion of self-efficacy as a distinct construct. Other models of health behavior change tend to group issues regarding personal assessments of their own ability to change behavior as either a barrier (as in the health belief model), or as part of the consequences associated with taking action (as in the theory of planned behavior) (Weinstein, 1993). The inclusion of self-efficacy may be an advantage for a study involving GD, which is a disease of self-management. In self-managed diseases the person's subjective estimation of their own capacity to cope with the myriad of demands placed upon them (i.e., blood glucose monitoring, diet and exercise modification, medication administration, increased medical appointments), may have an impact on their actual behavior. The salience of self-esteem and its significant contribution to explanations of why people alter their health protective behavior have been supported by two meta-analyses of studies involving PMT. Both analyses found that coping appraisal was the strongest predictor of intention to modify behavior and that self-efficacy was a

better predictor than response efficacy (Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000).

As this study is focused on risk perception and not on health behavior change, the study will not be specifically testing all elements of PMT. Rather, the manner in which PMT conceptualizes self-efficacy as being related specifically to the individual's beliefs regarding their own abilities to perform the recommended responses guided the selection of the self-efficacy measurement and how this variable was to be operationalized. In the qualitative component, the PMT variables of perceived severity and perceived vulnerability helped to guide interview questions and probes. A figure detailing PMT is presented below.

Figure 1. Protection Motivation Theory



Source: Maddux, J.E., & Rogers, R. W. (1983). Protection motivation theory and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology*, 19, 469-479. Used with permission.

### Definitions and Operationalization of Concepts

In order to measure concepts, they must be clearly defined as to ensure specificity and precision regarding what exactly is being measured. For a detailed description of all instruments please see Chapter 4.

**Risk perception.**

*Conceptual definition.* Risk perception in this study is defined as the subjective expectancy of an event occurring and beliefs of perceived severity and vulnerability regarding the potential of that event to cause harm.

*Operational definition.* Risk perception was operationalized using the adapted Perception of Pregnancy Risk Questionnaire (PPRQ) developed by Heaman & Gupton (Heaman & Gupton, 2009).

**Risk familiarity.**

*Conceptual definition.* Risk familiarity was conceptualized as the degree of knowledge the woman and her partner have regarding general knowledge about GD, complications associated with diabetes in pregnancy, disease management and understanding of blood glucose values.

*Operational definition.* Risk knowledge was operationalized by the Gestational Diabetes Knowledge Scale (GDKS) developed by Carolan and colleagues (Carolan, Steele, & Margetts, 2010).

**Dread.**

*Conceptual definition.* Dread was conceptualized as a general state of anxiety. Anxiety has been defined as “a protracted attitude characterized by tension” (Cameron, 1947, p. 246).

*Operational definition.* In this study anxiety was operationalized using the Generalized Anxiety Disorder Questionnaire (GAD-7) developed by Spitzer and colleagues (Spitzer, Kroenke, Williams, & Löwe, 2006)

**Cognitive heuristics.**

*Conceptual definition.* Cognitive heuristics are easily accessible mental constructs individuals access to make quick decisions (Tversky & Kahneman, 1974). The two forms of cognitive heuristics of interest in this study are availability: the ease to which individuals can think of examples of the situation under consideration and representativeness: the degree to which an individual believes they are similar to the typical of individuals who exemplify a risk status (Tversky & Kahneman, 1974).

*Operational definition.* Availability and representativeness were operationalized by investigator-developed questions designed to measure these concepts. These questions were included in the demographic questionnaire. Well validated measures for heuristics have not been developed and the need for such instruments have been articulated by several authors (Bayrampour et al., 2012b; Gerend et al., 2004).

**Perceived stress.**

*Conceptual definition.* Cohen asserts that it is not any particular causal event itself that is or is not inherently stressful. Rather, stressor effects are assumed to occur only when both the situation is appraised as threatening or otherwise demanding and the individual believes they lack sufficient resources to cope with the situation. The argument is that the causal event is the cognitively mediated emotional response to the objective event, not the objective event itself (Cohen, Kamarck, & Mermelstein, 1983). Lazarus and Folkman have defined stress in a similar manner as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (Lazarus & Folkman, 1984).

***Operational definition.*** Perceived stress was operationalized by the four-item version of the Perceived Stress Scale (PSS) developed by Cohen and colleagues (Cohen et al., 1983).

### **Self-efficacy.**

***Conceptual definition.*** Self-efficacy has been defined as individual's belief in their own ability to succeed in specific situations (Bandura, 1977).

***Operational definition.*** As it is generally advised to measure self-efficacy with a degree of specificity regarding what actions or behaviors are under examination (Chen, Gully, & Eden, 2001), for this study the self-efficacy portion of a PMT questionnaire was used. The original questionnaire was developed by Gaston & Prapavessis (Gaston & Prapavessis, 2009). This questionnaire has been adapted to be specific to GD risk and for use with men.

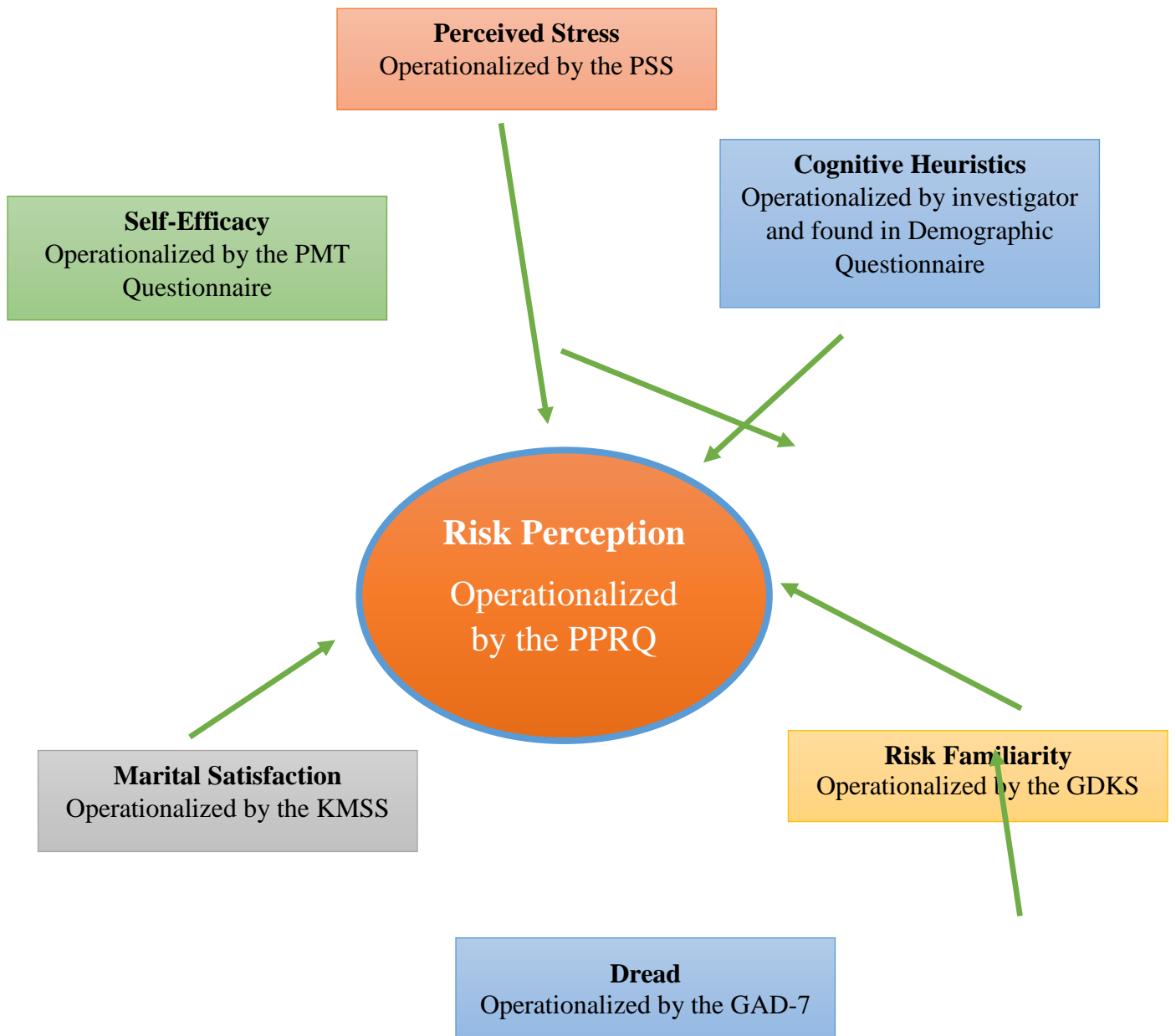
### **Marital satisfaction.**

***Conceptual definition.*** Marital satisfaction is a mental state that reflects the perceived benefits and costs of marriage to a particular person. The more costs a marriage partner inflicts on a person, the less satisfied one generally is with the marriage and with the marriage partner. Similarly, the greater the perceived benefits are, the more satisfied one is with the marriage and with the marriage partner (Bradbury, Fincham, & Beach, 2000).

***Operational definition.*** In this study, marital satisfaction was operationalized by the Kansas Marital Satisfaction Survey (KMSS) developed by Schumm and colleagues (Schumm, Scanlon, Crow, Green, & Buckler, 1983).

A figure which details the concepts and their relationships is presented below.

Figure 2. Diagram of conceptual framework.



## **Conclusion**

In summary, Chapter 3 first described the research scaffold. This is an important element of the study as it explicates the theoretical, epistemological, philosophical, and methodological foundation of the study. This is particularly important in a mixed-methods design. Rationale for the use of mixed methods was detailed, providing a clear explanation of the type of mixed methods design selected. The application of both a conceptual and a theoretical model was explained and figures for each were provided. Concepts were then defined and operationalized, including the quantitative research instruments.

## Chapter 4: Design and Methods

This chapter provides an overview of mixed methods research, followed by a description of the participants, the proposed setting, sampling plan and recruitment for both the quantitative and the qualitative components of the study. For the quantitative component of the study the measurement instruments, operationalization of variables, power analysis, and statistical analysis plan are reviewed. For the qualitative portion the content analysis plan is reviewed. The chapter then moves to a discussion of the methods used to ensure rigour within both the quantitative and the qualitative components of the study. Lastly, the chapter will review ethical considerations.

### Mixed Methods Design

This study utilized a mixed methods design. Mixed methods, at its most basic level, involves an approach to truth and knowledge which attempts to fully respect the wisdom of both qualitative and quantitative perspectives (Nuccio et al., 2015). Although steadily increasing in popularity, there is no universally accepted definition for mixed methods. For the purpose of this dissertation research the following definition has been selected:

Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology: it involves philosophical assumptions that guide the direction of the collection and analysis and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method: it focuses on collecting, analyzing, and mixing both qualitative and quantitative data in a single study or series of studies. Its central premise is that the use of qualitative and quantitative approaches in combination provides a better understanding of research problems than either approach alone. (Creswell & Plano-Clark, 2007 p. 427).

**Rationale for the use of a mixed methods design.** Combining qualitative and quantitative methods allows for meta-inference; a conclusion arrived at by integrating the inferences generated by both forms of methodologies (Polit & Beck, 2004). Mono-method studies have been perceived to have limited ability to adequately answer the increasing complexity of contemporary research questions (Cresswell & Plano-Clark, 2007). This broader approach to complex social issues produces findings with greater breadth and depth, providing researchers and clinicians with a more complete and detailed picture of the phenomenon under investigation (Johnson, Collins, & Onwuegbuzie, 2012). As this study sought to examine a complex social, medical and behavioral phenomenon through a gendered lens it was felt that exploration using both qualitative and quantitative methodologies would provide the most thorough introductory examination of gendered pregnancy risk perception.

It is important in a mixed methods study to clearly explicate the rationales for the design selection. In a review of 57 mixed methods studies, Green and colleagues identified five reasons researchers give for the use of mixed methods in social science research (Greene, Caracelli, & Graham, 1989). In this study, the rationales for the use of a mixed methods design were: triangulation - seeking convergence or collaboration of findings through the use of multiple approaches; complementarity – elaboration or clarification of the results from one approach with the results of the other; and development – using the results from one approach to develop or inform the other; examples include instrument development and sampling strategies (Greene et al., 1989).

***Type of mixed methods design used in this study.*** Mixed methods have been organized into typologies which categorize the different types of mixed methods research designs according to a number of characteristics, including aspects of the timing of data collection and

analysis, the degree to which the data is mixed within the phases of the study, and the priority or emphasis given to one approach versus another (Leech & Onwuegbuzie, 2009). Briefly, studies are described as either fully or partially mixed depending on the extent to which the two approaches are applied within the study design. Concurrent designs occur when qualitative and quantitative data are gathered and analysed simultaneously, whereas in a sequential design one form of data collection/analysis precedes and informs the other. In an equal status study neither approach has priority and in a dominant approach one type of data is emphasized. Studies may be conducted either to explore new areas or to expand on current knowledge (Leech & Onwuegbuzie, 2009).

This dissertation followed a partially mixed, sequential dominant status design. This type of design involves conducting a study with two phases that occur sequentially. The design is determined to be partially mixed if integration of methods does not occur at all stages of the research process (Leech & Onwuegbuzie, 2009; Morse 2016) Mixing of methods in this study occurred at the interpretation phase (Morse, 2016). The quantitative data was gathered first and used to inform the questions in the qualitative interviews. Responses to the primary quantitative measures also guided recruitment for the participants in the qualitative component of the study (the details of this are fully explained in the section on participant recruitment). In this study the quantitative component was dominant and answered the main research questions, while the qualitative component was used to supplement information and gain a broadened perspective of the phenomenon. The quantitative component was dominant in that this component had adequate power to draw inferences, while the qualitative component was less robust.

### **Sampling**

In mixed methods research a combination of quantitative and qualitative sampling techniques are used. This section provides details as to the manner in which the techniques have been applied. Specific details regarding the sampling methods applied in the two components can be found in the respective sections on quantitative and qualitative sampling. This study utilized a concurrent sampling technique as described by Teddlie & Yu (2007). In this method, convenience sampling is used to generate a quantitative sample from an accessible population and purposive sampling is used for the qualitative sample. In terms of temporal ordering of sampling, this study used partially mixed, sequential design where recruitment, gathering of data and data analysis was conducted at the same time (Wilkins & Woodgate, 2008).

This sampling plan is consistent with the recommendation that, when using concurrent sampling, researchers invite the same individuals to participate in both portions. Accessing different people for the two segments of the study may result in differing demographic or social characteristics which could confound the results (Cresswell & Plano-Clark, 2007).

### **Quantitative Component**

The objective of the quantitative component of this study is to address research questions one, two and three:

- 1) Are there differences in perception of pregnancy risk between women with GD and their male partners?
  
- 2) What are the gender-specific predictors of perception of pregnancy risk for pregnant women with GD and their male partners?

3) What demographic and psychosocial characteristics of the dyad are associated with discordance in perceived risk scores?

These questions are seeking a distinct version of a truth claim, one which is less subjective and socially constructed. The responses to these first two questions are also intended to have a greater degree of generalizability than the responses to the remaining questions and are thus more suited to investigation via quantitative inquiry methods.

### **Quantitative Research Design**

The quantitative portion of this study utilized a cross-sectional descriptive, correlational design. In a cross-sectional study, data is collected at a single point in time, creating a “snapshot” of the phenomenon (Polit & Beck, 2004). There is one dependent variable (perception of pregnancy risk) and a number of independent variables. The independent variables included gender, pregnancy related anxiety, perceived stress, self-efficacy, marital satisfaction, GD knowledge and cognitive heuristics.

**Sampling.** The quantitative component of this study utilized a convenience sampling strategy. Although there are limitations associated with non-probability sampling, it is commonly used in nursing research and involves accessing the most available group of people (Polit & Beck, 2004).

**Study setting.** Participants for this study were recruited from the fetal assessment units located in the Health Sciences Center and St. Boniface Hospital. These hospitals are both large tertiary care centers located in Winnipeg, Manitoba and are the only two hospitals in the city providing maternity care, with each having approximately 5000-6000 births per year. Fetal assessment units were selected as recruitment sites following consultation with a clinical expert

who advised that women diagnosed with GD are typically referred for at least one fetal assessment (S. Menticoglou, personal communication, May 9, 2014). Conducting recruitment at both sites was done to ensure maximum variation with respect to demographic characteristics as the two centers serve different populations.

**Study participants.** Participants for this study were women diagnosed with GD in their current pregnancy and their male partners. Both nulliparous and multiparous women were invited to participate, provided that, for multiparous women, this was their first pregnancy complicated by GD.

***Inclusion criteria.*** The following criteria were used in recruiting participants:

- 1) Nulliparous and multiparous women with a diagnosis of GD in the current pregnancy
- 2) Singleton pregnancy
- 3) The woman must have a male partner willing to participate
- 4) Both the woman and her partner have the ability to read, speak, write and understand English
- 5) Both the woman and her partner must be 18 years or older

Although women are generally screened for GD between 24-28 weeks gestation, in the case of multiple risk factors or clinical indication of GD, screening may be undertaken sooner.

***Exclusion criteria.*** Exclusion criteria included:

- 1) Multiparous women with a diagnosis of GD in a previous pregnancy

2) Women with a known severe psychological disorder which would preclude the ability to provide informed consent

3) Women with a male partner who is unwilling or unavailable to participate (i.e. away on military service or incarcerated)

4) Women with a female partner

Same-sex couples were ineligible to participate as it would be inappropriate to assume that the pregnant woman's same-sex partner can be equated with a masculine partner. Same-sex couples are deserving of a future study which focusses on their specific relationship.

5) Women with serious co-morbid health conditions

Women with other complications such as severe pregnancy induced hypertension, placenta previa, heart disease or other chronic illnesses were ineligible to participate as these conditions would likely have an impact on the degree of risk they perceive in their pregnancies.

**Recruitment.** The study received ethical approval from the Nursing/Education Ethics Review Board (ENREB), University of Manitoba (protocol #E2014:125), with ethics extensions granted for 2016 and 2017 (Appendix A). Access to the two sites was granted by the Health Sciences Center Research Impact Committee and the St. Boniface Hospital Research Review Committee (Appendix B). Data collection for the quantitative component commenced on January 8, 2015 and ended October 22, 2015. Qualitative data collection commenced on March 5, 2015 and ended January 13, 2016.

A recruitment schedule was developed in consultation with the Manager of Patient Care on each unit in order for the researcher or the research assistant to be present on days when

potential participants have appointments. Potential participants were initially approached by staff on the units to determine eligibility and willingness to receive an explanation about the study from the researcher or research assistant. The researcher or research assistant then approached the woman (and her partner if he was present) to explain the study, obtain informed consent and administer the quantitative questionnaires. A script was developed to assist the staff member approaching the potential participant to describe the purpose of the study. This script can be found in Appendix C.

There were challenges in the recruitment process for this study. As a result, a number of recruitment options were developed in order to achieve the needed flexibility in responding to various situations. All recruitment options were approved by ENREB. In the event that women attended the Fetal Assessment appointment with their partner and were interested in participating the couple was given the packet prior to their appointment. At Health Sciences Center there was a private room available to meet with participants; at St. Boniface, a private space was occasionally available, however most participants filled out their forms in the waiting room. Women typically spend 15-20 minutes waiting for appointments in these units (S. Menticoglou, personal communication, May 9, 2014). This was often not adequate time for participants to be screened, review and sign consent and complete the questionnaire package. One option was for the couple to complete the packet after their appointment. If this was not possible, the researcher or research assistant would make arrangements to meet at the next appointment and collect the packets.

If the partner was not present but the woman felt he would likely agree to participate, both packages were given to the woman to take home and complete. In these cases, the consent forms were reviewed with the woman, and contact information was highlighted. Permission was

sought to take note of the next scheduled fetal assessment units or prenatal care appointment and to meet her/them and collect the completed packages at that time. In the event that the partner planned to attend a future appointment, permission was sought to meet the couple at that appointment, so they could receive information about the study, sign the consents and fill out the questionnaires together.

A final option was the use of self-addressed stamped envelopes for return of the completed package. This option was used when the woman or couple had no time to complete the packet after the appointment and did not have another appointment scheduled, or when the partner was unable to attend any appointments. This option was only used three times as return rates for this form of recruitment are generally quite low (McGonagle, & Freedman, 2017). One of the three packets was returned, one was sent back with a note stating the couple was too busy to complete it and one was not returned by the partner.

Funding was obtained for the services of a research assistant. S.H., an experienced research assistant was hired for the project. Training for this position included an explanation of the study, inclusion and exclusion criteria, a review of research ethics including the process of obtaining informed consent, the administration of the questionnaires, and documentation of honorariums. S.H. was responsible for assisting with recruitment at St. Boniface Hospital as she was also employed as a unit clerk of the Labour Delivery Recovery Post-partum (LDRP) unit at Health Sciences Center. As many of the potential participants would be admitted to the LDRP unit it was felt that to avoid any conflicts of interest it would be more appropriate to have S.H. conduct recruitment at St. Boniface. A total of 15 couples (14%) of the sample were recruited from St. Boniface. S.H. also met with couples with whom there had been pre-arrangements made regarding future appointments.

**Procedures for data collection.** Once eligible women (and their partners if present), had expressed a willingness to receive an explanation regarding the study, the researcher or research assistant met with the participant. Eligibility to participate was confirmed by briefly reviewing inclusion and exclusion criteria. The study was explained both verbally and by referring to the relevant sections of the consent form. All potential participants had the opportunity to ask questions about the study and their possible participation. If the woman (and her partner if he was present), agreed to sign the consent, the researcher or the research assistant reviewed the consent form and then allowed the participant(s) privacy to complete the consent. This was felt to be important to ensure that the participant(s) did not feel obligated to agree to qualitative involvement and to give couples the opportunity to discuss qualitative involvement in private. In the event that the woman was called into her appointment prior to completing the forms she would bring the forms with them into the assessment room. The researcher/research assistant remained available to answer any questions and collect the package once it was completed. Participant(s) only received the honorarium once the questionnaire packet was returned. [The participants were asked to complete the questionnaires in the order provided in the packet, with the PPRQ to be completed first.

1) Perception of Pregnancy Risk Questionnaire

2) Cohen's Perceived Stress Scale

3) PMT Self-Efficacy Scale

4) Kansas Marital Satisfaction Survey

5) Generalized Anxiety Disorder Questionnaire

6) Gestational Diabetes Knowledge Scale

## 7) Demographic Questionnaire

The questionnaires were numbered with a unique participant number. Couples had the same participant number; women's packets were identified with an "A" and men's with a "B". A master list of participant names and codes was maintained. This list included which participant couples had agreed to be contacted regarding qualitative interview. A total of 117 couple packets were handed out during the recruitment period, but ten were not usable. Seven couples took the packets home to complete, having made arrangements to be met by either the researcher or the research assistant at the next appointment, and then subsequently had their baby before that appointment. One packet for the partner was not returned by mail, although the woman had completed her questionnaire packet in the fetal assessment unit. Another couple returned both packets by mail with a note stating they did not have time to complete them. One woman's questionnaires contained extensive amounts of missing data and was excluded from the analysis. A total of 107 (n=214) usable questionnaires were entered into the analysis. This represents a 94% response rate.

### **Honorariums**

A \$10.00 Walmart gift card was given to all participants to thank them for their time in participating in this study. Those couples who also agreed to participate in the qualitative component each received an additional \$10.00 gift card for their participation in the interview. This was in addition to the \$10.00 gift card they would have already received for their participation in the quantitative component. The most any one individual would have received for participating in both components of the study is \$20.00. This amount of money was intended to compensate participants for their time and any associated expenses (e.g., parking). This amount was considered to be nominal and should not have posed any undue coercion to

participate in the study for financial gain. Participants were asked to sign a receipt acknowledging they had received the gift card and only received the honorarium once they had handed back their completed packets. Gift cards were tracked in a log with participant numbers, dates given out, and using verification numbers on the card.

### **Sample Size Estimation**

There are a number of methods available to social science researchers to determine the number of subjects required to adequately power research inquiry. The types of statistical analysis planned must be taken into account during the process of sample size estimation as some statistical procedures, such as regression analysis, require greater numbers of subjects (Green, 1991). Conventional power analysis is dependent on three values: alpha – the probability of committing a Type I error, power – one minus the probability of making a Type II error and effect size – the degree to which a criterion variable is related to the predictor variable in the population (Moore, McCabe, & Craig, 2012). In order to conduct this form of power calculation, the researcher often uses estimations of these variables derived from other studies with similar populations and objectives. Means and standard deviations from these similar studies are used to generate sample estimates, often with the conventionally established criterion of  $\alpha = .05$ , a small-medium effect size and power set at 80% (Polit & Beck, 2004). Alternatively, there are a number of “rule-of-thumb” methods available. Of these, Cohen’s power table is undoubtedly the most utilized in health research (Green, 1991).

Sample size determination is often based on the premise that the researcher wishes to test a hypothesis. However, sample size may also be estimated using confidence intervals (Beal, 1989). This is an especially effective means of determining the required number of participants in studies where there are is no previous work from which to draw estimations and the researcher

wishes to achieve a greater degree of precision than permitted by the use of “rule-of-thumb” estimations (Beal, 1989). Confidence interval may also be used when there is no null hypothesis of interest, and the goal of the study is exploratory, or the investigator wishes to quantify some particular feature of the sample. A statistician from the Manitoba Center for Nursing and Health Research (MCNHR) was consulted regarding a confidence interval estimation. Using a 95% confidence interval and estimating a within-couple correlation of 0.5, a sample of 110 couples ( $n=220$ ) will yield an 81.2% probability of detecting a 95% width of 0.2 standard deviations of the difference between the risk perception scores of individual couples (B. Dufault, personal communication, April 24, 2014). The required sample size for the quantitative portion of this study was estimated at 110 couples ( $n=220$ ). A total of 107 couples ( $n=214$ ) were included in the analysis. Consultation was undertaken with the College of Nursing statistician to determine if this represented an adequate sample size to proceed with the analysis. It was determined that this was an adequate number (R. Ahmed, personal communication, November 13, 2015).

### **Research Instruments**

The quantitative portion of this study utilized seven structured self-report questionnaires. Questionnaires are the most common form of data gathering tools used in quantitative research and aim to gather valid, reliable and unbiased data (McColl et al., 2001). Wherever possible, this study used valid, psychometrically sound measurement tools. As the area of gender-based, pregnancy-specific risk perception has not been previously explored, it was necessary to modify certain instruments and create others. Further development and psychometric testing of these revised and newly developed questionnaires represents a possible area for future study.

The selection of instruments for this study was complicated by the requirement that the measurement tool be suitable for use with both women and men. The instruments selected to

measure the variables of self-efficacy and anxiety are examples of situations where a decision needed to be made in terms of balancing the desire to be specific regarding what was being measured, the desire to use well validated instruments, and the suitability of such instruments for use with both genders. For example, in measuring self-efficacy, it may have been more informative to measure self-efficacy specific to diabetes management using an established, well validated scale such as the Diabetes Empowerment Scale, which includes items such as “In general, I believe that I am able to decide which way of overcoming barriers to my diabetes goals works best for me.” (Anderson, Funnell, Fitzgerald, & Marrero, 2000). However, this scale would not have been appropriate to administer to male partners as they do not have diabetes. Modifying the items so as to be able to enquire about men’s thoughts on their partners’ self-efficacy would essentially invalidate the scale, thus nullifying the advantage of using a psychometrically sound measurement.

However, given the importance of self-efficacy and guided by the emphasis that this variable has received in meta-analysis which examine Protection Motivation Theory (Floyd et al., 2000; Milne et al., 2000), the decision was made to seek specificity in this variable. As such, it was decided to modify a component of an existing investigator developed Protection Motivation Theory questionnaire. This instrument is less well tested than other possible options but did offer the benefit of specificity and is easily modified to be applicable to men.

In the case of the variable of dread, operationalized by anxiety, there were different measurement priorities. Although this potential predictor has been found to be significant in other risk perception studies of pregnant women (Bayrampour et al., 2012b, 2013; Gupton et al., 2001; White et al., 2008) and in studies which examined risk perceptions in both genders (McQueen, Vernon, Meissner, & Rakowski, 2008; Wang et al., 2009), it was decided that a

pregnancy specific anxiety measurement was too similar to the PPRQ. For example, one of the questions in the Pregnancy Related Anxiety Scale developed by Rini and colleagues is “I am concerned/worried about losing the baby” (Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999). The PPRQ question asks “My baby’s risk of dying during this pregnancy is..”(Heaman & Gupton, 2009). This and several other questions were deemed to be too similar to be empirically useful. Thus, it was decided to measure anxiety as a global construct using a well validated measurement tool. The following sections will describe each of the instruments in greater detail.

**Perception of pregnancy risk questionnaire.** The Perception of Pregnancy Risk Questionnaire (PPRQ) was developed by Heaman & Gupton (2009) and contains nine questions divided into two subscales: “Risk to Self” (five items) and “Risk to Baby” (four items) . The PPRQ uses a visual analog scale (VAS) (Luoto et al., 2010) where participants are asked to place a vertical mark along a 100-mm horizontal line representing the participant’s “best guess” as to the degree of risk to self or baby elicited by the stem. The line is anchored by “No Chance at All” at one end and by “Extremely High Chance” at the other. A VAS is a useful way to measure intensity of subjective feelings and is easily understood by even low-literacy populations (Wewers & Lowe, 1990). The PPRQ wording has been assessed as having a seventh-grade reading level (Heaman & Gupton, 2009), which is appropriate for use in a study which may contain inner-city residents (Goodfellow, Trachimowicz, & Steele, 2008). The PPRQ was scored by measuring in millimeters from the beginning of the horizontal line to the vertical mark made by the participant. These numbers for individual questions were then summed and divided by 13 (using the revised PPRQ), generating a final risk perception score. Possible scores ranged from 0-100, with higher scores being indicative of a higher degree of risk perception.

The PPRQ is a well-tested and validated instrument and has been used in other pregnancy risk perception studies, including studies comparing the risk perceptions of women of advanced maternal age (AMA) with those of younger women (Bayrampour et al., 2012b), establishing the factors associated with pregnancy risk in nulliparous women (Bayrampour et al., 2013), assessing health care literacy gaps (Headley, 2009), and comparing the risk perception of women with complicated and uncomplicated pregnancies, although this study used the original 11-item version of the PPRQ (Gupton et al., 2001).

Psychometric testing of the PPRQ was conducted using a group of 199 women in the third trimester of pregnancy. Testing revealed good internal consistency reliability with a Cronbach's alpha = 0.87 for the total scale, 0.81 for "Risk to Self" subscale and 0.84 for the "Risk to Baby" subscale. Test re-test reliability conducted with 129 women one week after initial testing found intraclass correlation coefficients of .94 for the total scale, 0.93 for "Risk to Self" subscale and 0.92 for the "Risk to Baby" subscale, indicating excellent instrument stability

Validity of the PPRQ has been tested in a number of ways. Criterion related validity was demonstrated through a positive correlation ( $r=.46$ ) between the PPRQ and the Spielberger State Anxiety Inventory. Construct and contrast validity was demonstrated through the use of the known groups technique. In this technique the instrument is administered to groups hypothesized to differ on the attribute in question (Polit & Beck, 2004). In this case, the PPRQ was administered to women with pregnancies labelled as either low or high risk. Testing for convergent validity was conducted by examining the degree to which the PPRQ risk scores correlated with the woman's score on the Prenatal Risk Scoring Form ( $r =.46, p<.001$ ) (Heaman & Gupton, 2009).

The PPRQ was designed to measure a woman's overall perceptions of pregnancy risk and does not relate to any specific disorders of pregnancy. In order to capture risk perception related to the specific risks posed by GD, modification, in the form of additional items, was required. Four additional items were added to the PPRQ, creating a third "Risk of Diabetes" subscale. The items involved the risk for the mother to develop Type 2 diabetes later in life, the risk for the infant to develop Type 2 diabetes later in life, the risk for a birthweight >9lbs and the risk of neonatal hypoglycemia. These items were included based upon consultation with a clinical expert and knowledge gleaned from the researchers clinical practice experience. It was not feasible to pre-test these items prior to recruitment. A confirmatory factor analysis of the revised PPRQ would be a logical next step in the development of this instrument.

As this instrument was designed for use with women, wording of questions was altered in order to administer the questionnaire to men. This re-wording involved altering the stems in the "Risk to Self" subscale to "Risk for my partner..." . Permission had been obtained from the author to modify the scale (Appendix D). The original PPRQ and the additional/reworded questions can be found in Appendix E.

**Cohen's perceived stress scale.** Developed by psychologist Dr. Sheldon Cohen, the Perceived Stress Scale (PSS) is one of the most commonly used instruments to measure the perception of stress (Adouard, Glangeaud-Freudenthal, & Golse, 2005). The PSS has several versions; the original questionnaire contains 14-items and there are two shorter scales, a 10-item and a four-item version (Cohen, 1988; Cohen et al., 1983) For this project, the four-item version was selected as it is the most parsimonious.

The use of the four-item PSS in pregnant women has been recently psychometrically tested. Investigators administered the four-item PSS to 159 women by telephone and mailed

survey, finding good internal consistency reliability with a Cronbach's alpha of .84. Convergent validity was demonstrated by a positive correlation ( $r = .62$ ) with the Edinburgh Postnatal Depression Scale. Concurrent validity is demonstrated by a positive correlation with the mental health component of the Short Form-12 ( $r = .67$ ). The authors concluded that the four-item is a valid and useful tool to measure the perception of stress in a population of pregnant women (Karam et al., 2012). The frequency of this scale's use in general health research speaks to its suitability for use with male partners.

The scale contains both positively and negatively worded questions which are designed to measure the degree an individual has appraised life situations as being overwhelming or difficult to manage during the past month (Cohen et al., 1983) Participants are asked to rate the frequency of these feelings on a 4-point Likert scale. Positive statements indicate the ability to cope, while negative statements indicate distress (Cohen et al., 1983). Time frame direction was modified by including "During your/your partner's pregnancy,..." in the stem of each question. Scores range from 0 to 16 with higher scores representing higher stress. As this scale is not intended for diagnostic purposes, the author does not indicate cut-off scores indicative of high stress.

The PSS may be used for research purposes without explicit permission from the author, with the expectation that the inclusion of the PSS is appropriately cited.

(<http://www.psy.cmu.edu/~scohen/>). As per Dr. Cohen's request, a copy of the results will be forwarded to his research lab at Carnegie Mellon University. The PSS can be found in Appendix F.

**Protection Motivation Theory self-efficacy scale.** In order to explore the impact of the Protection Motivation Theory cognitive mediating processes of coping assessment and

specifically of self-efficacy, a thorough review of the literature applying Protection Motivation Theory was undertaken with the objective of identifying a measurement tool suitable for use with this study. The instrument selected is the Protection Motivation Theory Questionnaire (PMTQ). The PMTQ was developed by Drs. Anca Gaston and Harry Prapavessis from the University of Waterloo for use in a study examining maternal-fetal disease information as a motivator for exercise during pregnancy (Gaston & Prapavessis, 2009). Selection of this instrument was based on its use with pregnant women and the specificity with which questions delineated the impact of self-efficacy. The article also indicates that the PMTQ had been adapted from a variety of other previously developed scales and the authors report the results of a factor analysis on the scale, suggesting that some psychometric testing was conducted.

Permission to use and revise the scale was granted by Dr. Gaston, who also reviewed the revised scale and provided useful feedback as to its development (Appendix G). The original questionnaire contained 20 items and focused on exercise in pregnancy exclusively. As the research focus of this study varies from that of the scale's authors, revision was required. The revised version of the PMTQ for this study consisted of four questions which focus on self-efficacy specific to the management of GD. Separate questionnaires were developed, appropriately worded for use with women and men (Appendix H).

The revised scale contains four questions intended to explore the degree of self-efficacy a woman and her partner have in regard to undertaking the behaviors required to manage GD. An example of a question worded for women is "For me to do the type and amount of exercise needed to reduce my risk of developing health problems related to gestational diabetes would be...". The same question worded for men is "I think that for my partner to do the type and amount of exercise needed to reduce her risk of developing health problems related to gestational

diabetes would be...”. Participants respond on a 5-point Likert scale (1 = Extremely Easy/Extremely Confident, 2 = Easy/Confident, 3 = Not Sure, 4 = Difficult/Slightly Confident, 5 = Extremely Difficult/ Not Confident at all). The total score was summed with the response of “Not Sure” coded as 0. Scores range from 0 – 16. Higher scores indicated lower self-efficacy.

There are no well-validated, psychometrically tested Protection Motivation Theory instruments and given that the scale used in this study is a revision of an adapted instrument, it lacks established reliability and validity. Psychometric testing of the scale prior to use was not feasible. In the literature review conducted to locate an instrument, it was noted that each study used an individually adapted scale designed to meet the specifics of the research project. Creation of a well-tested Protection Motivation Theory instrument designed for use in pregnancy is an area worthy of further scholarly attention.

**Kansas marital satisfaction survey.** The Kansas Marital Satisfaction Survey (KMSS) was developed in the 1970’s by Family Studies professor Dr. Walter Schumm. The KMSS is a brief three item measure capable of distinguishing between distressed and non-distressed couples (Schumm, Nichols, Schectman, & Grigsby, 1983). The parsimonious nature of this scale makes it a highly useful measurement instrument. It was intended to assess three distinct elements of global marital evaluation as suggested by Spanier & Cole (1976): satisfaction with marriage as an institution, with the marital relationship, and with husband or wife as a spouse. The KMSS has been used in a variety of populations including couples undergoing in-vitro fertilization (Chan et al., 2012), alterations in health status during pregnancy and post-partum (Gjerdingen & Center, 2003), as well as in studies which examine gender differences (McNulty, 2008; Sanderson, 1993).

The scale consists of three items using a 7-point Likert scale (1=Extremely Dissatisfied, 2=Very Dissatisfied, 3=Somewhat Dissatisfied 4= Uncertain 5= Somewhat Satisfied, 6=Very Satisfied 7=Extremely Satisfied). Possible scores range from 7 to 21, with higher scores indicating greater satisfaction. A cut-off score of less than 17 has been established for determining distressed couples (Crane, Middleton, & Bean, 2000). The wording of the original scale was specific to married couples, using terms such as “marriage” and “spouse”. The wording has been altered in studies involving non-married couples and it is this wording which was used in this dissertation.

The internal consistency reliability of the KMSS has been established for the scale administered to both genders, Cronbach’s alpha ranging from .84 (Schumm et al., 1985) to .92 (Grover, Paff-Bergen, Russell, & Schumm, 1984). Test-retest reliability has been examined in a number of studies over a wide variety of time frames, ranging from  $r = .71$  at 10 weeks (Mitchell, Newell, & Schumm, 1983), to  $r = .49$  at three months (Kurdek, 1995). The KMSS has demonstrated convergent validity with the Dyadic Adjustment Scale and the Quality of Marriage Index (Schumm et al., 1986). Permission for use of the KMSS from the author can be found in Appendix I and the KMSS scale is located in Appendix J. Findings from this study will be sent to Dr. Schumm as requested.

**Generalized anxiety disorder questionnaire.** The seven item General Anxiety Disorder Questionnaire (GAD-7) was used to operationalize the psychometric theory property of dread. and was developed by eminent psychiatrist Dr. R.L Spitzer in 2006 (Spitzer et al., 2006). The scale assesses the degree to which individuals have experienced symptoms of generalized anxiety as derived from the diagnostic criteria for generalized anxiety disorder (Ruiz-Cantero et al.) in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (Spitzer et al.,

2006). Respondents are asked how often in the past two weeks they have been bothered by symptoms of GAD such as restlessness, irritability or worry. Response options range from 0 (not at all) to 4 (nearly every day). Possible scores range from 0-28. The scale's authors identify cut off points to demarcate moderate to high levels of anxiety. A score of 10 represents moderate anxiety, while a score of 15 indicates high or severe levels of anxiety (Spitzer et al., 2006).

Due to the parsimonious nature of the GAD-7 it is a very frequently used anxiety measurement tool. A recent meta-analysis of instruments used to measure GAD and panic disorders found that the GAD-7 was the most effective tool available for identifying GAD in the general population (Herr, Williams, Benjamin, & McDuffie, 2014). Within the context of pregnancy, anxiety is often assessed as being specific to pregnancy, rather than as a global construct. There are however, studies which have used the GAD-7 with populations of pregnant women (Guo et al., 2013; Guo et al., 2014). The GAD-7 was also used as a measure of anxiety in a study seeking to develop a pregnancy distress measurement tool (Pop et al., 2011).

The psychometric properties of the GAD-7 are well established. Internal reliability ranges from a Cronbach's alpha of .92 (Spitzer et al., 2006) to .89 (Löwe et al., 2008). Test re-test reliability has also been established at  $r = .83$  for a two-week period (Spitzer et al., 2006). Procedural validity, the extent to which the self-report scores agrees with scores obtained when the scale is administered by a health care professional, has been demonstrated with  $r = .83$  (Spitzer et al., 2006). Construct validity is demonstrated by the association of GAD-7 scores with self-reported disability days, number of visits to a mental health professional and the degree of difficulty individuals report as attributable to their symptoms (Spitzer et al., 2006). Construct validity is also supported by the extent to which the GAD-7 sum score was associated with known risk factors of generalized anxiety disorders, such as gender, age, educational level,

marital/employment status, and household income (Löwe et al., 2008). Additional evidence of construct validity can be found in that individuals with known anxiety disorders score significantly higher on the GAD-7 than the general population (Löwe et al., 2008). Convergent validity has been indicated by good correlations between GAD-7 scores and scores on two other anxiety scales, the Beck Anxiety Inventory ( $r = .72$ ) and the anxiety portion of the Symptom Checklist-90 ( $r = .74$ ) (Spitzer et al., 2006).

The GAD-7 is available in the public domain and no specific permission was required to use the scale. The scale does not require any adaptation as it was designed for use with both genders and is not pregnancy specific. The GAD-7 can be found in Appendix K.

**Gestational diabetes knowledge scale.** GD knowledge was used to operationalize the psychometric property of risk familiarity. The Gestational Diabetes Knowledge Scale (GDKS) was developed by Dr. Carolan and colleagues as an adaptation of a well-established measurement of the Diabetes Knowledge Scale (DKS) created by the American Diabetes Association (Dunn et al., 1984). The authors consulted with a number of specialists including an endocrinologist, a diabetes nurse educator, an obstetrician and a midwife to add GD specific questions to the DKS. The original scale contains 22 multiple choice questions, focusing on three main areas, general GD knowledge, maternal understanding of the management of GD and maternal understanding of normal blood glucose values (Carolan et al., 2010).

The scale was modified slightly for use in this study. Questions were re-worded for use with male partners. Some food items were changed to reflect North American food preferences. For example, lamb chop was changed to three pieces of bacon, as this population may not consume lamb on a regular basis. Two questions which asked about affective state during blood glucose testing and insulin administration were also removed as these questions did not have

right/wrong answers. Three questions specific to the use of insulin were removed as this population may not be using insulin and attempting to respond may predispose to incorrect answers.

Scoring of the scale involved summing the total number of correct responses. Some questions have more than one correct answer and participants are asked to circle all responses they believe to be correct. Each question also had an option of answering “I don’t know”. There was a total of 33 correct responses in the 18 items on the scale. Correct answers were summed, divided by 33 and then multiplied by 100 to yield a percentage correct. Participants were not penalized for incorrect responses. Permission to use and adapt this scale has been provided by the author (Appendix L). The knowledge scale worded for use with both men and women can be found in Appendix M.

**Demographic questionnaire.** Participants were asked to complete an investigator developed demographic questionnaire (Appendix N). In addition to standard questions (age, race/ethnicity, income etc.), the questionnaire contains items designed to explore gestational diabetes communications with care providers, duration of current relationship and family composition. The nature of the communication with care providers included a listing of possible morbidities related to GD. These adverse outcomes were selected after consultation with a clinical expert (S. Menticoglou, personal communication, May 8, 2014). The demographic questionnaire also contains questions which were intended to explore the cognitive heuristics of availability and representativeness. The questions are as follows:

- How many other women have you known with a diagnosis of gestational diabetes?
- Compared to the average pregnant woman, I feel my/my partner’s chance of having a difficult labour and delivery is...

- Compared to other babies, I feel that my baby's chance of developing health problems related to gestational diabetes after birth is...
- Compared to the average pregnant woman, I feel my/my partner's chances of developing diabetes later in life is...

### **Missing Data**

The probability of a certain degree of missing data is an inherent complication in self-report questionnaires (Fox-Wasylyshyn & El-Masri, 2005). Missing data may result in reduced statistical power, increased chance of committing a Type I error, underestimation of variance or making an error when estimating effects (Polit & Beck, 2004). There are no specific cut-off points for determining how much data can be missing from a sample before it threatens the veracity of the results. Recommendations range from accepting anywhere from 10-40% missing data for any one variable (Fox-Wasylyshyn & El-Masri, 2005).

In their text on the use of multivariate statistics, Tabachnick & Fidell suggest that the pattern of what data is missing may be more important than the percentages of total amounts missing (2006). There are two types of missing data: random and systematic. In random missing data there is no pattern to what data are missing. This type of pattern is referred to as Missing Completely at Random (MCAR) and any procedure can be used to treat the data (Duffy, 2000). However, if the missing data are systematic, this means that a certain number of participants have elected to skip a question for their own reasons and this can impact the validity and generalizability of the results. The participants who elected to not answer the question may be different in some important way to those who did answer (Tabachnick & Fidell, 2006). Systematically missing data may be Missing at Random (MAR) or not random. The missing data

should be analysed to determine its type as this will impact how the data is handled. The following sections will describe the amount and treatment of missing data.

**Type and amount of missing data.**

In this study, the missing data were determined to be both MCAR and MAR. A total of 108 couples returned questionnaires and there was a single questionnaire which was completed only by the woman, with no questionnaire returned by her partner. The woman's questionnaire was deleted from the analysis as there was no corresponding data from the partner. In one of the 108 paired questionnaires there was a single questionnaire in which, rather than responding with a vertical line on the VAS for the PPRQ, the woman responded to 6 of the 13 questions with a question mark placed in the horizontal line. This same participant also did not respond to two of the four PSS questions. Given the particularly high rate of missing questions on the PPRQ it was determined that it would not be possible to impute the missing responses and this questionnaire and that of her partner were deleted from the analysis. This is known as pairwise deletion, which occurs when a case is deleted from the analysis when it contains missing data in variables which are to be considered in the analysis (Fox-Wasylyshyn & El-Masri, 2005). In both of these cases the partner's responses were not included in any subsequent group analysis conducted. The obvious consequence to this deletion is a loss of statistical power. However, given the extent of the missing data and the relatively low number of cases where this decision was made it was felt that the loss of statistical power was acceptable.

