THE INTERSECTION OF FOOD INSECURITY, GDM, AND MENTAL HEALTH

THE INTERSECTION OF FOOD INSECURITY, GESTATIONAL DIABETES, AND MENTAL HEALTH CONDITIONS: EXAMINING PREGNANCY FROM A BIOCULTURAL PERSPECTIVE

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ABSTRACT

Pregnancy brings numerous physiological and psychosocial changes and conditions, which can include gestational diabetes mellitus (GDM), and mental health conditions, including anxiety, and mood disorders such as depression. Food insecurity, or not having access to a diet that meets needs and preferences, may make management of pregnancy complications more challenging. I examined whether or not food insecurity was associated with a greater prevalence of mental health conditions, or GDM during pregnancy. I used the biocultural and syndemics approaches to the investigate the relationships among these conditions and to understand their interactions with the larger environment.

The main questions are: (1) Does pregnancy increase the risk of developing or worsening food insecurity? (2) Are there positive associations between food insecurity during pregnancy and GDM as well as mental health conditions? (3) How does food insecurity impact the management of above-mentioned issues? (4) What are the experiences of individuals who have had GDM during pregnancy? To answer these questions, I undertook a mixed methods approach that involved quantitative analysis of the Canadian Community Health Survey, as well as a survey administered to pregnant people in the city of Hamilton. I also quantitatively analyzed pre-existing focus group transcripts and conducted one-on-one interviews with pregnant and postpartum people in Hamilton.

This study found that there is a syndemic interaction between food insecurity, GDM, and mental health conditions in Canada. Analysis of focus group and interview transcripts provided further insight into the complex environments that shape risk for developing one, or more of these conditions during pregnancy. These results indicate how the pregnancy experience is impacted by a multitude of factors, which can lead to increasing complication risk.

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LIST OF ABBREVIATIONS

CCHS – Community Health Survey
CI – Confidence Interval
DOHaD – Developmental Origins of Health and Disease
GDM – Gestational Diabetes Mellitus
IRR – Incidence Rate Ratios
M2B – Mothers to Babies
NCD – Noncommunicable Disease
OR – Odds Ratio
T2DM – Type 2 Diabetes Mellitus

DECLARATION OF ACADEMIC ACHEIVEMENT

The research contained in this thesis dissertation was completed by Sarah Oresnik under the supervision of Dr. Tina Moffat. Research questions and methodology were developed in consultation with Dr. Tina Moffat, Dr. Luseadra McKerracher, and Dr. Deb Sloboda. Data for this thesis, in part, came from the Mothers to Babies study, which is funded by Canadian Institute of Health Research (Hugs for Health Team Grant, no. 146333). Interviews analyzed in this thesis were conducted by Sarah Oresnik.

Chapter 1: Introduction

1.1 Introduction

Pregnancy is an embodied experience that brings with it numerous physiological and psychological complexities as well as relational changes due to the changing social roles of pregnancy and motherhood (Neiterman 2012). At one end of the spectrum these complexities can become diagnosable health complications, which can include Gestational Diabetes Mellitus (GDM), as well as mental health issues such as pregnancy-specific stress, depression and anxiety. Between 2004/5 and 2010/11, the number of cases of GDM in Canada[1] rose from 40.8 for every 1,000 deliveries to 54.5 per 1,000 deliveries (GOC 2016). This steady increase in incidence of GDM places significant burden on the healthcare system. GDM diagnosis also places stress on the people themselves; people diagnosed with GDM are more likely to experience stress and anxiety due to added fears about pregnancy and fetal complications, worry over losing control of blood glucose, and guilt from not having a 'normal' pregnancy (Leung Hui et al. 2014).

GDM, like many noncommunicable diseases (NCDs) including Type 2 Diabetes Mellitus (T2DM), cardiovascular disease, and certain cancers, tend to appear at relatively high frequencies in vulnerable populations, such as low-income, or food-insecure households because of environmental factors (Whitehead 1991). The Canadian Institute for Health Information (2015) reports a link between income inequality and increased prevalence of NCDs including T2DM. Individuals with a lower income are at a greater risk for NCDs. In Canada, inequality between the highest and lowest income class has

[1] This data excludes the province of Québec.

increased since the early 1990s across all Canadian provinces (CIHI 2015). Individuals with a lower income may be unable to access higher levels of education, have precarious employment, live in a food insecure household, have a harder time accessing healthcare, and live in poor housing, or insecure environments, all of which places them at greater risk for developing NCDs and mental health conditions (Bryant, Hess, and Bowen 2015; Jessiman-Perreault and McIntyre 2017). The link between low income and poor health indicates that the social, economic, and physical environment in which one resides impacts well-being (Marmot and Bell 2019; Raphael 2006). Therefore, when examining health risks, the social context in which one is situated needs to be taken into account.

1.2 Study Justification, Aims, Hypotheses, and Predictions

For this project, I examine the interaction between embodied pregnancy complications. Specifically, I explore relationships between: stress, depression and anxiety; GDM; and food insecurity. A biocultural approach, which explores how the environment impacts health and well-being will provide an understanding as to how these conditions interact (Dufour 2006). The biocultural approach takes into account the embodiment of the environment, the synergy and syndemic risk between intersecting conditions such as pregnancy related complications and social conditions, as well as the temporal impacts of this environment on future health (Brewis et al. 2020). Through this theoretical perspective, I will be able to consider the interaction between these multiple epidemics, the social and physical environments that shape health risks, and how these complications can have lasting effects throughout the lifecourse.

Although pregnancy health and food insecurity have been examined extensively, (Feig et al. 2014; Gross et al. 2018; Miszkurka et al. 2010; Power et al. 2016) there remain key gaps in this literature. In particular, pregnancy health epidemiology and interventions literature focuses disproportionately on the individual as opposed to the sociocultural and political economic environment, as well as on either qualitative or quantitative data (Ismaili M'hamdi et al. 2018; Sharp et al. 2018; Winett et al. 2016). Diseases, moreover, are viewed in isolation as opposed to in concert with one another (Menenhall 2012; Singer 1994).

With respect to the first of these three shortcomings, as Sharp, Lawlor, and Richardson (2018) note, DOHaD research tends to focus on maternal choices and actions and less attention is placed on other family members, or the environmental forces that influence the possible actions the mother is able to make. Placing responsibility for prenatal health exclusively or primarily on mothers is insufficient to improve maternal and fetal nutrition because issues that lead to food insecurity are often structural in nature and cannot be solved by an individual. Instead, we need to understand the role that society has in creating a healthy environment (Ismaili M'hamdi et al. 2018). The responsibility should not fall exclusively or primarily on the mother, but should be seen as a public issue because the environmental factors that lead to health inequalities are largely beyond the control of the individual who is adversely impacted (McKerracher et al. 2020b).

Regarding the second concern, there are a lack of projects that look at the co-occurrence of various health and social issues. Many studies focus on one disease in

isolation and do not consider the full embodied state of pregnancy (Feig et al. 2014; Miszurka et al. 2010; Power et al. 2016). This separation is problematic because it does not account for all the various environmental factors and barriers that may impede optimal health. The environmental context is key to understanding how communities experience disease and what their lived experience is. Health conditions need to be understood in relation to each other and the environment.

Lastly, many studies use either a qualitative or a quantitative approach and do not integrate textural and textual details, personal stories and histories, with broad quantitative trends. Research that relies solely on quantitative evaluations are able to point to larger trends but cannot report on the lived experience of individuals. Qualitative approaches are unable to report on larger trends, just the issues that they have observed in a community. Mixed methods, however, allow researchers to expand their study, which ultimately allows for greater analysis and contextualization of the collected data (Brannen 2005; Sandelowski 2000).

With these shortcomings of existing research in mind, the main objective of my study is to determine how the health and well-being of low-income pregnant or new mothers is altered during pregnancy in Canada and with a closer examination of Hamilton, Ontario. Specifically, I will investigate the co-occurrence of GDM and mental health issues such as depression and anxiety in a national, and food insecurity using a Canadian national dataset, as well as in two datasets (survey and focus groups) produced by the M2B Hamilton study, and qualitative research from my own qualitative interviews conducted in Hamilton. My aim is to understand the intersections among GDM, anxiety

and/or depression, and food insecurity, and what added challenges food insecurity presents when trying to manage the above conditions. Prior research has not examined the interaction of these various conditions nor these conditions in the context of understanding the embodied pregnancy experience.

The main questions I will answer through this research are: (1) Does pregnancy increase the risk of developing or worsening food insecurity? (2) Are there positive associations between household food insecurity during pregnancy and GDM as well as feelings of stress, anxiety and depression, at national and Hamilton levels? (3) How does food insecurity impact the management of above-mentioned issues? (4) What are the experiences of individuals who have had GDM during pregnancy and how does it affect their mental health and well-being? Overall, I will examine how income and access to food impacts health and well-being during pregnancy. Based on prior research conducted by the M2B study and prior research studies that indicate increased chronic disease prevalence with food insecurity (Gucciardi et al. 2009; Jessiman-Perreault and McIntyre 2017; Tarasuk et al. 2015), I hypothesize that GDM and mental health conditions will be of greater prevalence in the food insecure population. I also hypothesize that food insecurity is associated with and will exacerbate stress and anxiety levels along with the risk for developing GDM.

I hypothesized that these issues impact one another, because people living in low-income households often have poor diets, in part due to the fact that cheaper foods are highly processed and calorie dense (Drewnowski and Specter 2004). Furthermore, poorer diets can increase the risk of developing and managing health conditions, such as NCDs,

which are of greater frequency in these low-income communities. Conversely, suffering from health conditions may lead to impaired employment and reduced wages which may make people more vulnerable to experiencing household food insecurity. This project utilizes both quantitative and qualitative analysis. By using multiple data sources including surveys, focus groups, and interviews, I can examine large national trends and contextualize them in more local experiences of pregnant/postpartum people.

1.3 Thesis Organization

To present this project I will first provide background information about the study setting and introduce the theoretical concepts as well as the health conditions and their implications during pregnancy in Chapter Two. Chapter Three follows with a description of the qualitative and quantitative methods that I employed to investigate the above questions. In Chapter Four the findings of the statistical analyses of the quantitative surveys and thematic analysis of the focus groups and interviews will be presented. The results are discussed in Chapter Five in relation to the theoretical concepts introduced in Chapter Two as well as the findings from the various statistical tests when examined in concert with one another. The final chapter will summarize the main findings of this project and also touch upon the supports that participants suggested as ways to reduce the barriers they experienced during their pregnancy.

Chapter 2 Background: Setting, outline of health and environmental factors, and review of the theoretical frameworks and literature

2.1 Introduction

There are a variety of physical, psychological, and environmental factors that can influence diet and health during pregnancy. The ones analyzed in this project include food insecurity, GDM, as well as anxiety and mood disorders. Pregnancy diet can have immediate and lasting impacts on maternal and child health. In this chapter I will review characteristics of the local study site, which is Hamilton Ontario, information on the larger Mothers to Babies project, and background literature on GDM and mental health conditions during pregnancy. I will also outline the biocultural approach, which includes an understanding of syndemic risk, embodiment, and the DOHaD hypothesis. The biocultural perspective offers a way of understanding how our sociocultural, political, and physical surroundings impact our health. In particular, syndemic risk, will be pivotal to understanding the intersecting relations between the above-mentioned factors during pregnancy.

2.2 Study Setting: Hamilton, Ontario

Hamilton is a mid-sized city in Southern Ontario located near Toronto (Figure 2.1). With a population of approximately 537, 000, which increases to 750,000 when considering the surrounding areas, Hamilton is a city that is rapidly growing and is expected to increase in size by 20% by 2036 (City of Hamilton 2018; Statistics Canada 2019). As a common location choice for new Canadian immigrants, Hamilton is a

multicultural city, with 24% of its residents having been born outside of the country (City of Hamilton 2018). More demographic information can be found in Table 2.1.

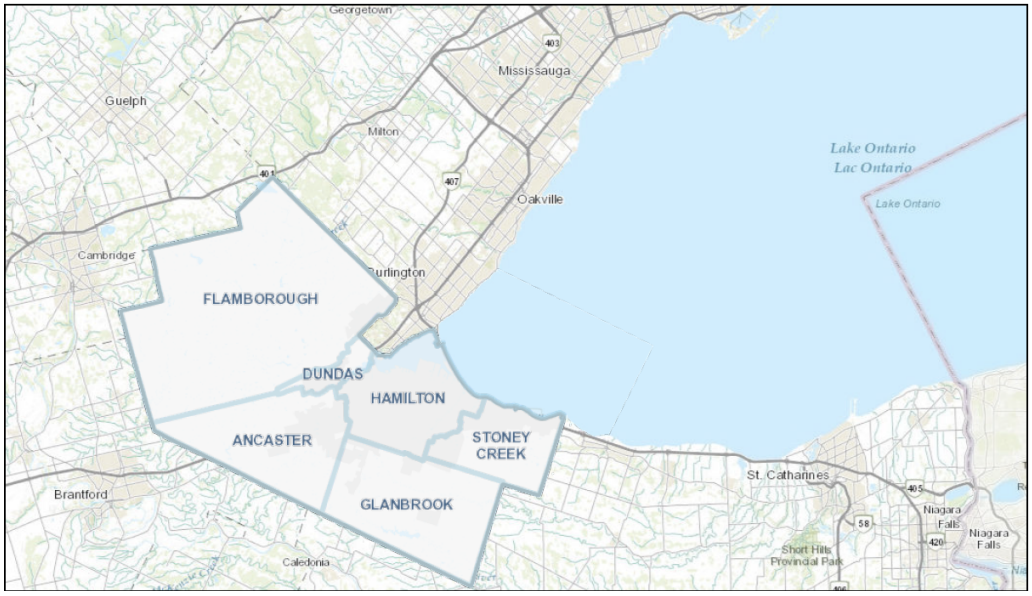

Figure 2.1: City of Hamilton Map
Map includes the five surrounding areas of Flanborough, Ancaster, Glanbrook, and Stoney Creek. (City of Hamilton n.d.)

Within the city, there are striking health disparities that characterize neighbourhoods. In collaboration with McMaster University, a study conducted by the newspaper *The Hamilton Spectator* investigated inter-neighbourhood variation of 13 different measures of health including lifespan, emergency room visits, hospital admissions, alternative care use, family physician use, and low infant birth weight (DeLuca, Buist, and Johnston, 2012). This "Code Red" study was first conducted ten years ago; however, in early 2019 an update was done and the same markers of health were re-examined (Buist 2010, Buist 2019). Of the 13 indicators of health, only two measures saw a reduction in inequities: low infant birth weight and an increased use of family physicians, although low-income individuals are in need of complex care and

emergency room visits are still high. Furthermore, the study found that health disparities are prevalent between low- and high-income neighbourhoods. One of the starkest measures of these differences is life expectancy, which falls well below the provincial average of 75.3 years for men and 80.2 years for women, in some neighbourhoods. The highest life expectancy in Hamilton is in the Mountain region and in the suburbs with an average of 87.7 years; in the low-income neighbourhoods, the life expectancy for residents is 64.8 years, 23 years less than expected in affluent neighbourhoods. This difference in life expectancy is not the only gap between these areas; the study found that these measures of health were consistently poorest in the same area, the central downtown neighbourhood. These health issues cluster in low-income neighbourhoods due to disparate access to services across the city including grocery stores, as well as health and support services (Dean and Elliot 2012; DeLuca, Buist, and Johnston, 2012; Latham and Moffat 2007). The clustering of these health concerns in communities highlights the life altering consequences of poverty that exist in Hamilton. As the city continues to grow the health-care system will have to deal with more patients and also respond to neighbourhoods that are struggling. This thesis will examine how some of these environmental factors impact diet during pregnancy, especially for those pregnant mothers who may reside in these low-income communities.

Table 2.1: Sociodemographic information for Hamilton and the surrounding area.

Demographic Factor		**Percent of Population**	**Reference**
Age	0-14	16.4	(Stats Can 2019)
	15-65	65.8	
	> 65	17.9	

Household Income	< $20,000	8.4	(Stats Can 2019)
	$20,000-39,999	15.7	
	$40,000-59,999	15.4	
	$60,000-79,999	13.2	
	$80,000-99,999	11.4	
	> $100,000	35.8	
Government Assistance	Received a Government Transfer	69.2	(Stats Can 2019)
	Proportion of males that received a Government Transfer	63.5	
	Proportion of females that received a Government Transfer	74.5	
Immigration Status	< 5 Years in Canada (2011-2016)	2.4	(Stats Can 2019)
	First Generation Canadian	25.5	
Racialization	Non-Minority	82.8	(Stats Can 2019)
	Visible Minority	17.7	
	Indigenous (First Nations, Métis, or Inuit)	3.0	
Marital Status	Married or Common Law	56.7	(Stats Can 2019)
	Not Married or Common Law	43.4	
Single Parents	Single Mothers	14.3*	(Stats Can 2019)
	Single Fathers	3.5*	

*Percentage based on total number of census families in private households (210,825)

2.3 Pregnancy Diet Quality

Diet and health prior to and during pregnancy can have lasting impacts on offspring health, which is often why an emphasis is placed on the nutrition of the pregnant person (Sharp, Lawlor, and Richardson 2018). Pregnancy is often seen as a "teachable moment",

or an opportunity for people to make positive changes in their health and diet behaviours (McBride, Emmons, Lipkus 2003; Phelan 2010). However, many sociodemographic and environmental factors that can influence diet quality during pregnancy are outside of the individual's control. Therefore, pregnancy may not be a teachable moment, but a time when people, if they are able to, make habitual changes to their diet and lifestyle (Atkinson, Shaw, and French 2016). In their Prenatal Health Project Nash and colleagues (2013) surveyed 2282 pregnant people from London, Ontario between 2002 and 2005. They found that lower diet quality was associated with many individual characteristics including being in a common-law relationship (as opposed to being married), having increased anxiety, lacking family support, and having a lower income. Other studies have found that low income, younger age, lower education levels, and higher pre-pregnancy BMI were associated with poor diet quality scores (Bodnar and Sieta-Riz 2002; Rifas-Shiman et al. 2009; Shapior et al. 2016).

The DOHaD hypothesis suggests that noncommunicable diseases such as diabetes and heart disease may be related to one's environment in early life including maternal nutrition during pregnancy (Barker et al. 2002; Gluckman, Hanson and Beedle 2006; Hanson and Gluckman 2015). In the Mothers to Babies study, it was found that participants who had a better diet quality during pregnancy also had a greater knowledge about the Developmental Origins of Health and Disease hypothesis.The analysis also found that those with greater knowledge about the DOHaD hypothesis were of a higher socioeconomic position, of an older age, and had had fewer pregnancies. Diet quality during pregnancy is impacted by many factors including sociodemographic

characteristics such as marital status, age, and income, as well as the knowledge one has, or that is provided during pregnancy (McKerracher et al. 2020a).

2.4 Physical Health and Pregnancy

2.4.1 Gestational Diabetes Mellitus

People who are diagnosed with GDM during pregnancy deal with increased stress over their diet as they work to manage control their blood sugar. GDM introduces many challenges that people must contend with for the remainder of their pregnancy. Rates of GDM are rising globally, with an average of 7% of pregnancies worldwide complicated by GDM (Janevic et al. 2014). In Ontario, cases of GDM have more than doubled in the past 20 years (Feig et al. 2014). Between 2004/5 and 2010/11, the number of cases of GDM in Canada[2] rose from 40.8 for every 1,000 deliveries to 54.5 per 1,000 deliveries (GOC 2016). In a non-GDM complicated pregnancy, insulin resistance increases as the pregnancy progresses. Insulin is a hormone produced by the pancreas that facilitates the uptake of glucose from the blood stream to cells in the body. In cases of GDM, insulin resistance is increased further and there are greater levels of insulin resistance (Barbour et al. 2007). As explained by Diabetes Canada (2019), the pregnant body is unable to produce enough insulin to lower blood glucose levels and one can experience excessive hyperglycemia, or high blood glucose, as a result. GDM resolves after pregnancy, although 50% of people diagnosed with GDM will likely go on to develop T2DM later in their life as well as having an increased risk for GDM in subsequent pregnancies. GDM risk factors include maternal age (>age 35), having given birth previously to a baby

[2] These data do not include the province of Québec.

greater than nine pounds, previous pregnancies with GDM, obesity, family history of T2DM or prediabetes, and Polycystic Ovary Syndrome (PCOS).

Screening for GDM usually occurs at the end of the second trimester, or the beginning of the third (between the 24th and 28th weeks of pregnancy) (Diabetes Canada 2019). Despite steadily increasing incidence and prevalence rates of GDM over recent decades, the WHO (2018b) has not come out with a universal screening procedure; however, they do consider this to be high priority for research, development, and policy translation. There are guidelines listed as to when and how to diagnose GDM. These include: when fasting blood glucose is 7.0 mmol/L, when blood glucose is at or above 11.1 mmol/L two hours after a 75g oral glucose dosage, or when a random blood glucose test is at or above 11.1 mmol/L and other diabetes symptoms are present. Many physicians test for GDM by giving an oral glucose dosage (50 to 75g) and testing blood glucose levels a short while later (one to two hours) (Xiong et al. 2001).

It is imperative that GDM is diagnosed because there are numerous complications that can arise for both the mother and infant if blood glucose levels are not controlled, including: macrosomia (infant weight greater than nine pounds), major congenital malformations, birth injuries such as bone fractures, shoulder dystocia, and nerve palsies, hypoglycemia, long-term issues with insulin control, increased risk for T2DM (for mother and child), preeclampsia, perinatal mortality, and still birth (Crowther et al. 2005; Diabetes Canada 2019; Feig et al. 2014). Feig and colleagues (2014) found that in Ontario, rates of congenital anomalies in people with GDM have declined by 20% between 1996 and 2010; however, people with GDM are still at a 26% increased risk of

having an infant with congenital anomalies compared to people without maternal diabetes. Once a diagnosis has been made, there are a few treatment options available to control blood glucose levels. Some patients are able to control their glucose levels by altering their behaviours, which include increasing activity and consuming a healthier diet by eating whole grains and legumes. When behavioural changes are not enough physicians will prescribe insulin pills or injections that are to be used until the end of the pregnancy. Having GDM during pregnancy can also increase stress and anxiety (Leung Hui et al. 2014), which, in turn, can have adverse effects on maternal and infant health.

2.5 Mental Health and Pregnancy

In a review of the literature, Dunkel Schetter, and Tanner (2012) demonstrate that high stress, anxiety, and depression during pregnancy are associated with an increase in the risk of preterm birth and low infant weight at birth. These mental health complications have been associated with poor infant outcomes and can have lasting effects throughout the lifecourse including: impaired cognitive and motor development, and increased risk for mental health issues such as fearful temperament and reduced cognitive reactions (Dunke schetter, and Tanner 2012).

