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Healthcare providers’ gestational weight gain counselling practices and the influence of knowledge and attitudes: a cross-sectional mixed methods study

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ABSTRACT

Objective To understand current gestational weight gain (GWG) counselling practices of healthcare providers, and the relationships between practices, knowledge and attitudes.

Design Concurrent mixed methods with data integration: cross-sectional survey and semistructured interviews.

Participants Prenatal healthcare providers in Canada: general practitioners, obstetricians, midwives, nurse practitioners and registered nurses in primary care settings.

Results Typically, GWG information was provided early in pregnancy, but not discussed again unless there was a concern. Few routinely provided women with individualised GWG advice (21%), rate of GWG (16%) or discussed the risks of inappropriate GWG to mother and baby (20% and 19%). More routinely discussed physical activity (46%) and food requirements (28%); midwives did these two activities more frequently than all other disciplines (P<0.001). Midwives interviewed noted a focus on overall wellness instead of weight, and had longer appointment times which allowed them to provide more in-depth counselling. Regression results identified that the higher priority level that healthcare providers place on GWG, the more likely they were to report providing GWG advice and discussing risks of GWG outside recommendations (β=0.71, P<0.001) and discussing physical activity and food requirements (β=0.341, P<0.001). Interview data linked the priority level of GWG to length of appointments, financial compensation methods for healthcare providers and the midwifery versus medical model of care.

Conclusions Interventions for healthcare providers to enhance GWG counselling practices should consider the range of factors that influence the priority level healthcare providers place on GWG counselling.

INTRODUCTION

Supporting all women to achieve healthy gestational weight gain (GWG) is of clinical importance because GWG lower or higher than recommended is linked to a range of poor maternal, fetal and childhood outcomes. For mothers, excess GWG increases the risk of gestational diabetes mellitus and hypertensive disorders in pregnancy, and this is of special concern if excessive GWG occurs early in pregnancy. Excess GWG also poses risks at delivery for the mother including increased likelihood of needing an instrumental delivery or a caesarean section, and surgical morbidity and mortality. Furthermore, these factors result in an increased risk for the fetus and neonate including the adverse consequences of macrosomia and shoulder dystocia, need for intensive care unit admission and the risk of perinatal death. In the long term, the child is at risk of an altered growth trajectory that may lead to obesity. Excess GWG also increases the risk of postpartum weight

Strengths and limitations of this study

► This is a large and in-depth examination and comparison of healthcare providers’ practices related to monitoring and discussing gestational weight gain (GWG) with pregnant women.

► This study is enhanced by the use of mixed methods. Mixed methods research is well suited for health services, which are complex and influenced by multiple factors.

► The findings from this study may have a wide applicability, as the topics covered in this survey are considered routine and are undertaken as part of standard prenatal care in most developed countries.

► It was not possible to calculate a true response rate for the survey because the survey was distributed using email lists and social media through professional associations and networks although these methods allowed for wider reach and more responses.

► Those who responded may be more likely to engage in activities related to GWG counselling which could lead to inflation of the reported frequency of specific GWG counselling practices. Nevertheless, the rates of some counselling practices reported in this study are quite low.

To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2017-018527).
retention, which may leave a woman at an increased body mass index (BMI) to begin her next pregnancy.\(^1\)\(^8\) The cycle of excess GWG followed by postpartum weight retention and increasing maternal BMI can lead to increased risk in each subsequent pregnancy.\(^9\) These risks act synergistically resulting in a higher risk of metabolic and cardiovascular disease in later life for the mother as well as the child.\(^10\) Thus, excess GWG has short-term, long-term and intergenerational effects.\(^11\)

To mitigate the risks of inappropriate GWG, many countries, including Canada, have released GWG guidelines.\(^12\)\(^13\) Many of these are based on the Institute of Medicine (IOM) (USA) guidelines for GWG in pregnancy, which outline a range of total GWG over the course of pregnancy that is associated with optimal health outcomes for mother and child.\(^14\) In order for these guidelines to be of benefit to pregnant women, the IOM recommends that healthcare providers advise women on the recommended range of GWG based on prepregnancy BMI, and that they track and discuss weight progress over the course of pregnancy, as well as offering tailored counselling on dietary intake and physical activity.\(^15\) Many countries provide guidance to healthcare providers in the form of evidence-based guidelines in order to support them in providing physical activity and nutrition counselling to pregnant women.\(^16\)\(^19\)