Other than these two instances, it was possible to handle the remaining missing data points without having to delete participants. Appendix O details the incidence and handling of missing data. The most frequent form of missing data occurred in the demographic questionnaire. The question with the highest frequency of missing data for both women and men

was “How many years of formal education have you completed starting with grade one but not counting any repeated years in the same grade?” The percentage of missing values for this question was  $n = 7$  (6.5%) for women and  $n = 12$  (11.2%) for men. Due to the high percentages of missing values for both women and men it was not possible to examine education as a continuous variable and the decision was made to conduct the analysis using the categorical variable for education. For other missing demographic questions, it was possible to extrapolate the missing response of one participant from the provided response of their partner to the same question. In the question “Please indicate the average family income of all members of your household for the past year before taxes and deductions”, there were 3 (2.8%) women and 3 (2.8%) men who did not answer this question. Fortunately, in all of these instances the participant’s partner did respond to the question and the answer was extrapolated from the available information.

### **Treatment of Missing Data**

In cases where the missing data occurred in either the PPRQ or one of the independent variable questionnaires the missing data was extrapolated using some form of data imputation. Data imputation refers to a variety of techniques which can be applied to “fill-in” the missing response with an estimated score either random regression imputation. The goal is to substitute the missing value with a reasonable guess and then proceed with the analysis as though there is no data missing (Buhi, Goodson, & Neilands, 2008). The nature of the missing data will dictate what form of imputation is used.

One of the simpler forms of imputation is group mean imputation. In this technique the missing data is replaced with the mean response for the same question within the sample (Raghunathan, 2004). This technique was selected to replace the single item of missing data in

the women's PPRQ. Other than the previously discussed deleted participant, there was only 1(.93%) participant with any missing data in the PPRQ, and this participant only omitted 1 of the 13 items. Group mean imputation was selected to fill in this missing data. In this form of imputation, the mean score for the group is used for the missing data point (Fox-Wasylyshyn & El-Masri, 2005). Group mean imputation was selected over regression imputation as the regression technique assumes the missing item can be predicted using conceptually related items (Fox-Wasylyshyn & El-Masri, 2005). This was deemed appropriate as the response to the missing item (risk of hemorrhage) tends to be lower than that of two other subscale items (risk to self and caesarean section) and higher than the response to the fourth question (woman's risk of dying).

Appendix O details the amount of missing data in the independent variable questionnaires, along with the imputed values and the rationale for the decision. Multiple regression imputation was selected as the most appropriate technique for this type of missing data. This technique uses stepwise regression to isolate the smallest combination of variables which best predict the missing data. The variables selected for use in the regression should be conceptually related to the missing item (i.e. items from the same sub-scale) (Widaman, 2006). This is an iterative technique where the prediction of the initial regression is used to run a new regression model and generate a second prediction, which is then used to run a third regression and so on. Each prediction produces new unstandardized regression coefficients which are used to estimate the value of the missing data. The iterative process continues until there is little to no change in the regression coefficients (Buhi et al., 2008). It has been suggested that provided that provided the extent of the missingness does not exceed 20% three to five repetitions should be sufficient (Acock, 2005). For the women there were two (1.9%) points of missing data in the

independent variables questionnaires. For the men there were three (2.8%) points of missing data. The multiple regression used to calculate for these values used four iterations. The following section describes the multiple imputation used to generate the values for the missing data and the variables included in the regression for both women and men.

For the women, in the independent variable questionnaires there were two participants with one point each of missing data in different instruments; one (.93%) in the PMTQ and one (.93%) in the GAD-7. In the PMTQ the missing item was *“For me to make the recommended changes in my diet needed to reduce my risk of developing health problems related to gestational diabetes would be”*. The variables used in the imputation were the other three items in the questionnaire. After four regression models were constructed, the value selected was three which corresponded to the response choice *“Not Sure”*. In the GAD-7 the missing item was *“Over the last 2 weeks, how often have you been bothered by the following problems - Feeling afraid as if something awful might happen”*. The variables used in the regression models were three conceptually related questions from the instrument (feeling nervous, anxious or on edge, not being able to stop or control worrying, worrying too much about different things). After four regression models were constructed, the value selected was zero which corresponded to the response choice *“Not at all”*. In total 1.9% of the women’s missing data was imputed using multiple regression.

Men in this study had missing data in one of the independent variable questionnaires, the PSS. A total of three (2.8%) had missing items in two questions on the PSS. The question *“During your partner’s pregnancy, how often have you felt that you were unable to control the important things in your life?”*, was left blank by two participants. The question *“During your partner’s pregnancy, how often have you felt that difficulties were piling up so high you could*

*not overcome them?*” was left blank by one participant. The variables used in the imputation for all three of the regression models were the other three questions in the instrument. After four regression models were constructed, the value selected for both the participants in the “*unable to control important things*” question was four, which corresponded to the response choice “*Fairly Often*”. In the “*difficulties piling up*” question the value selected was three, which corresponded to the response choice “*Sometimes*”. In total 2.8 % of the men’s missing data was imputed using multiple regression. The total imputation/extrapolation for the entire sample was 4.7% generated using multiple imputation, .93% generated using group mean imputation and 5.6% generated using extrapolation from the partner’s questionnaire for a total of 11.23% of the total sample data.

### **Data Left as Missing**

There were several points of missing data that were left as missing, as the variables were descriptive and would not be used in the analysis. It has been suggested that, providing the variables are not included in the analysis, but serve a descriptive purpose, it is preferable to leave the items as missing, rather than applying listwise deletion (Acock, 2005). This section will describe those points of missing data for the women and the men.

For the women, three (2.8%) did not respond to the question “*How many weeks pregnant were you when you were diagnosed with gestational diabetes?*”. It would be difficult to defend using any form of imputation (i.e. group mean) as women with multiple risk factors could be screened sooner, thus this was left as missing data. The question “*How many of your past pregnancies have been with your current partner?*” was left blank by one (.93%) participant. Again, it would be a difficult to defend using any form of imputation or extrapolation and the data was left as missing. As mentioned previously, there was a considerable amount of missing

data in the question regarding number of years of formal education leading to the decision to focus on the categorical variable for education, rather than continuous. Unfortunately, there were two (1.7%) women who also did not answer the question “*What is your highest level of education?*”. This meant that there was no way to extrapolate the level of education for these two participants and thus all analysis which includes education used an n of 105 for women. One woman (.93%) who indicated that she was not born in Canada did not respond to the question “*How many years have you lived in Canada?*”. Although this information could be extrapolated from her partner’s answer to the same question, this would be an assumption that the couple arrived in Canada together, which is difficult to defend. Finally, there was one (.93%) woman who did not answer the question “*Were you prescribed insulin during your pregnancy?*”. Although it may have been possible to gather this information from client’s chart, ethical approval was not obtained for the investigator to access the charts. There is the possibility that this participant chose to not answer this question and that decision must be respected. In total, for the women, 7.3 % of the data was left as missing.

For the men, one (.93%) did not answer the question “*How many of the past pregnancies you have fathered have been with your current partner?*”. It was however, possible to extrapolate this information. This participant indicated this was not his first time fathering a pregnancy. His partner responded that she had been pregnant with another partner previously. She reports having one child and being currently pregnant with her second. Therefore, this is the couple’s first child together. The question, “*How many children do you have?*” was left blank by two (1.7%) of the men. It is not possible to extrapolate this information and thus the data were left as missing. As was the case with the woman, the men had considerable missing data in the number of years of formal education question. There was one (.93%) male participant who also

did not respond to the question “*What is your highest level of education?*”. Therefore, all analysis which includes education used an n of 106 for men. The question “*Which of the following best describes your racial background?*” was left blank by one (.93%) male partner and as there was no way to impute or extrapolate this variable it was also left as missing. All analysis which includes race/ethnicity again used an n of 106 for men. As with the women the question “*How many years have you lived in Canada?*” was left blank by one (.93%) man who indicated that he was not born in Canada and was left as missing for the same rationale. In total, for the men, 5.4 % of the data was left as missing. For the total sample 12.7% of the data was considered to be descriptive and was left as missing.

### **Quantitative Data Analysis**

The investigator created the data set, entered the data, and conducted descriptive and basic interpretive analyses using SPSS for Windows Versions 21-24. Funding was secured to retain the services of Mr. James Plohman, the MCNHR research coordinator to assist with data analysis and the development of the data set. Consultation was also undertaken with Mr. Brendan Dufault, the MCNHR statistician who assisted with beginning development of the data analysis plan and the confidence interval power calculation. In September 2015, the College of Nursing hired an Associate Professor with a background in statistics. Dr. Rashid Ahmed assisted with the development of the analysis plan and verified the univariate analysis for the linear and the logistic regressions, Dr. Ahmed and the investigator conducted the linear and logistic regressions using SPSS Version 22 software. The dependent variable for all tests was scores on the PPRQ. Following the departure of Dr. Ahmed from the College of Nursing, Dr. Rasheda Rabbani, a biostatistician from The George and Fay Yee Center for Healthcare Innovation, was consulted regarding the analysis of research question number three. For question three, the dependent

variable was the difference between the couple's final PPRQ scores. Dr. Rabbani developed the analysis plan for both a logistic and a linear regression. The investigator completed the analyses and then verified the results of the univariate and the multivariate analysis with Dr. Rabbani. This analysis was conducted using SPSS Version 24 software.

An alpha level of  $< 0.05$  was the significance level for all statistical tests. This level is appropriate given the sample size and the moderate correlations found in other studies using the PPRQ (Bayrampour, 2012; Bayrampour, 2013; Gupton, 2001; Headley, 2009) and the nature of the variables in the analysis. If the analysis had the potential to inform decisions which could potentially lead to harm, then a stricter standard for significance would be required (Polit, 2010).

Descriptive statistics were generated to describe the demographic characteristics of the participants and compare characteristics of the couples. Continuous variables were described using measures of central tendency and percentiles and nominal level variables were described using proportions. Several of the nominal level variables in the demographic section were collapsed into categories to facilitate analysis. Income, race/ethnicity, education, BMI, number of children, number of prenatal care appointments attended, and the representative heuristic question were all collapsed into 3 or more categories. Other variables, such as place of birth (Canada vs. other), region of residence (Winnipeg vs. rural), and prescription of insulin (yes vs. no) were dichotomized. The dependent and independent variables were tested for normalcy using histograms and Q-plots. It is not necessary that the distributions be normal provided the tests used are adequately robust (Polit, 2010). All assumptions were met for the various statistical procedures used in this analysis (R. Ahmed, personal communication, November 13, 2015).

**Research question #1.** Are there differences in perception of pregnancy risk between women with GD and their male partners?

The paired t-test was used to test for significant differences between the PPRQ scores of the paired dyads. This test is used in situations where the researcher is interested in looking at matched pairs rather than at two distinct groups (Polit, 2010). Using this method, the PPRQ score of the woman was subtracted from the score of her partner to generate a value denoted as  $\Delta$  (delta – meaning change). The paired t-test then constructs a column of the  $\Delta$  to test the null hypothesis that the difference between two responses measured on the same statistical unit has a mean value of zero (Polit, 2010). Differences in scores were analyzed for each of the 13 items in the PPRQ, for each of the three sub-scales and for the total score.

**Research question #2.** What are the gender-specific predictors of perception of pregnancy risk for pregnant women with GD and their male partners?

This process involved several steps. In the first step, a series of univariate analyses were conducted to determine which variables were significantly associated with PPRQ scores for women and for men. A total of 16 variables were selected for the univariate analysis and the same variables were used in both analyses. The dependent variable was treated as a continuous variable. Pearson's correlation coefficient ( $r$ ) was used to test the direction and strength of the relationships between the dependent variable and other continuous variables (scores on the PSS, PMTQ, KMSS, GAD7 and GDKS questionnaires, age, number of years in relationship and BMI). Effect sizes of the correlations were calculated using eta squared and reported according to the Cohen classification of .01= small effect, .06= medium effect, and .14= large effect (1988). Independent t-tests were used to test for differences between the dependent variable and

nominal level variables with two groups (yes or no responses), such as place of birth (Canada vs. other), region of residence (Winnipeg vs. rural) and being prescribed insulin (yes vs. no). The independent t test tests whether the differences between sample means occurred due to random chance in the sample or if it represents a true difference (Polit & Beck, 2012)

One-way analysis of variance (ANOVA) was used to test for differences between the dependent variable and nominal level variables with three or more groups. The ANOVA is a parametric procedure which breaks down the amount of variability present in the dependant variable into either variability which can be attributed to the independent variable and all other extraneous variability (i.e. individual differences, measurement error). Variation between the groups is compared to variation within the groups. When between group differences are larger than those occurring within the group there is a high probability that the differences are attributable to the independent variable. This is expressed as an *F* ratio (Polit & Beck, 2004). While a significant *F* ratio suggests that there are differences between the groups it does not indicate which pairs of means are significantly different from each other. Post hoc tests isolate the difference between group means to determine which are responsible for rejecting the null hypothesis (Moore et al., 2012; Tabachnick & Fidell, 2006). The Honestly Significant Differences (HSD) test was used to compare means when a significant *F* ratio was found (Polit & Beck, 2004). In all of the ANOVAs and the t-tests, the homogeneity of variance was assessed using Levine's test, which determines if the variance in the scores is homogenous between the groups (Tabachnick & Fidell, 2006) None of the ANOVAs or the t-tests conducted violated the assumption of homogeneity.

An important aspect of a univariate analysis involves examining the associations between independent variables for evidence of multicollinearity, which occurs when independent

variables are highly correlated (Polit & Beck, 2012). These highly correlated variables add little to the predictive power of the regression model. Each redundant variable uses up one degree of freedom, making it more difficult to reject the null hypothesis (Farrar & Glauber, 1967). The generally accepted threshold for correlations is  $r \geq .80$ , with higher correlations being seen as evidence of multicollinearity (Polit, 2010). However, while high bivariate correlations are suggestive of collinearity, it is not conclusive evidence (Schroeder, Lander, & Levine-Silverman, 1990). In order to examine the data for evidence of multicollinearity, separate correlation matrices of the dependent variable and the continuous level independent variables were constructed for women and for men and the correlations assessed.

In the next step, the independent variables found to be significant at  $p < .05$  in the univariate regressions were entered into a multiple linear regression analysis using the General Linear Model. Separate regression models were created for women and men. Multiple linear regression analysis was used to identify the predictors of perception of pregnancy risk. Linear regression is a commonly used statistical procedure and is used to predict the effects of multiple independent variables (also referred to as predictors) on a continuous dependent variable (Tabachnick & Fidell, 2006).

The analysis generated a regression coefficient (also known as *b*-weight) for each predictor. The *b*-weight indicates the how much change in the dependent variable (PPRQ scores) will be associated with a unit increase for each predictor, while holding the influence of the other independent variables in the model constant (Polit & Beck, 2012; Tabachnick & Fidell, 2006). These *b*-weights are then standardized to determine the relative weight of each individual predictor variable (Munro, 2005). Linear regression yields a value denoted as *R*, which represents the multiple correlation coefficient. Unlike the *r* statistic used in a Pearson's

correlation,  $R$  cannot have a negative value.  $R$  values range from .00 – 1.00, indicating the strength, but not the direction of the relationship between the dependent variable and the predictors (Polit & Beck, 2012). The goal of a regression model is to determine the smallest number of predictors capable of accounting for the greatest proportion of variance in the dependent variable (Munro, 2005). The amount of variance in the dependent variable is measured by  $R^2$  which measures the proportion of variance in the dependent variable by all the predictor independent variables included in the model (Munro, 2005).

An important aspect of a linear regression is the method used for entering predictors into the model. In this analysis, a hierarchical process was utilized. In a hierarchical model the order of entry is theory driven rather than depending on the strength of the correlation between the predictor and the dependent variable as is the case in a stepwise model (Munro, 2005). Predictors may be entered one at a time or in subsets but there must always be a theoretical rationale for the order of entry (Tabachnick & Fidell, 2006). Order of entry was influenced by the theoretical and conceptual model as well as the findings from other studies which examined perception of pregnancy risk.

In the final step, selected excluded variables (i.e., univariately non-significant) were entered into the multivariable model one at a time to test for the possibility that they became significant upon adjustment. The model residuals were graphed and scrutinized for proper distribution, and influential observations were noted and their effects investigated.

In order to test for the effects of collinearity between the variables in the regression model, the variance inflation factors (VIF) of each independent variable (excluding the intercept) were also examined. VIF measures how much the variance of the estimated regression

coefficients are inflated as compared to when the predictor variables are not linearly related. VIF should not exceed 4 and a value of 10 suggests serious collinearity (Munro, 2005). This was an exploratory model building process which arrived at a final model able to predict the greatest amount of variance in the dependent variable.

***Research question #3.*** What demographic and psychosocial characteristics of the dyad are associated with discordance in perceived risk scores?

For this question, both a logistic and a linear regression model were constructed. This section will report the analysis plan for the linear regression. The analysis plan and results for the logistic model can be found in Appendix P. The dependent variable for this analysis was the difference between the couple's total PPRQ scores. This was done by subtracting the woman's score (which was generally higher) from the man's score. In some cases, where the man's score was higher, this resulted in a negative number. This did not impact the analysis as there was still a continuous variable (R. Rabbani, personal communication, December 8, 2016). In examining this variable, it was found that the distribution violated the assumption of normalcy. The distribution of difference scores was skewed to the left with a kurtosis of .623. This non-normalcy required correction as a normal distribution is an assumption of linear regression (Tabachnick & Fidell, 2006). In order to transform this variable a log correction was conducted. The distribution of differences scores contained values equal to zero and a log transformation cannot be performed when a distribution contains a zero (Tabachnick & Fidell, 2006). The distribution was modified by adding one to each value. The log transformation was then performed.

Once the log transformation was performed the analysis proceeded using the same 17 independent variables used in the analysis for research question #2. As this question was concerned with the couple, some modification of the variables was required. For some of the variables, the scores on instruments and responses to some demographic questions were combined into a single composite score representing the couple. Other demographic variables were transformed into dichotomized responses. This was necessary because, unlike the separate linear regressions for women and men performed for Research Question #2, this question was interested in factors predicting a characteristic of the couple. Details regarding these transformations are found in the Results section. The following section will describe the treatment of the independent variables.

Again, as in the analysis conducted for question #2, the independent variables found to be significant at  $p < .05$  in the univariate regressions were entered into a multiple linear regression analysis using the General Linear Model. Multiple linear regression analysis was used to identify the predictors of differences in PPRQ scores.

### **Qualitative Component**

The qualitative component of this dissertation seeks to answer research questions 4-8:

- 4) What factors influence the perception of risk in women with GD and their male partners?
- 5) How does gender influence perception of risk in women with GD and their male partners?
- 6) What role do pregnant women diagnosed with GD see their partner as having in aiding their efforts at health behavior change?
- 7) What role do partners see themselves as having in assisting the pregnant woman with health behavior change?
- 8) What are the information and support needs of women diagnosed with GD and their partners?

These questions are more socially constructed, and the meaning ascribed to risk perceptions and how those perceptions shape behavior is more amenable to investigation through qualitative methods. In addition, questions six and seven seek to explicate a specific aspect of the inter-personal relationship between the couples, that of support and the expectation of support. Finally, question eight involves an examination of information and support needs regarding GD.

### **Qualitative Research Design**

Qualitative description was selected as the design because the topic of gender-based pregnancy risk perception was a nascent area which would benefit from accurate description, which clearly describes the details of the phenomena being investigated. Qualitative description does not require researchers to move away from the data or provide highly abstracted interpretations (Sandelowski, 2000a, 2010). The use of a design which focuses on description allows for an accurate rendition of the meanings participants attribute to their experiences. In addition, qualitative description “leaves room for the unanticipated” (Giorgi, 1992, p. 122), which is a significant advantage in an area where there is little prior knowledge.

Participants were asked a series of semi-structured questions designed to elicit their thoughts on the meaning of risk during pregnancy, both generally and with specific reference to GD and how those perceptions influenced their intention to alter their health behaviors. Probes were indicated in the guide to assist the researcher to explore certain concepts more thoroughly. Both women and men were asked to reflect on their thoughts regarding gender differences in risk perception. Women were asked to reflect on the amount and nature of assistance/support received from their partners in making health behavior changes, while male participants were asked to what extent they believed they offered supports. Please see interview guide in Appendix Q.

**Sampling**

The sample of couples for the interview was drawn from a subset of couples who had completed the quantitative questionnaires. The final page of the quantitative consent form contained an invitation to participate in the qualitative component of the study. Both members of the couple had to indicate a willingness to be contacted regarding qualitative participation and this may have negatively impacted recruitment (See the Limitations section for further details). The original goal was to utilize a stratified purposive sample in which the sampling frame would be divided into strata to obtain relatively homogeneous sub-groups and a purposeful sample would then be selected from each stratum (Onwuegbuzie & Collins, 2007). Stratification of the sample was to be based on the results from PPRQ (the dependent variable). The intent was to use PPRQ scores to divide the couples into having either concordant or discordant perceptions of risk. However, due to the unanticipated low numbers of couples willing to participate in the qualitative component, a convenience sample of all couples agreeing to the interview was used, regardless of the degree of concordance in their risk perception scores. According to the typology created by Onwuegbuzie & Collins (2007), the qualitative sample could be described as a convenience sample where participants were selected on the basis of being available and willing to participate. For a discussion of the implications of this sampling frame please see the Limitations section in Chapter 6.

**Study Participants**

The original goal was to interview a sub-set of couples with either concordant or discordant perceptions of risk. Due to a low response rate for participation in the qualitative component of the study, all couples who consented to be contacted regarding the qualitative interview were contacted regardless of concordance or discordance in their PPRQ scores. Couples were contacted by telephone or E-mail, whichever method was indicated in their

response to the invitation. Couples who participated in an interview were provided with an honorarium to thank them for their time.

### **Recruitment**

Recruitment for the qualitative component occurred after couples completed the quantitative portion. All 20 couples who indicated a willingness to participate regarding interviews were contacted by the researcher. If the couple agreed to participate, a mutually acceptable time and location for the interviews was arranged. Prior to conducting the interview, the researcher re-confirmed the couple's intent to participate in the interview, explained the interview procedure and answered any questions. The couples then signed the qualitative consent form (Appendix S). Given that the women were in the third trimester of pregnancy at the time of the quantitative participation, some women gave birth before the interviews could be arranged, and those interviews (n=5) were therefore conducted in the post-partum period.

***Procedure for data collection.*** All interviews were conducted in the participants' home. Once the researcher arrived, the purpose of the qualitative study was explained verbally and with reference to the relevant sections of the consent form. The potential participants had the opportunity to ask questions about their participation. Written signed consent was obtained from both the woman and her partner. Although the goal was to interview couples separately, this was not always possible. As the interviews were conducted in the participants' home, there were occasions when the researcher was interviewing one member of the couple and the other member remained in the room. On two occasions, the participants requested to be interviewed together. This decision to interview separately was based on the need to ensure that participants felt able to honestly articulate their opinions and beliefs. There is considerable evidence that when being interviewed together, couples present answers that are acceptable to their partner (Morris, 2001;

Taylor & de Vocht, 2011; Valentine, 1999; Zipp, Prohaska, & Bemiller, 2004; Zipp & Toth, 2002). For a detailed discussion of the implications of not interviewing all participants separately, refer to the Limitations section in Chapter 6.

The procedure for qualitative data collection involved a semi structured face-to-face interview. The interview guide is located in Appendix Q. Socio-demographic descriptive data on the participants in the qualitative component of the study was extrapolated from the couple's quantitative responses. All interviews were digitally recorded and transcribed using strict verbatim by a trained transcriptionist, ensuring a thorough and accurate rendition of the interview. Interviews ranged from 45-90 minutes in length for the individual interviews and from 60-80 minutes for the two interviews done with couples. When transcribed, the transcripts ranged in length from 15-36 double spaced pages.

In order to provide a description of the context of the interview, the researcher also completed a contact summary sheet which summarized the field experience (i.e. the location of the interview, relevant contextual factors, and personal impressions). These summaries were a form of field notes which were useful to capture immediate impressions and assisted the researcher in reflecting on the experience (Streubert Speziale & Carpenter, 2003).

### **Sample Size**

It is difficult to estimate the number of couples required to achieve data saturation, which occurs when subsequent interviews do not yield any new findings (Streubert Speziale & Carpenter, 2003). Other qualitative work on risk perception in pregnant women reached data saturation in interviews numbering between seven (Patterson, 1992) and 20 (Corbin, 1987) women. A recent study which examined the risk perceptions of women of advanced maternal age

interviewed 15 women (Bayrampour et al., 2012a). An initial recruitment goal of 6-10 couples (12-20 interviews) was established. As mentioned previously, due to an unanticipated low response rate to the qualitative component, eight couples were recruited, for a total of 14 interviews (two couples were interviewed together).

### **Qualitative Data Analysis**

Interviews were digitally-recorded and transcribed verbatim by a trained transcriptionist. The transcripts were formatted as single sided, double spaced documents with a two-inch margin on all sides. Each line of the transcript was numbered. The researcher then confirmed the accuracy of the transcripts by listening to the digital recordings and making any necessary corrections to the transcripts. Any words or phrases marked as “unintelligible” by the transcriber were filled in by listening closely to the recording to determine what was said. Typographical and spelling errors were also corrected. These transcripts were read multiple times prior to beginning the actual analysis. Immersion in the data is an important aspect of the analysis as it allows the researcher to make sense of the data and to generate a sense of “what’s going on” (Morse, 1995).

Content analysis was used to code and analyze the data. Content analysis has three phases: preparation, organizing and reporting (Elo & Kyngäs, 2008). In the preparation phase the researcher has three main decisions: selecting the unit of analysis, deciding whether the analysis will be used in an inductive or deductive manner and selecting the level of analysis. (Elo & Kyngäs, 2008). According to Graneheim & Lundman, (2004), the most suitable unit of analysis is the interview transcription, and this was the unit selected for analysis.

Content analysis can be inductive or deductive (Sandelowski, 2000a). Which method is selected depends on the purpose of the study. Inductive analysis is more common and is used when there is not a great deal of previous knowledge regarding the phenomenon (Elo & Kyngäs, 2008). The inductive approach moves from the specific to the general. As gender differences in pregnancy risk perception are a nascent area, the inductive approach was selected.

The next decision involves the level of interpretation present in the analysis. These levels are described as manifest or latent content (Graneheim & Lundman, 2004). Manifest content refers to what the text actually says, i.e., the words and terms which are used by the individual speaker. Latent content is more interpretive and involves interpretation of the underlying meaning of the text (Downe-Wamboldt, 1992). The individual interviews were examined for both latent and manifest content. Latent content memos were integrated throughout the transcript. These memos included the researcher's thoughts and made connections between previous statements by other participants. Given that the goal of this qualitative analysis was descriptive, emphasis was placed on manifest content; however, as Sandelowski sagely observed "all description entails interpretation" (Sandelowski, 2000a, p. 335), and thus some interpretation of latent content was undertaken.

Once these decisions were made, the analysis proceeded to the organizing phase. The inductive coding process began with open coding, in which each line of the transcript was analyzed and condensed into meaning units, which are words or statements which relate to the same underlying content (Graneheim & Lundman, 2004). These meaning units, and latent content memos were added to each transcript using Track Changes.

In addition to meaning units and latent content notes, methodological and field notes were also incorporated. The methodological notes identified points in the interview where the

researcher felt there were improvements needed in how a question was asked, or what prompts were used. By reviewing these notes, adjustments were made in future interviews to gain richer data (Streubert Speziale & Carpenter, 2003). Given that the researcher is a novice, these notes provided assistance in developing interview skills and modifying the interview guide. The field notes included the investigator's descriptions of the interview, including the physical environment, impressions of the reaction of participants to certain questions and personal reflections of the investigators feelings throughout the interview. These field notes were frequently reviewed to assist in preparing for analysis of interviews.

Once all transcripts had been open coded, the meaning units were transferred to a coding sheet for each couple. These meaning units were then grouped into codes which were further condensed into higher order categories (Elo & Kyngäs, 2008). This process involved more than simply deciding if each meaning unit was similar or dissimilar but was a process of deciding what categories belonged together by comparing the data to other observations that did not belong to the same category (Elo & Kyngäs, 2008). A table was created with each category, its associated codes and a frequency count of the number of times each code appeared in the transcripts.

This information was then transferred to individual coding frameworks for each interview. These frameworks were organized according to the research question. The framework for each interview included the category, exemplar quotes and a tabulation of the number of times each category appeared in the transcript. Sandelowski defends the use of counting in qualitative research by pointing out that meaning depends, in part, on numbers. Tabulations (or counts) can be very useful in qualitative research to establish the frequency of a category and to showcase the labor and complexity of qualitative work. Numbers can also assist in generating

meaning from qualitative data; to document, verify, and test researcher interpretations or conclusions (Sandelowski, 2001).

Finally, in the reporting stage, the results were presented in a way that readers have a clear understanding of how the analysis was conducted and how the results relate to the study purpose. Categories were organized according to research question. The use of the research questions as an organizing feature allowed the reporting to demonstrate a link between the results and the data (Streubert Speziale & Carpenter, 2003).

### **Reliability and Validity**

This section discusses the measures used to ensure reliability and validity in both components of this study. Reliability and validity are typically thought of as applying to quantitative research, while rigour pertains to qualitative studies and refers to the techniques described by Guba & Lincoln; these include credibility, dependability, confirmability and transferability (1994). These terms can be accurately applied to both forms of research methodologies. The goal of rigour is to ensure the accurate representation of participants' experiences (Streubert Speziale & Carpenter, 2003). Rigour is a product of the methods used to ensure reliability and validity (Polit & Beck, 2012).

In recent years there has been a movement away from separate standards and a call for the return to the use of social science terminology in qualitative research (Morse, 1999; Morse, 2015). In an editorial published in the journal *Qualitative Health Research*, Morse (1999) makes the argument that good science relies on rigour which is ensured through validity and reliability; if qualitative research declares itself unconcerned with validity and reliability then it cannot be considered to be good science. This section will discuss how rigor was demonstrated through

measures intended to enhance reliability and validity, in both components of this mixed methods study.

### **Quantitative component**

A number of measures were used to demonstrate reliability and validity in the quantitative component of this study. These are separate yet closely related concepts. In quantitative studies, reliability is typically defined as the extent to which instruments used in a study consistently measure the targeted attribute (Polit & Beck, 2012). Validity is also crucial to ensuring a study is rigorously conducted. Validity is commonly defined as the degree to which an instrument measures the construct it is supposed to be measuring (Polit & Beck, 2012).

Reliability also refers to the steps taken to reduce errors in measurement. Whenever possible in this study reliable instruments were selected. These are instruments with well established psychometric properties which have been used extensively with a diverse range of populations. Information on the reliability and validity of the instruments, including published Cronbach alpha values for each instrument, can be found in this chapter in the section titled Research Instruments. In addition, Cronbach alpha was also calculated for the instruments as they were administered to this particular population. Cronbach alpha reliability coefficients were calculated for all instruments (with the exception of the demographic questionnaire and the GDKS), including the three subscales of the PPRQ (Risk to Self, Risk to Baby and Risk of Diabetes). This information can be found in Chapter 4 Quantitative Results in the section Summary of Independent Variables.

**Reliability.**

Errors of measurement are a threat to reliability. In this study, a number of steps were taken to reduce the impact of measurement error. To ensure that instruments were reliably and accurately scored, careful attention was paid to factors such as reverse scored items, items with a midpoint other than zero and using the same ruler to measure the visual analogue scale of the PPRQ. All instruments were scored by the investigator to ensure consistency. The coding of items in SPSS was also done by the investigator and a codebook was maintained to ensure consistency in the coding of variables.

Details regarding the validity of the instruments used in this study can be found in this chapter in the section titled Research Instruments. In particular, this section contains details regarding the validity testing of the PPRQ. Ideally, factor analysis of the three-subscale version of the PPRQ would have been undertaken to ensure the validity of the revised instrument. However, a sample size of 107 was inadequate for accurate factor analysis (B. Dufault, personal communication, November 30, 2016), as exploratory factor analysis requires a minimum of 10 participants per item (Pett, Lackey, & Sullivan, 2003), meaning that the 13-item revised PPRQ would have required a minimum sample of 130 participants.

**Validity.**

One of the most important aspects of ensuring validity in a quantitative study is consultation with a biostatistician, especially when the study is conducted by a novice researcher (Al-Hamdan & Anthony, 2010). During the course of creating the SPSS data set and conducting the statistical analysis, consultation was undertaken with several experts. Mr.J. Plohman, Research Technologist at the Manitoba Center for Health Research who has expertise in SPSS,

assisted in setting up the dataset, data coding and establishing a data codebook. During data analysis frequent consultation was undertaken with three biostatisticians, Mr. B. Dufault and Dr. R. Rabbani at the Center for Healthcare Excellence and Dr. R. Ahmed, statistician for the College of Nursing. In addition, the researcher reviewed all statistical analysis with her doctoral advisor, Dr. M. Heaman.

### **Qualitative component**

As previously mentioned, the terms reliability and validity will be used to describe the mechanisms used to ensure rigor in the qualitative component of this study. Reliability and validity refer to the extent that the findings reflect a true and accurate representation of the participant's experiences (Morse, 2015). Successful content analysis requires that the researcher analyzes and simplifies the data and then forms categories which reflect the subject of study in a reliable manner (Morgan, 1993).

#### **Validity.**

Prolonged engagement with the subject matter is one method to improve the validity of results (Streubert Speziale & Carpenter, 2003; Morse 2015). In the case of this study, data collection took place over a period of more than 10 months, with the researcher meeting some participants several times. Prior to handing out the quantitative packet the researcher spent time speaking with participants, answering their questions and learning about their pregnancy journey. Often, the researcher would meet these participants again on subsequent visits to the Fetal Assessment Unit. While no formal interviews were conducted at this stage of recruitment, the opportunity to meet with women and their partners on multiple occasions was important. In this way, it was possible for participants to develop trust in the researcher which may lead to richer data (Morse 2015). For participants in the qualitative component, the researcher spent

approximately 10-15 minutes chatting with the participants prior to beginning the interview and often spent time with them following the interview.

Peer review is another means of establishing validity in qualitative analysis (Morse 2015). At several analytical points, the researcher sought peer review and debriefed with members of the thesis committee to discuss the findings and interpretations in order to increase the internal validity of findings. This is achieved through addressing potential researcher bias; however, Morse cautions that “validity is not something that is awarded by committee consensus but is something that must be analytically earned” (Morse, 1998, p.445). Care was taken to ensure that the researcher remained responsible for the interpretation and construction of the analysis.

Triangulation has been suggested as a means of demonstrating validity of qualitative results (Streubert Speziale & Carpenter, 2003). Given that there are no other studies which explore pregnancy risk perception from a gendered perspective, it was not possible to directly triangulate the results with those of other studies. However, results were triangulated with those from other studies which examine pregnancy risk from a woman’s perspective. Triangulation was also examined between the quantitative and the qualitative components. The Discussion chapter integrates the findings from the quantitative and the qualitative components of the study.

### **Reliability.**

Thick description ensures both reliability and validity as it ensures that the phenomenon is described thoroughly and from a multitude of participant perspectives (Morse 2015). Thick description involves describing and interpreting social actions. This is an interpretive process within the appropriate context in which the social action took place and captures the thoughts,

emotions, and social interaction of the participants. One of the most important elements of thick description is that the researcher assigns motivations and intention to the actions observed (Ponterotto, 2006). The partially structured interviews were between 45-90 minutes in duration. For some of the interviews this time produced thick and rich descriptions of the phenomenon under investigation. Other participants were less forthcoming, and their interviews were thinner, with less detail provided. In addition, given that the method used- qualitative description - has been described as a low-inference mode of analysis, it was difficult to ascribe intention to the words and actions of the participants. In the case of this study, more qualitative interviews were needed to truly develop thick and rich descriptions. More content would have been beneficial and may have added new perspectives to the analysis. Please see the Limitations section in Chapter 6 for a discussion of this issue.

In order to ensure immersion in the data and accuracy of transcription, the interviews were listened to a number of times by the investigator to ensure familiarity with the content. Once the interviews were transcribed, the transcriptions were compared to the digital recordings to ensure accuracy. Any words or phrases listed as “unintelligible” were filled in by carefully listening to the recording. These processes also assist in establishing reliability and validity (Morse 2015). The use of quotations from participants is another method of enhancing reliability of the research as this points out to readers where and from what kinds of original data, the categories are developed (Sandelowski, 1995). Participant’s quotes were used throughout the qualitative results chapter as exemplars of the categories.

Development of a coding system is another mechanism used to ensure reliability as a systematic coding framework helps to ensure consistency in the data (Morse 2015). Formally referred to as confirmability which is similar to replication in quantitative studies (Morse 2015),

a coding system is the record of how conclusions were arrived at and how the results were generated. This system is especially important when interviews are semi-structured, and the questions are relatively standardized. Details regarding the coding system are found in the Qualitative Data Analysis section of this chapter. For this study, field and methodological notes were taken and detailed charts were compiled during the process of content analysis so the process of arriving at categories was made as transparent as possible (Elo & Kyngäs, 2008). Further details regarding these notes can be found in the Qualitative Data Analysis section of this chapter.

Lastly, transferability refers to the extent to which results apply to other groups. It falls to the users of qualitative results to determine the transferability or “fittingness” of results (Streubert Speziale & Carpenter, 2003). The extent to which the results of this study apply to other settings or populations must be assessed by those who seek to apply the results. The same can be said for how these results may apply to other risk situations, both within the context of pregnancy (such as pregnancy induced hypertension) or in other diagnoses.

### **Ethical Considerations**

Ethics approval was granted by the University of Manitoba Education/Nursing Research Ethics Board (Protocol # E2014:124) on December 15, 2014. A one-year extension to this approval was requested and granted, extending the ethics approval until December 15, 2016. A second one-year extension was requested and granted, further extending ethics approval until November 18, 2017. Please see Appendix A for approval/extension certificates. Access to the recruitment sites was obtained from the Health Sciences Center Research Impact Committee (RI2014:171) and the St. Boniface Hospital Research Review Committee (RRC/2014/1440). Please see Appendix B for access approval certificates.

This research was carried out in accordance with the Manitoba Health Personal Health Information Act (Health, 2013). Potential participants were first approached by a member of the unit staff to determine eligibility and interest in hearing more about the study. This was done to ensure individuals did not feel coerced into participating. The couples were also granted privacy when completing the consent forms to ensure they had the opportunity to discuss the possibility of qualitative participation without the researcher/research assistant being present. Potential participants were provided with both a verbal and a written explanation regarding the purpose of the study and had opportunity to ask questions. The following ethical considerations were emphasized: participation is voluntary and declining to participate would not impact any healthcare services the individual may receive, and participants had the right to withdraw from the study at any time with no impact on healthcare services.

All participants signed a consent form for each component of the study they participated in. The consent process was consistent with the Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans (Canadian Institutes of Health Research, 2010). Consent forms for both the quantitative and qualitative components can be found in Appendices R and S respectively. All questionnaires were anonymous, containing only a participant code. All participants received a \$10.00 Walmart gift card upon completion of the questionnaire packet and after completion of the qualitative interview. Participants were asked to sign a receipt acknowledging receipt of the gift card. Please see Appendix T for the Honorarium Receipt. Gift cards were tracked using participant code numbers and the verification numbers found on the card for reconciliation purposes according to the requirements of the University of Manitoba.

Consent forms and questionnaire packets were maintained in separate locked file drawers in the researcher's private residence. All research material, including the master list of

participant names and code numbers and the honorarium tracking sheet were kept on a secure password protected laptop. Only the researcher, the PhD Advisory Committee Chair, the research assistant and the statistician had access to the quantitative data. Only the researcher, the PhD Advisory Committee Chair, the PhD Advisory Committee Internal Member and the transcription company had access to the qualitative data. Transcript Divas, a Canadian transcription company, was hired to transcribe the interviews. Digital recordings were sent to and received back from Transcript Divas using an encrypted link via Dropbox. Transcripts were saved as audio and Word files on a password protected computer. All transcripts were rendered anonymous by removing names and any potentially identifying information.

The master list of identification numbers with their corresponding names will be destroyed by shredding the paper copy and deleting the electronic copy from the computer at the conclusion of the study. All other documents will be moved to a locked research data storage room at the College of Nursing and destroyed seven years after the completion of the study. This includes the completed questionnaires, electronic and paper versions of the transcripts, and electronic and paper versions of the field notes. Electronic data will be deleted from the computer files and paper versions will be destroyed by shredding. As all recordings of interviews will be done using a digital recorder, there will not be audio cassette tapes of the interviews.

There were no ethical issues encountered during the conduct of this study. While there were measures in place to offer assistance to any participant who was distressed by any of the questions asked in either component, no participant expressed any concern over the nature of the questions. There were no direct benefits to participating in this study, although participants were advised that they were assisting with the production of knowledge that may assist in future care delivery

**Conclusion.**

Chapter 4 described the methods used in this study. The analysis plan for both components was provided and included a detailed discussion of the treatment of missing data in the quantitative component. The analysis plan was divided into quantitative and qualitative sections, and then further divided according to research question. Methods to ensure reliability and validity for both components of the study were described. Lastly there is a discussion of ethical considerations.

## Chapter 5: Quantitative Results

This chapter will present the results from the quantitative component of the study. The demographic characteristics of the participants in the quantitative component will be described, followed by a descriptive summary of the dependent and independent variables for both men and women. A summary of the independent variables will be provided which includes results from the PSS, PMTQ, KMSS, GAD7 and the GDKS as well as a summary of other independent variables including the representative and availability heuristics, knowledge of complications and sources of information. The results of the statistical analyses will be presented for the first three of the research questions.

### Demographics

The demographic characteristics of the couples who participated in the quantitative component of the study are presented in Table 1. Demographic, social and pregnancy related characteristics are presented separately for women, men and those applicable to the couple. There were a total of 109 participant couples in this study. However, as noted in the section on missing data, complete data were available for only 107 couples and therefore the following demographics describe 214 participants (107 women and 107 men).

#### Demographics: Women.

The women in this study ranged in age from 18 to 44 years ( $M = 31.85$ ,  $SD 4.91$ ). At the time of study participation, the women were between 24 to 40 weeks gestational age ( $M = 35.58$ ,  $SD 2.94$ ). The majority of the women were either primiparous ( $n = 38$ , 35.5%) or reported at least one previous pregnancy which ended with a loss or termination ( $n = 17$ , 15.9%). Taken together, slightly over half of the female participants were preparing to deliver their first child ( $n$

= 55, 51%). There was a wide range for the gestational age of GD diagnosis, ranging from 4 to 40 weeks, however most women were diagnosed at approximately 26 weeks ( $M = 26.51$ ,  $SD = 6.50$ ). As mentioned previously, the current clinical guideline published by the Society of Obstetricians and Gynecologists of Canada recommends screening all pregnant women for GD between 24-28 weeks gestation. Women with multiple risk factors may be screened during the first trimester (Berger et al., 2016). It is likely that women screened very early in pregnancy do not have true GD but rather have undiagnosed Type 2 diabetes (Aljohani, et al., 2008a; Chen et al., 2009; Ratner et al., 2008). Refer to the Limitations section for a discussion of the implications of including women screened during the first trimester of pregnancy in this sample.

In terms of body composition, 44 women (41%) reported a pre-pregnancy weight and height which places their body mass index (BMI) in the obese category. BMI's ranged from a low of 16 to a high of 65 ( $M = 29.35$ ,  $SD = 8.60$ ). The women in this study were well educated with the majority reporting completed vocational or university education ( $n = 78$ , 72.9%). There was considerable ethnic diversity among the women who participated in the study, with 40 (37.4%) being Caucasian, 21 (19.6%) women reported being of First Nations, Métis or Inuit ancestry, a further 21 (19.6%) were Filipino and 15 (14.0%) women reported Asian background. The remaining ethnic categories ( $n = 10$ , 9.3%) were grouped as "Other" due to low percentages. The majority of the female participants were born in Canada ( $n = 69$ , 64.5%). For those women born outside of Canada, the average number of years residing in Canada was 6.7 ( $SD = 5.98$ ).

### **Demographics: Men.**

The men in this study were slightly older than the women, ranging from 18 to 55 years ( $M = 34.03$ ,  $SD = 5.68$ ). The majority of the male participants reported having fathered at least one previous pregnancy ( $n = 62$ , 57.9%). The men were also well educated with 65 (60.7%) having

completed vocational or university education. As with the women, the male participants were also from diverse ethnicities. Once again, the largest ethnic group was Caucasian ( $n = 46$ , 43.0%), the remaining ethnic groups for the men were: 17(15.9%) First Nations, Métis or Inuit, 16 (15.0%) Filipino and 16 (15.0%) Asian background. The remaining ethnic categories ( $n = 12$ , 11.2%) were again grouped as “Other” due to low percentages. The men were also primarily born in Canada ( $n = 67$ , 62.6%). Those men not born in Canada reported living in Canada slightly longer than the women in the sample ( $M = 7.45$  years,  $SD 5.84$ ). Most of the male participants reported being able to attend at least one prenatal care appointment ( $n = 67$ , 62.6%).

### **Demographics: Couple.**

There was a slight discrepancy in the marital status reporting between the women and men in this study. The majority of the couples, 74 (69.2%) of the women and 72 (67.3%) of the men, reported being married. Living common-law was reported by 31 (29.0%) of the women and 33 (30.8%) of the men. There were 2 (1.9%) couples who reported their marital status as “other”. In terms of reporting family composition, women and men were asked how many children they had. The participants were not asked how many children currently resided in their home. Therefore, the following numbers reflect the total number of children for the participant and not necessarily how many children the couple currently cares for. For the couples in this study, 51 (47.7%) of the women and 50 (46.7%) of the men report having no children, 46 (43.0%) of the couple’s report having 1-2 children and 10 (9.3%) women and 11 (10.3%) men report having 3 or more children.

The mode for average family income for the couple was \$100,000 and over. When family income was collapsed into low income ( $< \$39,999$ ), moderate income ( $\$40-\$79,999$ ) and high income ( $\geq \$80,000$ ), 29 (27.1%) women and 28 (26.2%) men reported having a low income, with

38 (35.5%) women and 39 (36.4%) men reporting a moderate income, followed by 40 (37.4%) couples reporting a high income. It is interesting to note the slight discrepancy between the women and the men in the moderate to low income groups. Defining what constitutes a low family income can be difficult. Statistics Canada no longer uses static cut-off points to define levels of income, so in order to determine what would constitute low income for this study, data from 2007 was used. In 2007, Statistics Canada defined low income for a family of two adults and two children as \$30,903 before taxes (Canada, 2009). Due to the categories of family income provided on the questionnaire, it was not possible to categorize low income as  $\leq$ \$31,000. The cut-off point of \$39,999 was determined to represent a reasonable estimate of low income. The majority of the couples; 78 (72.9%) of the women and 80 (74.8%) of the men, reported residing in the city of Winnipeg. Once again, there was a slight discrepancy in the responses between the couples.

The majority of the couples in this study can be described as being in their mid-thirties, married, Caucasian, having a vocational or university education with an annual family income in excess of \$80,000 and living in the city of Winnipeg. There is however, considerable diversity within the sample, with approximately 35% of the participants being born outside of Canada.