2.5.1 Depression

Depression affects 10 to 12% of pregnancies (Gavin et al. 2005; Melville et al. 2010). However, some studies have reported rates as high as 20% (Gotlib et al. 1989) Researchers have noted that there is a continuum of depression between pregnancy and the postpartum period. Furthermore, if depression during pregnancy goes untreated it can increase the risk for postpartum depression (Gotlib et al. 1989; Ryan, Milis, and Misri 2005). Risk factors for developing depression during pregnancy include: a personal or

familial history with depression, psychosocial factors such as a history with abuse, substance use, and smoking cigarettes. (Gavin et al. 2005; Ryan Milis and Misri 2005). There are also several sociodemographic variables that increase risk, including being of a younger age, having completed less education, having more children in the household, being a single parent, and being socially isolated (Gavin et al. 2005; Husain et al. 2012; Ryan Milis and Misri 2005; Zuckerman et al. 1989). In their meta-analysis of depression during pregnancy Grote and colleagues (2010) found that people of a lower socioeconomic position twice as likely to have depression during pregnancy.

Depression during pregnancy is serious as it can lead to increased health risks for both mother and child. As mentioned above, if depression goes undiagnosed then there is a greater risk for postpartum depression (Gotlib et al. 1989; Ryan, Milis, and Misri 2005). Depression can also increase stress in the mother and has been associated with poor weight gain during pregnancy and an increase in substance abuse (Zuckerman et al. 1989). Studies have also found that pregnant people with depression have a poor appetite and often have lower quality diets than their unafflicted peers (Barker et al. 2013; Manber, Blasey, and Allen 2008). Low diet quality during pregnancy can have lasting impacts on the child's health, including increasing risk for NCDs (Barker et al. 2002; Gluckman, Hanson and Beedle 2006; Hanson and Gluckman 2015). There are also increased risks for the child, with studies finding that untreated depression can lead to an increased risk for miscarriage, low birth weight and preterm birth (Field, Diego, and Hernandez-Reif 2006; Grote et al. 2010). Infants have also been found to have higher cortisol levels, increased irritability and possible temperament and behavioural issues

(Davis et al. 2007; Field, Diego, and Hernandez-Reif 2006). In their review of the literature, Alder and colleagues (2007) found that there was an association between increased anxiety and depression and elevated risks for a variety of adverse health outcomes, such as: premature delivery (which also means infants are born with a low birth weight), preeclampsia, postpartum depression, increased labour pains, increased fetal heart rate, and decreased fetal movement.

There are a few different treatment options available for depression during pregnancy. These include individual or group therapy and antidepressants (Ryan, Milis, and Misri 2005). There has been some concern regarding exposure to antidepressants during the third trimester, including increased risk for respiratory distress, feeding difficulties, and a low birth weight in the child, but long-term effects have not been reported (Ryan, Milis, and Misri 2005). Despite this potential risk, medications should not be discontinued suddenly as that would increase the risk for relapse (Ryan, Milis, and Misri 2005). Another issue is the effect antidepressant medications can have on metabolism. Non-pregnant individuals who are using antidepressant medications may be at a greater risk for weight gain and the development of T2DM as a side-effect (Lopez-Yarto et al. 2012). Through their review of the literature, Lopez-Yarto and colleagues (2012) were unable to find a link between psychiatric medication and GDM risk or excess gestational weight gain; however, only two studies were suitable for their review so this complication should be examined further as this potential relationship between antidepressant medication and GDM is pertinent for health practitioners to be aware of.

2.5.2 Stress and Anxiety

Stress and anxiety during pregnancy can have an impact on maternal and infant health. There is not an agreed upon percentage for how many people are impacted by stress and anxiety during pregnancy due to a lack of agreed upon screening tools (Dunkel Schetter and Tanner 2012). However, many studies have suggested that a large proportion of pregnant people experience stress and anxiety (Dunkel Schetter and Tanner 2012). In a study of urban pregnancies Melville and colleagues (2010) found that up to 78% of their participants (n=1888) experienced low to moderate psychosocial stress and 6% had high levels during their pregnancy.

Many studies have found that psychosocial stress is a factor for preterm birth (Dunkel Schetter and Tanner 2012; Hobel, Goldstein, and Barrett 2008; Rondó et al. 2003). In addition to premature delivery, stress and anxiety during pregnancy has also been linked to low birth weight (Dunkel Schetter and Tanner 2012; Rondó et al. 2003). Low birth weight and prematurity can pose serious complications for the infant. Prematurity can impact fetal development and later health outcomes (Dunkel Schetter and Tanner 2012). Low birth weight increases the risk for perinatal and neonatal infant mortality and morbidity (Paneth 1995; Moore and Freda 1998).

Diet during pregnancy and its association with stress and anxiety have not been researched in great depth. In their review of the literature Baskin and colleagues (2015) have found that there is a relation between maternal stress and depressive symptoms as well as decreased diet quality. However, there were only nine studies conducted that examined maternal diet quality and pregnancy stress and depressive symptoms so further studies are needed to test these findings. However, poor diet quality during pregnancy

may have further implications for maternal and offspring health later in the lifecourse (Barker et al. 2002; Gluckman, Hanson and Beedle 2006; Hanson and Gluckman 2015).

There are a variety of treatment methods available for stress and anxiety during pregnancy including both pharmaceutical and nonpharmaceutical approaches (Vythilingum 2008). Treatment without medication includes attending counselling sessions, psychotherapy, relaxation therapy, and mindfulness-based cognitive therapy (Goodman et al. 2014; Vythilingum 2008). Familial support can help mitigate some of the effects of chronic stress on preterm birth and studies have found that partner involvement and social support can decrease the effects of chronic stress on preterm birth (Ghost et al. 2010; Zachariah 2009). Medication for anxiety during pregnancy is not as commonly prescribed due to potential health risks for the fetus, which is why nonpharmaceutical treatment options are often explored instead (Goodman et al. 2014; Vythilingum 2008). However, medications that can still be used include selective serotonin reuptake inhibitors and tricyclic antidepressants (Vythilingum 2008). Stress and anxiety may also co-occur with depression during pregnancy, which means health and care providers need to ensure they are addressing all psychosocial issues to ensure proper treatment and improve pregnancy health outcomes (Hirschfeld 2001).

2.6 Food Insecurity

Food security was defined at the 1996 World Food Summit as having "physical and economic access to sufficient, safe, and nutritious food to meet…dietary needs and food preferences for an active and healthy life" (FAO 2019). This is the definition of food security that Canada has adopted for its own measures. Food security is also often

thought of in regard to four pillars, or themes that encompass the various factors that impact food security. These pillars include availability, access, utilization and stability, with stability being the most recently added (CFS 2017). Webb and colleagues (2006) note that the first three pillars are hierarchical, with availability being necessary, but not sufficient for access, and access is a requirement, but not enough for utilization. These pillars illustrate the complexities of food security. In addition to the affordability of food, access to food can be impacted by a variety of factors including, proximity to affordable grocery stores, the ability to transport groceries home, the time to prepare meals, and having access to familiar food items. Statistics Canada measures food insecurity with an 18-item questionnaire, listed in Appendix 1, that is administered in the Canadian Community Health Survey (CCHS) (PROOF 2018). This questionnaire measures both adult and child food insecurity. The CCHS is an annually administered survey that samples approximately 130,000 people (GOC 2017). Although the CCHS is administered annually, the decision to measure food insecurity is left up to the provinces (PROOF 2018). However, the 2017/2018 cycle of the CCHS included food insecurity as a required item, which provided updated rates of food insecurity in the country. Between 2017 and 2018, 12.7% of Canadian households experienced some form of food insecurity in the prior 12 months (Tarasuk and Mitchell 2020). The CCHS does not ask about transportation, time, or other barriers that may hinder people from living a food secure life.

People who live with low income are the most vulnerable to experiencing food insecurity (Tsang, Holt, and Azevedo, 2011). Furthermore, those individuals tend to be at

greater risk for having poor health and developing noncommunicable diseases (Loopstra and Tarasuk 2013). In their examination of health and diet across 195 countries, the Global Burden of Disease 2017 Diet Collaborator Team (2019) found that in 2017 11 million deaths globally were due to malnourished, or unbalanced diets. This study makes evident the health effects that arise due to a lack of access to food. Food insecurity also impacts mental health and those who are food insecure are at a greater risk for mental health issues than those that are food secure, which is in part due to the increased stress of not having enough finances (Power et al. 2016).

Food insecurity also plays a particular role in the lives of mothers and pregnant people that differs from the rest of the population (Martin and Lippert 2012). Pregnancy increases one's risk of becoming food insecure because of the additional costs that come from planning for a new baby (Gross, Mendelsohn, and Messito 2018). Overall, being food insecure tends to mean you have a poorer diet because low-cost foods tend to be those that are energy dense and processed (Gross, Mendelsohn, and Messito 2018). This type of diet can put one at an increased risk for weight gain and obesity as well as NCDs.

Pregnant people and mothers living with food insecurity may exhibit altered feeding behaviours, which can also affect infant feeding practices (Gross, Mendelsohn, and Messito 2018; Martin and Lippert 2012). Mothers in food insecure households are at greater risk of becoming overweight or obese than men in food insecure households and people in food secure settings (Martin and Lippert 2012). Through their research Molly Martin and Adam Lippert (2012) found that this was because of the intersection of food insecurity and the gendered divide around child and household care. Mothers tend to

embody gender norms and take on the bulk of childcare. Part of this role in food insecure households is acting as a buffer to prevent the children from feeling the full effects of food insecurity. By placing the needs of the children first, mothers are more likely to skip meals and eat later after the children are full. These eating patterns coupled with a poor diet places these people at risk for weight gain that is not seen in their male counterparts. This increased risk of weight gain could then lead to an increased risk for T2DM and possibly GDM if the mother becomes pregnant again.

Food insecurity not only alters maternal eating behaviours, but can also affect infant feeding styles, which can have lasting effects on satiety cues in the child (Gross, Mendelsohn, and Messito 2018). Mothers who were food insecure during pregnancy and infancy were more likely to exhibit non-responsive infant feeding styles. Non-responsive feeding means that mothers are not observing and following when their child is hungry or full. Rachel Gross, Alan Mendelsohn, and Mary Messito (2018) propose that this may be due to mothers trying to compensate for lack of food by encouraging eating when food is available, or trying to soothe crying babies. Overall, the feeding behaviour of the infant could have lasting effects on childhood growth and development as well as how children notice and respond to their own hunger cues later. Food insecurity can affect anyone throughout the life course and has detrimental effects on health and well-being.

2.7 Income and Maternity Leave

In addition to the above factors, there are numerous household variables that can impact one's diet and access to healthy foods during pregnancy. One major issue is income and maternity leave. To take time off work during pregnancy people must go on

maternity leave, which almost halves their personal income for the duration of their leave period. This decrease in income can create an added stress as people still have the same bills to pay. Marital or Common-Law status is an important variable as well because it indicates the number of adults in the home who can contribute to the household. The number of dependents or children that someone must care for can also have an impact on food insecurity in the household. The cost of housing and rent must also be considered as this is a major bill that must be paid each month. These household factors ultimately all impact household income, which, as touched on above, is important as it is often money that is left after other bills are paid which is used to buy groceries.

Maternity leave in Canada, except Québec, is available for those who are absent from work because they are pregnant, have recently given birth, or have adopted a new child and have worked 600 hours in the year prior to the beginning of your claim. Those who are eligible for maternity leave are able to receive 55% of their income, up to a weekly maximum of $573 for a total of 15 weeks. This maternity benefit period can be followed by parental benefits, which would allow one to extend their leave for 35 weeks, or up to 40 weeks if split by a partner. If a new parent or parents need to take more time they can apply for the extended parental benefits that last for up to 61 weeks, or 69 weeks if split with a partner; however, under this benefit plan people are only able to receive 33% of their income, with a weekly maximum of $344 (GOC 2020).

2.8 Theoretical Background

2.8.1 Biocultural Theory

As mentioned above, the environment is an important factor to consider when examining population health. However, the term environment can connote different

definitions depending on the context. I am defining environment in a broad scope in order to see the multitude of factors that impact health and how these factors can also influence one another. Environmental factors are elements that individuals and populations encounter and interact with. This incorporates: the physical environment, including water, pollution, and ecosystems; the social environment, such as prejudice, social class and status; the political environment, for example government and policies; economic position, which includes SES, income, and employment stability; and historical factors, such as past generational treatment and cultural prejudices (Ismaili M'hamdi et al. 2018; Lock 2015; Mendenhall 2012; Wiley and Cullin 2016). These forces do not exist in isolation. For example, having a low SES may hinder one's ability to access education meaning one is unable to find a secure job, which can lead to a persistent cycle of poverty. This intersectionality is important to address as these factors collectively form the environment that influences health and well-being.

The biocultural approach started to emerge in the discipline of anthropology in the 1950s, although the term biocultural was not utilized until the 1970s (Wiley and Cullin 2016; Zuckerman and Martin 2016). The use of this approach in anthropology has shown how our biological bodies are plastic and can change due to environmental factors. In the 1980s the role of culture as an environmental stressor was considered to also be a factor that could impact population health, specifically in regard to infectious disease (Armelagos and McArdle 1975). Since then, the idea of culture as a factor influencing health has been extensively studied, beyond infectious pathogen risk. In particular, the inequities that our cultural and social environments create in regard to ethnicity and

socioeconomic position have been documented (Gravlee 2009; Worthman and Kohrt 2005). The examination of culture and society as health factors demonstrates that the biocultural approach is complex and needs to consider not just the physical environment, but also the political and economic environments as well; together these factors come to form the local context, which is key for understanding human health (Brewis et al. 2020).

The biocultural approach has expanded since it was first utilized in the literature. It now includes under its umbrella notions of synergy, or syndemic risk that exists between environmental factors, embodiment, as well as the DOHaD hypothesis (Brewis et al. 2020; Leatherman and Goodman 2019). The biocultural approach has often been used as a holistic, or all encompassing, perspective when examining health and well-being. By recognizing the many overlapping and intersecting points in the environment, synergistic relations between health conditions and environmental factors can be observed. A case in point is noncommunicable diseases (NCDs). They are often not caused by one risk factor, but are the culmination of many factors, including diet, access to food, and job security, to name a few. It is not possible to directly state one cause of an NCD such as T2DM because of this complex etiology. Examination of syndemic risk does not seek a direct cause, but instead examines these risks in concert to see how one factor may amplify or interact with another factor in the diagnosis or experience of the disease. It is in this manner that we come to embody our local environments. The environment, through health and disease risk becomes imprinted on our physical bodies. The DOHaD hypothesis posits that the health and diet of previous generations impacts on the risk of developing NCDs in the current generation (Hicks and Leonard 2014). As

anthropologists this reminds us that we need to not only be attuned to the local context, but also to the temporal factors to understand what that local context once was and how it has changed.

2.8.2 Syndemics

Syndemics was first described by Merrill Singer (1994) as the experience of multiple epidemics, or the co-occurrence of diseases, acting synergistically with one another and the social environment. The word syndemics is derived from the words synergy and epidemics. The idea of studying the whole health experience instead of isolating each epidemic counters the tendency toward biological determinism (Lock 2015). Since its initial development it has included social conditions, which draws attention to sociocultural and political economic environmental conditions (Singer and Clair 2003). For example Singer (2004) has examined the interaction of substance abuse, street/domestic violence. Emily Mendenhall (2012) has employed a syndemic framework to explore the intersection of violence, depression, diabetes, immigration/isolation, and abuse among Mexican immigrants in the US, and Sarah Willen and colleagues (2017) have examined how migrants are more likely to face human rights violations and how their health suffers as a result. Epidemics are no longer restricted to medicalized diseases, but can include social issues such as epidemic poverty (Mendenhall 2012). The interactions between an individual and their environment are complex. The syndemic approach means examining multiple aspects of an experience and paying attention to not

only the diseases that affect communities, but what social and political forces have increased susceptibility to poor health, which is why it fits within the biocultural perspective. Furthermore, the syndemic approach can help reveal how our biology becomes situated in our environments (Niewöhner and Lock 2018). It is important to learn how diseases act in communities and can impact some individuals and not others.

Contextualizing the environment in which these diseases arise, which the biocultural approach does, allows for an understanding of why some diseases tend to cluster in certain populations, communities, or neighbourhoods because the inequalities become apparent (Mendenhall 2012). This insight would not occur if one were to just study a disease separately from how the environment is also impacting the community's health and individual bodies. Incorporating a patient's experiences into their disease diagnosis provides the opportunity to deconstruct the whole disease experience (Mendenhall 2012). Then, it will be more apparent how specific environmental factors, throughout the life course, have influenced a person's disease susceptibility. Being aware of the multiplicity of forces means that one can see the interrelations among issues.

2.8.3 Developmental Origins of Health and Disease (DOHaD)

The DOHaD paradigm describes how early life events, or conditions, such as environmental chemical exposure, diet, and stress result in an increased incidence of NCDs in future generations (Winett et al. 2016). Life experience of parents prior to conception and the maternal environment during pregnancy can have lasting consequences which can increase propensity for developing NCDs (Barker, Eriksson, and Forsén 2002; Gluckman, Hanson and Beedle 2006). The DOHaD hypothesis was first

proposed by epidemiologists Dr. David Barker and Dr. Clive Osmond in the late 1980s after observing an association between birth weight and the development of NCDs (Thiele and Anderson 2016). The research they and their colleagues conducted showed that those born at a lower birth weight were at a greater risk of developing heart disease and T2DM later in life. Since then, extensive research has been done to examine this observation in adults (Jaiswal et al. 2012; Wang et al. 2014).

The knowledge that has been uncovered through DOHaD research has multiple implications for public health because NCDs are on the rise globally (Hanson and Gluckman 2015). The World Health Organization (2018a) reported that 70% of deaths globally can be attributed to T2DM and other respiratory and cardiovascular diseases. As Mary Barker and colleagues (2018) note, DOHaD research, if properly acted upon, could be useful in mitigating disease incidence in future generations. It is therefore imperative that the academic research is translated into public knowledge and that actions are taken to reduce barriers to health.

The DOHaD hypothesis is pertinent of use for my research because although I am not conducting a longitudinal analysis, the lasting effects of GDM should still be considered. As mentioned earlier, 50% of people who develop GDM during pregnancy will be diagnosed with T2DM later in their life and their children will be at an increased risk for obesity and developing T2DM in their lifecourse (Crowther et al. 2005; Diabetes Canada 2019; Feig et al. 2014). Furthermore, if their child becomes pregnant then she is also at risk for developing GDM (Crowther et al. 2005; Feig et al. 2014). Many of these babies are not of a low birthweight, but are instead macrosomic (greater than 9lb) due to

their environment during development (Catalano 2010). Rising GDM rates should be closely examined because GDM cases increase the risk for developing NCDs later in the lifecourse for both mother and child (Catalano 2010).

2.8.4 Embodiment

Research into DOHaD and the biocultural approach must include an understanding of how inextricably entangled our bodies are with all aspects of the environment. Disease can no longer be understood through only the immediate context, especially in regard to NCDs. Our bodies are in a constant dialectical relationship with our environment. By expanding the notion of the body, it becomes evident that there are a multitude of forces that influence individuals on various levels. The diet and stressors encountered can impact immediate health and the health of future generations (Lock 2015). Not only do our environments impact our health and well-being, but our bodies become an account of our environmental experiences (Krieger 2004). These factors shape individuals and they come to embody the environment in which they are situated. Understanding these ideas of embodiment, or how the body is molded by its surroundings, will be crucial for understanding how one's health and well-being is affected by these social determinants of health. Furthermore, ideas of embodiment will be useful for my project as they help tie together the DOHaD and biocultural frameworks that I will be using.

The DOHaD approach posits that the environment of past generations as well as during early-life events can influence risk to developing NCDs such as T2DM, and cardiovascular diseases. The biocultural perspective takes into account the environmental

factors, which can cooccur; this perspective also entails being mindful of the environment in which the individual resides and comes to embody (Lock 2015). The embodiment of the environment needs to be considered in order to understand how health conditions and disparities arise in the population. In particular, when examining environment embodiment is useful in determining why certain diseases tend to cluster in certain communities. As research with the biocultural approach has demonstrated thus far, the body is heavily influenced by the environment in which one is situated. Therefore, the body cannot be thought of as one singular being, but should be viewed as the result of various dialectical relations with one's environment (Scheper-Hughes and Lock 1987).

2.9 Summary

In this chapter I have outlined the local area of study, Hamilton, Ontario, explained how GDM, as well as anxiety and mood disorders, such as depression, create additional complications during pregnancy. I also reviewed food insecurity and the barriers that it creates for attaining optimal pregnancy health. I introduce theoretical approaches, including the biocultural approach that encompasses other frameworks such assyndemic risk, the DOHaD hypothesis, and embodiment. The use of all of these frameworks guides my analysisto investigate the interactions between social conditions and health issues during pregnancy. GDM for example, is a condition that is influenced by both genetics and the environment; therefore, it is important to recognize and understand how social determinants of health and social inequities can impact disease risk (Krieger 2004). The immediate social and physical environment of the mother must also be assessed: Is healthy food affordable? Are there grocery stores nearby? Is there

time to prepare meals during the day? What other priorities does the pregnant person have? These are all questions that need to be considered when examiningrisks for GDM alone. The biocultural approach will allow for these social and health complications to be analyzed in concert.

Chapter 3: Materials and Methods

3.1 Introduction

I employed both qualitative and quantitative methodologies to examine the pregnancy experiences of pregnant and recently post-partum people in Hamilton, Ontario[3]. To obtain qualitative data specifically relevant to the experience of GDM, food insecurity, and mental health, I conducted six interviews with pregnant and recently post-partum people living in the Hamilton region. I also analyzed ten focus groups that had been done previously in the M2B study: four with pregnant and post-partum people and six with health and social care providers. The M2B team also conducted a survey between 2015/6? and 2018 with pregnant people living in the city of Hamilton. These focus groups and survey provided information on the prevalence of certain conditions, such as GDM and food insecurity, as well as experiences and perspectives on pregnancy nutrition and health. For a broader, national view, I analyzed the 2017/2018 cycle of the Canadian Community Health Survey (CCHS) to explore if there were relationships among GDM, food insecurity, and anxiety and depression. The benefit of using both qualitative and quantitative methods is that, while the statistical analysis of the surveys can inform about the prevalence and risk of these conditions, it does not provide

[3] One participant was from the neighbouring Halton health region.

information about the experiences and perspectives of pregnant and postpartum people. Combining the two methods provides greater depth into some issues that will be explored, such as barriers that impact food security like time, transportation, and the affordability of food. The M2B Study protocol and the interviews I conducted for this project received ethics approval from the Hamilton Integrated Research Ethics Board (HiREB), project numbers 0507 3604 respectively.