There is growing evidence to suggest that the quality of GWG counselling interactions needs improvement, as women and healthcare providers report conflicting views of these interactions.\(^20\) Many women report that their healthcare provider did not provide recommendations for GWG during their prenatal care, nor provide counselling about nutrition and physical activity behaviours during pregnancy.\(^21\)\(^22\) Healthcare providers have reported taking a reactive approach, initiating a discussion about weight in pregnancy only after weight exceeds the recommendation.\(^23\)\(^24\) Healthcare providers may lack knowledge or skills to undertake this type of counselling;\(^25\)\(^26\) or consider GWG to be a low priority in the context of a typical prenatal visit.\(^23\)

Women may see a variety of healthcare provider disciplines for prenatal care including general practitioners, obstetricians, midwives, nurse practitioners and registered nurses.\(^27\) There is some evidence to suggest that the approach to GWG counselling may vary by healthcare provider discipline;\(^28\)\(^29\); however, this area has not been fully explored. In order to better support healthcare providers to have positive GWG counselling interactions with women, there needs to be a detailed understanding of current practices, and what is influencing these practices. This information can be used to develop interventions to promote appropriate GWG in routine prenatal care. As such, the objectives of this study were to characterise and compare the GWG counselling practices of healthcare providers who provide prenatal care; and to examine potential influences on advice and counselling practices.

### METHODS

#### Study design

This study was conducted using a concurrent mixed methods design, consisting of an online survey and semi-structured qualitative interviews. Qualitative and quantitative data were collected in tandem, analysed separately and integrated.\(^30\) Mixed methods research is well suited for research questions that call for real-life contextual understandings and multilevel influences, and lends itself well to the development of complex interventions.\(^31\)

Ethics approval for this study was obtained from the Health Research Ethics Board at the University of Alberta (Study identification Pro00045899). All participants provided informed consent to participate in this study.

#### Quantitative methods

##### Survey development

A survey questionnaire was developed, pilot-tested and assessed for content validity by a team of researchers with expertise in the areas of obstetrics, nutrition, exercise physiology, health promotion and health psychology (online supplementary file).

##### Recruitment and data collection

Healthcare providers including general practitioners, obstetricians, midwives, nurse practitioners and registered nurses in primary care settings from across Canada were recruited through professional associations and networks who agreed to distribute survey information to their members. All healthcare providers who provided prenatal care were eligible to participate. The survey was available from December 2014 to May 2015 on Research Electronic Data Capture software hosted at the University of Alberta.\(^32\)

#### Outcomes

Survey participants provided information about their professional characteristics, and were asked to respond to questions regarding their practices, knowledge and attitudes related to GWG, nutrition and physical activity. Specifically, participants were asked about the proportion of their pregnant patients with whom they undertook selected GWG counselling practices as outlined in the IOM recommendations,\(^15\) using a scale from 1 (<10% of pregnant patients) to 5 (>90% of pregnant patients). Respondents were also asked for their self-assessment of their general knowledge to support GWG counselling, their detailed knowledge of the content of practice guidelines related to GWG (specifically the IOM/Health Canada GWG guidelines\(^33\) and Health Canada’s nutrition guidelines\(^34\) and physical activity guidelines\(^35\)) and the priority level they placed on discussing, assessing and assisting women with GWG (eg, Given all the issues of concern during a typical prenatal visit, I consider discussing GWG a high priority). Responses indicated level of agreement with each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). The survey also examined whether healthcare providers considered
themselves to be the most appropriate person within their practice setting to provide GWG counselling (I am the most appropriate provider in my practice setting to discuss GWG).