Table 1. Demographic Characteristics of Participants

Variable	Women n=107 n(%)	Men n=107 n(%)
<b>Characteristics of the Individual</b>		
<b>Age</b>		
18 – 25	9(8.4)	6 (5.6)
26 – 35	74(69.2)	63 (58.9)
36+	24(22.4)	38 (35.5)
<b>Marital Status/Family Structure</b>		

Married	74(69.2)	72(67.3)
Common-law	31(29.0)	33(30.8)
Other	2(1.9)	2(1.9)
<b>First pregnancy or fathering a pregnancy</b>	38(35.5)	45(42.1)
<b># of Children Reported</b>		
1-2	46 (43.0)	46 (43.0)
3+	10 (9.3)	11 (10.3)
<b># of PNC Appointments Attended by partner</b>		
None	--	39 (36.4)
1	--	29 (27.1)
2-3	--	31 (29.0)
4+	--	8 (7.5)
<b>Required insulin during pregnancy</b>		
Yes	46(43.4) ^	--
No	60(56.6) ^	--
<b>Education</b>		
At least high school	13(12.1)~	22(20.6)^
Incomplete vocational/university	14(13.1)~	19(17.8)^
Complete vocational/university	78(72.9)~	65(60.7)^
<b>Race/Ethnicity</b>		
Caucasian	40(37.4)	46(43.0)
First Nations/Métis/Inuit	21(19.6)	17(15.9)
Filipino	21(19.6)	16(15.0)
Asian	16(15.0)	16(15.0)
Other	9(8.4)	12(11.2)
<b>Born in Canada?</b>		
Yes	69(64.5)	67(61.3)
No	38(35.5)	40(36.9)

---

**Characteristics of the Couple**


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<b>Income</b>	
<=\$39,999	29(27.1)
\$40,000-\$79,999	38(35.5)
>=\$80,000	40(37.4)
<b>Reside in Winnipeg?</b>	
Yes	78(72.9)
No	29(27.1)

---

~ based on n=105, ^ based on n=106

### **Summary of Independent Variables**

This section describes the score results for the independent variables in this study. The independent variables include the instruments selected to operationalize the concepts detailed in the conceptual model and theoretical framework as well as the questions asked to operationalize cognitive heuristics. These instruments are briefly reviewed in this section. Results for both women and men are discussed. Table 2 presents descriptive data for all the questionnaires.

#### **Perceived Stress – PSS.**

Perceived stress was operationalized using the four item PSS, with responses from “0=Never” to “4=Very Often” on a five-point Likert scale. Scores range from 0 to 16 with higher scores indicating higher levels of perceived stress. The author of this instrument does not indicate any clinical cut-off points. Women in this study reported a mean PSS score of 10.12 (SD 2.44), with scores ranging from 0 to 15. Men in this study reported significantly lower PSS scores than the women based on paired t-test (Table 2). The mean PSS score for men was 9.37 (SD 2.65) and the scores ranged from 0 to 16. Cronbach’s alpha for the instrument in this study was .65 for women and .98 for men. The alpha scores for women are lower than those reported in other studies using the four- item PSS. This may be due to characteristics of the participants as alpha is a product of the scores on the test by a specific sample and different samples will generate different alpha scores (Tavakol & Dennick, 2011). Cohen has noted that the four-item version of the PSS has lower reliability scores as compared to the longer versions (Cohen, 1988)

#### **Self-efficacy – PMTQ.**

Self-efficacy is a component of Protection Motivation Theory and was operationalized using a modification of previously developed questionnaire. The PMTQ contains four items with responses on a five-point Likert ranging from “Extremely Confident/Easy” to “Not Confident at

All/Extremely Difficult”. Scores range from zero to 20 with higher scores indicating lower levels of self-efficacy. In this questionnaire a score of zero indicates the response “Not Sure”. There are no clinical cut-off points. Women in the study reported a mean PMTQ score of 8.83 (SD 3.56). The lowest reported score was zero and the maximum reported score was 19. The mean male PMTQ score was 7.48 (SD 3.66). Scores for the men ranged from zero to 18. Cronbach’s alpha for the PMTQ was .84 for women and .74 for men. Women had significantly higher scores than men, indicating lower levels of confidence in their ability to manage GD (Table 2).

### **Marital Satisfaction- KMSS.**

The KMSS is a three-item measurement which distinguishes between satisfied and dissatisfied couples. Responses are given on a seven-point Likert scale ranging from 1= “Extremely Dissatisfied” to 7 = “Extremely Satisfied”. Possible scores range from three to 21 with a cut-off point of 17 or under indicating dissatisfied couples. Lower scores indicate lower levels of marital satisfaction, while higher scores indicate higher levels of satisfaction. The couples in this study were generally very satisfied with their relationship. Women had a mean score of 19.08 (SD 3.01). Scores ranged from a low of three to a high of 21 with 54 (50.5%) reporting a final KMSS score of 21. Men also reported being satisfied in the relationship, with 55 (51.4%) having a final KMSS score of 21. The mean score for men was 19.41 (SD 2.34). Scores for men also ranged from three to 21 (Table 2). The KMSS demonstrated excellent internal reliability in this study with Cronbach alpha of .98 and .97 for women and men respectively.

### **Dread- GAD-7.**

The psychometric paradigm suggests that the degree of dread evoked by a risk condition impacts how risky the specific condition or situation are felt to be. This can be a difficult concept to operationalize. Anxiety is a construct often used to operationalize dread. The GAD-7 is a

seven-item measurement tool designed to determine the degree to which respondents have experienced the symptoms of Generalized Anxiety Disorder in the past two weeks. Response options range from “Not at all” to “Nearly every day”, with possible scores ranging from 0-28. A score of  $\geq 10$  indicates moderate anxiety, and  $\geq 15$  indicates high/severe levels of anxiety. Women in the study had a mean GAD-7 score of 6.74 (SD 4.72) with the lowest reported score being zero and the highest being 19. A total of 30 (28%) of the women had scores indicating moderate-severe anxiety. The GAD-7 scores for men were lower overall. The mean score was 4.76 (SD 4.44). The mean scores for both women and men indicate low levels of anxiety however, a small percentage of the sample did have higher scores. Scores ranged from zero to 21 and a total of 15 (14%) had scores in the moderate/severe anxiety range. The Cronbach alphas for the GAD-7 were .89 for women and .88 for men.

### **Risk Familiarity – GDKS.**

The psychometric paradigm also suggests that the degree to which an individual is familiar with the risk also impacts their risk perceptions. In order to operationalize risk familiarity a questionnaire which tests GD knowledge was selected. The GDKS was modified with permission of the author and consisted of 18 multiple choice questions. Many of the questions had multiple correct responses. One point was given for each correct response selected. There were a total of 33 correct responses. The score for the GDKS is reflected as a total score and as percentage of questions answered correctly. The mean GDKS score for women was 19.50 or 59.1%. The lowest score was seven (21.2%) and the highest score was 28 (84.8%). Men in this study had significantly lower GDKS scores compared to the women, with a mean score of 17.25 (52.3%) and scores ranging from a low of five (15.1%) to a high of 26 (78.8%).

Table 2. Differences in women's and men's total mean scores on questionnaires using paired t-test

Questionnaire	Women's scores M (SD)	Men's scores M (SD)	M difference (SD)	t	Sig
PSS	10.1 (2.4)	9.37 (2.65)	.75 (3.05)	2.5	.013*
PMTQ	8.8 (3.6)+	7.6 (3.7)	-1.3 (5.3)	-2.6	.010*
KMSS	19.1 (3.0)	19.4 (2.3)	0.3 (3.4)	1.0	.315
GAD-7	6.7 (4.7)	4.8 (4.4)	-1.9 (5.7)	-3.5	.001**
GDKS	19.5 (4.7)	17.3 (4.6)	-2.2 (4.9)	-4.6	<.001***
Raw Score out of 33					
GDKS expressed as a %	59%	52%			

\* p< 0.05; \*\* p<0.01; \*\*\* p<0.001, + based on n = 104

### **Cognitive Heuristics.**

**Representativeness.** The representative heuristic is a cognitive heuristic which refers to how at risk the individual feels they are as compared to the typical person who develops the disease state in question. For the women in the study, 17 (15.9%) felt that they and their babies had “About the same” degree of risk as compared to the average woman and baby, while 11 (10.3%) felt that they and their babies were at higher risk and 79 (73.8%) perceived the risk to themselves and their babies as lower than average. Male participants had similar ratings of comparative risk, with 25 (23.4%) rating their partners and baby's degree of risk as “About the Same”, 76 (71.0%) felt the risk was lower than average and six (5.6%) rating a higher than average risk.

**Availability.** The availability heuristic refers to how easily an individual is able to think of risk situations similar to their own. This was measured by a single question which asked participants how many other women they knew who had been diagnosed with GD. In this sample, 34 (31.8%) of the women and 52 (48.6%) of the men reported knowing no other women with GD. Women reported knowing an average of 1.4 other women with GD, while men reported knowing an average of .98 other women with GD.

### **Partner's Attendance at Prenatal Care Appointments**

Men in the study were asked if they attended prenatal care appointments with their partner. Of the 107 male participants, 39 (36.4%) did not attend any appointments, 29 (27.1%) attended one visit and 39 (36.4%) attended more than one visit. The mean PPRQ score for men who did not attend any prenatal care appointments was 31.63 (SD 17.37), for men who attended one appointment the mean score was 35.0 (SD 17.71) and for those who attended two or more appointments the mean score was 34.4 (SD 15.06). An ANOVA was calculated to compare the differences in mean PPRQ scores between the groups. No statistically significant difference was found between the groups ( $F = .425, p = .655$ ).

ANOVA was also used to compare the differences in mean scores for the PSS, PMTQ, KMSS, GAD-7 and the GDKS. The only questionnaire where there was a statistically difference mean score based on attendance at prenatal care appointments was the KMSS. There was a statistically significant difference at the  $p < .05$  level in total KMSS between two of the three groups:  $F(2, 104) = .78, p = .029$ . Post-hoc comparisons using the Tukey Honestly Significantly Difference (HSD) found the mean score for Group 2 – Men who attended one prenatal care appointment ( $M = 18.52, SD = 3.51$ ) was significantly different from Group 3 – Men who attended more than two appointments ( $M = 20.03, SD = 1.50$ ) ( $p = .040$ ), ( $p = .022$ ), There was

no statistically significant difference in marital satisfaction between men who did not attend prenatal care appointments and those who did, while men who attended only one prenatal care appointment expressed more marital dissatisfaction than men who attended two or more appointments. This result represents a moderate effect size (0.67). Please see Table 3.

Table 3. ANOVA results of questionnaire scores based on partner's prenatal care attendance.

Questionnaire	n	Questionnaire score M (SD)	F statistic	p
<b>PPRQ</b>				
Did not attend any visits	39	31.63 (17.37)	.425	.655
Attended 1 visit	29	35.01 (17.71)		
Attended 2+ visits	39	34.44 (15.06)		
<b>PSS</b>				
Did not attend any visits	39	9.62 (22.52)	33.96	.674
Attended 1 visit	29	9.03 (2.64)		
Attended 2+ visits	39	9.38 (22.82)		
<b>PMTQ</b>				
Did not attend any visits	39	6.67 (4.31)	2.254	.110
Attended 1 visit	29	8.55 (2.82)		
Attended 2+ visits	39	7.49 (3.38)		
<b>KMSS</b>				
Did not attend any visits	39	19.46 (1.70)	3.660	.029*
Attended 1 visit	29	18.52 (3.51)		
Attended 2+ visits	39	20.03 (1.50)		
<b>GAD-7</b>				
Did not attend any visits	39	4.77 (4.65)	1.454	.238
Attended 1 visit	29	3.69 (3.08)		
Attended 2+ visits	39	5.54 (4.98)		
<b>GDKS expressed as a raw score out of 33</b>				
Did not attend any visits	39	16.08 (4.72)	2.111	.126
Attended 1 visit	29	17.66 (4.48)		
Attended 2+ visits	39	18.13 (4.50)		
<b>GDKS expressed as a %</b>				
Did not attend any visits	39	48.73%	--	--
Attended 1 visit	29	53.52%		
Attended 2+ visits	39	54.94%		

\*  $p < 0.05$ ;

### Knowledge of Complications & Sources of Information

Participants were asked what complications of GD were discussed with them by their healthcare provider. For the men, the question was divided into options for men who were able to attend at least one prenatal care appointment and those who were not. For those men unable to attend appointments, they were asked what complications their partner shared with them. This list of complications was developed in consultation with a clinical expert. The complication most identified as being discussed was the possibility that the baby could be born weighing over nine pounds (n=104, 97.2% for women, n= 57, 53.3% for men who attended at least one prenatal care appointment, and n= 28, 26.2% for men who were unable to attend any appointments). There was a marked difference in the awareness of complications between men and women in general and also between men who could attend at least one appointment and those that could not. Please see Table 4 for details.

Table 4. Knowledge of Complications.

Complication	Women n (%)	Men who attended at least one PNC appointment n (%)	Men who did not attend PNC appointments n (%)
Requiring a caesarian section	58 (54.2)	38 (35.5)	16 (15.0)
Post-partum hemorrhage	10 (9.3)	9 (8.4)	6 (5.6)
Birth weight<9lbs	104 (97.2)	57 (53.3)	28 (26.2)
NICU admission	33 (30.8)	16 (15.0)	3 (2.8)
Maternal risk of developing Type 2 diabetes	88 (82.2)	38 (35.5)	15 (14.0)
Infant risk of developing Type 2 diabetes	62 (57.9)	29 (27.1)	11 (10.3)
Stillbirth	10 (9.3)	4 (3.7)	1 (0.9)
Difficult vaginal birth	63 (58.9)	36 (33.6)	17 (15.9)
Neonatal hypoglycemia	54 (50.5)	28 (26.2)	10 (9.3)
Other	5 (4.7)	3 (2.8)	--
Not aware of any complications	--	--	9 (8.4)

Participants were asked to identify what sources provided them with information regarding GD. The most frequently selected options for both women and men who attended at least one prenatal care appointments were physicians for women (n=97, 90.7%) and for men (n=67, 62.6%), followed by the internet (n=80, 74.8%) for women and (n=66, 61.7%) for men. Nurses were selected as a source of information by n=63 (58.9%) of women and n=49 (45.8%) of men who attended at least one prenatal care appointment. For men who did not attend prenatal care appointments, the internet was the most selected source of information (n=23, 59.0%), followed by family and friends (n=20, 51.3 %) Please see Table 5 for a detailed breakdown of the sources of information. Please note that totals may not equal n as participants may have indicated multiple sources of information.

Table 5. Sources of Information.

Information Source	Women n= 107 n (%)	Men who attended at least one PNC appointment n= 68 n (%)	Men who did not attend PNC appointments n= 39 n (%)
Physician	97 (90.7)	67 (62.6)	15 (38.5)
Nurse	63 (58.9)	49 (45.8)	12 (30.8)
Midwife	7 (6.5)	5 (7.4)	2 (5.1)
Internet	80 (74.8)	66 (61.7)	23 (59.0)
Family/friends	58 (54.2)	25 (36.8)	20 (51.3)
Newspapers/magazines	17 (15.9)	5 (7.4)	3 (7.7)
Other	15 (14.0)	5 (7.4)	2 (5.1)

### **Timing of GD Diagnosis**

It is possible that the amount of time the woman has been diagnosed may impact risk perception of the woman and her partner. Psychometric theory suggests that more novel risks are seen as more hazardous (Tversky & Kahneman, 1974). It may be that, for women diagnosed in early pregnancy, the perception of severity decreases over time, especially if the GD is well controlled. It is also possible that, for women diagnosed near the end of pregnancy, the risk appears very serious given the proximity of the diagnosis to the estimated date of delivery. In order to explore the effect of timing of diagnosis, an ANOVA was calculated to examine the associations between GA at diagnosis and final PPRQ scores for both women and men. Timing of diagnosis was divided into three groups, Group 1 diagnosed at <24 weeks (n= 20), Group 2 diagnosed at 24-28 weeks (n=41) and Group 3 diagnosed at 33+ weeks (n=43). These cut-offs were guided by applying the SOGC recommended timeframe of initial GD testing between 24-28 weeks gestation. Thus, Group 1 would have been tested earlier than the recommended gestation and may have more risk factors, Group 2 were tested within the recommended time frame and Group 3 were tested later in gestation. The total number included in the analysis was 104 women as three women had missing data for the question regarding gestational age at diagnosis. The implications of time of testing will be discussed in the Limitations section.

There were no statistically significant differences in either the women's ( $F(2, 101) = 1.65, p = .198$ ), or the men's ( $F(2, 101) = .195, p = .823$ ) mean PPRQ scores between the three groups. This data suggests that timing of diagnosis does not impact risk perceptions for either the woman or her partner. Table 6 shows the mean scores for women and men based on time of GD diagnosis.

Table 6. Mean PPRQ scores for women and men based on timing of diagnosis.

Group+	Women's mean PPRQ score (SD)	Men's mean PPRQ score (SD)
Group 1 Diagnosed at <=23 weeks gestation	34.70 (17.88)	34.95 (15.26)
Group 2 Diagnosed at 24-28 weeks gestation	42.13 (15.72)	32.12 (14.97)
Group 3 Diagnosed at 29+ weeks gestation	36.80 (17.12)	33.0 (16.57)

+ based on n = 104

It may also be possible that the timing of study participation relative to the timing of the diagnosis may impact risk perceptions. If the interval between being diagnosed with GD and participating in a study examining risk perceptions of GD is short, Protection Motivation Theory suggests that the risk may seem more severe (Maddux & Rogers, 1983). In order to test this hypothesis an ANOVA was conducted to test for associations between GD diagnosis and study participation interval and PPRQ scores in both women and men. Diagnosis/participation interval was divided into three groups, Group 1 was 0-6 weeks from diagnosis to study participation, Group 2 was 7-9 weeks and Group 3 was 10+ weeks. No significant differences in PPRQ scores were found based on time between diagnosis and study participation for either women or men. This result suggests that the interval between GD diagnosis and study participation does not impact risk perceptions for either the woman or her partner. Table 7 presents the results of the ANOVA.

Table 7. ANOVA of PPRQ scores for women and men based on interval between diagnosis and study participation.

Variable	Women				Men			
	n	PPRQ scores M (SD)	F statistic	p	n	PPRQ scores M (SD)	F statistic	p
<b># of Weeks between GD Diagnosis and Study Participation</b>								
Group 1: 0-6 weeks	40	39.37 (19.00)			40	31.83 (19.61)		
Group 2: 7-9 weeks	30	40.58 (14.59)	.317	.729	30	37.87 (13.69)	1.415	.248
Group 3: 10+ weeks	37	37.26 (17.27)			37	31.97 (14.81)		

### Research Question #1

Research question one asks, “Are there differences in perception of pregnancy risk between women with GD and their male partners?” This question seeks to explore the differences between how women and men perceive risk in pregnancy. To answer this question the paired t test was used to compare PPRQ scores of the couple.

### Summary of Dependent Variable

The dependent variable in this study was perception of pregnancy risk, measured using the PPRQ score (Heaman & Gupton, 2009). As previously described four additional questions were added to the PPRQ which formed a “Diabetes Risk” subscale. Total PPRQ was calculated by summing the score for each item and dividing by 13. Scores for the three subscales were

calculated by summing the scores for each question in the subscale and then dividing by the number of question in the subscale.

As the PPRQ was modified from its original version for use in this study, psychometric testing of the modified instrument was conducted. Although it was not feasible to pilot test the revised questionnaire, some basic psychometric analysis was conducted. In the current study, the Cronbach's alpha was 0.92 for the total scale for both women and men. In the "Risk to Self" subscale the alpha coefficient was .76 and .74 for women and men respectively. The "Risk to Baby" subscale Cronbach's alpha = .83 for women and .84 for men, while the "Diabetes Risk" subscale had alpha coefficients of .85 and .84 for women and men respectively. Overall, the modified PPRQ demonstrated good overall internal consistency reliability.

An inter-item correlation matrix was created for both women and men. Inspection of the matrices revealed that the majority of the correlations were greater than  $r = .3$ , with the strongest correlation for women being  $r = .762$  and  $r = .879$  for men.

Table 8. PPRQ inter-item correlation matrix for women's responses.

PPRQ item	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Risk for self	1.0												
2. Risk for unborn baby	.879	1.0											
3. Risk of hemorrhaging	.562	.611	1.0										
4. Risk of having a caesarean section	.407	.434	.285	1.0									
5. Risk of dying during this pregnancy	.404	.488	.584	.268	1.0								
6. Baby's risk of being born prematurely	.422	.482	.289	.297	.398	1.0							
7. Baby's risk of having a birth defect	.380	.402	.379	.254	.505	.444	1.0						
8. Baby's risk of NICU admission	.517	.557	.478	.395	.423	.536	.596	1.0					
9. Baby's risk of dying during this pregnancy	.442	.497	.611	.259	.774	.428	.535	.549	1.0				
10. Baby's risk of having a	.344	.377	.205	.518	.246	.317	.445	.519	.309	1.0			

birth weight >9 pounds													
11. Baby's risk of hypoglycemia	.424	.482	.384	.356	.467	.481	.626	.572	.504	.531	1.0		
12. Risk of developing diabetes later in life	.570	.557	.356	.494	.379	.399	.397	.485	.363	.514	.490	1.0	
13. Baby's risk of developing diabetes later in life	.504	.591	.421	.423	.508	.508	.531	.635	.515	.545	.580	.765	1.0

Table 9. PPRQ inter-item correlation matrix for men's responses.

PPRQ item	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Risk for partner	1.0												
2. Risk for unborn baby	.879	1.0											
3. Risk of hemorrhaging	.562	.611	1.0										
4. Risk of having a caesarean section	.407	.434	.285	1.0									
5. Partner's risk of dying during this pregnancy	.404	.488	.584	.268	1.0								
6. Baby's risk of being born prematurely	.422	.482	.289	.297	.398	1.0							
7. Baby's risk of having a birth defect	.380	.402	.379	.254	.505	.444	1.0						
8. Baby's risk of NICU admission	.517	.557	.478	.395	.423	.536	.596	1.0					
9. Baby's risk of dying during this pregnancy	.442	.497	.611	.259	.774	.428	.535	.549	1.0				
10. Baby's risk of having a birth weight >9 pounds	.344	.377	.205	.518	.246	.317	.445	.519	.309	1.0			
11. Baby's risk of hypoglycemia	.424	.482	.384	.356	.467	.481	.626	.572	.504	.531	1.0		
12. Partner's risk of developing diabetes later in life	.570	.557	.356	.494	.379	.399	.397	.485	.363	.514	.490	1.0	
13. Baby's risk of developing diabetes later in life	.504	.591	.421	.423	.508	.508	.531	.635	.515	.545	.580	.765	1.0

### PPRQ Scores

Table 10 provides means and standard deviations of the scores for women and men for each of the 13 questions and Table 11 provides the means and standard deviations for the

subscale scores. This section will discuss results for women and men on the scale as a whole and for each of the subscales.

### **PPRQ Scores for Women.**

The women in this study had a mean PPRQ score of 39.0 (SD 17.3) with a maximum score of 80 and a minimum score of one. This is a broad range of scores and indicates that women in this sample had very divergent perceptions of pregnancy risk. In the four-item “Risk to Self” subscale the mean score was 34.3 (SD 16.3), with a minimum score of zero and a maximum score of 80. The “Risk to Baby” subscale contains five items and the mean score was 30.1 (SD 17.6). The scores in this subscale ranged between one and 79. In the four-item “Risk of Diabetes” subscale, the mean score was 50.8 (SD 21.8), with scores ranging from zero to 93. These mean scores indicate that women in this sample felt the highest risk to themselves and their infants was related to diabetes.

### **PPRQ Scores for Men.**

Male participants had significantly lower overall PPRQ scores for the total scale and all three subscales compared to their female partners. The mean PPRQ score for men was 33.6 (SD 16.6) and scores ranged from zero to 70, once again demonstrating diversity in risk perceptions. The mean score on the “Risk to Partner” subscale was 31.7 (SD 14.2). The scores in this subscale ranged from zero to 63. Please note that the phrasing on the questions from the “Risk to Self” subscale was altered to reflect the men’s perceptions of the risks faced by their partner. In the “Risk to Baby” subscale the questions were worded the same as those for the women. The mean score in this subscale was 26.1 (SD 17.2), and scores ranged from one to 79. In the “Risk of Diabetes” subscale the men’s scores were also higher than that of the total score

and the scores for the other subscales. The mean score was 42.1 (SD 21.5), with the highest score being 80 and the lowest score being one. Once again, these scores indicate that, for the men in this study, they perceived the greatest risk to their partners and infants to come from diabetes.

Table 10. Comparison of scores on each item in the PPRQ using the paired t test.

PPRQ Item	Women's scores M (SD)	Men's scores M (SD)	M difference (SD)	Paired t	Sig
Risk for self/ partner	48.7 (23.4)	41.8 (23.1)	6.9 (26.1)	2.7	.007**
Risk for unborn baby	49.2 (23.7)	43.0 (22.6)	6.2 (27.5)	2.3	.022*
Risk of hemorrhaging	34.6 (22.6)^	32.8 (21.3)	1.8 (26.1)	0.7	.472
Risk of having a caesarean section	51.8 (28.8)	48.9 (25.3)	2.9 (28.7)	1.1	.291
Risk of dying during this pregnancy	18.4 (20.6)	14.0 (17.4)	4.4 (23.9)	1.9	.059
Baby's risk of being born prematurely	27.8 (26.3)	25.7 (26.9)	2.0 (29.2)	0.7	.477
Baby's risk of having a birth defect	25.6 (22.6)	19.5 (19.6)	6.1 (24.6)	2.6	.012*
Baby's risk of NICU admission	30.7 (22.1)	26.8 (21.5)	-4.4 (27.7)	-1.5	.137
Baby's risk of dying during this pregnancy	17.1 (19.3)	15.6 (20.5)	-1.5 (22.5)	-0.7	.494
Baby's risk of having a birth weight >9 pounds	52.2 (29.6)	43.1 (29.2)	-9.1 (31.9)	-3.0	.004**
Baby's risk of hypoglycemia	45.3 (24.1)	34.2 (24.7)	-10.8 (28.3)	-3.9	<.0001***
Risk of developing diabetes later in life (for self/partner)	58.2 (24.7)	50.2 (26.5)	-8.0 (27.2)	-3.1	.003*
Baby's risk of developing diabetes later in life	47.3 (26.5)	40.6 (25.1)	-6.7 (28.7)	-2.4	.018*

\* p< 0.05; \*\* p<0.01;\*\*\* p<0.001

^ based on 106

Table 11. Comparison of PPRQ Total and Subscale Scores Using the Paired t Test.

	Women's scores M (SD)	Men's scores M (SD)	M difference M (SD)	t	Sig
PPRQ total	39.0 (17.3)	33.6 (16.6)	5.4 (17.7)	3.2	.002**
Risk to Self/Partner	34.3 (16.3)	31.7 (14.2)	2.6 (3.3)	8.3	<.0001***
Risk to Baby	30.1 (17.6)	26.1 (17.2)	3.9 (19.5)	2.1	.040*
Diabetes Risk	50.8 (21.8)	42.1 (21.5)	8.7 (22.4)	4.0	<.0001***

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

In summary for research question #1, this data demonstrates that women had significantly higher perception of pregnancy risk scores on seven of the 13 PPRQ items as compared to their male partners. Scores were significantly higher for women in the questions assessing perception of risk to self and to infant, the risk of birth defect, birth weight >9lbs, neonatal hypoglycemia and the risk for mother and infant to develop diabetes later in life compared to her partner. Women's scores on all three of the subscales were significantly higher than that of her partner. The most significant differences were found in the "Risk of Diabetes" and the "Risk to Self" subscales.

### Research Question #2

Research question #2 asks, "What are the gender-specific predictors of perception of pregnancy risk for pregnant women with GD and their male partners?" This section will present the results of the analysis for each significant variable with the results for women and men discussed separately.

**Univariate analysis results for women.**

Of the 17 variables studied using univariate analysis, nine were found to be significantly associated with perception of pregnancy risk for the women in the study. The independent variables which were significantly associated with PPRQ scores for women were: age, race/ethnicity, BMI, Winnipeg residence, being born in Canada, PSS scores, KMSS scores, GAD7 scores, and the representativeness heuristic. The following variables were not found to be associated with perception of pregnancy risk for women; self-efficacy (as operationalized by the PMTQ), risk familiarity (as operationalized by the GDKs), level of education, number of children, income level, availability heuristic and being prescribed insulin. The following section discusses each significant variable.

**Age.** Pearson's correlation examined the associations between age and total PPRQ scores. A small negative correlation was found ( $r = -.29$   $p = .003$ ), meaning that younger women tended to have a higher perception of pregnancy risk.

**Race/Ethnicity.** The race/ethnicity variable was re-coded into 3 groups, Group 1 - Caucasian, Group 2 - First Nations/Métis/Inuit, and Group 3 - Other. There was a statistically significant difference at the  $p < .05$  level in total PPRQ between two of the three groups:  $F(2, 104) = 8.9$ ,  $p < .001$ . Post-hoc comparisons using the Tukey Honestly Significantly Difference (HSD) found the mean score for Group 3 - Other ( $M = 32.34$ ,  $SD = 16.91$ ) was significantly different from Group 1 - Caucasian ( $M = 40.94$ ,  $SD = 14.79$ ) ( $p = .040$ ), and from Group 2 - First Nations/Métis/Inuit ( $M = 49.79$ ,  $SD = 16.69$ ) ( $p < .001$ ), Groups 1 and 2 did not differ significantly in their PPRQ scores. This finding demonstrates that women who are Caucasian or First Nations/Métis/Inuit have similar perceptions of pregnancy risk and that these women perceive a higher degree of pregnancy related risks than women from other ethnic backgrounds.

**BMI.** A moderate positive correlation was found between total PPRQ score and BMI ( $r=.33$ ,  $p=.001$ ). This relationship indicates that as a woman's BMI increased, so did her perception of pregnancy risk.

**Area of residence.** A moderate effect size (.86) was observed between women who resided in Winnipeg and those who did not. There was a significant difference in the final PPRQ scores of women residing in the city of Winnipeg ( $M = 35.91$ ,  $SD 15.21$ ) and those who live outside of the city ( $M = 47.25$ ,  $SD 19.88$ ). Women who live outside Winnipeg have significantly higher perception of pregnancy risk as compared to those who live in other communities:  $t(105) = -3.15$ ,  $p = .002$ .

**Born in Canada.** There was a significant difference in the total PPRQ scores between women born in Canada ( $M = 42.65$ ,  $SD 15.72$ ) and women not born in Canada ( $M = 32.32$ ,  $SD 18.15$ ). Women who were born in Canada had significantly higher perceptions of pregnancy risk  $t(105) = 3.08$ ,  $p = .003$  (two tailed). This difference represents a moderate effect size (.82).

**Perceived Stress Scale (PSS).** A moderate positive correlation was found between stress scores on the PSS and final scores on the PPRQ ( $r=.42$ ,  $p<.0001$ ). As the woman's perceived stress increased, so did her perception of pregnancy risk.

**Kansas Marital Satisfaction Survey (KMSS).** Marital satisfaction, as measured by the KMSS, was also significantly associated with total PPRQ scores. There was a small negative correlation detected ( $r=-.20$   $p = .038$ ). Women with greater degrees of marital dissatisfaction had higher PPRQ scores. This indicates that as marital satisfaction decreased, perception of pregnancy risk increased.

**Generalized Anxiety Disorder Questionnaire (GAD-7).** There was a moderate positive correlation ( $r=.35$   $p = <.001$ ) between PPRQ scores and anxiety as measured by the GAD-7. This finding indicates that as anxiety increased so did the perception of pregnancy risk.

**Representativeness heuristic.** Women were divided into three groups based on how alike or dissimilar they felt they and their infants were to typical pregnant woman and the typical infant (Group 1: about the same; Group 2: low similarity; Group 3: high similarity). A moderate effect size (.10) was observed between these groups. There was a statistically significant difference at the  $p < .05$  level in total PPRQ scores between two of the three groups ( $F = 3.808$ ,  $p = .027$ ). Post-hoc comparisons using the Tukey HSD indicated that the mean score for Group 3 ( $M = 50.0$ ,  $SD (17.33)$ ) was significantly different from Group 1 ( $M = 38.6$ ,  $SD (18.55)$ ) and Group 2 ( $M = 37.5$ ,  $SD (16.64)$ ). The mean PPRQ scores for Groups 1 and 2 were not significantly different. This result indicates that women who felt that they and their infant were highly similar to a typical pregnant woman and infant had higher pregnancy related risk perceptions, while women who felt they and their infants has about the same or less similarity to the typical pregnant woman and infant.

In summary, a total of nine of the 17 selected predictor variables were found to be univariately predictive of women's perception of pregnancy risk as measured by their PPRQ scores and were entered into the multivariate model. Both positive and negative correlations were detected. Tables 12-14 summarize the results of the univariate analysis for women according to the statistical test used.

Table 12. Pearson *r* correlation matrix of continuous variables for women.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PPRQ total score	--											
2. PSS total score	.421**											
3. PMTQ total score	.174	.324**										
4. KMSS total score	-.201*	-.312**	-.011									
5. GAD7 total score	.349**	.579**	.326**	-.270**								
6. GDKS total score	.163	.032	.270**	-.034	.026							
7. Age	-.285**	-.107	.046	.083	-.085	.115						
8. # of years of education¥	.035	-.073	.017	-.109	-.176	.259**	.142					
9. BMI	.329**	.150	.085	.064	.160	.215*	-.108	-.177				
10. # of years in relationship	-.082	-.128	.182	.294**	-.097	.224*	.510**	-.036	.069			
11. # of children	.051	-.141	-.176	.068	-.119	-.079	-.259**	.181	-.123	-.210*		
12. Availability heuristic	.187	.127	.109	.005	.153	-.010	-.157	-.191	.006	-.073	-.189	--

\* Correlation is significant at the 0.05 level; \*\* Correlation is significant at the 0.01 level.

¥ based on n = 100

Table 13. ANOVA results of the univariate analysis of the associations of categorical independent variables and PPRQ scores for women.

Variable	n	PPRQ scores M (SD)	F statistic	p
Education~				
up to completed high school	13	36.5 (15.22)		
incomplete vocational/university	14	39.5 (21.61)	.172	.842
complete vocational/university	78	39.5 (17.07)		

Income				
< \$39,999	29	38.7 (17.86)	.007	.931
≥ \$40,000	78	39.1 (17.64)		
Race/Ethnicity				
Caucasian	40	41.0 (14.79)	8.932	<.0001***
First Nation/Métis/Inuit	21	49.8 (16.70)		
other	46	32.34 (16.91)		
Number of children				
no children	51	42.2 (18.88)	1.778	.174
1-2 children	46	35.7 (15.10)		
3+ children	10	37.7 (16.54)		
Representative heuristic				
about the same	17	38.6 (18.55)	3.808	.027*
low similarity	79	37.5 (16.64)		
high similarity	11	50.0 (17.33)		

\*  $p < 0.05$ ; \*\*\*  $p < 0.001$ : ~ based on  $n = 105$

Table 14. T test results of the univariate analysis of dichotomous independent variables and PPRQ scores for women.

Variable	PPRQ score M (SD)	df	t	p
Prescribed insulin? ^				
Yes	41.02 (17.57)	104	1.127	.263
No	37.21 (17.05)			
Reside in Winnipeg?				
Yes	35.91 (15.21)	105	-3.146	.002*
No	47.25 (19.88)			
Born in Canada?				
Yes	42.65 (15.72)	105	3.077	.003*
No	32.32 (18.15)			

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; ^ based on  $n = 106$

Before proceeding to the multivariate linear regression analysis, the correlation matrix of the independent variables for women (Table 8) was examined for evidence of multicollinearity. The highest correlation was found between PSS (stress) scores and scores on the GAD -7 (anxiety). The correlation between these two variables was .579, which is below the generally accepted cut-off point of  $p = \geq 0.80$  (Farrar & Glauber, 1967). No correlations were found to be suggestive of problematic collinearity between variables.

### **Multivariate Linear Regression Analysis Results for Women**

The independent variables were entered into the equation first as a block of demographic variables consisting of age income, race/ethnicity and being born in Canada. Although there were no correlations higher than  $p = \geq 0.80$ , once the variables were entered into the regression model there was evidence of collinearity between the variables Winnipeg residence and born in Canada. When both variables were included in the model the significance of other variables changed. The variance inflation factor (VIF) for the variable born in Canada was 3.8. Although this does not exceed the recommended cut-off point of four, when the variable was included in the model, other variables became insignificant, causing instability in the model, and therefore it was removed. The variable for Winnipeg residence contributed more to the model and was retained in the demographic block. Next, each significant variable was added one at a time using a data driven, rather than a computer automated approach. As each variable was added, the effect of the variable on the model was assessed by examining the impact on regression coefficients, changes in confidence intervals and significance levels. Adjustments were made for confounding effects and for collinearity between variables.

There was also evidence of collinearity between the anxiety (GAD-7) variable and the stress variable (PSS). These variables were moderately correlated ( $p = .579$ ). The VIF for the

anxiety variable was 3.8, again not meeting the cut-off point of four, but creating instability in the model, and therefore it was removed. Each of the variables was tested to determine which contributed more to the explanatory power of the model. Recall that the PSS scores had a slightly stronger positive correlation with PPRQ scores ( $r=.42, p<.0001$ ), as compared to GAD-7 scores ( $r=.35, p = <.001$ ). PSS was found to be a stronger predictor of PPRQ scores and thus it was retained in the model. Variables were then removed from the equation one at a time beginning with the variables that were the most non-significant ( $p < 0.1$ ). None of the effect estimates changed more than 20% when these predictors were removed from the model.

Lastly, selected non-significant independent variables were added to the equation. These non-significant variables were selected based on their importance according to the theoretical and conceptual frameworks. The non-significant variables selected were GDKS scores (operationalizes the psychometric concept of risk familiarity), PMTQ scores (operationalises the Protection Motivation Theory element of self-efficacy) and the availability heuristic which was operationalized as the number of other women with GD the participant has known. Only the availability heuristic had any effect on the effect sizes and significance levels of the equation and thus was included in the final model. The results of the parsimonious model are presented in Table 15.

The results of this model revealed that two variables were significant predictors of perception of pregnancy risk for women. Scores on the PSS were the strongest predictor of perception of pregnancy risk ( $\beta= 0.32, p = .001$ ). The next strongest predictor was BMI, with a standardized beta of 0.19 and  $p = .028$ . These results indicate that for women experiencing an index diagnosis of GD, perception of pregnancy risk is partially a function of their level of perceived stress and their BMI. ( $R^2 = .36$ ).

Table 15. Multiple regression analysis with women's PPRQ scores as the dependent variable.

Variable	Unstandardized Coefficients			$\beta$	t	p
	B	SE B				
Age						
18-25 years	6.91	7.08	.15	1.88	.063	
26-35 years	--	--	--	--	--	
36+ years	8.42	8.37	.19	1.312	.193	
Income						
low income 0-\$39,999	3.45	3.52	0.09	0.98	.329	
high income $\geq$ \$40,000 <sup>§</sup>	--	--	--	--	--	
Race/Ethnicity						
Caucasian <sup>§</sup>	--	--	--	--	--	
First Nation/Métis/Inuit	4.78	4.61	0.11	1.04	.302	
Other	-6.42	4.76	-0.18	-1.35	.181	
Reside in Winnipeg?						
Yes <sup>§</sup>	-.691	4.79	-0.02	-0.14	.885	
No	--	--	--	--	--	
BMI	.430	0.19	0.19	2.23	.028*	
PSS score	2.18	0.63	0.32	3.45	.001*	
KMSS score	-.73	0.51	-0.13	-1.44	.154	
Availability heuristic	1.20	1.01	0.10	1.19	.238	

\*  $p < 0.05$ ; <sup>§</sup> Reference group;

Note: Note:  $R^2 = .36$ ; Variables entered in the following order; Demographic block (age, income, race/ethnicity, Winnipeg residence), PSS, BMI, KMSS, Availability heuristic.

### Univariate analysis results for men.

Of the 17 predictor variables included in the univariate analysis, nine variables were found to be significantly predictive of perception of pregnancy risk in men. The independent variables which were significantly associated with PPRQ scores for men were: race/ethnicity, education, their partner's BMI, Winnipeg residence, being born in Canada, PSS scores, PMTQ scores, GDKS scores, and GAD7 scores. The following variables were not found to be associated with perception of pregnancy risk for men: age, marital satisfaction (as operationalized by the KMSS), number of children, income level,

availability and representative heuristics and their partner being prescribed insulin. The following section discusses each significant variable.

***Race/Ethnicity.*** The race/ethnicity variable was collapsed into three groups, Group 1- Caucasian, Group 2 - First Nations/Métis/Inuit, and Group 3 –Other. There was a statistically significant difference found at the  $p < .05$  level in total PPRQ between two of the three groups:  $F(2, 104) = 5.7, p = .005$ . Post-hoc comparisons using HSD found the mean score for Group 3 – Other ( $M = 27.89, SD = 16.81$ ) was significantly different from Group 1 – Caucasian ( $M = 35.90, SD = 14.72$ ) ( $p = .048$ ), and from Group 2 - First Nations/Métis/Inuit ( $M = 41.95, SD = 16.42$ ) ( $p = .007$ ), Groups 1 and 2 did not differ significantly in their PPRQ scores. This finding demonstrates that men who are Caucasian or First Nations/Métis/Inuit have similar perceptions of pregnancy risk and that these men perceive a higher degree of pregnancy related risk perceptions than men from other ethnic backgrounds.

***Education.*** Recall that due to extensive missing data in the question on number of years of education, this variable was treated as categorical in the univariate analysis. The variable was collapsed into three groups; Group 1 – Completed Vocational/University, Group 2 - Incomplete Vocational/University, and Group 3 – Up to Completed High School. There was a statistically significant difference found:  $F(2, 103) = 6.2, p = .003$ . Post-hoc comparisons using HSD found significant differences in total PPRQ between Group 3 ( $M = 43.17, SD = 12.10$ ) and Group 1 ( $M = 32.24, SD = 16.00$ ) ( $p = 0.17$ ) and Group 2 ( $M = 26.41, SD = 18.83$ ) ( $p = .003$ ). Groups 1 and 2 did not differ significantly. Men with incomplete vocational or university educations has the lowest perception of pregnancy risk. Men with up to a high school education had the highest pregnancy risk perceptions.

**BMI.** A moderate positive correlation was detected between men's total PPRQ score and their partner's BMI ( $r=.29$   $p=.002$ ). This finding suggests that as their partner's BMI increased, so did the men's perception of pregnancy risk scores.

**Area of residence.** For men residing in the city of Winnipeg ( $M = 31.54$ ,  $SD 16.94$ ) and men residing outside of the city of Winnipeg ( $M = 39.59$ ,  $SD 14.04$ ), there was a significant difference in the total PPRQ scores. Men who resided outside of the city of Winnipeg had significantly higher perceptions of pregnancy risk scores:  $t(105) = -2.22$ ,  $p = .028$ .

**Born in Canada.** A significant difference in PPRQ scores was observed between men born in Canada ( $M = 37.92$ ,  $SD 15.68$ ) and men not born in Canada ( $M = 26.28$ ,  $SD 15.59$ ). There was also a significant difference in the total PPRQ scores. Men who were born in Canada had significantly higher perception of pregnancy risk scores:  $t(105) = 3.72$ ,  $p = <.0001$ .

**Perceived Stress Scale (PSS).** A small positive correlation was found between stress scores on the PSS and final scores on the PPRQ ( $r=.20$ ,  $p=.043$ ). As the men's perceived stress increased, so did perception of pregnancy risk scores.

**Protection Motivation Theory questionnaire (PMTQ).** A small positive correlation was found between PPRQ scores and scores on the PMTQ ( $r=.22$   $p=.025$ ). Recall that higher scores indicated lower levels of efficacy. As men's confidence in their partner's ability to manage their GD decreased, their pregnancy risk perception scores increased slightly.

**Gestational Diabetes Knowledge Scale (GDKS).** A moderate positive correlation was found between PPRQ and risk familiarity as measured by GDKS scores ( $r = .525$   $p = .004$ ). This indicates that as GD knowledge increased in men, their scores for pregnancy perception of risk also increased.

**Generalized Anxiety Disorder Questionnaire (GAD-7).** There was a small positive correlation ( $r = .28, p = .004$ ) between total PPRQ scores and anxiety as measured by the GAD-7. This finding indicates that as men's anxiety increased so did their perception of pregnancy risk scores.

In summary for the men's univariate analysis, a total of nine of the 17 selected predictor variables were found to be univariately predictive of perception of pregnancy risk, measured by PPRQ scores and were entered into the multivariate model. Tables 16-18 summarize the results of the univariate analysis according to the statistical test used.

Table 16. Pearson  $r$  correlational matrix of continuous variables for men.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PPRQ total score	--											
2. PSS total score	.196*	--										
3. PMTQ total score	.217*	.010	--									
4. KMSS total score	-.067	-.065	-.120	--								
5. GAD7 total score	.275**	.501**	.137	-.028	--							
6. GDKS total score	.251**	.525**	.155	-.018	.078	--						
7. Age	-.150	-.181	.183	-.023	-.099	.117	--					
8. # of years of education <sup>£</sup>	-.188	-.112	.079	.137	-.113	.354**	.248*	--				
9. BMI	.291**	.318**	.029	-.069	.310**	-.030	-.035	-.223*	--			
10. # of years in relationship	-.003	-.138	-.051	.147	-.081	.155	.307**	.023	.064	--		
11. # of children	-.155	-.074	-.217*	.041	-.028	.141	.247*	.143	-.147	-.388**	--	
12. Availability heuristic	.118	.175	.048	-.172	.036	.019	-.069	.028	.007	-.107	.172	--

\* Correlation is significant at the 0.05 level; \*\* Correlation is significant at the 0.01 level. £ based on  $n = 95$

Table 17. ANOVA results of the univariate analysis of the associations of categorical independent variables and PPRQ scores for men.

Variable	n	PPRQ score M (SD)	F statistic	p
<b>Education+</b>				
up to completed high school	22	43.2 (12.10)	6.208	.003*
incomplete vocational/university	19	26.4 (18.83)		
complete vocational/university	65	32.2 (16.00)		
<b>Income</b>				
<\$10,000-\$39,999	28	34.6 (19.13)	.133	.070
≥ \$40, 000	78	33.2 (19.13)		
<b>Race/Ethnicity<sup>^</sup></b>				
Caucasian	46	35.9 (14.73)	5.674	.005*
First Nation/Métis/Inuit	17	42.0 (16.41)		
other	43	27.89 (16.81)		
<b># of children</b>				
no children	50	34.6 (19.13)	1.643	.198
1-2 children	46	30.5 (16.81)		
3+ children	11	35.8 (14.21)		
<b>Representative heuristic</b>				
about the same	25	33.0 (12.94)	.101	.904
low similarity	76	33.6 (17.53)		
high similarity	6	35.7 (20.00)		

\* p&lt;0.05

<sup>^</sup> based on n = 106; + based on n = 104

Table 18. T test results of the univariate analysis of dichotomous independent variables and PPRQ scores for men.

