
Electronic Thesis and Dissertation Repository

5-12-2021 1:00 PM

Perspectives of Canadian Midwives on Nutrition for Pregnancy

Yvana T. Sawaya, *The University of Western Ontario*

Supervisor: Twynstra, Jasna, *Brescia University College*

Co-Supervisor: Seabrook, Jamie, *Brescia University College*

Co-Supervisor: Madill, Janet, *Brescia University College*

A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Foods and Nutrition

© Yvana T. Sawaya 2021

Follow this and additional works at: <https://ir.lib.uwo.ca/etd>



Part of the [Medicine and Health Sciences Commons](#)

Recommended Citation

Sawaya, Yvana T., "Perspectives of Canadian Midwives on Nutrition for Pregnancy" (2021). *Electronic Thesis and Dissertation Repository*. 7832.

<https://ir.lib.uwo.ca/etd/7832>

This Dissertation/Thesis is brought to you for free and open access by Scholarship@Western. It has been accepted for inclusion in Electronic Thesis and Dissertation Repository by an authorized administrator of Scholarship@Western. For more information, please contact wlsadmin@uwo.ca.

Abstract

Limited data exists on Canadian midwives' experiences with nutrition for pregnancy. An anonymous e-survey was distributed via midwifery associations' e-newsletters, social media, and clinics' public e-mail addresses to explore Canadian midwives' nutrition attitudes, education, and recommendations.

Almost all (99.4%) of the 161 respondents provided nutrition advice to pregnant women and almost two-thirds (63.7%) received nutrition training. Midwives had positive attitudes towards nutrition (median=5 on scale where 1=very unimportant and 5=very important) and their comfort levels in advising on nutrition topics ranged from moderate to high. An average of 85.3% of their recommendations aligned with Health Canada pregnancy guidelines and relevant literature. There was no difference in the number of recommendations that align with guidelines between midwives who received nutrition education (16.4/19) and those who did not (15.9/19; $p=0.13$).

Overall, Canadian midwives provide nutrition advice with comfort and knowledge that has no relationship to whether they received formal nutrition education.

Keywords

Nutrition, Midwifery, Pregnancy, Attitudes, Comfort, Nutrition Recommendations.

Summary for Lay Audience

Maternal nutrition during pregnancy is vital for the health and development of both the mother and infant, and nutrition guidance must be provided to pregnant women. Midwives, family physicians, and obstetricians are the three primary maternity care providers in Canada and are credible sources of nutrition information. Of the three primary maternity care providers, midwives provide the most nutrition counselling to pregnant women, yet little is known about Canadian midwives' nutrition training, attitudes, experiences, and recommendations. Using an anonymous, online survey distributed to midwives across Canada, this thesis provides evidence that most midwives had received formal nutrition training and that they had positive attitudes towards the importance of prenatal nutrition and towards the importance of their role in providing nutrition education to pregnant women. Midwives frequently encountered and were comfortable in advising on several nutrition topics in their practice, including heartburn, anemia, weight gain, nutrition for breastfeeding, and healthy eating. As well, most of the midwives' pregnancy-related nutrition advice aligned with Health Canada guidelines and relevant literature, regardless of whether the midwives had received nutrition training or not. Overall, findings from this thesis show that Canadian midwives have positive attitudes towards nutrition and are a trusted source of nutrition information. In the future, this work may lay the foundation for further understanding Canadian midwives' experiences with nutrition in practice and identifying the nutrition areas for which the midwives may require additional information and training.

Acknowledgments

Completing this thesis during a pandemic has been one of the most challenging yet rewarding experiences, and I would like to express my gratitude to everyone who made it possible: my advisor, Dr. Jasna Twynstra, for her continuous support, expert guidance, and insightful feedback; my co-supervisor, Dr. Jamie Seabrook, for his words of encouragement and constructive recommendations to my work; my committee member, Dr. Janet Madill.

I dedicate this work to my parents, Tony and Amal, who devoted their lives to my better education, and to my brother, Boutros, for his unconditional support.

Table of Contents

Abstract	ii
Summary for Lay Audience	iii
Acknowledgments.....	iv
Table of Contents	v
List of Tables	vii
List of Figures	viii
List of Appendices	ix
Chapter 1	1
1 Introduction	1
1.1 Nutrition for pregnancy.....	1
1.2 Pregnant women’s interest in prenatal nutrition	1
1.3 Prenatal care in Canada.....	5
1.4 Canadian midwives’ competencies, training, and model of care.....	7
1.5 Midwives’ perspectives on and comfort with nutrition for pregnancy	12
1.6 Midwives’ recommendations and alignment with prenatal nutrition guidelines..	13
1.7 Summary	14
1.8 Study objectives	15
Chapter 2.....	16
2 Methodology	16
2.1 Study design.....	16
2.2 Participants.....	16
2.3 Sampling and recruitment	16
2.4 Survey development.....	17
2.5 Survey structure	18

2.6 Data analysis	20
2.7 Ethics approval.....	22
Chapter 3.....	23
3 Results	23
3.1 Demographic characteristics and education.....	23
3.2 Midwives’ opinions on and experiences with nutrition.....	29
3.3 Midwives’ nutrition recommendations.....	39
3.4 Effect of nutrition training on midwives’ nutrition experiences.....	42
3.5 Nutrition topics for which midwives would like more resources available.....	45
Chapter 4.....	47
4 Discussion	47
4.1 Main findings	47
4.2 Midwives’ nutrition training.....	47
4.3 Midwives’ attitudes towards and experiences with nutrition for pregnancy	48
4.4 Midwives’ comfort with specific nutrition topics.....	51
4.5 Midwives’ nutrition recommendations	54
4.6 Interest in further nutrition information.....	56
4.7 Access and referral to registered dietitians	57
4.8 Limitations	58
4.9 Conclusions, implications, and future directions.....	59
References.....	61
Appendices.....	72
Curriculum Vitae	139

List of Tables

Table 1: Respondents' descriptive characteristics (N=161).....	24
Table 2: Characteristics of midwives' nutrition education during and after their Midwifery Education Program (N=161).....	25
Table 3: Nutrition topics that midwives received training for after their Midwifery Education Program (n=28).....	26
Table 4: Frequency of reference to specific sources for nutrition information (N=161).....	28
Table 5: Provision of nutrition advice to pregnant women by midwives (N=161).	31
Table 6: Association between years of experience in practicing midwifery and how nutrition information was provided to clients.....	32
Table 7: Correlation between frequency of encounter and comfort level on advising clients about specific nutrition topics (N=161).	33
Table 8: Midwives' access, referrals, and barriers when referring clients to registered dietitians (N=161).	35
Table 9: Additional barriers to making client referrals to a registered dietitian ^a	36
Table 10: Correlation between midwives' comfort levels in advising on nutrition topics and the percentage of midwives who have referred clients to other healthcare providers for each topic.....	38
Table 11: Summary of responses to specific nutrition recommendation questions.....	40
Table 12: Differences in midwives' characteristics based on their formal training (N=161).	43
Table 13: Nutrition topics that midwives would like enhanced resources for and/or more information on.....	46
Table 14: Recommended weight gain during pregnancy, by pre-pregnancy BMI ^a	74

List of Figures

- Figure 1: The distribution of midwives that received nutrition training based on the location, in Canada or outside of Canada, where they completed their MEP. Differences were assessed using a chi square test. N=161 27
- Figure 2: Midwives' ratings of the importance of healthy nutrition during pregnancy (black) and the importance of their role in providing nutrition information to pregnant women (grey), on a five-point Likert scale where 1 = very unimportant and 5 = very important. N=161 30
- Figure 3: Percentage of respondents who had access to a registered dietitian based on their setting of practice. A chi-square test was used to compare the differences in access between settings. N=161 37

List of Appendices

Appendix A: Canadian Nutrition Guidelines for Pregnancy	72
Appendix B: Study Survey (English)	78
Appendix C: Study Survey (French).....	103
Appendix D: Health Sciences Review Board Approval Letters	128
Appendix E: Letter of Information	134

Chapter 1

1 Introduction

1.1 Nutrition for pregnancy

Maternal nutrition during pregnancy is critical for the health of the mother and infant as poor diet quality is associated with abnormal glucose tolerance, pre-eclampsia, preterm birth, and miscarriage (1). Following pregnancy, excess gestational weight gain can decrease rates of breastfeeding, contribute to greater weight retention, and can subsequently lead to maternal obesity (2-5). Inadequate maternal nutrition is also linked with poor infant outcomes such as compromised development, low birth weight, and an increased risk of developing chronic diseases later in life such as cardiovascular disease, diabetes, and abnormal bone mass formation (6-8). Overall, as inadequate nutrition intake throughout pregnancy can result in adverse maternal and birth outcomes, women should be counselled on healthy nutrition for their pregnancy (9, 10).

1.2 Pregnant women's interest in prenatal nutrition

Pregnant women's outlook on healthy nutrition is reported to be positive overall (8, 9). A study of 60 women showed that information-seeking behaviours for healthy nutritional intake tended to be highest during the first trimester, as women viewed nutrition to be one of the few aspects that they can change in their everyday lives to help protect the health of their baby (11). Women highly rated the importance of a healthy diet during pregnancy, and reported that they were highly motivated to maintain that healthy diet throughout their pregnancy (12). The nutrition-related topics that pregnant women were most interested in included: healthy eating (13, 14), food safety (11, 12), nutritional

requirements for pregnancy (12), cooking and food preparation skills (12), as well as recommendations for decreasing common complaints during pregnancy, such as vomiting (11), heartburn (14), and nausea (14). Other topics that women believe to be important for pregnancy include weight management during and after pregnancy, vegan and vegetarian diets, Listeria, and nutrition for breastfeeding (14).

A systematic review showed that the method by which caregivers provided health information (e.g., verbally, written) was perceived by pregnant women to be an important aspect to helping them utilize that information (15). In general, women prefer to receive nutrition information through individual consultations with their care provider, and alternatively by receiving written information through workshops and lectures (14). However, the type of care provider that the women would have preferred receiving this information from was not specified (14).

A study of 50 women sheds more light on how information from different care providers is perceived, and found that women rely on doctors such as obstetricians for factual information, midwives for reassurance and support, and friends and family for their experience (16). Additionally, a study of 422 women from the Netherlands found that pregnant women reported midwives, who were their primary care providers, as one of the most referred-to and important sources of information, including nutrition information (17). Another study from the United States (US) that included focus groups of 69 pregnant women showed that although the majority of pregnant women tended to receive most of their nutrition-related advice from family and friends, they were more likely to adhere to specific, factual advice provided to them by their care provider (18). Overall, these findings demonstrate that care providers are often perceived as the most important

and credible sources of information, and pregnant women tended to pay greater attention to, and comply with, nutrition-related information provided by their care providers than with information provided by other sources, such as friends and relatives (16-23).

Research has shown that pregnant women who received effective nutrition guidance from their care providers were more likely to have made positive dietary changes (24). A study of 237 pregnant women showed that women who made beneficial dietary changes, such as choosing healthier foods and decreasing alcohol consumption, were more likely to have discussed their dietary behaviours with their care providers (24). The effectiveness of care providers' nutrition counselling is further demonstrated in a randomized control trial of 200 pregnant women that aimed to decrease excess gestational weight gain (25). Women who were in the intervention group received six individualized nutritional counselling sessions from a "nutrition counsellor" in addition to standard maternity care, while women in the control group received standard maternity care only. The nutrition counselling sessions focused on educating women on how to choose healthier food options like fruits and whole grains, limiting their intake of unhealthy foods and beverages such as sweets and sugary drinks, and eliminating unhealthy eating habits, such as skipping meals (25). Findings showed that women in the intervention group were significantly less likely to have gained excess gestational weight gain than women in the control group ($p < 0.001$), and that dietary counseling had significantly increased the nutritional knowledge and food-choice behaviours for women in the intervention group compared to those in the control group ($p < 0.001$) (25). Another study from the US found that women who received counselling on gestational weight gain from their care providers were more likely to have gained within the recommended weight ranges (26).

These studies provide convincing evidence of a positive effect of nutrition counseling on healthy behaviours of pregnant women.

However, pregnant women might not be receiving sufficient nutrition advice from their care providers during pregnancy (27), and although care providers recognized the importance of prenatal nutrition, women in developed countries, including Canada, reported that they received insufficient nutrition information during their pregnancy (15). Specifically, women perceived the dietary advice from their care providers to be unclear, confusing, and not individualized to meet their dietary needs (28). Pregnant women also reported having received little benefit from the limited nutrition information they received from their care providers, particularly on supplementation (29, 30), and that when multiple providers were involved in care, different providers offered conflicting information on pregnancy-related nutrition issues, which resulted in confusion among the women (21). Additionally, pregnant women who received care from midwives reported that nutrition information was discussed too late into the pregnancy (12 weeks), as the women were particularly interested in receiving nutrition information during the first trimester (11, 31), and that midwives rarely addressed their nutrition-related concerns or motivators to modifying their nutrition behaviours (31). A Canadian study of 88 women who had a midwife as their primary care provider showed that only 40% reported having received any counselling on the amount or range of weight gain they should aim for during their pregnancy (32). Furthermore, only 31% of participants reported that they were counselled on the risks of inadequate or excess weight gain, and over 78% of women reported to have used other sources of information for weight gain and nutrition during their pregnancy (32). In contrast, 95% of other maternity care providers reported

counselling women to gain a specific amount of weight, while 81% reported that they recommended weight gain values that align with the 2009 Institute of Medicine (IOM) and/or Health Canada guidelines (32, 33). Overall, maternity care providers can be key influencers of nutritional behaviour changes during pregnancy if they provide women with adequate, timely, and appropriate nutrition guidance; however, the provision of nutrition information to pregnant women in practice has been lacking.

1.3 Prenatal care in Canada

In Canada, there are three primary maternity care providers that are in an ideal position to provide nutrition counseling to pregnant women, and they include family physicians, obstetricians, and midwives. Family physicians and obstetricians provide care for pregnant women with low-risk pregnancies and deliver infants in hospitals; however, obstetricians are also the primary care providers for women with high-risk pregnancies (34). Midwives are care providers for low-risk pregnancies, but are not limited to only hospital births, as they can deliver babies in a client's home or at a birthing centre.

Midwives approach care by integrating modern obstetrical knowledge with traditional midwifery practices, such as promoting natural birth, and can be involved from the first trimester of pregnancy to childbirth, and to at least six weeks postpartum (35). Family physicians can provide care to women from the preconception stages to pregnancy, postpartum, and for as long as maternal and infant care is needed, even for issues that are not pregnancy-related (35). On the other hand, obstetricians primarily provide care during pregnancy and childbirth, with one follow-up appointment at six weeks postpartum (36). However, with the exception of those practicing in rural communities, fewer family physicians have been providing obstetrical care in Canada, and obstetricians have been

filling that gap (35). The most recent findings from the 2009 Canadian Maternity Experiences Survey (MES) showed that up to 58% of pregnant women have obstetricians and 34% have family physicians as their primary maternity care providers (37).

Nonetheless, there has been a shortage of maternity care providers in Canada, particularly within rural and remote communities (38). The specific challenges that maternity care providers identified when working in these communities included long distances to access referral centres and specialist services, as well as a sense of professional isolation and high frequency of on-call duties due to a lack of other care providers in the area (39, 40).

Despite their different approaches to maternity care, postpartum comparisons of birth outcomes between infants delivered by family physicians, obstetricians, and midwives in Canada yielded no significant differences in major outcomes, such as the prevalence of morbidity or mortality and preterm births (41, 42). Comparisons also showed that midwives provided the least number of obstetric interventions, while obstetricians provided the highest (41, 42). This may be because women who have a midwife as a primary maternity care provider are those who are considered to have low-risk pregnancies, while higher-risk pregnancies are reserved for obstetric care (43).

Additionally, further findings from the 2009 Canadian MES showed that pregnant women with midwives as their care providers were more likely to rate their pregnancy experience as “very positive” than women who received care from obstetricians, family practitioners, and nurses/nurse practitioners (44). The results also showed that women who had midwives as their primary care providers were more likely to receive care earlier than those whose providers were obstetricians (44). They were also most likely to have a

greater number of prenatal appointments than women who received care from any other primary provider (44). A Canadian study that compared pregnant women's experiences with receiving nutrition counseling for gestational weight gain from midwives, family physicians, and obstetricians, found that most pregnant women receiving midwifery care were slightly older, better educated, and of middle income, compared to women receiving care from other providers (32). Furthermore, women with midwives as their primary care provider typically had 30 to 45 minute appointments, which are longer than the 15-minute appointments with family physicians and the 10-minute appointments with obstetricians (32). This provided midwives with a greater opportunity to counsel and develop a rapport with the women, which was identified by pregnant women as an important aspect to overcoming discomfort in discussing nutrition and weight gain with their care providers (32, 45). Finally, the longer and more frequent appointments may be a contributor to why, of the three primary maternity care providers in Canada, midwives reported having provided the most counselling on nutrition (33, 46, 47). However, little is known about Canadian midwives' experiences with and approaches to nutrition for pregnant women.

1.4 Canadian midwives' competencies, training, and model of care

Midwives in Canada must achieve competences indicated in the Canadian Competencies for Midwives to become registered healthcare professionals, and these competencies include being able to assess nutritional intake and provide nutrition counselling, as well as being knowledgeable on the nutritional requirements during pre-conception, pregnancy, and postpartum (48). It is the responsibility of Colleges of Midwives to

ensure that the entry-level midwife had achieved these competencies prior to registration (49). Midwifery is currently regulated by a College of Midwives in 11 of the 13 provinces and territories in Canada, including Ontario, Alberta, British Columbia, Quebec, Manitoba, Saskatchewan, Nova Scotia, New Brunswick, Newfoundland and Labrador, Nunavut, and the Northwest Territories (49). The scope and model of practice in each province and territory primarily focus on the same principles. According to both national and provincial models, midwives are expected to work as autonomous providers in a community-based, primary care model, and to utilize an evidence-based practice approach to care (50). Midwives encourage natural birth and promote health and wellness in women and their infants and families in a more holistic approach than other providers, while being considerate of the social, cultural, and physical aspects of the woman's pregnancy experience (48, 51, 52). Midwives also encourage their clients to make informed decisions regarding their care (48, 51, 52). Another principle in the national and provincial models is continuity of care, where midwives in Canada provide care from early pregnancy to at least six weeks postpartum (48, 51, 52). They also provide women with the choice of place to give birth, such as out-of-hospital births (e.g., home births). Continuity of care and choice of birth place are regarded as two key tenets of midwifery care that differentiate them from other care providers (48, 51, 52).

Further requirements to becoming a regulated midwife in Canada include the completion of a Midwifery Education Program (MEP), after which the Canadian Midwives Registration Exam must be written in the Provincial University where they intend to become registered (50). The first MEP began in Ontario in 1993, and soon afterwards in Quebec, then in British Columbia (50). Programs in Manitoba and Alberta were

implemented more recently in 2006 and 2009, respectively, for a total of six national MEPs (50, 53). The most recent statistics provided by the Canadian Association of Midwives reported that, in 2019, there was a total of 1909 registered midwives, the majority of which practiced in Ontario (50.9%), followed by British Columbia (20.6%), and Quebec (12.0%) (54).

Since midwifery became a regulated profession in Ontario in 1994, and in most other provinces shortly after, there has been a rising trend in the number of women in Canada that are choosing a midwife as their primary care provider during pregnancy. Results from a 2000-2001 longitudinal survey showed that 3% of births in Canada were attended by a midwife (55). This number doubled to 6% in 2009 and rose to 10% in 2015 (37, 56). The most recent statistics from 2017 showed that 10.8% of births in Canada were attended by a midwife (57). This indicates that there has been a steady increase in midwife-assisted births in Canada, and the Association of Ontario Midwives estimates that another 40% of women would like to have a midwife during pregnancy but are unable to do so due to high demand (55). According to findings from the 2009 MES, the proportion of women who reported having a midwife as their primary maternity care provider was the highest in British Columbia (9.8%), followed by Manitoba (9.4%), Ontario (9.2%), Quebec (2.6%), then Alberta (2.5%) (37). Interestingly, the regions where midwives were most commonly reported to be primary maternity care providers were also the regions in which midwifery care is publicly funded (37). Overall, midwives in Canada are having an increasing amount of contact with pregnant women, and because pregnant women are actively seeking out nutrition information, midwives can play an important role in nutrition education during pregnancy.