3.2 Qualitative Analysis

3.2.1 Interviews

Recruitment for interviews was conducted primarily in the city of Hamilton with assistance from the Community Midwives of Hamilton. Midwifery services are covered by provincial healthcare and are available without a doctor's referral (AOM, 2020). My partnership with the Community Midwives of Hamilton allowed me to connect with other midwifery groups in Hamilton as well as two groups in Burlington who helped to recruit participants. I also went to and contacted various food centres in Hamilton and was able to put my poster up on bulletin boards around the city. In addition, I reached out to mom's groups on Facebook to see if they would make a post for my project. Many groups were willing to make such posts. Recruitment for this project proved difficult and it was primarily through the midwifery social media platforms that I was able to recruit participants.

In total, I conducted semi-structured interviews with six pregnant and post-partum people. Potential participants were asked to contact me if they had experienced food insecurity, mental health challenges or gestational diabetes during their pregnancy. Since the eligibility was quite broad, I ended up with a range of participants. From this

convenience sample (Bernard, 2006), five of these participants resided in Hamilton, and one lived in Burlington, Ontario, a nearby city of 183,000 (Statistics Canada, 2016), but had been in Hamilton for her first pregnancy. After participants reached out, I provided them with information about the study summarized in a one-page document. I also sent them a consent form to review. Participants who were still interested in partaking after reading the documents emailed me back and we arranged a time for the interview. The interviews were conducted at a location that was most convenient for the participant: two were conducted in a private office at McMaster University, two were in the participant's home, and two were held in public spaces (library and coffee shop). Before I began, participants and I signed two copies of the consent form, one for the participant to keep and one for my records. The consent form includes a statement on confidentiality and I also provided a verbal statement before we began with the interview. I reminded participants that they were not required to answer any questions if they did not want to and that they were welcome to withdraw from the study at any point in time. No participants declined any questions or left the study. After signing the consent forms all participants were given a $25.00 activated Visa gift card. I also provided participants with parking reimbursement for those who drove to McMaster and two bus tickets for both the participant and their children if they took a bus to the interview. Prior to the interview, participants filled out a short anonymous sociodemographic survey, listed in Appendix 2, for the purposes of gathering background information about them. The interviews lasted between 20 minutes and one hour and were recorded on either a small digital audio

recorder or with the Voice Record Pro application on my phone. All participants consented to having their interview recorded before I turned on the recording device.

3.2.2 Interview Transcription and Coding

I transcribed the interview recordings verbatim. After the initial transcription was complete I listened to the recording again to make any appropriate edits to the final document. Once the transcription was complete I removed all participant names and replaced them with their previously assigned code. Recordings were erased at the end of the project.

Once all of the interview transcripts were complete, a coding schematic was created to prepare for the coding process. To create the coding framework, the question guide was used to generate topics that were discussed in interviews. The framework consisted of many major nodes and subsequent sub-nodes that branched off the major node as discussed by Attride-Stirling (2001). Major nodes that were identified included: Challenges and Barriers, Mental Health Experiences, Food and Diet, Prenatal Care, Supports, Gaps and Solutions, and Gestational Diabetes Experiences. There were many sub-nodes under those major topics, and some sub-nodes were broken down with further nodes beneath them. All transcripts were then read over again before the coding process began. Coding was done manually. I copied pieces of text from the transcript and placed those excerpts under the appropriate node, or nodes as some pieces of text included multiple topics, on a master document. In order to keep excerpts of text from each interview distinct, in case I needed to go back and reference the original transcript, the participant code was placed at the beginning of each excerpt and each interview was

coded with a different font colour in the master document. After each interview transcript had been coded, I was ready to begin the thematic analysis.

Thematic analysis was done according to the steps outlined by Attride-Stirling (2001). I began thematic analysis by reading through all the excerpts of each node individually. While reading through each node or sub-node I made notes regarding themes that were prevalent across the content. After the basic themes of each node were recorded, I started to look for organizing themes, or a broader theme that encompassed multiple basic themes. Once the organizing themes were identified, I analyzed those themes by creating a mind map. The mind map consisted of boxes with major organizing themes as well with the associated basic themes underneath. Working with the organizing themes in this manner allowed me to draw connections between different organizing themes and reposition the boxes to explore the different ways in which the themes were connected (Braun and Clarke 2006). The analysis that generated the connections between the organizing themes led to the global or overarching themes (Attride-Stirling 2001). These global themes include some, but not all organizing themes. This analysis did not result in one overarching theme or idea, but a couple of global themes, which together explain the ideas discussed in the interviews. The major global themes identified include: *People experience increased difficulty with accessing a healthy diet during pregnancy due to a variety of issues including specific pregnancy symptoms*; *the relationship that people have with food changes during pregnancy*; *pregnancy brings new stresses that people have to learn to live with*. Once the interviews had been coded, the themes were considered alongside the themes and discussions from the M2B focus groups.

3.2.3 Mothers to Babies Focus Groups

The Mothers to Babies (M2B) project is an inter-disciplinary study that aims to examine and support pregnancy health in the City of Hamilton. The team includes members with backgrounds in anthropology, biomedical science and biochemistry (fetal physiology, epidemiology, nutrition sciences), social psychology, obstetrics/midwifery, and public health. The M2B team has conducted a survey with pregnant people living in Hamilton, Ontario as well as focus groups with pregnant people and new mothers, midwives, registered dietitians, public health nurses, and Early Childhood Education care providers. The M2B survey will be discussed in the Quantitative Data section below. In addition to the focus groups and survey, a stakeholder meeting was also held to bring voices in the community together and to generate ideas for solutions. The stakeholder meeting data was not included in the data analysis for this thesis.

A total of ten focus group interviews were conducted. Four of the focus groups were carried out in neighbourhoods with high poverty rates, with 19 of the 22 people having been recruited directly from Welcome Baby prenatal classes, which are federally funded by the Canada Prenatal Nutrition Program. These classes are free to join and participants receive a free meal, grocery store and prenatal vitamin gift cards, bus tickets, and information about pregnancy health and nutrition from a registered dietitian and nurse. There are seven Welcome Baby groups spread around the city of Hamilton. These prenatal classes are strategically located to serve people who are experiencing vulnerabilities, especially those related to poverty and newcomer status. The remaining six focus groups were conducted with health and social care providers with a breakdown

as follows: Two focus groups were conducted with registered dietitians and public health nurses that run the Welcome Baby programs; two were with midwives; two were with early childhood educators who work at new-parent and young child drop-in centres (EarlyON) around the city.

There were two interview guides created, one with 13 questions for the focus groups with pregnant and postpartum people, and the second with 14 questions for interviews with health and social care providers. Consent was received from participants before the sessions began. After being collected, forms were stored in a locked filing cabinet in a private office at McMaster University. Participants were given $25 grocery store gift cards and two bus tickets for partaking in the focus group. All focus groups were led by a member of the research team and lasted between 60-120 minutes. All focus groups were audio recorded and transcribed verbatim by members of the research team, except in one instance when approximately two thirds of a recording was lost. Detailed notes were also taken during the interviews and were sufficient to use as a replacement for the missing portion of the audio recording. Recordings were transcribed verbatim by members of the research team. Transcripts were checked over and then anonymized by replacing names with predetermined codes.

After all the focus groups were complete, six members of the study team, including myself, got together and began to prepare for coding the transcripts to identify key themes and ideas discussed in the various focus groups. To begin, a coding framework was crafted. The coding framework was made by creating a series of nodes and sub-nodes that categorized different topics from the focus groups as Attride-Stirling (2001)

discusses. The interview guides were used to help generate some of the larger nodes, and then sub-nodes were created to further divide topics. The coding framework was created and then tested many times until the final model was produced. The framework was tested by having multiple team members code the same section of a transcript and then compare and discuss discrepancies between coders until a final coding framework was decided upon by consensus. As there were multiple members of the research team coding the documents, many meetings were held to construct a cohesive coding scheme that ensured intercoder agreement, which ended up being over 90% (McKerracher et al. 2020b). Major nodes included: Challenges and Gaps, Health, Knowledge, Solutions, and Supports. Coding took place in NVivo 12, which is a software that allows for thematic network analysis (Attride-Stirling 2001). Coding was split up across five team members, with the majority done by three trainee members of the team, which included myself. Once the focus groups were coded the researchers reconvened and analyzed themes that emerged through the coding process. The full description of the analysis of the M2B data can found in McKerracher et al. 2020b.

3.2.4 Mothers to Babies Stakeholders Meeting

Following the focus group interviews a stakeholder meeting was organized that brought together pregnant and postpartum people, health and social care providers, and members of the research team. At the meeting preliminary findings from the focus groups and survey were presented. Small groups were then organized, each with a mix of participants to discuss pregnancy health and nutrition in Hamilton and issues with care. Afterwards all participants came together to discuss issues that they had identified in their

groups and possible solutions to these barriers. Detailed notes were taken throughout the meeting and the small group and final discussion sessions were audio recorded and transcribed by myself.

3.3 Quantitative Data: Description and Analyses

3.3.1 Canadian Community Health Survey

The CCHS is an annual cross-sectional survey that gathers information on health for the Canadian population (Stats Canada 2020). Respondents for the survey are selected through a multi-stage allocation strategy with the purpose of ensuring there is an even distribution among provinces and territories (Stats Canada 2020). Surveys are conducted in person? with either computer assisted personal software, or over the phone with telephone interview software (Stats Canada 2020). The survey aims to sample 130 000 people nationally across a two-year cycle for the annual component of the survey (Stats Canada 2020). Survey respondents must be over the age of 12 (Stats Canada 2020). The survey does not include people who are full-time members of the Canadian Forces, individuals who live on Indigenous reserves, including those in the Québec health regions of Région du Nunavik and Région des Terres-Cries-de-la-Baie-James, and those who are in prisons, care facilities, or part of the foster-care system. The survey is composed of common content, which every participant is asked about every year, and optional content, which provinces decide to include, as well as a rapid response component which may be added into the survey for just a three-month period (Stats Canada 2020). Provinces do not have to include all questions every year and therefore there may be some questions in the survey that have fewer respondents (Stats Canada 2020). This has been the case in the

past for household food security, but the 2017/2018 cycle included all provinces and territories. For the 2017/2018 cycle that was used in this analysis 113 290 participants were surveyed. As these respondents only represent a sample of the Canadian population, Statistics Canada uses specific master weights that can be applied to the responses to more accurately impute representation of the national population as a whole. The weight that is applied to each participant's response is determined by the number of households in the population as a whole that the respondent represents. This is determined by the area of residence and the telephone number of the respondent (Statistics Canada 2010). All reported data from the CCHS is weighted to represent the national population.

The CCHS asks about maternal experiences, including whether or not the respondent is currently pregnant. Survey participants that affirmatively responded to that question were used as the pregnant population for this study. By including only those who were currently pregnant at the time of survey response in my sample, the answers to the questions about other complications, such as food insecurity, depression, and anxiety, will be representative of the barriers they were facing while they were pregnant, not issues that may have arisen before or after but not during pregnancy. As the CCHS encompasses questions about mental and physical healthmetrics as well as a food insecurity instrument, I was able to use the survey to analyze whether or not risk for one's pregnancy health conditions were associated with food security and mental health status at the time of the survey.

In order to conduct the analyses on the CCHS I needed to obtain access to the master files. The master files differ from the microdata files that are publicly available.

The master files are stored in Research Data Centres (RDCs) across Canada. To obtain access to these files my MA supervisor and I first had to submit applications which outlined my research questions and why the CCHS would be useful. Following the acceptance of my application were screened by Statistics Canada, which included submitting my fingerprints, in order to have access to the RDCs. Once inside the RDC, data was only allowed to be used in tests if there were more than five people in every cell prior to the application of weights. This ensures that survey respondents are unidentifiable in any reports. All data that was used from the CCHS was vetted before leaving the RDC. For all analyses significance was set a $p = 0.05$.

3.3.1.1 Food Insecurity

Food insecurity was measured as an annual component on the most recent cycle (2017/2018) of the CCHS. The 18 questions that are used in the CCHS all revolve around whether low income prohibited access a healthy diet. For the 2017/2018 cycle of the CCHS Statistics Canada began reporting food security in four categories. These include: food secure, no affirmative answers to any of the 18 questions; marginal food insecurity, one affirmative response; moderately food insecure, two to five affirmative responses; and severely food insecure, six or more affirmative responses. Due to a small sample size of participants with GDM, the four-category food insecurity scale was condensed to a binary scale for these analyses. The binary scale was created by placing respondents who were marginally, moderately, or severely food insecure into one food insecure category, while the food secure respondents remained in a food secure category.

To analyse how pregnancy impacts one's risk for food insecurity, a logistic regression analysis was conducted. Logistic regression was used because the dependent variable, food insecurity, is binary. The analysis investigates whether or not people who are currently pregnant are at a greater risk for food insecurity. For this analysiss the only independent variable was whether or not the individual was pregnant. Those who were pregnant were compared to those who were asked if they had been pregnant, but answered negatively. Instead of comparing them to the general population, the risk of being food insecure was analysed within this cohort of females. This test helped determine whether or not being pregnant impacted one's risk for experiencing food insecurity.

The above analysis examined how different portions of the population have differing risks for food insecurity. To examine how other sociodemographic and health conditions are associated with one's risk for food insecurity during pregnancy a logistic regression analysis was conducted with food security as the dependent variable. A stepwise method was used to determine which variables to include in the final model. The final analysis consisted of five statistically significant independent variables: income, level of education achieved, number of dependents, reporting a mood disorder, or reporting an anxiety disorder. The stepwise process allowed me to see how each factor was associated with food insecurity, but also if there were any interactions between the independent variables.

3.3.1.2 Gestational Diabetes

The CCHS asks respondents whether or not they have been diagnosed with diabetes. A later follow-up question asks whether or not respondents, who are between the ages of 15 and 54, if they were pregnant when they were first diagnosed with diabetes. This question was used in conjunction with those who reported being pregnant at the time of the survey to determine the population that had probably been diagnosed with GDM. If participants reported being diagnosed with diabetes during their pregnancy, they were then coded as '1'. Pregnant people who did not report a diabetes diagnosis during pregnancy were coded as '0'. The CCHS does not ask how far along in their pregnancy someone is; therefore, this variable may underestimate the prevalence of GDM in pregnancy in Canada, since GDM is diagnosed at the end of the second or beginning of the third trimester. This means that if a survey participant had not reached that stage of their pregnancy, then they would not yet have been tested for GDM.

To see if risk for GDM was associated with other factors, multiple logistic regression analyses were conducted. The first test was to determine if there was an association between food security status and being diagnosed with GDM. Due to the small sample size when looking at the initial crosstabulation between the food security scale and GDM, there were cells with too small a sample size to proceed. The first logistic regression analysis had GDM as the dependent variable and food security as the independent variable. Following the first logistic regression, more variables were added to determine how other sociodemographic factors were associated with GDM using a stepwise analysis. Alongside food security, the other independent variables were age, income, and number of dependents. Although pre-pregnancy BMI is a known risk factor,

it was not included because the CCHS does not ask pregnant respondents to report pre-pregnancy, or current BMI.

To determine if there was an association between GDM, food security, and mental health, further logistic regression analyses were conducted with GDM as the dependent variable. Because an interaction between the mood and anxiety was observed in prior logistic analyses, two models were tested: one with mood disorder, the other with anxiety disorder. Food security was also included as a second independent variable for both analyses.

3.3.1.3 Mental Health – Stress and Anxiety and Mood Disorder

The CCHS asks respondents a variety of questions about their mental health. For this study the question "Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or a panic disorder?" was used to determine whether or not someone was dealing with stress and anxiety-specific mental health issues. Affirmative answers were used to determine the proportion of the pregnant population that had an anxiety disorder. When examining the cross tabulation between anxiety and food security status, there is an evident difference in the rates of food security between those who were diagnosed with an anxiety disorder and those who were not. A logistic regression analysis was used to determine whether or not there was a significant association between reporting an anxiety disorder and being food insecure during pregnancy. This analysis included anxiety as the dependent variable and food security status as the independent variable. Following this, more variables were added to see which other factors are associated with anxiety disorders. The CCHS also measures the prevalence of mood

disorders by asking participants “Do you have a mood disorder such as depression, bipolar disorder, mania or dysthymia?”. Affirmative responses to this question were used to determine the proportion of the pregnant population that had a mood disorder. The first logistic regression analysis included only food security as an independent variable and mood disorder as the dependent variable. To determine if other factors impacted risk for reporting a mood disorder a stepwise regression analysis was conducted to add in other sociodemographic variables. The final model included the following independent variables: food security, having an anxiety disorder, level of education, and number of dependents.

3.3.2 Mothers to Babies Survey

A 140-item survey was created and administered to pregnant people in Hamilton. It was conducted from June 2017 to September 2018. The survey was available online and in a paper format; the paper version was also available in Arabic as that was the most common language spoken by participants at one of the main promotion centres. The survey asks pregnant people a range of questions including sociodemographic information, their knowledge about pregnancy health and nutrition, their agreement with the statements pertaining to the DOHaD hypothesis, their typical diet, and what barriers they face in regard to eating and nutrition during pregnancy. Overall, 404 pregnant people participated in the survey; however, only 330 respondents both completed the questionnaire in full and resided within Hamilton. For all analyses significance was set at $p = 0.05$.

3.3.2.1 Food Insecurity

The survey did not include the 18 food security questions that are included as a part of the CCHS, nor did it have the shortened 6 item food security survey developed by the USDA (2012). To determine the prevalence of food insecurity in the survey population, answers to the following question were used to create a binary scale: Does not having enough money make it hard for you to eat healthy food during pregnancy? Participants were asked to answer on a five-point Likert scale from 1 (Not at all) to 5 (A lot). Those who responded with a four or a five to this question were classified as food insecure and those with answers in the 1 to 3 range were categorized as food secure. This question was selected because all of the questions in the 18-item food security survey ask pertain to whether or not income impacts one's ability to access food. As this question centres on affordability, it was seen as an apt substitute to determine food insecurity during pregnancy.

The M2B survey included many questions about factors that affect eating behaviour and ability to eat healthfully during pregnancy. These variables were used to explore the challenges that people have in eating a healthy diet during their pregnancy. Analyzing these other variables also provides insight into how food insecurity is experienced beyond just affordability of food.

The survey asked respondents to answer if affordability, lack of time, whether lacking transportation to a grocery store, and if uncertainty about what to eat made it difficult to eat healthy food during pregnancy. Responses were chosen on a five-point scale from 'not at all' to 'a lot'. A logistic regression analysis was performed to better understand the association between the two variables. The independent variables for this

analysis besides lack of time, transportation and knowledge as barriers included: socioeconomic position, maternal age, and number of dependents in respondents' households.

The final variable that was analysed alongside food insecurity was difficulty with eating healthfully. For this question, participants were asked "How hard is it for you to eat healthy during pregnancy?" Respondents were asked to answer on a five-point scale from 'not at all' to 'a lot'. A logistic regression analysis was performed. For this analysis, food insecurity was the dependent variable and the independent variables, aside from difficulty eating healthy, were socioeconomic position, maternal age, and number of dependents.

In the logistic regression analyses involving the M2B survey, socioeconomic position was used as an independent variable for analyses except when income was the dependent variable. Socioeconomic position was determined by combining household income, socioeconomic position, and source of income responses and has been used in prior publications for the M2B survey (McKerracher et al. 2020a). Socioeconomic position was scored from two to eight, with two indicating that the respondent was part of a household with an annual income that was less than $23 000, that social assistance was a source of income, and they had not completed high school (McKerracher et al. 2020a).

3.3.2.2 Household Factors

Household variables including income, marital status, and number of dependents can all impact risk for becoming food insecure and the ability to access a healthy diet during their pregnancy. The M2B survey included questions about these

sociodemographic factors and I analysed the relation between these variables and food insecurity through a series of logistic regression analyses.

The M2B survey categorized income into four categories (< $23 000, 23 000 – 39 999, 40 000 – 79 999, 80 000+). Socioeconomic position was not included as an independent variable in this analysis because income was one of the factors that went into determining socioeconomic position. When socioeconomic position was included there was an interaction as part of the income variable is included in socioeconomic position. To examine the relationship between income and food insecurity, a logistic regression analysis was conducted. To better understand how risk for becoming food insecure changes with income, a logistic regression analysis was conducted with food security as the dependent variable. The independent variables for this test, aside from income, were maternal age and number of dependents.

Relationship status was another sociodemographic that was examined to see if there was an association between income or food insecurity risk and whether or not someone was in a relationship. Those who reported being married or in a common-law relationship were counted as being in a relationship for this study. Income was first tested because those who are married or common-law may be more likely to have a larger household income. By first examining the association between income and those in a relationship, I would know whether or not to include income as an independent variable. If there was a strong relationship between income and being in a relationship then including income, or socioeconomic position later as independent variables may mask the association between relationship status and food insecurity. To examine the association between income and

relationship status a Poisson regression analysis was used, as income, the dependent variable, is ordinal. The independent variables for this test included maternal age and number of dependents. The Poisson regression indicated that there was a strong association between income and relationship status; therefore, income and socioeconomic position were not included when examining the effects of relationship status and food insecurity. A logistic regression analysis was also run to determine how risk for being food insecure changed based on whether or not they had a partner. The independent variables included maternal age and number of dependents.

Having more dependents in a household has been associated with a greater risk of food insecurity, especially for the adults who often act as a buffer to prevent children in the house from feeling the effects of food insecurity (Neter et al. 2014; Nieneier and Fitzpatrick 2019; Spear 2002). Given this information I decided to investigate the relationship between food security status and the number of dependents a respondent reported having in the M2B survey. There was a large range for the number of dependents, from zero to six. To examine the relationship between number of dependents and food insecurity a logistic regression analysis was performed. For this analysis socioeconomic position and maternal age were used as independent variables alongside number of dependents.

3.3.2.3 GDM

The M2B survey asked participants whether or not a healthcare provider had diagnosed them with any pregnancy complications, including GDM. As respondents were all pregnant people, not all participants had reached their third trimester and therefore

more individuals could have been diagnosed with GDM later on. A logistic regression analysis, with GDM as the dependent variable, was conducted to determine whether or not being food insecure was associated with an increased risk for GDM, without adjusting for gestational week.

3.4 Summary

For this project, both quantitative and qualitative methods were used to understand the relationship among food insecurity, pregnancy complications, and mental health conditions at both the national and local, Hamilton, levels. The CCHS provided national survey data on food insecurity, GDM, and mental health conditions. By using the CCHS I was also able to determine if certain sociodemographic factors may affect risk for food insecurity or complications, such as GDM and mental health conditions. The M2B data provided both a quantitative and qualitative understanding of the pregnancy experience. The survey, which was conducted in Hamilton, provided local prevalence rates for pregnancy complications and food insecurity. The focus groups with pregnant and postpartum people as well as health and social care providers allowed for further insight into pregnancy experiences when facing barriers such as food insecurity, or managing pregnancy complications. The one-on-one interviews that I conducted with pregnant and postpartum people who had dealt with food insecurity, mental health conditions, and/or GDM during their pregnancies also allowed for further inquiry into their experiences living with these conditions. Together, these data sets formed the basis for analysis and understanding of how diet and access to food is impacted during pregnancy.