Variable	PPRQ score M (SD)	df	t	p
Prescribed Insulin? ^				
Yes	34.58 (15.76)	104	.439	.662
No	33.15 (17.18)			
Reside in Winnipeg?				
Yes	31.54 (16.94)	105	-2.223	.028*
No	39.59 (14.04)			
Born in Canada?				
Yes	37.92 (15.68)	105	3.722	<0.001**
No	26.28 (15.59)			

\*  $p < 0.05$ ; \*\*  $p < 0.001$ ; ^ based on  $n = 106$

Once again, as with the univariate analysis for women, the correlation matrix of the independent variables for men (Table 9) was examined for evidence of multicollinearity. The highest correlation was between PSS and GAD-7 scores, which were moderately correlated at  $r = .506$ . This is beneath the cut-off point of  $p = \geq 0.80$ , thus, no correlations were found to be suggestive of collinearity and the analysis could proceed to the multivariate regression.

### Multivariate Analysis Results for Men

The multivariate analysis for men was conducted using the same procedure as was used in the women's analysis. The first block contained the same demographic characteristics of income and race/ethnicity as was used in the women's analysis. A confounding effect was again observed between the variable of Winnipeg residence and born in Canada. The VIF for born in Canada was 4.0 and this variable was removed from the model. The variable describing Winnipeg residence was a more significant predictor and was included in the final model. For the men's model, education as a categorical variable was also added to the demographic block as it was a significant univariate predictor of perception of pregnancy risk scores for men.

There was again evidence of collinearity between the anxiety (GAD-7) variable and the stress variable (PSS). These variables were moderately correlated ( $p = .506$ ). The VIF for the stress variable was 3.9, again not meeting the cut-off point of four, but creating instability in the model, and therefore it was removed. Each of the variables was tested to determine which contributed more to the explanatory power of the model. Recall that the GAD-7 scores had a slightly stronger positive correlation with men's PPRQ scores ( $r = .28, p = .004$ ), compared to PSS scores ( $r = .21, p = .043$ ). In this analysis GAD-7 scores were the stronger predictor of PPRQ scores and were retained in the model.

The same procedure which was used in the women's analysis was followed for adding and subtracting variables in the equation. None of the other variables displayed evidence of collinearity and the total model performed as well as more parsimonious models. Thus, the total model (excluding born in Canada and PSS scores) was maintained.

The non-significant univariate variables added to the men's regression equation were, marital satisfaction as measured by the KMSS and the two heuristics of availability and representativeness. Of these variables, only availability added to the predictive power of the model and was included in the final model. The results of the parsimonious model are presented in Table 19.

This model demonstrates that five variables were significantly predictive of perception of pregnancy risk in men. The strongest independently significant predictor was level of education. Although it would have been preferable to use years of education, due to missing data, education was treated as a categorical variable. In part, increased education had a negative association with risk perception scores. Men with up to a high school education had the highest

risk perception scores in the univariate analysis. Both of the higher categories of education were associated with decreased PPRQ scores, however, only one category, (incomplete vocation/university) was significant when compared to men with up to completed high school. Education had a standardized beta weight of -0.31 ( $p = .004$ ). The second strongest predictor was the psychometric property of risk familiarity operationalized by the GD Knowledge Scale (GDKS). The GDKS had a standardized beta weight of 0.23. ( $p = .018$ ). The next predictor was also a psychometric property - dread, represented by anxiety in the conceptual model and operationalized using the GAD-7. This predictor had a standardized beta weight of 0.21 ( $p = .020$ ). The next predictor variable was Winnipeg residence. This variable had a negative standardized beta weight of -0.18 and  $p = .044$  meaning that men who resided in Winnipeg had lower PPRQ scores than men living in other communities. The final predictor was the Protection Motivation variable of self-efficacy, as operationalized by the PMTQ. This variable had a standardized beta weight of 0.17 ( $p = .045$ ).

This data indicates that for men whose partners are experiencing GD for the first time, risk perception is related to a number of factors. These factors include their level of education, their GD knowledge, their degree of anxiety, their area of residence, and how confident they are in their partner's ability to manage GD. Overall, the model explained 30% of the variance in men's perception of pregnancy risk ( $R^2 = .30$ ).

Table 19. Multiple regression analysis with men's PPRQ scores as the dependent variable.

Variable	Unstandardized Coefficients		$\beta$	t	p
	B	SE B			
Income					
high income $\geq$ \$40,000 <sup>s</sup>	--	--	--	--	--
low income 0-\$39,999	-0.37	3.57	-0.01	-0.10	.917
Education					

up to completed high school <sup>§</sup>	--	--	--	--	--
incomplete vocational/university complete	-13.51	4.60	-0.31	-2.94	.004*
vocational/university complete	-6.15	4.20	-0.18	-1.50	.137
Race/Ethnicity					
Caucasian <sup>§</sup>	--	--	--	--	--
First Nation/Métis/Inuit	4.26	4.90	0.09	0.87	.387
Other	-5.07	3.30	-0.15	-1.54	.128
Reside in Winnipeg?					
Yes <sup>§</sup>	-6.93	3.39	-0.18	-2.04	.044*
No	--	--	--	--	--
Partner's BMI	0.16	0.18	0.08	0.88	.383
PMTQ score	0.78	0.38	0.17	2.03	.045*
GDKS score	0.83	0.34	0.23	2.41	.018*
GAD-7 score	0.80	0.34	0.21	2.37	.020*
Availability heuristic	0.94	2.60	0.03	0.36	.720

\*  $p < 0.05$ ; + based on  $n = 106$ ; <sup>§</sup>Reference group

Note:  $R^2 = .30$ ; Variables entered in the following order; Demographic block (income, education, race/ethnicity, Winnipeg residence), BMI, PMTQ, GDKS, GAD-7, & availability.

In summary for research question #2, there were unique gender specific predictors of perception of pregnancy risk for women with GD and their male partners. Women's perceptions of pregnancy risk were predicted by their level of perceived stress and their BMI. For their male partners, risk perception was predicted by their levels of education, GD knowledge and anxiety, their area of residence, and the extent to which they believed their partners were capable of managing GD. Income and race/ethnicity were not predictive of risk perception for either the women or the men after adjusting for other variables in the final regression models.

### Research Question #3

In order to answer research question #3, "What demographic and psychosocial characteristics of the dyad are associated with discordance in perceived risk scores?", both a logistic and a linear regression were conducted. Initially, it was felt that a logistic regression was

the most appropriate analysis since the research question sought to identify predictors of discordance in PPRQ scores. Accordingly, the dependent variable for the logistic regression was dichotomized into concordant and discordant scores. Discordance was defined as scores falling into the top quartile, which created a cut-off of a difference in scores between the woman and her partner of  $\geq 21$  points. This analysis did not yield significant results. Consultation with a statistician was undertaken and it was determined that the use of arbitrary cut-off points for the dependent variable, rather than cut-offs established by previous studies, was “obliterating significance” (B. Dufault, personal communication, November 30, 2016). The statistician recommended the use of linear regression for this analysis. The results of the linear regression are presented here. The results of the logistic regression can be found in Appendix P.

As explained in the methods section, the dependent variable for this regression was the difference between the couple’s PPRQ scores, which was calculated by subtracting the woman’s score from the man’s (see page 89). In examining this variable, it was found that the distribution violated the assumption of normalcy. The distribution of difference scores was skewed to the left with a kurtosis of .623. This non-normalcy required correction as a normal distribution is an assumption of linear regression (Tabachnick & Fidell, 2006). In order to transform this variable a log correction was conducted. The distribution of differences scores contained values equal to 0 and a log transformation cannot be performed when a distribution contains a zero (Tabachnick & Fidell, 2006). The distribution was modified by adding one to each value. The log transformation was then performed. Figures 3 and 4 show the PPRQ difference distribution before and after the transformation.

Figure 3. PPRQ difference distribution.

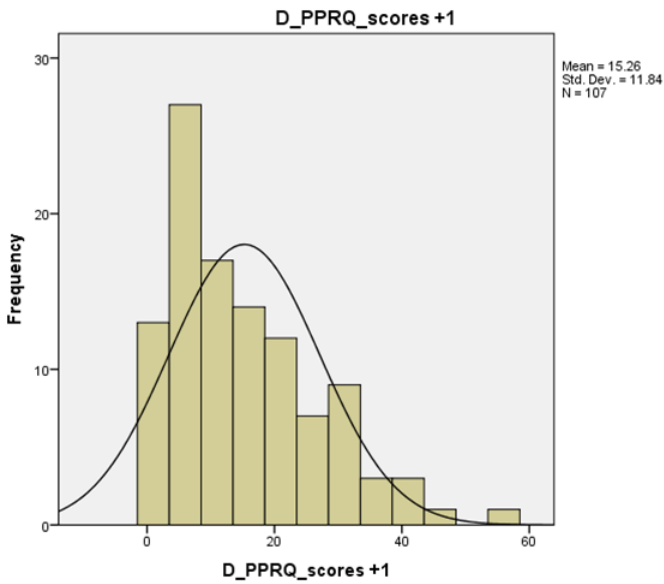
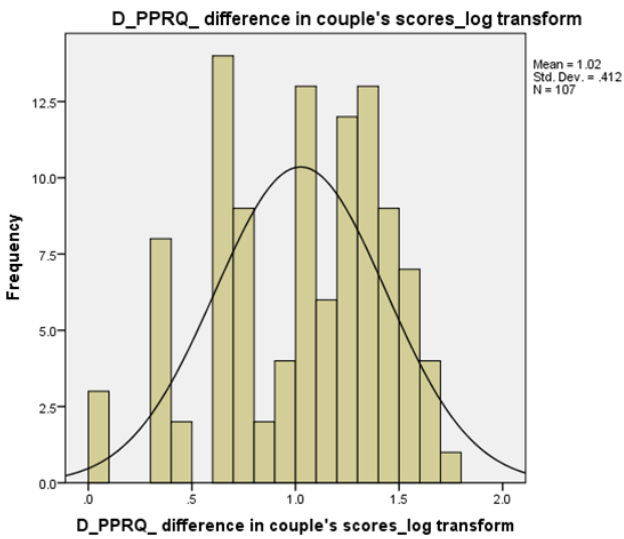


Figure 4. PPRQ difference distribution after log transformation.



Once the log transformation was conducted several of the independent variables also required transformation so as to be representative of the dyad, rather than the individual participant. The following section will describe the treatment of the independent variables.

### **Demographic variables.**

In order to perform a linear regression for the couple, some of the independent variables to be included in the univariate analysis were first transformed from two responses/scores for each member of the dyad into a single composite score which represented the couple.

The questions on Winnipeg residence and insulin use had “yes” or “no” responses and no transformation was required. For the question, “Were you born in Canada,” this variable was dichotomized into responses where 0 = “both born in Canada”, and 1 = “one or both not born in Canada”. The BMI question was only asked of women and was left as a continuous variable. For the question “*How many years have you been in a relationship with your current partner?*” couples were divided into two groups, with 0= 0-5 years and 1 = 6+ years. In the question “*How many children do you have?*” 0 = “the couple has at least one child” and 1 = “does not have children”. For the question on race/ethnicity, couples were divided into two groups where 0= two members shared the same ethnic background or 1= the couple was from different backgrounds. Couples were divided into 0 = high income ( $\geq$ \$40,000) and 1=low income ( $\leq$  \$39,999). As the education variable had extensive missing data when asked as number of years of education, educational categories were used. The couples were dichotomized into 0 = those in the same category of education and 1 = those whose educational category was different. Finally, for the age variable, the division was based on the degree of difference in their ages, with 0 = 0-5 year’s difference and 1 = 6+ years different. As a note: the woman’s pre-pregnancy BMI did not require any transformation and was treated as a continuous variable.

**Questionnaires.**

In transforming four of the five questionnaires (PSS, PMTQ, KMSS and the GAD-7), the numerical scores for the woman and the partner were converted into a single composite score using the following mathematical operation. For each item on each questionnaire, the individual scores were summed and then divided by two, yielding the mean score for that item for the couple. These mean scores were then summed creating the composite score for that questionnaire. Scores on the questionnaires were treated as continuous variables.

**Heuristic variables.**

The two heuristic variables also were transformed. In the case of the availability heuristic -*“How many other women have you known with a diagnosis of gestational diabetes?”*, the number of pregnant women known by each member of the couple was added together to create a number representing the total number of pregnant women with a GD diagnosis known by the couple. The representativeness heuristic was assessed using three Likert scale responses and examines the degree to which the woman and her partner feel she and the infant were likely to experience complications of GD as compared to the “average” pregnant woman and infant. The score was calculated using the same formula as was used in the questionnaires. Higher scores indicated a greater degree of perceived similarity. Both heuristic variables were treated as a continuous variable.

This section will discuss the results of the univariate analysis using the log transformed variable of differences in PPRQ scores as the dependent variable. The differences in PPRQ scores ranged from a minimum of zero to a maximum of 55, with a mean difference of 14.16 (SD 11.86).

**Univariate Analysis Results for Differences in PPRQ Scores.**

The same 17 variables used in the analysis for Question #2 were used in Question #3. Continuous variables were compared using Pearson's  $r$ , and categorical variables were compared using the paired t-test.

Table 20. Pearson  $r$  correlational matrix of continuous variables for differences in PPRQ scores.

Variable	1	2	3	4	5	6	7	8
1. PPRQ score difference	--							
2. PSS total score for couple	.092	--						
3. PMTQ total score for couple	.055	-1.91*	--					
4. GAD7 total score for couple	.097	.510**	.255**	--				
5. KMSS total score for couple	-.104	-.215*	-.223*	-.252**	--			
6. BMI	.070	-.297**	.082	.296**	.011	--		
7. Availability heuristic	.157	.144	.108	.058	-.049	-.070	--	
8. Representative heuristic	.069	.174	.190*	.261**	-.106	.802	.029	--

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

The strongest correlation found was between the couple's PSS scores, measuring stress and the couple's GAD-7 scores measuring anxiety. These variables were positively correlated at .510,  $p < .001$ .

The remaining categorical independent variables were assessed for significant differences in mean difference in PPRQ scores using the independent t-test. The only significant variable was area of residence, where couples who reside outside of the city of Winnipeg were significantly more likely to have differences in their PPRQ scores than those who lived in Winnipeg.  $t(105) = -2.05$ ,  $p = .042$ , two-tailed). Table 21 details the results of the univariate analysis for dichotomous independent variables.

Table 21. T test results of the univariate analysis of dichotomous independent variables and differences in PPRQ scores.

Variable	Difference in PPRQ score M (SD)	df	t	p
Age				
0-5 years of difference in age	14.38 (11.67)	105	.198	.843
6+ years of difference in age	13.83 (12.71)			
Reside in Winnipeg?				
Yes	.98 (.40)	105	-2.05	.042*
No	1.16 (.43)			
Born in Canada?				
Both members of the couple were born in Canada	15.56 (12.77)	105	-1.36	.177
One or both members of the couple were not born in Canada	12.41 (10.23)			
Ethnic Background				
Couple has the same ethnic background	14.53 (12.75)	105	-.431	.680
Couple has different ethnic backgrounds	13.42 (8.55)			
Education Level				
Couple has the same level of education	13.04 (11.28)	105	-1.34	.165
Couple has different levels of education	16.46 (13.00)			
Income				
Couple has a high income \$40,000+	14.74 (12.53)	105	.689	.492
Couple has a low income $\geq$ \$39,999	12.97 (9.81)			
# of Years in Relationship				

0-5 years	13.72 (12.14)	105	-.754	.453
6+ years	15.95 (13.17)			
# of Children				
First time parents- no children	15.78 (10.40)	105	-1.25	.216
Couple has at least one child	12.93 (10.40)			
Prescribed Insulin? <sup>^</sup>				
Yes	14.39 (11.10)	104	.288	.774
No	13.73 (12.10)			

<sup>^</sup> based on n=106

### Multivariate Analysis Results for Differences in PPRQ scores

Although only one independent variable was found to be significant in the univariate analysis, the decision was made to run a number of multivariate analyses to determine if, when added in blocks, any variables became significant. The first analysis included a block containing demographic variables (age and education difference, number of children, number of years in the relationship, whether the couple was from the same ethnic background, income, Winnipeg residence, whether either of the couple was born outside of Canada and BMI), followed by the questionnaire and heuristic responses entered one at a time. The next analysis contained a block of the questionnaire composite scores (PSS, PMTQ, KMSS, GAD7, and GDKS), followed by the demographic variables entered one at a time. The final analysis consisted of all 17 variables together. As none of these analyses resulted in significant findings, the results of the final analysis are presented here (Table 22).

Table 22. Multiple regression analysis with log transformed differences in PPRQ scores as the dependent variable.

Variable	Unstandardized Coefficients				
	B	SE B	$\beta$	t	p
<b>Age</b>					
0-5 years of difference in age <sup>\$</sup>	--	--	--	--	--

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6+ years of difference in age	.022	.113	.22	.198	.856
Reside in Winnipeg?					
Yes <sup>§</sup>	--	--	--	--	--
No	.167	.104	.181	1.60	.551
Born in Canada?					
Both members of the couple were born in Canada <sup>§</sup>	--	--	--	--	--
One or both members of the couple were not born in Canada	.0032	.106	-.038	-.298	.444
Ethnic Background					
Couple has the same ethnic background <sup>§</sup>	--	--	--	--	--
Couple has different ethnic backgrounds	-.017	.111	-.018	-.154	.889
Education Level					
Couple has the same level of education <sup>§</sup>	--	--	--	--	--
Couple has different levels of education	.062	.097	.073	.642	.617
Income					
Couple has a high income \$40,000+ <sup>§</sup>	--	--	--	--	--
Couple has a low income $\geq$ \$39,999	-.027	.104	-.030	-.261	.364
# of Years in Relationship					
0-5 years <sup>§</sup>	--	--	--	--	--
6+ years	.130	.109	.149	1.19	.191
# of Children					
First time parents- no children <sup>§</sup>	--	--	--	--	--
Couple has at least one child	.098	.093	.119	1.06	.327
Prescribed Insulin? <sup>^</sup>					
Yes	-.030	.094	-.036	-.318	.856
No <sup>§</sup>	--	--	--	--	--
Partner's BMI	-.001	.006	-.020	-.157	.738

PSS score for the couple	-.002	.013	-.023	-.181	.123
PMTQ score for the couple	.001	.020	.004	.036	.173
GAD-7 score for the couple	.011	.015	.100	.779	.074
GDKS score for the couple	-.069	.105	-.079	-.658	.293
KMSS score for the couple	-.015	.014	-.142	-1.13	.199
Availability heuristic for couple	.061	.057	.115	1.06	.126
Representative heuristic for the couple	.061	.105	.065	.579	.444

<sup>§</sup>Reference group; <sup>^</sup> based on n=106; Note:  $R^2 = .851$ ; Variables entered in the order they appear in the table.

In summary for research question #3, Winnipeg residence did not retain significance when entered into the multivariate model. Thus, no significant predictors of PPRQ discordance were found in this analysis, using both logistical and linear regression. None of the VIFs were greater than two in this analysis, indicating that there were no issues with multicollinearity. The model explained 8.5% of the variance in differences in PPRQ scores between the dyads ( $R^2 = .851$ ). The implications of this lack of significant findings are discussed in the Limitations section.

To summarize the results of the quantitative analysis, women had higher overall PPRQ scores compared to men, with stress and pre-pregnancy BMI being significant independent predictors of increased risk perception. For men, increased risk perception was predicted by their level of education, anxiety, the extent to which they believed their partners were capable of managing GD, and their GD knowledge. No predictors of discordance in the couples' PPRQ scores were found in this study.

**Conclusion**

In conclusion, the quantitative component of this study contributed new knowledge to the field of pregnancy risk perception. In particular, information regarding the perspective of the male partner and the variables which may predict increased (or decreased) pregnancy risk perceptions has not been previously explored. For women, this study adds support to the significance of a woman's pre-pregnancy BMI and the influence weight has on pregnancy risk perceptions. The finding that BMI is an independently significant predictor of increased PPRQ scores may indicate that women are aware of the risks posed by obesity. For men, the finding that education was inversely associated with PPRQ scores and that those men with less GD knowledge had higher pregnancy risk perception scores is potentially useful for clinicians. Recall that years of education and GDKS scores had a positive correlation (.354), significant at the 0.01 level. For educators, knowing that men with lower levels of education may also have less GD knowledge may assist in developing tailored education programmes. It is also noteworthy that attendance at prenatal care visits was not associated with PPRQ scores or level of GD knowledge. Finally, no significant variables were found which explain the differences in couple's PPRQ scores, leaving this as an area for further research.

## Chapter 6: Qualitative Results

In this chapter the qualitative results will be described, beginning with the demographics of the participating couples. Categories arising from the content analysis of the interview data will be presented. The categories have been organized by research question. Emergent findings (those that did not fit with any of the research questions) will also be discussed. Supporting quotes are provided from individual participants.

### Demographics

The demographic characteristics of the qualitative sample are presented in Table 23. Of the 107 couples who participated in the quantitative component, a total of 20 (18.7%) indicated a willingness to be contacted regarding the qualitative interview. Of these 20 couples, seven declined to be interviewed when contacted, citing lack of time for interviews or indicating that they had changed their minds about participating. The remaining five could not be contacted (did not respond to multiple voicemail/text messages and/or email). In total, eight (7.8%) couples were interviewed, consisting of six interviews with women, six interviews with men and two interviews with couples, for a total of 14 interviews.

Demographic data for participants in the qualitative interviews was obtained from their responses to the quantitative questionnaires. Missing data were minimal. For the men, one participant did not answer the question regarding number of years of formal education and a second did not answer the question regarding total family income. Information regarding family income was extrapolated from the woman's response. For the women, one participant did not answer the question regarding number of week's gestation at time of GD diagnosis. Quantitative data was used to describe the population of the component of the study. The information is

provided to allow for comparisons between the participants in the quantitative component and the participants in the qualitative component.

Table 23. Demographic characteristics of participants in the qualitative component of the study.

Variable	Women n=8 n (%)	Men n=8 n (%)
<b>Characteristics of the Individual</b>		
<b>Age</b>		
18 – 25	0	1(12.5)
26 – 35	6 (75.0)	3 (37.5)
36+	2 (25.0)	4 (50.0)
<b>Education</b>		
Up to high school	2 (25.0)	2 (25.0)
Incomplete vocational/university	1 (12.5)	2 (25.0)
Complete vocational/university	5 (62.5)	4 (50.0)
<b>Race/Ethnicity</b>		
Caucasian	6 (75.0)	6 (75.0)
First Nations/Métis/Inuit	0	0
Filipino	1 (12.5)	1 (12.5)
Asian	0	0
Other	1 (12.5)	1 (12.5)
<b>Born in Canada</b>		
Yes	6 (75.0)	5 (62.5)
No	2 (25.0)	3 (37.5)
<b>Characteristics of the Women</b>		
	Women n=8 n (%)	
<b>BMI</b>		
Underweight/normal weight	5 (62.5)	
Overweight/Obese	3 (37.5)	
<b>Gravida</b>		
1	3 (37.5)	
2	3 (37.5)	
3	2 (25.0)	
<b>Gestational age at GD diagnosis<sup>^</sup></b>		
≤ 24 weeks	3 (37.5)	
25+weeks	4 (50.0)	
<b>Prescribed insulin?</b>		
Yes	3 (37.5)	

No	5 (62.5)
<b>Characteristics of the Men</b>	
	Men n=8
	n (%)
<b># of PNC appointments attended by partner</b>	
None	2 (25.0)
1	4 (50.0)
2-3	2 (25.0)
<b>First time fathering a pregnancy</b>	4 (50.0)
<b>Characteristics of the Couple</b>	
	Couples n=8
	n (%)
<b>Income</b>	
<\$10,000-\$39,999	2 (25.0)
\$40,000-\$79,999	1 (12.5)
>=\$80,000	5 (62.5)
<b>Marital Status</b>	
Married	5 (62.5)
Common-law	3 (37.5)
<b># of Children Reported</b>	
1-2	4 (50)
3+	0
<b>Reside in Winnipeg?</b>	
Yes	7 (87.5)
No	1 (12.5)
<b>Interviewed postpartum?</b>	
Yes	5 (62.5)
No	3 (37.5)
Based on n=7	

Table 24. Mean (M) and standard deviation (SD) values for selected demographic characteristics.

Variable Mean	Women n=8 M (SD)	Men n=8 M (SD)
Age of participants (Age range)	32.9 (26-43)	37.5 (25-55)
BMI and range	28.5 (15.9-53.1)	--
Gestational age ^	27.1 (21-33)	--

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	All Participants (n=16)
	M (SD)
Mean # of years in relationship (Range of years)	10.25 (4–23)

---

Based on n=7

### **Descriptive Summary of Scores on PPRQ and Selected Independent Variables for Participants in the Qualitative Component of the Study**

Figure 5 provides a visual comparison of the mean scores on the PPRQ and its subscales for the women and men who participated in the qualitative interviews. In addition, Table 25 presents the mean, standard deviation and range of scores for women and men for the total PPRQ and its three subscales as well as for other selected independent variables. In order to place these results in context, the Wilcoxon Signed Rank test was performed to compare the results for the PPRQ total and subscale scores and for the scores on the selected questionnaires for women and men. The Wilcoxon Signed Rank test is a non-parametric test which is the equivalent of the paired t-test. This test is appropriate for use with very small sample sizes (Crichton, 2000; de Winter, 2013). Using this test, there were no significant differences in scores for the PPRQ or any of the subscales between women and their partners. There were also no significant differences in any of the questionnaires. These findings indicate that this qualitative sub-sample is not generally representative of the larger sample. In the quantitative sample, women's mean scores were significantly higher on the PPRQ and all three subscales. Women also had higher PSS (perceived stress), GAD-7 (anxiety) and GDKS (GD knowledge) scores as compared to their male partners. The implications of these findings will be discussed in the Limitation section.

Figure 5. Mean scores for PPRQ and subscales for participants in the qualitative component of the study.

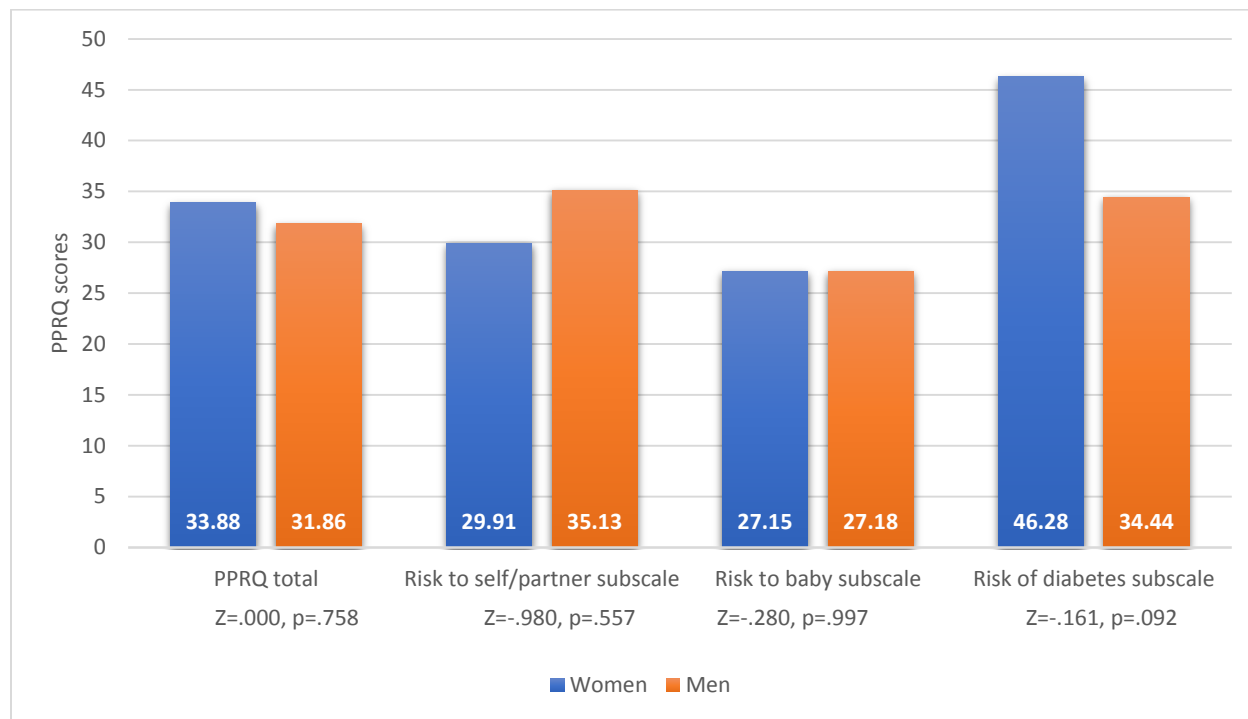


Table 25. Range of scores and comparison of mean instrument scores for women and men in the qualitative component of the study, using Wilcoxon Signed Rank test.

Variable	Range of scores		M (SD)		Z	p
	Women	Men	Women	Men		
PPRQ total	1-49	10-59	33.88 (14.50)	31.86 (16.85)	.000	.758
Risk to Self/Partner	17-50	17-50	35.13 (12.90)	32.97 (11.33)	-.980	.557
Risk to Baby	2-45	3-63	27.15 (12.05)	27.18 (19.68)	-.280	.997

Diabetes Risk	1-68	3-63	46.28 (21.31)	34.44 (24.05)	-.161	.092
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Scores on selected independent variables

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Variable	Range of scores		M (SD)		Z	p
	Women	Men	Women	Men		
PSS total score	6-12	5-14	8.00 (1.93)	7.88 (2.90)	.339	.734
PMTQ total score	6-9	6-12	8.25 (2.00)	7.63 (.92)	-.921	.357
KMSS total score	18-21	19-21	20.25 (1.39)	20.50 (.93)	-.743	.458
GAD7 total score	0-5	1-12	2.38 (2.07)	5.38 (4.37)	-1.527	.127
GDKS raw score out of 33	15-25	14-25	19.88 (3.52)	20.75 (3.77)	-.776	.438
GDKS total score expressed as a %	(45-76%)	(42-76%)	(60.3%)	(62.9%)	--	--
Availability heuristic	0-3	0-3	.88 (1.13)	.50 (1.07)	-.736	.461
Representative heuristic	3-8	0-12	5.38 (2.20)	4.25 (4.33)	-1.052	.293

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\*  $p < 0.05$

### Description of Qualitative Findings

Content analysis was used to describe how women and men perceived risk in a pregnancy complicated by GD. Protection Motivation Theory and the conceptual framework helped inform the analysis. This section will present the results of the qualitative analysis organized into categories according to research question. Qualitative questions were intended to contribute to the fourth research purpose which was to explore how perception of pregnancy risk influences

behavior change related to GD. Supporting quotes from the participants will be offered as exemplars.

#### **Research Question #4**

The fourth research question is “What factors influence the perception of risk in women with GD and their male partners?” This question was designed to elicit the participant’s sense of what did (or did not) make GD seem to be a condition associated with risk. These factors included: attempts to minimize risk, awareness of personal risk factors, feeling confident in their ability to make changes due to a perceived satisfactory knowledge level, comparing themselves to others and holding a number of misconceptions regarding GD.

**Minimalizing the risk of GD to the health of both baby and mother.** Perceived severity of GD, or lack thereof, was frequently mentioned as a factor influencing perception of pregnancy risk. Both women (n=6) and men (n=7) in this study had a tendency to minimize the severity of GD and the seriousness of potential complications, both to the woman’s health as well as the health of the infant.

*“Like it-it’s not the worse that could happen but it’s not really you know the best thing that could happen either. I didn’t -- I didn’t really worry about it...I was like it’s fine, it’s just diabetes, like not a big deal to have diabetes while you’re pregnant that could be bad—right, but it could be nothing, no long term, nothing that lasts all your baby’s life.”* Participant A3: Female, Age 26.

*“So it’s y-you hear a lot more about it than-than you used to, um, and they said that it wasn’t -- it was kind of no big deal, you know you just kind of follow the doctor’s orders, manage the blood sugars and everything should be okay. The baby’s been around where it should be and, it’s as good as it’s going to get from this point on. We’re hoping that everything goes good and-and there’s no complications and keep going from there.”* Participant B3: Male, Age 25.

One couple in particular appeared to be quite unconcerned about the risks of GD.

Speaking several weeks after the delivery of their baby (who was delivered without complications), the parents commented:

*“It was no big grand - there was no big, you know, huge deals. I mean I had the diabetes, I had to poke myself and give myself shots and they generally - they didn't generally feel very nice, but you, know stuff, you've got to do, right?”* Participant A7: Female, Age 28.

*“I don't know - I doesn't make a difference really, it's just something to - (pause) just another part I guess.”* Participant B7: Male, Age 31.

Some couples focused on the management of the glucose readings as an indicator that GD was not serious in their case.

*“Yeah, actually for me, it's not that alarming because, uh, the only difference in the—in the result is just point one. Point one and, uh, in the normal range. I forgot the exact measure—Take for example, uh, seven point five, something like that, mine is seven point six. The range was fine, you know uh mainly fine. So there was not any that were uh too-too far out, uh of where they should be. I just showed—showed him the result and just said—and he said, “Oh, that's—that's nothing, because his is-is, uh, is worse. (Laughs)”* Participant A4, Female, Age 41.

*“Well, ... I ignore it. I wasn't surprised at all. So it's, for me, it's nothing. Uh, I'm not worried, I'm not alarmed, because I know her uh, eating habits. It's just that I thought probably this is just brought about by the—by her pregnancy.”* Participant B4: Male, Age 55.

Another method participants (especially men), used to minimize the risk of GD involved the belief that GD was misdiagnosed during the pregnancy. Men in particular often expressed that they believed the diagnostic testing was inaccurate (n=5). Some believed the inaccuracy was due to their partner not following directions prior to the test, others questioned the entire testing procedure. While there were women (n=3) who disbelieved the initial diagnosis, they accepted the accuracy of the diagnosis sooner than their partners. Two of the men, interviewed post-partum, maintained that they were still not convinced their partner actually had GD. After a period of time most of the participants accepted the diagnosis. *“I even talk to myself, ‘Probably there was something wrong with-with the testing. Or probably she just, uh, took something that would, you know, jump up her blood glucose.’”* Participant B4: Male, Age 55.

One father, interviewed 33 weeks after the birth of the couple's second child felt that his partner had been misdiagnosed and stated that he believed his partner was misdiagnosed.

*When she told me, I told her, I'm so sure she did not have it...she should not have eaten any food [before the test] but she did and then took the test and that made it positive. I would have believed them if she had taken a second test and it came out positive again. But since she was not wanting to take that second test, I said 95%, I was so sure she did not have it. I knew she never had diabetes. I never believed that she did.* Participant B2: Male, Age 40.

The belief that medical error, or their partner's not following direction for the screening may represent a form of denial in the diagnosis.

**Awareness of personal risk factors.** Several women (n=6) discussed how their own personal risk factors, in particular obesity and poor pre-pregnancy diet, put them at higher risk for GD. Men did not mention their partner's risk factors, possibly out of a wish to not embarrass them by discussing their partner's weight or eating habits.

*"Well, I mean, I knew I was overweight before I was pregnant, and that was one of my biggest concerns during pregnancy, is how much weight I would gain. I knew I might be putting myself at umm you know that that increased my chances of diabetes"* Participant A1: Female, Age 31.

*"Yeah, I kinda knew it [gestational diabetes] was a possibility. I knew that I was overweight and umm, we had been planning for a baby in the next year, you know later on and I thought." Yup I've got to get serious about losing this weight cause I have to be in shape for the pregnancy". But it was summer (chuckles) you know so there were BBQ's and ice cream. And then surprise – I'm pregnant. So I knew it was a possibility but even knowing that when I actually got the news I was still shocked."* Participant A8: Female, Age 32.

Other women (n=4) expressed surprise that GD had occurred in the pregnancy given that they felt they had a very healthy diet and lifestyle. A few men also expressed this attitude (n=2). These participants were aware of the woman's personal vulnerability of being diagnosed with GD, but felt it was quite low.

*"Really you know, I didn't even consider it [being diagnosed with GD]. Our diet is really good 'cause Annie [her older child] has so many food allergies, we're always so careful about diet, umm like sugar and processed foods and all that. So, I have to say we were kind of eating that way anyways so it, it wasn't a big lifestyle change for me."* Participant A6: Female, Age 30.

*So the concern wasn't so much can we manage this. Because we were already doing it. But the concern was what else can we do? You know so like our diet was pretty darn clean. So I had panicked about what are we cutting out."* Participant B6: Male, Age 32.

*“I was just so surprised [about the GD diagnosis]. Because, like, what he mentioned a while ago, I’m really very particular when it comes to what-what to put in the table, what kind of food to put in the table, and, as well as, what kind of food to buy”* Participant A4, Female, Age 41.

*“Yeah when she told me [about the GD diagnosis] I couldn’t believe it. Like-like I’ve said, um, I know her eating habits, I know she’s ...very particular with, uh, with sweets and fats and-and carbs, because she’s always, you know, she’s always reminding me not to eat those kinds and I—which I live to eat”* Participant B4: Male, Age 55.

**Confident in their ability to make recommended changes.** All of the women interviewed (n=8), felt they had been successful in making the recommended changes to manage GD, and, in general, their partners agreed (n=5). The participants expressed that they felt they were generally able to control their food intake and understood how to manage their diagnosis.

Participants also expressed that the experience of being diagnosed with GD and the subsequent changes in diet represented an opportunity to make beneficial health changes for the whole family (n= 4 women and 5 men).

*“I’m doing Ok with it [GD diagnosis] really cause I think everything was pretty simple. Just, you know, get up and move around, eat what you’re supposed to eat and try to not get stressed out and get worried, rest if you need to rest, that kind of thing”* Participant A5: Female, Age 43.

*“We were fairly well informed and because we just listened to the doctor, and because it was pretty borderline, um, I think we were - we were okay with it because - because we felt we could manage it, basically.”* Participant B1: Male, Age 31.

*It definitely encourages me to get more healthy, like I said, to lose some weight, um, to be more cognizant of my diet, um, before and during my-my next pregnancy. So, it’s definitely, it’s just a little bit more of a motivation. Um, yeah, I would say that’s the biggest thing.* Participant A2: Female, Age 32

While women spoke very readily (and generally positively) regarding their efforts at changing their diets, they indicated that they were less successful at increasing their exercise levels. Women appeared to be somewhat reluctant to discuss exercise as most admitted to not increasing activity levels as recommended. The majority of the women (n=6) stated that they did not increase their activity levels. There were a number of rationales for not increasing exercise.

These included lack of motivation, dislike of exercise, cold and/or harsh weather, feeling too tired and having no one to exercise with. As one first time expectant mother explained:

*“I don’t like to walk around alone [Laughs]. I have -- I have no issues walking around alone but I prefer not to, so if he doesn’t want to go for a walk then we don’t go for a walk, and then I don’t go for a walk. So if he could be more, like more motivated you know with going for walks or whatever then maybe I would want to do more too.”* Participant A3: Female, Age 26.

Another expectant mother felt that weather was a major factor in why she did not increase her exercise.

*“And I go for a walk and if I did that - but the weather was so awful. [Laughter] It was icy and it's like I don’t want to fall and I have to take the dog out so, you know, I couldn’t walk all the time. And I didn’t want to walk on the treadmill and fall on the treadmill.”* Participant A5: Female, Age 43.

Some of the responses to question #4 also related to variables from the conceptual model, in particular, risk knowledge and the availability heuristic. Participants discussed their degree of knowledge regarding GD management and the potential consequences for mother and infant. In terms of the effects of knowing other women who had experienced GD, there was a mixed reaction in terms of the effects on risk perception related to GD. Some participants felt it was helpful, while others felt it made no difference to their risk perceptions. Participants also held several misconceptions about GD.

**GD knowledge level.** Most of the women (n=5) and some of the men (n=3) expressed that they felt they had an adequate amount of knowledge regarding GD. *“I was watching my diet so, so I was pretty sure my baby would not be so big.”* Participant A2: Female, Age 32.

*“Yeah umm, I really believe we had it under control. We understood what had to be done and we just did it. And umm, even when Lisa needed to be on insulin we just went along and incorporated that umm, that aspect of her treatment. It really isn’t complicated you know. Just*

*eat right, try, you know to umm get a bit of exercise and listen to your doctor.” Participant B8: Male, Age 41.*

There were other participants, however, who expressed less confidence in their ability to manage GD, particularly in the time period just after diagnosis. These participants (women n=3 and men n=2) stated that the treatment regime was difficult to follow and, especially in the beginning, they did not understand what the glucose values represented. They also expressed that it was difficult to know how to adjust their diet.

*“At first, I would feel like, my glucose level was coming down so low. I didn’t understand, didn’t know ahh, what the numbers meant. The doctor had to tell me that no you’re not going too low. But just I was, umm I kept thinking it’s getting too low, to be affecting my baby.” Participant A2: Female, Age 32.*

*“I, I was just perplexed that I ate less because I didn’t want to make the, in my mind I didn’t want to make the baby more sick or make my numbers go high and I didn’t know how to track them. Yeah well, after I found out how am I going to test my blood sugar? What, what are good blood sugar numbers?” Participant A5: Female, Age 43.*

In general, the couples had a fairly good knowledge of the potential complications for both mother and infant. For the mother, the complication participants were most aware of was the risk of developing Type 2 diabetes later in life. For the infant, they were most aware of the risks of birth injury, macrosomia, NICU admission, and developing Type 2 diabetes later in life. Overall, women had greater awareness of complications as compared to men (n=7 and n=6 respectively), and both genders tended to express more concern over the risk to baby.

*“It [Type 2 diabetes] would affect her a lot, because, uh, there might be some, um, uh, what do you call this? There might be some, uh, other diseases that would develop out of this, uh, diabetes issue. You know, heart problem. Yeah, and other kidney problem basically, or eye problems” Participant B4: Male, Age 55.*

*“Well, the sugar, um, create larger babies, um, can create preemies, so the baby could be born earlier than it should, bigger than it should. The baby can get diabetes or have more chance of getting diabetes as well as the mother can get diabetes. Um, weight gain, too much weight gain on the mother as well as the baby. Um, and of course the whole sugar, diabetes thing as it is, like sugar shock and all that sort of thing.” Participant B5: Male, Age 43.*

*“Um, me, if I didn't take care of it, it could probably become permanent. If I, uh, and then for her [referring to the infant]it was - for during the pregnancy she could over-develop but - like her body could over-develop, but her organs wouldn't. And so she would be born premature 'cos she'd be the right weight, but then all of her organs wouldn't be functioning and then that would be very bad for her.”* Participant A7: Female, Age 28.

**Comparing with the experience of peers.** Participants who knew another woman with GD (women n=5, men n=4) indicated that they often compared their experiences with those of the woman/women they knew. For some of these participants, they felt fortunate to know someone who had gone through the experience, while others felt this did not impact their perceptions.

*“There was a woman I knew back home. She had gestational diabetes and she gave birth. The baby was very big, very overweight and the baby was in the ICU for a long, so keep monitoring all his vital signs and his blood. And it was very hard for her because she had other children to see and to try and be at the ICU and then with her children. That scares me. I don't like that. I want to go home with my baby”* Participant A2: Female, Age 32.

*But, uh, though I only know of three people at work t-that have had it and they've had healthy children and-and their children are all grown up now. And that umm makes me feel better cause if-if they say, “Oh well you know it's not normal and you know it's rare”, and they said that you know, “Oh my child came out and he was like 10 pounds, I had a lot of complications”, it-it would make you feel a little bit more like is it something that I should be really, really worried about.”* Participant B3: Male, Age 25.

**Misconceptions regarding GD.** Many of the participants held a number of misconceptions about GD concerning etiology, diet and exercise, which influenced their perception of risk. One of the more common misconceptions expressed by the majority of men in this study (n=7) was the belief that their own or their partner's personal and/or family history of diabetes influenced the woman's development of GD. This is one of the most consistent finding in the transcripts. Men in particular stated that they believed that their own history of diabetes (two of the men in this study were diabetic themselves) or their strong family history created a pre-disposition for diabetes in their partner's pregnancy. Women (n= 2) were aware that a

personal family history of diabetes could have increased their risk of GD, which is an accurate assessment. However, most women (n=4), when discussing their partner's beliefs that his (or his family's history) contributed to the GD, were aware that this was not accurate. The following quotes are from a young couple expecting their first child. The father was quite convinced that his family history of diabetes had influenced the development of GD. However, his partner was aware that this was not the case.

*“Well you know I don't have diabetes but my mother has diabetes, and my father doesn't have diabetes but of most of his family has diabetes [Laughs] ... So why wouldn't -- why wouldn't it affect the pregnancy? It should in a sense affect the pregnancy because it's you know 50 -- it's 50/50. Like the baby, the development is [Laughs], like half of me and half of Kim. So that kinda makes sense in one way that all that diabetes is in my family but not in hers. So then you'd think well that's my kid you know [Laughs], half the development so it makes sense that there would be a big chance the kid would have it too.”* Participant B3: Male, Age 25.

*“Umm well he, at first he-he thought it was because of him, his family's, genetics that made it, that caused the diabetes, cause it's really in his family. But then I told him that it wasn't because of him, h-his family, it had nothing to do with it and that it's on me on my side and it's me. You know like the mother father side kind of thing, it's got nothing to do with your-your DNA introducing with mine, it's all me.”* Participant A3: Female, Age 26.

Another fairly common misconception (women n=3, men n=5) was the belief that GD always disappears after pregnancy. This relates to risk perception in that it leads to the belief that the diabetic state will resolve after delivery and thus will not affect long-term health. This misconception was held by parents still expecting their child and those who had already delivered. Of note is the fact that none of the post-partum participants had had their six-month post-partum screening conducted. The following quote is from a mother who delivered her first child four months prior to the interview.

*“So even though it's been Ok, you know, not the end of the world. I'm really glad now that it's done and I've had the baby and the diabetes is gone and I don't have to umm you know worry about every little thing that I eat”* Participant A8: Female, Age 32.

Some participants also felt that “borderline” GD does not represent a serious health risk to mother and baby (women n=5, men n=4), thereby minimizing their perception of risk related to GD.

*“Apparently, she’s borderline which made me feel better, a bit better. So, and that could be done with diet and everything. So, that was, made me a feel a bit better it’s not full blown, having to take insulin type diabetes. Yeah, so. I say it, at least its borderline cause I’m going to be away. If she’s gonna have to have something at least it’s the lowest of the types.”* Participant B5: Male, Age 43.

*“So it was very, um, we’ll say, gestational diabetes gray area is what she actually ended up with, which probably also might have had something to do with the - the lesser amount of worry that I had...Basically, what we got back from the doctor was as long as she mildly adjusted her diet and didn’t take in large amounts of sugar, she probably wouldn’t have any, you know, detrimental side effects because she was so kind of borderline gray area”* Participant B1: Male, Age 31.

Many of the participants held misconceptions concerning what constitutes “healthy” food choices for a diabetic. Participants (women n=4, men n=3) expressed surprise at the dietary information they received, especially regarding fruit and dairy products. The assumption was that these were health choices and the participants were quite surprised to find they were foods that needed to be restricted in a diabetic diet. There were also misconceptions regarding portion sizes.