However, nutrition training may not be a large part of midwives' education. The MEP curriculum in Canada, including practicum placements, did not have any components that were dedicated to nutrition (50). Similar trends in midwifery education are seen in other countries (58-61). A UK study of 77 registered midwives found that up to 86% of the midwives did not receive any nutrition training following qualification, and nearly three-quarters (74.3%) reported lacking the knowledge and skills to provide nutrition counseling to pregnant women (59). An Australian study of 329 midwives found that, although the majority reported having received nutrition training (79.3%), some reported that this training was limited and insufficient (60). Almost all (94.2%) of the midwives reported that they required additional training and education in nutrition for pregnancy (60). Similarly, a study of 370 New Zealand midwives found that only 37% of midwives reported to have received formal nutrition education (61). This is concurrent with another study from New Zealand, which found that less than 40% of midwives had ever received formal nutrition training (62). Specific nutrition topics that the midwives lacked training for included nutrition for vegetarian women (59, 61), women from ethnic or religious groups (59, 60), women with medical conditions (59, 61), gestational weight management (60), developing nutritional assessment skills (60), and managing reflux during pregnancy (61). A lack of essential knowledge and skills to provide adequate and reliable nutrition is contrary to the expectations of the women in their care (62).

Lack of relevant nutrition training and knowledge is one of the care providers' main barriers to providing nutrition education (63). In a study from the UK that included midwives and general practitioners (GPs), a lack of resources, time, and training were identified as barriers to providing prenatal nutrition information (64). Similarly, in

another study from Sweden, midwives reported that they struggled staying up to date with nutrition information due to insufficient time and that pregnant women needed help interpreting information from online sources (65). Findings from a systematic review on maternity care providers, including midwives, highlighted that care providers had a low level of engagement regarding pregnancy-related nutrition concerns (15). The review further emphasized that providers perceived time, cost, and lack of training as barriers to nutrition counselling and concluded that further education on nutrition in pregnancy may be beneficial to healthcare professionals, including midwives and GPs (15).

The health professionals that do receive extensive nutrition training and are regarded as experts in nutrition are registered dietitians (RDs). RDs are professionals who are trained and accredited to provide nutrition advice to the general population, including pregnant women, and pregnant women have reported that they would prefer to receive nutrition information from them (14). An Ontario study showed that primary maternity care providers preferred having access to RDs within their practices whom they could refer their pregnant patients or clients to, particularly when advising on nutrition for complex or medical issues (45). However, barriers to RD referrals in Ontario were identified by the physicians in the study, the main barrier being patients' financial limitations, as RDs are not always covered by insurance or the Ontario Health Insurance Plan (OHIP) and many women could not afford out-of-pocket RD services (45). Physicians also reported that referring patients to external RDs that are covered by OHIP, ones who do not work in their practice, was challenging, although the challenges themselves were not specified (45). As a result, physicians reported that they could not always refer pregnant women to

RDs, and that RD accessibility was limited (45). However, midwives' experiences with referring clients to RDs was not reported on in this study.

Overall, it is required within the Canadian Competencies for Midwives that they have adequate knowledge of nutrition for pregnancy, however, there is limited data on the nutrition training for midwives in Canada. Although RDs are the nutrition professionals who would be a helpful resource for pregnant women and maternity care providers alike, Canadian physicians have identified barriers to referring their pregnant patients to an RD. Gaps in literature exist regarding Canadian midwives' accessibility to and ability to refer to an RD.

1.5 Midwives' perspectives on and comfort with nutrition for pregnancy

In the early 1990s, Canada was one of only a few developed countries that did not yet have midwifery legislation, while midwifery care in New Zealand, Australia, and the UK had been established for nearly 100 years (66-69). Due to a comparatively shorter duration of midwifery regulation in Canada, more research is available on midwives' approach to nutrition during pregnancy in the UK, New Zealand, and Australia, while no findings are available for Canadian midwives' approach.

Generally, studies report that midwives perceive nutrition to be important for pregnancy (61, 70, 71) and that providing nutrition information to pregnant women was a midwifery role (61, 70). However, knowledge and confidence scores on nutrition topics were low. Specifically, two studies of 329 and 370 midwives, reported a lack of knowledge and confidence on topics of vegetarian or vegan diets (61, 70), diets of women with previous

or complex medical conditions (61, 70), and diets of women from ethnic or minority groups (70). Similar results were found in UK studies of 77 and 15 midwives, respectively, in which the midwives reported a lack of confidence in providing nutrition counselling for vegetarian diets (59, 72), diets for individuals from ethnic minorities (59), women with obesity (59, 72), listeriosis (59), and women with medical conditions (59), such as gestational diabetes (59). More studies from the UK suggest that midwives have low confidence in their knowledge of weight management with their pregnant clients (71), especially for obesity management efforts (73).

To increase their knowledge and confidence levels, midwives turn to different sources of nutrition information. A UK study of 46 midwives found that midwives mainly referred to non-credible sources for information on weight gain, particularly the media and/or personal experiences (73). In contrast, an Australian study of 329 midwives found that midwives mainly referred to other care providers such as RDs, the midwives' general knowledge, followed by their midwifery education (70). Given the variety of credible and non-credible sources of nutrition information available, it is important that midwives refer to credible and valid sources to ensure that effective nutrition information is provided to pregnant women (74). The sources of nutrition information that Canadian midwives refer to and their perceptions on the importance of nutrition during pregnancy have not been investigated.

1.6 Midwives' recommendations and alignment with prenatal nutrition guidelines

Prenatal clinical care guidelines that focus on pregnancy-related nutrition topics were developed for care providers in several countries, including Canada (43). However, data

suggest that midwives may not be adhering to these guidelines. A Canadian study of 174 maternity care providers, including obstetricians, family physicians, and midwives, found that midwives were more likely to recommend greater weight gain than the maximum guidelines compared to the other providers (33). A study from the UK showed that despite the current recommendations on folic acid made public by the National Health Service, most midwives lacked knowledge of when the ideal time would be for women to begin a folic acid supplement (75, 76). Furthermore, promoting iron supplementation during pregnancy is required within Swedish prenatal care guidelines, however, in a Swedish study of 134 midwives, 15% did not recommend iron supplementation to pregnant women (77). This is concurrent with data from other countries, which highlighted that, although nutrition recommendations were a component of midwives' clinical practice guidelines, this component was not always implemented in practice (58, 61, 78).

Health Canada has national nutrition guidelines for pregnancy that are accessible to all maternity care providers, including midwives (Appendix A). As previously noted, however, data from other countries have found that midwives may not be adhering to their respective country's guidelines (33, 75, 77, 78). Building on this background reviewed herein, it is evident that data on Canadian midwives' nutrition recommendations are lacking.

1.7 Summary

In summary, pregnant women show an increased interest in nutrition during pregnancy and believe that midwives are a trusted source of nutrition information. However, they also reported having received insufficient nutrition education from their maternity care

providers, including midwives. Healthy prenatal nutrition is crucial for short- and long-term birth outcomes, and credible nutrition guidance must be provided to pregnant women. Midwives in Canada reported having provided the most counselling on nutrition to pregnant women than any other maternity care provider. However, there is a paucity of data on Canadian midwives' approach to nutrition for pregnant women.

1.8 Study objectives

The overall objective of this study was to identify registered Canadian midwives' experiences with nutrition education and nutrition topics in practice. The study aimed to answer three specific research questions:

1. What are the perspectives of Canadian midwives on nutrition during pregnancy and their role in providing nutrition education to pregnant women?
2. How often do Canadian midwives provide nutrition advice to their pregnant clients and how comfortable are they in doing so?
3. What factors, such as levels of nutrition education, are associated with Canadian midwives' pregnancy-related nutrition recommendations?

Chapter 2

2 Methodology

2.1 Study design

This study was conducted using a cross-sectional design consisting of an original, anonymous, web-based questionnaire.

2.2 Participants

Our target population included all Canadian midwives (n=1909) who were registered and in good standing with their respective provincial/territorial midwifery associations (54). Respondents who were not registered midwives or in good standing with midwifery associations in Canada were not eligible to participate.

2.3 Sampling and recruitment

A convenience sample of eligible participants were recruited via four different strategies to maximize response rate: 1. advertisement in the e-newsletter of the Canadian Association of Midwives, 2. social media recruitment (Facebook and Twitter), 3. advertisement in the e-newsletter of provincial/territorial midwifery associations that agreed to distribute the survey, and 4. recruitment email to midwifery clinics' with publicly available e-mail addresses. Recruitment through the e-newsletters and social media occurred first and concurrently. In the e-newsletters, the recruitment message and survey link were distributed weekly for two months. For social media recruitment, one post was made on both Facebook and Twitter by the graduate student, principal investigator, and one of the co-investigators. The post could be shared among their followers to increase distribution of the recruitment message. Following these

recruitment efforts, a final recruitment call was made via e-mail which was sent to the publicly available e-mail addresses of midwifery clinics in Canada. The original e-mail was followed by two reminder e-mails sent at biweekly intervals. To help reach midwives across Canada, all correspondence related to the study, including the survey, were provided in English and French. In total, the survey remained open for five months, from June to November of 2019. Participants were provided with a chance to win one of five \$100 gift cards.

2.4 Survey development

The survey was developed using Qualtrics software (Qualtrics, Provo, UT, USA, <https://www.qualtrics.com>). The surveys of two studies, one from Australia (70) and one from New Zealand (61) that aimed to identify midwives' nutrition approach in practice were consulted to create the current survey. In particular, the survey questions on comfort and frequency of encountering nutrition topics, the importance of nutrition during pregnancy and a midwife's role in providing nutrition education to pregnant women, as well as some nutrition recommendation questions, were added and adapted to the current study based on Canadian pregnancy guidelines and current literature. The final survey was reviewed by the entire research team which included an RD who was consulted for the questions on pregnancy-related nutrition components in the survey. The survey was then pilot tested by obstetrician/gynaecologists (OB/GYN) (n=5) for clarity. Minor adjustments were made to the wording and order of some questions based on the feedback provided by the OB/GYNs prior to distributing the survey to the study population.

2.5 Survey structure

The survey consisted of four main sections and was estimated to take less than 10 minutes to complete (Appendix B – English version and C – French version).

Section 1: Demographic characteristics and education

This section of the survey aimed to gather demographic data on the respondents.

Questions on their age, years of experience in midwifery practice in Canada, as well as the location (geographical setting and province/territory) in which they practiced were included. Further questions covered whether midwives had received nutrition education and training during their MEP and/or after midwifery registration, as well as the extent to which specific topics were covered in this training. The survey also asked midwives to indicate the sources of information that the midwives refer to most often to enhance their own nutrition knowledge.

Section 2: Midwives' opinions on and experiences with nutrition in practice

In this section, midwives rated on a five-point scale, where 1 = very unimportant and 5 = very important, how important they believe healthy nutrition during pregnancy is and the importance of their role in providing their pregnant clients with nutrition information. Respondents also identified whether they have provided their clients with nutrition information, and if so, on what occasions (e.g., first antenatal visit, in case of medical condition) and in what format (e.g., verbally, via pamphlet). Additionally, they were asked if they have access to RD services, whether they have made referrals to RDs, and to identify the main barriers to referrals.

Respondents were also asked to rate on a five-point scale, where 1 = very uncomfortable and 5 = very comfortable, how comfortable they are in providing information on specific nutrition topics. As well, on a four-point scale (never encounter, rarely encounter, sometimes encounter, frequently encounter), participants were asked to rate how frequently they encounter specific nutrition-related topics in practice. Topics included in the survey were those that Health Canada regard as key pregnancy-related nutrition information (79-83) as well as those identified by non-Canadian literature that midwives did not feel confident in providing nutrition advice on (59, 61, 70). In total, these topics included: healthy eating, vegetarian diets, vegan diets, the ketogenic diet, Listeria, anemia, heartburn, safe food handling, nutrition for breastfeeding, nutrition for women with gestational diabetes, recommended weight gain during pregnancy, herbal supplements, and diets of women from different ethnic or minority groups. Finally, the survey asked whether midwives have referred their clients to other health-care professionals for the aforementioned nutrition issues.

Section 3: Pregnancy-related nutrition recommendations

A total of seven questions were included to learn about midwives' general pregnancy-related nutrition recommendations. The topics included nutrients that midwives would be concerned about if a client followed a vegan diet, foods that midwives recommend avoiding due to a higher risk of Listeria, and midwives' recommendations for managing constipation and nausea during pregnancy. Further questions were asked to identify the body mass index (BMI) range that midwives consider to be overweight, their recommended gestational weight gain range for a pregnant woman with pre-pregnancy obesity, their recommendations on when women should begin taking a folic acid

supplement, and their perceptions on the safety of herbal supplements during pregnancy. Each question had at least one response that aligned with relevant literature and/or current Health Canada guidelines.

Section 4: Nutrition resources

The final section of the survey consisted of one open-ended question about what nutrition-related topics, if any, the participants would like more information on and/or have resources available for.

2.6 Data analysis

Data were analyzed using IBM SPSS Statistics version 26 (Armonk, New York).

Descriptive statistics were used to summarise categorical data using frequencies or medians. Normally distributed continuous variables were summarized with the mean and standard deviation, whereas skewed continuous data were summarized using the median. A chi-square test was used to test the association between categorical variables. An independent-samples t-test compared the means between two groups. Fisher's Exact Test was used for categorical variables with an expected cell frequency of <5 , Spearman rank correlation coefficient was used for continuous variables, and Mann-Whitney U-Test was used for ordinal outcome variables. For the Spearman rank correlation coefficient, $\rho \pm 0.10$ was considered a weak correlation, $\rho \pm 0.30$ was considered moderate, and $\rho \pm 0.50$ was considered strong (84). A p-value of <0.05 was considered statistically significant.

For the survey question on setting of midwifery practice, the remote and rural categories each had a low number of responses. As a remote community can fall into Statistics Canada's definition of a rural community, which is a population that lives in regions

outside the commuting zone of urban centres with populations of at least 10,000, remote and rural categories were collapsed into one “remote/rural” category (85). In the survey section on nutrition recommendations, each survey response which aligned with the guidelines was given a score of 1, and a score of 0 for those that did not align. The final score out of 19 for each midwife was as a sum of all answers and an overall average out of 19 recommendations that aligned with the guidelines was calculated. Any participant that did not answer one or more questions was excluded from this analysis. A total of 45 participants did not answer one or more questions.

For a sensitivity analysis, the data were also analyzed by including all participants’ scores who responded to 10 or more of the 19 recommendation related questions. Out of 161 respondents, only 1 respondent answered less than 10 questions and was excluded from this sub-analysis. Overall, there was no difference in statistical interpretations for any of the results between the sub-analysis and the original, above analysis. Therefore, the data from the original analysis are reported throughout the thesis.

Furthermore, open-ended textboxes were added to some questions to provide midwives with a space to include more information or expand on their responses. The data collected from these textboxes and from the final open-ended question were analyzed using content analysis. The analytical procedure was completed independently by two researchers (graduate student and principal investigator) to ensure consistency. The researchers independently coded the answers until recurrent themes emerged. When applicable, similar themes were grouped together into major themes. The findings were then discussed between the researchers to obtain consensus on any differences and to find agreement between themes.

2.7 Ethics approval

This study was approved by the Western University Health Sciences Research Ethics Board (REB) at Western University, REB #112013 (Appendix D). All participants provided their consent to participate by submitting the survey (Appendix E).

Chapter 3

3 Results

3.1 Demographic characteristics and education

A total of 161 Canadian midwives completed the survey resulting in an 8.4% response rate [Table 1]. Respondents' ages ranged from 22 to 69 years and most had two to five years of experience in midwifery (26.1%). Midwives practicing in Ontario represented over half of the respondents (54.5%), followed by those practicing in British Columbia (25.6%), then Alberta (13.1%). There were no responses from midwives practicing in provinces and territories not mentioned in Table 1, including New Brunswick, Newfoundland and Labrador, the Northwest Territories, Prince Edward Island, Quebec, and Yukon. Finally, the majority of midwives worked in an urban setting (49.4%), while 25.6% and 25.1% worked in suburban and rural or remote settings, respectively.

Most respondents (78.3%) had completed their midwifery education in Canada [Table 2]. Overall, 63.7% of participants had received nutrition training. Over half of the respondents (58.1%) had received nutrition training during their MEP, mostly when nutrition training was integrated into one or more of their courses (93.3%) and during their practicum placement (73.4%). A lower proportion (17.4%) of respondents reported having received nutrition training after their MEP, which occurred mostly through workshops (68.0%) and online courses (56.5%). A minority of midwives (11.8%) reported having received nutrition training both during and after their MEP. Midwives (n=8) also reported having engaged in nutrition training following their MEP primarily through self-directed learning [Table 2].

Among those who received nutrition training after their MEP (n=28), their training mainly focused on the topics of healthy eating (82.1%), weight gain (67.9%), and anemia (64.3%) [Table 3]. Additionally, those who completed their midwifery education in Canada were more likely to have received nutrition training than those who did not (p=0.03) [Figure 1].

Table 1: Respondents' descriptive characteristics (N=161).

	n	Mean ± SD
Age in years	160	40.3 ± 9.9
Years of experience in midwifery	n/total n	Percentage
Less than 2	30/161	18.6%
2-5	42/161	26.1%
6-10	36/161	22.4%
11-20	36/161	22.4%
More than 20	17/161	10.5%
Province / Territory of practice	n/total n	Percentage
Alberta	21/160	13.1%
British Columbia	41/160	25.6%
Manitoba	5/160	3.1%
Nova Scotia	1/160	0.6%
Nunavut	3/160	1.9%
Ontario	87/160	54.4%
Saskatchewan	2/160	1.3%
Setting of practice	n/total n	Percentage
Urban	79/160	49.4%
Suburban	41/160	25.6%
Rural / Remote	40/160	25.1%

Note: SD = standard deviation; total n = total number of recorded responses for each question

Table 2: Characteristics of midwives' nutrition education during and after their Midwifery Education Program (N=161).

Country of MEP completion	n/total n	Percentage
Canada	126/161	78.3%
Outside Canada	35/161	21.7%
Nutrition education	n/total n	Percentage
Have never received nutrition	58/160	36.3%
Have received nutrition training	102/160	63.7%
Received during MEP	93/160	58.1%
Received after MEP	28/161	17.4%
Received both during and after MEP	19/161	11.8%
Delivery mode of nutrition education		
<i>During MEP</i>	n/total n	Percentage
As a required nutrition course	29/79	36.7%
As an elective nutrition course	9/71	12.7%
Nutrition information was integrated into one or more courses	83/89	93.3%
During practicum placement	58/79	73.4%
<i>After MEP</i>	n/total n	Percentage
In clinic/hospital	6/22	27.3%
Online courses	13/23	56.5%
Workshops	17/25	68.0%
Other ^a	8/16	50.0%

Note: MEP = Midwifery Education Program; total n = total number of recorded responses per question

^a Other responses included self-directed learning

Table 3: Nutrition topics that midwives received training for after their Midwifery Education Program (n=28).