Data analysis
GWG counselling practices of each healthcare provider group were calculated as frequency and percentage of responses, dichotomised into ‘Routine (undertaken with >90% of pregnant patients)’ and ‘Not routine’ (all other response choices) based on the IOM recommendations that these practices occur with every woman (IOM, 2013). Cases with missing data were removed from analyses. Principal components analysis was used to reduce the numerous survey questions into a smaller number of factors. The mean score of the items loading onto each factor was used to represent that factor score for respondents. For example, four questions loaded onto a factor that was named ‘providing weight gain advice and discussing risks’ and were averaged together into a composite score for that factor. Mean scores were calculated for the remaining factors of general knowledge, detailed knowledge of practice guidelines and the priority level healthcare providers place on GWG, in a similar manner. Differences in mean composite scores were compared among healthcare provider disciplines using one-way analysis of variance (ANOVA) with Bonferroni post hoc tests; residuals for all composite scores were normally distributed. Mean scores for each factor were used in multiple linear regression models to evaluate the relationship between the predictors of interest and GWG counselling practices. For all models, multicollinearity was not an issue with all tolerance values >0.36 and variance inflation factors <2.8.

Qualitative methods
Materials
A semistructured interview guide was developed by the study team based on the study objectives and included questions and prompts regarding healthcare provider practices in relation to GWG, as well as the reasons behind these practices. The interview guide also included questions regarding provider knowledge in and attitudes towards GWG.

Recruitment and data collection
Potential participants were identified through collaborating members of the study team. A purposive sample of maximum variation was recruited to gather the perspectives of healthcare providers from the different disciplines practising in urban or rural locations in two Canadian provinces (Alberta and British Columbia). When these contacts were exhausted, an advertisement was distributed by email to medical clinics relevant to the requirements for variability in the sample. Interviews were conducted over the telephone, audio-recorded and transcribed verbatim.

Data analysis
Qualitative content analysis was used to describe and inductively interpret the data. Qualitative content analysis is a process that is a ‘reduction and sense making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings’ (Patton, p45). Audio recordings and transcripts were reviewed, and reviewed again while making notes about key words and phrases. Key concepts were categorised and recategorised as patterns emerged. Data analysis occurred concurrently with data collection, and sampling adequacy was demonstrated by saturation of the data, as replication occurred in categories as new participants were included in the analysis. Findings were discussed and approved by the study team.

Data integration
The categories emerging inductively from the interviews were compared with the results from the quantitative survey to determine if findings from each method confirmed the other, as well as to expand the strength of each type of data to better explain the phenomenon.

RESULTS
Participant characteristics
Overall, 1189 healthcare providers responded to the survey. Of these, 122 did not meet the eligibility criteria (ie, did not see pregnant women in their practice), 27 did not specify their healthcare provider discipline, 155 did not answer any questions beyond practice characteristics and 377 indicated a healthcare provider discipline that was outside the scope of these analyses. Thus, 508 responses from general practitioners, obstetricians, midwives, nurse practitioners and registered nurses in primary care settings from across Canada are included in this analysis (table 1). Twenty-three healthcare providers from these same disciplines participated in the interviews.

GWG counselling practices of healthcare providers
Providing weight gain advice and discussing risks
A small proportion of healthcare providers routinely provided women with a GWG target based on their prepregnancy BMI and discussed the recommended rate of GWG based on their GWG target (21% and 16%; table 2). Few indicated that they routinely discussed the impacts of inappropriate GWG on mother (20%) and baby (19%). The composite score for providing weight gain advice and discussing the risks did not differ between healthcare provider disciplines (table 3).

Key concepts and quotes relating to counselling practices that emerged from the interviews are outlined in table 4. Interviewees described the first prenatal visit as including measurement of weight, calculation of BMI and a large amount of information sharing, including general information on GWG. Some healthcare providers advised women on a total GWG target; however, this was not always congruent with guidelines. The amount of