Chapter 4: Findings

4.1 Introduction

In this chapter, I present the results of the CCHS survey, one-on-one interviews, M2B survey and M2B focus groups in regard to how barriers such as food security, resource inequities, and whether or not having a mental or physical health diagnosis were associated with increased difficulty in accessing food during pregnancy. The surveys will provide estimates of the prevalence of the health conditions and household food insecurity as well as an analysis of whether or not certain barriers, such as food insecurity are associated with risk for experiencing these health conditions. The discussions from the interviews and focus groups inform the experiences of those impacted by those challenges. I will begin by presenting the sociodemographic characteristics of the survey and interview participants. I will then explore the prevalence of food insecurity in the survey groups and discuss how other barriers, such as a lack of time or transportation, or changes in income, impede ability to access healthy foods. I will also explore the frequency of physical and mental health complications including GDM, mood disorders, and anxiety disorders. The association of food insecurity with mental and physical health will also be analyzed.

4.2 Participant Sociodemographic Profile

The data from the CCHS shows that 2.88% of the sample were pregnant at the time of the survey. The majority of those who were pregnant (56.92%) were between the ages of 25 and 34. A large portion (87.68%) of this population were also married or in a common law relationship. In regard to education, 77.56% of pregnant people had received a post-secondary education and 69.36% were employed, both of which are

similar to the general population, according to the CCHS (reference?). Full details of the sociodemographic information are listed in Table 4.1.

Table 4.1: Sociodemographic Data of pregnant Canadians

Demographic Variable		**Percent of Population**
Age	15-19	2.38
	20-24	9.95
	25-29	26.76
	30-34	30.16
	35-39	17.72
	40-44	6.84
	45+	6.20
Household Income	< $20,000	9.75
	$20,000-39,999	11.51
	$40,000-59,999	13.53
	$60,000-79,999	13.38
	$80,000-99,999	10.61
	$100,000 +	41.22
Racialization	White	69.12
	Racialized Group	30.88
Marital Status	Married or Common Law	87.68
	Not Married or Common Law	12.32
Number of Dependents	0	43.88
	1	36.34
	2	12.29
	3	4.15
	4	1.60
	5+	1.74
Food Security	Food Secure	81.77
	Marginally Food Insecure	6.43
	Moderately Food Insecure	9.00

	Severely Food Insecure	2.80
Education	< High School	7.34
	High School	15.10
	Post-Secondary	77.56
Employment Status	Employed	69.36
	Unemployed	30.64
Diet Quality	Eats fruits and vegetables less than 5 times per day	54.62
	Eats fruits and vegetables more than 5 times per day	45.38

As the CCHS sample is weighted to create an inference for the entire Canadian population there is not a specific sample size and the data is instead presented as percentages.(CCHS 2017/2018)

The M2B survey was answered by people who were pregnant at the time of the survey and lived in Hamilton, Ontario. The majority of those who responded were between the ages of 25 and 34 (65.99%). The majority of respondents (81.95%) were married or in a common-law relationship, which is 5.74% less than the CCHS average reported in Table 4.1 The full profile of the sociodemographic characteristics of the M2B respondents is listed in Table 4.2.

Table 4.2 Sociodemographic data of M2B survey participants

Demographic Variable		**Percent of Population**
Age	15-19	3.07
	20-24	9.72
	25-29	27.37
	30-34	38.62
	35-39	16.37
	40-44	4.60
	45+	0.26
Household Income	< $23,000	17.19

	$23,000-39,999	14.33
	$40,000-79,999	21.49
	$80,000 +	46.99
Racialization	White	73.64
	Racialized Group	26.36
Marital Status	Married or Common Law	83.72
	Not Married or Common Law	16.28
Number of Dependents	0	46.70
	1	36.29
	2	9.90
	3	4.06
	4	1.78
	5+	1.27
Food Security	Food Secure	79.55
	Food Insecure	20.45
Education	< High School	7.44
	High School	6.92
	Some Post-Secondary	9.74
	Post-Secondary	75.90
Employment Status	Employed	51.15
	Unemployed	48.85

As not every participant responded to all questions there is not a set sample size for the demographic data. The variables are listed as percentages instead.

Interviewees were living with a range of characteristics and health issues that were key variables for this study (food insecurity, GDM, mental health conditions). Of the six interviewees, two had GDM. Three participants had diagnosed mental health complications (although there were others who spoke of having high stress and anxiety, but were not clinically diagnosed). Of the three participants with diagnosed mental health conditions, two were diagnosed prior to pregnancy and one was diagnosed during

pregnancy. Food insecurity was an issue for four of the six participants, with three being marginally food insecure (affirmative answer to 1 question) and one had high food insecurity (affirmative answer to five or six questions). Of the six participants three dealt with both a mental health condition and food insecurity. Half of the participants reported themselves to be from a racialized group, two were not born in Canada, but all were Canadian citizens or permanent residents. All participants identified as female. All participants had a college diploma or university degree. Table 4.3 outlines all demographic characteristics.

Table 4.3: Sociodemographic data of interview participants

Sociodemographic Variable		**Number of Respondents (n = 6)**
Age	25-29	2
	30-34	4
Gender	Female	6
Number of Dependents	0	1**
	1	2
	2	2
	3	1
Occupation	Part-time	1
	Full-time	4
	Stay at Home Mom	1
Birth Country	Canada	4
	Iran	1
	Romania	1
Citizenship	Canadian/ Permanent Resident	6
Racialization	Visible Minority	3
	Non-Minority	3
Level of Education	College Diploma/ University Degree	6
Income	< $20,000	1
	$20,000-39,999	1

	$40,000-79,999	2
	> $80,000	2
Relationship Status	Single (1)	1
	Married or Common Law	4
	Other	1
Food Security*	Food Secure	2
	Low Food Security	3
	Moderate Food Insecurity	0
	High Food Insecurity	1

* The six-question scale used for the interviews does not measure child food insecurity in households and has a slightly different scoring system than the 18-question module that the CCHS employs. Interpretations are based interpretation from the USDA (2012).
* *Pregnant with first child.

4.3 Food Insecurity

Food insecurity, or not having access to healthy and preferred food options, time to make and eat meals, and lacking transportation to and from a grocery store can have a negative impact on health and well-being. Income is another major issue when it comes to discussing food insecurity and, although it will be touched upon in this section, it will be discussed at greater length along with employment and maternity leave below. Income is not the only reason people have difficulty accessing food and in this section I will explore how other barriers, such as time and transportation impact food insecurity. Although the food security questionnaire on the CCHS revolves around income and having money for food, there are other factors that need to be explored. The M2B survey asked participants about a variety of barriers and how they impacted their diet during pregnancy as well as their ability to eat healthfully.

The CCHS (2017/18) indicates that 18.2% of pregnant people in Canada are food insecure. The results from the binary logistic regression analysis I conducted, in which regressed food security status on pregnancy status are presented in Table 4.4. The analysis found that there was not a significant relationship between being pregnant and having an increased risk for being food insecure ($p = 0.494$) despite the greater prevalence of food insecurity seen in the pregnant population. The CCHS does not include any questions about how time, transportation or other factors can impact food security.

Table 4.4: Logistic regression analysis with food security status as the dependent variable and pregnancy as the independent variable

Independent Variable	**IRR**	**P Value**	**95% Confidence Interval**
Pregnant	1.111	0.494	0.821, 1.504

There was a total of 73 M2B survey participants (20.45%) who were classified as food insecure based on responding the survey question that money is a barrier to eating health food during pregnancy. This is greater than the national and Hamilton prevalence of food insecurity, but closer to the prevalence of 18.5% found for respondents to the CCHS who were pregnant.

Food insecurity as defined earlier, occurs when people do not have access to safe and nutritious food to meet both their food preferences and dietary requirements (FAO 2019). Money is often seen as the most crucial barrier; however, there are many other resource inequities that impact food access. The result of the logistic regression in which I regressed food insecurity on income, level of education, number of dependents, and report of an anxiety disorder among the pregnant sub-population of the CCHS are

presented in Table 4.5. Income, level of education, and reporting an anxiety disorder were significantly associated with food insecurity. Increases in income and level of education were associated with a decrease in risk for food insecurity by approximately 25% and 40% respectively (Table 4.5). Having an anxiety disorder was associated with two times higher likelihood of being food insecure, independent of income, education, and number of dependents (Table 4.5). The confidence intervals associated with the anxiety disorder variable are quite wide; however, the lowest point of margin indicates that having an anxiety disorder still increases one's risk of being food insecure by 14% (Table 4.5).

Table 4.5: Logistic regression analysis with food security status as the dependent variable and income, education, number of dependents, and anxiety disorder, as independent variables

Independent Variable	**IRR**	**P Value**	**95% Confidence Interval**
Income	0.725	0.005	0.580, 0.908
Education	0.615	0.033	0.394, 0.961
Number of Dependents	1.126	0.352	0.877, 1.446
Anxiety Disorder	2.863	0.005	1.137, 5.972

The regression analysis results in which I regressed food insecurity on income, education, number of dependents and reporting a mood disorder in the pregnant sub-population of the CCHS are reported in Table 4.6. The model shows that there is a significant association between food security status and income ($p = 0.007$), education ($p = 0.025$), and having a mood disorder ($p = 0.021$), as seen in Table 4.6. The effect that income and education have on food insecurity in this model is similar to the model in Table 4.5. Increases in income reduce the risk of food insecurity by just over 25% and lower levels of education are associated with a 40% increases in risk for food insecurity. In this model, we see that having a mood disorder just over doubles one's risk for being

food insecure independent of income, education, and number of dependents. The confidence interval for mood disorder is quite wide, however, as seen in the model including anxiety above, the lowest part of the margin still indicates that having a mood disorder increases one's risk of being food insecure by 14%.

Table 4.6: Logistic regression analysis with food security status as the dependent variable and income, education, number of dependents and mood disorder as independent variables

Independent Variable	**IRR**	**P Value**	**95% Confidence Interval**
Income	0.740	0.007	0.593, 0.921
Education	0.602	0.025	0.386, 0.939
Number of Dependents	1.182	0.156	0.938, 1.491
Mood Disorder	2.430	0.021	1.141, 9.266

As the above model shows, multiple sociodemographic factors are associated with risk for food insecurity. In the next section, I will examine how other social and economic barriers relate to one's ability to access a secure diet. Food insecurity status is defined in the M2B survey as respondents agreeing or strongly agreeing that money is a barrier to eating a healthy pregnancy diet. The M2B survey, however, posed a variety of questions about other barriers that impact diet as well. These questions help explore factors that are associated with food insecurity in addition to income. Some of the questions in the M2B survey that I will explore further are participants' ability to eat healthfully, if certain participants were aware of what to include in their diets, whether or not time was viewed as a barrier to healthy eating, and if transportation to grocery stores was considered a barrier. In the following section I will explore if risk for food insecurity is associated with these variables.

4.3.1 Food Insecurity: Affordability of Food

Issues around food affordability and food insecurity were brought up in focus group discussions and one-on-one interviews. Many participants spoke about how they navigated the grocery store based on their budget and that affordability of food, particularly healthy foods made it difficult to have a balanced diet. As one mother in a focus group put it "it costs money to eat healthy". The affordability of food at the grocery store is a major obstacle especially in the produce section as these participants noted:

> And it doesn't help that the food prices in the stores are going up when you are trying to eat healthy. Just buying fruits and vegetables you are looking at, you know, $40 dollars if not more a week. Just on that alone.

> Healthy food's not cheap. The 'crap food' is cheaper than healthy food, which is completely backwards. They want you to eat all this healthy stuff, but they make it impossible for certain income families to get that. And then you go to the food bank and if you're lucky that they have some produce it's kind of like old.

The cost of groceries created barriers even for participants that were marginally food insecure. Marginally food insecure interview participants spoke about having to constantly budget, check fliers, and price check whenever possible. Although their diets were not affected as much as others who were moderately or severely food insecure, thinking about food and groceries was something that they had to put a lot of active thought into, which was a source of stress as this participant noted:

> It's a little, a little stressful. Yeah, um, yeah, it's um. Because my husband is still in school, it is just my income, so it's almost like I have to be, like I have to kind of have that mindset and know that ok, like I have to sit and look through the fliers. I can't just go to the store and just put things in my cart and buy whatever I want.

Another interview participant spoke about how she makes a lot of her own food from scratch to save money; however, she also mentioned that this took a lot of time and

became more difficult for her when she was pregnant, because it was harder to be on her feet all the time.

However, it is not just the grocery bill that they have to worry about. People also have to balance their food budget with other bills as this participant mentioned:

> And it's true, there's times where like okay well am I getting groceries for two weeks or am I paying hydro?
>
> So it was rent over food sometimes. We always had food, so it's not like I couldn't really eat if I wanted to, but sometimes it wasn't food I wanted to eat. Especially being pregnant you get the cravings. And then working as much as I did and you walk everywhere because I don't drive.

An interviewee, who was marginally food insecure also found that they had to pace their budget to ensure they could afford groceries at the end of the month.

> Sometimes, like, depending on the budget for the month, we can't get groceries until like the next payday or whatever, but usually we're pretty good at pacing it.

Food is not the priority because there are numerous other bills to pay before going to the grocery store. The messaging about eating a healthy diet that pregnant people receive also increases the stress when they go grocery shopping and are unable to afford the healthy diet that they want to achieve.

> I don't eat organic because so expensive…So trying to eat healthy but if all grown with artificial add-ins not sure if beneficial.

Pregnant people are stressed about their diet especially when health and social care providers inform them that the healthiest diet is one they cannot afford. This interviewee noted that the food and examples of meals provided at the local Welcome Baby program were unachievable and left them feeling deflated because they could not provide that diet for themselves.

> They feed you all this like. They give you meals when you're there right. So, they feed you all this really healthy stuff like quinoa, and that's not cheap. So, they'd be giving you this really healthy meal with like chickpeas and quinoa and it's really good and you're like 'Oh, I wish I could eat this.', but I couldn't. We couldn't afford that kind of stuff, it was kind of just like I tried to cook as much as possible if we had like those groceries, but it was like mostly sandwiches and eggs.

Health and social care providers are aware of this mismatch between the diet they recommend during pregnancy and the food that people have access to. In the focus groups some care providers spoke about the struggle to provide nutrition information, but also take into account the barriers to access those foods that many participants experienced.

> I do find it difficult talking about nutrition, healthy eating when you know that they just don't have the money to buy food. But, even in individual circumstances or in a group setting, they just need money. And I just, I feel inadequate saying "Here's a food bank. Here's where you can go for free meals…" And they're asking me for extra gift cards or they're using their prenatal gift card to buy groceries to feed their children – not even themselves. Um, so that's when I find it kind of hard to speak to "Well, you know, you need to eat more fruits and vegetables and try whole grains". It's like, that's… no. You need more money.

In many cases health and social care providers would have a list of resources, such as food banks, available for their clients who were food insecure. A midwife at the shelter health network mentioned noting on their Ontario Works form that a client was lactose intolerant to increase the money the client received.

> We were encouraged, those of us who are part of the shelter health network, we're especially encouraged – we fill out these forms often for people who have needs – to just say people are lactose intolerant because they get more money. Because the more money women can get in those situations, it often does translate into nutrition like buying food rather than anything else.

Health providers were not trained on how to deliver nutritional information to people who are food insecure and in an effort to provide people with resources, often ended up giving

out information about food banks, which do not always provide healthy food either as this worker noted:

> Because when you're talking about you know, fresh fruits, vegetables, you know, staying away from the processed foods, sometimes they just don't have the resources for that. And it's hard because you know there are food banks, there are places that they could access food but it's not good quality food like it's not the stuff that we're recommending. So, you kind of get to a point where you're like, you can tell them what to do but they don't have the means to do it so. Where do you go from there?

Reliance on food banks and other stopgap services makes it difficult for people to access the foods they want or require, because food bank foods are often processed with few fresh foods available.. The difficulty participants felt in regard to obtaining healthy food while reliant on food services was brought up in the focus groups.

> I was going to food banks and food banks give you what they have, not what you need. And, a lot of it isn't that healthy or expired, stuff like that.
>
> People visit more and more foodbanks and then the foodbanks are getting overwhelmed because they can't provide for the amount of people that they're trying to give food to. So, the choices that you get at the foodbank are not necessarily healthy choices. They are just basically there to fill the shelves to give somebody some sort of meal. So most things you find, um, don't contain things like eggs, milk, or meat at a food bank…or fruit or vegetables. You are getting things that are in boxes or cans. And that's what a lot of people in Hamilton are relying on.

Another mother in an interview noted that she goes to the food banks for diapers only, because the food that they offer is not healthy and her children will not eat it. Food banks, although helpful, do not provide unprocessed foods that people find more costly in the grocery store. The foods that they do provide also do not match the healthy diet that health and care providers promote for pregnancy.

Nutrition and diet quality are important during pregnancy and are often stressed by health and social care providers. However, access to healthy food is hindered by food insecurity and the affordability of food. Grocery bills are often not the first priority as people have other payments that they need to make before budgeting for food. The need to budget and added stress over budgeting can even occur if someone is marginally food insecure, as seen in the interviews. For those who are food insecure there is also a disconnect between the diet that health providers tell them about and the meals that they can actually afford to eat, or obtain from food banks. Overall, the cost of groceries has impacts the diet one is able to obtain; and for those who find that the affordability of food is a barrier are at an increased risk for food insecurity.

4.3.2Food Insecurity: Time

Time is a major barrier and a significant resource that is needed to access a healthy diet. Although not part of food insecurity questions asked in the CCHS, the amount of time people have to grocery shop, prepare, and eat food has an impact on household and individual food security status. The M2B survey asked participants whether or not time was a barrier to eating healthy food during pregnancy. Of the survey respondents, 39.89% agreed or strongly agreed with that statement. A logistic regression analysis was conducted with food insecurity as the dependent variable. The logistic regression analysis indicates that those who experience time as a barrier are almost twice as likely to experience food insecurity ($p = 0.000$) independent of socioeconomic position, maternal age, and number of dependents the respondent cared for (Table 4.8). What is also

interesting about this analysis is that, although time as a barrier doubles the risk of being food insecure, an increase in socioeconomic position decreases one's risk by half.

Table 4.7: Logistic regression with food security as the dependent variable and time as a barrier, socioeconomic position, maternal age, number of dependents as independent variables.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Time as a Barrier	1.965	0.000	1.424, 2.710
Socioeconomic position	0.561	0.000	0.451, 0.699
Maternal Age	0.988	0.746	0.919, 1.062
Number of Dependents	1.029	0.866	0.737, 1.437

Time was an issue that was raised in many focus groups as well as some of the interviews. The main issues that participants dealt with were not having time to prepare food, not having enough time to eat, and having to spend more time getting groceries. Many focus group participants discussed how lacking time to prepare food made it difficult for them to eat a healthy diet. One focus group participant noted that her food choices were impacted by what options were quick and convenient. Her words also illustrates how difficult it can be to prepare meals if you are a new, single parent.

> Honestly, it's- if you don't have someone who's you know, making food for you, you're eating whatever you can whenever you can. Um, especially after the baby is born. You just, like, if I can throw it in the in the freezer, or sorry not the freezer, throw it in the microwave, baby brain. That's the way I'm doing it.

Many pregnant people are busy working and trying to balance work schedules and a healthy diet is challenging because people were often pressed for time.

> If I can take time to make a meal and eat that way, I'll try to do it. If not it's meal prepping or it's me grabbing a chocolate bar, just because I need sugar to go for the next hour and a half.

Being able to make food in advance takes time to plan as well as to prepare. If people are not able to do that, then they will choose from what they can access quickly, which is not always as healthy, or their preferred meal or snack.

Focus group participants also discussed how their diet changed once they had more time for themselves, which may occur once someone begins their maternity leave.

> I actually eat healthier than when, when I was working because I was so much on the go all the time, that I would pick up that fast food, but now I'm at home I can actually make that dinner, more consistently, and it's more healthier when it's homemade, do you know what I mean?
>
> Now that she's in daycare three days a week, it gives me a break so I can actually make better, uh, food choices. Make better meals.

In these instances, participants whose schedules changed either by starting maternity leave, or when their child started daycare took the extra time that they had to change their diets. Instead of relying on quick and on-the-go foods, these participants were able to prepare themselves healthy meals and have more control over their food choices.

Time is not only a barrier to being able to prepare healthy meals, but can also impact how often one is able to eat. The focus groups with health providers revealed that one issue they notice is that pregnant people often don't have the time to eat more than once or twice a day because they are juggling other commitments.

> Often times they're only eating one or two times a day, they don't realize they should be eating a bit more often. Either because, um, they're not feeling well, or they just don't have time because they have other children or they're too tired or just didn't realize they need to eat a bit more often.

Not being able to access time to eat can lead to further issues. If someone is not eating often enough, they may not be gaining enough weight and feel fatigued.

Work schedules can also limit the amount of time that people have to eat. One interview participant did not end up with a set time to eat because their job involved moving between multiple locations in the city on foot.

> I don't have a lot of time to eat while I'm walking down the street. So sometimes I would make it home [to grab something for lunch].

She mentioned that as her pregnancy progressed, she had to make it more of a priority to make it home for a bite to eat between appointments because she was worried that she was not eating enough. This was a challenge she faced throughout her pregnancy. To do this though, she had to shorten her availability at work. She was unable to take time off from work, or start her maternity leave early, because she was in need of the income, especially because her roommate had just lost their job. Time was a major barrier that she dealt with and a resource that she, and many other participants, could not access. Overall, time as a barrier was associated with an increase in food insecurity. Conversations with health providers and pregnant and postpartum people revealed that lacking time as a resource made it difficult for people to prepare healthy meals and also meant they often were unable to prioritize time to eat.

4.3.3 Food Insecurity: Transportation

Having access to reliable transportation is another factor that can alter diet. The M2B survey asked people whether or not lacking transportation to a grocery store that sells healthy food made it difficult for them to eat healthy food during their pregnancy. Unlike the question about time as a barrier and affordability of food, a smaller percentage of the respondents, 10.1% or 36 people, agreed or strongly agreed with this statement as listed on Table 4.8. Although there were fewer agree and strongly agree responses, these

responses become significant when examining them in relation to food insecurity. Table 4.8 is a cross tabulation that compares the breakdown of responses to transportation as a barrier by food security status. There were fewer participants who selected strongly agree and agree, the majority of those responses were from individuals who were food insecure. Of those who strongly agreed that transportation was a barrier, 11 of the 14 respondents, or 78.6% were food insecure. In contrast, those who strongly disagreed that transportation was a barrier for them were predominantly food secure. 89.7% of food secure respondents answered that they strongly disagreed. Therefore, although there are fewer responses of agreement, they are significant when comparing answers based on food security status.