Topic	n/total n	None n (%)	Touched on a little n (%)	Discussed in detail n (%)	I do not recall n (%)
Ketogenic diet	26/28	14 (53.8%)	7 (26.9%)	4 (15.4%)	1 (3.8%)
Herbal supplements	28/28	8 (28.6%)	12 (42.9%)	8 (28.6%)	0
Nutrition for women of different ethnic origins	28/28	17 (60.7%)	5 (17.9%)	2 (7.1%)	4 (14.3%)
Nutrition for gestational diabetes	28/28	2 (7.1%)	11 (39.3%)	14 (50.0%)	1 (3.6%)
Vegan diet	27/28	8 (29.6%)	11 (40.7%)	6 (22.2%)	2 (7.4%)
Vegetarian diet	27/28	7 (25.9%)	12 (44.4%)	8 (29.6%)	0
Safe food- handling	26/28	8 (30.8%)	8 (30.8%)	10 (38.5%)	0
Weight gain	28/28	1 (3.6%)	8 (28.6%)	19 (67.9%)	0
Healthy eating	28/28	1 (3.6%)	4 (14.3%)	23 (82.1%)	0
Nutrition for breastfeeding	28/28	4 (14.3%)	9 (32.1%)	15 (53.6%)	0
Heartburn	28/28	7 (25.0%)	10 (35.7%)	11 (39.3%)	0
Anemia	28/28	4 (14.3%)	6 (21.4%)	18 (64.3%)	0
Listeria	26/28	9 (34.6%)	10 (38.5%)	7 (26.9%)	0

Note: bolded numbers represent the most selected response for each topic; total n = total number of recorded responses per question

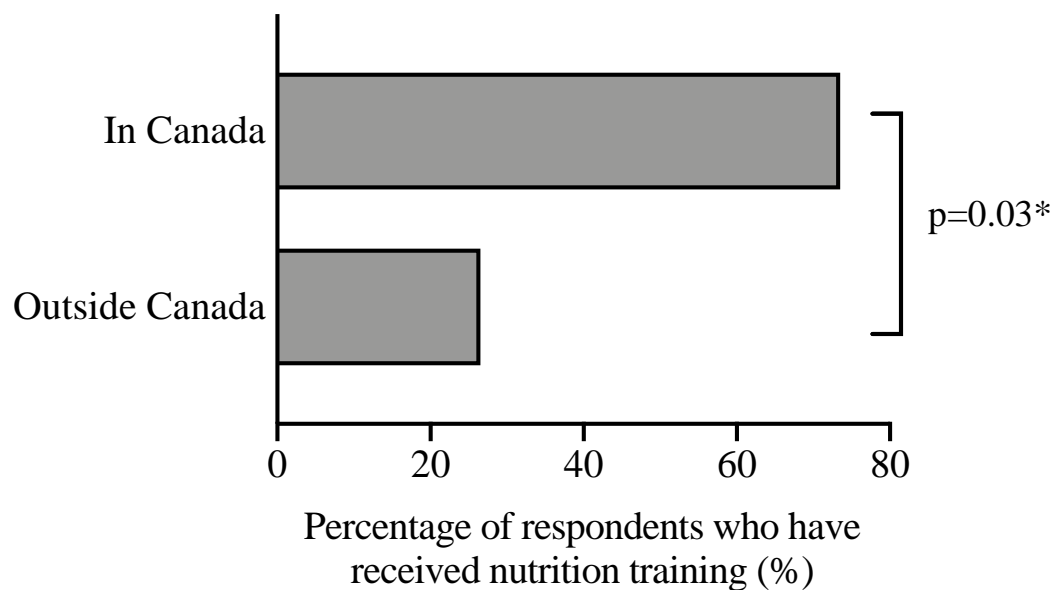


Figure 1: The distribution of midwives that received nutrition training based on the location, in Canada or outside of Canada, where they completed their MEP. Differences were assessed using a chi square test. N=161

***Indicates significance at $p < 0.05$**

The sources of information that midwives most frequently referred to for enhancing their nutrition knowledge were clinical practice guidelines (84.5% selected sometimes or frequently), other health professionals (73.7%), and government or official websites (71.5%) [Table 4]. The least referred-to sources were social media (22.7%) and media such as television, newspapers, and magazines (20.0%) [Table 4]. Other sources that midwives referred to included blogs or websites and books that are not necessarily textbooks.

Table 4: Frequency of reference to specific sources for nutrition information (N=161).

Source of information	n/total n	Never n (%)	Rarely n (%)	Sometimes n (%)	Frequently n (%)
Other health professionals	160/161	11 (6.9%)	31 (19.4%)	97 (60.6%)	21 (13.1%)
Government or official websites	161/161	12 (7.5%)	34 (21.1%)	84 (52.2%)	31 (19.3%)
Research articles	161/161	9 (5.6%)	40 (24.8%)	84 (52.2%)	28 (17.4%)
Textbooks	160/161	34 (21.3%)	60 (37.5%)	60 (37.5%)	6 (3.8%)
Social media	159/161	61 (38.4%)	62 (39.0%)	33 (20.8%)	3 (1.9%)
Media (TV, newspapers, magazines.)	160/161	63 (39.4%)	65 (40.6%)	28 (17.5%)	4 (2.5%)
Clinical practice guidelines	161/161	7 (4.3%)	18 (11.2%)	88 (54.7%)	48 (29.8%)
Other ^a	57/161	33 (57.9%)	5 (8.8%)	15 (26.3%)	4 (7.0%)

Note: bolded numbers represent the most selected response for each source; total n = total number of recorded responses per question

^a Other responses included books that are not necessarily textbooks and online resources like blogs and websites

3.2 Midwives' opinions on and experiences with nutrition

On a five-point Likert scale (where 1 = very unimportant and 5 = very important), most respondents highly rated (selected 4 or 5) the importance of healthy nutrition during pregnancy (92.5%) and the importance of a midwife's role in providing nutrition education to pregnant women (83.3%) [Figure 2]. Additionally, almost all respondents had provided nutrition information to pregnant women (99.4%), which tended to take place at the first antenatal visit (96.2%), in case of a medical condition (96.8%), and at the woman's request (100%), while a minority provided advice at every antenatal visit (19.0%) [Table 5]. This advice was most commonly provided verbally (99.4%), by directing clients to websites (73.2%), and through pamphlets or booklets (61.0%). Other methods that midwives (n=36) utilized to provide nutrition advice include directing clients to other health care providers and through books and handouts. Additionally, there was no correlation between the years of experience in midwifery and the method in which nutrition advice was provided ($p>0.05$) [Table 6].

Nutrition topics that midwives encountered most frequently in practice included nutrition for heartburn (86.3%), anemia (84.4%), weight gain (75.8%), and healthy eating in general (75.6%) [Table 7]. Similarly, on a 5-point Likert scale, where 1=very uncomfortable and 5=very comfortable, midwives scored a median of 4 on their comfort level when providing information on anemia, healthy eating, heartburn, and nutrition for breastfeeding, and a median of 3 on topics pertaining to vegan diets, herbal supplements, and nutrition for women of different ethnic origins. Comfort levels for advising on ketogenic diets were the lowest (median=2). Interestingly, the level of frequency in which midwives encountered nutrition topics in practice was significantly correlated with their

comfort levels in advising on all topics ($p < 0.05$), except for anemia where the relationship was not significant. The strength of correlation was considered moderate for herbal supplements ($r = 0.47$), the ketogenic diet ($r = 0.46$), nutrition for women of different ethnic origins ($r = 0.43$), *Listeria* ($r = 0.40$), safe-food handling ($r = 0.34$) and the vegetarian diet ($r = 0.34$), while the strength of relationship was low for all other topics [Table 7].

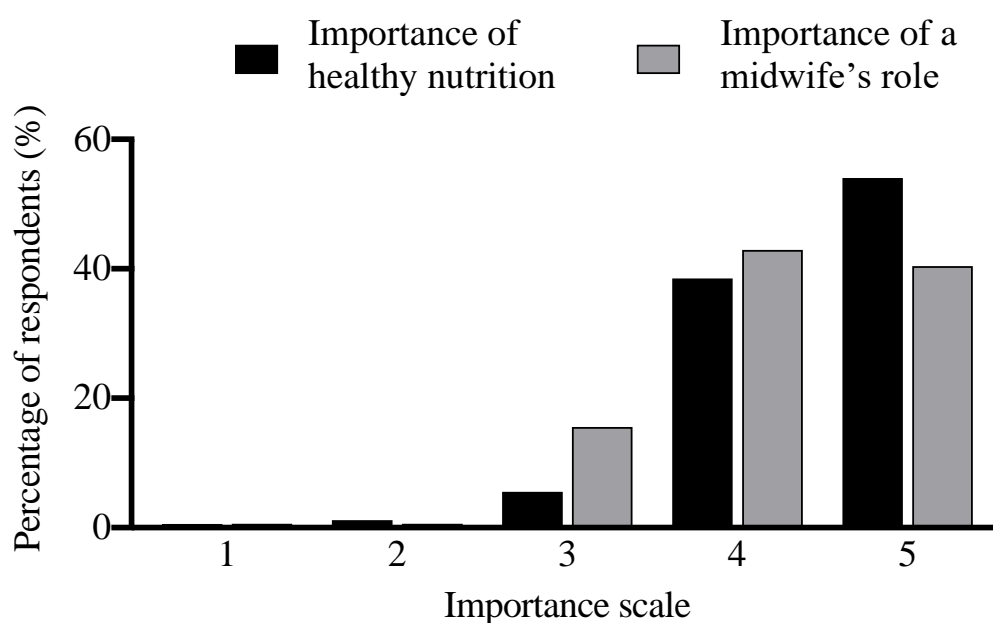


Figure 2: Midwives' ratings of the importance of healthy nutrition during pregnancy (black) and the importance of their role in providing nutrition information to pregnant women (grey), on a five-point Likert scale where 1 = very unimportant and 5 = very important. N=161

Table 5: Provision of nutrition advice to pregnant women by midwives (N=161).

Have you ever provided nutrition information to pregnant women?	n/total n	Percentage
Yes	160/161	99.4%
No	1/161	0.6%
Please identify the occasions when you provided nutrition information:	n/total n	Percentage
First antenatal visit	152/158	96.2%
Every antenatal visit	26/137	19.0%
In case of a medical condition	153/158	96.8%
At the woman's request	159/159	100%
Please indicate whether you have provided nutrition advice in any of the following ways:	n/total n	Percentage
Pamphlet / Booklet	94/154	61.0%
Verbally	159/160	99.4%
Directed to website	112/153	73.2%
Directed to mobile applications	25/136	18.4%
Other ^a	36/95	37.8%

Note: total n = total number of recorded responses per question

^a Other responses included directing clients to other health care providers or through books and handouts

Table 6: Association between years of experience in practicing midwifery and how nutrition information was provided to clients.

How nutrition information was provided to clients	Years of experience in practicing midwifery					p-value
	Less than 2	2-5	6-10	11-20	More than 20	
	n/total n (%)	n/total n (%)	n/total n (%)	n/total n (%)	n/total n (%)	
Pamphlet / Booklet	18/94 (19.1%)	24/94 (25.5%)	23/94 (24.5%)	21/94 (22.3%)	8/94 (8.5%)	0.92 ^b
Verbally	29/159 (18.2%)	42/159 (26.4%)	36/159 (22.6%)	36/159 (22.6%)	16/159 (10.1%)	0.28 ^c
Directed to website	23/112 (20.5%)	30/112 (26.8%)	24/112 (21.4%)	25/112 (22.3%)	10/112 (8.9%)	0.90 ^c
Directed to mobile applications	2/25 (8.0%)	12/25 (48.0%)	3/25 (12.0%)	5/25 (20.0%)	3/25 (12.0%)	0.14 ^c
Other ^a	8/33 (24.2%)	11/33 (33.4%)	5/33 (15.2%)	7/33 (21.2%)	2/33 (6.1%)	0.42 ^c

Note: total n = total number of recorded responses per question; ^a Other responses included directing clients to other health care providers or through books and handouts; ^b Chi Square test; ^c Fisher's Exact Test

Table 7: Correlation between frequency of encounter and comfort level on advising clients about specific nutrition topics**(N=161).**

Topic	Comfort ^a	Frequency ^b	Spearman's ρ	p-value ^e
	Median	Median (%)		
Ketogenic diet	2	Rarely (50.0%)	0.46 ^c	0.001*
Herbal supplements	3	Sometimes (41.6%)	0.47 ^c	0.001*
Nutrition for women of different ethnic origins	3	Rarely (42.2%)	0.43 ^c	0.001*
Nutrition for gestational diabetes	3	Sometimes (57.1%)	0.32 ^c	0.001*
Vegan diet	3	Rarely (52.8%)	0.23 ^d	0.004*
Vegetarian diet	3.5	Sometimes (55.6%)	0.34 ^c	<0.001*
Safe food-handling	4	Sometimes (36.6%)	0.34 ^c	0.001*
Weight gain	4	Frequently (75.8%)	0.18 ^d	0.02*
Healthy eating	4	Frequently (75.6%)	0.26 ^d	0.001*
Weight gain for women with obesity	4	Sometimes (58.4%)	0.25 ^d	0.001*
Nutrition for breastfeeding	4	Frequently (53.4%)	0.17 ^d	0.03*
Heartburn	4	Frequently (86.3%)	0.17 ^d	0.03*
Anemia	4	Frequently (84.4%)	0.08	0.31
Listeria	4	Rarely (46.0%)	0.40 ^c	0.001*

^a Five-point Likert scale: 1 = very uncomfortable and 5 = very comfortable; ^b Four-point Likert scale: never, rarely, sometimes, frequently; ^c Indicates a moderate correlation at $\rho \pm 0.30$; ^d Indicates a weak correlation at $\rho \pm 0.10$; ^e Spearman's rank correlation; *Indicates significance at $p < 0.05$

Nearly three-quarters (73.9%) of respondents had access to an RD, and 64.0% reported that they had made referrals to RDs [Table 8]. While the majority of respondents had access to and utilized dietitian services, respondents also identified barriers to referring clients to dietitians, with the most commonly reported barrier being that clients could not afford an RD (56.2%). A smaller proportion also reported clients not being interested in receiving nutrition information (43.4%) and midwives not having access to an RD (29.5%) as barriers.

Midwives (n=56) provided additional barriers to dietitian referrals, from which three major themes were identified [Table 9]. The first theme was RD accessibility, such as lack of availability, long wait lists, appointments only being available during clients' work hours, and that referrals are only possible or reserved for specific medical conditions, like gestational diabetes. The second theme was clients' interest, where midwives perceived clients as not interested in being referred to an RD. The third theme was midwives' perspectives on referrals, as some midwives reported not having perceived any of their clients to be in need of a referral; not knowing how to work the system to make referrals; as well as having concerns about dietitians' advice and model of care not aligning with their own model or advice.

There was no difference in access to RDs based on geographical setting of practice ($p=0.35$) [Figure 3]. Furthermore, most midwives reported making client referrals to other health care providers for topics concerning nutrition for gestational diabetes (92.5%) and anemia (64.6%) [Table 10]. Midwives also reported making referrals for topics concerning herbal supplements (36.6%), weight gain (37.9%), weight gain for

obesity (45.3%), and healthy eating (47.2%). Topics for which referrals were reported the least included ketogenic (2.5%), vegan (11.3%), and vegetarian diets (8.1%), safe food handling (1.9%), and Listeria (8.1%). Midwives' comfort in advising on the 14 topics was not correlated with the percentage of midwives which referred clients to other healthcare providers for all topics ($p>0.05$), except for herbal supplements ($p=0.03$) [Table 10].

Table 8: Midwives' access, referrals, and barriers when referring clients to registered dietitians (N=161).

Do you have access to RD services?	n/total n	Percentage
Yes	119/161	73.9%
No	42/161	26.1%
Have you made referrals to an RD?	n/total n	Percentage
Yes	103/161	64.0%
No	58/161	36.0%
What are the main barriers for making referrals to an RD?	n/total n	Percentage
I do not have access to an RD	38/129	29.5%
My clients can't afford an RD	77/137	56.2%
Clients are not interested in receiving nutritional information	59/136	43.4%
Other	37/81	45.7%

Note: RD = registered dietitian; total n = total number of recorded responses per question

Table 9: Additional barriers to making client referrals to a registered dietitian^a.

Major themes	Sub-themes	Examples of responses
Registered dietitians' accessibility	- Lack of RD availability	<i>"[Dietitian] services are not always available"</i>
	- Long wait lists to see an RD	<i>"Long wait to see [a dietitian]"</i>
	- Appointments are only available during clients' work hours	<i>"[Appointments are] only available during work hours"</i>
	- Referrals are reserved for pregnant women with medical conditions	<i>"The [dietitians] I have access to are only for clients with diabetes..."</i>
Clients' interest	- Clients are not interested in being referred	<i>"We have access in our community to a registered [dietitian] for free, but clients often decline the referral or feel they cannot afford nutritious food"</i> <i>"Available online/by phone, but not much client interest"</i>
	- Not knowing how to make referrals	<i>"Not knowing the referral process"</i>
Midwives' knowledge of the referral process and perspectives on dietitians' advice	- Do not believe clients need dietitian referrals	<i>"[Don't] feel it is necessary for most clients and don't trust alignment with midwifery model of care"</i>
	- Uncertain of whether dietitians' advice and model of care align with midwives' own model and advice	<i>"I don't always agree with their advice in my community"</i>

Note: RD = registered dietitian; ^a Data were extracted from the responses in the "other" category to the question: "What are the main barriers for making referrals to an RD?"

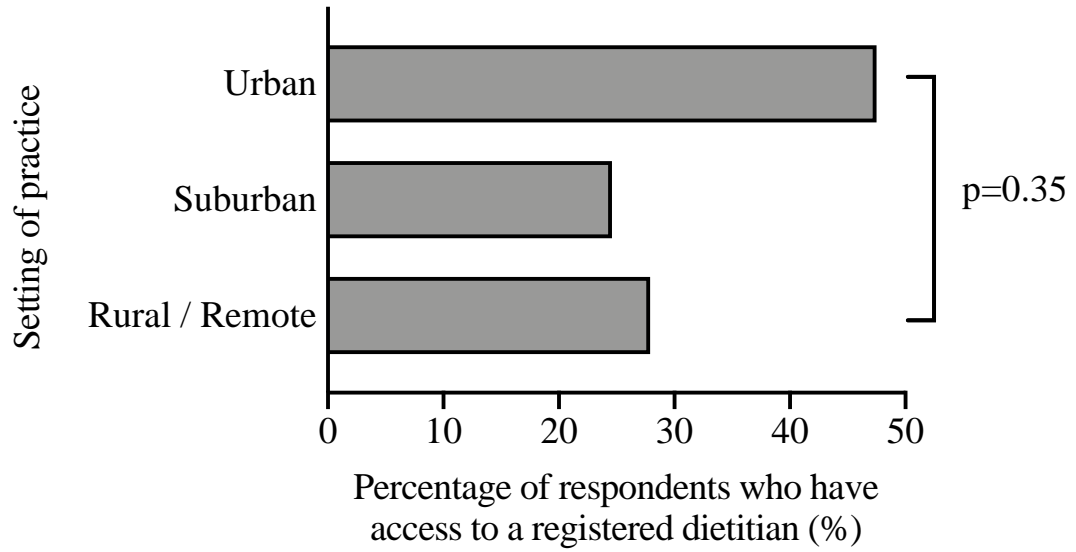


Figure 3: Percentage of respondents who had access to a registered dietitian based on their setting of practice. A chi-square test was used to compare the differences in access between settings. N=161

Table 10: Correlation between midwives' comfort levels in advising on nutrition topics and the percentage of midwives who have referred clients to other healthcare providers for each topic.