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Table 1  Characteristics of participating Canadian healthcare providers

| Healthcare provider discipline                  | Survey participants, n=508 | Interview participants, n=23 |
|-----------------------------------------------|----------------------------|------------------------------|
|                                               | n  | %  | n  | %  |
| General practitioner                          | 159| 31 | 7  | 30 |
| Obstetrician                                  | 139| 27 | 5  | 22 |
| Midwife                                      | 97 | 19 | 5  | 22 |
| Registered nurse—primary care                 | 75 | 15 | 4  | 17 |
| Nurse practitioner                            | 38 | 7  | 2  | 9  |
| Province                                      |    |    |    |    |
| British Columbia                             | 55 | 11 | 9  | 39 |
| Alberta                                      | 149| 30 | 14 | 61 |
| Saskatchewan and Manitoba                    | 56 | 11 | NA |    |
| Ontario                                      | 168| 33 |    |    |
| Quebec                                       | 17 | 3  |    |    |
| Maritimes*                                   | 47 | 9  |    |    |
| Territories†                                  | 11 | 2  |    |    |
| Location of practice                         |    |    |    |    |
| Urban                                        | 296| 58 | NC |    |
| Rural                                        | 125| 25 |    |    |
| Urban and rural                              | 86 | 17 |    |    |
| Proportion of all patients who are pregnant women (%) |    |    |    |    |
| <10                                          | 103| 20 | NC |    |
| 10–30                                        | 94 | 19 |    |    |
| 30–60                                        | 119| 23 |    |    |
| 60–90                                        | 46 | 9  |    |    |
| >90                                          | 146| 29 |    |    |
| Stage of pregnancy at first visit            |    |    |    |    |
| Before pregnancy                             | 30 | 6  | NC |    |
| First trimester                              | 328| 65 |    |    |
| Second trimester                             | 74 | 15 |    |    |
| Third trimester                              | 34 | 7  |    |    |
| Don't know/too variable to say                | 41 | 8  |    |    |

*Maritimes=Newfoundland and Labrador, New Brunswick, Nova Scotia.
†Territories=Northwest Territories, Yukon Territory (no respondents from Nunavut).
NA, not applicable; NC, not captured.

information provided in the first visit was perceived by the healthcare providers to be overwhelming for women.

**Weight assessment**

Approximately three-quarters of respondents weighed women at every visit (76%), while half of respondents would routinely relay GWG information to women every time they are weighed (table 2). Midwives reported measuring weight at every visit less frequently than all other disciplines (table 3).

Interviewees noted that weight was typically measured at each visit, except for midwives who generally measured women’s weight if clinically necessary, or if women requested them to do so (table 4). After the first visit, interview participants indicated that they revisited the topic to varying levels of depth, typically only when the healthcare provider or woman expressed concern about her weight.

**Discussing physical activity and food requirements**

Nearly half (46%) of healthcare providers reported routinely discussing physical activity with women while about one-third routinely discussed appropriate extra food requirements (28%), and only about one-third felt they could routinely give examples of appropriate changes that women could make to meet extra food requirements (32%) (table 2). In contrast, over two-thirds would discuss the importance of prenatal vitamins (67%). The composite score for the three survey questions regarding discussing physical activity and food requirements differed between healthcare provider disciplines (table 3). Midwives did this more frequently than all other disciplines except for nurse practitioners.

Healthcare providers of all disciplines described providing general information on GWG, physical activity and nutrition in the early stages of pregnancy, and many indicated providing women with printed resources in this area (table 4). The midwives interviewed described spending more time assessing women’s current lifestyle and providing individualised advice than did physicians (table 4).

**Predictors of counselling practices**

Healthcare providers, regardless of discipline, reported similar responses for having appropriate general knowledge of GWG, physical activity and nutrition, as well as knowledge of related practice guidelines (table 3); only the difference between midwives and registered nurses responses was significant. There were significant differences in the level of priority placed on GWG. Midwives and obstetricians had lower composite scores for the priority level they place on GWG than general practitioners and nurse practitioners, but did not differ significantly from each other (table 3). The majority of healthcare providers considered discussing GWG with women to be within their role (77%).

**Predictors of providing weight gain advice and discussing risks**

The composite score for providing weight gain advice and discussing risks of inappropriate GWG was most strongly related to the priority level that healthcare providers placed on GWG (table 5), followed by their detailed knowledge of GWG, physical activity and nutrition guidelines.