Table 4.8: A cross tabulation comparing food security and transportation as a barrier

Transportation as Barrier	**Food Secure**	**Food Insecure**	**Total**
Strongly Disagree	243	28	271
Disagree	19	6	25
Neutral	14	10	24
Agree	5	17	22
Strongly Agree	3	11	14
Total	284	72	356

The results of the logistic regression in which I regressed food insecurity on transportation as a barrier, socioeconomic position, maternal age, and number of dependents are presented in Table 4.9. Those who found that a lack of transportation hindered their ability to eat healthily during pregnancy were approximately twice as

likely to experience food insecurity in comparison to those who had access to transportation, independent of socioeconomic position, maternal age, and number of dependents that the participant cared for, as reported in Table 4.9. Analysis of the M2B survey reveals that transportation as a barrier is associated with food insecurity ($p = 0.000$) (Table 4.9).

Table 4.9: Logistic regression with food security as the dependent variable and transportation as a barrier, socioeconomic position, maternal age, number of dependents as independent variables.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Transportation as a Barrier	1.937	0.000	1.424, 2.635
Socioeconomic position	0.732	0.002	0.598, 0.895
Maternal Age	1.003	0.934	0.933, 1.079
Number of Dependents	0.969	0.855	0.694, 1.354

Issues regarding transportation were also raised in interviews and focus groups, both by pregnant and postpartum people and health and social care providers. Transportation issues included being able to get to and from a grocery store, transportation difficulties around work, and the cost of transportation. Having reliable transportation to a store with healthy grocery options can be difficult for people who rely on public buses, or walking as their predominant methods of transportation. However, these modes of transport are not always the most efficient for gathering a large amount of food because people are limited by what they can carry, or bring onto a bus.

> Yeah, if we go on the bus we are not going to full grocery shop because it will break my stroller and our arms. Um, but if we're with someone who can drive, or if we have the extra money to cab even. Then we will buy as much as we can with the money that we have. Even if we have no spending money leftover.

Grocery shopping is made even more complicated if one is caring for multiple children. The amount of groceries that they are able to bring home in one trip is reduced because they are often dealing with strollers, as this food insecure interviewee noted:

> Yeah, yeah, because I have to push the stroller and my daughter, I can't, the stroller and the buggy. I just go to get a little at a time.

In both of these examples the amount of food that could be purchased in a trip was limited by what could be carried home. This meant that participants would take multiple trips to the grocery store, or to food banks, throughout the week to get enough food. This takes up time, which as discussed above increases risk for becoming food insecure.

Issues regarding transportation to grocery stores was noted by public health nurses in one of the focus groups. She recalled a conversation that she heard at a prenatal nutrition class.

> Yesterday at [a Welcome Baby] group I was observing [a public health nurse] teaching a topic and I was sitting beside a lady and they were eating yogurt and cantaloupe I think? And she said, not to me but the person beside, "If fruit wasn't so expensive and it wasn't so heavy I'd actually buy it". Because you said they walk everywhere right? So, and it's something heavier than a box of Kraft dinner, or you know some of the other things... a frozen pizza. Like that's a little easier and lighter than fruit.

The type of food that people are able to access is also impacted by their mode of transportation. Another topic that was brought up was that many people who do not have a car visit corner shops because they are shorter distances from their houses and it is easier to carry things back. Lacking transportation to a grocery store with healthy options makes it difficult to access healthy foods. People who face transportation as a barrier

have to plan around what they can carry home which, as the public health nurse noted, is not often the healthy produce that people are told to include in their diet.

Lacking a personal vehicle for transportation makes it difficult to get to other locations besides the grocery store. For those reliant on public transport, they often have to go through a longer commute in comparison to those who are able to drive their own vehicle to and from their jobs. This was an issue that was raised in a focus group by a mother who was trying to find a new place to work after the birth of her child, so as to reduce her transit times.

> Um, and then, when I go, when I go back to work, I've already said I'm not going back to the job I have right now because it's out- it's far into Burlington and I don't drive. So, it takes me on average an hour and a half bus to get there. And then, um, once I have her in daycare, if something goes wrong, I have to have someone close here to pick her up for me, and I can still take two hours to get back to pick her up. So, I'm going to lose out on what minimum wage earning is, it's not worth my time to go back to where I am.

The long commute, though not related to obtaining food, takes time out of one's day. In this instance, the person was travelling up to three hours a day to get to and from work, which decreases the amount of time available for other activities, which could include meal preparation and having time to sit down and eat more often throughout the day. Therefore, lacking transportation alters the amount of time one has, which can increase one's risk for becoming food insecure.

Transportation is a major obstacle for people and can cause increased stress for those who are reliant on public transport. This increased stress is because public transport is not always reliable and it does not always take you to your destination, which means you need to plan further in advance for your trips. In interviews and focus groups

participants who did not have access to their own vehicle discussed how difficult it was to get to preferred stores, work, and other destinations by transit because buses would take too long to take them there and they were not able to carry everything. At times, they were able to get rides from friends or family members; however, these rides were not a constant. When they were provided, they did provide some relief, as this participant mentioned:

> I feel like my biggest challenge is transportation because I don't drive so it's hard for me like to get around to the places I want to go. So, I'm lucky that my mom, like I mentioned lives down here because this time of the year the weather is nice, but in winter it's hard. So, now that I'm having my second child I have anxiety just thinking about how it is going to be.

The lack of certainty regarding transportation is a source of stress, especially when dealing with colder weather and multiple children. Transportation is a major obstacle for people who do not have access to their own personal vehicle: reliance on public transport adds more time to their commutes. For many people who face issues getting transportation to grocery stores with healthy food, they are at an increased risk of being food insecure. Therefore, transportation is an important factor to consider when considering access to a healthy diet.

4.3.4 Food Insecurity: Diet Knowledge

Having knowledge and access to reliable information about what to eat can influence one's diet. Only 26 people (7.3%) of M2B survey respondents agreed or strongly agreed with that being uncertain about what to eat made it difficult to eat healthily. The breakdown of responses, however, becomes more significant when comparing these answers to food security status. As seen in Table 4.10, 10, or 38.5% of

those responses came from the food insecure participants who make up approximately 20% of the sample. Looking at the other end of the spectrum, there was a greater number of participants who felt that they were certain about what to eat who were also food insecure. Of the 227 respondents who strongly disagreed with this statement, 85.0% of them were food secure.

Table 4.10: A cross tabulation comparing food security and uncertainty about diet

Not Sure What to Eat	**Food Secure**	**Food Insecure**	**Total**
Strongly Disagree	193	34	227
Disagree	37	14	51
Neutral	37	14	51
Agree	10	8	18
Strongly Agree	6	2	8
Total	283	72	355

The results of the logistic regression in which I regressed food insecurity on uncertainty about what to eat, socioeconomic position, maternal age, and number of dependents are presented in Table 4.11. The results of the analysis indicate that there is a significant relationship between being uncertain about what to eat and food security status ($p = 0.050$) independent of socioeconomic position, maternal age, and number of dependents the respondent cared for, as reported in Table 4.11. Unvertainty about what to eat during pregnancy was associated with a 35% increase in likelihood of being identified as food insecure.

Table 4.11: Logistic regression with food security as the dependent variable and not sure what to eat, socioeconomic position, maternal age, number of dependents as independent variables

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Not Sure What to Eat	1.350	0.050	1.000, 1.822
Socioeconomic position	0.682	0.000	0.565, 0.825
Maternal Age	0.972	0.424	0.907, 1.042
Number of Dependents	1.128	0.438	0.831, 1.531

Discussions about general pregnancy diet knowledge varied between focus groups and interviews with pregnant and postpartum people and focus groups with health and social care providers. One participant diagnosed with GDM had some difficulty, but those struggles were directly related to managing how many carbohydrates she could eat and her blood glucose readings. Pregnant and postpartum people did not discuss difficulty in knowing what to eat during their pregnancy. There was, however, one participant who found they had received too much information and did not know how to sort through everything they were told.

> So there's this balance of am I really supposed to be eating that much food, or…and like the quantity of certain foods versus others and lie it's just, it's a little bit overwhelming. I'm just kind of overwhelmed with information.

Many stated that they felt like they had a good idea about what to eat during their pregnancy and spoke about how they were balancing their diets and making adjustments throughout their pregnancy. Many were trying to eat healthier, take their prenatal vitamins, and some participants were even seeking out foods rich in certain nutrients, like folate.

> You're eating, you're thinking about whatever how much vitamins you need. Like folic acid, they tell you, you need folic acid before you get pregnant so I'm like eating all these foods with folic acid in it. Like I was so conscious about what I was eating.

Another comment was that although people had some knowledge about what to eat, they would be happy to learn more to keep up to date with changing information as this one mother noted:

> In the long run do you really think you actually have enough though, because there's always going to be something new. Right, so, you might think you have, you think you have, you might, oh my god, you might think you have enough, there we go, and then a new study will come out and like "let's try that". Right, so there's always going to be something you don't know that you don't know that you'll end up learning either way. So, someone who's pregnant a year from now like they might get, different, you know, information from what we had, right. Thirty years ago, like my mom and I were talking about, so my brother and I are, we're, we're in our mid, we're in our thirties. She's like, "everything's changed. Right, since, you know, since I had kids". I'm like, "yeah mom people, things evolve and everything and whatnot". So yeah, so I think no matter what there's always going to be something new. That, um, we can learn about pregnancy and nutrition for what's better for the babies, right?

Another mother found that her knowledge increased with each subsequent pregnancy as new information was built onto information she already knew.

> [I] know the basics of like pregnancy, but every time you get pregnant you learn more. Um, by experience.

Feelings about uncertainty regarding diet was not an experience that was overly present in the focus groups and interviews with pregnant and postpartum people. This may in part be because recruitment for both surveys and focus groups was done in partnership with free Welcome Baby prenatal classes offered by Hamilton Public Health Services, as well as midwifery services. Therefore, these participants possibly had more exposure to public health nurses/midwives and registered dietitians providing them with

more opportunities to ask questions and clarify their understanding about what to eat than those who were not utilizing these services. One focus group participant who was pregnant with their first child discussed how they were looking for information because they had no prior knowledge. One of the main sources that they found was the Welcome Baby prenatal class.

> Before I'm pregnant I know nothing about the nutrition, the foods that you eat, foods that you eat during, during the pregnancy period. But after that I think that um ah, in Hamilton there are lots of resources you can turn to. Like the, I go to the Maternity Centre once a month and the, the, the doctor will, uh, told me, uh in this period you should watch for like uh nutrition facts. And also, I come this place to the learning class once a week. I think uh this really help me a lot.

Health and social care providers, however, had a slightly different experience in regard to providing knowledge for pregnancy diets. They too found that people come to meetings with an assortment of information that they have gathered from family and friends as well as the internet.

> And they come to the meetings with quite a bit of knowledge. So before we had to give handouts, and itsy bitsy pieces of information and they had to read that several times, but now they come with a lot of information and we have to sort the information out. Um, so majority of our clients now are quite well informed and they have the information. What they find overwhelming is how to apply the information to the truth of their everyday life and their changing bodies and to the frustrations that come with it.

Instead of being the primary source of information, health providers must ensure that the knowledge that the person comes with is reliable and complete. What is challenging is presenting nutritional information that people can access and use, especially for those who are food insecure.

> If you teach them Canada's Food Guide, are they actually buying Canada's Food Guide? Not necessarily because there are other barriers. So, it's not always

> knowledge... I think they know- “In an ideal world this is what I would eat and I would feed my family and I would do this, and I would do that... But in my crappy little world of no money and no way of getting groceries and- I can't so I don't”. So then then you have to- we teach about reading labels and then they gotta try and navigate that literacy thing and trying to read labels and understand amounts, percentages... it's like math... um, and small small writing and and comparing and making decisions and that for your family is hard. So there's so many barriers and it's hitting them from every which way and and this food industry that's powerful and they put you know the processed food... all the sugar and salt and the cheaper prices and the marketing-… So, we- you know, we try to bring that awareness at least um for when they're making food choices but it's challenging.

This care provider found it difficult to provide information about a healthy pregnancy diet to people in a concise manner and in a way that people will be able to apply some of that knowledge to their current situation. The main issue in knowledge translation is being able to provide information that takes into account the barriers that people face. If these challenges are taken into account, then people can put their new knowledge into praxis. Analysis of diet knowledge during pregnancy has revealed that gaps in knowledge are associate with an increased risk for food insecurity and that providing people with knowledge is not enough to equip them to make dietary changes.

4.3.5 Food Insecurity: Difficulty with Eating Healthfully

The above variables are all associated food insecurity and increase the difficulty that people have when accessing a healthy diet. In addition to asking those specific questions, the survey also asked participants to rate how hard it was for them to eat healthy during their pregnancy on a five-point scale from ‘Not at All’ to ‘A Lot’. Overall, 18.3% of all respondents noted that they had difficulty eating healthy during their pregnancy. Diet is influenced by many factors; however, those who are food insecure expressed an increased difficulty in eating healthfully during their pregnancy. Of those

who had difficulty eating healthy, 52 participants, or 38.5% of respondents were food insecure. The results of the regression analysis with food insecurity as the dependent variable and level of difficulty with healthy eating, socioeconomic position, maternal age, and number of dependents are presented in Table 4.12. There is a significant relationship between food insecurity and level of difficulty to eat healthy ($p = 0.000$). Furthermore, those who had experienced greater difficulty in eating healthy were twice as likely to be food insecure, independent of socioeconomic position, maternal age and number of dependents. Having access to healthy food is a challenge that food insecure people and households face.

Table 4.12: Logistic regression with food security as the dependent variable and difficulty with eating healthfully, socioeconomic position, maternal age, number of dependents as independent variables

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Level of Difficulty with Eating Healthy	2.007	0.000	1.425, 2.827
Socioeconomic position	0.652	0.000	0.536, 0.794
Maternal Age	0.976	0.506	0.908, 1.049
Number of Dependents	1.071	0.673	0.779, 1.473

As analyzed above, there are many factors that impact level of difficulty with healthy eating. Access and affordability of food, being able to transport food, and having time to prepare and eat food are just some of the issues that food insecure individuals may encounter. Overall, these challenges make it difficult to achieve a healthy diet, even if they are making an effort to eat healthy. This interview participant mentioned that they

bought items on sale and then made large amounts of food, but that those meals limited variation in her diet.

> Um, sometimes it's easier to get like certain things or make something in bulk and then you're just eating that for like a number of days. Or if something's on sale you buy more of that one thing. So, I think it's harder in practicality to actually have a variety all the time.

This participant, who was marginally food insecure also spoke at length about how she tried to keep her diet balanced and follow the recommended guidelines, but that it was difficult because of cost and time.

> And again, trying to eat the good foods. Like try not to go for the fast foods or the frozen foods, but sometimes it's just easier and you don't have any other options.

The M2B survey revealed that many people have difficulty eating a healthy diet during pregnancy. As examined above there are a plethora of barriers in one's social and physical environment that ultimately impact what food and what diet one is able to access.

4.3.6 Household Factors

There are a variety of household factors that also alter access to food and a healthy diet. Factors such as income, marital status, number of dependents, and housing costs can all limit what one is able to afford. The M2B survey was analysed to see if these factors were associated with risk for food insecurity.

4.3.6.1 Income and Maternity Leave

Income, even prior to switching from employment income to maternity benefits, is often insufficient to cover bills and leave enough money to afford groceries. A total of 25

M2B survey participants indicated that they were on maternity leave. Income breakdown of participants can be found in Table 4.2. The results of the logistic regression in which I regressed food insecurity on income, maternal age, and number of dependents are presented in Table 4.13. There is a significant relationship between income and food security status independent of maternal age and number of dependents. Having a greater income reduced one's risk of becoming food insecure by 50%. This is a significant drop in food insecurity risk and is important to note as many of these respondents will see a reduction in their income when they begin maternity leave, which may increase their risk for food insecurity. It is also interesting to note that number of dependents is not associated with an increased risk of becoming food insecure.

Table 4.13: Logistic regression with food security as the dependent variable and income, maternal age, number of dependents as independent variables

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Income	0.488	0.000	0.365, 0.651
Maternal Age	0.961	0.208	0.904, 1.022
Number of Dependents	1.187	0.188	0.919, 1.532

Issues around income and maternity leave were brought up in focus groups and interviews by both pregnant and postpartum people and public health and social care providers. Many pregnant and postpartum participants noted that they had to prepare for their maternity leaves by working until the last moment possible to get as much income as they could before they switched to maternity benefits. However, working until the end of pregnancy can be challenging and make it more difficult for people to prepare and manage their pregnancy symptoms.

> But you know, but maybe if I didn't work, if I didn't work it would have been a little easier. Just gone on mat leave earlier or something….I ended up working like almost to the end. I started, he was born in November and I started mat leave a little bit before Halloween because I needed the money.

Another interviewee noted that she had to start her maternity leave earlier than she planned because she had a job that involved a lot of movement and her back pain was impeding her from working.

Participants often brought up how the money they received during the maternity leave was not sufficient. People have to cover regular bills and the new costs of having a newborn with a reduced income, which was stressful for some.

> When you're on mat leave it's hard to pay your normal bills. When planning, we were gonna go minimum and anything extra was gonna go to the baby. Incredibly stressful when you're not used to this lifestyle.

> You know, I'm lucky I have a landlord who lets me pay my rent in half because my cheque that I get every two weeks is not covering my rent. Right?…I'm stuck, there's nothing I can do, so she's like, 'no we'll do it this way', and it works.

> There is a whole bunch of services in Hamilton, grocery delivery, it all costs though. When you're pregnant everything goes downhill in income.

The decreased income during maternity leave can be difficult for people to deal with as they try to keep up with their regular bills. As other payments are the priority this leaves even less money for people to spend on their groceries, which could influence their ability to access a food secure diet. These issues were noted by health and social care providers who realized how a low-income increased people's stress and restricted what they were able to access and buy.

> So just trying to find ways to um increase their income and then you know once that's kind of taken care of it can spill down.

Having extra money after paying bills would give people more money to spend on groceries for the household and also allow them to have more control over their lives because they may no longer be as reliant on food banks. Health and social care providers often discussed income as a determinant of health because those with a low income were more likely to turn to food banks, which as mentioned above, are not always able to provide healthy grocery items.

> Like, the people we see, so many of them live in poverty and the reason so many issues exist is because of that determinant of health – income. If people had adequate income to make decisions to have capacity and control in their lives, they could do some of these things. They wouldn't be worried about 'Where's next month's rent coming from?'. They wouldn't be worried about all these other costs and stresses they have in their life so that's a huge thing.

Income is a determinant of health and ultimately impacts what services and food people have access to. As the M2B survey analysis found, those with a higher income are less likely to be food insecure. However, as the focus groups and interviews illustrated, maternity leave, which reduces one's income by 45%. can increase financial stress during and after pregnancy.

4.3.6.2 Relationship/Partner Status

Having a partner, or being in a relationship, often means that there is a second person who can provide assistance around the house and with the newborn, provide household income, and offer psychosocial and emotional support. For those without a spouse or common-law partner, things can become more difficult especially during maternity leave, when their only source of income is reduced.

The relationship between household income and relationship status was first analysed to determine if there was a strong association between the two. For this analysis income was set as the dependent variable. As shown in Table 4.14, the Poisson regression analysis found that there is a significant relationship between income and having a partner ($p = 0.000$). Those with a partner had a 63% increased incidence of having a greater income independent of maternal age and number of dependents. Socioeconomic position was not included as a variable because income was used to derive the data for socioeconomic position.

Table 4.14: Poisson regression analysis with household income as the dependent variable and relationship status, maternal age, and number of dependents as independent variables.

Independent Variable	**Incidence Rate Ratio**	**P Value**	**95% Confidence Interval**
Relationship Status	1.629	0.000	1.313, 2.020
Maternal Age	1.025	0.000	1.012, 1.038
Number of Dependents	0.887	0.000	0.830, 0.948

To better understand the association between relationship status and food insecurity, a logistic regression analysis was conducted with food insecurity as the dependent variable. The analysis, summarized in Table 4.15, shows there was a significant relationship between food security and having a partner, independent of maternal age and number of dependents ($p = 0.002$). Based on these results, it appears that those who were not married or in a common-law relationship were more than 2.8 times as likely of being food insecure. These two analyses inform us that not having a partner is associated with an increased risk for food insecurity. This is because those with a partner are more likely to have a greater household income.

Table 4.15: Logistic regression with food security as the dependent variable and relationship status, maternal age, and number of dependents as independent variables

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Relationship Status	2.857	0.002	1.492, 5.470
Maternal Age	0.939	0.018	0.891, 0.989
Number of Dependents	1.376	0.007	1.091, 1.736

Partners were discussed occasionally during focus groups and interviews. In most instances, participants discussed how their partner was able to support them by offering support, or by helping through meal prepping. “My husband is a huge support. He does a lot of the meal planning for us”. Partner support was also found to be useful for those who were dealing with physical symptoms or other complications. This person who had been diagnosed with GDM was glad to have her partner to help support her through the medical appointments.

> My husband has been great because he’s seen [GDM] before and he knows how hard it is on me and so whatever and any, whatever I needed and whatever I wanted to advocate for he was in full support of.

Not all partners are able to be present at medical appointments and even prenatal classes because in some instances they are providing the sole income for the household as this health worker noted

> I hear a lot of families who are juggling, ‘I’m at home with the children ‘cause I can’t afford to send them to child care because my entire paycheck will go to childcare so I stay home and then my husband’s working. We’re only on one income’, that comes up quite often.

Partners may be able to help provide an income for the family and if they are not the only income earner in the household, they may also be able to help support pregnant

and postpartum people throughout their pregnancy. Beyond income, many participants also noted that their partners provided emotional support throughout their pregnancy. Overall, analysis of the M2B survey and focus groups and interviews indicates that partner involvement is complex and situationally dependent. There are many aspects of food insecurity beyond income and affordability. Therefore, even if a partner contributes to the household income, they may not be able to help with other barriers to food security, such as the high affordability of food, time, and transportation.

4.3.6.3 Number of Dependents

A logistic regression analysis was conducted with food security status as the dependent variable. The results of the analysis, as listed in Table 4.16, indicate that in our sample having more dependents is not significantly associated with food insecurity ($p = 0.475$) (Table 4.16). This result is not what was expected based on prior research and how other factors affected food insecurity.

Table 4.16: Logistic regression analysis with food security as the dependent variable and number of dependents, socioeconomic position, and maternal age as the independent variables

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Number of Dependents	1.117	0.475	0.824, 1.515
Socioeconomic Position	0.664	0.000	0.551, 0.801
Maternal Age	0.977	0.514	0.912, 1.047

Despite not finding statistical evidence of an association between food insecurity status and number dependents in the household, there were discussions among focus group and interview participants about how children impacted their time and diet. Participants spoke occasionally about having to care for other children and how this

impacted the food and time to eat that was available. Many of the barriers mentioned so far can be increased when the person is caring for dependents. These issues include reduced time and not having enough food. Not having enough time, as mentioned above, can impact the amount of time one has to prepare, but also eat meals. When someone is caring for other children, the time they have to feed and prepare food for themselves is reduced. If children are not yet school aged, then one parent may stay home to take care of them because it would cost more money to put them in childcare than they would make working. Another issue is having food to feed themselves and their children. Health providers at Welcome Baby prenatal classes, as quoted above, have had people ask for extra grocery store gift cards or use their grocery store gift cards to buy food for their children, not themselves. People often turn to foodbanks as well for infant supplies including formula and diapers as well as pantry snack foods such as granola bars for older children. This food insecure interviewee mentioned that she was able to get some of her food from the grocery store, but that she would "get the extra stuff from the food banks. Like snacks for the kids 'cause that's not cheap". Pregnant people who care for other children or dependents may have less time to feed and prepare food for themselves and may also prioritize feeding others in the household before themselves.