*“Certain vegetables, vegetables that I thought that were super good for you that I find out has like a lot of, uh, carbs and-and, uh, sugars in it, um, such as like potatoes. [Laughs] yeah I thought potatoes were super good for you, I’m from New Brunswick, we always eat potatoes [Laughs] but apparently potatoes have, uh, really high carbs and stuff in it.”* Participant B3: Male, Age 25.

*“Yeah believe it or not uh potatoes. Starches have a lot of sugars in them. I never would’ve thought about carbs. I never would’ve thought about that. And the same with fruits. What is and isn’t good, you know. Like everyone knows candy and chocolate and that, that’s bad for you but you think “fruit really- that’s bad”* Participant A5: Female, Age 43.

*Umm and then the other thing was portion sizes. When she [the dietician] told me I could still gave bread I was like “Super”, cause I love bread. And and then she told me umm what the portion size was for you know one serving of bread and I was like “Wow. I’ve been eating like triple that at one time”. So that was kinda shocking, you know, how small a serving really was.”* Participant A8: Female, Age 32.

In summary for research question # 4, there appears to be a number of factors that influence risk perception related to GD. The most frequently mentioned factors included attempts to minimize personal risk, expressing confidence in their ability to manage GD and holding a number of misconceptions. Somewhat paradoxically, in terms of GD knowledge, participants had a reasonably accurate knowledge base concerning the complications associated with GD while at the same time, in terms of perceived severity, there was an attempt to downplay the seriousness of the diagnosis. While knowledge regarding complications was fairly accurate, there were other areas where participants had misconceptions regarding GD, indicating perhaps gaps in the health information provided by healthcare professionals.

#### **Research Question #5**

The fifth research question asks, “How does gender influence perception of risk in women with GD and their male partners?” The intent of this question was to begin to gain an understanding of how gender might influence risk perception within the specific content of gestational diabetes. This proved to be a somewhat difficult question for participants to understand and the question was re-worded and additional prompts developed to aid in their comprehension of what was being asked.

**Risk perception as related to one’s personality.** For couples who were able to formulate an answer to this question (3 women and 3 men), they tended to reflect on gender differences in risk perception as a function of personality. Participants mentioned things like being a “planner”, needing to have a certain degree of control over life events or having a tendency to be either positive or negative in general. One woman, on insulin and pregnant with

her first child, explained her partner's concerns by commenting, "*He-he's the negative Nancy [laughs], yeah.*" Participant A3: Female, Age 26.

Another participant described differences in her and her partner's way of responding to everyday challenges as an example of how she felt personality, and not gender, moderated risk perceptions.

*And also, he's more laid back than I am. Like about all things. So if the car is making a funny noise I'm worried and he's not. So I think that's the same when we talk about risks or bad things that can happen. He's like "well if it happens it happens and then we'll deal with it kinda thing" [Laughter]. While I'm like "Ok what can we do, what comes next". It's just different ways of reacting to life.* Participant A5: Female, Age 43.

*Umm I feel like gender, you know being a man or a woman really, it doesn't have anything to do with it. How you see things, like how risky something is, is, that's more about you and how you like, umm deal with life than anything else. Like what are your life experiences and your personality. Are you someone who freaks out or are you someone who like "OK what happens now".* Participant B8: Male, Age 41.

The personality characteristic most associated with risk perception was the tendency to worry. Almost half of the participants (4 women and 3 men), when asked about risk perception, responded by equating risk perception with worry. They felt that the tendency to be "a worrier" was the same as having a high risk perception. One woman, speaking several weeks after delivering her first baby, felt that she and her partner had very different reactions to the diagnosis but felt that those differences were due to her tendency to worry.

*"I tend to be more of the worrier. So it's nice that Tyler is usually pretty calm and he can take a more practical, like, he can kind of take emotions out of it and say, okay, this is what they're saying. This is good news or bad news, or whatever it happens to be, and this is what we'll do to deal with it."* Participant A1: Female, Age 32.

One couple, who were interviewed together, agreed that, from their perspective, risk perception was more about one's tendency to worry than about a reaction to new information.

*“I’ve- I’ve never been one to really overly worry about a lot of things, so I wouldn’t say that that’s with us, no.”* Participant A7: Female, Age 28.

*“I might worry about certain things, but only if it’s that I know that there’s a large chance for it - the rest of the time it’s - it’s not something that I worry about. Like I don’t even worry about most things.”* Participant B7: Male, Age 31.

**Risk perceptions were felt to be similar.** Overall, many of the couples interviewed felt that they were quite similar in their risk perceptions regarding GD. When asked how he felt he and his partner viewed the risks associated with GD, one first time father responded:

*“Yeah, I think the same. Uh, the mindset is the same, but the approach might be a little bit difference—different because her is more of, uh, like, she’s a—she’s a nurse, she has a lot of, uh, uh, skills and knowledge about, um, medical whatever, issues. But uh, yeah, we think the same.”* Participant B4: Male, Age 55.

Interestingly, this was the case even when the couple had very different PPRQ scores. A couple, who were interviewed separately and had very different PPRQ scores, also felt they shared similar views on risk perception. *“Yes I think we were both, I think we both felt similar emotions about it. We were both very concerned about the health of our baby and about the health of myself”* Participant A6: Female, Age 30.

*“I think Lisa and I felt pretty much the same you know. I’ve been an over-planner all my life and she’s umm she’s the same way. We both look at a situation and then try to like figure out, to plan the the way we’re going to deal with it. And that’s with everything, like with finances or parenting whatever it is.”* Participant B6: Male, Age 32.

In summary for research question #5, most participants did not view gender as having an influence on risk perception. Rather, personality characteristics, and specifically the tendency to worry was seen as the primary influence on risk perception. Couples also felt they shared similar thoughts regarding the risks of GD even when their PPRQ scores suggested otherwise.

**Research Question #6**

This question asks, “What role do pregnant women diagnosed with GD see their partner as having in aiding their efforts at health behavior change?” The goal of this question was to identify/describe the expectations of women diagnosed with GD regarding the behavior of their partners. This is clinically useful information in that an understanding of women’s expectations may assist healthcare providers in expanding their view of GD management beyond just the health behaviors of the woman and expand teaching to include the partner.

**Practical support to aid behavior change.** Most of the women (n=6) mentioned forms of practical support that their partners provided to support health behavior change specific to GD. Assistance with daily chores and refraining from bringing tempting foods into the home were some examples of this form of support.

*“Umm he’s been super helpful, like with the diet and everything. He never brings home stuff that’s, things that I can’t eat, you know like chips or junk or whatever. Even though I know he likes to have things, like maybe ice cream or cookies, he never buys that ‘cause I can’t eat it. Even with exercise you know, sometimes I’m like “I’m too tired for a walk” and he’ll be like “nope, come on get up, just a short walk”. And for me, I know like, he’s, he’s tired too but he’s doing this to help me”* Participant A8: Female, Age 32.

*“Dan was very sure good at making sure that I took care of myself. He’s better with scheduling and- and patterns... so he’s good at making sure that I stay on the routines that I need... Uh, or I took my meds when I needed to”* Participant A7: Female, Age 28.

**Making dietary changes together.** When asked to identify facilitators of health behaviour change, many (n=6) women spoke about the importance of making changes in diet as a couple, or as a family. For these women, the willingness of her partner to alter his diet was a very important factor in their attempts to alter their eating habits. While some of the women commented that, as the person responsible for meal planning, their partner’s diet changes were not a conscious choice, others very much appreciated this tacit form of support.

*“Completely was a family thing. Um we’ve done everything as a family. When Andrew was diagnosed [with gluten intolerance] well when he went off wheat totally we cut out wheat. There’s no wheat in our house. I don’t understand how I could eat like a lovely piece of bread in front of him and be like you can’t have that. You know and that was the same for me. As soon as I was on less sugar, Andrew never had a lot of sugar anyway but he you know he would only drink diet pop, he would never have something that I couldn’t have in front of me.”* Participant A6: Female, Age 30.

*“Yes, yeah and like my husband and my son, well I mean my son is 14 so he’ll eat anything that’s around. But even him he’s not eating sugary things, he’s not complaining when we’re having, you know, broccoli again for dinner. It’s just like, okay that’s fine, that’s what we eat. So, I mean that helps too. It’s not like I have to cook something for me and something for him. Well, it just makes - it’s just one less thing you have to worry about.”* Participant A5: Female, Age 43.

Although most of the women did acknowledge the importance of changing the family’s diet as a form of support, there were some who commented that, although they felt their partner made an effort at altering his diet, there were still instances where support in this area was lacking and this was perceived as being detrimental to their GD management. Some women (n=2) felt that their partners expressed a great deal of concern but then failed to back this up with actual tacit support, such as exercising with them or altering their diet. One first time mother described how tempting food and drink was still in the house.

*“I know he still likes his drinks and his snacks and so that still around. Well I mean there’s other people in this house so they have to eat and drink their stuff too, so there’s always pop lying around, there’s always the ice tea powder still. Umm, maybe, yeah, if the food and stuff just wasn’t there this would be a lot easier, but ...I’m the one with diabetes so it’s up to me.”* Participant A3: Female, Age 26.

**Attendance of the partner at prenatal care.** Attendance at prenatal care was another important source of partner support for these women. All but two of the men interviewed were able to attend at least one prenatal care visit. Several of the women (n=4) expressed that they felt their partner’s attendance at visits was helpful. They mentioned things like having another “set of ears” or “two brains” as beneficial in making the most of their appointments. Whereas in couples

where the partner could not attend visits (n=2), the women expressed that attendance would have been helpful.

*“Yeah after I was diagnosed with gestational diabetes it was important to have Andrew there with me because I was so nervous. And I wanted him; I know that when you’re so nervous sometimes you don’t hear everything. So I wanted him to be there so he could also help you know manage the disease. I needed his help. Um also just made him feel reassured too cause we were both really nervous as to the effects it would have on our baby so yeah and him being there made me feel better. Just in general”* Participant A6: Female, Age 30.

*“Oh yes, it was so much better when Paul could be there, which, umm it wasn’t very often, like he could only come to the appointment with the endocrinologist, once with the dietician and then umm he came to one fetal assessment but it was, especially with the endocrinologist ‘cause that was when they told me I’d need, that I’d have to go on insulin, you know, that the diet wasn’t working. I was so shocked then and just crying and upset. He was calmer so he was asking questions about things and how to manage and those were, they were really important questions but I was just so, you know devastated that I was no condition to be asking anything.”* Participant A8: Female, Age 32.

One women, whose partner was unable to attend any appointments expressed that she felt this was a disadvantage.

*“Well, it was like it would have been nice if he was there just to have a second person to - cause sometimes he’ll hear them say something that maybe I didn’t. It’s the same thing when you’re going to buy a car or whatever, it’s good to have - cause his brain does not work the same way as my brain does. And it would - just would have been nice to have somebody else there, just listen and maybe would have thought of questions that I wouldn’t have at the time”* Participant A5: Female, Age 43.

**Need for emotional support.** Emotional support was also found to be important.

Specifically, some women (n=3) expressed that partners should realize that the woman may feel guilt and have the perception that she caused the GD. These women felt that partners should be aware of this and reassure the woman that this is not the case and refrain from any comments which might make her feel responsible for the diagnosis. One woman, interviewed several weeks after the delivery of her second child, described that women may feel guilt with respect to GD and may feel they are somehow responsible to causing the disease. She explained that support from the woman’s partner can help to manage these emotions.

*“And just understand like she’s emotional at the best of times, she’s feeling guilty. It’s just and also don’t make her feel like she’s responsible at all. You know don’t say oh you shouldn’t’ve maybe you shouldn’t’ve drank so much pop or maybe you shouldn’t’ve had so much chocolate. She already knows that, she’s already feeling that. Like just if that’s what you think, shhh. Don’t say it.”* Participant A6: Female, Age 30.

In summary for research question #6, in terms of aiding in health behaviour changes, participating in the changes as a couple, or a family was seen as a key indicator of support. While most of the women felt their partners attempted to alter their diets, some were more satisfied with the degree of those efforts than others. Attendance at prenatal care was found to be important to these women as the presence of their partner was viewed as reassuring and comforting. In the cases where the partner was unable to attend, or only able to attend one visit, the women felt that they were at a bit of a disadvantage in terms of understanding all of the information provided to them at their appointments. Finally, women wanted their partners to recognize that a diagnosis of GD could trigger intense feelings of guilt and to refrain from any behaviours or comments that may intensify those feelings.

### **Research Question #7**

Research questions #6 and #7 are connected. Question #6 explored the women’s expectations of her partner’s support. Question #7 asks “What role do partners see themselves as having in assisting the pregnant woman with health behavior change?” The purpose of this question was to permit a comparison between what the women expected of her partner’s behaviors and attitudes and how the men felt they should be expressing support. Women and men described some of the same behaviors although there were important differences.

**General instrumental support.** As was the case with the women, partners expressed that general support for the pregnancy was important (n=6). Men tended to speak more generally about the need to “be supportive” and did not mention specific tasks. *“Um, I would be very, uh,*

*attentive now, because, of course, um... I want [her] to be a diabetic free woman, especially during, uh, her pregnancy.*” Participant B4: Male, Age 55. *“Um, you know, just help your partner deal what the doctor suggests, I guess. You know. Yeah”* Participant B1: Male, Age 31.

One first time father, interviewed two weeks before their baby’s due date, reflected on his behavior during his partner’s pregnancy and felt that, while he did make efforts at being supportive of things like diet change, there were things he felt he could have done differently.

*“Um, but when it came to you know meals and stuff I found that I was -- I tried to support her as much as possible, At certain points I felt kind of like I’d failed supporting her because like I wasn’t -- you know I wasn’t eating healthy myself, I was you know smoking and stuff like that like which is not good. Um, but I felt like it-it was kind of a success because we were still able to manage the sugars and stuff. So I’m hoping that I did the right things.”* Participant B3: Male, Age 25.

**Making dietary changes together.** Similar to the women, partners also endorsed that health behavior changes should be made together (n=6). This was seen as a lifestyle change that should continue on past pregnancy and benefitted the health of the family as a whole.

*“And I, I really believe it’s really important that you do it as a couple. Um it’s a family process. And you know umm, ultimately, at the end of the day, it’s just better for the whole family, like just cutting out the junk and all the processed foods and all that. So really, it’s it shouldn’t just be for the diabetes. That’s how you should be eating... But from a, you know a perspective we do everything together so you c-, w-we’ve had that same philosophy of you can’t quit smoking if you have a smoker in the house. It’s true. You’re never going to quit.”* Participant B6: Male, Age 30.

*“They should support their wife, even with diabetes or no diabetes, pregnancy is no joke. You have to support your wife and make sure she is very comfortable during that pregnancy because I have seen other people with a true pregnancy who lost their life, lost their baby. And so whatever the case, being pregnant alone is like being sick to which you need adequate medical attention at all times. So for all that is there should support your wife at all times. At all times they should provide whatever she needs to be comfortable.”* Participant B2: Male, Age 40.

Although many partners endorsed that diet changes should be made together, several (n=4), discussed difficulties in making this change. These men talked about eating according to the GD diet when the couple was together and then eating differently or “sneaking treats” when

they were alone. These men felt that, as long as they maintained the diabetic diet when they were eating with their partner, they were being supportive.

*“Well, umm, yes when Tina and I ate together sure, like I’m eating the way she’s supposed to eat you know, low sugar, low carbs, portions all that stuff. But you know at other times, like umm for instance if I’m on a night shift and it’s 4 in the morning, you know, [laughing], I’m stopping for some McDonalds. But really, it’s like, that’s not cheating you know. I’m not eating this stuff in front of her going “Oh this is so great- too bad you can’t have any”.* Participant B8: Male, Age 41.

*“But I always found myself kind of sitting back going well you know I don’t have these problems so maybe I can kind of eat more of what I want to eat, you know when Kim’s not around. Dinners and breakfast and stuff was you know like all about Kim, you know, and then you know during the day when Kim was at work or-or I was just driving around ... I just -- I would just pick up junk food and eat that. Sure, like I know it’s bad to cheat and eat fast food and stuff like that that but you know I-I’d do it away from her like when I was alone and you know, I’d kinda think “what she doesn’t know can’t hurt her” kinda thing.”* Participant B3: Male, Age 25.

**Attendance of the partner at prenatal care.** Attendance at prenatal care was also viewed by men as an important indicator of support. Partners expressed that they felt it was important to attend so they had the opportunity to hear the information first hand and ask their own questions (n=5). Men who could not attend cited work as the main reason for not attending and expressed that, if not for work, they would have come to appointments.

*Um, well, I’ve always, when, I mean, even when we had the first one I’ve always went in with the, with the prenatal stuff anyway. I always considered it important. So the diabetes don’t really change that much, it’s just an added thing now with the visits. And extra appointments now cause now we’ve got to go to the diabetes doctor and all that and so on and so forth, so that portion of it changed. And I wanted to be there for the diabetes portion of it because I didn’t understand and as to how, with my fears of it as well and get to understand it a little bit better.* Participant B5: Male, Age 43.

*“Well it was my first child and, uh, and especially when we -- when we figured out that she did have gestational diabetes I kind of wanted to be there for her and let her know that I understood and that I was there for like the long haul and that I did care about what was going on.”* Participant B3: Male, Age 25.

One man explained that, although he felt bringing his partner to appointments was an important role for him, he felt that the number of appointments was excessive and unnecessary.

*Yes of course you have to do these things. She does not like to go alone and it's hard with him [pointing at his older son] so I am there. I was also concerned because I know; I am a very busy person. So she was difficult to speak to, she take my time. I have to spend more gas, spend my time, I have to re-schedule my job to make sure I take her to the hospital then we have to re-schedule our time to feeding for our child as well. So it's a lot of challenges all together.*

Participant B2: Male, Age 40.

**The role of monitor.** Some of the men (n=4), felt it was their responsibility to monitor their partner's diet and medication. These men discuss things like paying attention to what their partner was eating, reminders regarding blood glucose checks and medication (i.e. insulin). *"Oh for sure, yeah. I'm always reminding her "Did you do your blood sugar, when's your next insulin?" All the time yeah"* Participant B8: Male, Age 41.

*"So, I try to monitor, ask her questions, "So w-w-what was the result of, uh, your latest, uh, blood works?" So, yeah, I am on top of it. I mean, I really monitor the results of her blood works. And, uh, yeah, watch, uh, watch all the food—the food intake that she normally don't take, like, you know, foods that are rich in carbs and-and fats. So, yeah."* Participant B4: Male, Age 55.

*"Yeah, cause you're the monitor, right, you're making sure that she's doing what she should be doing. Make sure she's doing what she should be doing and not sneaking a cookie in the pantry. So you've gotta be her anchor. So, if she does go one way or the other way, her diet is going off and not doing as well, she's not exercising as much as she should be, you should be the one that, make sure you're the one that coaches her, gets her going and that's it. So be strong for them, be tough but nice about it."* Participant B5: Male, Age 43.

In summary for research question #7, men, like women, felt that general support for the pregnancy was important. However, they did not describe specific behaviours or tasks as the women did but spoke more in terms of being generally supportive. Men also endorsed that making dietary changes as a couple was a significant role for them. Yet some of these men discussed feeling that these diet changes only needed to be maintained when the couple was eating together. Attendance at prenatal care was another common expression of support and men

appreciated the opportunity to ask their own questions. Lastly, some of the men felt that part of their role as a supportive partner was to act as a monitor for their diet and exercise and to offer reminders for other aspects of GD management such as glucose testing and insulin.

### **Research Question #8**

The final research question asks, “What are the information and support needs of women diagnosed with GD and their partners?” This question is intended to assist health care providers and health educators to better understand the needs of pregnant women diagnosed with GD and their partners

**Need to trust the healthcare provider.** Of the eight women and eight men who were interviewed the majority (6 and 4 respectively), spoke about the importance of trusting the guidance of their healthcare providers. Couples generally endorsed that there is a need to trust authoritative knowledge such as obstetricians, dieticians and endocrinologists. Although some participants (and in particular men), felt that there was a disparity between experiential knowledge as expressed by women who had experienced GD, and healthcare professionals’ knowledge, in general participants felt that they should trust their care provider. Participants were asked to identify their main sources of information regarding diabetes. All of the women in the study and four of the men identified a healthcare provider.

*“ Doctor, nutritionist, dietician, um, we have to find out, if you don’t know—if you don’t know anyone, we can find out who’s-who’s that one and then ask from them. But, of course, uh, we-we-we should seek, uh, help from professionals. They are the ones, the ones with the knowledge, training to have background in what to do.”* Participant A4, Female, Age 41.

The attitude of the healthcare provider was also seen as important. If the provider conveyed a sense of confidence regarding the treatment efficacy, this was viewed as

encouraging. Women valued a straight forward, matter-of-fact manner in the delivery of GD information as these two female participants describe.

*“I didn’t feel like my doctor was negative. I felt he was pretty supportive, and he was good at-at not being alarming, like, he was good at saying, okay, this is - this is what I’m seeing. These are the things we can do to monitor it and to help provide, for me, treatment, and, you know, we’ll just watch a little more closely. So I felt pretty reassured. It was like, okay, I’m gonna trust him”*  
Participant A1: Female, Age 31.

*“He just told me what it was about, the test and why I should have it, the things that could happen. That many women get diabetes and the test is easy to do so you know, you know what is happening for you. Why you need to know about things to help yourself and your baby.”*  
Participant A2: Female, Age 32.

**Expressing a need for more prompt follow-up after diagnosis.** The time of the diagnosis was seen as particularly difficult time for many of the participants. Most of the women (n=7), were told of their diagnosis over the telephone. While this was seen as an acceptable way to communicate the diagnosis, many women felt that they needed more prompt in-person follow up. Receiving the diagnosis was described by the majority of the women (n=7), as unexpected and distressing news. Although most stated that they were asked during the phone call if they had any questions, the women felt too overwhelmed at the time to ask even the most basic questions. *“Completely overwhelmed. And then I remember driving home cause I’d gotten the call at work and I was just in tears like just in tears cause I was so worried you know and and honestly it was guilt”* Participant A6: Female, Age 30

*It was shock, just like complete and utter shock. I felt tears in my eyes like right away...I was trying not to cry and trying to think and he [healthcare provider] was saying so do you have any questions and I was just just like trying to think what did he say – diabetes – what! So umm so I just said no no I didn’t have any questions and I can’t even remember getting off the phone. And then Paul [partner] comes home and I tell him I’ve got diabetes. And he’s like more calm and he doesn’t freak out but he has umm like a million questions, what about this and what what should you eat and what does this mean and I have no idea. I didn’t even know when my next appointment was.* Participant A8, Female, Age 32.

Many participants reported waiting weeks for an appointment following the diagnosis and some (n= 5 women and 4 men), expressly discussed the need for a prompter follow-up. These participants described the time between diagnosis and follow-up as the most difficult time of the pregnancy. They felt that, at the time of diagnosis, some preliminary information regarding diet and blood glucose should be offered. *“So to me that was the frustrating part was from the time of finding out to the length. That, that, that was pretty hard cause then you don’t know what you’re doing quite yet until you see the appointment”*. Participant B6: Male, Age 32.

**The need for personalized dietary information.** Once follow-up began, other concerns emerged. The partners in particular (n= 4), felt that information provided by dietitians and endocrinologists was too general to be useful and did not take into account individual factors such as severity of GD, personal dietary preference and lifestyle. These men felt that pamphlets and other take home information was not useful and that they were generally just advised to follow the Canadian Food Guide. There was the general feeling that the information provided was considered to be general health knowledge. One female participant, who had a background in healthcare commented: *“It was just having things I know, from my schooling, basic things like don’t take much sugar and try to get exercise. There was not information I didn’t already know.”* Participant A2, Female, Age 32.

Men felt that a personalized diet plan developed especially for their partner would have been more helpful. Some of the women (n=3) shared this opinion, but it was the men who expressed the most dissatisfaction over the lack of personalized information.

*“It just kind of seemed like they would just bring out like the Canadian food chart and it’ll be like, “Oh well you should be eating you know some of this and like some of this and some of this” and I was like well I could have done that online right [laughs], like why don’t you, you*

*know, do something that-that is different from-from a Canadian health guide, you know food guide.” Participant B3: Male, Age 25.*

*“Cause, I mean, the pamphlet they gave us, far as I’m concerned, is crap...the whole thing was a kind of waste of paper. Like for Allison [partner], she’s going to have a ginger ale at some point you know. That’s just the way it is, no doubt about it. The pamphlets and the doctors and whatever can say “no don’t do that” all they want but it’s gonna happen so how should she deal with that?” Participant B5, Male, Age 43.*

Although there were concerns expressed by some participants about the quality of the education they received, some participants (n= 3 women and 1 man) expressed that they found the dietician in particular to be very helpful. These women stated that after the first visit with the dietician they felt quite confident in their ability to manage their diagnosis. The idea that information needed to be tailored to them specifically was not a factor for women in the same way it was for their partners. One women, speaking several weeks after the birth of her first child expressed:

*“After the first time seeing her [the dietician], I felt like whew, Ok Ok, now I get it. It’s everything, it all was clearer you know, what to eat, when to check my sugar, what to do. And and even, you know when I needed to start with the insulin she was like Oh that’s Ok. It happens. It doesn’t mean you weren’t, that you were doing a bad job, not not following your diet or anything. It just made me feel better...more knowledgeable.” Participant A8: Female, Age 32.*

**Probability-type information is difficult to understand.** Participants also had concerns about the way in which information was expressed. In responding to a question regarding what healthcare providers could do to improve services to women and their partners diagnosed with GD; in addition to describing the need for personalized information, some participants (2 women and 3 men) also had concerns about the way information was expressed. Specifically, they expressed a dislike of probability-type information. This form of information was viewed as confusing and difficult to interpret. One couple, speaking in separate interviews, discussed how they felt about probability-type information by stating:

*“But you just sort of like, skim over those numbers because it’s so hard to figure that out, what does that even really mean.... I can’t really even process that.”* Participant A5: Female, Age 43.

*“I actually hate it in a way. You say something like, you know, one in a thousand and I go oh, that’s actually quite bad. And then they think and then I think about the percentage, one has 0.1% chance. Okay, that actually makes me feel better. It’s just the way the numbers are, right. It’s the same fucking numbers.”* Participant B5, Male, Age 43.

**The internet as a source of information.** Participants were asked about their use of the internet to seek out information or to confirm information given to them by their healthcare provider. Five of the eight couples interviewed stated that they did look up GD information on the internet and/or went to GD related sites. However, there was general agreement that was not a reliable source of information. They felt that too much information, particularly personal stories about very poor outcomes, was overwhelming and could increase worry and stress. One female participant, interviewed at 38 weeks expressed that, while the internet could be helpful, the information could also cause needless worry.

*“Well, it’s like anything on the internet. I went and just kind of looked at the general stuff where they’re suggesting what things to have cause I mean some vegetables and some fruits are definitely worse for sure than others. So, I kind of looked at that and ... you could get a link to look at well, what does this mean if you’re pregnant? What things can go wrong? But the internet is bad for what can go wrong. And I’ve already been hearing you’re 43 and a half and you’re pregnant and there’s all these things that can go wrong. Do I want to read all the bad stories? Like I know I have to do, what I’m supposed to do, so I really don’t want to keep going down the line to find out what is the worst case scenario things that can happen”* Participant A5: Female, Age 43.

A male participant, speaking several weeks after the delivery of their child, commented that while it might seem helpful to read other women’s personal stories, some, especially those with very poor outcomes, could be distressing.

*“It’s [referring to the internet] full all these stories, and who even knows if they’re true or what, all these women and some have everything work out perfect even if they, you know, they don’t, they didn’t follow, do what their doctor said and then there’s these women who are like I did everything I was supposed to and still this and this and this happened. And some of its*

*horrible stuff, like my baby died. So I just told her [partner] not to bother with all that.”*  
Participant B8: Male, Age 41.

Participants spoke of the tension between wanting to seek out additional information and feeling overwhelmed by the amount of available information. One female participant who required insulin to control her diabetes expressed:

*“You have to try-to try not to pay attention to every little thing you hear ‘cause you’ll go- you’ll drive yourself crazy. I usually go for like WebMD or -- and that kind of stuff, and like legitimate web pages with articles that I can actually trust”* Participant A3, Female, Age 26

**Professional vs. mother’s experiential knowledge:** As mentioned, while male participants also expressed the need to trust in the healthcare provider (n=4) some of the men interviewed (n=5) felt that there was a disparity between the authoritative knowledge of the healthcare provider and the experiential knowledge from women who had experienced GD. This created a sense that perhaps healthcare providers did not have all the answers related to the etiology and management of GD. This created a tension between acknowledging the healthcare provider as the expert while simultaneously questioning their knowledge. One expectant first-time father articulated this tension by stating:

*“Um, but it-it’s kind of misleading in a sense when-somebody says, “Oh well I had like a normal sized baby and I never really managed my diabetes” and then you have the doctor saying, “You have to manage the diabetes”. So it’s like well you know who’s right and who’s wrong, is-is there really a right or wrong or are we still kind of in the stage where we’re still trying to understand what gestational diabetes affects in the long run.”* Participant B3: Male, Age 25.

**Men are satisfied to receive information from their partners when they cannot attend prenatal care.** Finally, for three of the couples, the woman’s partner was unable to attend any prenatal care appointments. In these couples, the men expressed that they received the majority of their information regarding GD from their partners. This was seen as a satisfactory

arrangement by both members of the couple. *“He doesn’t really think about it much. He just asks me things and I tell him and that’s fine.”* Participant A2: Female, Age 32.

To summarize the findings for research question #8 “What are the information and support needs of women diagnosed with GD and their partners?”, overall women and their partners were generally satisfied with the care they received, although there were several suggestions for improvement. Men especially felt that information regarding diet needed to be more personalized although this did not appear to be as significant a concern for women. For women, the most pressing concern appears to be a need for quicker follow-up after the initial diagnosis. Women felt that they were too overwhelmed to process information at the time of diagnosis and expressed that the period between initial diagnosis and follow-up was the most stressful time of the pregnancy. Participants indicated that while they did access the internet, this was not a significant source of information. For the women, most indicated they received most of their information from a dietician while most of the men received their information from their partners.

### **Conclusion**

This chapter provided the results of the qualitative component of this study, organized according to research question. Each question was presented and followed by a description of the categories pertaining to that question. Participant quotes were provided to illustrate the category. Key categories found that while participants had knowledge of the complications of GD they expressed that these outcomes were unlikely for them. Couples felt that risk perceptions were a function of personality and not attributable to gender. Both women and men endorsed the importance of making diet changes together and that fathers’ attendance at prenatal care was helpful and desirable. Men expressed that the role of monitor was a way to demonstrate support

to their partners. Couples explained that prompt follow up after diagnosis was important and men felt that personalized dietary plans would be helpful.

## **Chapter 7: Discussion**

Rates of GD continue to increase globally and are particularly high in the province of Manitoba (Assembly of Manitoba Chiefs, 2012). New screening and diagnostic criteria have the potential to increase these rates even higher. GD confers serious long and short-term health risks to both mother and infant (Moen et al., 2017). There is also considerable intervention research designed to reduce rates of GD and/or reduce morbidity associated with the disease. Although a great deal of research has been focused on GD, there are a limited number of studies that focus on the pregnancy risk perceptions of women currently diagnosed with GD and, despite mounting evidence of the importance of paternal involvement in pregnancy and childbirth, there are no studies which directly examine the pregnancy risk perceptions of the woman's partner. This mixed methods study was designed to address these gaps.

This chapter will discuss the key findings from the study in relation to current evidence and to Protection Motivation Theory (PMT), as well as outlining the contributions of this study to the state of the science. The results of the quantitative component of the study will be discussed first, followed by the findings from the qualitative component. The integration of the findings from both methods will also be discussed. The strengths and limitations of the study will be described, followed by a discussion of the overall implications for clinical practice, policy development and future research.

### **Discussion of Quantitative Findings**

#### **Overview of findings.**

This study is the first to examine differences in perception of pregnancy risk among women with GD and their male partners and as such makes a unique contribution to the

understanding of risk perception during pregnancy. A key finding in the quantitative component was that women had significantly higher risk perceptions regarding GD. Women's scores were significantly higher across all three PPRQ subscales, with the largest differences being found in the Risk for Diabetes subscale (women's mean score = 50.8, men's mean scores = 42.1; mean difference 8.7). The Risk to Self subscale had the smallest differences (34.3, 31.7, and 2.6 for women's mean, men's mean and mean difference respectively). The results also identified gender specific predictors of risk perception in pregnancy, which contributes new knowledge to the literature. BMI and perceived stress were independent predictors of increased PPRQ scores in women, while anxiety, GD knowledge, self-efficacy and urban residence were significant predictors of increased PPRQ scores in men. This study did not find any significant predictors of differences in couple's Perception of Pregnancy Risk Questionnaire (PPRQ) scores.

***Differences in perception of pregnancy risk.*** The first quantitative research question was “*Are there differences in perception of pregnancy risk between women with GD and their male partners?*” Women's increased perception of pregnancy risk was demonstrated by significantly higher scores on seven of the 13 items on the PPRQ and all three subscales as compared to their male partners. As there have been no previous studies comparing women's perceptions of pregnancy risk to men's, this is a novel finding. While it may be expected that women's PPRQ scores would be higher than those of their male partner's, it is important to understand the specifics of how scores differ in order to better meet the educational and support needs of both genders. Explanations for this finding can be found in other results from this study as well as by comparing this study to other similar work found in the pregnancy risk perception literature.

This study found that 36.4% of the male partners were unable to attend any prenatal care appointments. While prenatal care attendance was not associated with PPRQ scores, attendance

did impact men's knowledge of GD complications. Women received more education regarding the complications of GD than their partners. However, even attending one prenatal care appointment improved knowledge of complications, as compared to men who were not able to attend. For example, 53.3% of men attending at least one prenatal care appointment correctly identified birth weight greater than 9 pounds as a complication of GD, while only 26.2% of men who did not attend appointments were aware of this complication. For women, 97.2% of the sample (n=104) were aware of this potential complication. Only men who did not attend prenatal care stated they were unaware of any complications associated with GD (n=9, 8.4%). An enhanced awareness of complications may have contributed to higher PPRQ scores among women. Women in this study also reported significantly higher GAD-7 (anxiety) scores as compared to their male partners. This may be due to the fact that it is her health, both present and future, that is being impacted by GD. Concern for her own well-being, as well as for the health of the fetus, may impact women's PPRQ scores.

As there are no other studies which compare pregnancy risk perceptions across gender, the results will be situated within the existing literature on gender differences in risk perception and pregnancy related risk perception. The finding that women's risk perceptions were higher than their male partners is consistent with a large body of literature on gender and risk. Across multiple studies, men consistently rated risks as lower than women (Slovic, 1987). Studies have been conducted on topics as varied as cancer risk (McQueen et al., 2008), nuclear disasters (Murakami, Nakatani, & Oki, 2016), traffic accidents (DeJoy, 1992), and health habits (Von Bothmer & Fridlund, 2005). A common thread in all these studies is the finding that women are consistently more risk adverse than their male counterparts.

Several explanations have been offered for this phenomenon. Women feel more personally threatened by certain risks such as crime, environmental hazards and health risks. This heightened vulnerability has been attributed to a number of factors including the social role of women as nurturer and women's increased awareness and knowledge of these risks (Greenberg & Schneider, 1995; Liere & Dunlap, 1980). Early attempts to explain gender differences in risk perception found that white males who were affluent and well educated consistently rated risks related to health, the environment and activities as very low. This became known as the "white male effect" (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000; Palmer, 2003). Yet further study suggested that the white male effect was more nuanced (Olofsson & Rashid, 2011). Some studies found that the influence on risk perceptions had less to do with gender and ethnicity and more to do with socio-economic resources, political power and white males' privileged position in society. Thus, equality was seen as the mediating factor in risk perceptions (Palmer, 2003).

Although men in this study rated risks related to GD as lower than women, the white male effect does not appear to explain this phenomenon. The white male effect refers to the influence of ethnicity, income and education. While education was an independently significant predictor for men, the other aspects that comprise the white male effect did not influence PPRQ scores in this study. Ethnicity was not a significant predictor of increased pregnancy-related risk in the multiple regression, after adjusting for other variables, and income was not univariately significant. Yet ethnicity did impact the univariate results as for both women and men, Indigenous ancestry was a significant factor. Indigenous participants had the highest PPRQ scores for both women and men ( $M = 49.79$  and  $M = 41.95$  respectively). Caucasian participants had the next highest scores and those from other ethnicities (for example Black, Asian and

Filipino) had the lowest scores. Given that the number of Indigenous women and men who participated in this study was relatively low as compared to other ethnic groups (n= 21 for women and n= 17 for men), it may be possible that ethnicity would have been an independent predictor if the number of Indigenous participants were higher.

The gender difference found in this study may relate more to the meaning participants ascribed to the risk, rather than simply based upon gender. A systematic review and meta-analysis of gender in risk research has found that although men consistently express less concern about risks, men and women are similar in ranking the seriousness of risks. So, while men and women worry about the same things, women tend to worry more ( Byrnes, Miller, & Schafer, 1999). This tendency can be seen clearly in the PPRQ scores in this study. Women and men ranked the seriousness of each PPRQ item the same, with the exception of risk of a birth weight  $\geq 9$ lbs, which was rated second for women and third for men. For all items, the woman's mean risk perception score was higher than the man's. Of note, the couples in the qualitative component stated that they felt their risk perceptions to be about the same, despite some of the couples having very different PPRQ scores. The couples also did not feel that gender was a factor in their level of risk perception, stating that personality was a more important factor.

Applying gender theory to these findings, the meaning of risks can be attributed to social roles, locus of control, power relations and social control. Several studies have found that women are more orientated towards home and family, thus perceiving situations that threatened these elements as more dangerous (DeJoy, 1992; Filippin & Crosetto, 2016; Kahan, Braman, Gastil, Slovic, & Mertz, 2007; Murakami et al., 2016; Wong, Zane, Saw, & Chan, 2013). Certainly, the risk posed by GD threatens the well-being of the fetus and the mother. Mothers also may be concerned about the possibility of future development of Type 2 diabetes for themselves and

their infants and the effect this diagnosis could have on their families. Given that women have the traditional social role of caregiver, these health threats could be related to the higher PPRQ scores and increased levels of anxiety seen in the women. In the qualitative findings, women acknowledged an awareness of these complications and potential health risks but then minimized the extent that they felt the risks applied to them.

Aside from women's social role as the nurturer, women's risk perceptions may be affected by the degree to which society holds pregnant women responsible for the well-being of the fetus. The current discourse on pregnancy as a medical state, rather than a natural one, holds that women should comply with medical surveillance and advice in order to protect the developing fetus. Critical social theorists have discussed how, consistent with the Risk Society thesis, pregnant women are expected to monitor their bodies and are held solely responsible for any issues which arise in pregnancy (Ettorre, 2002; Lupton, 2012; Salmon, 2011). This societal expectation may influence risk perceptions, causing pregnant women to ascribe additional risk to their pregnancies.

In situating this study in the empirical literature involving perceptions of pregnancy risk, the scores reported in this study were comparable to those reported by other researchers for pregnant women with complications but higher than those reported by women without complications. In this study, the total mean PPRQ score for women was 39.0 and for men the mean PPRQ score was 33.6. For the three subscales, the mean scores were 34.3 for women and 31.7 for men in the Risk to Self/Partner subscale. Mean scores in the Risk to Baby subscale were lower; 30.1 and 26.1 for women and men respectively. The highest scores were found in the Risk for Diabetes subscale where the mean score for women was 50.8 and for men was 40.1

In an early study conducted by the developers of the PPRQ, an 11-item version was used to compare the risk perceptions of women with complicated versus uncomplicated pregnancies. In this study 50% of the sample had been hospitalized for at least 48 hours due to an unexpected complication of pregnancy. A mean score of 43.1 and 24.1 out of 100 was reported for women with complicated and uncomplicated pregnancies respectively (Gupton et al., 2001). In the psychometric testing of the PPRQ using an exploratory factor analysis with a population of pregnant women (n= 199); of which 100 were experiencing complications and had been hospitalized, the authors reported a mean score of 32.75 (Heaman & Gupton, 2009). In a recent study which compared risk perceptions between women of advanced maternal age (AMA) to those of younger women, the authors reported similar PPRQ scores. The total score for women at AMA was 29.65, with the highest score reported as 30.97 in the Risk to Self subscale (Bayrampour et al., 2012b).

There are several potential explanations as to why participants' PPRQ scores in this study were generally higher than those found in comparable studies. The most obvious explanation involves the inclusion of the Risk of Diabetes subscale, which, as mentioned, generated very high scores, thus driving up the mean average. Another possible explanation for these higher scores is that the participants in this study have received a diagnosis of a potentially serious complication; so, it stands to reason that this would increase their perceptions of risk.

These findings support the theoretical associations between the Protection Motivation Theory variables of perceived severity (beliefs regarding the seriousness of the disease) and perceived vulnerability (beliefs regarding the extent one feels personally susceptible to the health threat). These women have received a diagnosis of a complication and information regarding the extent to which this condition could harm their own health, or the health of the fetus, thus

emphasizing the severity of the health threat and the extent of their and/or the fetus's vulnerability to the threat. According to Protection Motivation Theory, these two variables, which are part of the threat appraisal process, can increase risk perceptions; the result can be either adaptive or maladaptive depending on the effects of fear (Maddux & Rogers, 1986)

There are multiple studies that have demonstrated that labeling a women's pregnancy as "high-risk" has a detrimental impact on the woman's psychosocial state (Gupton et al., 2001; Heaman et al., 2004; Lupton, 2012; Saxell, 2000; Stahl & Hundley, 2003). High-risk participants in the Gupton et al. study had been hospitalized for at least 48 hours during their pregnancy. The reasons for hospitalization included premature rupture of membranes, threatened pre-term labour, hemorrhage and GD (Gupton et al., 2001). These women then, had also experienced serious pregnancy complications and had high PPRQ scores. These women had a mean PPRQ score of 43.1. This is higher than the scores found in the current study (39.0 for women and 33.6 for men). A study which used a different instrument to measure pregnancy risk perception also found high risk perception scores amongst women who were currently or had been previously hospitalized (Gray, 2006). In Gray's study, women who were currently in hospital had a risk perception score of 86.41 (which would translate into a PPRQ score of 43.21), while women with a history of hospitalization scored 108.94 (which would translate into a PPRQ score of 54.47) (Gray, 2006).

These results suggest that having a complication in pregnancy increases risk perceptions, in both women and their male partners. This increase has been established in pregnant women, and the results of this study indicate that a complication in pregnancy has the same impact on men's risk perceptions.

The second quantitative research questions was; “*What are the gender-specific predictors of perception of pregnancy risk for pregnant women with GD and their male partners?*” This section will detail these predictors, first for women, and then for men.

### **Predictors of pregnancy risk perception for women.**

For the women, out of the 17 predictor variables entered into univariate analysis, nine were found to be significant: age, race/ethnicity, BMI, Winnipeg residence, being born in Canada, PSS scores, KMSS scores, GAD7 scores, and the representativeness heuristic. In the multivariate linear regression only two variables, increased stress and increased BMI were significant independent predictors of increased PPRQ scores, after adjusting for other variables in the model. The final model accounted for 36% of the variance in risk perception scores, indicating that other unmeasured factors accounted for a significant proportion of the variance. It is not unusual for a study on risk perception to result in a relatively low percentage of explained variance; as Coxon and colleagues explain, there are numerous facets to risk assessment in pregnancy and the perspectives of the women, her partner, the care provider and even the community at large must all be taken into account, creating a highly dynamic, complex phenomenon (Coxon et al., 2012).

***Perceived stress.*** Perceived stress was included in the conceptual model and accounted for 10.6% of the variance in PPRQ scores. This adds to the understanding of the effect of perceived stress on the risk perceptions of pregnant women. Other studies have not used perceived stress as a predictor of pregnancy risk, but perceived stress has been associated with a variety of adverse outcomes such as obstetric complications (Alder, Fink, Bitzer, Hösli, & Holzgreve, 2007), low birthweight (Borders, Grobman, Amsden, & Holl, 2007; Lobel et al., 2008), pre-term birth or small for gestational age (Heaman et al., 2013) and inadequate prenatal

care (Heaman, Blanchard, Gupton, Moffatt, & Currie, 2005). In pregnancy risk perception studies that have used a measure of stress, there have been mixed results. A seminal study by Gupton and colleagues found that stress did not contribute to higher risk perception scores for hospitalized women with complicated pregnancies. However, stress was a significant independent predictor of increased risk perception scores for women experiencing an uncomplicated pregnancy. Stress in this study was measured by a subscale of The Prenatal Psychosocial Profile (Gupton et al., 2001).

Stress develops when an individual is exposed to a stimulus (stressor) that is appraised to be threatening and the individual does not feel they have adequate coping resources to manage the stressor (Lazarus, 1984). How stress is measured may be a factor in determining the extent to which stress is able to predict risk perception scores. There are a number of instruments used in pregnancy studies to measure this construct. Two of the most common forms of measurement are stressful life events and perceived stress (Kingston, Heaman, Fell, Dzakpasu, & Chalmers, 2012). It has been suggested that instruments which measure general stressors or daily challenges (hassles), do not adequately capture the unique emotions of pregnancy, which often include negative hassles and positive “uplifts” (DiPietro, Ghera, Costigan, & Hawkins, 2004). Thus, it has been recommended that stress in pregnant women be measured using a pregnancy-specific instruments such as the Pregnancy Experience Scale, as these instruments may provide increased predictive validity (Lobel et al., 2008). However, the Pregnancy Experience Scale contains 41 items, making it difficult to include due to participant fatigue. In this study the 4-item PSS was used to measure perceived stress. Although the PSS measures general stress, the wording was altered to focus on pregnancy, as the phrase “During your/your partner’s pregnancy,....” was

added to the beginning of each question. It may be that a parsimonious instrument designed to specifically measure pregnancy-related stress would have been a more powerful predictor.

Other studies which examine predictors of risk perception in pregnancy have found pregnancy-related anxiety to be significantly associated with increased risk perceptions. Bayrampour et al. conducted a study examining the predictors of risk perceptions for nulliparous women. This study found that pregnancy related anxiety was the strongest independent predictor, accounting for 30% of the variance on its own (Bayrampour et al., 2013). The key differences between this and our study was the use of a pregnancy specific anxiety measurement, the Pregnancy-Related Anxiety Scale (Rini et al., 1999), whereas in this study, a global measure of anxiety, the GAD-7 was used. The Bayrampour work did not include a measurement of stress. There is some indication that the anxiety brought on by receiving a diagnosis of GD may decrease as the pregnancy gets closer to term. In a study comparing women with an index diagnosis of GD to a control group of women with uncomplicated pregnancies, state and trait anxiety were higher in the GD group at time of diagnosis (at approximately 30 weeks); however, by 36 weeks the scores were not significantly different (Daniells et al., 2003).