Generally, healthcare providers in the interviews reported that GWG discussions may receive lower priority due to the time constraints in a typical appointment (table 4). This was related to their compensation
Table 2  Survey responses regarding gestational weight gain counselling practices routinely undertaken (with >90% of pregnant patients) by Canadian healthcare providers

| Healthcare provider discipline                                                                 | GP   | %   | OB   | %   | MW   | %   | NP   | %   | RN   | %   | All  | %   |
|-------------------------------------------------------------------------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|
| I provide women with a weight gain target based on their prepregnancy BMI                       | 27   | 17  | 35   | 25  | 23   | 24  | 8    | 21  | 15   | 21  | 108  | 21  |
| Missing                                                                                         | 4    | 1   |      |     |      |     |      |     |      |     |      |     |
| I discuss the recommended rate of weight gain based on their weight gain target                | 22   | 14  | 19   | 14  | 15   | 16  | 11   | 29  | 15   | 21  | 82   | 16  |
| Missing                                                                                         | 6    | 1   |      |     |      |     |      |     |      |     |      |     |
| I discuss the impact of inappropriate weight gain on the mother during pregnancy                | 22   | 14  | 33   | 24  | 21   | 22  | 13   | 34  | 11   | 15  | 100  | 20  |
| Missing                                                                                         | 4    | 1   |      |     |      |     |      |     |      |     |      |     |
| I discuss the impact of inappropriate weight gain on the baby                                    | 21   | 13  | 30   | 22  | 21   | 22  | 15   | 40  | 10   | 14  | 97   | 19  |
| Missing                                                                                         | 7    | 1   |      |     |      |     |      |     |      |     |      |     |
| I weigh women at every visit                                                                    | 146  | 92  | 122  | 88  | 34   | 35  | 32   | 84  | 47   | 65  | 381  | 76  |
| Missing                                                                                         | 4    | 1   |      |     |      |     |      |     |      |     |      |     |
| I relay weight gain information to women every time I weigh them                                | 82   | 52  | 62   | 45  | 38   | 40  | 25   | 66  | 41   | 57  | 248  | 50  |
| Missing                                                                                         | 7    | 1   |      |     |      |     |      |     |      |     |      |     |
| I discuss appropriate physical activity with pregnant women                                     | 75   | 48  | 53   | 38  | 61   | 64  | 20   | 53  | 22   | 31  | 231  | 46  |
| Missing                                                                                         | 7    | 1   |      |     |      |     |      |     |      |     |      |     |
| I discuss appropriate extra food requirements with pregnant women                              | 41   | 26  | 26   | 19  | 37   | 39  | 14   | 37  | 21   | 30  | 139  | 28  |
| Missing                                                                                         | 7    | 1   |      |     |      |     |      |     |      |     |      |     |
| I can easily give examples of appropriate changes that women could make to meet extra food requirements | 40   | 26  | 30   | 22  | 48   | 50  | 17   | 46  | 23   | 32  | 158  | 32  |
| Missing                                                                                         | 7    | 1   |      |     |      |     |      |     |      |     |      |     |
| I discuss the importance of taking prenatal vitamins                                            | 124  | 79  | 85   | 61  | 49   | 51  | 34   | 90  | 44   | 61  | 336  | 67  |
| Missing                                                                                         | 6    | 1   |      |     |      |     |      |     |      |     |      |     |

BMI, body mass index; GP, general practitioner; MW, midwife; NP, nurse practitioner; OB, obstetrician; RN, primary care registered nurse.

method, as general practitioners and obstetricians were remunerated in a fee-for-service model that resulted in restriction on the length of appointments, as well as the topics covered. Midwives were compensated by course-of-care, which resulted in longer and more flexible appointments. However, midwives described a lower priority level placed on GWG, as their practice was less focused on weight, in particular weight assessment, and more focused on a woman’s overall health and well-being. Healthcare providers’ perceptions of the sensitivity of discussing GWG with pregnant women were also related to their providing weight gain advice and discussing risks (table 4). Some healthcare providers noted their discomfort with initiating GWG discussions, or discussing GWG too frequently, as they were concerned that this may cause psychological distress for the woman.