Topic	Comfort ^a	Percentage of midwives who have referred on specific topics	p-value ^b
	Median	Percentage	
Ketogenic diet	2	2.5%	0.38
Herbal supplements	3	36.6%	0.03*
Nutrition for women of different ethnic origins	3	6.2%	0.69
Nutrition for gestational diabetes	3	92.5%	0.66
Vegan diet	3	11.3%	0.72
Vegetarian diet	3.5	8.1%	0.49
Safe food-handling	4	1.9%	0.55
Weight gain	4	37.9%	0.48
Healthy eating	4	47.2%	0.70
Weight gain for women with obesity	4	45.3%	0.58
Nutrition for breastfeeding	4	14.3%	0.67
Heartburn	4	21.7%	0.20
Anemia	4	64.6%	0.21
Listeria	4	8.1%	0.71

^a Five-point Likert scale: 1 = very uncomfortable and 5 = very comfortable;

^b Mann-Whitney U Test; * Indicates significance at $p < 0.05$

3.3 Midwives' nutrition recommendations

The two most commonly reported nutrients that midwives would be concerned about if a client followed a vegan diet were omega-3-fatty-acids (83.8%) and vitamin D (65.0%), while fewer were concerned about zinc (35.1%) and vitamin A (29.3%) [Table 11]. To decrease the risk of Listeria, midwives recommended avoiding deli meats (88.7%), soft cheeses (80.5%), and raw fish sushi (74.7%), whereas a minority recommended avoiding hard cheeses (6.1%). For managing constipation during pregnancy, respondents recommended consuming fruits and vegetables (100%) and water or juice (98.1%), while only one respondent recommended dairy foods (0.7%) and meats (0.7%). As for managing symptoms of nausea, eating small frequent meals was recommended by all participants (100%), followed by avoiding having an empty stomach (98.1%). Most midwives identified a BMI range of 25.0 - 29.9 kg/m² as “overweight” (59.7%) and recommended beginning a folic acid supplement at least three months prior to pregnancy (88.2%). Furthermore, a majority (64.6%) did not perceive herbal supplements to be safe during pregnancy.

Table 11: Summary of responses to specific nutrition recommendation questions.

Which of the following nutrients are you concerned about specifically if your client follows a vegan diet?	n/total n	Percentage
Zinc	47/134	35.1%
Vitamin A	39/133	29.3%
Omega-3-fatty-acids ^a	124/148	83.8%
Vitamin D ^a	91/140	65.0%
Which of the following foods have you recommended your clients avoid during pregnancy due to risk of Listeria?	n/total n	Percentage
Soft cheeses ^b	128/159	80.5%
Hard cheeses	8/132	6.1%
Deli meats ^b	141/159	88.7%
Raw fish sushi ^b	118/158	74.7%
Which of the following foods have you recommended for managing constipation during pregnancy?	n/total n	Percentage
Water / Juice ^c	157/160	98.1%
Dairy foods	1/142	0.7%
Fruits and vegetables ^c	161/161	100%
Meats	1/141	0.7%
Which of the following would you advise your clients in trying to minimize the effect of nausea during pregnancy?	n/total n	Percentage
Drink plenty of fluids with meals	19/153	12.4%
Avoid having an empty stomach ^d	158/161	98.1%
Eat large quantities of food at meal times	2/155	1.3%
Eat small frequent meals ^d	161/161	100%
Which of the following pre-pregnancy BMI ranges would you consider as overweight?	n/total n	Percentage
18.5 – 24.9 kg/m ²	1/159	0.6%
25.0 – 29.9 kg/m ² ^e	95/159	59.7%
30.0 – 34.9 kg/m ²	59/159	37.1%
I do not know	4/159	2.5%

What is your ideal recommendation to women on when they should begin taking a folic acid supplement?	n/total n	Percentage
At least 3 months before pregnancy ^f	142/161	88.2%
At least 1 month before pregnancy	16/161	9.9%
After confirming one is pregnant	3/161	1.9%
In general, would you advise your clients that herbal supplements are safe for pregnancy?	n/total n	Percentage
Yes	57/161	35.4%
No ^g	104/161	64.6%

Note: BMI = Body Mass Index; each listed recommendation requested a “yes” or “no” response; total n = total number of recorded responses per question

^a Nutrients of concern in vegan diets, per current literature (86)

^b Foods to avoid for Listeria risk, per Health Canada guidelines (87)

^c Foods for managing constipation during pregnancy, per Health Canada guidelines (79)

^d Minimizing nausea during pregnancy, per Health Canada guidelines (81)

^e Pre-pregnancy BMI range considered “overweight”, per IOM guidelines (4)

^f Recommended time to begin folic acid supplement, per Health Canada guidelines (79)

^g Recommendation on herbal supplements during pregnancy, per Best Start Resource Centre guidelines (88)

3.4 Effect of nutrition training on midwives' nutrition experiences

There was no statistically significant difference in the setting of midwifery practice between midwives who received nutrition education and those who never received nutrition education ($p=0.67$) [Table 12]. Midwives who received nutrition training rated the importance of nutrition for pregnancy higher (median 5) than the midwives who did not receive nutrition training (median 4) ($p=0.001$). Similar significant differences ($p=0.008$) were seen in midwives' outlook on their role in providing nutrition education as those who were trained (mean=4.31) rated it higher than those who were not trained (mean=4.03). Comfort levels on advising about specific nutrition topics were not influenced by midwives' nutrition education. However, nutrition training was significantly correlated with whether midwives had referred their clients to RDs ($p=0.001$), where midwives with nutrition training referred more (73.5%) compared to those without training (46.6%). Lastly, nutrition training did not affect how well the midwives' recommendations aligned with guidelines and/or relevant literature. Out of 19 possible recommendations, an average of 16.4 (SD=1.6) recommendations from trained midwives aligned with guidelines, compared to 15.9 (SD=1.9) recommendations by midwives without any reported nutrition education ($p=0.13$). Furthermore, there was no significant difference in recommendations that aligned with guidelines and/or literature between midwives who completed their MEP in Canada (16.2 ± 1.7) and those who completed their MEP outside of Canada (16.0 ± 1.6 ; $p=0.71$) [Table 12].

Table 12: Differences in midwives' characteristics based on their formal training (N=161).

	Nutrition education		p-value
	Have received ^a	Never received ^b	
Referral to an RD^c, n/total n (%):			
Midwives that have referred clients to an RD	75/102 (73.5%)	27/58 (46.6%)	0.001*
Importance of^{d,e} :			
Healthy nutrition for pregnancy	5	4	0.001*
A midwife's role in providing nutrition information	4	4	0.008*
Setting of practice^c, n/total n (%):			
Urban	51/102 (50.0%)	27/57 (47.4%)	0.67
Suburban	24/102 (23.5%)	17/57 (29.8%)	
Rural / Remote	27/102 (26.5%)	13/57 (22.8%)	
Comfort with topics^{d,f} :			
Ketogenic diet	2	2	0.14
Herbal supplements	3	2	0.05
Nutrition for women of different ethnic origins	3	2.5	0.74
Nutrition for gestational diabetes	4	3	0.22
Vegan diet	3	3	0.42
Vegetarian diet	3.5	4	0.37
Safe food-handling	4	4	0.96
Weight gain	4	4	0.57
Healthy eating	4	4	0.36
Weight gain for women with obesity	4	4	0.53
Nutrition for breastfeeding	4	4	0.49
Heartburn	4	4	0.41
Anemia	4	4	0.14
Listeria	4	3	0.63
Recommendations^{g,h} (mean ± SD):			
Recommendations that align with guidelines and/or literature	16.4 ± 1.6	15.9 ± 1.9	0.13
	MEP in Canadaⁱ	MEP outside Canada^j	p-value
Recommendations that align with guidelines and/or literature	16.2 ± 1.7	16.0 ± 1.6	0.71

Note: RD = registered dietitian, SD = standard deviation; MEP = midwifery education program; total n = total number of recorded responses per question; ^a n = 102; ^b n = 58; ^c Chi-

square test; ^d Mann-Whitney U-Test; ^e Median response on a five-point Likert scale, where 1 = very unimportant and 5 = very important; ^f Median response on a five-point Likert scale, where 1 = very uncomfortable and 5 = very comfortable; ^g Independent-samples t-test; ^h Mean score out of a total of 19 possible responses; ⁱ n = 94; ^j n = 23 * Indicates significance at p<0.05

3.5 Nutrition topics for which midwives would like more resources available

A total of 118 midwives answered the question on what topics they wish to have more information on, and they are described by five major themes [Table 13]. One theme was diets, particularly vegan and vegetarian diets, low carbohydrate, and ketogenic diets, as well as cultural or religious ethnic diets. Another major theme was supplements, including vitamin, mineral, and herbal supplements. Midwives were also interested in additional resources on nutrition for medical conditions, particularly for diabetes and anemia. The fourth theme was food safety, with a focus on the topics of Listeriosis and safe food handling. The final major theme was general pregnancy-related nutrition information.

Table 13: Nutrition topics that midwives would like enhanced resources for and/or more information on.

Major themes	Sub-themes	Examples of responses
Diets	<ul style="list-style-type: none"> - Vegan and vegetarian diets - Cultural, ethnic, and religious diets - Low carbohydrate and ketogenic diets 	<p><i>“More clients are coming who struggle with obesity. Would love more info as some come eating a keto diet. As more clients choose vegan or vegetarian lifestyles, having some standard nutritional messages for these women would be helpful.”</i></p> <p><i>“Diet for pregnant people of different ethnicities”</i></p>
Supplements	<ul style="list-style-type: none"> - Vitamin, mineral, and herbal supplements 	<p><i>“Herbal supplements - nervines that are safe in pregnancy, nervines that are safe with breastfeeding”</i></p> <p><i>“Supplements (magnesium, choline, vit D,) ... and how to choose a good calcium supplement and omegas for example.”</i></p>
Nutrition for medical conditions	<ul style="list-style-type: none"> - Diabetes - Anemia 	<p><i>“Gestational Diabetes (preventative and management) ... Anemia”</i></p>
Food safety	<ul style="list-style-type: none"> - Listeriosis - Safe food handling 	<p><i>“Listeria! Food poisoning in general.”</i></p> <p><i>“safe food handling contaminated foods”</i></p>
General nutrition information		<p><i>“General healthy diet specific to pregnancy”</i></p> <p><i>“...very basic nutritional information for clients because of lack of knowledge,”</i></p>

Chapter 4

4 Discussion

4.1 Main findings

The main findings of this study indicate that Canadian midwives perceived nutrition during pregnancy and their role in providing nutrition information to pregnant women as important. Almost all midwives were comfortable with and had provided nutrition information to their clients, most commonly on the topics of healthy eating, weight gain, heartburn, anemia, and nutrition for breastfeeding. Although over one-third of the midwives had not received nutrition training, the majority of their nutrition recommendations aligned with those provided in Health Canada guidelines and/or relevant literature and there was no association between nutrition training and midwives' recommendations on nutrition topics.

4.2 Midwives' nutrition training

A higher proportion of midwives in Canada reported having received nutrition education (63.7%) compared to midwives in New Zealand (37.0%) and Australia (51.1%) (61, 70). Interestingly, from the publicly accessible MEP curricula, only two of the seven Canadian programs offer a mandatory nutrition course. Despite a lack of mandatory nutrition courses, the majority of midwives (58.1%) reported having received nutrition training during their MEP when it was integrated into their courses. Therefore, although there is a lack of courses dedicated to nutrition topics only, the MEP curriculum does appear to provide nutrition education to students. Also, the proportion of Canadian midwives who received nutrition education during their MEP may be even higher, as one

of the programs with mandatory nutrition training is the Université du Québec à Trois-Rivières in Quebec, and there are no recorded responses from midwives practicing in Quebec in the present survey.

4.3 Midwives' attitudes towards and experiences with nutrition for pregnancy

Given the importance of healthy nutrition during pregnancy, receiving nutrition guidance during pregnancy may lead to better fetal and maternal health outcomes (25, 26). In Canada, there is an increasing number of women that have been choosing midwifery care for their pregnancy, suggesting an increasing demand on midwives to provide nutrition advice to their clients (89). The positive attitudes towards prenatal nutrition reported by midwives in this study suggests that Canadian midwives are aware of the importance of their role in providing nutrition advice for pregnancy. These findings were concurrent with the attitudes of 370 and 329 midwives in New Zealand and Australian studies, respectively, who also believed healthy nutrition was important for pregnancy, and that midwives had an important role in educating pregnant women about nutrition (61, 70). Along with providing advice, midwives' advice should also be in alignment with current guidelines in order to achieve the best health outcomes. Positive attitudes by physicians and dietitians towards nutrition care were shown to influence their adherence to guidelines (90). Therefore, positive attitudes of midwives' in this study could influence the alignment of their recommendations with Canadian guidelines for pregnancy. Additionally, the current study showed a significant positive correlation between midwives' nutrition education and their attitudes towards the importance of nutrition. This is similar to findings from Italian and US studies where care providers' attitudes

towards the importance of nutrition progressively improved as they received nutrition training throughout their nursing degree (91-93). Overall, as nutrition training can improve attitudes towards the importance of nutrition, and positive attitudes relate to better guideline adherence, it is important for all Canadian midwives to receive nutrition training during their education. The current study also found that almost all Canadian midwives provided nutrition advice to pregnant women (99.4%), similar to findings from other studies (33, 47, 70). Research from Canadian studies showed that midwives provided the most counselling for gestational weight gain and prenatal nutrition compared to all other primary maternity care providers (33, 47). Similarly, a study of 329 midwives from Australia found that 93.0% have provided nutrition education to their pregnant clients (70). Furthermore, midwives reported that this advice was most frequently provided verbally, followed by clients being directed to a website or pamphlet. A positive correlation between receiving verbal advice and referring to the information provided has been reported by pregnant women (31), suggesting that the clients from midwives in this study were more likely to have referred to the materials and information provided to them, which in turn may lead to better maternal and birth outcomes (26).

The discussion of nutrition issues with pregnant women was reported to primarily take place at the first antenatal visit, which is in line with the 2020 national Canadian maternity care guidelines (43). However, a minority (19.0%) of midwives reported doing so during every antenatal visit, despite the guidelines' recommendation of having a weigh-in during every visit and discussing with their clients whether weight fluctuations from visit-to-visit aligned with IOM guidelines (43). Similarly, a Swedish study of 17 midwives found that midwives avoided communicating weight gain recommendations

due to their concerns over causing feelings of shame or guilt in clients (94). Another study identified similar concerns among maternity care providers in Canada, where participants (midwives, obstetricians, and family physicians) reported feelings of discomfort when discussing a patient's weight out of fear that patients would perceive the topic as a personal judgement rather than a medical concern (45). Overall, while Canadian midwives do provide clients with nutrition guidance in the first prenatal appointment, there may be some reluctance in discussing weight-related topics during every visit as recommended by the national maternity care guidelines.

To enhance their nutrition knowledge, a large proportion of midwives reported having frequently referred to a variety of credible sources of information, including other health care professionals and resources such as government or official websites, clinical practice guidelines, and research articles. This finding is similar to those from Australia and New Zealand, where midwives most frequently referred to other health care providers (70) as well as government documents and pamphlets (61), respectively. In contrast, findings from a UK study of 46 midwives showed that the sources of information, such as the media and personal experiences, regarding gestational weight gain the midwives referred to were not credible (73). Nutrition information from media sources are often inaccurate, which can result in a lack of credibility in the advice provided to pregnant women (95). Overall, most Canadian midwives refer to credible sources of information, which is important as the credibility of a recommendation is linked to better client adherence to the recommendation, which results in better health outcomes (96).

4.4 Midwives' comfort with specific nutrition topics

Self-perceived confidence levels are important, as studies have shown that care providers with higher self-perceived confidence levels tended to perform better in their clinical work and have better clinical judgement than providers with lower confidence levels (97, 98). The topics that Canadian midwives were most comfortable in advising on included safe food-handling, weight gain, healthy eating, nutrition for breastfeeding, heartburn, anemia, and Listeria. As these topics are highlighted in Health Canada clinical practice guidelines for maternity care providers, this indicates that Canadian midwives are comfortable in advising clients on pregnancy-related nutrition topics deemed important by Health Canada (43, 82, 99).

Interestingly, most of the topics that midwives were comfortable with were also the most frequently encountered in practice. The frequent encounters may therefore be contributing to their comfort levels due to the high exposure. However, Listeria and safe food-handling were rarely encountered in practice, yet midwives reported high comfort levels in advising on these topics. This may be because of the emphasis that national maternity care guidelines have placed on the risks of listeriosis for pregnancy and how to prevent women from contracting it through safe food handling practices (87).

While previous studies attributed midwives' lack of confidence in advising on certain nutrition topics, such as vegan and vegetarian diets, gestational diabetes, and nutrition for women of different ethnic origins to a lack of formal nutrition training, this does not seem to be the case for Canadian midwives (59, 70). Canadian midwives' formal nutrition training was not significantly correlated with their comfort levels in advising on any of the 14 topics included in the survey. However, this finding is not consistent with that of a

systematic review which concluded that there was a significant improvement in midwives' nutrition knowledge and confidence levels after having participated in the nutritional training programs (100). It should be noted, however, that no Canadian studies were included in this review and that the authors reported a lack of strong evidence for this conclusion due to the study designs and limitations of the studies included in the review (100). In this study, it was the level of frequency in which the midwives were exposed to nutrition topics in practice that was moderately correlated with their comfort levels in advising on them. The lack of comfort on advising women of different ethnic origins may be due to the lower interaction midwives have with these populations. Individuals who are ethnic minorities tend to access maternity services later in their pregnancy (101, 102); therefore, it is possible that the midwives do not interact with this population or for long enough to become familiar with their dietary preferences and needs. Furthermore, Canada is home to a large number of different ethnicities (103), which may make it difficult for midwives to be knowledgeable of the dietary habits of each ethnicity. Lower comfort levels in advising on topics such as the ketogenic, vegetarian, and vegan diets may be explained by the relatively new popularity of these diets, and Canadian midwives may not been exposed to them in high frequencies (104, 105). Despite not having high comfort levels in advising on vegan diets, most of the midwives identified the nutrients of concern for women following a vegan diet that were also highlighted by relevant literature (86). This suggests that although midwives lack comfort in advising on such diets, they are knowledgeable of the needs of clients who are following a vegan diet.

Midwives' lack of comfort in advising on herbal supplements, despite encountering it in practice, may be explained by the lack of a "practice protocol" set by Canadian midwifery regulatory bodies to which midwives can refer for approaching the topic of herbal supplements with clients (106). Despite this, most midwives (64.6%) would not recommend that herbal supplements are safe for pregnancy, which is in alignment with Canadian maternity guidelines (88). However, this finding is in contrast to data from a study conducted with 24 midwives in Alberta, where 100% of participants reported having recommended herbal remedies to their pregnant clients (106). The two most common motivations for midwives recommending herbal remedies, which fall under complementary alternative medicine (CAM), were client interest in CAM as well as scientific evidence of their efficacy, which is conflicting with current national guidelines (88). However, most Alberta midwives also reported a lack of sufficient education in CAM and the study concluded that the midwives may benefit from more CAM training opportunities (106). Overall, midwives do not perceive herbal supplements as safe for pregnancy but do provide recommendations on herbal supplements at the client's request.

The majority of midwives also reported having some encounter with gestational diabetes, while also having reported poorer comfort in advising on this topic. Not surprisingly, nutrition for gestational diabetes was also the topic that midwives most frequently reported having referred their clients to other health care professionals for. Midwives in Canada are expected to screen for and diagnose gestational diabetes, as well as provide clients who have gestational diabetes with nutritional therapy; only when a client's hyperglycemia is not responding to this nutritional therapy should midwives refer clients to a physician (107-109). The high frequency of health care provider referrals for

gestational diabetes further suggests midwives lack comfort in providing nutrition advice for gestational diabetes and indicates a need for further training on this topic.

4.5 Midwives' nutrition recommendations

In the current study, most midwives identified the BMI range for the overweight category that aligned with IOM and Health Canada guidelines (4, 43); however, the range identified by 40.3% of respondents did not align with the guidelines, indicating that midwives may require further awareness of Health Canada's pre-pregnancy BMI categories and gestational weight gain recommendations. Nonetheless, this finding is in contrast to findings from New Zealand and Australia, where most midwives (59% and 73.3%, respectively) did not identify the recommended maternal weight gain range (61, 70). Also, several Canadian studies have shown that only 30–35% of pregnant women's weight gain fell within their recommended range, whereas over half had exceeded their recommended range (110-112) and that receiving counselling on gestational weight gain from a care provider has been effective in minimizing excess weight gain (26). The women who had received weight gain counselling during pregnancy were less likely to have exceeded the IOM weight gain ranges (26). It is essential for women to remain within these gestational weight gain ranges to help prevent adverse maternal outcomes, such as complications during delivery and postpartum weight retention, as well as adverse birth outcomes, like preterm birth (4, 5). Since IOM weight gain recommendations differ based on pre-pregnancy BMI categories, it is important that all midwives have an understanding of what BMI range falls into each category in order to provide recommendations on gestational weight gain that align with the guidelines, to help improve maternal and fetal birth outcomes (4).