4.3.6.4 Housing

Housing and having access to an affordable place to live with utilities is a major issue in that many participants were facing. Neither the focus group question guide, nor the interview question guide included specific questions on housing; however, issues around housing were raised by participants when asked about the specific challenges that

they have encountered. One major issue is the cost of rent, which has increased in Hamilton over the past number of years. In the focus groups and interviews, participants discussed not only how housing was not accessible or affordable, but that the quality of places to rent was decreasing. This food insecure participant discussed how expensive her prior apartment had been and that the landlord's decision to sell the property left them scrambling for a new home with little time before her baby's due date.

> **Participant:** And like rent in our place was very expensive, um, for an apartment that like the landlord would not take care of….So it was rent over food sometimes.
> **Interviewer:** And when did you move here?
> **Participant:** November. So my landlord last minute decided he was going to try and say he's selling the property and we had to get out in like 30 to 60 days or whatever. And I was going to give birth to him in November. So, I was worried about not finding a place on time. And it took a really long time. The only reason I got this place is because I took over a lease.
> **Interviewer:** And do you find that rent here is more manageable?
> **M3:** Yes, so this place is technically bigger than the two bedroom that I had…. And it was 1350 all included, here is only 1125 all included and it's way nicer, the floors aren't painted gray. He painted the floors with like house paint, not even like a special paint for the floors. Wooden floors, nice, rustic, rustic wooden floors he painted them gray and the walls were gray, I lived in a jail cell. So that probably brought my mood down too.... And here it's nice and bright there's windows. At our other place we didn't really have windows and they didn't really open if we did have windows.

This participant's experience illustrates how difficult it can be to find a space that is affordable and is taken care of. The grey interior and dysfunctional windows also took a toll on her mental health.

Negotiating with a landlord is another issue that participants dealt with. In some instances, people had understanding landlords, such as the participant quoted above who mentioned that her landlord pay her rent in installments while she was on maternity leave.

However, that is not always the case and often people find that the rent that landlords are charging is unaffordable, which limits their ability to pay for other bills.

> Right there, like even, this day in age, good luck buying a house. Like I don't even want to ever look at buying a house at this point. Right, you know, looking for a two bedroom. I'm lucky where I am I have everything inclusive, um, I just happen to know the right people in the right places. And I'm hoping that when I look to move they have other properties that are around the same, same budget or whatever, everything inclusive because I don't want to put out extra money for hydro and gas. The place where I moved from I was paying, um, it was rent, which was almost right, almost $1000 dollars for two small bedroom, plus hydro, plus gas, because I had a fireplace. The winter before I left, I couldn't afford gas, I couldn't afford the gas bill. I had no heat….Yeah, so, like you have to figure out what you're going to do. So, this winter was great I was nice and toasty and warm, because I got to control the heat in the house. Um, but the place before that like…he was a builder from Toronto, came and took over a small apartment building, made the rooms, I know the building wanted two bedrooms so he made the two bedroom, like the one bedroom apartments into two bedrooms. They were small, tiny, and raised the rent…. And the area wasn't the greatest. And then to pay for gas on top of that so I have heat. Because my apartment didn't have baseboard heating. So, I was like 'I'm out dude, I have to move'. So, yeah, like there needs to be, more, definitely needs to be more affordable housing. And I think that's a lot, even if you listen to the election right now, a lot of people everywhere going 'affordable housing'.

The cost of rent has major implications for quality of life because it limits what one can afford. In these two examples, participants connected their mental health issues to an improperly cared for buildings, and not being able to afford their gas bills during the winter months. People have to plan a budget around their expenses, the largest of which is often rent. This participant discusses the issues with increasing housing costs and how that impacts other spending decisions and ultimately their diet.

> **Participant 1:** And housing in Hamilton has skyrocketed to the point where 90% of your income is pretty much is, feels like it's going to a home. And that takes away from your ability to provide food, uh, for your family. Which then makes poor eating habits start happening and people visit more and more foodbanks and

> then the foodbanks are getting overwhelmed because they can't provide for the amount of people that they're…trying to give food to. So, the choices that you get at the foodbank are not necessarily healthy choices. They are just basically there to fill the shelves to give somebody some sort of meal. So most of the things you find, um, don't contain things like eggs, milk, or meat at a food bank-
> **Participant 2:** Or fruit.
> **Participant 1:** Or fruit or vegetables. You are getting things that are in boxes or cans. And that's what a lot of people in Hamilton are relying on.

The cost of housing and the quality of housing has an impact on people's health and well-being. As rent prices increase in Hamilton, the amount of money that people have to put towards other bills and groceries decreases. This leaves some sacrificing certain bills, such as gas, or staying in a place that impacts their mental health because it is difficult to find a new place that has an affordable rent. Affordable housing is an issue that participants of focus groups and interviews raised when asked what challenges they faced, even though they were not specifically prompted by the question guides. This indicates that issues around housing are important to consider when discussing health and food insecurity. As the final quote illustrates the food that one is able to access is impacted by how much they end up paying on their home. Those who are unable to afford groceries turn to food banks and other stopgaps to bring food into their homes.

4.4 Physical Health

In this section I describe the results from the CCHS and M2B survey in regard to GDM from the M2B survey. I explore if food insecurity and mental health conditions are associated with GDM.

4.4.1 Gestational diabetes

Diabetes diagnosis during pregnancy was asked in the CCHS and GDM was listed as a complication in the M2B survey. This allows for an examination of not only

prevalence of this condition in the national and Hamilton populations, but also to explore how GDM is associated with different sociodemographic and personal health factors. Overall, 3.81% of the CCHS (2017/18) sub-sample of pregnant people were diagnosed with diabetes during their pregnancy (Table 4.17). As mentioned in the methods, Chapter 3 (p.42), this is probably an underreport of the true prevalence, since some of the survey respondents may not yet have been diagnosed with GDM.

Table 4.17: Those diagnosed with diabetes during pregnancy in Canada.

Demographic Variable		Percent of Population
GDM	Not Diagnosed	96.19
	Diagnosed	3.81

Data from the CCHS 2017/2018 cycle

I hypothesized that there was a significant relationship between household food insecurity and being diagnosed with GDM. A logistic regression analysis was conducted with GDM as the dependent variable to determine whether or not household food security status was associated with being diagnosed with GDM The analysis indicates that there is a significant positive relationship between GDM and food insecurity ($p = 0.000$) as seen in Table 4.18. Furthermore, those who are food insecure are more than 7 times likely to be diagnosed with GDM. Although this test reports a very high odds ratio, there is a quite a large confidence interval, which is probably due to a small sample size. However, even the low end of the confidence interval reports that those who are food insecure are approximately 2.76 times more likely to be diagnosed with GDM. This test indicates that there is a relationship that should be explored further.

Table 4.18: Logistic regression analysis with GDM as a dependent variable and food security scale as the independent variable. Data from the CCHS 2017/2018 cycle

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	7.259	0.000	2.764, 19.067

The results of the logistic regression analysis in which I regressed GDM diagnosis on food security, age, income, and number of dependents among the pregnant sub-sample of the CCHS is presented in Table 4.19. The logistic regression analysis of this model found that food security status ($p = 0.001$) and number of dependents ($p = 0.010$) had a significant association with GDM, as seen in Table 4.19. Those who are food insecure are still at a greater risk, even after controlling for age, income, and number of dependents. Being food insecure increased risk of diagnosis by approximately 5 times that of those who were food secure. Again, there is a large confidence interval for food security due to the small sample size; however, even the low end of the interval indicates that those who are food insecure are almost twice as likely to have GDM. Those who have more dependents are just over 50% more likely to also be diagnosed with GDM. The results of this test indicate that risk for being diagnosed with diabetes during pregnancy is associated with food security status and the number of dependents.

Table 4.19: Logistic regression analysis with GDM as the dependent variable and food security, age, income, and number of dependents as independent variables. Data from the CCHS 2017/2018 cycle

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	5.107	0.001	1.938, 13.457
Age	1.321	0.073	0.974, 1.792
Income	0.797	0.124	0.596, 1.065
Number of Dependents	1.523	0.010	1.106, 2.096

To examine the relationship between GDM and food security and mental health two regression analyses were conducted. The first analysis looked at how GDM risk was associated with food security and mood disorders, and the second examined how risk was altered by food security and anxiety disorders. As seen in Table 4.20 the first analysis found that there was a significant relationship between food insecurity and GDM ($p = 0.000$), but not mood disorders ($p = 0.274$). The risk between GDM and food security is similar to what was seen in the prior models. The second analysis with anxiety also found a significant relationship between GDM and food security ($p = 0.000$), as reported in Table 4.21. However, there was not a significant relationship between GDM and anxiety disorders ($p = 0.464$). These analyses show that there is a significant relationship between GDM and food security status, but there is not a significant relationship between GDM and mental health conditions.

Table 4.20: Logistic regression analysis with GDM as the dependent variable and food security and mood disorder as the independent variables.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	7.126	0.000	2.582, 19.665
Mood Disorder	0.313	0.274	0.039, 2.515

Table 4.21: Logistic regression analysis with GDM as the dependent variable and food security and anxiety disorder as the independent variables.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	6.691	0.000	2.596, 17.245
Anxiety Disorder	1.625	0.464	0.444, 5.947

The M2B survey had a total of 20 participants who reported that they had been diagnosed with GDM during their pregnancy, or 7.4% of our sample. A logistic regression analysis, with GDM as the dependent variable, was conducted to determine whether or not food insecurity, or household income, was associated with an increased risk for being diagnosed with GDM. The food insecurity analysis found that there was not a significant relationship between GDM and food insecurity ($p = 0.188$) independent of maternal age, number of dependents, ethnicity, and pre-pregnancy BMI as seen in Table 4.22. These results may reflect the sample, which had a high proportion of participants with a high SES (McKerracher et al. 2020a) and a smaller sample ($n = 20$) of participants who reported having GDM. This model did indicate that there is a significant relationship between number of dependents ($p = 0.011$) and pre-pregnancy BMI ($p = 0.005$). Those who had more children were 80% more likely to be diagnosed with GDM and those with a greater BMI prior to pregnancy are almost 75% more likely to be diagnosed, as indicated in Table 4.22. Pre-pregnancy BMI is associated with a greater risk of being diagnosed with GDM during pregnancy. It is interesting to note that similar to the CCHS data, those with more dependents (higher parity) are at an increased risk for GDM independent of maternal age.

Table 4.22: Logistic regression analysis examining how food security status, age, number of dependents, ethnicity, and pre-pregnancy BMI are associated with GDM. Data from M2B survey.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	0.261	0.188	0.035, 1.929
Maternal Age	0.992	0.882	0.890, 1.105
Number of Dependents	1.800	0.011	1.144, 2.832
Ethnicity	2.280	0.163	0.717, 7.255

Pre-Pregnancy BMI	1.735	0.005	1.180, 2.550

Despite no significant relationship between food insecurity and GDM found in the M2B survey data, the CCHS data indicates that at a national level being food insecure increases one's risk for being diagnosed with GDM. The M2B survey indicates that greater pre-pregnancy BMIs are associated with GDM diagnosis. The interviews and focus groups also indicate that being diagnosed with GDM has a large impact on diet and one's relationship with food during the remainder of their pregnancy. Those with GDM have to closely monitor their diet and many interview and focus group participants found that it was difficult to alter and constantly monitor their diet to prevent them from requiring insulin.

> I did get [GDM], which was not fun. You have to watch everything you eat. Right, so you have to figure out your cravings and how to, how to figure out your carbs.…Because it's, it's different. There's pregnancy eating and then there's gestational diabetes pregnancy that you have to play around with. It's two different things that you have to, that you have to play, that you have to go with.
>
> Before GDM it was a free for all, whatever I wanted to eat, and even now even though I'm controlled, I've kind of relaxed my diet because I've done so well. But I still keep in mind eating healthy and it really forces you to for your baby right?
>
> Being diagnosed and having to like test my blood sugar and watch what I was eating like religiously. It like, made me like obsess about food, which I've never done. I've always just tried to eat normally, balance, nutrition, right. Like, I never right was a dieter or anything. So then all of a sudden I was obsessing about food and what can I eat, what can't I eat and that just; it was weird for me, it was very weird.

This constant attention to meals made it difficult for them because it meant they could not eat the same meals as their families, or they would have to try and figure out what foods they could eat while balancing a work schedule.

> I had to critically assess every meal. I had to preplan things for like, I ended up cooking like three different meals right. Because I would cook a meal for my husband and I and I always supplement it for the kids because kids are picky, my kids are picky.
>
> It was hard when I was commuting because I found like the things I could eat didn't transport well, kind of, right. Kind of, it's hard to, you know they say like, like oatmeal is fairly good because it's high in protein, but you can't eat oatmeal in the car.

Having to alter their diets increased the amount of stress and pressure that people felt during their pregnancies. For those who had a difficult time managing their blood sugar levels they found that they would be constantly thinking about food and what they were able to eat.

> The poster child for pregnancy makes it look all happy-go-lucky, rainbows, and it's not necessarily the case. And I know a lot of moms who had to be on insulin and how painful that is and all the bruising that can go along with that. Moms that are like me who just have to like, to hustle to make sure you're doing what you need to do to survive it. It's not a fun experience.
>
> I think it was more just the stress about food that kind of added an unnecessary little hiccup to the whole experience. Um, I, uh, I definitely felt like I was under more pressure because of the diagnosis.
>
> It was more just the obsessing of what I could eat and worrying about it spiking my blood sugar, right. Especially at the very beginning when you're not sure of the quantities or portion sizes or that kind of stuff. Um, but once I got a better understanding of what I could and couldn't eat I felt like I could handle it and like manage it with diet.

Those diagnosed with GDM have a level of awareness regarding their diet that is not the same as those who do not have to monitor their blood sugar levels. Often GDM diagnosis means that people need to adopt a new diet, or adapt their current diet, which may be difficult to do, especially during pregnancy. Those with GDM were more aware of the food they were eating and could eat during their pregnancy, as well as which foods they

should avoid. Ultimately, this created a stressful relationship to their diets during their pregnancies.

4.5 Mental Health

Analysis of the public CCHS cycles that Statistics Canada releases from 2003-2018 show that there has been a marked increase in the prevalence of anxiety and mood disorders in the general Canadian population. Rates of anxiety have more than doubled in the last 15 years from 4.0% to 9.0% and rates of mood disorders have also risen from 5.3% to 8.8%, as listed in Table 4.23. This rise in anxiety and mood disorders in the general population brings forth questions of how it impacts people during pregnancy, especially those who are facing other barriers such as food insecurity.

Table 4.23: Proportion reporting anxiety and mood Disorders in the general population CCHS 2003-2018

Year of CCHS Survey	Percent of Population with Anxiety Disorders	Percent of Population with Mood Disorders
2003	4.0	5.3
2005	4.4	5.6
2007-2008	5.5	6.6
2008-2009	5.5	7.0
2009-2010	5.1	6.4
2011-2012	6.4	7.1
2013-2014	6.9	7.7
2015-2016	8.2	8.2
2017-2018	9.0	8.8

In addition to asking about mood disorder and anxiety disorder the CCHS asks participants to rate their mental health, their stress levels, and how connected they feel with their community. The full mental health demographic variables have been listed in Table 4.24.

Table 4.24: Mental Health sociodemographic data of pregnant Canadians

Demographic Variable		**Percent of Population**
Mood Disorder	Not Diagnosed	92.90
	Diagnosed	7.10
Anxiety Disorder	Not Diagnosed	90.31
	Diagnosed	9.69
Mental Health Perception	Excellent	35.00
	Very Good	40.74
	Good	19.16
	Fair	3.91
	Poor	1.19
Life Stress Perception	Not at all stressful	8.65
	Not very stressful	24.29
	A bit stressful	43.84
	Quite a bit stressful	22.44
	Extremely stressful	0.79
Sense of Belonging to Community	Very Strong	11.73
	Somewhat strong	57.45
	Somewhat weak	23.31
	Very weak	7.51

(CCHS 2017/2018)

4.5.1 Stress and Anxiety

Overall, 9.7% of the pregnant sub-sample from the CCHS reported being diagnosed with an anxiety disorder (phobia, OCD, etc.), which is around the same prevalence of the total CCHS sample. The results of the logistic regression analysis which examined anxiety as the dependent variable and food security as the independent variable are reported in Table 4.25. There is a significant relationship between food security and having an anxiety condition ($p = 0.000$) (Table 5.24). Those who are food insecure are

almost 4 times more likely to have an anxiety condition in comparison to those who are food secure. Although there is a wide confidence interval due to a small pregnant sample population, the low end of the margin still indicates that food insecurity is associated twice as often in those with an anxiety disorder.

Table 4.25: Logistic regression analysis with anxiety disorder as the dependent variable and food security as the independent variable.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	3.918	0.000	1.965, 7.813

The results of the regression analysis in which I regressed anxiety disorder on food security, mood disorder, education, and number of dependents are presented in Table 4.26. This test indicated that there is a significant relationship between food security status ($p = 0.029$) and having a mood disorder ($p = 0.000$), as reported in Table 4.26. Being food insecure was associated with an increased risk of having an anxiety disorder by almost almost 2.5 times greater that those without an anxiety disorder, independent of having a mood disorder, level of education, and number of dependents. In addition, those with a mood disorder were more than 35 times more likely to have an anxiety disorder independent of food security, education, and number of dependents. There is quite a large confidence interval associated with the mood disorder variable, however, the low end of 15, reported, is still quite a large associated risk.

Table 4.26: Logistic regression analysis with anxiety disorder as the dependent variable. Independent variables include food security, having a mood disorder, education, and number of dependents.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	2.497	0.029	1.099, 5.673
Mood Disorder	35.973	0.000	15.722, 82.308

Education	0.829	0.560	0.442, 1.556
Number of Dependents	1.394	0.185	0.853, 2.279

Food security status was associated with a significant increased risk for having an anxiety disorder. Overall, at a national level pregnant people who are food insecure, as well as those with a mood disorder, are at an increased risk of reporting an anxiety disorder during their pregnancy.

Both pregnant and postpartum people, as well as health and social care providers. discussed anxiety and its effect in the lives of pregnant people in the focus groups and interviews. Throughout the conversations, however, people did not discuss the effects of anxiety on their diet. Instead, discussion focussed on general issues regarding the incidence of anxiety and the feelings one has regarding their mental health. Health and social providers noted that mental health is becoming a larger and larger issue that they work on with their clients.

> I'm finding more and more women have this anxiety that isn't necessarily crippling for everyone but it is gnawing on them. And dealing with that anxiety and that fear and everything that surrounds the unpredictability of pregnancy and birth, right? But anxiety is something I'm noticing is a lot more prevalent.
>
> Honestly, mental health is the number one topic, especially anxiety.

Pregnant and postpartum participants discussed in more detail what they were worried about, which included ensuring one had enough resources for dealing with the unknown new experience of being pregnant and having a child.

> I'm worrying about parenting and doing the right thing for my children, but as far as like big life stressors or worries or whatever, my personal thing that I deal with a lot is anxiety and worry. So, everything then becomes a worry or a stressor. So, even though I shouldn't worry about money, I do worry about money, and I'm always like thinking is there going to be enough for tomorrow or, for next year or

> what if something detrimental happens, and, and, and we- and my husband loses his job. I always worry about all those negative things. So, that, that is a struggle that I've had for several years.
>
> I have a lot of anxiety issues. Because I saw my doctor about it and she was saying it's probably because of everything we were going through with the IVF. So, she was saying that it's connected. Like assuming it's connected to that because I always had a little bit of anxiety, I think everybody does, but it got really bad to the point where I needed to be on medication so I was taking medication. And then I started feeling better when I got pregnant. But they are still kind of keeping an eye on me and like checking in, like 'How are you feeling? and How are you doing?'. Different anxiety, different stress. It's more like: 'Is my baby going to be ok?', like, how, just the whole delivery process. Since it's my first I don't know anything right, so, it's just like kind of like the unknown, and I've always been like that. The unknown really kind of stresses me out a lot so. Kind of play it over in my head a lot and go over like 'this could happen'. Like try to think positive, but then the negative kind of comes up.

The issues with anxiety that were seen among participants were not narrowed down to one specific issue. Instead, their minds tended to fixate on potential negative outcomes regarding the future. So, although diet and changes to diet were not specified, it is concerning that health and social providers are noticing an increase in the number of people, who like the above participants, are dealing with general anxiety, which in some cases, becomes overwhelming and requires medication. There was only one participant who mentioned that they took medication for their anxiety; however, they stopped taking it once they became pregnant, even though their doctor told them it was safe, because they were worried about potential side effects.

Mental health challenges can be difficult to deal with, especially with a busy work schedule insufficient time to focus on health. This food insecure participant had to work full time for almost the entire pregnancy because of the need for income. However, this

busy work schedule was brought up when I asked her what would have improved their mental health management

> I don't know. No, maybe if I wouldn't honestly if I wouldn't have worked my entire pregnancy. If I had just taken some calm time to get everything, you know [ready].

This participant found that they lacked time as a resource, which impacted their mental health because they were not able to have time to process their pregnancy and properly prepare for their child. Time, as discussed above, is a major factor in food insecurity. Although, changes in diet, or diet habits, were not mentioned in conversations around stress and anxiety, discussions with respondents reveal how difficult it can be to manage stress and anxiety during and after pregnancy.

4.5.2 Depression and Mood Disorders

Overall, 7.1% of pregnant people in the CCHS reported having a mood disorder, which is slightly less than the 8.8% of the general population who responded affirmatively. The results of the logistic regression analysis in which I regressed mood disorder on food security are reported in Table 4.27. The test found that there was a significant relationship between food security status and risk of developing a mood disorder in the pregnant population ($p = 0.000$), as reported in Table 4.27. Those who are food insecure are at least 3.5 times more likely to experience a mood disorder, such as depression.

Table 4.27: A logistic regression analysis with mood disorder as the dependent variable and food security as the independent variable.

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	3.673	0.000	1.796, 7.510

The results of the regression analysis in which I regressed mood disorder on food security, anxiety disorder, education, and number of dependents are listed in Table 4.28. This model indicates that one's risk for having a mood disorder is 15 times greater, at a minimum, if they have an anxiety disorder ($p = 0.000$) as reported in Table 4.29. Since there is such a wide spread in the confidence interval due to a small sample size, the low end of the margin was used to assess risk. Including anxiety disorder as a variable shows how close a relationship there is between having a mood disorder and having an anxiety disorder. Also, as we know from the above analysis, being food insecure is significantly associated with having an anxiety disorder, which is why in this analysis it is no longer significant, as there is clearly a strong association between food insecurity and mental health. However, I decided to keep anxiety disorder in the model to show the close relationship between mood and anxiety disorders independent of food insecurity.