Predictors of discussing physical activity and food requirements
The priority level that healthcare providers place on GWG, their detailed knowledge of GWG, nutrition, and physical activity guidelines, and their general knowledge of this area were all significantly related to their discussing physical activity and food requirements with women during a prenatal visit (table 6). After adjustment for practice characteristics, being a midwife remained a significant predictor of this activity within a prenatal visit.
Table 3  Composite scores for gestational weight gain (GWG) counselling practices and influences on practices compared by healthcare provider discipline

| Healthcare provider discipline | Mean (SD) | GP | OB | MW | NP | RN | All | Sig. | Post hoc |
|--------------------------------|-----------|----|----|----|----|----|------|------|---------|
| Providing weight gain advice and discussing the risks | 2.95 (1.1) | 3.03 (1.2) | 2.95 (1.2) | 2.91 (1.5) | 2.54 (1.3) | 2.91 (1.2) | 0.072 | NA |
| Weighing women at every visit | 4.87 (0.54) | 4.75 (0.80) | 3.36 (1.56) | 4.61 (1.10) | 4.03 (1.55) | 4.41 (1.22) | <0.001 | MW< <All* |
| Discussing physical activity and food requirements | 3.65 (1.1) | 3.37 (1.1) | 4.23 (0.8) | 3.81 (1.1) | 3.31 (1.4) | 3.65 (1.1) | <0.001 | MW> (GP, OB, RN)* |
| General knowledge in GWG, physical activity and nutrition | 3.50 (0.75) | 3.61 (0.75) | 3.77 (0.70) | 3.42 (0.80) | 3.36 (0.94) | 3.56 (0.78) | 0.017 | MW>RN† |
| Detailed knowledge of GWG, physical activity and nutrition guidelines | 2.85 (0.98) | 2.96 (0.91) | 3.22 (0.88) | 2.85 (1.02) | 3.00 (1.01) | 2.97 (0.95) | 0.047 | MW>GP† |
| Priority level of discussing, assessing and assisting women with appropriate weight gain | 4.09 (0.61) | 3.82 (0.82) | 3.59 (0.86) | 3.8 (0.87) | 4.25 (0.65) | 3.89 (0.78) | <0.001 | MW< (GP, NP)* OB-(GP, NP)† |

*Significant at 0.01; scale of 1=lowest to 5=highest score
†Significant at 0.05.

Compared by one-way analysis of variance (ANOVA).

GP, general practitioner; GWG, gestational weight gain; MW, midwife; NA, Not applicable; NP, nurse practitioner; OB, obstetrician; RN, primary care registered nurse.

**DISCUSSION**

Midwifery practices in relation to discussing physical activity and food requirements also emerged from the interview data (Table 4). Midwives reported that their approach focused on overall health and wellness, and maternal obesity. For healthcare providers working within a multidisciplinary team, access to dietetic services was an important enhancement to GWG counselling practices.
| Category                      | Concept                                                                 | Representative quote(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Practices                     | The first visit involves a large amount of information sharing          | “That’s the trouble with prenatal care. There’s so much information that women need, especially in the first trimester. Genetic screening, and lifestyle, and alcohol, and smoking, and family, and you know, on and on and on.” (General Practitioner)                                                                                                                                                                                                                                                                                                                                                       |
|                               | Weight is assessed routinely, but not discussed in detail unless there is a concern | “Weight is something I would bring up with everyone at the first visit and only - well, I always check the weight every single other visit. But if there’s no problem, I wouldn’t bring it up. I might make a comment like, ‘Oh, your weight looks good.’” (General Practitioner)                                                                                                                                                                                                                                                                                                                                                   |
|                               | Midwives have a different approach to gestational weight gain            | “We are aware of their weight gain. But more important to us than their weight gain is their nutrition and how they’re feeling about it and, you know, providing encouragement, support and education so that they can be empowered to make healthy choices.” (Midwife) “I feel like it’s really important to discuss healthy eating and exercise, but the actual focus on the weight gain and the number of pounds that a woman should gain, I don’t really feel that’s important at all, that piece of it.” (Midwife)                                                                BOVE  HE  TLY  N  ADD  C  T  NE  D  N  E  NV  NE  D  N  E  NV  NE  N  T  I  V  E  L  I  N  F  L  U  E  N  CE  S  ON  P  R  A  C  T  I  C  E  |
Therefore, they may report that they provide GWG counselling, but not to every pregnant woman. Further, when the depth of this counselling is explored, the self-reported rates are likely to diminish. Future studies should objectively assess the quality of these discussions and evaluate their impact on GWG, health behaviours like physical activity and diet and women’s perceptions of support. Furthermore, research is needed to elucidate the most effective counselling methods that will help women achieve appropriate GWG. This additional information could help guide or refine approaches to antenatal care undertaken by different groups of care providers.