In addition, the majority (88.2%) of Canadian midwives' recommendations for when to begin taking a folic acid supplement aligned with Health Canada guidelines (113). This is in contrast to findings from a UK study of 35 midwives, where only half identified the recommended time to beginning a folic acid supplement (75), but similar to findings from Australia, where roughly 94% of midwives' recommendations for the same topic were in alignment with Australian guidelines (70). Given the adverse outcomes associated with not consuming enough folic acid during the first few weeks of pregnancy, such as neural tube defects and stillbirth, it is essential that midwives are knowledgeable of this Health Canada recommendation (113).

Other recommendations that are highlighted in Health Canada prenatal guidelines include managing nausea during pregnancy. In Canada, nausea affects up to 80% of the pregnant population, making it the most common complaint in pregnancy (114). If left unmanaged, nausea can adversely affect women's quality of life, family relationships, and their ability to work (115, 116). It is also associated with increased health care costs, and the Society of Obstetricians and Gynaecologists of Canada, which is the organization that develops the national clinical practice guidelines for obstetrical care, recommends for care providers to help women manage nausea symptoms early in pregnancy (115, 116). The current study found that the majority of Canadian midwives provided recommendations to minimize nausea during pregnancy that were in alignment with Health Canada guidelines.

The second most common complaint during pregnancy is constipation (117), and all midwives recommended that pregnant women consume fruits and vegetables and nearly all recommended that they consume water or juice to help manage constipation. These

recommendations are all in alignment with Health Canada guidelines (81). These findings are similar to recommendations provided by Australian midwives, where most recommended fruit and vegetable consumption as well as fluid intake, but only one participant recommended meats and dairy foods (70). Overall, Canadian midwives appear to be knowledgeable of effective treatments for managing constipation during pregnancy.

Furthermore, midwives reported that they recommend for pregnant women to avoid soft cheeses, deli meats, and raw fish sushi for their risk of listeriosis. These recommendations are all in alignment with Health Canada guidelines (118). Similarly, the majority of Australian midwives also provided recommendations on foods to avoid for their Listeria risk that were in alignment with guidelines (70). Although rare in occurrence, it is important that midwives know which foods must be avoided to prevent listeriosis, because the Listeria bacteria can cross through the placenta to the fetus whose immune system would not yet be developed enough to ward off the bacteria, which could lead to adverse birth outcomes like stillbirth (118).

4.6 Interest in further nutrition information

Despite most having received nutrition training, Canadian midwives also identified several topics for which they would like more information and resources available for, such as specific diets (i.e., vegan, vegetarian, ethnic, and low carbohydrate diets), vitamin and herbal supplements, and nutrition for medical conditions, such as diabetes.

Interestingly, a study of 306 physicians from the US which identified the major nutrition topics that they would like more information on included several of the similar nutrition topics, such as low carbohydrate diets, vitamin and mineral supplements, as well as herbal supplements (119), suggesting this is a problem that needs to be addressed in

health care providers' education. Considering that diets such as the vegan, vegetarian, and low carbohydrate diets have been on the rise (104, 105), and that there are nutrients of concern for pregnant women following these diets, a lack of which could lead to adverse health outcomes (120, 121), it is important that midwives have an understanding of what to advise their pregnant clients who follow these lifestyles. Regarding supplements, although in Canada it is currently not recommended for pregnant women to consume herbal supplements (88), midwives do provide advice on herbal supplements mainly because of their clients' interest in them (106). Therefore, midwives may want to learn more about herbal supplements to better answer their clients' inquiries on this topic. As for vitamin supplements, some are recommended by Health Canada for use in pregnancy, such as folic acid (99), however, midwives indicated that they are interested in vitamins such as magnesium and choline, which are not supplements necessarily recommended by Health Canada, and thus midwives' interest may also be attributed to clients' inquiries. Finally, midwives' interest in further information regarding nutrition for gestational diabetes is not surprising, given their lack of comfort and high referral rates for this topic.

4.7 Access and referral to registered dietitians

Specific health care providers that midwives reported having made referrals to included RDs. Similar to Australian midwives, the majority of midwives in Canada have access to and have made referrals to RDs (70). This is crucial, as Canadian data has shown that maternity care providers perceive RD access and referrals as beneficial for themselves and for their clients, particularly for clients with complex conditions (45). Furthermore, RD interventions have been found to be effective at reducing gestational hypertension

and excess gestational weight gain for pregnant women with obesity, which translates to better maternal health outcomes (122).

Interestingly, there was no statistically significant difference in access to an RD between midwives practicing in different settings, i.e., urban, suburban, rural/remote, when specialist services were noted to be difficult to access in rural and remote areas in Canada (39, 40, 123). However, other barriers for physician referrals to RDs have been reported in Canada, and they included clients' inability to afford RD services as they are not always covered by OHIP (45). Similarly, midwives in the current study also identified clients' financial limitations as the major barrier for RD referrals. Additional barriers for RD referrals cited by Canadian midwives included RD referrals being reserved for specific medical conditions, such as gestational diabetes, which is similar to barriers cited by Australian midwives (70). Overall, these barriers may indicate a need for changes to OHIP policy regarding RD coverage, particularly for pregnant women, as well as to policies regarding which conditions justify RD referrals.

4.8 Limitations

This study is not without limitations. The survey was not completed by midwives practicing in all the provinces and territories of Canada, and there was particularly no representation from Quebec, which has a large number of practicing midwives (230 of 1909 midwives). This resulted in a smaller sample size (161 of 1909 midwives), therefore, the findings of this study may not be generalizable to all midwives practicing in Canada. Furthermore, midwives who are more interested in and knowledgeable of nutrition may have been more likely to have completed the survey, resulting in sampling and self-selection bias. Although the survey was piloted for readability by five

obstetricians, the survey itself is not validated otherwise. Also, as a result of the cross-sectional nature of this study, only correlational and not causal inferences could be made from the data. However, the data from the survey provide a preliminary understanding of the current experiences with nutrition topics by Canadian midwives. Midwives self-reported on all survey questions, therefore the data may have been subject to self-report bias. Lastly, due to a logistical error with the survey, the question on nutrition topics midwives received training for during their MEP was not seen by respondents. The question on midwives' weight gain recommendations for a pregnant woman with a pre-pregnancy BMI indicative of obesity did not contain a response that aligned with IOM and Health Canada guidelines. Despite these limitations, this study provides evidence that Canadian midwives receive nutrition education and provide nutrition advice in accordance with guidelines.

4.9 Conclusions, implications, and future directions

Overall, Canadian midwives do provide nutrition advice to pregnant clients and have positive attitudes towards nutrition for pregnancy. They frequently referred to credible sources of nutrition information, indicated high comfort levels for advising on several nutrition topics, and provided nutrition recommendations that align with Health Canada guidelines regardless of whether they received formal nutrition education. Although most have received formal nutrition training, the midwives identified several topics for which they would like further information, such as specific diets, supplements, and nutrition for medical conditions. To our knowledge, this study is the first of its kind in Canada and as such can lay the foundation for further understanding of midwives' nutrition experiences, education, recommendations, and training needs. Future work should focus on

implementing more training on nutrition during midwives' education programs and/or through continued nutrition education, as well as creating credible resources on the nutrition topics that midwives would like more information on.

References

1. Tovar A, Must A, Bermudez OI, Hyatt RR, Chasan-Taber LJM, journal ch. The impact of gestational weight gain and diet on abnormal glucose tolerance during pregnancy in Hispanic women. *Maternal and child health journal*. 2009;13(4):520-30.
2. Langley-Evans SC. Nutrition in early life and the programming of adult disease: a review. *J Hum Nutr Diet*. 2015;28 Suppl 1:1-14.
3. Uusitalo U, Arkkola T, Ovaskainen ML, Kronberg-Kippila C, Kenward MG, Veijola R, et al. Unhealthy dietary patterns are associated with weight gain during pregnancy among Finnish women. *Public Health Nutr*. 2009;12(12):2392-9.
4. Institute of Medicine. *Weight Gain During Pregnancy: Reexamining the Guidelines*. Rasmussen KM, Yaktine AL, editors. Washington (DC): National Academies Press (US); 2009.
5. Campbell EE, Dworatzek PDN, Penava D, de Vrijer B, Gilliland J, Matthews JI, et al. Factors that influence excessive gestational weight gain: moving beyond assessment and counselling. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2016;29(21):3527-31.
6. Barker DJ, Hales CN, Fall CH, Osmond C, Phipps K, Clark PM. Type 2 (non-insulin-dependent) diabetes mellitus, hypertension and hyperlipidaemia (syndrome X): relation to reduced fetal growth. *Diabetologia*. 1993;36(1):62-7.
7. Martyn CN. Fetal and infant origins of cardiovascular disease. *Midwifery*. 1994;10(2):61-6.
8. Jones G, Riley MD, Dwyer T. Maternal diet during pregnancy is associated with bone mineral density in children: a longitudinal study. *European journal of clinical nutrition*. 2000;54(10):749-56.
9. Charbonneau KDM, Seabrook JAP. Adverse Birth Outcomes Associated with Types of Eating Disorders: A Review. *Canadian Journal of Dietetic Practice and Research*. 2019;80(3):131-6.
10. Campbell EE, Gilliland J, Dworatzek PDN, De Vrijer B, Penava D, Seabrook JA. Socioeconomic status and adverse birth outcomes: A population-based Canadian sample. *Journal of biosocial science*. 2018;50(1):102-13.
11. Szwajcer EM, Hiddink GJ, Koelen MA, van Woerkum CM. Nutrition-related information-seeking behaviours before and throughout the course of pregnancy: consequences for nutrition communication. *European journal of clinical nutrition*. 2005;59 Suppl 1:S57-65.

12. Bookari K, Yeatman H, Williamson M. Falling short of dietary guidelines - What do Australian pregnant women really know? A cross sectional study. *Women Birth*. 2017;30(1):9-17.
13. Bookari K, Yeatman H, Williamson M. Informing Nutrition Care in the Antenatal Period: Pregnant Women's Experiences and Need for Support. *Biomed Res Int*. 2017;2017:4856527.
14. Wilkinson SA, Tolcher D. Nutrition and maternal health: What women want and can we provide it? *Nutrition & Dietetics*. 2010;67(1):18-25.
15. Lucas C, Charlton KE, Yeatman H. Nutrition advice during pregnancy: do women receive it and can health professionals provide it? *Matern Child Health J*. 2014;18(10):2465-78.
16. Benn C, Budge RC, White GE. Women planning and experiencing pregnancy and childbirth: information needs and sources. *Nurs Prax N Z*. 1999;14(3):4-15.
17. Szwajcer EM, Hiddink GJ, Maas L, Koelen MA, van Woerkum CMJ. Nutrition-related information-seeking behaviours of women trying to conceive and pregnant women: evidence for the life course perspective. *Family Practice*. 2008;25(suppl1):i99-i104.
18. Athearn P, Kendall P, Hillers V, Schroeder M, Bergmann V, Chen G, et al. Awareness and Acceptance of Current Food Safety Recommendations During Pregnancy. *Maternal and Child Health Journal*. 2004;8(3):149-62.
19. Hiddink G, Fieren C. Consumers' expectations about nutrition guidance: The importance of primary care physicians. *The American journal of clinical nutrition*. 1997;65(6S):1974s.
20. van Dillen SME, Hiddink GJ, Koelen MA, de Graaf C, van Woerkum CMJ. Perceived relevance and information needs regarding food topics and preferred information sources among Dutch adults: results of a quantitative consumer study.(Original Communication). *European journal of clinical nutrition*. 2004;58(9):1306.
21. Bianchi CM, Huneau J-F, Le Goff GI, Verger EO, Mariotti F, Gurviez P. Concerns, attitudes, beliefs and information seeking practices with respect to nutrition-related issues: a qualitative study in French pregnant women.(Case overview). *BMC pregnancy and childbirth*. 2016;16(1).
22. ACOG Committee opinion no. 548: weight gain during pregnancy. *Obstetrics and gynecology*. 2013;121(1):210-2.
23. Bloomingdale A, Guthrie LB, Price S, Wright RO, Platek D, Haines J, et al. A qualitative study of fish consumption during pregnancy. *The American journal of clinical nutrition*. 2010;92(5):1234-40.

24. May L, Suminski R, Berry A, Linklater E, Jahnke S. Diet and pregnancy: health-care providers and patient behaviors. *The Journal of perinatal education*. 2014;23(1):50-6.
25. Abdel-Aziz SB, Hegazy IS, Mohamed DA, Abu El Kasem MMA, Hagag SS. Effect of dietary counseling on preventing excessive weight gain during pregnancy. *Public Health*. 2018;154:172-81.
26. Cogswell ME, Scanlon KS, Fein SB, Schieve LA. Medically advised, mother's personal target, and actual weight gain during pregnancy. *Obstetrics and gynecology*. 1999;94(4):616-22.
27. Begley A. Barriers to good nutrient intakes during pregnancy: A qualitative analysis. *Nutrition & Dietetics*. 2002;59(3).
28. Ferrari RM, Siega-Riz AM, Evenson KR, Moos MK, Carrier KS. A qualitative study of women's perceptions of provider advice about diet and physical activity during pregnancy. *Patient education and counseling*. 2013;91(3):372-7.
29. Charlton KE, Yeatman H, Brock E, Lucas C, Gemming L, Goodfellow A, et al. Improvement in iodine status of pregnant Australian women 3 years after introduction of a mandatory iodine fortification programme. *Preventive medicine*. 2013;57(1):26-30.
30. El-mani S, Charlton KE, Flood VM, Mullan J. Limited knowledge about folic acid and iodine nutrition in pregnant women reflected in supplementation practices. *Nutrition & Dietetics*. 2014;71(4):236-44.
31. Szwajcer EM, Hiddink GJ, Koelen MA, van Woerkum CM. Written nutrition communication in midwifery practice: what purpose does it serve? *Midwifery*. 2009;25(5):509-17.
32. McDonald SD, Pullenayegum E, Bracken K, Chen AM, McDonald H, Malott A, et al. Comparison of midwifery, family medicine, and obstetric patients' understanding of weight gain during pregnancy: a minority of women report correct counselling. *Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC*. 2012;34(2):129-35.
33. Ferraro ZM, Boehm KS, Gaudet LM, Adamo KB. Counseling about gestational weight gain and healthy lifestyle during pregnancy: Canadian maternity care providers' self-evaluation. *Int J Womens Health*. 2013;5:629-36.
34. Magee LA, Cote AM, Joseph G, Firoz T, Sia W. Obstetric medical care in Canada. *Obstetric medicine*. 2016;9(3):117-9.
35. Canadian Institute for Health Information. *Giving Birth in Canada: Providers of Maternity and Infant Care.*; 2004.

36. Vancouver Division of Family Practice. Family doctor, midwife, or obstetrician - how do you choose? 2016 [Available from: <https://pregnancyvancouver.ca/family-doctor-midwife-or-obstetrician-how-do-you-choose/>].
37. Public Health Agency of Canada. What mothers say: The Canadian Maternity Experiences Survey. Ottawa: Public Health Agency of Canada; 2009.
38. Ross S. An illustration of the "inverse care law": A commentary on giving birth in Canada: providers of maternity and infant care. *Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC*. 2005;27(1):51-3.
39. Barer M, Stoddart G. Improving Access to Needed Medical Services in Rural and Remote Canadian Communities: Recruitment and Retention Revisited. Vancouver; 1999.
40. Chan B BM. Access to physicians in underserved communities in Canada: Something old, something new. Fifth International Medical Workforce Conference; Sydney: Australian Medical Workforce Advisory Committee and Commonwealth Department of Health and Aged Care; 2000. p. 213-42.
41. Fraser W, Hatem-Asmar M, Krauss I, Maillard F, Breart G, Blais R. Comparison of midwifery care to medical care in hospitals in the Quebec pilot projects study: clinical indicators. *L'Equipe d'Evaluation des Projets-Pilotes Sages-Femmes. Canadian journal of public health = Revue canadienne de sante publique*. 2000;91(1):I5-11.
42. Sandall J, Soltani H, Gates S, Shennan A, Devane D. Midwife-led continuity models versus other models of care for childbearing women. *Cochrane Database Syst Rev*. 2016;4:Cd004667.
43. Public Health Agency of Canada. Family-Centred Maternity and Newborn Care: National Guidelines. Ottawa: Public Health Agency of Canada; 2020 [updated January 27 2020. Available from: <https://www.canada.ca/en/public-health/services/publications/healthy-living/maternity-newborn-care-guidelines-chapter-3.html>].
44. O'Brien B, Chalmers B, Fell D, Heaman M, Darling EK, Herbert P. The Experience of Pregnancy and Birth with Midwives: Results from the Canadian Maternity Experiences Survey. *Birth (Berkeley, Calif)*. 2011;38(3):207-15.
45. Murray-Davis B, Berger H, Melamed N, Mawjee K, Syed M, Barrett J, et al. Gestational weight gain counselling practices among different antenatal health care providers: a qualitative grounded theory study. *BMC pregnancy and childbirth*. 2020;20(120).
46. Morris J, Nikolopoulos H, Berry T, Jain V, Vallis M, Piccinini-Vallis H, et al. Healthcare providers' gestational weight gain counselling practises and the influence of knowledge and attitudes: a cross-sectional mixed methods study. *BMJ open*. 2017;7(11):e018527.

47. Premji S, McDonald SW, Zaychkowsky C, Zwicker JD. Supporting healthy pregnancies: Examining variations in nutrition, weight management and substance abuse advice provision by prenatal care providers in Alberta, Canada. A study using the All Our Families cohort. *PLoS One*. 2019;14(1):e0210290.
48. Canadian Midwifery Regulators Council. Canadian competencies for midwives. 2005 [updated June 19 2018; cited 2019 November 28]. Available from: https://cmrc-ccosf.ca/sites/default/files/pdf/National_Competencies_ENG.pdf.
49. Canadian Association of Midwives. Regulation.: Canadian Association of Midwives; 2019 [cited 2019 February 27]. Available from: <https://canadianmidwives.org/midwifery-regulation/>.
50. Butler MM, Hutton EK, McNiven PS. Midwifery education in Canada. *Midwifery*. 2016;33:28-30.
51. College of Midwives of British Columbia. Midwifery scope and model of practice.: College of Midwives of British Columbia.; 2018 [updated 2018 December 10; cited 2020 February 27]. Available from: <https://www.cmbc.bc.ca/wp-content/uploads/2018/12/Midwifery-Scope-and-Model-of-Practice.pdf>.
52. Malott AM, Kaufman K, Thorpe J, Saxell L, Becker G, Paulette L, et al. Models of organization of maternity care by midwives in Canada: a descriptive review. *Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC*. 2012;34(10):961-70.
53. Canadian Association of Midwives. Education.: Canadian Association of Midwives; 2020 [cited 2020 February 27]. Available from: <https://canadianmidwives.org/education/#1465331869359-73dba082-f921>.
54. Canadian Association of Midwives. Midwifery across Canada. 2019 [cited 2020 December 4]. Available from: <https://canadianmidwives.org/midwifery-across-canada/>.
55. College of Midwives of Ontario. The facts about home birth in Ontario Toronto2015 [cited 2018 December 8]. Available from: <http://midwifery-care.com/wordpress/wp-content/uploads/The-Facts-About-Home-Birth-in-Ontario1.pdf>
56. BORN Ontario. Annual Report 2012–2014 Ottawa2015 [cited 2018 December 8]. Available from: <https://www.bornontario.ca/assets/documents/specialreports/121187%20Final%20Web%20-%20English.pdf>
57. Canadian Association of Midwives. Midwifery and midwifery-led births Canadian Association of Midwives; 2017 [cited 2019 November 28]. Available from: <https://canadianmidwives.org/2018/08/08/registered-midwives-midwifery-assisted-births/>.