Table 4.28: A logistic regression analysis with mood disorder as the dependent variable. Independent variables include food security, having an anxiety disorder, education, and number of dependents

Independent Variable	**Odds Ratio**	**P Value**	**95% Confidence Interval**
Food Security	1.750	0.252	0.672, 4.557
Anxiety Disorder	35.859	0.000	15.689, 81.961
Education	0.876	0.700	0.448, 1.716
Number of Dependents	0.894	0.551	0.619, 1.291

Overall, those who are food insecure and those who have anxiety disorders are at a greater risk for having a mood disorder. The second model indicates that there is a close relationship between mood disorder, anxiety, and food insecurity in the pregnant Canadian population.

Depression and mood disorders were discussed in focus groups as well as one-on-one interviews. Participants with depression mentioned that health providers played a critical role in helping with their care. This participant, for instance, did not realize that they were dealing with both depression and post-partum depression until a public health nurse talked to her about it, who then informed her doctor.

> And if I didn't have my public health nurse and my activity worker, I call her an activity worker, she's actually a volunteer that comes in and works with [my daughter] and does activities with her, so. If I didn't have those things that were offered by Public Health, it would be a lot harder to go through the depression because my nurse realized that I was going through post-partum and I had depression on top of it. She went and told my family doctor who then forced me to come in and talk to her because she was concerned about my well-being. If I didn't have, basically what I feel like strangers taking care of me, where would I be?

It was because of the healthcare team that this person was able to receive the care that they needed after they gave birth. Another pregnant participant was diagnosed with depression during their pregnancy and received care through the Women's Health Concerns Clinic in Hamilton. This clinic was a crucial resource for this participant, because they only spoke to their healthcare team about their mental health issues and did not want to bring up the issue with their family. These participants' experiences demonstrate how important care teams during and after pregnancy are for diagnosing and treating mental health conditions.

Diet and weight management were also a major issue for this food insecure participant who was diagnosed with depression during their pregnancy.

> At the beginning was so bad like I was losing weight instead of gaining weight. Now I'm little bit better. But my midwife said still the baby's kind of small so you have to take like vitamin D, iron, calcium, prenatal vitamins….Yeah, because I don't feel [like I want] to eat, I feel sick.

This participant had lost their appetite during their pregnancy because of the depression, which was starting to be a concern for her child's health.

Energy levels and proper sleep were another issue that this participant dealt with, which made it difficult for them to continue with their normal tasks during the day.

> I feel so emotional and. My mood is very low like I don't want to do anything, I don't want to talk to anybody. I just want to stay home, I don't want to go out.

In addition to not having much motivation during the day she found that she was unable to stay asleep at night and were often kept up by her thoughts.

> My midwife told me I have to take the sleeping, sleeping pills. Because it's hard to go back to sleep. When I wake up in the middle of night. I have to stay up like two, three hours. Like I sleep for maybe four, five hours. And during the day I get headaches, I have to handle the two other kids….Really exhausting.

Dealing with depression made it difficult for this person to continue with their daily activities and was beginning to have an effect on their physical health during pregnancy.

Changes in emotions was also an issue for this interviewee who deals with borderline personality order. They were initially told that they would not be able to get pregnant, due to other health issues, and so their pregnancy came as a surprise to them, which also meant that they were not prepared for the emotional changes they dealt with.

> I have borderline personality disorder. So adding pregnancy hormones to that was not good…. It's like very, the emotions are already very intense so adding like pregnancy emotions you're like, you feel like your world is exploding whether you're happy or sad.

Intense emotions was an issue that this participant struggled with throughout their pregnancy. She was not on medication and had learned to manage her emotions through mental exercises and counselling; however, the hormonal changes during pregnancy added a new stressful challenge. Throughout the pregnancy the participant had to "learn

to get it under control again. Bring it down". This participant was also severely food insecure, which added another stressor for them to deal with. Depression and mood disorders create extra challenges during pregnancy, which can affect the health of both the pregnant person and the developing child. Healthcare and social supports are important resources that many participants relied on.

4.6 Summary

Analysis of the CCHS 2017/2018 cycle, M2B survey, M2B focus groups, and one-on-one interviews revealed that there are many health and environmental variables associated with living in a food insecure household during pregnancy. Relationships with food may and frequently do change during pregnancy, especially if blood sugar levels must be managed through dietary control. A statistically significant relationship between GDM and food security was observed in the CCHS data. Focus group and interview participants who had GDM discussed the difficulty and stress that managing GDM brought for them. In regard to mental health, reporting either an anxiety or mood disorder substantially increased the risk of being diagnosed with the other condition. Despite this close relationship between these mental health conditions, food insecurity was only associated with the risk of being diagnosed with an anxiety disorder not a mood disorder. However, those who reported either condition and were pregnant had a greater prevalence of food insecurity than the general pregnant population. Factors such as the affordability of food, the time one had to prepare food, lacking transportation, not having enough nutritional knowledge, having difficulty eating healthfully, and household income were associated with an increased risk of living in a food insecure household during

pregnancy. These analyses illustrate the many factors that influence one's food security status, and also reveal how those who are food insecure have an increased likelihood of dealing with a pregnancy complication.

Chapter 5: Discussion

5.1 Introduction

The initial aim of this project was to understand how social, psychological, and physical conditions such as food insecurity, and health complications, including mental health conditions and GDM, interact synergistically with one another during pregnancy. The initial questions were: Do those who are pregnant exhibit a greater prevalence of food insecurity? Are there positive associations between household food insecurity during pregnancy and GDM as well as feelings of stress, anxiety, or mood disorders at national levels? What are the experiences of individuals who have managed food insecurity, GDM, and anxiety of mood disorders? Analyses of data from the CCHS and the M2B survey provided the prevalence of these conditions in Canada and Hamilton respectively and the interactions among them. The M2B focus groups with pregnant and postpartum people and healthcare providers, as well as one-on-one interviews with pregnant and postpartum people dealing with food insecurity, mental health conditions, or GDM during their pregnancies provided greater insight into how environmental and individual factors shape pregnancy experiences. Thematic analysis indicated that the multiple variables and challenges that people face in regard to obtaining a healthy diet during pregnancy can be placed broadly into two categories: individual and environmental, as depicted in Figure 5.1. Pregnancy diet and health are impacted by a variety of different factors, depending on one's circumstances.

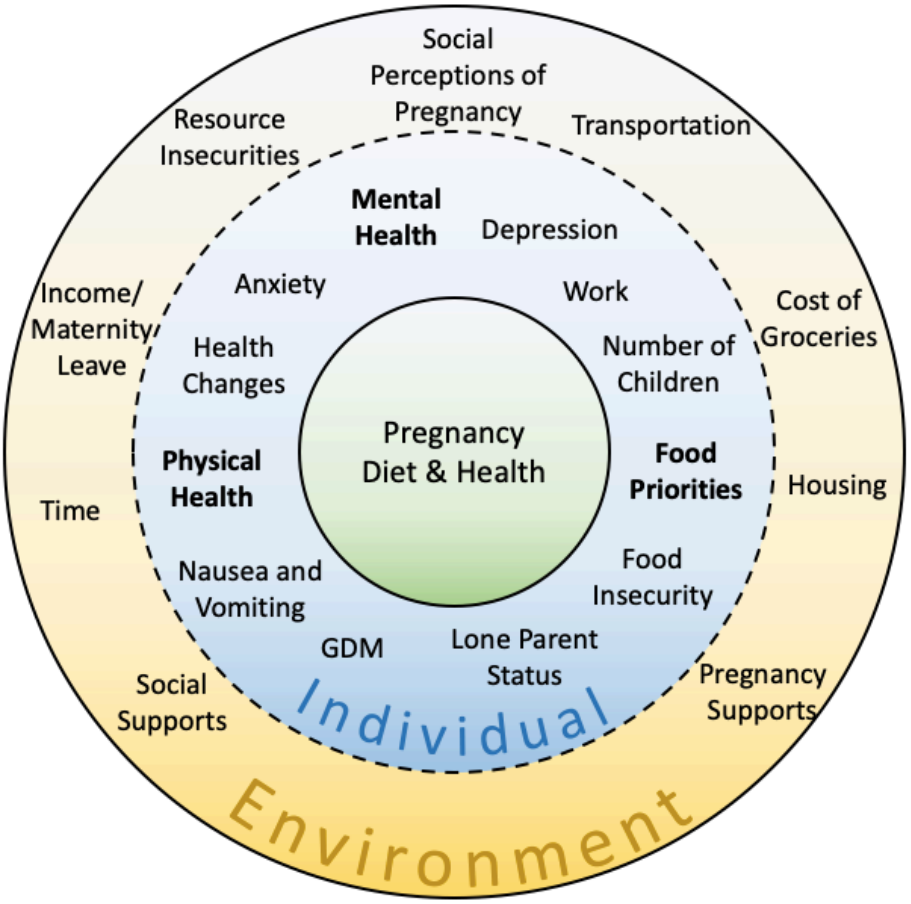

Figure 5.1: Thematic map outlining factors that influence pregnancy diet/health

In the first part of this chapter, I will discuss the syndemic interactions between GDM, mental health conditions, and food insecurity, as found in the CCHS data. Following this, I will describe how these conditions can impact diet and access to food during pregnancy. The variables identified in the environmental level of Figure 5.1 illustrate how the syndemic interaction between GDM, mental health conditions, and food insecurity, are nested within and have a relation to the biocultural environment. Although Figure 5.1 depicts two major levels of variables, the interactions between the

mentioned factors are complex. It is difficult to draw a solid boundary between them because the individual is influenced by their environment.

5.2 Co-occurrence of Conditions

One of the initial hypotheses for this project was that there would be a higher prevalence of food insecurity in the pregnant population in comparison to the general Canadian population (12.7%). The data indicate that the pregnant population experience food insecurity at a higher prevalence, with 18.2% of the CCHS pregnant sample and 20.5% of the M2B respondents reporting food insecurity. However, the difference in prevalence between the pregnant and non-pregnant CCHS respondents was not statistically, significantly different. Another hypothesis was that there would be a syndemic relationship between GDM, mental health conditions, and food insecurity. This hypothesis was based on research that has found that those who are food insecure are at a greater risk for mental health conditions and noncommunicable diseases such as T2DM and cardiovascular conditions (Jessiman-Perreault and McIntyre 2017; Seligman, Laraia, and Kushel 2010; Tait et al. 2018). Analysis of the CCHS data found that being food insecure was positively associated with GDM diagnosis, as seen in Table 4.18. The association between food insecurity and GDM, along with other metabolic pregnancy complications, such as anemia, has also been observed by Laraia, Siega-Riz, and Gundersen (2010) in their research on the Pregnancy, Infection, and Nutrition cohort study in the United States. Other statistical tests done with CCHS data indicated that having a mental health condition was positively associated with an increased prevalence of household food insecurity, as reported in Tables 4.25 and 4.27. My analysis also

showed that there was a significant relationship between having a mood disorder and an anxiety disorder (Tables 4.26 and 4.28). I did not find a significant relationship between GDM and food security status with the M2B survey data and the survey did not ask about whether respondents managed any anxiety or mood disorders. Overall, analysis from the national CCHS data indicates that food insecurity impacts disease risk for cardiovascular disease and T2DM not only as one ages, but also is associated with an increased risk for developing GDM during pregnancy. This risk is important to note, because the CCHS and M2B survey analysis also indicated that food insecurity has a higher presence among the pregnant population, as seen in Tables 4.1 and 4.2 respectively.

The increased risk that food insecurity brings for metabolic and mental health conditions is seen during the nine-month window of pregnancy and indicates that food insecurity influences the health of pregnant people and potentially the health of their child. For those diagnosed with GDM during their pregnancy, there are increased health risks later in life for both them and their children. Half of those who are diagnosed with GDM will go on to develop T2DM later in life (Diabetes Canada 2019). In addition to immediate complications for the infant, including macrosomia and birth complications, the infant is also at an increased risk for developing T2DM later in their lifecourse (Crowther et al. 2005; Diabetes Canada 2019; Feig et al. 2014). The DOHaD hypothesis holds that environment during early development, including *in utero*, can impact one's risk for noncommunicable diseases, including T2DM and cardiovascular conditions later in life (Barker and Thornburg 2013; Hanson 2014). Food insecurity does not resolve with pregnancy, in fact, it may worsen. Furthermore, as indicated by the analysis of the M2B

survey, multiple variables including issues such as time, transportation, employment and health conditions all impact access to food, as indicated in Figure 5.1. Therefore, those who deal with food insecurity are likely to deal with food insecurity after pregnancy as well. Depending on the effects of food insecurity that the child faces after birth, they may be at a greater risk for developmental challenges regarding language, motor skills, behaviour, social and emotional interactions, as well as poorer school performance (Jyoti, Frongillo, and Jones 2005; Rose-Jacobs et al. 2008).

Overall, this analysis demonstrated that those who are food insecure are at a greater risk for both GDM as well as mental health conditions. There is a strong association between food insecurity and mental health conditions in the pregnant Canadian sub-sample of the CCHS (Tables 4.25 and 4.27). The CCHS does not provide insight into whether or not those who reported a mental health diagnosis had developed the condition prior to or during their pregnancy. However, having a mental health condition, regardless of when diagnosed. alongside food insecurity during pregnancy is another challenge that people must manage. This association between food insecurity and psychosocial factors including anxiety and depression has also been reported in the United States (Laraia et al. 2006). Mental health conditions, such as depression or anxiety disorders can lead to pregnancy complications including low birth weight and preterm birth (Dunkel Schetter and Tanner 2012; Field, Diego, and Hernandez-Reif 2006; Grote et al. 2010; Rondó et al. 2003).

This syndemic interaction and the accompanying health implications illustrate how health risks are not isolated to a single generation, but instead also have a temporal aspect

as there can be multigenerational effects. Considering past and future generational effects on health, relates to lifecourse epidemiology in regard to noncommunicable diseases (Yoav and Kuh 2002). Individuals are not only embedded in their environment, but also the life, health, and environment of past generations (Kuzawa and Quinn 2009). Risk for these health conditions are raised if one is food insecure. The interplay between food insecurity and chronic health conditions has been well documented (Jessiman-Perreault and McIntyre 2017; Seligman, Laraia and Kushel 2010; Tait et al. 2018). However, by also adding in this temporal dimension we see how the effects of food insecurity can be multigenerational. This is especially important for policy and health professionals to note. Food insecurity, as noted is associated with many issues including: inadequate income, and social barriers such as lack of transportation, cost of groceries, and time to prepare meals. Therefore, to prevent these health conditions and support individuals managing them, social and policy change needs to occur to mitigate these environmental barriers as listed in Figure 5.1.

5.3 Pregnancy Experience

The surveys provided insight into whether or not there were relationships among GDM, mental health conditions, and food insecurity; however, the interviews and focus groups with pregnant and postpartum people as well as with health and social care providers provided further insight into whether or not pregnancy experience is altered by managing one or more of these conditions.

5.3.1 Gestational Diabetes Mellitus

Although GDM is usually tested for between the 24th and 28th weeks of pregnancy, and a positive diagnosis has major implications for diet and health for the remainder of a pregnancy. GDM is managed through dietary changes and blood sugar monitoring. If blood sugar levels cannot be controlled by diet insulin is used as treatment. The dietary changes that focus group and interview participants spoke about centred around limiting carbohydrates, which often meant avoiding the foods they were craving. Participants described changing their diets as a difficult experience. Instead of eating what they wanted to, they often had to preplan every meal and "critically assess" everything they ate. This shift in their relationships with food and their diets to something that brought them stress was a common issue for these participants as they worked to control their blood sugar levels. The strict diet and lifestyle changes that these participants had to follow resemble the experiences that Svensson, Nielson, and Maindal (2017) identified in their discussions with Danish people following their pregnancy with GDM. Carolan, Gill, and Steele (2012) found that participants in their study had a hard time managing their cravings, especially during social gatherings and that the dietary advice provided was not culturally sensitive. In their interviews with people with GDM, Evans and O'Brien (2005) also found that participants were often frustrated and stressed when it came to managing their blood sugar because proper diet and exercise did not always translate to good readings. Along with their increased stress, they discussed how they felt they had lost a sense of control over their pregnancy because their blood glucose was being so closely monitored by health providers. In their study of people with GDM in Manitoba, Canada, Neufeld (2011) also found that participants were overwhelmed when they were

diagnosed and had a difficult time understanding what they were able to eat. Increased stress regarding diet and blood sugar readings is a common perception for those managing GDM during their pregnancy.

The changes that participants made to their diet were not always straightforward as they also had to work with the other activities in their life. Overall, these participants found that managing GDM and having to adhere to a regimented diet brought on a lot of added stress during their pregnancy. This has been described as "from stun to gradual balance" by Persson, Winkvist, and Mogren (2010) and has been observed in another GDM study (Draffin et al. 2016. In their interviews with pregnant people with GDM, Carolan, Gill, and Steele (2012) identified that time pressure was a major barrier to managing GDM. Participants in this study mentioned that they found that they now had to add dietary self-management into their already busy schedules that included employment, family obligations, and household tasks. GDM diagnosis, as experienced by the people , is difficult to manage because they have to be constantly vigilant about what they are eating and juggle GDM management with their other work.

5.3.2 Mental Health Conditions

Mental health conditions such as mood and anxiety disorders cause added challenges during pregnancy. Mood disorders such as depression can lower one's energy levels, making it more difficult to complete daily tasks. Interview participants with mental health diagnoses spoke about how challenging it was to manage their pregnancy and other jobs while dealing with a mental health condition. It is evident, from interviews that depression and mood disorders were a significant barrier that impact the whole of

everyday life, including diet. In their study with 175 pregnant people, Nicholson and colleagues (2006) found that depression and the accompanying symptoms were associated with a decreased health-related quality of life. Health Related Quality of Life was also measured by Da Costa and colleagues (2010). From their survey of almost 250 pregnant people they found that those with depressed mood scores were more likely to report lower health-related quality of life in regard to physical pain, general health, social ability, vitality, mental and emotional health. Those with anxiety also reported lower health-related quality of life in regard to physical functioning and role limitations due to health problems. For those with depressive symptoms they found that sleep problems, independent of their depressed mood, negatively impacted quality of life scores as well. Manber, Blasey, and Allen (2008) investigated how the symptoms and effects of depression compare in those who are pregnant and those who are not pregnant. They found that depressive symptoms during pregnancy are similar to the symptoms that nonpregnant people with depression experience. This finding indicates that depressive symptoms during pregnancy should be taken seriously and that healthcare practitioners should appropriately address these health concerns. As at least 7.1% of pregnant people in Canada deal with a mood disorder during pregnancy and the prevalence of mood disorders are increasing in the general population. Mental health is a crucial aspect of pregnancy that physicians and care providers should be attentive to. Depression and mood disorders during pregnancy lead to additional symptoms, on top of general pregnancy symptoms, that have a negative impact on health during pregnancy.

Pregnancy is a time of change, which brings with it stress and worry. For those who manage an anxiety disorder this can make dealing with the unknowns more challenging. Three interview participants with anxiety conditions mentioned that they would worry and fixate on every small worry until it became a larger issue in their mind. By fixating on potential problems, participants mentioned how they ended up running through various scenarios in their mind in an attempt to plan for the worst or if things do not go as expected. This increase in anxiety and stress has also been noted by health and social care providers who work with pregnant people to try and manage those feelings and emotions. One participant, who was food insecure, mentioned that they felt like they did not have enough time to prepare everything because they constantly had to work because they could not afford to go on maternity leave early. This is important to note because this financial constraint, that impacts access to food, prevents people from taking the time to prioritize caring for themselves.

Issues around anxiety have been noted in other studies, although there have been few studies that have focussed on the qualitative experiences of anxiety during pregnancy. In their interviews with people during the postpartum period, Highet and colleagues (2014) found that there was less awareness regarding anxiety in comparison to depression. Participants who had anxiety mentioned that they struggled with their mental health, because they had been prepared for depression and its associated symptoms. However, when they began to develop anxiety conditions, they felt lost because the symptoms did not fully align with the signs of depression and they did not recognize the risk or the symptoms of anxiety. While this was not the experience for participants in my

study, this research illustrates how anxiety during pregnancy may be underreported because people are not aware of the risk or the symptoms due to the focus on depression. The prevalence of anxiety based on the CCHS data indicates that 9.7% of pregnant people manage an anxiety disorder, which is only slightly higher than that of the general population of 9.0%. Anxiety prevalence, however, has been reported as much higher in studies of pregnant people. In their research Lee and colleagues (2007) found that a third of pregnant participants experienced elevated levels of depression and that more than half had elevated symptoms related to anxiety. In their interviews with 24 pregnant people Furber and colleagues (2009) examined how psychological distress impacted their pregnancy experience. Interview participants discussed how their feelings of anxiety often included trying to prepare for the unknown. Furthermore, these feelings of stress and anxiety were all-encompassing and had an impact on their lives and abilities to perform general tasks (2009). In their review of the literature, two of the major themes Staneva, Bogossian, and Wittkowski (2015) noted regarding anxiety during pregnancy were 'spiraling down' or losing control, and 'regaining control'. People with anxiety often felt overwhelmed, scared, and worryied about the future. People who learnt to manage their anxiety also went through an adjustment phase that involved making the decision to prioritize their self-care and engage in relaxation exercises. This theme of 'spiraling down' is observed in some of conversations, but many people also then spoke about how they worked to control those emotions. The ability to prioritize self-care (Staneva, Bogossian, and Wittkowski 2009) is not possible for all people. Some participants in my interviews mentioned how they went to prenatal yoga but could not go

as often as they wanted to do to the high costs. As mentioned above, the one participant living with severe food insecurity was unable to prioritize self-care due to financial constraints.

5.3.3 Food Insecurity

A lack of access to reliable food due to financial and other barriers such as a lack of time or transportation made it difficult for participants to prioritize their diet and self-care during their pregnancy. Of the four interview participants who were food insecure three were marginally food insecure and one was severely food insecure. Although food insecurity was not quantitatively measured in the focus groups, many participants discussed issues accessing food, including food bank usage. Reliance on food banks was difficult because users often do not get a say in the food items they receive. Participants in both the focus groups and the interviews mentioned that they were not always satisfied with the food, because it is always canned or dried goods and are not always the healthiest options. For participants who were not using food services they experienced increased stress around grocery shopping. They mentioned that they always had to shop based on the flyer and available sales. When at the grocery store they said they had to be conscientious of what they bought, and would often have to swap out more expensive items that they wanted, such as chicken breast or fresh berries, for a cheaper option. While their diets are not impacted as much as those who are receiving groceries from a food bank, they still discussed increased stress at the grocery store. Other studies of food insecurity during pregnancy have found that food insecurity was strongly associated with

increased stress levels during pregnancy, as well as increased dietary fat intake at 12 months postpartum (Laraia, Vinikoor-Imler, and Siega-Riz 2015).