The fact that this study found that stress remained a significant independent predictor of risk after adjusting for other variables in the model, (recall that anxiety was significant in the univariate model), may be related to issues involving measurement, multicollinearity, and concept definition. The first question involves the measurement of stress and anxiety. Is it preferable to measure stress and anxiety as a global construct or to be more specific? Generally, one should be as specific as possible when measuring psychosocial constructs (Stevens, 2012). In this study there was evidence of collinearity between the anxiety (GAD-7) variable and the stress variable (PSS). These variables were moderately correlated ( $p = .579$ ). In the regression

model, perceived stress was found to be a stronger predictor of perception of pregnancy risk and thus remained in the model. Whether the study finds anxiety or stress to be a significant predictor, there is considerable evidence that strong emotions in general have an impact on risk perceptions (Loewenstein, Weber, Hsee, & Welch, 2001; Xie, Wang, Zhang, Li, & Yu, 2011). A systematic review of studies examining the risk perceptions of women with high-risk pregnancies found a significant association across studies between risk perception and anxiety and stress (Lee et al., 2012).

***Increased BMI.*** The other independent predictor of pregnancy risk perception for women was increased BMI. It should be noted that demographic factors were not included in the conceptual model. Please see Figure 6 in the Discussion section for a revised conceptual model. In the linear regression, for every one-unit increase in BMI, the woman's PPRQ scores increased by .19. This study provides support for the assertion that overweight/obese women are aware of their increased level of risk. This is an important finding in that the majority of studies which examine the association between BMI and GD in pregnant women focus on the women's perceived risk of either developing GD in a subsequent pregnancy (Jones et al., 2012; Jones et al., 2009), or their risk of developing Type 2 diabetes later in life (Bellamy et al., 2009; Kim et al., 2007) and are conducted during the postpartum period. One small Australian study explored health beliefs, satisfaction with diagnostic process and risk perceptions (utilizing an investigator developed online questionnaire), of women currently diagnosed with GD. The authors reported that 73% of the women felt they were at risk for developing Type 2 diabetes in the future and BMI was positively correlated with increased risk perceptions (Goldstein, Gibson-Helm, Boyle, & Teede, 2015). However, this study suffers from a number of methodological and statistical limitations. Risk perception was assessed using an un-validated instrument, the study was conducted

exclusively online so it was not possible to validate that the participants had been diagnosed with GD, the sample size was small (n=48) and the response rate was low (40%) (Goldstein et al., 2015).

This study was one of the few which found BMI to be a significant independent predictor of increased pregnancy risk with participants who were currently pregnant. Most studies which examined the association between BMI and pregnancy risk perception have found no associations between the two. Jones and colleagues used a modified version of the Risk Perception Survey for Developing Diabetes to examine the associations between cardiovascular risk, diabetes risk, knowledge and self-efficacy among non-pregnant American Indigenous women with a previous history of GD (2012). Although women in this study acknowledged that high BMI was associated with greater cardiovascular and diabetes risk (indicating higher knowledge levels), BMI was not predictive of higher risk perceptions. In the qualitative component of this study, women indicated that they did not believe their BMI was high enough to confer increased risk (Jones et al., 2012). This suggests that unrealistic optimism plays a role in mediating between the Protection Motivation Theory variables of severity and vulnerability.

Qualitative studies involving women with GD, or a history of GD provide more evidence of this awareness of increased risk. A study regarding the perspectives of care providers and First Nations and Métis women with GD found that the women were aware of the connection between pre-pregnancy BMI, GD and adverse outcomes. Many of these Indigenous women felt that care providers blamed them for developing GD and made judgements regarding their lifestyle and dietary habits (Tait Neufeld, 2014). Another study of women living with GD and obesity in pregnancy found that social, economic and personal stressors impacted their ability to manage their GD. These women discussed issues such as the increased expense of eating healthy foods

and stated that they felt their care providers did not take these factors into account when creating treatment plans (Jarvie, 2017). In a rare study which included the view of the pregnant woman's partner, Keely and colleagues found that men resisted the stigma of being obese while pregnant and sought to defend their partners from what they viewed as discriminatory treatment (Keely, Cunningham-Burley, Elliott, Sandall, & Whittaker, 2017).

This study supports the research finding that women with a higher BMI are aware of their increased pregnancy risk. The study also suggests that stress persists past initial diagnosis and impacts risk perceptions for a longer time period than has previously been suggested (Daniells et al., 2003; Langer, 2000). Further research is needed to determine other predictors of pregnancy risk, as the model left considerable variance unexplained. Further, more study is required to explicate the differences between stress and anxiety and to what degree each construct impacts risk perception.

#### **Predictors of pregnancy risk perception for men.**

Turning to the significant independent predictors of men's pregnancy risk perception, there appears to be a more varied picture compared to women. In the multivariate analysis, there were five significant predictors of pregnancy risk perception for men, after adjusting for other variables in the model. These variables were: education level, risk familiarity (GDKS scores), dread (GAD-7 scores), area of residence, and self-efficacy (PMTQ scores) ( $R^2 = .37$ ). As there is a scarcity of research concerning men's risk perceptions regarding pregnancy, these results will be situated into the larger body of research on risk perception in general.

***Education level.*** Men's educational level was an independent predictor of increased PPRQ scores, with higher levels of education having a negative association with perceived risk compared to those with up to high school education. However, only incomplete

vocational/university was significant ( $\beta = -0.31$ ,  $p = .004$ ) while complete vocational/university was not significant ( $\beta = -0.18$ ,  $p = .137$ ). This is a novel finding in the pregnancy risk perception literature as this is the only study where education has had an independently significant impact on risk perception scores. It should be noted that education was not a significant predictor for women and previous pregnancy risk perception research has focused exclusively on women. Gupton et al. found that women with lower education levels had more complications in pregnancy; however, education was not included as a predictor in the regression analysis, so it was not possible to determine if education level was itself a significant independent predictor (Gupton et al., 2001). Similarly, Heaman et al. found that women with high risk pregnancies had less education than those with low risk pregnancies (Heaman et al., 1992). Again, this difference in education only applied to objective risk and not to risk perceptions.

In the general risk perception literature, there have been very few studies which examined the association between risk perceptions and education. In their seminal work "*Theories of risk perception: Who fears what and why?*", Wildavsky and Dake (1990) suggest that factors such as social position, knowledge of risks (which is in alignment with psychometric theory), and economic position are potential influences on risk perceptions related to technology, war and the environment. Individuals who possess higher social status and education levels tend to have reduced risk perceptions. These factors have a relationship to education level as those with social and economic power are usually well educated (Wildavsky & Dake, 1990). The relationship between education and health related risk perceptions is poorly understood and represents an area for future study.

The social determinants of health may also play a role in explaining why men with higher education had lower PPRQ scores. Health influencing factors are embedded within broad

societal factors, including those at the individual, community and general population levels (Mikkonen, & Raphael, 2010). Some of these factors may help to explain the connection between education and risk perceptions. At the individual level, education itself is an important determinant of health as those who are well educated generally enjoy better health. This means that those who have lower education levels are more likely to have experienced health issues and thus may be more concerned about a pregnancy condition such as GD. Health literacy is another individual level factor. Those with higher levels of education may be better able to comprehend complicated health information (Mikkonen, & Raphael, 2010). Access to health care services are also associated with higher education (Mikkonen, & Raphael, 2010). Higher education often means that individuals are better equipped to seek out healthcare resources. At the level of community, access to healthcare services may be less available and require more personal advocacy to seek out (Mikkonen, & Raphael, 2010). Thus, men with lower levels of education may not understand the GD information provided to them and may not be able to access additional resources.

***Risk familiarity.*** Another independent predictor of risk perception in men was the psychometric property of risk familiarity. Risk familiarity was operationalized as GD knowledge as measured by the GDKS. For every one-unit increase in GDKS scores, there was a .23 increase in men's PPRQ scores. This finding indicates that as men's knowledge of GD increased, their PPRQ scores also increased. Men's mean percentage score on the GDKS was 52%, compared to 59% for women, indicating an overall lower knowledge level. Men were also less aware of the complications of GD than women, particularly men who did not attend prenatal care appointments.

Recall that psychometrics theorized that individuals with greater knowledge of a risk condition should be more familiar with the risk and thus assess it as less risky (Slovic et al., 1986; Fischhoff et al., 1978), which is contrary to our findings. There are three points for discussion of this finding: how men's knowledge scores in this study compare to those of other study participants, the fact that increased knowledge resulted in higher risk perception scores and that GD knowledge was an independent predictor for men only.

Unfortunately, the original study which developed the GDKS does not report total scores, so it is not possible to make comparisons between that study and our findings. However, a GD knowledge scale was developed for use in another study. Women (n=166) were given a 15-item test, which, like the GDKS, was created by modifying the well validated Diabetes Knowledge Scale created by the American Diabetes Association (Dunn et al., 1984). The mean knowledge score for these participants was 67%, higher than the knowledge scores for women and men found in our study (Hussain, Yusoff, & Sulaiman, 2015). Studies using the Diabetes Knowledge Scale have reported mean scores ranging from 53% (Kueh, Morris, & Ismail, 2017) to 64% (Kueh, Morris, Borkoles, & Shee, 2015). The scores from this study fall within the range of scores found in the literature.

It is possible that differences in how GD knowledge was acquired could account for this difference. Women would have received information about GD directly from a healthcare provider; whereas men, especially those who did not attend prenatal care appointments, would have received GD knowledge from other sources, mainly from the internet and their partner. There was evidence that attending prenatal appointments did improve GD knowledge in men, expressed as a difference in percentage scores (48.73% for no attendance, 53.52% for one appointment and 54.94% for two or more appointments). However, when the association

between prenatal care attendance and the GDKS score was analysed, there was no significant difference in GD knowledge between men who did not attend prenatal care appointments and those who did.

It may also be possible that men initially had very low knowledge regarding GD, and as they learned more about the disease and its potential consequences, they perceived GD as associated with greater risk. The associations between risk perceptions and knowledge are highly varied, both in pregnancy-related risk perception and in the general risk perception literature. In the pregnancy risk perception literature, there is evidence which suggests that knowledge regarding specific pregnancy risk does not lead to increased risk perceptions. Bayrampour et al. (2013) found that knowledge of the risk did not lead to increased risk perceptions in nulliparous women of advanced maternal age. A study which examined the associations between pregnant women's HIV risk perceptions, knowledge and health behaviors found no association between knowledge regarding HIV/AIDS and women's personal assessment of their risk (Stringer et al., 2004). In contrast, studies which examined pregnant women's perceptions of risk regarding medication use during pregnancy found that receiving education regarding the safety of various medications did result in reduced perceptions of risk (Bonari et al., 2005; Koren, 2007; Magee, Maltepe, Lifshitz, Navioz, & Koren, 1999). This suggests that misconceptions or misinformation regarding a risk condition may affect risk perceptions; however, the directionality of the effect is unclear.

The notion that increased knowledge can lead to increased risk perceptions is discussed in seminal work in risk literature. Pioneering studies have found that there is a negative association between risk perceptions and the familiarity of the risk in question (Slovic, 1987; Slovic, Fischhoff, & Lichtenstein, 1986; Tversky & Kahneman, 1974). In these studies, as risk

familiarity increased risk perceptions decreased. Other studies have found that increased knowledge regarding a risk condition leads to increased risk perceptions. For example, a study conducted regarding nurse's knowledge and risk perceptions regarding seasonal influenza vaccination found that those with higher knowledge scores also had higher risk perceptions (Zhang, While, & Norman, 2012). The association between greater knowledge levels and higher risk perceptions has been found in numerous studies on various risk conditions such as breast cancer (Cyrus-David, 2010), HIV/AIDS (Maswanya et al., 1999), and SARS (Brug et al., 2004).

This finding does contribute support to the notion that, under certain circumstances, risk familiarity as operationalized by risk knowledge can result in increased risk perceptions. The factors which contribute to this relationship have yet to be clearly determined and the role of gender is also uncertain.

***Dread.*** Dread was also a significant independent predictor for risk perception in men. According to psychometric theory, the dreadfulness of the risk condition has a positive correlation with risk perceptions (Fischhoff et al., 1978). Dread was operationalized as anxiety and measured by the GAD-7. For every one-unit increase in GAD-7 scores there was a .21 increase in PPRQ scores. This finding adds support to psychometric theory by demonstrating the theorized positive correlation between dread and risk perception scores. As discussed in the section on women's risk perceptions and stress, anxiety has been found to be associated with increased risk perceptions in a number of studies on pregnancy related risk perception among women (Bayrampour et al., 2012b, 2013; Gupton et al., 2001).

The framing of the risk communication may also have an impact of the level of anxiety produced by the diagnosis. It is well established that the way risk information is communicated influences risk perceptions (Boholm, 1998; Fischhoff, Bostrom, & Quadrel, 1993; Thaler, 2008;

Weinstein, 1984). It has been suggested that physicians may deliver pregnancy related risk information in a manner that attempts to convince women of the seriousness of the condition and thus encourage behavioral change (Jordan & Murphy, 2009; MacKenzie Bryers & van Teijlingen, 2010). This has been described as a form of “benevolent sexism” and may represent a belief that pregnant women are somehow a vulnerable group in need of protection and guidance (Sutton, Douglas, & McClellan, 2011; Thomas, Lupton & Pederson, 2017).

Yet the question remains how this relates to partners. It may be that the same communication techniques used to convince women of the seriousness of GD are also effective with men. Whether the men are receiving this information directly from a care provider or from their partner, aspects of risk communication, such as using positive rather than negative outcomes, and the use of “elastic” terms such as likely, probably or rare may have an effect on men’s risk perceptions (Edwards, Elwyn, & Mulley, 2002; Jordan & Murphy, 2009). Men may also be impacted by the use of an absolute versus a relative risk to communicate the probability of an adverse outcome (Keller & Siegrist, 2009). Men may in fact, seek out numerical information regarding pregnancy complications. In a qualitative study which examined men’s reactions to the detection of a soft marker during ultrasound, men reported the need to “get the facts” as a first priority (Åhman, Lindgren, & Sarkadi, 2012,). As was the case in the woman’s discussion regarding stress, it is clear that strong emotion influences risk perceptions.

***Area of residence.*** Another significant independent predictor was area of residence. Residing in Winnipeg was found to decrease PPRQ scores ( $\beta = 0.18$ ,  $p = 0.44$ ). This is consistent with findings from the literature which suggest that individuals who live in rural settings often have higher risk perceptions due to issues such as reduced access to medical care and lack of transportation (Arcury, Preisser, Gesler, & Powers, 2005; Merwin, Snyder, & Katz, 2006).

*Self-efficacy.* The final predictor is self efficacy, a variable in Protection Motivation Theory, measured by the Protection Motivation Theory Questionnaire (PMTQ). Recall that, for this variable, higher scores indicate lower self-efficacy. For every one-unit increase in PMTQ scores there was a 0.17 increase in PPRQ scores for men. This result indicates that, for men who reported lower levels of confidence in their partner's ability to manage GD, their pregnancy risk perception increased.

Protection Motivation Theory suggests that there is a link between self-efficacy (the belief that one is capable of making the recommended changes in health behaviour) and risk perception. Self-efficacy is a component of coping appraisal and, as such, any decrease in self-efficacy would lead to higher risk perceptions (Maddux & Rogers, 1988). In two meta-analyses of the effect of the four Protection Motivation Theory variables, both studies found that self-efficacy had the strongest association with both intention to alter behaviour and cessation of behaviour, indicating that it may be the most important Protection Motivation Theory variable in terms of influencing health behaviours (Floyd et al., 2000; Milne et al 2001). A recent study examined the associations between perception of cardiovascular risks and self-efficacy to alter diet. Participants in this study with higher self-efficacy scores had significantly lower risk perception scores (Imes, Novosel, & Burke, 2016). In general, studies which employ Protection Motivation Theory examine the association between the Protection Motivation Theory variables and the intention to alter health behaviours (protection motivation). This study is one of the few to examine the effect of a Protection Motivation Theory variable on risk perceptions and thus makes a contribution to the understanding of how Protection Motivation Theory (and specifically self-efficacy) impacts perception of risk.

One of the challenges in this study was measuring self-efficacy related to another person's abilities. It must be noted that these results reflect the impact of self-efficacy and risk perception regarding the risks to another person. Recall that men were asked how confident they felt about their partner's ability to manage GD. There is some related literature in the work done with parents who have a child with a condition such as severe allergy, asthma, diabetes or epilepsy. As the child matures, responsibility for management of the disease switches from parent to child. Some of these studies do assess the degree of confidence the parent has in the child's ability to manage. The majority of this work is qualitative and describes the initial struggle in relinquishing control, followed by an increased confidence in the child's ability to self-manage (Heath, Farre, & Shaw, 2017). A quantitative study exploring how parents and young people share the responsibility for chronic illness management found that the parent's degree of confidence in their child's ability (as measured by an investigator developed instrument), was independently significantly associated with higher levels of shared management (Kieckhefer, Trahms, Churchill, & Simpson, 2009). While risk perception was not specifically assessed in this study, high perceptions of disease severity were found to decrease shared care (Kieckhefer et al., 2009). This finding seems to suggest that if the disease is perceived as particularly severe, relinquishing responsibility for care is more difficult.

Of course, the findings from this body of work are not directly applicable to this study as the participants were both adults. However, in the qualitative findings there was discussion regarding some of the men feeling as if they had to monitor their partner's diet and activity level. This suggests that men who did not think their partners were especially capable of managing GD then felt an increased sense of risk. This is an unusual finding in that studies which examine the manner in which hypervigilance impacts self-efficacy and risk perceptions suggest that

hypervigilance leads to increased self-efficacy (Cismaru & Lavack, 2007; Ruiter Kok, Verplanken & Brug, 2001; Umeh, K. 2004). This may have led to a sense of obligation to oversee the women's efforts at GD control. There must be caution with this interpretation as the sample for the qualitative component was small and not all male participants endorsed the role of monitor.

It is noteworthy that partner's BMI was not an independently significant predictor for men. It was noted in the qualitative findings that men appeared to be reluctant to discuss their partner's weight in relation to their knowledge of risk factors for GD. In a qualitative study of the perceptions of obese women and their partners during pregnancy, it was found that men resisted any negative connotations regarding the impact their partner's weight may have on pregnancy (Keely et al., 2017). These male participants felt the need to defend their partners and resist the stigma associated with obesity, especially during pregnancy. It may be that the men in this study felt the same need to resist any indication that their partner's weight may be a contributing factor to the development of GD. This study provides support for the assertion that, even though the risk condition may not directly involve them, men do form risk perceptions regarding pregnancy conditions. This is an important finding in pregnancy risk perception research as it provides evidence that the risk perceptions of men are different than those of women and are influenced by different factors.

The final quantitative research question was "*What demographic and psychosocial characteristics of the dyad are associated with discordance in perceived risk scores?*" Both logistic and multiple regression analyses yielded a consistent lack of significant results. Although this finding (or lack thereof), was unexpected, it nevertheless should be reported and discussed. Non-significant findings also add to the general body of knowledge and should be disseminated

(Lederman & Lederman, 2016). The original hypothesis for this question was based on psychometric theory and theorized that factors such as differences in age, education levels and factors such as having different stress or anxiety scores should have resulted in different risk perceptions between the woman and her partner. The fact that, in this sample, that was not the case does provide some information to the limited knowledge base regarding gendered pregnancy risk perception.

There are several reasons for these non-significant findings. To our knowledge, no previous studies have explored differences in risk perception between members of a couple and therefore, no a priori knowledge regarding the correct statistical approach was available. In addition, it may be that factors contributing to discordance in couple's PPRQ scores is a complex and nuanced issue, and that our study was not designed in such a way to detect these factors, or alternately, that the study was inadequately powered to detect these differences. Given the fact that 73.8% of the couples had concordant scores using a cut-off point of  $\geq 21$  points support the notion that inadequate power may explain the lack of significant results (i.e., only 28 couples had discordant scores). Even when the difference in PPRQ scores for the couple was treated as a continuous variable there were still no significant results. Further study is needed, with a larger sample to attempt to determine what characteristics of the couple might predict discordance in pregnant risk perception scores.

In summary, the quantitative findings for this study added valuable information to the understanding of pregnancy risk perceptions. Notably, the study found that there were unique gender specific predictors of perception of pregnancy risk for women with GD and their male partners. Although, as anticipated, women's risk perception scores were higher than men's, men's risk perception scores were elevated as compared to much of the pregnancy risk

perception literature. This suggests that male partners may have unique concerns and learning needs related to pregnancy.

### **Discussion of Qualitative Findings**

#### **Overview of findings.**

The key findings from the qualitative component were that both women and men simultaneously acknowledged the risks posed by GD but attempted to minimize the degree to which these risks applied to them personally. Women were generally aware of their risk factors for developing GD, although some were surprised by the diagnosis, believing they did not fit with the “typical” woman who developed GD. Participants stated that they did not feel that gender played a role in differing risk perceptions. They expressed that personality factors were more salient to risk perception than gender. Participants held a number of misconceptions regarding GD etiology, severity, and management. For women, their partner’s attendance at prenatal care was an important indicator of support. Both genders agreed that making dietary changes together was a key factor in successfully managing GD, although men often admitted to “cheating” on the diet when away from their partners. Men endorsed the role of “monitor,” seeing themselves as responsible for supervising their partner’s eating habits. This was viewed by the men as an indication of support for behavior change. Both women and men felt that dietary advice needed to be more personalized, although this was stated more emphatically by male participants. Trust in the healthcare provider was viewed as important; however, both genders expressed dissatisfaction at the amount of time between diagnosis and follow-up, describing this as the most difficult time in the pregnancy. The internet was a frequently used source of information; however, couples agreed that this information was not trustworthy and could increase anxiety. For all participants, the main motivator for change was the wellbeing of

the fetus. Couples also saw GD as an opportunity to make needed changes in the families eating habits.

*Simultaneously acknowledging and minimizing risk.* The tendency to acknowledge risk while minimizing personal vulnerability has been described in one other study of pregnant women with GD. An Australian study found that obese/overweight women were able to identify the risk factors for GD yet rated their own risk as low or slight. These women also reduced their level of physical activity during the study period, despite identifying inactivity as a GD risk factor (Harrison et al., 2012).

It may be that the answer for this seeming paradox can again be found in Protection Motivation Theory (PMT). Recall that PMT contains the variables perceived severity and perceived vulnerability. Briefly, perceived severity refers to perceptions regarding the severity of the disease and its potential to affect health. Perceived vulnerability refers to a person's sense that they may be susceptible to the disease. Logically, it would seem that if one's perceived severity is high, and the person has accurate information as to the risk factors for this disease, their perception of personal vulnerability should also be high. However, this is often not the case. Research into the social psychology of risk perception has demonstrated that there is often a disconnect between these two variables (Armor & Taylor, 1998; Sharot, Korn, & Dolan, 2011; Shepperd, Klein, Waters, & Weinstein, 2013).

Explanations for why this occurs are complex but center on a concept known as optimistic bias. The seminal work on this phenomenon comes from Dr. Neil Weinstein, who coined the phrase "optimistic bias" to describe the common misperception that negative health outcomes happen to other people, while perceiving the self to be at less risk (Weinstein, 1982).

Weinstein argued that individuals make comparative risk assessments in an egocentric manner, and that while they may have accurate perceptions regarding the severity of the disease and its risk factors, people also believed that this risk applies more to others than to themselves (Weinstein, 1982).

Optimistic bias is a robust finding and has been demonstrated in a number of health-related studies, ranging from risk for developing high blood pressure (White et al., 2017), contracting H1N1 (Cho, Lee, & Lee, 2013), cancer risk (Hay et al., 2016) and the dangers associated with high-risk sexual behaviours (Taylor et al., 1992). Much of the pregnancy related literature on optimistic bias focuses on the risks of unintended pregnancy and STD transmission, mainly in adolescents. Consistently, these studies have found that young women rate their risks of becoming pregnant or contracting an STD as lower than average, despite admitting to frequent unprotected sex (Ethier, Kershaw, Niccolai, Lewis, & Ickovics, 2003; Reyna & Farley, 2006; Whaley, 2000).

It is possible that the participants in the qualitative component of this study are exhibiting this well documented phenomenon. These participants received information regarding GD and its potential consequences and so were able to identify risk factors for GD and potential adverse outcomes for the mother and baby. Yet there was a reluctance to acknowledge that they (or their partners), might experience these adverse events. Instead, participants may have relied upon factors such as optimistic bias, the representative heuristic and self-serving estimates of their own vulnerability to downplay personal vulnerability. This study demonstrated that men apply the same cognitive measures to acknowledge and minimize risk as women.

Critical social theory provides an additional explanation for this unwillingness to acknowledge personal vulnerability. There exists tremendous social pressure for pregnant women to conform to specific social norms. These include expectations regarding diet, pre-pregnancy weight and gestational weight gain (Lupton, 2012). As GD has become strongly associated with obesity and excessive gestational weight gain, women may feel a need to defend themselves against any suggestion that they have acted in a manner which put the health of the developing fetus at risk. Faircloth refers to this as “identity work”, or the narrative process of self-making that mothers go through to define their position in society as a mother (Faircloth, 2010). In a study of pregnant women with a BMI  $\geq 40$  and their partners, this identity work was described as a process of negotiating an “in-between” path of acknowledging the “problem” of weight while resisting the associated stigma (Keely et al., 2017). The same process was evident in this study, where both women and their partners did not attempt to downplay the seriousness of GD and were able to discuss the implications of the disease, thus presenting themselves as responsible parents who were open to learning about the diagnosis. Yet they also resisted the implication that any of these poor outcomes could apply to them.

*Personality as a determinant of risk perception.* As this is the first qualitative study to ask women and men to reflect on the role of gender in pregnancy risk perception there is little existing literature to draw from. It must be noted that the small sample size does restrict applicability of these findings to other populations. However, even given this limitation, this is an important finding as it demonstrates that although there are clear gender-based differences in perception of risk, these couples believed other factors, such as personality traits, were the greater influence. In particular, the tendency to worry was identified as being associated with higher risk perceptions regarding not only pregnancy but many aspects of life, such as general

health, finances and safety concerns. This focus on personality, and worry specifically may be related to the qualitative finding that stress and anxiety were significant predictors of increased PPRQ scores for women and men respectively. The influence of personality is also evident in women's higher anxiety scores. In studies which measure the construct of worry, it has been established that women tend to worry more than men (Byrnes et al., 1999; Maccoby & Jacklin, 1978). In everyday language, worry and risk perception may seem to be synonyms. However, they are distinct constructs as worry refers to an emotional state, while risk perception is an assessment of the potential for harm (Sjöberg, 2003). It has been theorized that risk perception drives worry and that there is a synergistic effect between the two (Sjöberg, 1998). Further research is required to clearly delineate the impact worry has on risk perception and vice versa. However, as the qualitative results in this study clearly suggest, the two constructs are closely related.

*Adequate GD knowledge.* Participants in this study believed that they possessed adequate knowledge of GD to enable them to successfully manage their disease. This may be related to the PMT variables of response-efficacy and self-efficacy. According to PMT, individuals who believe that the treatment regime (response), offered to them by healthcare providers will be effective in managing their health condition have a greater inclination to change their health behaviour accordingly (Maddux & Rogers, 1983). More importantly, those who believe themselves to be capable of carrying out the recommended changes (self-efficacy), are far more likely to successfully adapt the recommended response. Several meta-analyses of studies which have applied Protection Motivation Theory have found that self-efficacy is the most powerful Protection Motivation Theory variable in predicting behavioural change (Floyd et al., 2000; Milne et al., 2000). While this study did not examine actual health behaviour change, it does

support the importance of response-efficacy and self-efficacy. What this study adds is information regarding how these variables apply to male partners in pregnancy risk perception. The finding that men also discussed their level of GD knowledge in relation to their degree of confidence in their partner's ability to manage GD suggests that it is important for educators to ensure that women's partners are also included in GD education.

The finding that women believe they have adequate GD knowledge has been reported in other studies. In a recent qualitative study, Draffin et al. reported that women diagnosed with GD experienced initial difficulties with understanding GD management but eventually felt they acquired enough knowledge and skills to be successful at controlling blood sugars (Draffin et al., 2016). This finding is also reported in a study in which participants described a process of initially feeling quite unable to manage, and then slowly adapting to the demands of diet restrictions and glucose monitoring to the point of feeling confident (Evans & O'Brien, 2005). Once again, the contribution of this work is the suggestion that men may go through the same process of gradually acquiring skills and knowledge related to GD.

*Comparing their experience with peers.* Both female and male participants discussed how they compared their own experiences with GD with those of their peers. This is consistent with the conceptual framework and the availability heuristic, which postulates that individuals incorporate the experiences of others in forming risk perceptions. This finding supports earlier work on the importance of peer relationships in the formation of risk perceptions. In a qualitative study conducted in Winnipeg, Tait-Neufeld (2011) found that Indigenous women often preferred to acquire information regarding diabetic diet and food choices from their peers who had experienced diabetes, rather than from healthcare providers. The use of the availability heuristic can be seen in other pregnancy related risk perception research. In a study focused on pregnant

women's perceptions of risk regarding Group B Streptococcus (GBS), one of the key findings involved the extent to which women turned to other mothers for information regarding the potential seriousness of GBS. These women formed their risk perceptions almost solely on these personal narratives, which in many cases contradicted medical information. (Darbyshire et al., 2003). However, the salience of the availability heuristic is not found in every study. The importance of information gleaned from the experiences of peers seems to be a primarily qualitative finding as some quantitative studies did not find availability to be a significant aspect of risk perceptions (Bayrampour et al., 2012b, 2013).

It is noteworthy that the quantitative component of this study did not find any associations between the availability heuristic and perception of risk scores. This variable was operationalized by asking participants how many other women they knew who had experienced a pregnancy complicated by GD. It may be that this is not an effective method for accessing information related to availability, and that simply listing a number does not create a greater sense of risk, while discussing the experience of others does have an impact. This is a methodological question deserving of further study.

***Misconceptions regarding GD.*** One of the most consistent qualitative findings concerns a number of misconceptions held by participants regarding GD. Some of these beliefs were shared by both women and men, while some were unique to the men. Some of these misconceptions were corrected during the course of the pregnancy, while others persisted. The fact that these couples, many of whom had already had their baby, still held erroneous beliefs regarding GD suggests that there may be gaps in education regarding GD etiology, management and long-term prognosis.

The misconception most discussed by male participants was the belief that their own or their family's history of either Type 1 or Type 2 diabetes was a contributing factor to their partner developing GD. Some of the women were aware that their partner held this belief and made efforts to explain that their partner's personal/family history had no bearing on GD. This is a novel finding that, to our knowledge, has not yet been described. This finding is important for a number of reasons. It demonstrates that, despite reporting they had adequate GD knowledge, male partners had significant gaps in understanding the etiology of GD. These men were relying on a common-sense approach; as the fetus shared their genetic makeup, they believed that this led to a predisposition towards diabetes. This belief reveals an assumption that the fetus has diabetes as well as the mother. One of the most important concepts in helping parents understand the post-partum management of the infant delivered by a diabetic mother is that the infant does not have diabetes; however, the infant is at increased risk of developing Type II Diabetes in later life (Landon, Catalano & Gabbe, 2012; Moore, Hauguel-De Mouzon, & Creasy, 2014). Believing that they somehow caused their infant to develop diabetes in utero is similar to the often-expressed women's belief that she has caused the GD through being overweight and/or diet choices. Both of these situations add unnecessary burdens and stress to parents and should be addressed by healthcare providers.

Incorrect ideas regarding what constitutes healthy food choices and portion sizes were a common misconception for both women and men. In particular, dairy products and fruit were viewed by participants as healthy foods for a diabetic and participants were surprised to find that intake of these foods is restricted in a diabetic diet. Other studies describe women with GD struggling to understand dietary advice, with some women resorting to a "trial and error" method of meal planning (Carolan, 2013; Hui, 2014). A study conducted with Indigenous women with

GD in Winnipeg found that these women found dietary advice confusing and contrary to their own beliefs regarding healthy foods (Neufeld, 2011). A recent study reported similar findings with regard to fruit, reporting that women with GD were surprised and frustrated that fruit was so restricted and could lead to very elevated sugar levels (Draffin et al., 2016). This finding indicates a need for additional education regarding dietary choices.

***Importance of partner support.*** Participants in this study discussed the importance of partner support, with both genders endorsing the notion that support from the partner was essential in successfully managing GD. In particular, couples felt that attendance at prenatal care was important, both as an expression of support and as an opportunity to ask questions and gain knowledge. Men who were unable to attend appointments expressed regret that they missed these appointments, stating that they would have valued the opportunity to ask questions directly to the care provider.

The importance of paternal involvement in pregnancy care has been well established, both in studies related to GD and within the general pregnancy literature. A recent large Canadian study demonstrated that lack of partner support can have long standing effects on the health and well-being of both mother and child. Urquia and colleagues used data from the Canadian Maternity Experiences Survey to examine the impact of partner disengagement. They found that women who lacked a supportive partner were significantly more likely to experience intimate partner violence, suffer from post-partum depressive symptoms and have non-routine patterns of seeking healthcare for their children (Urquia, Pulver, Heaman, Ray, Daoud, & O'Campo, 2017).

Carolan (2013) described that a supportive environment underpinned all the themes in her qualitative study involving the experience of GD. Emotional support was viewed as essential in adapting to the diagnosis and successful day-to-day management. Marital status was found to be a significant independent predictor of adequate glycemic control in a quantitative study examining the associations between social supports and glycemic control in pregnant women with GD (Colicchia, Parviainen, & Chang, 2016). The lack of support (specifically from partners), was identified as a barrier to successful diabetes control among low-income pregnant women (Yee, McGuire, Taylor, Niznik, & Simon, 2015).

What this study adds is knowledge regarding the male partner's attitudes and feelings regarding his role in providing support. Men identified two primary types of support, emotional and instrumental. Emotional support was described as providing encouragement and praise, while instrumental support was more tacit and involved active indicators of support such as attending prenatal care and altering his own diet and exercise habits. Other studies have identified that these forms of instrumental support are important (Carolan, 2013; Carolan, Gill, & Steele, 2012; Mukona, Munjanja, Zvinavashe, & Stray-Pederson, 2017). However, a novel finding from this study involves men's perceptions of their role as monitor for their partner's health habits. Male participants describe supervising their partner's dietary choices and exercise patterns and felt that this was a way of supporting their partner. Interestingly, women in this study did not comment on their partner monitoring their diet, nor did they indicate a desire for this level of partner supervision.

*Need for personalized dietary plans and prompt follow-up after diagnosis.* Both women and men described the need for more prompt follow-up after diagnosis, as well as the need for more personalized diet plans. Participants described that the time period after diagnosis was

extremely stressful as participants indicated they had inadequate information and knowledge to successfully manage GD. The importance of timely and personalized dietary advice was identified as a key finding in a recent systematic review of qualitative studies (Costi, 2012).

Personalized dietary plans have been identified as important to pregnant women with GD as this allows the woman to tailor food choices to fit her particular lifestyle and culture (Carolan et al., 2012; Colicchia et al., 2016; Figueroa Gray, Hsu, Kiel, & Dublin, 2017). While there is considerable qualitative evidence that waiting for information negatively impacts women diagnosed with GD, there are no studies which examine men's attitudes towards waiting for information or personalized dietary plans. In this study, it was the male participants who were most emphatic regarding the need for personalized food plans. Men also expressed dissatisfaction regarding the education provided by dietitians, while the women in this study either did not mention dietitians or were satisfied with their care. This is a novel finding; however, a recent UK study may contribute to explaining this finding. The UK study sought to explore experiences, attitudes and health-related beliefs of pregnant women with a BMI  $\geq$  40 and their male partners. Several of the women in this study had been diagnosed with GD, and all were aware of the risk of diabetes associated with their weight, while their partners did not feel weight was a contributor to GD (Keely et al., 2017).

The couples in the Keely et al. study performed what has been termed as "identity-work"; which is the narrative process of self-making an identity through describing one's reasons for their behaviors (Faircloth, 2010). In the case of pregnant women with a BMI  $\geq$  40 and their partners, this identity work included simultaneously acknowledging and resisting the stigma associated with obesity (Keely et al., 2017). In particular, the men forcefully defended their partners. One of the ways men rationalized their partner's eating habits was to state that she

received either no, or very little helpful dietary direction from healthcare providers (Keely et al., 2017). It may be then, that the men in this study are defending their partners from direct or implicit social criticism for having diabetes during pregnancy. Yet these results must be interpreted with caution as the sample for the qualitative component of the study was low, as was the number of men ( $n = 7$ ), who participated in the Keely et al study.

Prompt support was another factor discussed by the participants. Both women and men agreed that the wait between diagnosis and the first appointment with a healthcare provider was too long and many stated it was the most difficult aspect of the experience. This is consistent with other qualitative studies which have demonstrated that waiting for information regarding treatment, diet and glucose monitoring is very stressful and increases the sense of fear for the health of the infant and the mother (Cohen et al., 1983; Draffin et al., 2016; Figueroa Gray et al., 2017; Hjelm et al., 2008; Persson, Winkvist, & Mogren, 2010). This study contributes to knowledge of this phenomenon by including the male partner's perspective and the finding that men also feel that the wait for information is too long. Some of the men reported that it was during this waiting period that they began searching the internet for information to try to gain some understanding of disease management.

While this study did report a number of the same issues found in previous GD research, there were a number of topics which are frequently mentioned in the GD literature that did not emerge in this study. Interestingly, many of the qualitative studies involving women with GD also discuss women's reporting a feeling of being out of control in their pregnancy or having the sense that they have lost the hoped-for experience of the "ideal" pregnancy. For example, Nolan et al, (2011), describe how women discussed feeling a loss of personal control during pregnancy, feeling that their pregnancy experience had been "usurped" by healthcare providers and medical

issues and feeling that their blood sugars were beyond their control regardless of diet or medications. These feelings led to a profound sense of loss, and in some cases failure and shame. Loss of control was found to be a theme in other pregnancy risk perception literature. Bayrampour et al. found that perceived control was a key factor for women at advanced maternal age. Those with a higher sense of perceived control had lower risk perceptions (Bayrampour et al., 2012a).

Participants in this study did not report feeling out of control, nor did they discuss a sense of loss over an idealized pregnancy. It may be that, for those women were interviewed post-partum, these feelings had abated since the delivery of a healthy baby and now, in retrospect, did not seem so relevant. As there were only three participants interviewed during pregnancy, it is possible that the lack of discussion around this topic was related to the low number of interviews, although participants were encouraged to discuss their feelings regarding the experience of GD. All of the participants interviewed while pregnant were in the very late stages of pregnancy and this may have also influenced their recollections. These couples may have had sufficient time to come to terms with the diagnosis. It may be that if more participants were interviewed during pregnancy and/or were interviewed closer to time of diagnosis, this issue of loss may have been discussed.

Other studies have reported that many women with GD feel a sense of anxiety regarding eating in social situations when food choices may be limited (Colicchia et al., 2016; Draffin et al., 2016; Hui, Sevenhuysen, Harvey, & Salamon, 2014). This was not reported as a concern by the participants in this study. When asked questions regarding barriers to following a diabetic diet, neither women nor men spoke about challenges in social eating or being offered sugary or high fat foods.

In summary, the qualitative component of this study supported findings from other qualitative work with women diagnosed with diabetes during pregnancy. What this study added to the state of the science is information regarding the male partner. While men reported many of the same experiences in facing their partner's diagnosis, there were notable differences. Men emphasized the importance of personalized dietary plans more than women and were more likely to seek out information on the internet while waiting for a follow up appointment. This may have contributed to the large number of misconceptions men held regarding GD etiology and treatment. Importantly, men described the role of monitor, believing this to be an expression of support. How this monitoring role is viewed by women is an area deserving of further research. The qualitative findings provided more support for the application of Protection Motivation Theory than the quantitative results, indicating that these variables may be more applicable to the interpretation of qualitative findings. It may be that the need to develop a unique Protection Motivation questionnaire for each study impedes the application of this finding in quantitative analysis.

### **Integration of Findings**

In a mixed method study, it is important to consider how the findings were integrated, to describe linkages and detail similarities and differences between the quantitative and qualitative findings (Tashakkori & Teddlie, 2010). Bryman has detailed five questions which should be answered regarding mixed method studies. 1) Are the qualitative and quantitative data collected separately or together? 2) Which method has priority? 3) What is the function of the integration? 4) At what stage(s) in the research process does the integration occur? 5) Is there more than one data strand? (Bryman, 2006).

In this study the quantitative data collection began first as participants in the qualitative component of the study were to be recruited from the quantitative sample. Quantitative data collection began on January 5, 2015. Simultaneous data collection occurred from March 5, 2015 to September 23, 2015. Qualitative data collection continued until January 13, 2016. Quantitative data were given priority as the purpose of the qualitative data was to enhance and refine interpretation of the quantitative data. The function of the integration was primarily exploration and explanation. In exploration (sometimes also referred to as expansion), the intent is to use methodologies from both qualitative and quantitative paradigms to enhance and extend the understanding of a phenomenon (Tashakkori & Teddlie, 2010). In this study, gendered pregnancy risk perception was such a novel area it was felt that the best design for generating the clearest understanding of this issue was to use a mixed methods design. In explanation (also referred to as development), the results from one method assist in informing the understanding and development of the other (Tashakkori & Teddlie, 2010). The qualitative results of this study were used to help refine and enhance the results from the quantitative study, as well as potentially revealing other predictor variables which could then be used to improve future research. Integration occurred at the level of data interpretation. The mixed methods design would have been more appropriately applied had integration also occurred at the level of data analysis when emerging quantitative analysis could have informed qualitative interview questions. This is further discussed in the Limitations section. Lastly, there were two data strands used in this study. A data strand refers to the type of data collected via a specific method (Tashakkori & Teddlie, 2010). This study utilized statistical data generated by quantitative self-report instruments and narrative data generated by face to face semi-structured interviews.

The following sections will discuss the similarities and differences between the quantitative and the qualitative results and how the qualitative findings helped to strengthen the understanding of the quantitative results.

***Similarities.*** There are some points of similarities between the quantitative and the qualitative components of this study. In the quantitative component, GD knowledge was found to be poor, with scores on the GDKS instrument for both women and men below 60% (although this is consistent with diabetes knowledge scores from other studies). During the interviews, it was revealed that participants held a number of misconceptions regarding GD etiology and management, particularly the male participants. It is worth noting that, despite holding these misconceptions, the participants in the qualitative component of the study generally described their GD knowledge level as good. In this case, the quantitative findings helped to pinpoint some of the specific areas of knowledge deficiency regarding GD. This information could assist educators in highlighting certain aspects of GD such as etiology. The fact that male partners held specific misconceptions regarding the role their health/family history had on the development of GD was not detected by the GDKS. This suggests that while knowledge questionnaires may be useful in estimating general knowledge levels, specific knowledge needs may be best identified via interview.

***Differences.*** There were more points of differences between the two components of the study than there were similarities. One of the major differences was in regard to the impact of the availability and representative heuristics. Quantitatively, neither of these variables were a significant predictor of increased pregnancy risk perception for either women or the men. However, in the qualitative interviews, both genders discussed comparing their experiences to that of their peers who had been diagnosed with GD. Five of the women and four of the men discussed the impact of knowing a woman who had been through a pregnancy complicated by GD. This discrepancy suggests that the availability heuristic may be more than merely a function of how many women with GD the participant knows (which was how

availability was operationalized in the quantitative component), and more to do with other factors, such as the nature of the relationship. Availability then may be a factor best explored qualitatively.

With regard to the representative heuristic, for the women who knew another woman with GD, two discussed how that woman had experienced a poor outcome. In both of these cases the participant was keen to describe the differences between their situation and the other woman's, emphasizing differences such as parity, gestational weight gain and diet adherence. Although this is too small a sample to draw any inferences from, it does suggest that, like availability, the representative heuristic may be a more nuanced factor best captured by qualitative methods.

The representative heuristic may also have a part in explaining the qualitative finding that participants could simultaneously acknowledge risk but minimize their own vulnerability. In trying to explain why they felt they would not face many of the adverse outcomes associated with GD, many of the participants emphasized how they felt these risks did not apply to them, citing things like early diagnosis, adherence to diet, or the use of insulin. The representative heuristic was not a significant predictor for either gender in the quantitative analysis. Cognitive heuristics such as representativeness and availability are very complex psychological frameworks that are based on life experiences, knowledge and beliefs and are therefore difficult to measure (Boholm, 1998). It is certainly possible that such an individualized, contextual variable is not amenable to quantitative measurement.

It is worth noting that, in the qualitative findings most of the participants viewed the differences in risk perception as being attributable to individual personalities, rather than to gender. Participants in the qualitative component stated that one's individual personality characteristics affected risk perceptions, especially the tendency to worry. So, despite there being

clear gender differences in the quantitative analysis, the qualitative analysis pointed to a more individualized set of personality characteristics. Further research is needed to identify these factors.

### **How the qualitative findings assisted in the understanding of the quantitative findings**

While perceived stress was an independently significant predictor of increased pregnancy risk perception for women, the participants in the qualitative component did not discuss their stress level during the interview. There was some mention of feelings of worry or concern but neither the women nor the men classified their feelings as stress or anxiety. This may be due to a desire to appear confident and happy about their pregnancy. Many feminist scholars have discussed the societal pressure for women to present an idealized persona during pregnancy (Lupton, 1993, 2012; McNaughton, 2011). It may also be possible, given that only three of the women interviewed were still pregnant, that stress levels could have abated since the delivery of a healthy child and, as such, no longer seemed relevant. The quantitative findings regarding the presence of stress and anxiety allowed for an understanding that participants in the qualitative component may be reluctant to use terms like “stress” or “anxiety” and were more comfortable with more benign emotional descriptors such as “concern” or “worry”.

The quantitative component did include a number of questions regarding sources of information and demonstrated that men were very reliant on their partners for information. However, in the qualitative interviews a much richer, more detailed understanding of the importance of information sources emerged. Both members of the couple spoke about the importance of trust in the healthcare provider and how this relationship could impact concerns regarding the health of the mother and baby.

In the quantitative analysis, the partner's attendance at prenatal care was not a significant predictor of increased pregnancy risk perception. Yet in interviews both women and men spoke of the importance of partner attendance. This finding would seem to indicate that while partner attendance at prenatal care may not impact perception of risk it is still an important dimension of overall satisfaction with the experience of pregnancy. This study did not include, qualitatively or quantitatively, any measurement or specific question directed at satisfaction with care. However, in interviews both genders discussed aspects of care such as trust in the healthcare provider, the importance of timely follow-up appointments and the need for personalized dietary plans. The prevalence of these elements in the qualitative interviews suggests that a measurement of satisfaction with quality of care may be a useful addition to future quantitative studies.

Overall the influence of the qualitative component was limited by the small sample size and the lack of simultaneous qualitative and quantitative analysis. These issues are further discussed in the Limitations section.