58. Schmied VA, Duff M, Dahlen HG, Mills AE, Kolt GS. 'Not waving but drowning': a study of the experiences and concerns of midwives and other health professionals caring for obese childbearing women. *Midwifery*. 2011;27(4):424-30.
59. Mulliner CM, Spiby H, Fraser RB. A study exploring midwives' education in, knowledge of and attitudes to nutrition in pregnancy. *Midwifery*. 1995;11(1):37-41.
60. Arrish J, Yeatman H, Williamson M. Self-Reported Nutrition Education Received by Australian Midwives before and after Registration. *J Pregnancy*. 2017;2017:5289592.
61. Elias S GT. Nutrition knowledge and attitudes of New Zealand registered midwives. *Nutrition & Dietetics*. 2007;64(4):290-4.
62. Wills G, Forster D. Nausea and vomiting in pregnancy: what advice do midwives give? *Midwifery*. 2008;24(4):390-8.
63. Morales S, Kendall PA, Medeiros LC, Hillers V, Schroeder M. Health care providers' attitudes toward current food safety recommendations for pregnant women. *Applied nursing research : ANR*. 2004;17(3):178-86.
64. Heyes T, Long S, Mathers N. Preconception care: practice and beliefs of primary care workers. *Fam Pract*. 2004;21(1):22-7.
65. Wennberg AL, Hamberg K, Hornsten A. Midwives' strategies in challenging dietary and weight counselling situations. *Sexual & reproductive healthcare : official journal of the Swedish Association of Midwives*. 2014;5(3):107-12.
66. Hawkins M KS. *The Midwifery Option: A Canadian Guide to the Birth Experience*. Toronto: HarperCollins Publishers; 2003.
67. Davies R.A. "She did what she could" ... A history of the regulation of midwifery practice in Queensland 1859-1912.: Queensland University of Technology; 2003.
68. Stojanovic J. Midwifery in New Zealand 1904-1971. *Contemp Nurse*. 2008;30(2):156-67.
69. Reid A. Birth Attendants and Midwifery Practice in Early Twentieth-century Derbyshire. *Social History of Medicine* 2011;25(2):380-99.
70. Arrish J, Yeatman H, Williamson M. Australian midwives and provision of nutrition education during pregnancy: A cross sectional survey of nutrition knowledge, attitudes, and confidence. *Women Birth*. 2016;29(5):455-64.
71. Macleod M, Gregor A, Barnett C, Magee E, Thompson J, Anderson AS. Provision of weight management advice for obese women during pregnancy: a survey of current practice and midwives' views on future approaches. *Maternal & child nutrition*. 2013;9(4):467-72.

72. Lee D HC, Garrod D. Exploring Health Promotion Practice Within Maternity Services. Stockport: NHS Foundation Trust; 2010.
73. Heslehurst N, Russell S, McCormack S, Sedgewick G, Bell R, Rankin J. Midwives perspectives of their training and education requirements in maternal obesity: a qualitative study. *Midwifery*. 2013;29(7):736-44.
74. Cash T, Desbrow B, Leveritt M, Ball L. Utilization and preference of nutrition information sources in Australia. *Health Expect*. 2015;18(6):2288-95.
75. Barrowclough D, Ford F. A nutrition open- learning pack for practising midwives. *Nutrition & Food Science*. 2001;31(1):6-12.
76. National Health Service. Why do I need folic acid in pregnancy? 2018 [updated 2018 March 16. Available from: <https://www.nhs.uk/common-health-questions/pregnancy/why-do-i-need-folic-acid-in-pregnancy/#:~:text=It's%20recommended%20that%20all%20women,the%20baby's%20s%20is%20developing>.
77. Barbour RS, Macleod M, Mires G, Anderson AS. Uptake of folic acid supplements before and during pregnancy: focus group analysis of women's views and experiences. *J Hum Nutr Diet*. 2012;25(2):140-7.
78. Wulff M, Ekström E-C. Iron supplementation during pregnancy in Sweden: to what extent is the national recommendation followed? *Acta obstetrica et gynecologica Scandinavica*. 2003;82(7):628-35.
79. Government of Canada. The sensible guide to a healthy pregnancy. Ottawa: Public Health Agency of Canada; 2018 [updated 2019 October 22; cited 2020 February 26]. Available from: <https://www.canada.ca/en/public-health/services/health-promotion/healthy-pregnancy/healthy-pregnancy-guide.html>.
80. Government of Canada. Iron and pregnancy Ottawa: Public Health Agency of Canada; 2016 [updated 2016 May 26; cited 2020 February 26]. Available from: <https://www.canada.ca/en/public-health/services/pregnancy/iron-pregnancy.html>.
81. Public Health Agency of Canada. Common pregnancy complaints. Ottawa: Public Health Agency of Canada; [updated June 27 2019; cited 2019 February 26]. Available from: <https://www.canada.ca/en/public-health/services/pregnancy/complaints.html>.
82. Health Canada. Prenatal Nutrition Guidelines for Health Professionals - Background on Canada's Food Guide Ottawa: Health Canada; 2009 [updated January 14 2010; cited 2020 February 27]. Available from: <https://www.canada.ca/en/health-canada/services/publications/food-nutrition/prenatal-nutrition-guidelines-health-professionals-background-canada-food-guide-2009.html>.
83. Institute of Medicine. Dietary Reference Intakes, the Essential Guide to Nutrient Requirements. Washington DC: National Academies Press; 2006.

84. Cohen J. Statistical power analysis for the behavioral sciences. Second Edition ed: Lawrence Erlbaum Associates; 1988.
85. Statistics Canada. Rural and Small Town Canada: Analysis Bulletin. Ottawa: Statistics Canada; 2001.
86. Saunders AV, Craig WJ, Baines SK. Zinc and vegetarian diets. *The Medical journal of Australia*. 2013;199(4):S17-S21.
87. Health Canada. Causes of listeriosis (Listeria). Ottawa: Health Canada; [updated 2016 August 29; cited 2020 February 26]. Available from: <https://www.canada.ca/en/public-health/services/diseases/listeriosis/causes-listeriosis.html>.
88. Best Start Resource Centre. Healthy eating for a healthy baby. Toronto, Ontario; 2010.
89. Canadian Association of Midwives. Number of registered midwives per province and territory.: Canadian Association of Midwives; 2017 [cited 2019 November 28]. Available from: <https://canadianmidwives.org/midwifery-across-canada/>.
90. Cahill NE, Narasimhan S, Dhaliwal R, Heyland DK. Attitudes and Beliefs Related to the Canadian Critical Care Nutrition Practice Guidelines. *Journal of Parenteral and Enteral Nutrition*. 2010;34(6):685-96.
91. Bollo M, Terzoni S, Ferrara P, Destrebecq A, Bonetti L. Nursing students' attitudes towards nutritional care of older people: A multicentre cross-sectional survey incorporating a pre post design. *Nurse Educ Today*. 2019;78:19-24.
92. Levy MD, Loy L, Zatz LY. Policy approach to nutrition and physical activity education in health care professional training. *The American journal of clinical nutrition*. 2014;99(5 Suppl):1194s-201s.
93. Bonetti L, Terzoni S, Lusignani M, Negri M, Froidi M, Destrebecq A. Prevalence of malnutrition among older people in medical and surgical wards in hospital and quality of nutritional care: A multicenter, cross-sectional study. *J Clin Nurs*. 2017;26(23-24):5082-92.
94. Christenson A, Johansson E, Reynisdottir S, Torgerson J, Hemmingsson E. Shame and avoidance as barriers in midwives' communication about body weight with pregnant women: A qualitative interview study. *Midwifery*. 2018;63:1-7.
95. Ayooob K-T, Duyff RL, Quagliani D. Position of the American Dietetic Association: Food and Nutrition Misinformation. *Journal of the American Dietetic Association*. 2002;102(2):260-6.

96. Calnan M, Rowe R. Researching trust relations in health care: Conceptual and methodological challenges - an introduction. *Journal of Health Organization and Management*. 2006;20(5):349-58.
97. Power M, Schulkin J. Obstetrician/Gynecologists' Knowledge, Attitudes, and Practices Regarding Weight Gain During Pregnancy. *Journal of Women's Health*. 2017;26(11):1169-75.
98. Bandura A. *Self-Efficacy in Changing Societies*. Cambridge: Cambridge University Press; 1995.
99. Health Canada. Healthy eating when pregnant and breastfeeding. Ottawa: Health Canada; 2019 [updated January 15 2020; cited 2020 February 26 2020]. Available from: <https://food-guide.canada.ca/en/tips-for-healthy-eating/pregnant-breastfeeding/>.
100. Othman S, Jayasekara R, Steen M, Fleet J. A systematic review for exploring the effectiveness of healthy eating education programmes for improving midwives' levels of knowledge and confidence in promoting healthy eating in pregnant women. *Evidence Based Midwifery*. 2018;16(3):84-93.
101. Raleigh VS, Hussey D, Seccombe I, Hallt K. Ethnic and social inequalities in women's experience of maternity care in England: results of a national survey. *J R Soc Med*. 2010;103(5):188-98.
102. Henderson J, Gao H, Redshaw M. Experiencing maternity care: the care received and perceptions of women from different ethnic groups. *BMC pregnancy and childbirth*. 2013;13(1):196.
103. Government of Ontario. 2016 Census Highlights: Factsheet 9.2016 2020 November 24 [cited 2020 November 24]. Available from: <https://www.fin.gov.on.ca/en/economy/demographics/census/cenhi16-9.html>.
104. Freedman MR, King J, Kennedy E. Popular diets: a scientific review. *Obes Res*. 2001;9 Suppl 1:1s-40s.
105. Freire R. Scientific evidence of diets for weight loss: Different macronutrient composition, intermittent fasting, and popular diets. *Nutrition*. 2020;69:110549.
106. Oguaju C, Dewey D, Wolbring G, Becker G, Page S. Experiences, Opinions, and Use of Complementary and Alternative Medicine Among Alberta Midwives. *Canadian Journal of Midwifery*. 2018;17(2):18-35.
107. College of Midwives of Ontario. Consultation and transfer of care. 2015 [Internet]. Available from: <https://www.cmo.on.ca/wp-content/uploads/2015/11/Standard-Consultation-and-Transfer-of-Care-Nov.-2015.pdf>.
108. College of Midwives of British Columbia. Indications for discussion, consultation and transfer of care. 2020 [Internet]. Available from: <https://www.cmbc.bc.ca/wp->

[content/uploads/2020/03/Indications-for-Discussion-Consultation-and-Transfer-of-Care.pdf](#).

109. Kehler S, MacDonald T, Meuser A. Gestational diabetes mellitus: A review for midwives. In: Midwives AoO, editor.: Association of Ontario Midwives; 2015. p. 31.
110. Murray-Davis B, Berger H, Melamed N, Hasan H, Mawjee K, Syed M, et al. Weight gain during pregnancy: Does the antenatal care provider make a difference? A retrospective cohort study. *CMAJ Open*. 2019;7(2):E283-E93.
111. Crane JM, White J, Murphy P, Burrage L, Hutchens D. The effect of gestational weight gain by body mass index on maternal and neonatal outcomes. *Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC*. 2009;31(1):28-35.
112. Woolcott C, Dodds L, Ashley-Martin J, Piccinini-Vallis H. Distribution of pregnancy-related weight measures. *Can Fam Physician*. 2016;62(7):e400-e6.
113. Government of Canada. Folic acid and neural tube defects.2018. Available from: <https://www.canada.ca/en/public-health/services/pregnancy/folic-acid.html>.
114. Mazzotta P, Maltepe C, Navioz Y, Magee LA, Koren G. Attitudes, management and consequences of nausea and vomiting of pregnancy in the United States and Canada. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*. 2000;70(3):359-65.
115. Campbell K, Rowe H, Azzam H, Lane CA. The Management of Nausea and Vomiting of Pregnancy. *Journal of Obstetrics and Gynaecology Canada*. 2016;38(12):1127-37.
116. Heitmann K, Solheimsnes A, Havnen GC, Nordeng H, Holst L. Treatment of nausea and vomiting during pregnancy —a cross-sectional study among 712 Norwegian women. *European Journal of Clinical Pharmacology*. 2016;72(5):593-604.
117. Bardsley A. Assessment and treatment options for patients with constipation. *Br J Nurs*. 2017;26(6):312-8.
118. Health Canada. Safe food handling for pregnant women Ottawa: Health Canada; 2015 [cited 2020 January 30]. Available from: <https://www.canada.ca/en/health-canada/services/food-safety-vulnerable-populations/food-safety-pregnant-women.html>
119. Mihalynuk TV, Knopp RH, Scott CS, Coombs JB. Physician informational needs in providing nutritional guidance to patients. *FAMILY MEDICINE-KANSAS CITY-*. 2004;36(10):722-6.
120. Melina V, Craig W, Levin S. Position of the Academy of Nutrition and Dietetics: Vegetarian Diets. *Journal of the Academy of Nutrition and Dietetics*. 2016;116(12):1970-80.

121. Kossoff EH, Zupec-Kania BA, Amark PE, Ballaban-Gil KR, Christina Bergqvist AG, Blackford R, et al. Optimal clinical management of children receiving the ketogenic diet: Recommendations of the International Ketogenic Diet Study Group. *Epilepsia*. 2009;50(2):304-17.
122. Thornton YS, Smarkola C, Kopacz SM, Ishoof SB. Perinatal outcomes in nutritionally monitored obese pregnant women: a randomized clinical trial. *J Natl Med Assoc*. 2009;101(6):569-77.
123. Siopis G, Jones A, Allman-Farinelli M. The dietetic workforce distribution geographic atlas provides insight into the inequitable access for dietetic services for people with type 2 diabetes in Australia. *Nutrition & Dietetics*. 2020;77(1):121-30.
124. O'Connor DL, Blake J, Bell R, Bowen A, Callum J, Fenton S, et al. Canadian consensus on female nutrition: adolescence, reproduction, menopause, and beyond. *Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC*. 2016;38(6):508-54.e18.
125. Cullen G, O'Donoghue D. Constipation and pregnancy. *Best Pract Res Clin Gastroenterol*. 2007;21(5):807-18.
126. Trottier M, Erebara A, Bozzo P. Treating constipation during pregnancy. *Can Fam Physician*. 2012;58(8):836-8.
127. Longo SA, Moore RC, Canzoneri BJ, Robichaux A. Gastrointestinal Conditions during Pregnancy. *Clin Colon Rectal Surg*. 2010;23(2):80-9.
128. Madjunkov M, Chaudhry S, Ito S. Listeriosis during pregnancy. *Arch Gynecol Obstet*. 2017;296(2):143-52.
129. Craig WJ. Health effects of vegan diets. *The American journal of clinical nutrition*. 2009;89(5):1627s-33s.
130. Reid MA, Marsh KA, Zeuschner CL, Saunders AV, Baines SK. Meeting the nutrient reference values on a vegetarian diet. *The Medical journal of Australia*. 2013;199(S4):S33-40.
131. Health Canada. Prenatal Nutrition Guidelines for Health Professionals - Iron Contributes to a Healthy Pregnancy Ottawa: Health Canada; 2009 [cited 2020 January 30]. Available from: : <https://www.canada.ca/en/health-canada/services/publications/food-nutrition/prenatal-nutrition-guidelines-health-professionals-iron-contributes-healthy-pregnancy-2009.html>.
132. Institute of Medicine. Nutrition During Pregnancy: Part I Weight Gain: Part II Nutrient Supplements. Washington (DC): National Academies Press (US); 1990.

Appendices

Appendix A: Canadian Nutrition Guidelines for Pregnancy

Several pregnancy-related nutrition guidelines are available for maternity care providers in Canada, and these guidelines will now be explored in more detail. According to the Canadian Consensus on Female Nutrition guidelines published by the Society of Obstetricians and Gynaecologists of Canada, general, key aspects of a healthy diet in pregnancy consist of consuming nutrient-dense, energy-appropriate foods, maintaining appropriate gestational weight gain, following Health Canada's food safety recommendations, and avoiding the consumption of alcohol and herbs (124). Health Canada has also developed prenatal nutrition guidelines which further elaborate on the nutrition requirements for pregnancy (43, 82, 99).

These guidelines encompass what healthy eating during pregnancy entails, with a focus on receiving sufficient amounts of omega-3-fatty-acids, iron, calcium, iodine, and folate through foods and supplements (43, 82, 99). Iron is important for a baby's brain to fully develop prenatally and for building iron stores postpartum (79). Although iron needs are greater for pregnant women than their non-pregnant counterparts, as long as their multi-vitamin supplementation contains 16 - 20 mg of iron, additional iron supplementation is not required unless their health care provider recommends otherwise (79). Health Canada also recommends that all women consume 0.4 mg of folic acid every day, through their multi-vitamin supplements, at least three months prior to pregnancy and throughout pregnancy (79). This is because folic acid is essential for the formation of an infant's brain, spine, and skull, which takes place in the first four weeks of pregnancy (79). If the

neural tube, the primordium of the brain and spinal cord, does not close properly in those early weeks of pregnancy, this would result in abnormalities in the infant's spine, brain, or skull; a birth defect known as a neural tube defect (NTD), such as spina bifida or anencephaly (79). Although Health Canada recommends folic acid supplements to reduce the risk of NTDs, they also highlight the importance of a folate-rich diet, and a supplement should not be regarded as its substitute (79). Iodine is also essential for the fetus' brain development, and women who are deficient in iodine need to be advised on consuming 220 mcg (0.22 mg) during pregnancy (43). Furthermore, women require more omega-3-fatty-acids when pregnant, because the omega-3-fatty acids can transfer across the placenta to the fetus, to support the growth and development of the infant (43). Pregnant women also require sufficient amounts of calcium and vitamin D to support their bones and the skeletal development of the infant (43). The Recommended Dietary Allowance for calcium for pregnant and breastfeeding women within 14 to 18 years of age is 1300 mg/day, and 1000 mg/day for women aged 19 to 50 years (43).

Additionally, the guidelines provide information on weight gain for pregnancy, the recommendations for which were adopted by Health Canada from the IOM, and are based on each woman's pre-pregnancy Body Mass Index (BMI) (4). The recommended weight-gain ranges differ based on each BMI category of underweight, normal weight, overweight, or obese. For example, the recommended weight gain range for a woman with a pre-pregnancy BMI that is classified as overweight is 7 to 11.5 kilograms (kg). The ranges for each category can be found in Table 12.

Table 14: Recommended weight gain during pregnancy, by pre-pregnancy BMI^a.

Pre-pregnancy BMI	Recommended Weight Gain
Underweight (< 18.5 kg/m ²)	12.5 - 18 kg (28 - 40 lbs)
Normal weight (18.5 - 24.9 kg/m ²)	11.5 - 16 kg (25 - 35 lbs)
Overweight (25.0 - 29.9 kg/m ²)	7 - 11.5 kg (15 - 25 lbs)
Obese (≥ 30.0 kg/m ²)	5 - 9 kg (11 - 20 lbs)

Note: BMI = Body Mass Index

^a Adapted from IOM, The National Academies Press, 2019.

Health Canada has additional guidelines for managing common complaints during pregnancy, such as nausea, constipation, and heartburn, as well as for nutrition in special circumstances, such as vegetarianism (81). Pregnant women are also more susceptible to food poisoning, particularly listeriosis, which is caused by the *Listeria* bacteria that can be spread through foods and from mother to infant during pregnancy (87). Listeriosis is considered risky because it can cause miscarriage or stillbirth in 20% of infected pregnant women, but can be prevented with proper food handling practices (43). Therefore, key information on safe food handling during pregnancy is covered in these guidelines as well (87). Further information on all of these topics and Health Canada's recommendations are as follows:

Nausea

Nausea is the most common gastrointestinal complaint during pregnancy, particularly during the first three months, and is a result of hormonal changes; although particular scents and movements may worsen symptoms (125, 126). Feelings of nausea usually

dissipate by the first trimester, but for the first four months, the Public Health Agency of Canada has provided suggestions on how to decrease symptoms, including avoiding having an empty stomach, eating small and frequent meals, drinking fluids between and not during meals, eating cold foods, and smelling lemons (79, 81). Over-the-counter medications to treat nausea are not recommended prior to seeking advice from a health care provider. A health care provider must also be consulted if nausea or vomiting has not decreased by the first trimester of pregnancy, if a woman is not receiving adequate nutrition due to severe vomiting, or if an entire food category (e.g., meats) triggers feelings of sickness (81).