There are many barriers that impede access to food. The M2B survey asked about how a variety of variables including time, transportation, and uncertainty about what to eat impacted one's diet during pregnancy. Logistic regression analyses indicated that those who indicated that time, transportation, or were uncertain about what to eat were at a greater risk for being food insecure. Although those with a low income were also at an increased risk for being food insecure, it is important to note that financial constraints are not the only barrier that people face when accessing food. Those who have time constraints find that they are unable to put time into preparing meals and often don't have time to sit down and eat a proper meal multiple times throughout the day. The location of stores with healthy food options as well as the transportation required to obtain food can increase difficulty in accessing a healthy diet. An issue that was raised by interview participants who relied on public transportation was the amount of food that they could bring home from the grocery store, or food bank, per trip. Participants mentioned that they had to make multiple trips to the stores and that it was hard to bring back a full grocery trip on the bus, especially when managing a stroller. Having to take multiple trips to the grocery store means that people must spend an increased amount of time getting food, which limits the amount of time they have for other activities. Furthermore, participants mentioned that relying on multiple buses, or long bus routes negatively impacted the safety of perishable items that they purchased. In their analysis of public transportation systems and low-income households in America, Deokrye Baek (2016)

determined that increases in bus services would decrease the probability of household food insecurity. Furthermore, in their focus groups with low-income members of Lackawanna County, Pennsylvania, Christaldi and Castellanos (2014) noted that participants frequently mentioned how transportation issues, including cost, frequency of services, and inconvenient bus routes hindered their ability to obtain food from either grocery stores or food services.

The M2B survey indicated that those who were uncertain about what to eat were 35% more likely to be food insecure ($p = 0.050$). Research into nutrition knowledge and food insecurity has shown mixed results. Lombe and colleagues (2016) found in their study of the 2007-2008 National Health and Nutrition Examination Survey in the United States that those who had knowledge of the food pyramid had better health outcomes. However, in the food insecure population awareness of the food pyramid did not protect individuals from negative health outcomes such as hypertension and T2DM. Their study suggests that the risks of being food insecure cannot be countered by nutrition knowledge alone. In an experimental study Eicher-Miller and colleagues (2009) found that food insecure people in the United States who were given nutrition classes saw improvements in their food security status in comparison to those who had not received the classes. In the M2B survey, not being sure about what to include or exclude in one's diet during pregnancy was associated with higher levels of food insecurity. These studies indicate, that providing education on what to eat alone may not resolve food insecurity; however, it may help if other barriers such as transportation and time are also reduced.

The way in which food security is measured provides another barrier into understanding the true prevalence of food insecurity in Canada. While Statistics Canada did begin reporting on marginal food insecurity for the CCHS 2017/2018 cycle, the content of the questions and those who are included in the CCHS sample may influence the national estimates of prevalence of food insecurity. The food security questions in the CCHS, as listed in Appendix 1, are all focused on how income impacts one's ability to access food. However, as analyses using data from the M2B survey illustrated, there are a multitude of non-monetary barriers that may add to one's risk of becoming food insecure. These include time, transportation, and knowledge about what to eat. While a lower income is associated with a greater risk of food insecurity, it is not the only barrier people face. The FAO defined food insecurity as when people have both physical and economic access to food that not only fulfills one's dietary needs, but also their preferences. Food insecurity is more complex than whether or not one has enough money for groceries. In addition to not exploring further challenges associated with food insecurity, the CCHS does not include people who live in Indigenous reserves, members of the Canadian Forces, those who are institutionalized, as well as certain regions in Québec and Nunavut. While Statistics Canada (2020) states that these excluded communities only represent 3% of the target population, some of these communities and populations have a higher prevalence of food insecurity (Tarasuk and Mitchell 2020).

5.4 Material Resource Barriers

Beyond the conditions examined, the analysis revealed that there are many other factors that impact one's access to resources and food. These factors, including low

income, lack of affordable groceries, and insecure or expensive housing, can exist prior to pregnancy and can become even harder to deal with during pregnancy. As was found in the CCHS and the M2B survey, as income decreases risk for being food insecure increases. As part of a series of studies on food insecurity in the United States Laraia and colleagues (2006) found that income was also a risk for food insecurity (see also Laraia et al. 2010 and Laraia 2013). Income also impacts ability to afford both groceries and housing. Maternity leave posed a challenge for some participants, especially those who were food insecure. As one participant noted she was unable to take time off work prior to giving birth because she needed the money. However, if she had been able to afford more time off, she would have been able to manage her mental health better. Maternity leave is not always accessible, especially to those who are in a lower income bracket or do not work outside the home.

Many participants discussed how groceries, especially produce items, are expensive and unaffordable. Furthermore, for those who are food insecure, the grocery bill is not their priority because they need to pay for other bills and expenses first. Rent was often mentioned as the first expense, followed by hydro and other necessities. Food and nutrition were not the top priority because there are so many other costs that they prioritize first (Christaldi and Castellanos 2014; McKerracher et al. 2020b). The difficulty with managing household expenses and bills is also described in Hamelin, Beaudry, and Habicht's (2002) study that interviewed members of low-income households in Québec. Participants spoke about competing needs and having to prioritize items such as winter boots, and medicine, including insulin, before planning their grocery shop. Overall,

managing the grocery bill and the other life expenses makes it difficult for people with a limited income to prioritize food and a nutritious diet. Housing or the cost of rent is a major expense that limits one's food budget. Interview and focus group participants discussed how the high and rising cost of rent in Hamilton makes it difficult for them to afford other expenses. In their study of the 2011 cycle of the CCHS Sriram and Tarasuk (2016) found that affordable housing would reduce levels of household food insecurity.

5.5 Syndemic Risk

While this study unveils the associations between various health conditions at the national level. it is through a syndemic perspective that the relations between these conditions can be better understood. Due to the complex etiologies of mental health conditions and GDM, as well as the multitude of barriers that can lead to food insecurity, this study cannot determine any causation between these factors. Instead, the biocultural and syndemic perspectives allow for a greater understanding of how environment impacts health and how risks for having one or more of these conditions intersects. As demonstrated in Figure 5.2, there are multidirectional relationships between these conditions. There is not one cause and effect path, but rather living with structural conditions such as food insecurity, may increase one's risk for also dealing with GDM or anxiety/mood disorder. For example, if a person is diagnosed with GDM, they will have less time as they monitor their blood sugar and also attend extra appointments. Not having enough time was also associated with food insecurity. Furthermore, the stress of living with food insecurity may contribute to a mental health condition. Figure 5.2 illustrates these cross relations on a basic level; however, when examined alongside

Figure 5.1, which illustrates the various environmental factors that people are situated in, it becomes evident that while there is no one cause, people are influenced in a variety of factors, which ultimately increases syndemic risk.

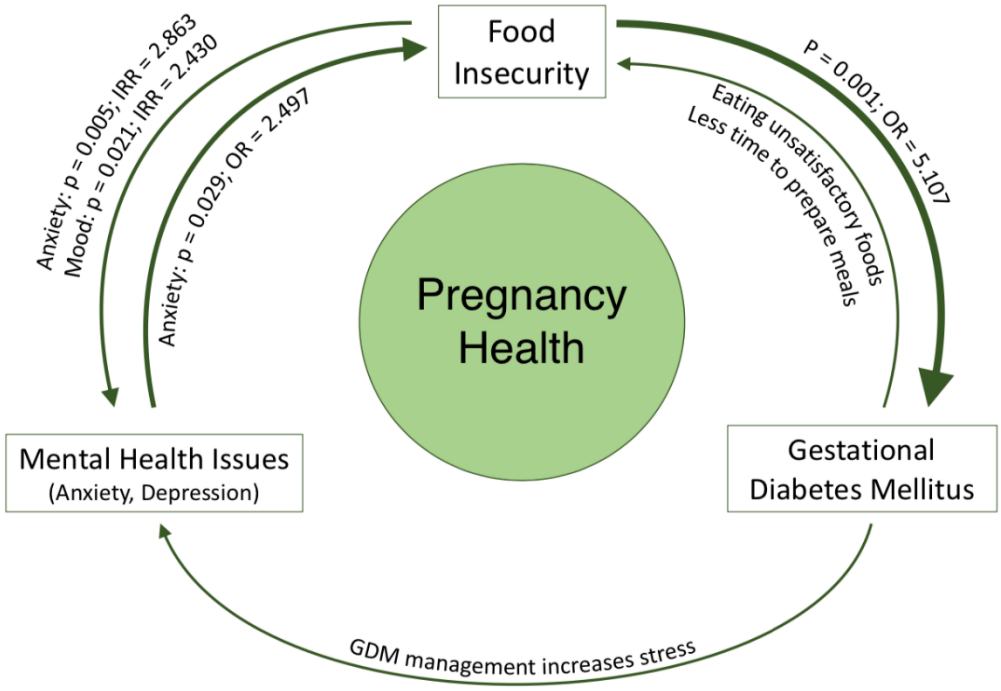

Figure 5.2: Diagram illustrating interactions between mental health, GDM, and food insecurity

5.6 Limitations

While this study analyzes various aspects of health and food insecurity through a variety of data sets, it is not without its limitations. These limitations include, the cross-sectional design of the study as well as the small sample size in the CCHS, and the low number of participants recruited for additional interviews. As this study is cross sectional in nature I was only able to examine a snapshot in the lifecourses of participants. As much of this study examined environmental factors, such as food insecurity, what we do

not know is the history of these participants. We do not know how long they have been food insecure, nor the length of time they have managed a mental health condition. Therefore, I cannot discern any causal relationships from these findings. I also do not know about familial history and I will not be following up with the children of these participants, which means that we cannot determine if there are any intergenerational effects in regard to GDM, mental health, and food insecurity.

In addition to the cross-sectional nature, the overall samples of pregnant people in both the CCHS and the M2B survey were sufficient for the study, they were small in number, especially when analyzing those who were pregnant and food insecure. While the sample size was sufficient for the analyses, many logistic regression results had large confidence intervals, which ultimately reduced the precision of the odds ratio estimates. To make a conservative interpretation, the low end of the confidence interval was reported. Had I amalgamated many cycles of the CCHS as one, I may have ended up with a larger sample size and therefore more precise estimates, but there were difficulties in doing this because the measurement of food insecurity changed in the 2017/18 cycle and I was limited by time to complete the data analysis. I also had fewer participants than anticipated who partook in the one-on-one interviews. To overcome this limitation and augment the quantitative and qualitative data, I also incorporated the M2B survey and focus group data into this study.

Overall, this low number of pregnant and postpartum people interview for this study resulted in having a couple of people speak about mental health, food insecurity, and GDM during their pregnancy, but there was no one person who experienced all these

conditions simultaneously. Having particpants who could speak about the experience of these conditions all together would help to better understand and present a lived experience of the syndemic risk and experiences.

5.9 Summary

Although a syndemic interaction among food insecurity, GDM, and mental health conditions was uncovered through CCHS analysis, it would be remiss if the analysis was not taken further. Examining the factors that are associated with food insecurity as well as the experience of managing GDM and mental health conditions during pregnancy reveal how environmental factors influence the pregnancy experience at the individual level. By examining the syndemic effects in the larger biocultural environment a clearer picture of pregnancy experience and associations between complications is formed. This study found that food insecurity was associated with a greater prevalence of GDM and mental health conditions. Attention needs to be paid to the environmental conditions that contribute to overall risk for facing these complications during pregnancy. There are a variety of factors including time, and transportation that are associated with food insecurity in addition to income. It is crucial to examine and eliminate these barriers because. as described above, pregnancy complications can lead to lasting health effects for not only the mother, but also the child.

Chapter 6: Conclusions

The initial aim of this study was to determine if food insecurity was associated with health complications such as mood and anxiety disorders and GDM, during pregnancy both in Canada at large in the City of Hamilton. Beyond examining the prevalence and associations between complications, this project also aimed to determine how pregnancy complications created added barriers and impacted the pregnancy experience. Analysis of the 2017/2018 cycle of the CCHS found that those who were food insecure were at an increased risk for being diagnosed with GDM as well as mood or anxiety disorders. This syndemic interaction among food insecurity, mental health conditions, and GDM was demonstrated at the national level but not with the M2B survey data. The M2B survey did not ask about prevalence of mental health conditions so this relationship could not be investigated. Qualitative data from focus groups from the M2B study and my individual interviews with pregnant and postpartum people in Hamilton, however, did support the quantitative data findings from the CCHS, in that it illustrated the connections between all of these conditions. The qualitative data also elaborated on the lived experience of having all of these conditions during pregnancy and the challenges they present.

Research on food insecurity in both Canada and the US has been shown to increases one's risk for multiple health conditions, which may be more difficult to manage if one is food insecure, or managing multiple health conditions. The increased risk for similar complications during pregnancy associated with food insecurity, indicates that food insecurity does not just impact health later in life, but also influences maternal health during the nine months of pregnancy and potentially the health of the offspring.

This increase in complications during pregnancy related to food insecurity should be of concern to health and social care providers and public health officials. Policy makers and governments should also be concerned aboutFood insecurity as it is directly related to the social environment which poses challenges and barriers, including income, inaccessible maternity leave, lack of reliable transportation, and a lack of time. These challenges need to be addressed in order to reduce food insecurity, which could in turn impact pregnancy health and well-being.

Addressing food insecurity is important not only for improving maternal health, but also the health of their offspring. As the DOHAD hypothesis proposes one's environment during early life development can impact risk for noncommunicable diseases later in the life course (Winnet et al. 2016). The experiences of one's parents, including the environment of the mother during pregnancy can also impact one's risk for NCD development (Barker, Eriksson, and Forsén 2002; Gluckman, Hanson and Beedle 2006). Of those who develop GDM during their pregnancy 50% will develop T2DM later in their lifecourse (Crowther et al. 2005; Diabetes Canada 2019; Feig et al. 2014). GDM also increases the risk of T2DM in the offspring and, if the child is a female, they will be at an increased risk for developing GDM if they become pregnant (Crowther et al. 2005; Feig et al. 2014). This intergenerational risk of diabetes, paired with the increased risk of GDM for those who are food insecure, indicates that addressing food insecurity would not only reduce NCD risk in the parental generation, but may also improve the health of future generations. These links should be noted and acted upon by public health officials to reduce levels of food insecurity in Canada.

Pregnancy is a time of major physiological and psychological changes. Diet quality, along with health and well-being during pregnancy can be impacted by many complications including mood and anxiety disorders, GDM, and food insecurity. This study found that there is a syndemic interaction between food insecurity and mental health and GDM complications during pregnancy. Food insecurity increases one's risk for managing or being diagnosed with the above-mentioned health conditions during pregnancy. Although food insecurity risk is increased if one has a lower income, food insecurity is impacted by many challenges including inadequate income to afford groceries, a lack of transportation, and a lack of time to prepare and eat meals. Pregnancy can pose many challenges that impact diet quality as this biocultural approach has illustrated. Public health officials should notice how food insecurity impacts not just the access of food for the maternal generation, but how health impacts associated with food insecurity can have impacts on the health of the next generation especially as national rates of GDM are rising (GOC 2016). Food insecurity can have intergenerational impacts on health. Access to a food secure diet should be a major concern of public health to improve the health of the population and relieve the added barriers that people face during their pregnancy.

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Appendix 1

Food Security Survey from the CCHS

Q1.
Which of the following statements best describes the food eaten in your household in the past 12 months, that is since [current month] of last year?

1. You and other household members always had enough of the kinds of foods you wanted to eat.
2. You and other household members had enough to eat, but not always the kinds of food you wanted.
3. Sometimes you and other household members did not have enough to eat.
4. Often you and other household members didn't have enough to eat.

Q2.
The first statement is: you and other household members worried that food would run out before you got money to buy more. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q3.
The food that you and other household members bought just didn't last, and there wasn't any money to get more. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q4.
You and other household members couldn't afford to eat balanced meals. In the past 12 months was that often true, sometimes true, or never true?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q5.
You or other adults in your household relied on only a few kinds of low-cost food to feed the child(ren) because you were running out of money to buy food. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q6.
You or other adults in your household couldn't feed the child(ren) a balanced meal, because you couldn't afford it. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q7.
The child(ren) were not eating enough because you and other adult members of the household just couldn't afford enough food. Was that often, sometimes or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q8.
In the past 12 months, since last [current month] did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

1. Yes
2. No (Go to Q9)

Don't know / refuse to answer

Q8b. How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

Don't know / refuse to answer

Q9.
In the past 12 months, did you (personally) ever eat less than you felt you should because there wasn't enough money to buy food?

1. Yes
2. No

Don't know / refuse to answer

Q10.
In the past 12 months, were you (personally) ever hungry but didn't eat because you couldn't afford enough food?

1. Yes
2. No

Don't know / refuse to answer

Q11.
In the past 12 months, did you (personally) lose weight because you didn't have enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Q12.
In the past 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Q12b. How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

Don't know / refuse to answer

Q13.
In the past 12 months, did you or other adults in your household ever cut the size of any of the children's meals because there wasn't enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Q14.
In the past 12 months, did any of the children ever skip meals because there wasn't enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Q14b. How often did this happen?

1. Almost every month

2. Some months but not every month
3. Only 1 or 2 months

Don't know / refuse to answer

Q15.
In the past 12 months, were any of the children ever hungry but you just couldn't afford more food?

1. Yes
2. No

Don't know / refuse to answer

Q16.
In the past 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Appendix 2

Demographic Survey Given to Interview Participants

INSTRUCTIONS: *Please provide us with some basic information about you. When you're finished, please turn over this sheet and leave it on the table when you leave.*

Your answers will be kept confidential so please do not put your name on this sheet. Thank you!

1. I identify as (Check one):
   [ ] Male
   [ ] Female
   [ ] Other_____
   [ ] Prefer not to say

2. What is your birth month and year?

   Month: _____

   Year: _____

3. My current occupation is:

   _____

   a. My work is :
      [ ] Part-time
      [ ] Full-time?

4. A) If currently expecting a baby: I am or my partner is _____ months pregnant.

   B) My partner or I recently gave birth: the baby is_____ months old.

5. I have _____(#) of children at home.

6. Have you ever attended a pregnancy or new parenting group?

   [ ]Yes
   [ ]No

   a. If yes, the main one I visit is_____ at

      _____ location.

Life and Health Experiences

1. In which country were you born?

   _____

2. *If* you were born outside of Canada, in which year did you arrive in Canada?

   _____

3. Are you a (Check one)
   [ ] Canadian Resident/Permanent Resident
   [ ] Temporary Resident

4. What is your racial/cultural background? (Check all that apply)

   [ ] African (such as Somali, Nigerian)
   [ ] African-Canadian
   [ ] Arab (such as Iraqi, Egyptian)
   [ ] Caribbean (such as Jamaican, Trinidadian)
   [ ] Chinese
   [ ] European (such as Italian, Finnish)
   [ ] Filipino
   [ ] Indigenous (Status or non-status Indian, Métis, Inuit)
   [ ] Japanese
   [ ] Korean
   [ ] Latin American (such as Mexican, Chilean)

[ ] South Asian (such as Indian , Pakistani)
[ ] Southeast Asian (such as Vietnamese, Cambodian)
[ ] West Asian (such as Iranian, Afghani)
[ ] White
[ ] None
[ ] Other:_____

5. What is your highest level of education?
   [ ] Up to Grade 8
   [ ] Did not finish high school
   [ ] Finished high school, but no college or university
   [ ] Some college or university
   [ ] College diploma or university degree
   [ ] Prefer not to answer

6. What is your total yearly household income from all sources before taxes? (Check one)
   [ ] Less than $20 000
   [ ] $20 000 - $39 999
   [ ] $40 000 - $79 999
   [ ] Greater than $80 000
   [ ] I don't know
   [ ] Prefer not to answer

7. Are you:
   [ ] Single
   [ ] Married
   [ ] Common Law
   [ ] Other _____

8. While growing up did you have reliable access to food?

   [ ]Yes
   [ ]No

9. Is your food situation better or worse than when you were a child?

   [ ]Yes
   [ ]No

10. Have you ever been diagnosed with Type 2 Diabetes Mellitus?

[ ]Yes
[ ]No

11. Have you ever been diagnosed with Gestational Diabetes Mellitus (GDM)?
[ ]Yes
[ ]No

Food Security

(For these statements please consider the situation of you and your household for the past 12 months.)

1. The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more."

   [ ]Often true
   [ ]Sometimes true
   [ ]Never true

2. (I/we) couldn't afford to eat balanced meals.

   [ ]Often true
   [ ]Sometimes true
   [ ]Never true

3. In the last 12 months, did (you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?
   [ ]Yes
   [ ]No

   a. If yes, how often did this happen?
      [ ]Almost every month
      [ ]Some months, but not every month
      [ ]Only 1 or 2 months

4. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?
   [ ]Yes

[ ]No

5. In the last 12 months, were you ever hungry but did not eat because there was not enough money for food?
   [ ]Yes
   [ ]No

6. How often do you use food services (i.e. food banks, community kitchens) to help feed your family?

Mental Health

1. Did your mental health worsen, stay the same, or improve after you became pregnant?

   [ ]Improve
   [ ]Stay the same
   [ ]Worsen

2. In the last month, how often have you been upset because of something that happened unexpectedly?

   [ ]Never
   [ ]Almost never
   [ ]Sometimes
   [ ]Fairly often
   [ ]Very Often

3. In the last month, 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

4. In the last month, how often have you felt nervous and "stressed"?

[ ]Never
[ ]Almost never
[ ]Sometimes
[ ]Fairly often
[ ]Very Often

5. In the last month, how often have you felt confident about your ability to handle your personal problems?

[ ]Never
[ ]Almost never
[ ]Sometimes
[ ]Fairly often
[ ]Very Often

6. In the last month, how often have you felt that things were going your way?

[ ]Never
[ ]Almost never
[ ]Sometimes
[ ]Fairly often
[ ]Very Often

7. In the last month, how often have you found that you could not cope with all the things that you had to do?

[ ]Never
[ ]Almost never
[ ]Sometimes
[ ]Fairly often
[ ]Very Often

8. In the last month, how often have you been able to control irritations in your life?

[ ]Never
[ ]Almost never
[ ]Sometimes
[ ]Fairly often
[ ]Very Often

9. In the last month, how often have you felt that you were on top of things?

   [ ]Never
   [ ]Almost never
   [ ]Sometimes
   [ ]Fairly often
   [ ]Very Often

10. In the last month, how often have you been angered because of things that were outside of your control?

   [ ]Never
   [ ]Almost never
   [ ]Sometimes
   [ ]Fairly often
   [ ]Very Often

11. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

   [ ]Never
   [ ]Almost never
   [ ]Sometimes
   [ ]Fairly often
   [ ]Very Often