### **Performance of the Theoretical and Conceptual Models**

This study utilized both a theoretical and a conceptual model, both to aid in the selection of study variables and to contribute to the analysis and discussion of the findings. Evaluation of the functioning of the models is important in determining what variables were significant predictors and which ones were not, particularly since the women's and men's model predicted a relatively small percentage of the variance in scores and no significant predictors were found for differences in couple's PPRQ scores. Variables may have influenced both components of the study or only contributed to one. Looking at the performance of Protection Motivation Theory in terms of its ability to predict increased risk perception scores, the value of the theory was limited in that it was only a predictor for men. However, it must be considered that only one of the

variables (self-efficacy) was tested. This decision was made to select only the most potentially significant predictors. However, in retrospect, it really cannot be said that this study tested Protection Motivation Theory. If the theory is to be applied to future studies in this area, all four of the variables (perceived severity, perceived vulnerability, self-efficacy and response efficacy) should be included. The theory was quite useful in assisting with the explanation and discussion of a number of the findings, particularly in the qualitative component.

The conceptual model developed by this author was slightly more useful in terms of identifying significant predictors, but in unexpected ways. BMI and education were independently significant predictors for women and men respectively. While these sociodemographic variables were not identified in the conceptual model per se, they were contained within the demographic questionnaire which was included in the model as it contained the questions regarding the cognitive heuristics. This is one of the first studies of pregnancy risk perception to have found significant sociodemographic predictors. While there was very little missing data for BMI, the question asking for years of education contained so much missing data that it could not be used as a continuous variable. When possible, in a linear regression, it is always preferable to use continuous variables as opposed to categories (Polit & Beck, 2012). Although it is not possible to know why so many participants left this question blank it is possible that they did not understand the question. Knowing the potential value of this variable, future studies should frame the question about years of education to include an example so participants are less unsure how to answer.

Risk familiarity and dread are elements of psychometric theory and were significant independent predictors for men, although neither explained a large proportion of the variance. Stress was included in the conceptual model due to its prevalence in other studies of pregnancy

risk perception. Both stress and anxiety were significant in the both the women's and the men's univariate analysis and stress was an independently significant predictor of increased PPRQ scores for women and anxiety was a predictor for men. Recall that anxiety was removed from the women's final model due to issues with collinearity and stress was removed from the men's final model. In future studies it may be important to select either stress or anxiety as included variables.

Marital satisfaction and the cognitive heuristics of availability and representativeness were also included in the conceptual model. Neither contributed to the quantitative analysis; however, availability helped to explain the qualitative finding of comparing one's self to others. There is a lack of reliable and valid instruments to test these constructs and, in general, researchers ask a single question regarding availability and use an investigator developed instrument for representativeness. Development of instruments to examine heuristics is an area for future development.

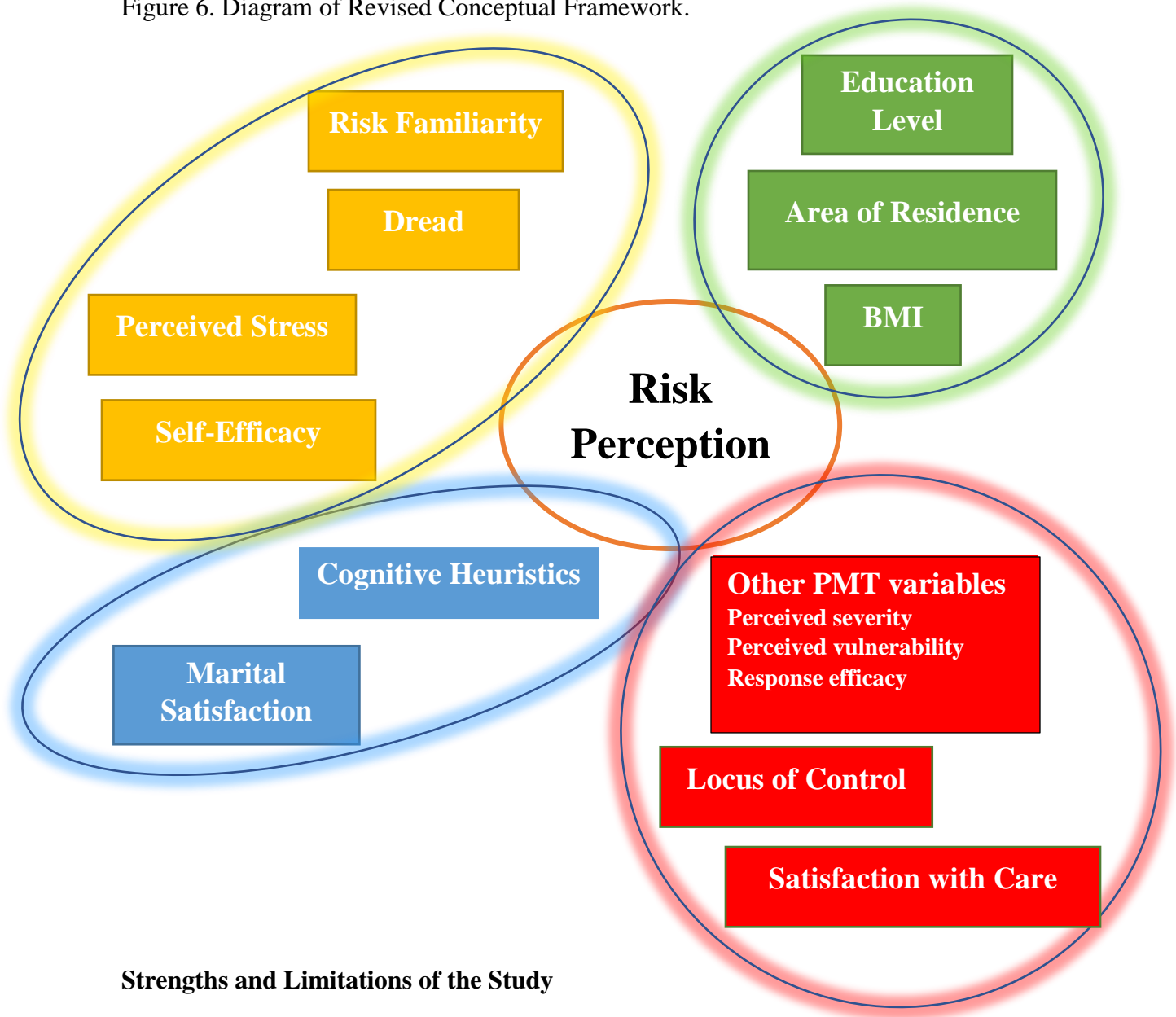
It was felt that, in a study where all participants were couples in an intimate relationship, a measure of the quality of that relationship would be important. Although pregnancy can be a time of increased strain for many relationships, even leading to intimate partner violence (Debono, Borg-Xuereb, Scerri, & Liberato, 2017; Heaman, 2005), couples in this study were overall highly satisfied with their relationship. Of course, it may be the case that selection bias plays a role in this finding. Couples who are highly conflicted may not have been interested in participating in a research study together, or as many of the couples filled out the questionnaires together, they may have been reluctant to indicate dissatisfaction. In future studies, investigators may want to consider the need to measure marital satisfaction and place more focus on exploring

availability and representativeness qualitatively or developing improved quantitative measures of these concepts/constructs.

Lastly, there are variables that were not included in this study that may have contributed either as predictors or in the analysis and discussion. As mentioned, testing of the other three Protection Motivation Theory variables (perceived severity, perceived vulnerability and response efficacy), would have potentially useful. It was determined during the design phase of this dissertation to only include the Protection Motivation Theory variable which, in other studies, proved to have the greatest predictive power related to risk perceptions. This decision was made in an attempt to keep questionnaire items to a minimum and avoid participant fatigue. Also, pregnancy risk literature does discuss the importance of locus of control in influencing decisions (Caughey, Washington, & Kuppermann, 2008; Grinshpun-Cohen, Miron-Shatz, Rhee-Morris, Briscoe, Pras, & Towner, 2015) and in risk perceptions (Bayrampour et al., 2012; Bayrampour et al., 2013).

Figure 5 shows a revised version of the conceptual model. Variables circled in yellow were included in the original model and were significant predictors and/or useful in analysis, variables circled in blue were not significant predictors in the quantitative component but were useful in the qualitative component. Variables circled in green are sociodemographic variables that may require more focus in future studies. Lastly, variables circled in red were not included in this study but could be considered in future work.

Figure 6. Diagram of Revised Conceptual Framework.



### Strengths and Limitations of the Study

#### Strengths of the Study.

This study had a number of important strengths which contribute valuable information to the state of the science. Most significantly, this was, to our knowledge, the first study to examine the perspective of the male partner regarding pregnancy risk perception and discovered several unique gender-specific predictors of risk. The importance of partner involvement in pregnancy and the positive effect this involvement has on pregnancy outcomes has been demonstrated in a number of studies (Alexander, Zhu, Paul, & Kjerulff, 2017; A. P. Alio et al., 2010; Cohen et al.,

2016; Hohmann-Marriott, 2009; Lin, Chang, Chen, Lee, & Chen, 2017; Luo, Wilkins, & Kramer, 2004; Laurie T. Martin, Michelle J. McNamara, Alyssa S. Milot, Tamara Halle, & Elizabeth C. Hair, 2007; Urquia et al., 2017). This study expands on this body of literature to include gender differences in pregnancy risk perception.

The study design, analysis plan and execution conferred a number of important strengths. This study used well validated, psychometrically tested instruments whenever possible. In particular, the PPRQ, which was the instrument used to assess pregnancy related risk perception, is an established instrument used in numerous studies. The PSS, the GAD-7, and the KMSS are also well validated questionnaires. Additionally, the quantitative component was adequately powered by a reasonably large sample size, adding reliability to the findings and minimizing the risk of a Type II error (Polit & Beck, 2012). The statistical analysis plan was developed from the inception of the study with the input of a statistician and consultation was ongoing throughout the data analysis. This ensured that all statistical analyses were reviewed for accuracy by a statistical expert.

In addition, the study contained a very low percentage of missing data. The overall percentage of missing data points was 0.23%, and 11.23 % of those missing data points were amenable to extrapolation via well validated methods, leaving .03% missing. Experts in the field suggest that anything  $\leq 20\%$  missing of the total data is an acceptable percentage that will not jeopardize reliability (Acock, 2005; Duffy, 2000; El-Masri & Fox-Wasylyshyn, 2005). In addition, the majority of the data left as missing was found in one question regarding years of education, resulting in this being treated as a categorical, rather than a continuous variable. The use of both a theoretical and a conceptual framework is another strength, as this assures the study was well grounded in the current literature and in health behaviour theory. Lastly, many

pregnancy risk perception studies which focus on GD recruit participants who have been diagnosed with GD in a past pregnancy and ask them to reflect on the experience. All of the women in the quantitative component of the study and three in the qualitative component were currently pregnant, allowing for contemporaneous exploration of risk perception during pregnancy.

### **Limitations of the Study.**

As in every study, this research work contains limitations. In the context of a dissertation it is important to identify these limitations and view them as an opportunity for learning. (Lunenburg & Irby, 2008). Some of the limitations noted in this section are common to most health and social science research, while others were unique to this study.

Like most nursing research, this study relied upon convenience sampling in the recruitment of participants. This of course, opens the possibility of selection bias, in that those who elected to participate were different than those who did not participate. Certainly, in this study, women without partners or situations when only one member of the couple wished to participate did exclude a number of potential participants. Additionally, participants had to speak, read and write English. In a multi-cultural environment such as Winnipeg, which has a large population of newcomers to Canada, this meant that the perspectives of those couples were not included. As this was a correlational study, it was not possible to make inferences of causality. This study did not include a chart review and was not designed as a longitudinal project. As a result, it is not possible to determine if risk perception was in any way related to glucose control, pregnancy outcomes or the later development of Type 2 diabetes. This is an important area for future research.

There were several key limitations that were unique to this study and thus represent opportunities for improvements in future work. Perhaps most importantly, the study predicted a low amount of variance in the linear regression models when compared to similar studies (Bayrampour et al., 2012a, 2013; Gupton et al., 2001). It is unclear why this occurred, although differences in selection of instruments to study predictors may account for some of the difference. Further study is required to identify additional, more effective predictors of gendered risk in pregnancy.

An unexpected limitation was the lack of results for quantitative research question # 3 which sought to identify the predictors of significant differences in pregnancy risk perception between couples. This may have been due to inadequate power to detect potentially very subtle differences, or problems with arbitrarily creating cut-off points to differentiate discordance in the PPRQ scores (B. Dufault, personal communication, November 30, 2016).

Although many of the instruments used were well validated, there were less well-established instruments used as well. The PMTQ questionnaire was adapted with permission, from a tool used in a previous study on women's perceptions of risk in developing Type 2 diabetes following GD. The demographic questionnaire, which contained the questions operationalizing the variables of availability and representativeness was developed by the investigator. Due to the nature of the study, all of the instruments had to be adapted for use with both female and male participants. This entailed making changes to the PPRQ for administration to men, which may have impacted the instrument's internal validity.

A small number (n=20) of the women in the quantitative component were screened for GD prior to or at 24 weeks. This is earlier than the recommended gestational age for GD

screening as established by the Society of Obstetricians and Gynecologists of Canada, who recommends screening between 24-28 weeks (Berger et al., 2016), and may have resulted in some misclassification of GD (although all the women identified themselves as having a diagnosis of GD). Although it was determined that gestational age at the time of screening was not associated with increased risk perception scores for women or men, it is still possible that early screening influenced their risk perceptions in some manner not detected by the quantitative measures used. None of these couples participated in the qualitative component so it was not possible to probe the effect early screening and diagnosis had on their risk perceptions

Some of the more serious limitations of this study occurred in the qualitative component. An unexpected difficulty in recruiting participants for the interviews resulted in a low sample size for this component. Although the initial goal in the proposal was to recruit 8-12 couples and this goal was met by the recruitment of eight couples, this may not have provided adequate data from which to generate themes. To gain rich descriptions of experiences, more interviews were needed. Low interview numbers can lead to thin data and missing perspectives (Morse, 2010).

The qualitative interview recruitment was also quite prolonged due to difficulties in reaching several of the couples and scheduling a date for the interview. The last two couples were interviewed 3-4 months after delivery, which may have impacted their recollection of feelings during the pregnancy. Also, five of the eight couples were interviewed in the postpartum period. Knowing the outcome of the pregnancy (which was a healthy baby and mother in all cases), may also have coloured their recollections regarding their perceptions of risk during the pregnancy.

Two of the eight couples requested to be interviewed together. The qualitative consent form did specify separate interviews, but it was felt that it would be best to respect the participant's preferences. It is generally advised that couples should be interviewed separately, as to ensure participants feel they are able to speak freely (Taylor & de Vocht, 2011). However, recently there has been support for interviewing couples together. In all interviews, knowledge is co-produced by the researcher and the interviewee. Adding the perspective of a significant partner may be a way of opening new information (Bjørnholt & Farstad, 2014). In the case of these interviews, it would have been preferable to interview the couple separately. In both cases where the couples were jointly interviewed one member of the couple tended to speak more, with the other supplying mainly acknowledgment or agreement with statements made by the more verbal partner.

There were several differences between the quantitative sample and the qualitative sub-sample which indicate that the sub-sample may not be representative of the larger quantitative sample. The most noteworthy difference is that participants in the qualitative component did not have gender-based differences in the PPRQ scores. There were also no differences found in GAD-7 (anxiety) or GDKS (GD knowledge) scores. In the quantitative sample, women had significantly higher scores on both variables. These differences may be attributable to the small sample size or that individual couples who agreed to qualitative participation, and then were able to be interviewed, may have differed from the larger sample in some way. The possibility that selection bias had an important impact on the qualitative findings must be considered a limitation of the study. Although generalizability of qualitative findings is not accorded the same importance as in quantitative studies (Johnson, 1997), the fact that these two samples have marked differences does impact the degree to which the findings can be compared to each other.

Lastly, the qualitative analysis process was undertaken once all the interviews had been completed. It would have been more appropriate and rigorous to conduct data collection and analysis simultaneously as this would have permitted the evolution of the interview guide and potentially improved the quality of interviews. Simultaneous collection and analysis confers the advantage of expanding on emerging concepts, refining questions and probes and generally results in richer data (Sandelowski, 1995). Given the low number of interviews, gaining these advantages had the potential to improve the quality of the qualitative findings.

### **Recommendations for Research, Policy, and Clinical Practice**

**Research.** This study makes a number of important contributions in the advancement of the understanding of pregnancy risk perception. Its main contribution was to include the perspectives of men. The fact that there were unique gender specific predictors of pregnancy risk perception is new knowledge in this field. It is hoped that having a complete understanding of all the factors that may impact the risk perception of a woman diagnosed with GD will lead to more effective behavioral interventions and educational programs. The quantitative findings demonstrate the importance of factors such as high BMI for women. This result does suggest that overweight/obese women are aware of their increased risk during pregnancy. The qualitative findings then demonstrate the manner in which women (and their male partners) acknowledge risk yet minimize its applicability to their own health. Additional research, both qualitative and quantitative, is needed to better explicate this complex and highly nuanced phenomena.

As one of the few studies to examine risk perception in women who were currently pregnant, the study does provide evidence of factors that influence risk perception which are not tempered by knowing the outcome of the pregnancy or recall biases. More research with

pregnant participants will add knowledge to the understanding of risk perception during pregnancy.

**Policy.** The findings of this study highlight the importance of partners' attendance at prenatal care visits. Although quantitatively, attendance at prenatal care was not associated with risk perception, qualitatively, both members of the couple felt that partner attendance was important. The fact that GD knowledge was positively associated with risk perception suggests that male partners need quality, accurate information regarding GD. Currently, in Manitoba, partners are permitted three unpaid days off work as family leave. Attendance at prenatal care is not specifically mentioned as a reason to request family leave so discretion is left to the employer (Manitoba, 2018). The results of this study highlight the importance of paternal attendance and partner engagement. These results may be used to support policy reform to specifically include prenatal care attendance in the Family Leave legislation and to advocate for paid time off for partners. Clinicians may also take action to improve access to prenatal care for male partners by altering their office hours to include evening and weekend appointments.

**Clinical practice.** This study may have positive effects on the provision of clinical care of women diagnosed with GD. The study found that women who are overweight or obese prior to pregnancy are aware of their increased risk, yet the qualitative component suggests that they then minimize the extent of their personal risk. This indicates that clinicians should be as specific as possible to the individual women regarding her degree of risk as this may be a more effective means of communicating risk information. Although providing general risk information is important, information should be tailored in a manner that relates to the woman's specific life experiences. This is consistent with recommendations made by a number of studies regarding translating epidemiological risk into more real-life scenarios (Carolan, 2013; Carolan et al.,

2012; Figueroa Gray et al., 2017; Hui et al., 2014; Mukona et al., 2017). Women who are experiencing increased levels of perceived stress also report higher risk perceptions. Clinicians need to be aware of this association in order to ensure that stress is not excessive and creating strain on the health of the pregnant woman.

The finding that, for men, increased GD knowledge is associated with increased risk perceptions has implications for clinical care, especially given that many men were unable to attend prenatal care appointments and had relatively low knowledge scores. Clinicians need to ensure that, in cases where the woman is responsible for conveying information to her partner, that she understands the information with sufficient depth as to be able to accurately explain the details to her partner. Clinicians may also take measures to increase their accessibility to men who cannot attend prenatal care appointments. Strategies such as being available for phone calls or email contact and providing valid and accurate written information has the potential to improve men's access to information from credible sources and decrease information seeking from less reliable sources such as the internet. When the partner has accurate information regarding pregnancy, he is more able to act as an effective support for his partner (Alexander et al., 2017; Alio, Bond, et al., 2011; Martin et al., 2007). Moreover, a recent study has recommended that clinicians promote convergence between a couple's representations of the consequences of Type 2 diabetes. This with-in couple agreement was found to promote health behaviors such as foot care and checking blood glucose levels (Pereira, Pedras, Machado, & Ferreira, 2016). Ensuring that men have accurate information on par with that provided to the pregnant woman is an important step in creating this convergence.

The qualitative component did suggest some of the consequences of incomplete GD knowledge as many of the men (and to a lesser degree, the women) held misconceptions

regarding the etiology, treatment and long-term consequences of GD. Knowledge of these misconceptions would provide the clinician the opportunity to provide more accurate information which could improve adherence to recommended health behavior change and improve outcomes.

The need for more prompt follow-up appointments after diagnosis was one of the main qualitative findings. Clinicians should be aware that long waits for care after diagnosis causes couples extreme stress and fear for the health of both mother and baby. Ensuring that wait times for follow-up appointments are minimized is an important recommendation.

### **Future Research Directions**

One of the major limitations of the quantitative component of this study was its low predictive ability. Fully 70% of the variance in scores remained unexplained. Additional research, especially qualitative studies, are needed to identify other potential predictors of risk perception for both women and men. Often qualitative research is needed to provide insight into a phenomenon to then examine it quantitatively (Polit & Beck, 2012; Sandelowski, Voils, & Knafel, 2009). A grounded theory study on gendered risk perception in pregnancy may be a useful future study. Grounded theory is a method often used when researchers are seeking to gain a more in-depth understanding of a phenomena and can be used to generate both formal and substantive theories (McCann & Clark, 2003).

The variables of Protection Motivation Theory contributed more to the qualitative analysis where perceived severity and vulnerability were potential explanations for the finding that couples acknowledged yet deflected risks associated with GD. In the quantitative component, the decision was made to only include the variable of self-efficacy, partially because empirical evidence has suggested that this is the most strongly predictive variable and partially

due to a desire to be parsimonious in the selection of items. In retrospect, it may have been more useful to include all four of the Protection Motivation Theory variables, (perceived severity and vulnerability, response and self-efficacy). This may have increased the predictive ability of the regression models.

The amount of variance explained by the regression models was low and addition of other variables in subsequent studies has the potential to improve the predictive power of the models. As just mentioned, testing all four Protection Motivation theory variables may be a useful addition. Applying variables related to gender theory, such as the meaning of risks to both genders, the influence of social roles, and social control could expand the investigation of gender-based pregnancy risk perception to encompass a wider and more nuanced set of variables (Colicchia et al., 2016; Kahan, Braman, Gastil, Slovic, & Mertz, 2005; Kandrack, Grant, & Segall, 1991). Selection of instruments to measure these variables may be difficult. Other studies have found that locus of control was a significant predictor of pregnancy risk perception (Bayrampour et al., 2012b, 2013) that should be added as a potential predictor in future research. The results of the grounded theory study previously mentioned may be useful in determining additional variables for quantitative study.

Improving the reliability and validity of some of the instruments used in this study is another valuable future project. Notably, studies which use a social cognitive theory such as Protection Motivation Theory generally must rely on investigator developed instruments to test elements of the theory and these variables typically predict a very low amount of variance (Ogden, 2003). One of the many suggestions for improvement of the use of social cognitive models is to create psychometrically valid instruments for the various theories (Conner & Norman, 2005; Sutton, 2004). This is a difficult task as studies examine a variety of phenomenon

and the wording of the items must be appropriately contextualized so strict standardization is not possible. It may however, be possible to create a template for the use of Protection Motivation Theory which creates a degree of uniformity on the wording and number of items and in the order that variables are tested. A Delphi study involving recognized experts in the application of Protection Motivation Theory may be a useful approach to creating this template. Similarly, cognitive heuristics lack valid and reliable measurement tools and also rely on investigator developed questionnaires. Often, the availability heuristic is tested using a single question.

Another measurement issue which requires further research is the adaptation of pregnancy specific instruments to be administered to male partners. Specifically, in this study, the PPRQ was revised to be applicable to partners. Additional psychometric testing is required to validate the revised PPRQ for the use in a male population. Testing is also required to further validate the use of a Diabetes Risk sub-scale. It may be that, when tested via factor analysis the questions from the Risk of Diabetes sub-scale actually factor into the Risk to Self and Risk to baby subscale, depending on the nature of the risk situation, as well as with the inclusion of the Diabetes Risk subscale. Further testing using the PPRQ with the diabetes subscale (the PPRQ-D), using a larger sample adequate for exploratory factor analysis may assist in further developing this instrument.

In order to link pregnancy risk perceptions to behavioral change and outcomes, longitudinal work is required. These studies would permit inferences to be made between the presence of elevated risk perceptions and health behaviors and pregnancy outcomes. This would be of particular significance to clinicians as providing evidence that those women with elevated risk perceptions were more or less likely to be adherent to lifestyle modifications and have

positive or adverse pregnancy outcomes would be very beneficial as risk perception testing may serve as an early screening tool during prenatal care.

Lastly, replication of this study with a larger sample size, using the insight gleaned from the grounded theory to select more powerful predictors, well tested instruments developed in the Delphi study on Protection Motivation Theory and the factor analysis of the revised PPRQ, and including women with a previous diagnosis of GD and women who speak languages other than English may permit development of even greater understanding of the factors which influence gendered pregnancy risk perception.

### **Conclusion**

Rates of GD continue to rise worldwide. Studies have indicated that, although precise diagnostic criteria and screening procedures have not been established, GD poses a serious risk to the health and well-being of childbearing women and their children. Unlike many other risk conditions in pregnancy, GD is a self-managed condition and the degree to which the disease is controlled is largely dependent on health behaviors. Existing evidence indicates that there are gaps in the understanding of the factors which contribute to pregnancy risk in women with GD. The most significant gap lies in the lack of understanding regarding how the woman's male partner thinks about the risks associated with GD. This mixed methods study represents an important advancement to addressing this gap. It is also one of the few studies on pregnancy risk perception and GD. The results of this study may help clinicians and educators understand how women and their male partners conceptualize risk as related to GD. This understanding may facilitate the development of effective educational strategies to assist women and their partners in managing diabetes and ensuring a healthy pregnancy for mother and infant.

The key quantitative findings in this study were that women had significantly higher risk perception scores as compared to their male partners and gender specific predictors of increased risk perception scores were identified. The qualitative findings triangulated the quantitative findings in some ways and generated new findings. In both components it was evident that GD knowledge was sub-optimal for both genders, although couples in the qualitative component considered themselves to be well informed regarding GD. The importance of partner support and attendance at prenatal care was a key qualitative finding and, while prenatal care attendance was not significantly associated with increased PPRQ scores, its impact was clear in the interviews. Both components of this study contributed novel findings which have the potential to advance understanding of gender-based pregnancy risk perception.

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## Appendix A.

## ENREB ethics approval and extension certificates



## APPROVAL CERTIFICATE

December 15, 2014

**TO:** Suzanne L. Lennon (Advisor M. Heaman)  
Principal Investigator

**FROM:** Lorna Guse, Chair  
Education/Nursing Research Ethics Board (ENREB)

**Re:** Protocol #E2014:125  
"Gender differences in perception of pregnancy risk among women with gestational diabetes and their male partners: A mixed methods study"

Please be advised that your above-referenced protocol has received human ethics approval by the Education/Nursing Research Ethics Board, which is organized and operates according to the Tri-Council Policy Statement (2). This approval is valid for one year only.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

## Please note:

- If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: <http://umanitoba.ca/research/ors/mrt-faq.html#pr0>)
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

The Research Ethics Board requests a final report for your study (available at: [http://umanitoba.ca/research/orec/ethics/human\\_ethics\\_REB\\_forms\\_guidelines.html](http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html)) in order to be in compliance with Tri-Council Guidelines.



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RENEWAL APPROVAL

November 19, 2015

Dr. Degner Grad Student Research Grant  
43405

**TO:** Suzanne L. Lennon  
Principal Investigator

**FROM:** Zana Lutfiyya, Chair [REDACTED]  
Education/Nursing Research Ethics Board (ENREB)

**Re:** Protocol #E2014:125  
"Gender differences in perception of pregnancy risk among women with gestational diabetes and their male partners: A mixed methods study"

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Please be advised that your above-referenced protocol has received approval for renewal by the Education/Nursing Research Ethics Board. **This approval is valid for one year only.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.



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#### RENEWAL APPROVAL

October 18, 2016

**TO:** Suzanne L. Lennon  
Principal Investigator [REDACTED]

**FROM:** Zana Lutfiyya, Chair  
Education/Nursing Research Ethics Board (ENREB)

**Re:** Protocol #E2014:125 (HS17354)  
"Gender differences in perception of pregnancy risk among  
women with gestational diabetes and their male partners: A  
mixed methods study"

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Please be advised that your above-referenced protocol has received approval for renewal by the Education/Nursing Research Ethics Board. **This approval is valid for one year and will expire on November 18, 2017.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Coordinator in advance of implementation of such changes.

Appendix B.

Health Sciences Center Research Impact Committee/St. Boniface Hospital Research Review Committee access approvals

**Clinical Research - Enrollment Number Information**

Please make corrections, and fill any blank areas, directly onto this page

Report Date: 14-Jul-15

Purpose/Protocol	Gender differences in perception of pregnancy risk among women with gestational diabetes and their male partners: A mixed methods study		
Sponsor	Dr. Lesley Degner Grad Student Grant		
Principal Investigator	Lennon, Ms. S.	RRC#	RRC/2014/1440
Co_Investigator	Dr. Maureen Heaman		

Total number of SBGH - related subjects\* currently active in this study (includes subjects in screening as well as those enrolled): 40

Total number of SBGH - related subjects who have completed the study (only those who completed the study as per the protocol): 38

Total number of SBGH - related subjects overall\*\* (includes all subjects, whether or not they finished): 40  
 \*\*Since the study started.

Is study Active or Closed? Active  Closed  Not Yet Started

Principal Investigator's Dept: College of Nursing, Faculty of Health Sciences

Signature of person completing this form: 

Printed name of person completing this form: Suzanne L. Lennon

Name of Research Coordinator(s) for this study: Suzanne L. Lennon

Coordinator(s) Phone number: 204485-3813

Angela Ramjiawan  
 Office of Clinical Research  
 Fax: 204-237-9860  
 Ph: 204- 237-2226  
 Email: aramjiawan@sbgh.mb.ca  
 By No Later than

**August 31, 2015**

\*NOTE: "SBGH-related" refers to subjects recruited from or at SBGH and subjects from the community who are coordinated by a group or investigator situated at SBGH.

## Appendix C.

Script to aid staff in approaching potential study participants

**Research Project Title: Perception of Pregnancy Risk among Women with Gestational Diabetes and their Partners: The Impact of Gender**

This information is intended to assist you in providing information about the study to potential participants. Women diagnosed with gestational diabetes in the current pregnancy and their male partners are eligible to participate.

**Inclusion criteria.** The following criteria will be used in recruiting participants:

- 1) Nulliparous and multiparous women with a diagnosis of GD in the current pregnancy
- 2) Singleton pregnancy
- 3) The woman must have a male partner willing to participate
- 4) Both the woman and her partner must have the ability to read, speak, write and understand English
- 5) Both the woman and her partner must be 18 years or older
- 6) Gestational age ranging from 32-40 weeks

**Exclusion criteria.** Exclusion criteria will include:

- 1) Women with a known severe psychological disorder
- 2) Women with a diagnosis of GD in a previous pregnancy
- 3) Women with an additional serious complication of pregnancy or pre-existing health condition such as hypertension, placenta previa or heart disease

**Script for use in approaching potential participants.**

A nurse researcher at the University of Manitoba is conducting a study with women who have been diagnosed with gestational diabetes and their male partners. This study is trying to find out if there are differences in how men and women think about risk during pregnancy. The study involves both the woman and her partner completing some questionnaire forms. Filling out these forms takes approximately 15-20 minutes and there is a gift card to thank you for your time. Are you willing to talk to the researcher to hear more about the study? You don't need to make a decision about participation until after you get more information.

A researcher at the University of Manitoba is conducting a study with women who have been diagnosed with gestational diabetes and their male partners. The purpose of the study is to determine if there are differences in how men and women think about risk during pregnancy. The study involves both the woman and her partner completing questionnaire forms. Filling out these forms takes approximately 15-20 minutes and there is a gift card to thank you for your time.

- If the researcher or research assistant is present on the unit please ask if the woman is willing to hear more about the study from the researcher. She doesn't have to decide whether to participate until she has the chance to ask questions. .
- If the researcher/assistant is not present, please note the time of the next appointment (if there is one scheduled) and inform the researcher/RA to ensure the potential participant can be approached at their next appointment.
- Please offer the potential participant an information pamphlet.

Thank you so much for assistance in recruiting participants for this study. Your efforts are greatly appreciated.

## Appendix D.

## Permission to use and modify PPRQ

May 27, 2014

Dear Suzanne Lennon:

Thank you for your interest in the Perception of Pregnancy Risk Questionnaire (PPRQ). I am enclosing a copy of the PPRQ for your use in a research project, as requested. The instrument consists of 9 visual analogue scales. Each item is scored by measuring the distance from the start of the 100 mm line to the vertical mark placed through the line by the participant (score for each item ranges from 0 to 100). You then add the score for each of the 9 items, and divide the total score by 9, to obtain an overall score out of 100. Permission for use of the revised 9-item PPRQ is given with the understanding that the instrument will be administered in its complete form with all scales intact, or adapted with permission, and that the source of the questionnaire (Heaman & Gupton, 2009) will be appropriately referenced in all documents and publications pertaining to the study. I am also requesting that you share your results with me upon completion of the project.

Heaman, M., & Gupton, A. (2009). Psychometric testing of the Perception of Pregnancy Risk Questionnaire. *Research in Nursing and Health, 32*, 493-503.

Other references related to the PPRQ are as follows:

Heaman, M., Gupton, A., & Gregory, D. (2004). Factors influencing pregnant women's perception of risk. *MCN The American Journal of Maternal Child Nursing, 29*(2), 111-116.

Gupton, A., Heaman, M., & Cheung, L. (2001). Complicated and uncomplicated pregnancies: Women's perception of risk. *Journal of Obstetric, Gynecologic, and Neonatal Nursing, 30*(2), 192-201.  
(Note that this study used the former 11-item version of the PPRQ)

I am also granting permission for you to add some additional items to the PPRQ to measure risk related to gestational diabetes.

Please feel free to contact me if you have any questions. Good luck with your project.

Sincerely,

Maureen Heaman, RN, PhD  
Professor

Appendix E.

Revised PPRQ

**PERCEPTION OF PREGNANCY RISK QUESTIONNAIRE**

The following questions ask you to rate your perception of personal risk during this pregnancy, and your perception of risk for your unborn child. There are no right or wrong answers. We are only seeking your opinion. Make your “best guess” of your risk and your unborn child’s risk for a poor health outcome. Do not put your name on the form.

On each of the following rating scales, please put a vertical mark through the line to indicate your assessment of risk for each item (see example).

**EXAMPLE:**

My chances of winning the lottery are:

No Chance \_\_\_\_\_ Extremely High  
At All \_\_\_\_\_ Chance

If you thought your chances of winning the lottery were very high, you might place your vertical mark through the line as follows:

No Chance \_\_\_\_\_|\_\_\_\_\_ Extremely High  
At All \_\_\_\_\_|\_\_\_\_\_ Chance

---

1. The risk for myself during this pregnancy is:

No Risk \_\_\_\_\_ Extremely High  
At All \_\_\_\_\_ Risk

2. The risk for my unborn baby during this pregnancy is:

No Risk \_\_\_\_\_ Extremely High  
At All \_\_\_\_\_ Risk

3. My risk of hemorrhaging (losing too much blood) during this pregnancy is:

No Risk \_\_\_\_\_ Extremely High  
At All \_\_\_\_\_ Risk

4. My risk of having a caesarean section is:

No Risk \_\_\_\_\_ Extremely High  
At All Risk

5. My risk of dying during this pregnancy is:

No Risk \_\_\_\_\_ Extremely High  
At All Risk

6. My baby's risk of being born prematurely is:

No Risk \_\_\_\_\_ Extremely High  
At All Risk

7. My baby's risk of having a birth defect is:

No Risk \_\_\_\_\_ Extremely High  
At All Risk

8. My baby's risk of needing to go to the Neonatal Intensive Care Unit is:

No Risk \_\_\_\_\_ Extremely High  
At All Risk

9. My baby's risk of dying during this pregnancy is:

No Risk \_\_\_\_\_ Extremely High  
At All Risk

Thank you for your cooperation in answering these questions.

Developed by Dr. Maureen Heaman & Dr. Annette Gupton, 2009 (revised 9 item version)

Modifications to the PPRQ to facilitate use with male partners and reflect focus on gestational diabetes

#### **Additional questions specific to GD**

10. My baby's risk of having a birth weight over 9 pounds is:
11. My baby's risk of having a low blood sugar after birth is:
12. My risk of developing diabetes later in life is:
13. My baby's risk of developing diabetes later in life is:

#### **Modifications to PPRQ questions for use with male partners**

1. The risk for my partner during this pregnancy is:
2. The risk for my unborn baby during this pregnancy is:
3. The risk of my partner hemorrhaging (losing too much blood) during this pregnancy is:

4. My partners risk of having a caesarean section is:
5. My partners risk of dying during this pregnancy is:
6. My baby's risk of being born prematurely is:
7. My baby's risk of having a birth defect is:
8. My baby's risk of needing to go to the Neonatal Intensive Care Unit is:
9. My baby's risk of dying during this pregnancy is:
10. My baby's risk of having a birth weight over 9 pounds is:
11. My baby's risk of having a low blood sugar after birth is:
12. My partner's risk of developing diabetes later in life is:
13. My baby's risk of developing diabetes later in life is:

## Appendix F.

## Cohen's Perceived Stress Scale

Please circle the response that best fits how you feel. Please circle only one response.

1. During your/your partner's pregnancy, how often have you felt that you were unable to control the important things in your life?

Never	Almost Never	Sometimes	Fairly Often	Very Often
1	2	3	4	5

2. During your/your partner's pregnancy, how often have you felt confident about your ability to handle your personal problems?

Never	Almost Never	Sometimes	Fairly Often	Very Often
1	2	3	4	5

3. During your/your partner's pregnancy, how often have you felt things were going your way?

Never	Almost Never	Sometimes	Fairly Often	Very Often
1	2	3	4	5

4. During your/your partner's pregnancy, how often have you felt that difficulties were piling up so high you could not overcome them?

Never	Almost Never	Sometimes	Fairly Often	Very Often
1	2	3	4	5

Appendix G.

Permission to use and adapt the PMT Questionnaire

Anca Gaston 

To: Suzanne Lennon

Attachments:

Suzanne Lennon modified PM~1.doc (62 KB)[Open in Browser]

May 30, 2014 8:08 PM

Hi Suzanne,

Nice to hear from you! First of all, you are very welcome to use the questionnaire and to make whatever modifications you deem suitable for your study.

Regarding the questionnaire, I think it looks pretty good! I have made some comments in your questionnaire to give you some things to think about. I hope they are helpful!

Anca

Anca Gaston, Ph.D.

Adjunct Assistant Professor

School of Kinesiology

Faculty of Health Sciences

Western University, London, Ontario, Canada

## Appendix H.

## PMT Self-Efficacy Scale

Scale for use with women

Please circle the best answer. Please circle only one response.

1. For me to do the type and amount of exercise needed to reduce my risk of developing health problems related to gestational diabetes would be...

Extremely Easy	Easy	Not Sure	Difficult	Extremely Difficult
1	2	3	4	5

2. Overall, how confident are you that you are capable of doing the types and amount of physical exercise needed to reduce your risk of developing health problems related to gestational diabetes?

Extremely Confident	Confident	Not Sure	Slightly Confident	Not Confident at all
1	2	3	4	5

3. For me to make the recommended changes in my diet needed to reduce my risk of developing health problems related to gestational diabetes would be...

Extremely Easy	Easy	Not Sure	Difficult	Extremely Difficult
1	2	3	4	5

4. Overall, how confident are you that you are capable of making the recommended changes in diet to reduce your risk of developing health problems related to gestational diabetes?

Extremely Confident	Confident	Not Sure	Slightly Confident	Not Confident at all
1	2	3	4	5

**PMT Self-efficacy Scale for use with men**

Please circle the best answer. Please circle only one response.

1. I think that for my partner to do the type and amount of exercise needed to reduce her risk of developing health problems related to gestational diabetes would be...

Extremely Easy	Easy	Not Sure	Difficult	Extremely Difficult
1	2	3	4	5

2. Overall, how confident are you that your partner is capable of doing the types and amount of physical exercise needed to reduce the risk developing health problems related to gestational diabetes?

Extremely Confident	Confident	Not Sure	Slightly Confident	Not Confident at all
1	2	3	4	5

3. For my partner to make the recommended changes in diet needed to reduce her risk of developing health problems related to gestational diabetes would be...

Extremely Easy	Easy	Not Sure	Difficult	Extremely Difficult
1	2	3	4	5

4. Overall, how confident are you that your partner is capable of making the recommended changes in diet to reduce the risk developing health problems related to gestational diabetes?

Extremely Confident	Confident	Not Sure	Slightly Confident	Not Confident at all
1	2	3	4	5

## Appendix I.

## Permission for use of the Kansas Marital Satisfaction Survey

To: [REDACTED]

June 2, 2014 2:35 PM

Dear Dr. Schumm,

I am hoping you have had the opportunity to read my previous message regarding the use of the KMSS. I would like to include the instrument in my dissertation proposal and would very much appreciate permission to use the scale. Thank you so much for your time and attention.

Best,

Suzanne L. Lennon BA, BN, PhD (c)

College of Nursing

University of Manitoba

email: Suzanne.Lennon@umanitoba.ca

In response to the message from Suzanne Lennon, 25/05/2014

To: Suzanne Lennon

Attachments:

Attachment information (553 B); KMS.ART-Dec2000.doc (151 KB)[Open in Browser]

June 10, 2014 4:41 PM

Dear Suzanne,

Anyone is free to use the KMSS but I do prefer to receive a request for using it. I also like to hear about the results you get with it. I do not charge for use of the scale for academic research. I have attached an older summary of work with the KMSS.

Thanks,

Walter Schumm

Professor of Family Studies

Kansas State University

## Appendix J.

## The Kansas Marital Satisfaction Survey

Please circle the best response. Please circle only one response per question.

1. How satisfied are you with your marriage/relationship?

- |                              |   |
|------------------------------|---|
| Extremely Dissatisfied _____ | 1 |
| Very Dissatisfied _____      | 2 |
| Somewhat Dissatisfied _____  | 3 |
| Uncertain _____              | 4 |
| Somewhat Satisfied _____     | 5 |
| Very Satisfied _____         | 6 |
| Extremely Satisfied _____    | 7 |

2. How satisfied are you with your relationship with your partner?

- |                              |   |
|------------------------------|---|
| Extremely Dissatisfied _____ | 1 |
| Very Dissatisfied _____      | 2 |
| Somewhat Dissatisfied _____  | 3 |
| Uncertain _____              | 4 |
| Somewhat Satisfied _____     | 5 |
| Very Satisfied _____         | 6 |
| Extremely Satisfied _____    | 7 |

3. How satisfied are you with your partner?

- |                              |   |
|------------------------------|---|
| Extremely Dissatisfied _____ | 1 |
| Very Dissatisfied _____      | 2 |
| Somewhat Dissatisfied _____  | 3 |
| Uncertain _____              | 4 |
| Somewhat Satisfied _____     | 5 |
| Very Satisfied _____         | 6 |
| Extremely Satisfied _____    | 7 |

## Appendix K.

## The General Anxiety Disorder Scale

Please circle the best response. Please circle only one response per question.

Over the last 2 weeks, how often have you been bothered by the following problems?

## 1. Feeling nervous, anxious or on edge

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## 2. Not being able to stop or control worrying

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## 3. Worrying too much about different things

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## 4. Trouble relaxing

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## 5. Being so restless that it is hard to sit still

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## 6. Becoming easily annoyed or irritable

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## 7. Feeling afraid as if something awful might happen

Not at all \_\_\_\_\_ 0  
Several days \_\_\_\_\_ 1  
More than half the days \_\_\_\_\_ 2  
Nearly every day \_\_\_\_\_ 3

## Appendix L.

## Permission to use and adapt the Knowledge of Gestational Diabetes Scale

Mary Carolan [REDACTED]

Actions

To: Suzanne Lennon

Attachments:

(2)[Download all attachments](#)

[Knowledge of GDM.pdf \(192 KB\)\[Open in Browser\]](#); [Knowledge of GDM instrumen~1.doc \(47 KB\)\[Open in Browser\]](#)

July 24, 2014 7:31 PM

Hi Suzanne,

That is an interesting idea and I have never thought of using this instrument on men, but I am assuming you are referring to the male partners of women with GDM? In this case, I am happy for you to use this instrument and amend it in whatever way suits your needs. When you write it up, you will outline those changes anyway.

Re -Did you establish cut-off points for determining poor, average and excellent knowledge?

Yes, we established cut-off points in each of the categories we tested. I am attaching the paper we wrote outlining those results.

There were also a number of questions that had more than 1 correct answer and we graded these according to the number of correct answers.

I am sending you a word version of the questionnaire, which will be easier for you to amend. Have a look at the questionnaire and if there are any further questions that you have, I will try and assist,

All the best with your project,  
Mary

**Prof Mary Carolan-Olah**

Professor of Midwifery

College of Health and Biomedicine

Victoria University, PO Box 14428

Melbourne 8001, Australia  
[REDACTED]

CRICOS Provider No. 00124K (Melbourne) CRICOS Provider No. 02475D (Sydney)

### Appendix M.

#### The adapted Knowledge of Gestational Diabetes Scale

Scale worded for use with women.