Constipation

Second only to nausea as the most common gastrointestinal complaint in pregnancy, constipation affects up to ~40% of women during pregnancy (125, 126). Constipation is generally defined as infrequent bowel movements or difficulty passing stool, and pregnant women are predisposed to developing it due to physiological, anatomical, and hormonal changes (126, 127). Food passes through a pregnant woman's body more slowly, to absorb additional nutrients from foods that she and her baby need (81).

Additional contributors to constipation during pregnancy include decreased physical activity and increased nutritional supplementations, such as iron (127). To help treat constipation, it is recommended to consume foods rich in fibre, such as fruits, vegetables, and whole grains, to drink more fluids, and to be physically active (81, 117). While these may be the first steps to treating constipation, referral to a health care provider may be required for severe constipation accompanied by abdominal pain, constipation with subsequent diarrhea, or rectal bleeding. Laxatives, enemas, or rectal suppositories are to

be avoided as treatments for constipation during pregnancy, as they may trigger contractions that can induce labour (81).

Heartburn

A result of hormonal changes and increased pressure from a growing fetus, heartburn is also a common complaint during pregnancy (79, 81). The symptoms of heartburn include a strong, burning sensation near the breastbone or heart area, including the pathway from throat to stomach, which is a result of gastric acids being pushed out of the stomach (79, 81). To help alleviate its symptoms, the Public Health Agency of Canada has a list of suggestions, including avoiding fried or greasy foods, drinking fluids between and not with meals, eating small meals, and eating slowly. While some women are able to treat heartburn with an antacid, which reduces the amount of gastric acids, it should be noted that not all antacids are safe for pregnancy, and a health care provider must be consulted prior to their use (79, 81).

Listeriosis and Safe Food Handling

Health Canada identified pregnant women, as well as their unborn or new-born child, to be at greater risk for contracting listeriosis than the average population (87). While cases are rare in Canada, listeriosis is still considered risky, as contracting it can cause miscarriage, stillbirth, premature birth, and life-threatening disease postpartum. As such, it is recommended that pregnant women avoid consuming foods that are more likely to carry *Listeria*, such as soft cheeses, ready-to-eat meats like deli meats and pâtés, raw sprouts, refrigerated smoked fish, raw seafood and meats, as well as raw or unpasteurized milk (87, 118, 128). A woman's immune system is compromised during pregnancy, and

because bacteria like *Listeria* can go through the placenta to the fetus, it is recommended to reduce the risk of food poisoning by following safe food-practices, proper food storage, and by thoroughly cooking all meats (118, 128). Examples of safe food-handling practices include cooking meat, poultry, and seafood to their safe internal temperatures as well as keeping cold food cold and hot food hot by ensuring they never reach temperatures from 4 °C to 60 °C (40 °F to 140 °F) (118).

Nutrition in Special Circumstances

For pregnant women who follow a vegetarian diet, or a diet with no consumption of any animal products (i.e., vegan diet), the IOM recommends daily Vitamin D and Vitamin B12 supplementations of 10 µg and 2.0 µg, respectively. Additional nutrients of concern for pregnant women following a vegan or vegetarian diet include calcium, iron, and long-chain omega-3 fatty acids (129, 130). However, supplementation for these nutrients is only recommended on a case-by-case basis; where health care professionals are to assess the needs of pregnant vegetarian and vegan women and provide specific advice on their nutrient needs (131, 132). In the case that a pregnant woman has anemia and is prescribed >30 mg/day of iron, supplementing with 15 mg and 2 mg of zinc and copper, respectively, is recommended (132).

Appendix B: Study Survey (English)

1. Are you currently a registered midwife in Canada?

Yes

No

2. What is your current age in years?

3. How many years of experience in midwifery practice do you have?

Less than 2 years

2-5 years

6-10 years

11-20 years

More than 20 years

4. Which province or territory do you practice in predominantly?

- Alberta
- British Columbia
- Manitoba
- New Brunswick
- Newfoundland and Labrador
- Northwest Territories
- Nova Scotia
- Nunavut
- Ontario
- Prince Edward Island
- Quebec
- Saskatchewan
- Yukon

5. In what setting are you currently practicing? Select the best answer.

- Urban
- Suburban
- Rural
- Remote

6. Did you receive your midwifery education in Canada?

- Yes
- No

7. Did you have courses that incorporated nutrition training **during** your Midwifery Education Program?

- Yes
- No

b. How was this training delivered?

	Yes	No
As a required nutrition course	<input type="radio"/>	<input type="radio"/>
As an elective nutrition course	<input type="radio"/>	<input type="radio"/>
Nutrition information was integrated into one or more courses	<input type="radio"/>	<input type="radio"/>
During practicum placement	<input type="radio"/>	<input type="radio"/>

c. How much of this training was attributed to the following topics throughout your Midwifery Education Program?

	None	Touched on a little	Discussed in detail	I do not recall
Healthy eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight gain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetarian diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegan diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ketogenic ("keto") diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anemia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heartburn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safe food handling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Nutrition for breastfeeding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women with gestational diabetes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommended weight gain during pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Herbal supplements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women of different ethnic origins	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Did you receive nutrition training **after** your Midwifery Education Program?

Yes

No

b. How was this training delivered? (check all that apply)

	Yes	No
In clinic/hospital	<input type="radio"/>	<input type="radio"/>
Online courses	<input type="radio"/>	<input type="radio"/>
Workshops	<input type="radio"/>	<input type="radio"/>
Other (please specify) _____	<input type="radio"/>	<input type="radio"/>

c. How much of this training was attributed to the following topics after your Midwifery Education Program?

	None	Touched on a little	Discussed in detail	I do not recall
Healthy eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight gain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetarian diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegan diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ketogenic ("keto") diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anemia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heartburn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safe food handling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for breastfeeding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Nutrition for women with gestational diabetes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommended weight gain during pregnancy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Herbal supplements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women of different ethnic origins	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. On a scale from 1 to 5, where 1 = very unimportant and 5 = very important, how would you rate the importance of healthy nutrition during pregnancy?

1

2

3

4

5

10. On a scale from 1 to 5, where 1 = very unimportant and 5 = very important, how important do you believe a midwife's role is in providing nutrition information to pregnant women?

1

2

3

4

5

11. Have you ever provided nutrition information to pregnant women?

Yes

No

12. Please identify the occasions when you provided nutrition information:

	Yes	No
First antenatal visit	<input type="radio"/>	<input type="radio"/>
Every antenatal visit	<input type="radio"/>	<input type="radio"/>
In case of a medical condition	<input type="radio"/>	<input type="radio"/>
At the woman's request	<input type="radio"/>	<input type="radio"/>

13. Please indicate whether you have provided nutrition advice in any of the following ways:

	Yes	No
Pamphlet/booklet	<input type="radio"/>	<input type="radio"/>
Verbally	<input type="radio"/>	<input type="radio"/>
Directed to website	<input type="radio"/>	<input type="radio"/>
Directed to mobile applications	<input type="radio"/>	<input type="radio"/>
Other (please specify) _____	<input type="radio"/>	<input type="radio"/>

14. Do you have access to registered dietitian services?

Yes

No

b. Have you made referrals to a registered dietitian?

Yes

No

c. What are the main barriers for making referrals to a registered dietitian?

	Yes	No
I do not have access to a registered dietitian	<input type="radio"/>	<input type="radio"/>
My clients can't afford a dietitian	<input type="radio"/>	<input type="radio"/>
Clients are not interested in receiving nutritional information	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>

15. Rate the frequency in which you refer to the following information sources to enhance your own nutrition knowledge:

	Never	Rarely	Sometimes	Frequently
Other health professionals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Government or official websites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Research articles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Textbooks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Media (TV, newspaper, magazines)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clinical practice guidelines (eg. SOGC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. On a scale from 1 to 5, where 1 = very uncomfortable and 5 = very comfortable, rate your comfort level for providing information on the following:

	1	2	3	4	5
Healthy eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight gain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetarian diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegan diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ketogenic ("keto") diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anemia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heartburn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safe food handling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Nutrition for breastfeeding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women with gestational diabetes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight gain for women with obesity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Herbal supplements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women of different ethnic origins	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. Rate the frequency in which you encounter the following nutrition-related topics in practice:

	Never Encounter	Rarely Encounter	Sometimes Encounter	Frequently Encounter
Healthy eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight gain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegetarian diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vegan diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ketogenic ("keto") diet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anemia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heartburn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Safe food handling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Nutrition for breastfeeding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women with gestational diabetes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight gain for women with obesity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Herbal supplements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition for women of different ethnic origins	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Please indicate if you have ever referred your clients to other health care professionals for the following topics:

	Yes	No
Healthy eating	<input type="radio"/>	<input type="radio"/>
Weight gain	<input type="radio"/>	<input type="radio"/>
Vegetarian diet	<input type="radio"/>	<input type="radio"/>
Vegan diet	<input type="radio"/>	<input type="radio"/>
Ketogenic ("keto") diet	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>
Anemia	<input type="radio"/>	<input type="radio"/>
Heartburn	<input type="radio"/>	<input type="radio"/>
Safe food handling	<input type="radio"/>	<input type="radio"/>
Nutrition for breastfeeding	<input type="radio"/>	<input type="radio"/>

Nutrition for women with
gestational diabetes

Weight gain for women
with obesity

Herbal supplements

Nutrition for women of
different ethnic origins

For the following set of questions, please select the answers that best apply to you. To minimize the length of the survey, the answers provided are not an all-inclusive list of potential options.

19. Which of the following would you advise your clients in trying to minimize the effect of nausea during pregnancy?

	Yes	No
Drink plenty of fluids with meals	<input type="radio"/>	<input type="radio"/>
Avoid having an empty stomach	<input type="radio"/>	<input type="radio"/>
Eat large quantities of food at meal times	<input type="radio"/>	<input type="radio"/>
Eat small frequent meals	<input type="radio"/>	<input type="radio"/>

20. Which of the following pre-pregnancy BMI ranges would you consider as overweight?

- 18.5 - 24.9 kg/m²
- 25.0 - 29.9 kg/m²
- 30.0 - 34.9 kg/m²
- I do not know

21. How much weight would you recommend a client gain for a singleton pregnancy if the woman was overweight pre-pregnancy?

- 11 – 20 lbs. (5-9 kg)
- 25 – 35 lbs. (11.5-16.0 kg)
- 28 – 40 lbs. (12.5-18 kg)
- Pregnancy is a natural process and weight does not need to be monitored at this time

22. What is your ideal recommendation to women on when they should begin taking a folic acid supplement?

- At least 3 months before pregnancy
- At least 1 month before pregnancy
- After confirming one is pregnant
- Before first trimester is complete

23. Which of the following nutrients are you concerned about specifically if your client follows a vegan diet?

	Yes	No
Vitamin D	<input type="radio"/>	<input type="radio"/>
Zinc	<input type="radio"/>	<input type="radio"/>
Vitamin A	<input type="radio"/>	<input type="radio"/>
Omega-3-fatty-acids	<input type="radio"/>	<input type="radio"/>

24. Which of the following foods have you recommended your clients avoid during pregnancy due to risk of listeria?

	Yes	No
Soft cheeses	<input type="radio"/>	<input type="radio"/>
Hard cheeses	<input type="radio"/>	<input type="radio"/>
Deli meats	<input type="radio"/>	<input type="radio"/>
Raw fish sushi	<input type="radio"/>	<input type="radio"/>

25. Which of the following foods have you recommended for managing constipation during pregnancy?

	Yes	No
Water/Juice	<input type="radio"/>	<input type="radio"/>
Dairy foods	<input type="radio"/>	<input type="radio"/>
Fruits and vegetables	<input type="radio"/>	<input type="radio"/>
Meats	<input type="radio"/>	<input type="radio"/>

26. In general, would you advise your clients that herbal supplements are safe for pregnancy?

Yes

No

27. We are interested in enhancing nutrition resources and/or educational tools for pregnancy for health care providers and pregnant women. What nutrition topics do you wish you had more information available for?

Appendix C: Study Survey (French)

1. Êtes-vous actuellement une sage-femme enregistrée au Canada?

Oui

Non

2. Quel est votre âge (en années)?

3. Combien d'années d'expérience dans la pratique de sage-femme avez-vous?

Moins de 2 ans

2-5 ans

6-10 ans

11-20 ans

Plus que 20 ans

4. Dans quelle province ou dans quel territoire pratiquez-vous actuellement?

- Alberta
- Colombie-Britannique
- Île-du-Prince-Édouard
- Manitoba
- Nouveau-Brunswick
- Nouvelle-Écosse
- Nunavut
- Ontario
- Québec
- Saskatchewan
- Terre-Neuve-et-Labrador
- Territoires du Nord-Ouest
- Yukon

5. Dans quel contexte pratiquez-vous actuellement? Sélectionnez la meilleure réponse.

- Urbain
- En banlieue
- Rural
- Éloigné

6. Avez-vous reçu votre éducation de sage-femme au Canada?

- Oui
- Non

7. Avez-vous suivi des cours intégrant la formation en nutrition **pendant** votre baccalauréat en pratique de sage-femme?

- Oui
- Non

b. Comment cette formation a-t-elle délivrée?

	Oui	Non
En tant que cours de nutrition obligatoire	<input type="radio"/>	<input type="radio"/>
En tant que cours de nutrition electif	<input type="radio"/>	<input type="radio"/>
L'information nutritionnelle a été intégrée dans un cours général	<input type="radio"/>	<input type="radio"/>
Pendant le stage	<input type="radio"/>	<input type="radio"/>

c. Combien de cette formation a été attribuée aux sujets suivants tout au long de votre Baccalauréat en pratique sage-femme?

	Aucun	Appris un peu	Appris en détail	Je ne me souviens pas
Alimentation saine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétarien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétalien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime cétogène	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anémie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brûlures d'estomac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Les pratiques de manipulation sécuritaire des aliments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition pour l'allaitement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition pour les femmes atteintes de diabète gestationnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids pendant la grossesse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suppléments à base de plantes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime des femmes appartenant à des groupes ethniques ou minoritaires	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Avez-vous reçu une formation en nutrition **après** votre baccalauréat en pratique de sage-femme?

Oui

Non

b. Comment cette formation a-t-elle été délivrée? (vérifier tout ce qui s'applique)

	Oui	Non
En clinique/hôpital	<input type="radio"/>	<input type="radio"/>
Cours en ligne	<input type="radio"/>	<input type="radio"/>
Ateliers	<input type="radio"/>	<input type="radio"/>
Autre (veuillez préciser) _____	<input type="radio"/>	<input type="radio"/>

c. Combien de cette formation a été attribuée aux sujets apres votre baccalauréat en pratique sage-femme?

	Aucun	Appris un peu	Appris en détail	Je ne me souviens pas
Alimentation saine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétarien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétalien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime cétoène	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anémie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brûlures d'estomac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Les pratiques de manipulation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

sécuritaire des aliments				
Nutrition pour l'allaitement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition pour les femmes atteintes de diabète gestationnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids pendant la grossesse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suppléments à base de plantes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime des femmes appartenant à des groupes ethniques ou minoritaires	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Sur une échelle de 1 à 5, 1 étant très peu important et 5 très important, quel est votre niveau d'importance pour la nutrition pendant la grossesse?

1

2

3

4

5

10. Sur une échelle de 1 à 5, 1 étant très peu important et 5 étant très important, quelle importance accordez-vous au rôle d'une sage-femme dans la fourniture d'informations nutritionnelles aux femmes enceintes?

1

2

3

4

5

11. Avez-vous déjà fourni des informations nutritionnelles aux femmes enceintes?

Oui

Non

12. Veuillez indiquer si vous avez fourni des informations nutritionnelles à l'une des occasions suivantes:

	Oui	Non
A la première visite prénatale	<input type="radio"/>	<input type="radio"/>
A chaque visite prénatale	<input type="radio"/>	<input type="radio"/>
En cas de problème médical	<input type="radio"/>	<input type="radio"/>
À la demande du client	<input type="radio"/>	<input type="radio"/>

13. Indiquez si vous avez fourni des conseils nutritionnels de l'une des manières suivantes:

	Oui	Non
Brochure/livret	<input type="radio"/>	<input type="radio"/>
Verbalement	<input type="radio"/>	<input type="radio"/>
Dirigé vers le site web	<input type="radio"/>	<input type="radio"/>
Dirigé vers des applications cellulaires	<input type="radio"/>	<input type="radio"/>
Autre (veuillez préciser) _____	<input type="radio"/>	<input type="radio"/>

14. Avez-vous accès aux services de diététistes enregistrés pour vos clientes enceintes?

Oui

Non

b. Avez-vous déjà recommandé à votre cliente de consulter un diététiste?

Oui

Non

c. Quels sont les principaux obstacles à l'orientation vers un diététiste?

	Oui	Non
Je n'ai pas accès à une diététiste	<input type="radio"/>	<input type="radio"/>
Mes clients ne peuvent pas se payer une diététiste	<input type="radio"/>	<input type="radio"/>
Les clients ne sont pas intéressés à recevoir des informations nutritionnelles	<input type="radio"/>	<input type="radio"/>
Autre	<input type="radio"/>	<input type="radio"/>

15. Évaluer la fréquence à laquelle vous référer aux sources d'informations suivantes pour améliorer vos propres connaissances en nutrition:

	Jamais	Rarement	Parfois	Souvent
Autres professionnels de la santé	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sites gouvernementaux ou officiels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Articles de recherche	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Livres de texte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Des médias sociaux	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Médias (télévision, journal, magazines)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guide de pratique clinique (eg. SOGC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Autre (veuillez préciser)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16. Sur une échelle de 1 à 5, 1 étant très inconfortable et 5 étant très confortable, évaluez votre niveau de confort pour fournir des informations sur les points suivants:

	1	2	3	4	5
Alimentation saine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétarien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétalien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime cétogène	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anémie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brûlures d'estomac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Les pratiques de	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

manipulation
sécuritaire
des aliments

Nutrition
pour
l'allaitement



Nutrition
pour les
femme
atteintes de
diabète
gestationnel



Prise de poids
pour une
femme
enceinte
obèse



Suppléments
à base de
plantes



Nutrition
pour les
femmes
d'origines
ethniques
différentes



17. Évaluez la fréquence à laquelle vous rencontrez les sujets suivants liés à la nutrition dans la pratique:

	Jamais Rencontre	Rarement Rencontre	Parfois Rencontre	Souvent Rencontre
Alimentation saine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétarien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime végétalien	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Régime cétogène	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anémie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brûlures d'estomac	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Les pratiques de manipulation sécuritaire des aliments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition pour l'allaitement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition pour les femmes atteintes de diabète gestationnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prise de poids pour les femmes obèses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Suppléments à base de plantes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nutrition pour les femmes d'origines ethniques différentes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Veuillez indiquer si vous avez déjà référé vos clients à d'autres professionnels de la santé pour les sujets suivants:

	Oui	Non
Alimentation saine	<input type="radio"/>	<input type="radio"/>
Pris de poids	<input type="radio"/>	<input type="radio"/>
Régime végétarien	<input type="radio"/>	<input type="radio"/>
Régimes végétaliens	<input type="radio"/>	<input type="radio"/>
Régime cétogène	<input type="radio"/>	<input type="radio"/>
Listeria	<input type="radio"/>	<input type="radio"/>
Anémie	<input type="radio"/>	<input type="radio"/>
Brûlures d'estomac	<input type="radio"/>	<input type="radio"/>
Les pratiques de manipulation sécuritaire des aliments	<input type="radio"/>	<input type="radio"/>
Nutrition pour l'allaitement	<input type="radio"/>	<input type="radio"/>

Nutrition pour les femmes
atteintes de diabète
gestationnel



Prise de poids pendant la
grossesse



Suppléments à base de
plantes



Régime des femmes
appartenant à des groupes
ethniques ou minoritaires



Pour la série de questions suivante, veuillez sélectionner les réponses qui vous conviennent le mieux. Pour minimiser la longueur de l'enquête, les réponses fournies ne constituent pas une liste exhaustive d'options potentielles.