**Below are some statements about diabetes. There may be more than one correct answer. After reading the statement please circle whatever answers you believe are true. If you do not know the answer, please circle I don't know.**

1. Because I have gestational diabetes, the baby may be:

- a. larger than usual
- b. smaller than usual
- c. born early
- d. admitted to special care
- e. I don't know

2. Women are more likely to develop gestational diabetes if they:

- a. are overweight
- b. have had more than 3 children
- c. are over 30 years
- d. are First Nations, Métis, or from India, Asia or the Middle east
- e. I don't know

3. Because I have gestational diabetes, I may..

- a. need to come to the clinic more frequently
- b. need a caesarean section
- c. develop permanent diabetes later in life
- d. I don't know

4. In uncontrolled diabetes the blood sugar is:

- a. normal
- b. increased
- c. decreased
- d. I don't know

5. Which one of the following is true?

- a. it does not matter if your diabetes is not fully controlled
- b. it is best to show slightly raised blood sugar in order to avoid low blood sugars

- c. poor control of diabetes could result in a greater chance of complications for the pregnancy and the baby
- d. I don't know

6. The normal range for blood sugar is:

- a. 4-8 mmol/L
- b. 7-15 mmol/L
- c. 2-10 mmol/L
- d. I don't know

7. Margarine is mainly:

- a. protein
- b. carbohydrate
- c. fat
- d. mineral and vitamin
- e. I don't know

8. Rice is mainly:

- a. protein
- b. carbohydrate
- c. fat
- d. mineral and vitamin
- e. I don't know

9. The presence of ketones in the urine is:

- a. a good sign
- b. a bad sign
- c. a usual finding in diabetes
- d. I don't know

10. You can eat as much as you like of the following foods:

- a. Apples
- b. Celery
- c. Meat
- d. Honey
- e. I don't know

11. A low blood sugar is caused by:

- a. having too much insulin in the body
- b. having too little insulin in the body
- c. too little food
- d. too little exercise
- e. I don't know

12. Women with gestational diabetes should:

- a. do moderate exercise such as walking
- b. exercise more than women who do not have gestational diabetes
- c. rest more than women who do not have gestational diabetes
- d. I don't know

13. Exercising when you have gestational diabetes:

- a. lowers your blood sugar
- b. raises your blood sugar
- c. allows you to eat more
- d. prevents excessive weight gain
- e. I don't know

14. Gestational diabetes is:

- a. present during pregnancy
- b. disappears once the baby is born
- c. may lead to diabetes in later life
- d. is not very serious
- e. I don't know

15. Gestational diabetes may be treated with:

- a. diet
- b. diet and exercise
- c. insulin
- d. pills
- e. I don't know

16. Two of the following substitutions are **wrong**. Which are they?

- a. 30 grams of bread = 4 crackers
- b. one egg = one small pork chop
- c. 200mls milk = 200mls orange juice
- d.  $\frac{3}{4}$  cup of cornflakes =  $\frac{3}{4}$  cup cooked porridge
- e. I don't know

17. If I **don't** feel like the egg suggested on my diet for breakfast, I can:

- a. have an extra piece of toast
- b. substitute 3 pieces of bacon
- c. have 30 grams of cheese instead
- d. not eat anything
- e. I don't know

18. When the baby is born:

- a. My diabetes will disappear
- b. I don't need to worry about being diabetic any more
- c. I should get a follow up glucose test at my 6 weeks check up
- d. I don't know

Scale worded for use with men

**Below are some statements about diabetes. There may be more than one correct answer. After reading the statement please circle whatever answers you believe are true. If you do not know the answer, please circle I don't know.**

1. Because my partner has gestational diabetes, the baby may be:

- f. larger than usual
- g. smaller than usual
- h. born early
- i. admitted to special care
- j. I don't know

2. Women are more likely to develop gestational diabetes if they:

- f. are overweight
- g. have had more than 3 children
- h. are over 30 years
- i. are First Nations, Métis, or from India, Asia or the Middle east
- j. I don't know

3. Because my partner has gestational diabetes, she may:

- e. need to come to the clinic more frequently
- f. need a caesarean section
- g. develop permanent diabetes later in life
- h. I don't know

4. In uncontrolled diabetes the blood sugar is:

- e. normal
- f. increased
- g. decreased
- h. I don't know

5. Which one of the following is true?

- e. it does not matter if your diabetes is not fully controlled
- f. it is best to show slightly raised blood sugar in order to avoid low blood sugars
- g. poor control of diabetes could result in a greater chance of complications for the pregnancy and the baby
- h. I don't know

6. The normal range for blood sugar is:

- e. 4-8 mmol/L
- f. 7-15 mmol/L
- g. 2-10 mmol/L
- h. I don't know

7. Margarine is mainly:

- f. protein
- g. carbohydrate
- h. fat
- i. mineral and vitamin
- j. I don't know

8. Rice is mainly:

- f. protein
- g. carbohydrate
- h. fat
- i. mineral and vitamin
- j. I don't know

9. The presence of ketones in the urine is:

- e. a good sign
- f. a bad sign
- g. a usual finding in diabetes
- h. I don't know

10. You can eat as much as you like of the following foods:

- f. Apples
- g. Celery
- h. Meat
- i. Honey
- j. I don't know

11. A low blood sugar is caused by:

- f. having too much insulin in the body
- g. having too little insulin in the body
- h. too little food
- i. too little exercise

j. I don't know

12. Women with gestational diabetes should:

- e. do moderate exercise such as walking
- f. exercise more than women who do not have gestational diabetes
- g. rest more than women who do not have gestational diabetes
- h. I don't know

13. Exercising when you have gestational diabetes:

- f. lowers your blood sugar
- g. raises your blood sugar
- h. allows you to eat more
- i. prevents excessive weight gain
- j. I don't know

14. Gestational diabetes is:

- f. present during pregnancy
- g. disappears once the baby is born
- h. may lead to diabetes in later life
- i. is not very serious
- j. I don't know

15. Gestational diabetes may be treated with:

- f. diet
- g. diet and exercise
- h. insulin
- i. pills
- j. I don't know

16. Two of the following substitutions are **wrong**. Which are they?

- f. 30 grams of bread = 4 crackers
- g. one egg = one small pork chop
- h. 200mls milk = 200mls orange juice
- i. 3/4 cup of cornflakes = 3/4 cup cooked porridge
- j. I don't know

17. If I **don't** feel like the egg suggested on my diet for breakfast, I can:

- f. have an extra piece of toast
- g. substitute 3 pieces of bacon
- h. have 30 grams of cheese instead
- i. not eat anything
- j. I don't know

18. When the baby is born:

- e. My partner's diabetes will disappear
- f. My partner doesn't need to be worried about being diabetic any more
- g. My partner should get a follow up glucose test at her 6 weeks check up
- h. I don't know

## Appendix N.

## Demographic questionnaire for women and men

## Demographic Questions for Women

Identification Number: \_\_\_\_\_

- 1) Please tell me your age in years. \_\_\_\_\_
- 2) What did you weigh before you became pregnant? \_\_\_\_\_ pounds or \_\_\_\_\_ kgs
- 3) How tall are you? \_\_\_\_\_ Feet and inches or \_\_\_\_\_ cms
- 4) How many weeks pregnant are you? \_\_\_\_\_
- 5) What is your due date? \_\_\_\_\_
- 6) How many weeks pregnant were you when you were diagnosed with gestational diabetes? \_\_\_\_\_
- 7) What is your marital status? Please check the best option  
\_\_\_\_\_ Married and living with your spouse  
\_\_\_\_\_ Common law and living with your partner  
\_\_\_\_\_ Other (please explain) \_\_\_\_\_
- 8) How many years have you been in a relationship with your current partner? \_\_\_\_\_
- 9) Including this pregnancy, how many times have you been pregnant? \_\_\_\_\_  
\*If you answered 1 please skip to Question # 12

10) How many of your past pregnancies have been with your current partner? \_\_\_\_\_

11) How many children do you have? \_\_\_\_\_

12) What is your highest level of education?

\_\_\_ no schooling

Elementary school

\_\_\_ Incomplete

\_\_\_ Complete

Junior High School

\_\_\_ Incomplete

\_\_\_ Complete

High School

\_\_\_ Incomplete

\_\_\_ Complete

Vocational/Technical College

\_\_\_ Incomplete

\_\_\_ Complete

University

\_\_\_ Incomplete

\_\_\_ Diploma

\_\_\_ Bachelor's Degree

\_\_\_ Master's Degree

\_\_\_ Doctorate

13) How many years of formal education have you completed starting with grade one but not counting any repeated years in the same grade?

\_\_\_\_\_ Years

14) Which of the following best describes your racial background? Please check only one.

\_\_\_ Arab/West Asian (e.g. Armenian, Egyptian, Iranian, Lebanese, Moroccan)

\_\_\_ Asian

\_\_\_ Black

\_\_\_ Filipino

\_\_\_ First Nations

- Inuit
- Métis
- Latino (Hispanic)
- White (Caucasian)
- Other (please specify) \_\_\_\_\_

15) Were you born in Canada?

- Yes
- No

If No – How many years have you lived in Canada?

\_\_\_\_\_ Years

16) Please indicate the average family income of all members of your household for the past year before taxes and deductions. Please remember that all your responses will be kept confidential.

- Under \$10,000
- \$10,000 - \$19,999
- \$20,000 - \$29,999
- \$30,000 - \$39,999
- \$40,000 - \$49,999
- \$50,000 - \$59,999
- \$60,000 - \$69,999
- \$70,000 - \$79,999
- \$80,000 - \$89,999
- \$90,000 - \$99,999
- Over \$100,000

17) Thinking back to when you were diagnosed with gestational diabetes, what complications did your healthcare provider tell you could result from diabetes in pregnancy? Please check all that you can recall.

- Increased chance of needing a cesarean section
- Increased chance of having too much bleeding after delivery
- Your baby might be born weighing over 9 pounds
- The baby might have to go to a Neonatal Intensive Care Nursery (NICU)
- You might be at increased risk for developing Type 2 Diabetes later in life

- \_\_\_ The baby might be at increased risk for developing Type 2 Diabetes later in life
- \_\_\_ There is a chance that the baby could die before being born (stillbirth)
- \_\_\_ Increased chance of a difficult vaginal birth
- \_\_\_ The baby may have low blood sugars following birth
- \_\_\_ Other (please describe) \_\_\_\_\_

18) How many other women have you known with a diagnosis of gestational diabetes? \_\_\_\_\_

19) Compared to the average pregnant woman, I feel my chance of having a difficult labour and delivery is...

Extremely Low	Quite Low	About the Same	Quite High	Extremely High
1	2	3	4	5

20) Compared to other babies, I feel that my baby’s chance of developing health problems after birth is...

Extremely Low	Quite Low	About the Same	Quite High	Extremely High
1	2	3	4	5

21) Compared to the average pregnant woman, I feel my chances of developing diabetes later in life is...

Extremely Low	Quite Low	About the Same	Quite High	Extremely High
1	2	3	4	5

22) Were you prescribed insulin during your pregnancy?

Yes \_\_\_\_\_

No \_\_\_\_\_

## Demographic Questions for Men

Identification Number: \_\_\_\_\_

- 1) Please tell me your age in years. \_\_\_\_\_
  
- 2) What is your marital status? Please check the best option  
\_\_\_\_\_ Married and living with your spouse  
\_\_\_\_\_ Common law and living with your partner  
\_\_\_\_\_ Other
  
- 3) How many years have you been in a relationship with your current partner? \_\_\_\_\_
  
- 4) Is this your first time fathering a pregnancy?  
\_\_\_ Yes\*  
\_\_\_ No  
\*If you answered Yes - please move to Question # 7
  
- 5) How many of the past pregnancies you have fathered have been with your current partner? \_\_\_\_\_
  
- 6) How many children do you have? \_\_\_\_\_

7) What is your highest level of education?

- no schooling
- Elementary school
- Incomplete
- Complete
- Junior High School
- Incomplete
- Complete
- High School
- Incomplete
- Complete
- Vocational/Technical College
- Incomplete
- Complete
- University
- Incomplete
- Diploma
- Bachelor's Degree
- Master's Degree
- Doctorate

8) How many years of formal education have you completed starting with grade one but not counting any repeated years in the same grade?

\_\_\_\_\_ Years

9) Which of the following best describes your racial background?

- Arab/West Asian (e.g. Armenian, Egyptian, Iranian, Lebanese, Moroccan)
- Asian
- Black
- First Nations
- Filipino
- Inuit
- Métis
- Latino (Hispanic)
- White (Caucasian)
- Other (please specify) \_\_\_\_\_

10) Were you born in Canada?

Yes

No

If No – How many years have you lived in Canada?

\_\_\_\_\_ Years

11) Please indicate the average family income of all members of your household for the past year before taxes and deductions. Please remember that all your responses will be kept confidential.

Under \$10,000

\$10,000 - \$19,999

\$20,000 - \$29,999

\$30,000 - \$39,999

\$40,000 - \$49,999

\$50,000 - \$59,999

\$60,000 - \$69,999

\$70,000 - \$79,999

\$80,000 - \$89,999

\$90,000 - \$99,999

Over \$100,000

12) Were you present at any appointments where a healthcare professional discussed gestational diabetes?

Yes

No (please skip to question # 15)

13) How many appointments where a healthcare professional discussed gestational diabetes were you able to attend? \_\_\_\_\_

14) Thinking back to the prenatal appointment(s) or Fetal Assessment Unit visits you were able to attend with your partner, what complications did the healthcare provider tell you could result from diabetes in pregnancy? Please check all that you can recall.

- Increased chance of needing a cesarean section
- Increased chance of having too much bleeding after delivery
- Your baby might be born weighing over 9 pounds
- The baby might have to go to a Neonatal Intensive Care Nursery (NICU)
- You might be at increased risk for developing Type 2 Diabetes later in life
- The baby might be at increased risk for developing Type 2 Diabetes later in life
- There is a chance that the baby could die before being born (stillbirth)
- Increased chance of a difficult vaginal birth
- The baby may have low blood sugars following birth
- Other (please describe) \_\_\_\_\_

15) As you were not able to attend appointments, what complications of gestational diabetes did your partner share with you?

\*If you were able to attend appointments please skip this question.

- None
- Increased chance of needing a cesarean section
- Increased chance of having too much bleeding after delivery
- Your baby might be born weighing over 9 pounds
- The baby might have to go to a Neonatal Intensive Care Nursery (NICU)
- You might be at increased risk for developing Type 2 Diabetes later in life
- The baby might be at increased risk for developing Type 2 Diabetes later in life
- There is a chance that the baby could die before being born (stillbirth)
- Increased chance of a difficult vaginal birth
- The baby may have low blood sugars following birth
- Other (please describe) \_\_\_\_\_

16) How many other women have you known with a diagnosis of gestational diabetes? \_\_\_\_\_

17) Compared to the average pregnant woman, I feel my partner's chance of having a difficult labour and delivery is...

Extremely Low	Quite Low	About the Same	Quite High	Extremely High
1	2	3	4	5

18) Compared to other babies, I feel that my baby's chance of developing health problems after birth is...

Extremely Low	Quite Low	About the Same	Quite High	Extremely High
1	2	3	4	5

21) Compared to the average pregnant woman, I feel my partner's chances of developing diabetes later in life is...

Extremely Low	Quite Low	About the Same	Quite High	Extremely High
1	2	3	4	5

## Appendix O.

## Incidence and handling of missing data

Table O1: Incidence and handling of missing data

Question	Part. #		Decision	Rationale for decision
Couple's Missing Data				
Entire responses for both woman and partner	05		Deleted	No data available for the partner
	40			Extensive amounts of missing data
Women's Missing Data				
Question	Part. #	N (%) missing in total sample	Decision	Rationale for decision
PPRQ #3: Risk of hemorrhaging	36	1 (.93)	35	Group mean imputation
PMT #3: Make the recommended changes in diet would be...	11	1 (.93)	3	Multiple imputation
GAD7 #7: Feeling afraid as if something awful might happen	32	1 (.93)	0	Multiple imputation
Demo #6: Weeks pregnant at diagnosis	08	3 (2.8)	Left as missing	This is a descriptive variable not included in the univariate analysis.
	20			
	55			
Demo #8: Years in relationship with current partner	21	1 (.93)	Changed to 3	Information extrapolated from partner's answer to the same question.
Demo #10: # of past pregnancies with current partner	11	1 (.93)	Left as missing	This is a descriptive variable not included in the univariate analysis.
Demo #12: Highest level of education	45	2 (1.7)	Left as missing	Analysis using this variable was conducted with an n of 105
	59			

Demo #13: Years of formal education	08	7 (6.5)	Left as missing	There is no way to impute this variable. Categories of education will be used.
	21			
	22			
	45			
	57			
	59			
	76			
Demo #15a: Years lived in Canada		1 (.93)	Left as missing	This is a descriptive variable not included in the univariate analysis.
Demo #16: Average family income	16	3 (2.8)	Changed to 3 \$20,000- \$29,999	Information extrapolated from partner's answer to the same question.
	54		Changed to 1 <\$10,000	
	59		Changed to 4 \$30,000- \$39,999	
Demo #24: Prescribed insulin		1 (.93)	Left as missing	Analysis using this variable was conducted with an n of 106
Men's Missing Data				
PSS #1: Felt that you were unable to control the important things in your life	36	3 (2.8)	4	Multiple imputation
	59		4	
PSS #4: Felt that difficulties were piling up so high you could not overcome them?	1		3	
Demo #3: Years in relationship with current partner	12	1 (.93)	Changed to 3	Information extrapolated from partner's answer to the same question.
Demo #5: Past pregnancies fathered with current partner	12	1 (.93)	Changed to 0	Information extrapolated from partner's answer to related question.
Demo #6: # of children	12	2 (1.7)	Left as missing	This is a descriptive variable not included in the univariate analysis.
	24			
Demo #7: Highest level of education	36	1 (.93)	Left as missing	Analysis using this variable was conducted with an n of 106
Demo #8: Years of formal education	04	11	Left as missing	There is no way to impute this variable. Categories of
	07			

	15			education will be used.
	28			
	36			
	81			
	82			
	84			
	86			
	92			
	100			
	109			
Demo #9: Racial background	36	1 (.93)	Left as missing	Analysis using this variable was conducted with an n of 106
Demo #10a Years lived in Canada	35	1 (.93)	Left as missing	This is a descriptive variable not included in the univariate analysis.
Demo #11: Average family income	38	3 (2.8)	Changed to 2 \$10,000- \$19,999	Information extrapolated from partner's answer to the same question.
	68		Changed to 6 \$50,000- \$59,999	
	84		Changed to 1 <\$10,000	

## Appendix P.

## Research Question #3. Logistic regression analysis plan and results

*Analysis Plan*

Similar to linear regression, a logistic regression analyzes the relationship between multiple independent variables on a dependent variable and yields a predictive equation. In a logistic regression however, the dependant variable must be categorical. In this study the categorical dependent variable was concordance vs. discordance in the couple's PPRQ scores. The predictor independent variables can be continuous or categorical (Polit & Beck, 2012). In this analysis the predictor independent variables were transformed into dichotomous variables. Logistic regression uses a maximum likelihood estimation (Kessler, Chiu, Demler, & Walters) which estimates the parameters most likely to have generated the observed data. MLE transforms the probability of an event occurring into odds, which reflect the ratio of an event occurring or not occurring. This generates a statistic called a regression coefficient or  $b$ , which can be interpreted as the change in the odds associated with one-unit change in the associated predictor independent variable. The factor by which  $b$  changes is called the odds ratio (OR). An adjusted odds ratio (AOR) holds other predictor variables in the model constant, generating an estimate around which confidence intervals can be built (Polit & Beck, 2012; Tabachnick & Fidell, 2006). Significance in a logistic regression model is tested using the likelihood index, which measures the probability of the observed results given the parameters in the analysis. A chi-square statistic is used to estimate test the null hypothesis that all the  $b$  values are 0. A small likelihood index is indicative of a good fit between the model and the data (Polit & Beck, 2012).

The process of logistic regression process has several steps. In the first step, the data must be transformed to meet the assumptions of a logistic regression. In order to transform the dependent variable, the scores of the dyad must be combined into a single value and then that value must be transformed from a continuous to a categorical variable. In this regression the dependent variable was concordance or discordance in PPRQ scores. Discordance was defined using quartiles. The use of quartiles to dictomize instruments which lack clinical cut-off points is a well-established statistical practice (R. Ahmed, personal communication, January 25, 2016). The top 25% of scores differed by  $\geq 21$ . Couples with scores on the PPRQ differing by less than 21 were considered as having concordant risk perceptions. This calculation was done by subtracting the man's PPRQ score, which was generally lower, from the woman's, which was generally higher. Of course, in some cases the man's PPRQ score was higher than the woman's resulting in a negative number. As it was not important in this analysis to determine which member of the dyad had the higher PPRQ score, no transformation of these negative values was required.

Next, the independent variables were transformed. For some of the variables, the responses to demographic questions and scores on instruments for the women and men were combined into a single composite score representing the dyad. The following section will describe the treatment of the independent variables in the logistic univariate analysis.

#### **Demographic variables.**

In order to perform a logistic regression, all independent variables to be included in the univariate analysis were first transformed from two responses/scores for each member of the dyad into a single composite score which represented the couple. This was necessary because,

unlike the separate linear regressions for women and men performed for Research Question #2, this question was interested in determining the factors predicting a characteristic of the couple.

The questions on Winnipeg residence and insulin use have “yes” or “no” response and no transformation was required. For the question, “Were you born in Canada” this variable was dichotomized into responses where 0 = “both born in Canada”, and 1 = “one or both not born in Canada”. The BMI question was only asked of women. BMI was dichotomized into 0 = underweight/normal weight group and 1= overweight/obese group. For the question “*How many years have you been in a relationship with your current partner?*”, couples were divided into two groups, with 0= 0-5 years and 1 = 6+ years. In the question “*How many children do you have?*”, 0 = “the couple has at least one child” and 1 = “does not have children” For the question on race/ethnicity couples were divided into groups where 0= two members shared the same ethnic background or 1= the couple was from different backgrounds. Couples were divided into 0 = high income ( $\geq \$40,000$ ) and 1=low income ( $\leq \$39,999$ ). As the education variable had extensive missing data when asked as number of years of education, educational categories were used. The couples were dichotomized into 0 = those with the same level of education and 1 = those whose educational category was different. Finally, for the age variable, the division was based on the degree of difference in their ages, with 0 = 0-5 year’s difference and 1 = 6+ years different.

### **Questionnaires.**

In transforming four of the five questionnaires (PSS, PMTQ, KMSS and the GAD-7), the numerical scores for the woman and the partner were converted into a single composite score using the following mathematical operation. For each item on each questionnaire, the individual

scores were summed and then divided by two, yielding the mean score for that item for the couple. These mean scores were then summed for the composite score on that questionnaire.

The questionnaire scores were dichotomized using quartiles. Although the GAD-7 and the KMSS have established cut-off points as described by the literature, dichotomizing these instruments using established cut offs created groups with too few participants to be used in a logistic regression. For the GAD-7, the established cut-off for high anxiety is  $\geq 10$ . In creating quartiles, a score of  $\geq 8$  represented the top 25% of scores and was used to dichotomize into Moderate/High Anxiety couples and Low Anxiety couples. For the KMSS, a score of  $\leq 17$  represents distressed couples using established measures. Using quartiles, a score of  $\leq 18$  was used. In the PSS (which has no diagnostic cut-offs) a score of  $\geq 22$  represented the top 25% and were determined to be High Stress couples, the remaining 75% being Moderate/Low Stress couples. This transformation is consistent with the treatment of the PSS in a number of other studies (Heaman, 2005; Heaman, Gupton, & Moffatt, 2005; Lennon & Heaman, 2015; Rieger & Heaman, 2016). As the PMTQ is a less well tested instrument, there are no established cut-offs and there is a lack of empirical support for the use of quartiles. In this study a score of  $\geq 10$  represented the top 25% of scores and these couples were designated as being “Not Confident” in the woman’s ability to manage her GD.

The treatment of the GDKS differed from the other questionnaires, as the GDKS score was expressed as percentage correct out of a total of 33 possible correct answers. The composite score was obtained by summing the number of correct responses for the couple and then dividing by 66, yielding a combined score that was converted to a percentage of correct responses. The composite score was then dichotomized into couples who together scored under the 50<sup>th</sup> percentile and those who scored  $\geq 50$  %.

**Heuristic variables.**

The two heuristic variables each required different transformations. In the case of the availability heuristic -“*How many other women have you known with a diagnosis of gestational diabetes?*” 0 = one or both members of the couple knows at least one other woman with GD and 1 = the couple does not know any other women with GD. The representativeness heuristic was assessed using three Likert scale responses and examines the degree to which the woman and her partner feel she and the infant were likely to experience complications of GD as compared to the “average” pregnant woman and infant. Quartiles were also used for this variable. A score  $\geq 13$  represented the top 25% of responses and was used to divide the groups into 0 = about the same/low perceived similarity and 1 = high perceived similarity.

In the next step, each dichotomous independent variable was tested in a univariate analysis to determine its association with the dichotomous dependent variable. The same 16 independent variables used in the linear regressions models were used in the logistic models. Bivariate logistic regression was conducted using each dichotomized predictor independent variable. This analysis generated an unadjusted (or crude) odds ratio, which is an indicator of the predictive ability of that single independent variable (Polit & Beck, 2012). In addition to the bivariate regression, a multivariate regression was conducted with a set of variables as a demographic block. The demographic block included age, education level, race/ethnicity and Winnipeg residence. These variables were selected based on their contribution to the linear regression models. The purpose of this multivariate analysis was to control for the demographic variables.

### Logistic Analysis Results

In order to answer research question #3—“What demographic and psychosocial characteristics of the dyad are associated with discordance in perceived risk scores?”, a logistic regression model was constructed. This analysis was also conducted in several steps. The first step was to dichotomize the dependent variable (scores on the PPRQ for both women and men) into a single categorical value. This was achieved by subtracting the woman’s score from the man’s, resulting in a single value representing the dyad’s degree of risk perception. This continuous variable was then dichotomized by dividing into two groups, concordant and discordant. Discordance was defined as scores falling into the top quartile, which created a cut-off of  $\geq 21$  points. A total of 28 couples (26.2%) of the sample had discordant PPRQ scores and 79 (73.8%) had concordant scores.

Next the results of the 17 predictor variables used in the linear regression were compared for concordant and discordant couples to see which variables differed significantly. Table A1 provides a comparison of couples with concordant versus discordant PPRQ scores using the chi square.

Table P1. Chi square comparison of variables: couples with concordant versus discordant PPRQ scores.

Variable for the couple	Couples with Concordant risk scores n (%)	Couples with Discordant risk scores n (%)	p
<b>Age Difference</b>			
0-5 years difference	64 (81.0)	20 (71.4)	.289
5+ years difference	15 (19.0)	8 (28.6)	
<b>Education</b>			

Same level of education	53 (68.8)	14 (51.9)	.113
Different levels of education	24 (31.2)	13 (48.1)	
Race/Ethnicity			
Same race/ethnic background	58 (73.4)	23 (82.1)	.355
Different ethnic backgrounds	21 (26.6)	5 (17.9)	
Winnipeg residence			
Resides in Winnipeg	62 (78.5)	16 (57.1)	.029*
Does not reside in Winnipeg	17 (21.5)	12 (42.9)	
Born in Canada			
Both were born in Canada	45 (57.0)	18 (64.3)	.499
One or both were not born in Canada	34 (43.0)	10 (36.7)	
Income			
≥\$40,000 = High income	58 (73.4)	20 (71.4)	.839
≤ \$39,999 = Low income	21 (26.6)	8 (28.6)	
# of years in relationship			
≤ 5 years	62 (55.8)	19 (67.9)	.845
≥ 6 years	27 (34.2)	9 (32.1)	
# of children between the couple			
At least one child between them	43 (54.4)	14 (50.0)	.686
Does not have children	36 (45.6)	14 (50.0)	

## Woman's BMI

Underweight/Normal	33 (41.8)	7 (25.0)	.115
Overweight/Obese	46 (58.2)	21 (75.0)	

Prescribed insulin<sup>^</sup>

Yes	34 (43.0)	12 (44.4)	.899
No	45 (57.0)	15 (55.6)	

## Couple's PSS scores

≤ 21 = Low/moderate stress	55 (69.6)	22 (78.6)	.365
≥ 22 = High stress	24 (30.4)	6 (21.4)	

## Couple's PMTQ scores

≤ 9 Moderate/high self-efficacy	59 (74.7)	21 (75.0)	.974
≥ 10 Low self-efficacy	20 (25.3)	7 (25.0)	

## Couple's KMSS scores

≥ 17 = Satisfied	71 (89.9)	21 (89.3)	1.00 <sup>ϕ</sup>
≤ 16 = Dissatisfied	8 (10.1)	3 (10.7) <sup>ϕ</sup>	

## Couple's GAD7 scores

≤ 7 = Low/moderate anxiety	70 (88.6)	25 (89.3)	1.00 <sup>ϕ</sup>
≥ 8 = High anxiety	9 (11.4)	3 (10.7) <sup>ϕ</sup>	

## Couple's GDKS scores

51% or higher GD knowledge scores	54 (68.4)	19 (67.9)	.961
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50% or lower GD knowledge scores	25 (31.6)	9 (32.1)	
Representative heuristic			
≥13 = High perceived similarity	19 (24.1)	8 (28.6)	
≤ 12= Not sure/low perceived similarity	60 (75.9)	20 (71.4)	.636
Availability heuristic			
Couple knows no women with GD	21 (26.6)	3 (10.7) <sup>ϕ</sup>	
Couple knows at least 1 woman with GD	58 (73.4)	25 (89.3)	.114 <sup>ϕ</sup>

ϕ Using Fisher’s Exact Test as the cell has less than 5; ^ = based on n = 106

Bivariate logistic analysis was conducted to determine the impact of the independent variables on the likelihood that couples PPRQ scores were discordant. The only significant variable in this analysis was Winnipeg residence. Couples who reside in Winnipeg were 2.7 times more likely to have discordant PPRQ scores as compared to couples who resided outside of the city (p = .046). However, when the analysis was run with the demographic block, this variable did not remain significant. In the analysis with demographic controls, no univariately significant variables were found. Table B2 details the results of the bivariate and demographic-control analysis.

Table P2. Results of bivariate logistic analysis of PPRQ score concordance with crude OR and OR adjusted for demographic variables.

Variable for the couple	B	SE B	Wald	df	p	OR (95% CI)	AOR (95% CI)
Age Difference							
0-5 years difference	Ref						

5+ years difference	-.513	.555	.854	1	.355	.69 (.35-1.35)	.60 (.20-1.78)
Education							
Same level of education	Ref						
Different levels of education	.671	.488	1.890	1	.169	.60 (.31-2.13)	1.96 (.75-5.10)
Race/Ethnicity							
Same race/ethnic background	Ref						
Different ethnic backgrounds	-.755	-.755	1.484	1	.223	.68 (.29-1.60)	.47 (.14-1.58)
Winnipeg residence							
Resides in Winnipeg	Ref						
Does not reside in Winnipeg	-.973	.526	3.415	1	.065	.50 (.27-.92) *	.38 (.14-1.06)
Born in Canada							
Both were born in Canada	Ref						
One or both were not born in Canada	-.383	.517	.550	1	.458	.85 (.41-1.56)	.68 (.25-1.88)
Income							
≥\$40,000 = High income	Ref						
≤ \$39,999 = Low income	.202	.535	.143	1	.705	.93 (.46-1.87)	1.22 (.43-3.49)
# of years in relationship							
≤ 5 years	-.499	.537	.862	1	.353	.93 (.47-1.85)	.61 (.21-1.74)
≥ 6 years	Ref						
# of children between the couple							
At least one child between them	Ref						
Does not have children	-.125	.464	.073	1	.073	.88 (.46-1.66)	.88 (.36-2.20)
Woman's BMI							
Underweight/Normal	Ref						
Overweight/Obese	.467	.555	.707	1	.400	1.80 (.84-3.83)	1.60 (.54-4.74)
Prescribed insulin							
Yes	.27	.493	.300	1	.584	1.04 (.54-2.01)	1.31 (.50-3.44)
No	Ref						
Couple's PSS scores							

≤ 21=	Ref							
Low/moderate stress								
≥ 22 = High stress	.858	.565	2.304	1	.129	1.43 (.64-3.17)	2.36 (.80-7.13)	
Couple's PMTQ scores								
≤ 9 Moderate/high self-efficacy	Ref							
≥1-0 Low self-efficacy	.072	.532	.873	1	.893	1.01 (.49-2.11)	1.07 (.38-3.05)	
Couple's KMSS scores								
≥ 17 = Satisfied	Ref							
≤ 18 = Dissatisfied	-.056	.515	.012	1	.914	.97 (.48-1.97)	.95 (.35-2.60)	
Couple's GAD7 scores								
≤ 7 = Low/moderate anxiety	Ref							
≥ 8 = High anxiety	.476	.566	.707	1	.400	1.24 (.56-2.73)	1.61 (.53-4.89)	
Couple's GDKS scores								
51% or higher GD knowledge scores	Ref							
50% or lower GD knowledge scores	.168	.519	.104	1	.747	.98 (.50-1.94)	1.18 (.42-3.27)	
Representative heuristic								
≥13 = High perceived similarity	-.391	.527	.550	1	.458	.84 (.42-1.69)	.68 (.24-1.90)	
≤ 12= Not sure/low perceived similarity	Ref							
Availability heuristic								
Couple knows no women with GD	.766	.684	1.254	1	.263	2.4 (.80-7.30)	2.15 (.56-8.22)	
Couple knows at least one woman with GD	Ref							

In summary for research question #3, in the initial univariate regression, only one variable was found to be a significant predictor of PPRQ score discordance. Living in Winnipeg was found to be a significant predictor of discordance ( $p=.046$ ). A second logistic model was created which controlled for demographic factors. This model found no significant predictors as

living in Winnipeg did not remain significant when controlled for other demographic variables. One of the assumptions of logistic regression is that the independent variable are related to the dependant variable in some way. Given the lack of statistically significant findings, the factors which predict concordance versus discordance in PPRQ scores remains unknown and an area for future exploration.

## Appendix Q.

## Qualitative Interview Guide

1) Please tell me a bit about your/your partner's pregnancy and any past pregnancies you have had yourself/together.

2) Could you describe for me what you believe it means to be "at risk" for a problem in your/your partner's pregnancy?

a) Do you consider your /your partner's pregnancy to be high risk?

b) What did you consider to be the greatest risk to yourself/your partner?

c) What did you consider to be the biggest risk to the baby?

Probe for:     - thinking of risk as a number or as a comparator with others  
                  - cultural beliefs regarding pregnancy and illness in pregnancy

3) There are some studies that have found that men and women think differently about risk. Could you tell me how you think your partner's thoughts about the risk of gestational diabetes might be different from yours?

If they thought there was a difference

Probe for :     -what kinds of factors would contribute to the differences such as not having the disease themselves

If they thought there was no difference

Probe for: -why they believe no differences exist, factors like- both are concerned for the health of the baby and/or partner is worried about the woman's health

4) What are the experiences of your friends and family members with gestational diabetes?

Probe for: -number of women they know who have had GD and the nature of those relationships (i.e., immediate relatives versus friends).

4b) If there were other women identified: Can you tell me about any complications for the moms or babies in those women you knew with GD?

Probe for: -seriousness of outcomes for either mom or baby

4c) If there were adverse outcomes: How does (refer to specific situation) make you feel about you/your partner's risk of having something like that happening to you/your partner?

5) What was it like for you when you found out you/your partner had been diagnosed with gestational diabetes?

a) Do you feel that you wanted more information about your/your partner's diagnosis?

b) What sort of questions came to mind about the diagnosis?

c) How the diagnosis impact your feelings about the pregnancy

Probe for: - beginnings of plans to alter health behaviors

-sense of incongruity between feeling that the pregnancy was healthy versus the diagnosis

-concerns for self/partner and concerns for baby

6a) If participants spoke of beginning to plan for health behavior change then paraphrase their comments to bridge into "...tell me a bit more about (whatever change plans had been mentioned).

6b) If no change plans had been articulated. Could you tell me about how your healthcare provider has suggested you/your partner manage gestational diabetes?

Probe for:

- specifics of behavior changes regarding outcomes, what maternal/fetal outcomes are they aware of
- indicators of response and self-efficacy
- for men: what was the information source regarding recommended changes. Were they able to attend appointments or did all info come from the partner?
- for women: did they understand the information they were given or were they overwhelmed by the diagnosis? Did they feel they had the opportunity to ask questions?

7a) QUESTION FOR WOMEN: In making these changes what kinds of things has your partner done to support you or help you out? What else could your partner do?

Probe for:

- expressions for a desire for tacit support and/or emotional support
- did the diagnosis alter their feelings about the importance of their partner attending PNC appointments?
- ask for elaboration on any expressions of frustration regarding their partner's supportive behavior

7b) QUESTION FOR MEN: What do you think your role is in terms of supporting your partner to make these changes? What types of help have you provided?

- Probe for:
- expressions of willingness to alter their own diet/exercise habits (tacit supports).
  - expression that their role should be mainly in providing emotional support or reminders to take medication/check blood sugars
  - indications that he feels he lacks information regarding gestational diabetes.

8) Is there anything else you would like to tell me?

## Appendix R.

## Consent form- Quantitative

**RESEARCH SUBJECT INFORMATION AND CONSENT FORM - QUANTITATIVE**

**Research Project Title:** “Perception of Pregnancy Risk among Women with Gestational Diabetes and their Partners: The Impact of Gender”

**Principal Investigator:** Suzanne L. Lennon BA, BN, PhD (c), College of Nursing, University of Manitoba, [REDACTED]

**PhD Advisor:** Dr. Maureen Heaman, Professor, RN, PhD, College of Nursing, University of Manitoba, [REDACTED]

**Funding Agency:** Manitoba Center for Nursing and Health Research - Dr. Lesley Degner Graduate Student Research Grant.

You are being asked to participate in a research study. This study is being conducted by a graduate student at the College of Nursing, University of Manitoba as a thesis project to meet the requirements of the PhD program. This information form should give you a general idea of what the research is about and what is being asked of you. You will be given a copy of this form to keep for your own records. Please take all the time you need to read this form carefully. If you have any questions about the study please feel free to ask the researcher or the research assistant.

**Purpose of the Study:**

The purpose of this study is to explore how women and men think about the risks of gestational diabetes and to find out if there are differences in their perceptions of pregnancy risk. The study is also trying to understand what things contribute to differences in the way women and men think about risk.

**Who can participate in the study?**

Women who have been diagnosed with gestational diabetes in their current pregnancy and their male partners are welcome to participate. Women who have been pregnant before can participate as long as this is the first time they have been diagnosed with gestational diabetes.

**Procedures:**

Once you have agreed to participate and have signed the consent forms, the researcher or the research assistant will give you a package of questionnaires to complete. You will be asked

questions about pregnancy risk, stress, the amount of confidence you have in how you will manage the diabetes, satisfaction with your relationship and anxiety about pregnancy.

Completing these questionnaires should take about 15-20 minutes of your time. The researcher or research assistant will be available if you have any questions about the questionnaires. These questionnaires are to be completed independently by both the woman and her partner. If the woman's partner is not available at the time the woman completes the package the researcher or assistant will either give the woman a package for her partner with a stamped envelope to return them or the researcher will arrange to meet with the partner later at a date and location to be agreed on.

**Confidentiality:**

All information gathered for this study will remain strictly confidential, except if you reveal a situation involving child abuse or the abuse of a vulnerable adult, in which case the law says we must report the abuse. Your questionnaire forms will be identified only with a unique code number and your name will not appear on any of the forms. The researcher will keep a list of names matched with code numbers in a locked, secure file cabinet in a research office at the University of Manitoba. The completed questionnaires will be stored in a separate locked file cabinet. The list of names will be destroyed when the study is completed and the questionnaire forms will be destroyed 7 years after the study ends. Only the researchers involved in the study will have access to the questionnaires and the content of the individual responses will not be discussed with anyone other than the researchers. The responses to questions will not be shared with the respondent's partner. Your identity will not be revealed in any reports or articles describing the results of the study.

**Risks:**

There are no known risks to participating in this study.

**Benefits:**

There are no direct benefits to the couples agreeing to participate in this study. However, your answers may help in gaining an understanding of how women and men think about risk in pregnancy.

**Compensation:**

Each participant will receive a \$10.00 grocery store gift card to thank you for taking the time to participate in this research study.

**Voluntary Participation and Withdrawal:**

Your participation in this study is completely voluntary and your decision about whether or not to participate will not affect the care you receive in any way. You have the right to not answer

any of the questions you are asked. You also have the right to stop taking part in the study at any time without affecting your care. If you withdraw from the study after you have begun participating, this will not affect your care and you will still receive the grocery gift card.

**Research Results:**

The findings from this study will be presented at a final thesis defence meeting attended by all members of the PhD advisory committee. This meeting is open to University of Manitoba faculty, staff, students as well as the general public. Findings from the study will also be presented to interested people such as the staff of the prenatal care units. The results will be shared through publication in academic journals (magazines) and presentations at conferences and workshops. The individual identities of the participants will not be revealed in any of these presentations or publications.

**Statement of Consent:**

Your signature on this forms means that you have had the study explained to you in a language that you understand, all questions have been answered to your satisfaction, and that you have agreed to take part as a participant. In no way does your signature waive your legal rights, nor does it release the researchers, funding agencies or recruitment sites from their legal and professional responsibilities. You can stop taking part in the study at any time and/or refuse to answer any questions you are not comfortable with. Please feel free to contact the researcher or research supervisor at any time should have you questions or concerns.

This research study has been approved by the Nursing Ethics Review Board at the University of Manitoba (ENREB Protocol #E2014:125). If you have any concerns or complaints about this project, you may contact any of the above-named persons or the Human Ethics Secretariat at [REDACTED]. A copy of this consent form will be given to you for your records and a copy will be retained by the researcher.

Participant's Signature: \_\_\_\_\_ Date \_\_\_\_\_

Printed name of the above: \_\_\_\_\_

Researcher or delegate's Signature: \_\_\_\_\_ Date \_\_\_\_\_

Printed name of the above: \_\_\_\_\_

**Research Project Title:** “Perception of Pregnancy Risk among Women with Gestational Diabetes and their Partners: The Impact of Gender”

Would you be willing to be approached at a later date to determine your interest in participating in an interview as part of this study? The purpose of the interview is to talk with you about your thoughts on pregnancy risk.

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, please complete the following information

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone number: \_\_\_\_\_

**Research Project Title:** “Perception of Pregnancy Risk among Women with Gestational Diabetes and their Partners: The Impact of Gender”

If you would like to receive a summary of the results of the study, please fill out your name and address. We can also send result to you by email.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone number: \_\_\_\_\_

Email address: \_\_\_\_\_

## Appendix S.

## Consent form- Qualitative

**RESEARCH SUBJECT INFORMATION AND CONSENT FORM - QUALITATIVE**

**Research Project Title:** “Perception of Pregnancy Risk among Women with Gestational Diabetes and their Partners: The Impact of Gender”

**Principal Investigator:** Suzanne L. Lennon BA, BN, PhD (c), College of Nursing, University of Manitoba, [REDACTED]

**PhD Advisory Committee Chair:** Dr. Maureen Heaman, Professor, RN, PhD, College of Nursing, University of Manitoba, [REDACTED]

**Funding Agency:** Manitoba Center for Nursing and Health Research - Dr. Lesley Degner Graduate Student Research Grant.

You are being asked to participate in a research study. This study is being conducted by a graduate student at the College of Nursing, University of Manitoba as a dissertation project to meet the requirements of the doctoral program. This information form should give you a general idea of what the research is about and what is being asked of you. You will be given a copy of this form to keep for your own records. Please take all the time you need to read this form carefully. If you have any questions about the study please feel free to ask the researcher.

**Purpose of the Study:**

In this part of the study, the main purpose is to gain an understanding of how women and men believe the two genders women think about risk. Another purpose is to find out how would like their partners to support them in their attempts to make health behavior changes to manage their gestational diabetes, and to determine how men perceive their role in helping their partner manage her gestational diabetes.

**Who can participate in the study?**

Couples who have completed the questionnaires from the first part of the study and who have agreed to be approached about participating in the interview may be invited to participate. Due to the nature of the information being sought, both partners would have to agree to be interviewed. Interviews will take place either during late pregnancy or after the birth of your baby.

**Procedures:**

Couples who have indicated they would be willing to participate in the interview will be individually contacted in order to arrange a date and location for the interview. The individual will be asked to sign a consent form for the interview portion of the study. Couples will be interviewed separately. The interview consists of some general questions regarding how you felt about GD during pregnancy, what sort of supports you experienced, and how you feel thinking about risk may have made you want to change your health behavior. The interview will be tape recorded. These tapes will then be typed out (transcribed) word for word.

**Confidentiality:**

All information gathered for this study will remain strictly confidential, except if you reveal a situation involving child abuse or the abuse of a vulnerable adult, in which case the law says we must report the abuse. The audio-tapes will be stored in a secured research office at the University of Manitoba. The audio-tapes will be transcribed (typed out word by word) by a trained transcriptionist. This individual will have signed a confidentiality agreement with the researcher which states that they are prohibited from sharing the content of the audio tapes with anyone but the research team. Once transcribed, the audiotapes will be erased. All of the transcriptions will be identified only with a unique code number and your name will not appear on the transcription. The researcher will keep a list of names matched with code numbers in a locked, secure file cabinet in a research office at the University of Manitoba. The transcriptions will be stored in a separate locked file cabinet. The list will be destroyed when the study is completed and the transcriptions will be destroyed 7 years after the study ends. Only the researchers involved in the study will have access to the transcriptions and the content of the will not be discussed with anyone other than the researchers. The transcriptions or any details of the interview will not be shared with the respondent's partner. Your identity will not be revealed in any reports or articles describing the results of the study.

**Risks:**

There are no known risks to participating in this study.

**Benefits:**

There are no direct benefits to the couples agreeing to participate in this portion of the study. However, your answers may help in gaining an understanding of how women and men think about pregnancy risk and health behaviors during pregnancy.

**Compensation:**

Each participant will receive a \$10.00 grocery store gift card to thank you for taking the time to participate in the interview portion of the research study. This gift card would be in addition to the \$10.00 card each participant would have already received for participating in the questionnaire portion.

**Voluntary Participation and Withdrawal:**

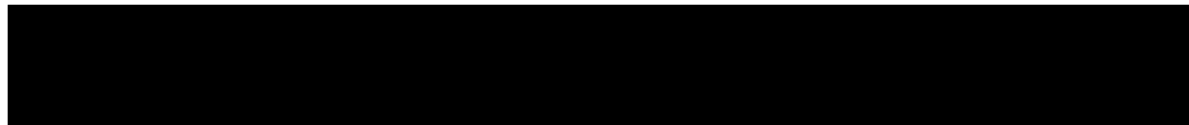
Your participation in this study is completely voluntary and your decision about whether or not to participate will not affect the care you receive in any way. You have the right to not answer any of the questions you are asked during the interview. You also have the right to request that the interview be stopped at any time. Once the interview is completed you have the right at any time, to contact the researcher and ask that your interview not be included in the study. If you withdraw from the study after you have begun participating, this will not affect your care and you will still receive the grocery gift card.

**Research Results:**

The findings from this study will be presented at a final dissertation defence meeting attended by all members of the PhD advisory committee. This meeting is open to University of Manitoba faculty, staff, students as well as the general public. Findings from the study will also be presented to health care providers who work with women having gestational diabetes. The results will be shared through publication in academic journals (magazines) and presentations at conferences and workshops. Interview information is often shared by including small quotes from the participants. These quotes will not include any names or identifying information. It will not be possible to determine the identity of the individual from the quotes included in the study results. The individual identities of the participants will not be revealed in any of these presentations/publications.

**Statement of Consent:**

Your signature on this forms means that you have had the study explained to you in a language that you understand, all questions have been answered to your satisfaction, and that you have agreed to take part as a participant. In no way does your signature waive your legal rights, nor does it release the researchers, funding agencies or recruitment sites from their legal and professional responsibilities. You can stop taking part in the study at any time and/or refuse to answer any questions you are not comfortable with. Please feel free to contact the researcher or research supervisor at any time should have you questions or concerns.



This research study has been approved by the Nursing Ethics Review Board at the University of Manitoba (ENREB Protocol #E2014:125). If you have any concerns or complaints about this project, you may contact any of the above-named persons or the Human Ethics Secretariat at 204 [REDACTED] A copy of this consent form will be given to you for your records and a copy will be retained by the researcher.

Participant's Signature: \_\_\_\_\_

Date \_\_\_\_\_

Printed name of the above: \_\_\_\_\_

Researcher or delegate's Signature: \_\_\_\_\_

Date \_\_\_\_\_

Printed name of the above: \_\_\_\_\_

Appendix T.

Honorarium receipt form

Research project: **Gender differences in perception of pregnancy risk among women with gestational diabetes and their male partners: A mixed methods study**

CONFIRMATION OF HONORARIUM RECEIPT

To thank you for taking time to participate in this study, you are being given a \$10.00 grocery store gift card.

Please sign below once you have received the gift card.

Participant's signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed name of above: \_\_\_\_\_