19. Parmi les propositions suivantes, laquelle conseilleriez-vous à vos clientes pour tenter de minimiser les effets des nausées pendant la grossesse?

	Oui	Non
Buvez beaucoup de liquides aux repas	<input type="radio"/>	<input type="radio"/>
Évitez d'avoir l'estomac vide	<input type="radio"/>	<input type="radio"/>
Mangez de grandes quantités de nourriture au moment des repas	<input type="radio"/>	<input type="radio"/>
Mangez de petits repas fréquents	<input type="radio"/>	<input type="radio"/>

20. Laquelle des plages d'IMC pré-grossesse suivantes considérez-vous comme étant en surpoids?

- 18.5 - 24.9 kg/m²
- 25.0 - 29.9 kg/m²
- 30.0 - 34.9 kg/m²
- Je ne sais pas

21. Quel poids recommanderiez-vous à une cliente de gagner pour une grossesse singleton si la femme était en surpoids avant la grossesse?

- 11 – 20 lb. (5-9 kg)
- 25 – 35 lb. (11.5-16.0 kg)
- 28 – 40 lb. (12.5-18 kg)
- La grossesse est un processus naturel et il n'est pas nécessaire de surveiller le poids pendant ce temps

22. Quelle est votre recommandation idéale aux femmes à propos quand elles devraient commencer à prendre un supplément d'acide folique?

- Au moins 3 mois avant la grossesse
- Au moins 1 mois avant la grossesse
- Après avoir confirmé leur grossesse
- Avant la fin du premier trimestre

23. Parmi les nutriments suivants, lesquels vous préoccupent particulièrement si votre client suit un régime végétalien?

	Oui	Non
Vitamine D	<input type="radio"/>	<input type="radio"/>
Zinc	<input type="radio"/>	<input type="radio"/>
Vitamine A	<input type="radio"/>	<input type="radio"/>
Les acides gras omega-3	<input type="radio"/>	<input type="radio"/>

24. Lequel des aliments suivants recommandez-vous que vos clientes évitent pendant la grossesse en raison du risque de listériose?

	Oui	Non
Fromages à pâte molle	<input type="radio"/>	<input type="radio"/>
Fromages à pâte dure	<input type="radio"/>	<input type="radio"/>
Charcuterie	<input type="radio"/>	<input type="radio"/>
Poisson cru de sushi	<input type="radio"/>	<input type="radio"/>

25. Lequel des aliments suivants avez-vous recommandé pour gérer la constipation pendant la grossesse?

	Oui	Non
Eau/jus	<input type="radio"/>	<input type="radio"/>
Produits laitiers	<input type="radio"/>	<input type="radio"/>
Fruits et légumes	<input type="radio"/>	<input type="radio"/>
Viandes	<input type="radio"/>	<input type="radio"/>

26. En général, conseilleriez-vous à vos clientes que les suppléments à base de plantes sont sans danger pour la grossesse?

Oui

Non

27. Nous sommes intéressés à améliorer les ressources nutritionnelles et / ou les outils pédagogiques liés à la grossesse pour les prestataires de soins de santé et les femmes enceintes. Pour quels sujets de nutrition souhaiteriez-vous disposez de plus d'informations?

Appendix D: Health Sciences Review Board Approval Letters



Date: 17 April 2019

To: Dr. Jasna Twynstra

Project ID: 112013

Study Title: Perspectives of Canadian Midwives on Nutrition During Pregnancy

Application Type: HSREB Initial Application

Review Type: Delegated

Full Board Reporting Date: 07May2019

Date Approval Issued: 17/Apr/2019 09:42

REB Approval Expiry Date: 17/Apr/2020

Dear Dr. Jasna Twynstra

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above mentioned study as described in the WREM application form, as of the HSREB Initial Approval Date noted above. This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date
Draw_participation_2	Online Survey	15/Apr/2019
Final_Reminder_Email_2	Email Script	15/Apr/2019
Midwife_Survey_2	Online Survey	15/Apr/2019
Non-Clinical_Letter_of_Information_and_Consent_2	Written Consent/Assent	15/Apr/2019
Recruitment_Email_WREM_2	Recruitment Materials	15/Apr/2019
Reminder_Email	Email Script	01/Feb/2019
Research_Plan_Jan_2019_	Protocol	27/Feb/2019
Reward_Email	Email Script	01/Feb/2019

No deviations from, or changes to, the protocol or WREM application should be initiated without prior written approval of an appropriate amendment from Western HSREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Philip Jones, HSREB Vice-Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).



Date: 22 July 2019

To: Dr. Jasna Twynstra

Project ID: 112013

Study Title: Perspectives of Canadian Midwives on Nutrition During Pregnancy

Application Type: HSREB Amendment Form

Review Type: Delegated

Full Board Reporting Date: 06Aug2019

Date Approval Issued: 22/Jul/2019 15:32

REB Approval Expiry Date: 17/Apr/2020

Dear Dr. Jasna Twynstra ,

The Western University Health Sciences Research Ethics Board (HSREB) has reviewed and approved the WREM application form for the amendment, as of the date noted above.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Newsletter_Recruitment_July 22	Recruitment Materials	22/Jul/2019	
Newsletter_Recruitment_July 22	Translated Documents	22/Jul/2019	
Research_Plan_2019_B_July 22	Protocol	22/Jul/2019	

Documents Acknowledged:

Document Name	Document Type	Document Date	Document Version
Translation attestation (Twynstra) (1)	Translation Certificate	22/Jul/2019	

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Joseph Gilbert, HSREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).



Date: 22 July 2019

To: Dr. Jasna Twynstra

Project ID: 112013

Study Title: Perspectives of Canadian Midwives on Nutrition During Pregnancy

Application Type: HSREB Amendment Form

Review Type: Delegated

Full Board Reporting Date: 06 Aug 2019

Date Approval Issued: 11/Jul/2019 12:14

REB Approval Expiry Date: 17/Apr/2020

Dear Dr. Jasna Twynstra,

The Western University Health Sciences Research Ethics Board (HSREB) has reviewed and approved the WREM application form for the amendment, as of the date noted above.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
FB_Twitter_Script	Recruitment Materials	08/Jul/2019	
Newsletter_Recruitment_Engish_July 9	Recruitment Materials	09/Jul/2019	
Newsletter_Recruitment_French_July 9	Translated Documents	10/Jul/2019	
Non-Clinical_Letter_of_Information_and_Consent_B	Consent Form	08/Jul/2019	
Research_Plan_2019_B_July 9	Protocol	10/Jul/2019	
SocialMedia_Recruitment_English_July 9	Recruitment Materials	09/Jul/2019	
SocialMedia_Recruitment_French_July 9	Translated Documents	10/Jul/2019	

Documents Acknowledged:

Document Name	Document Type	Document Date	Document Version
Translation attestation	Translation Certificate	10/Jul/2019	

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Joseph Gilbert, HSREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).



Date: 21 May 2019

To: Dr. Jasna Twynstra

Project ID: 112013

Study Title: Perspectives of Canadian Midwives on Nutrition During Pregnancy

Reference Number/ID: N/A

Application Type: HSREB Amendment Form

Review Type: Delegated

Full Board Reporting Date: 04 June 2019

Date Approval Issued: 21/May/2019 13:05

REB Approval Expiry Date: 17/Apr/2020

Dear Dr. Jasna Twynstra,

The Western University Health Sciences Research Ethics Board (HSREB) has reviewed and approved the WREM application form for the amendment, as of the date noted above.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Email_for_midwife_study_FR	Translated Documents	16/May/2019	
Final_Reminder_Feb_FR (1)	Translated Documents	16/May/2019	
Letter_of_Information_FR (5)	Translated Documents	16/May/2019	
Midwife_Survey_Amended	Online Survey	16/May/2019	1
Recruitment_Email_WREM (5) (1)	Translated Documents	16/May/2019	
Reminder_Email_Feb_FR (1)	Translated Documents	16/May/2019	
Survey_Amended_FR	Translated Documents	16/May/2019	1

Documents Acknowledged:

Document Name	Document Type	Document Date	Document Version
Attestation_FR	Translation Certificate	16/May/2019	

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Joseph Gilbert, HSREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).



Date: 4 October 2019

To: Dr. Jasna Twynstra

Project ID: 112013

Study Title: Perspectives of Canadian Midwives on Nutrition During Pregnancy

Reference Number/ID: This is not applicable to this amendment.

Application Type: HSREB Amendment Form

Review Type: Delegated

Full Board Reporting Date: 15 October 2019

Date Approval Issued: 04/Oct/2019 14:28

REB Approval Expiry Date: 17/Apr/2020

Dear Dr. Jasna Twynstra,

The Western University Health Sciences Research Ethics Board (HSREB) has reviewed and approved the WREM application form for the amendment, as of the date noted above.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Final_Reminder_Clinic_1	Recruitment Materials	20/Sep/2019	
Final_Reminder_Clinic_FR	Translated Documents	26/Sep/2019	
Recruitment_Email_Clinic_1	Recruitment Materials	20/Sep/2019	
Recruitment_Email_Clinic_FR	Translated Documents	26/Sep/2019	
Reminder_Clinic_FR	Translated Documents	26/Sep/2019	
Reminder_Email_Clinic_1	Recruitment Materials	20/Sep/2019	
Research_Plan_2019_Sept_Clinics_1	Protocol	04/Oct/2019	

Documents Acknowledged:

Document Name	Document Type	Document Date	Document Version
Research_Plan_2019_Sept_Clinics_2	Summary of Changes	04/Oct/2019	
Translation attestation (Twynstra) (2)	Translation Certificate	03/Oct/2019	

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Joseph Gilbert, HSREB Chair



Date: 20 March 2020

To: Dr. Jasna Twynstra

Project ID: 112013

Study Title: Perspectives of Canadian Midwives on Nutrition During Pregnancy

Application Type: Continuing Ethics Review (CER) Form

Review Type: Delegated

REB Meeting Date: 07April2020

Date Approval Issued: 20/Mar/2020 12:52

REB Approval Expiry Date: 17/Apr/2021

Dear Dr. Jasna Twynstra,

The Western University Research Ethics Board has reviewed the application. This study, including all currently approved documents, has been re-approved until the expiry date noted above.

REB members involved in the research project do not participate in the review, discussion or decision.

Western University REB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The REB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Daniel Wyzynski, Research Ethics Coordinator, on behalf of Dr. Joseph Gilbert, HSREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix E: Letter of Information



Perspectives of Canadian Midwives on Nutrition During Pregnancy

Letter of Information and Consent – Midwives

Principal Investigator

Dr. Jasna Twynstra, PhD

Brescia University College

Email: [REDACTED]

Tel: [REDACTED]

Introduction

You are being invited to participate in this research study about Canadian midwives' perspectives on nutrition during pregnancy because you are a registered midwife with the Canadian Association of Midwives (CAM).

Background

Healthy nutrition during pregnancy is important to help prevent adverse birth outcomes. In Canada, midwives are one of the possible health care professionals who women can choose to see during pregnancy. The purpose of our research is to examine Canadian midwives' thoughts and opinions of nutrition during pregnancy, and to learn about their common nutrition recommendations.

Study Procedures

If you agree to participate, you will be asked to complete an electronic survey that would take less than 10 minutes to complete. All midwives, approximately 1690 who are currently registered with CAM, will be contacted. We are aiming to receive a minimum of 314 participants. All survey responses are kept completely anonymous, and data will only be accessible to the researchers.

Risks

There are no known risks to participating in this study. However, participants can voluntarily provide an email address to be entered into a draw to win an e-gift card. Although this email address cannot be used to identify individual responses to the survey, the email address could ultimately be linked back to the individual.

Benefits

You may not directly benefit from participating in this study, but information gathered may provide benefits to society as a whole, which include understanding the nutrition topics that midwives encounter in their practice so that nutrition-based resources can be tailored to meet their needs, contributing towards further enhancing client care.

Withdrawal

You may withdraw from the study at any time. However, the information that was collected after your submission of the survey will still be used as the survey is

completely anonymous and the researchers will be unable to identify an individual participant's responses. No new information will be collected without your permission.

Confidentiality

Your survey responses will be collected anonymously through a secure online survey platform called Qualtrics. Qualtrics uses encryption technology and restricted access authorizations to protect all data collected. In addition, Western's Qualtrics server is in Ireland, where privacy standards are maintained under the European Union safe harbour framework. The data will then be exported from Qualtrics and securely encrypted using a software called VeraCrypt, and stored on Western University's password-protected laptops and an encrypted memory stick. The devices will be stored in a locked cabinet in the Principal Investigator's office and will only be accessible to the research team. Data collected will be stored for a minimum of seven years, before being permanently erased from the laptops and external memory drives using "DBAN". Representatives of Western University's Health Sciences Research Ethics Board may require access to your study-related records to monitor the conduct of the research.

Compensation

As a token of appreciation for your time, you can provide an email address to be entered into a draw to win one of five \$100 e-gift cards to Indigo. You will be prompted at the end of the survey to enter your email address. The researchers will not be able to link your email to your survey responses.

Rights as a Participant

Your participation in this study is voluntary. You may decide not to be in this study. Even if you consent to participate you have the right to not answer individual questions or to withdraw from the study at any time. If you choose not to participate or to leave the study at any time it will have no effect on your employment status or relationship with the Canadian Association of Midwives. You do not waive any legal right by consenting to this study.

Questions about the Study

If you have questions about this research study please contact Principal Investigator, Dr. Jasna Twynstra, at [REDACTED] or email: [REDACTED]

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics (519) 661-3036, 1-844-720-9816, email: ethics@uwo.ca.

Implied Consent

You indicate your voluntary agreement to participate by submitting the online survey.



Perspectives des sages-femmes canadiennes sur la nutrition pendant la grossesse

Lettre d'information et de consentement – Sages-femmes

Chercheur principal

Mme Jasna Twynstra, PhD

Brescia University College

Courriel: [REDACTED]

Tél: [REDACTED]

Introduction

Vous êtes invité(e) à participer à cette étude de recherche sur les perspectives des sages-femmes canadiennes en matière de nutrition pendant la grossesse parce que vous êtes une sage-femme inscrite auprès de l'Association canadienne des sages-femmes (ACSF).

Rationnel et objectifs

Une alimentation saine pendant la grossesse est importante pour aider à prévenir les conséquences négatives pour la mère et le bébé, à la naissance et à l'avenir. Au Canada, les sages-femmes sont l'un des professionnels de la santé que les femmes peuvent choisir de consulter pendant leur grossesse. Le but de notre recherche est d'examiner les opinions des sages-femmes canadiennes sur la nutrition pendant la grossesse et de connaître leurs recommandations nutritionnelles communes.

Procédure

Si vous acceptez de participer, il vous sera demandé de remplir un questionnaire électronique qui prendrait moins de 10 minutes à compléter. Toutes les sages-femmes, environ 1690 inscrites actuellement à l'ACSF, seront contactées. Nous visons un minimum de 314 participants. Toutes les réponses à l'enquête sont gardées totalement anonymes, et les données ne seront accessibles qu'aux chercheurs.

Risques associés au projet de recherche

Il n'y a pas de risque ou d'inconfort connu ou prévu associé à la participation à cette étude. Toutefois, les participants peuvent fournir volontairement une adresse électronique à entrer dans un tirage au sort pour gagner une carte-cadeau électronique. Bien que cette adresse électronique ne puisse pas être utilisée pour identifier les réponses individuelles au sondage, l'adresse électronique pourrait finalement être liée à l'individu.

Avantages associés au projet de recherche

Vous ne retirerez aucun avantage direct en participant à ce projet de recherche, mais les informations rassemblées pourraient présenter des avantages pour la société dans son ensemble. Cependant, votre participation pourrait nous aider à développer une ressource nutritionnelle pour les sages-femmes afin d'accroître leurs connaissances en matière de nutrition et de renforcer leur confiance pour discuter des informations nutritionnelles avec leurs clientes.

Participation volontaire et possibilité de retrait

Votre participation à ce projet de recherche est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de ce projet à n'importe quel moment, sans besoin de vous justifier.

Les renseignements recueillis après votre soumission d'enquête seront toujours utilisées, car l'enquête est totalement anonyme et les chercheurs ne pourront pas identifier les réponses des participants. Aucune nouvelle information ne sera collectée sans votre permission.

Confidentialité

Vos réponses seront recueillies de manière anonyme via une plateforme d'enquête en ligne sécurisée appelée Qualtrics. Qualtrics utilise une technologie de cryptage et des autorisations d'accès restreint pour protéger toutes les données collectées. De plus, le serveur Western de Qualtrics se trouve en Irlande, où les normes de confidentialité sont respectées dans le cadre de la sphère de sécurité de l'Union européenne. Les données seront ensuite exportées de Qualtrics et cryptées de manière sécurisée à l'aide d'un logiciel appelé VeraCrypt, puis sauvegardées sur des ordinateurs portables protégés par mot de passe de Western University et une clé USB cryptée.

Tous les renseignements recueillis seront traités de manière confidentielle et ne seront utilisés que pour ce projet de recherche. Toutes les données collectées seront sauvegardées sur des ordinateurs portables protégés par mot de passe. Les appareils seront rangés dans une armoire verrouillée dans le bureau du chercheur principal et seront uniquement accessibles à l'équipe de recherche. Les données collectées seront sauvegardées pendant au moins sept ans, avant d'être définitivement effacées des ordinateurs portables et des lecteurs de mémoire externes utilisant «DBAN».

Il est possible que nous devions permettre l'accès aux dossiers de recherche au comité d'éthique de la recherche de Western University à des fins de vérification ou de gestion de la recherche. Tous adhèrent à une politique de stricte confidentialité.

Remerciement

En guise de remerciement pour votre temps, vous pouvez saisir une adresse électronique (courriel) pour participer à un tirage au sort et gagner l'une des cinq cartes-cadeaux électroniques de 100 \$ à Indigo. À la fin du sondage, vous serez invité(e) à entrer votre adresse électronique. Les chercheurs ne pourront pas associer votre adresse électronique à vos réponses au sondage.

Droits en tant que participant

Vous êtes libre de ne pas participer à la recherche. De plus, même si vous acceptez de participer, vous avez le droit de ne pas répondre aux questions individuelles et vous pourrez vous retirer de la recherche à tout moment, sans explication. Votre participation ou retrait n'affecte pas votre statut d'emploi ou votre relation avec l'Association canadienne des sages-femmes.

Vous ne renoncez à aucun droit en consentant à cette étude.

Identification des personnes-ressources

Si vous avez des questions concernant le projet de recherche, veuillez contacter le chercheur principal, D^{re} Jasna Twynstra, au [REDACTED] ou par courriel: [REDACTED]

Si vous avez des questions quant à vos droits en tant que participant(e) à la recherche ou sur la conduite de cette étude, vous pouvez contacter le Bureau de l'éthique de la recherche humaine aux coordonnées suivantes: (519) 661-3036, 1-844-720-9816, ou par courriel: ethics@uwo.ca.

Consentement

Le simple retour du questionnaire rempli sera considéré comme l'expression implicite de votre consentement à participer au projet.

Curriculum Vitae

Name: Yvana Sawaya

Post-secondary Education and Degrees: Brescia University College
London, Ontario, Canada
2014-2018 HB.Sc.

The University of Western Ontario
London, Ontario, Canada
2018-2021 M.Sc.FN.

Honours and Awards: Dean's Honor List
Brescia University College
2017-2018

Related Work Experience

Course Assistant
School of Food and Nutritional Sciences
Brescia University College
2018-2020

Graduate Student Representative
Research and Scholarship Committee
Brescia University College
2019-2020

Publications:

Sawaya, Y., Seabrook, J., Madill, J., and Twynstra J. (2020). Canadian midwives' perspectives on nutrition for pregnant women. *Applied Physiology, Nutrition, and Metabolism*, 45, S46 (abstract).