This study identified multilevel influences on GWG counselling. Most notably, the priority level that healthcare providers placed on GWG had the strongest relationship with their practices. The qualitative results provided context to this finding, linking the priority level of GWG to factors at the healthcare system level, such as the time available in a typical prenatal appointment, and the compensation that healthcare providers receive for their time. Additionally, this study identified factors at the individual level. This included the importance of detailed knowledge of practice guidelines, which also was strongly associated with counselling practices.

### Table 5  Predictors of Canadian healthcare providers providing advice to pregnant women about gestational weight gain (GWG) and discussing risks of inappropriate weight gain during a prenatal visit

| Variable | Model† Unstd β | SE of β | Std β |
|----------|----------------|---------|-------|
| Constant | −1.14** | 0.38 | |
| General practitioner (reference) | | | |
| Obstetrician | 0.242 | 0.145 | 0.093 |
| Midwife | −0.076 | 0.199 | −0.026 |
| Primary care RN | −0.029 | 0.177 | −0.008 |
| Nurse practitioner | −0.057 | 0.206 | −0.012 |
| Detailed knowledge of GWG, physical activity and nutrition guidelines | 0.26** | 0.069 | 0.202 |
| General knowledge in GWG, physical activity and nutrition | 0.098 | 0.081 | 0.065 |
| Priority level of discussing, assessing and assisting women with appropriate weight gain | 0.71** | 0.071 | 0.459 |
| Role (I am the most appropriate provider to discuss gestational weight gain) | 0.172 | 0.133 | 0.056 |
| R² | 0.392 | | |

**P<0.01.
†Model is adjusted for: urban/rural location, proportion of all patients who are pregnant and trimester of pregnancy at first visit.
GWG, gestational weight gain; RN, registered nurse; Std, standardised; Unstd, unstandardised.

### Table 6  Predictors of Canadian healthcare providers discussing physical activity and food requirements with women as part of a prenatal visit

| Variable | Model† Unstd β | SE of β | Std β |
|----------|----------------|---------|-------|
| Constant | 0.688 | 0.345 | |
| General practitioner (reference) | | | |
| Obstetrician | 0.022 | 0.13 | 0.009 |
| Midwife | 0.518** | 0.179 | 0.192 |
| Primary care RN | 0 | 0.160 | 0 |
| Nurse practitioner | 0.342 | 0.189 | 0.077 |
| Detailed knowledge of GWG, physical activity and nutrition guidelines | 0.277** | 0.063 | 0.229 |
| General knowledge in GWG, physical activity and nutrition | 0.311** | 0.073 | 0.22 |
| Priority level of discussing, assessing and assisting women with appropriate weight gain | 0.341** | 0.064 | 0.236 |
| Role (I am the most appropriate provider to discuss gestational weight gain) | 0.18 | 0.12 | 0.063 |
| R² | 0.434 | | |

**P<0.01.
†Model is adjusted for: urban/rural location, proportion of all patients who are pregnant and trimester of pregnancy at first visit.
GWG, gestational weight gain; RN, registered nurse; Std, standardised; Unstd, unstandardised.
One novel finding was the new insights into the different approach reported by midwives. Midwives noted that their focus on the overall well-being of the women meant they discussed physical activity and nutrition in more depth than did physicians, and they measured weight less frequently. Even after controlling for multiple other predictors, midwives were significantly more likely than other healthcare providers to report discussing physical activity and food requirements with women during routine prenatal care. In other research, patients of midwives were more likely to recall having discussed physical activity with their healthcare provider as compared with patients of general practitioners and obstetricians, and midwives themselves report providing physical activity counselling to women more frequently than other disciplines. While the present study considered physical activity and nutrition counselling practices as one composite score, there seems to be growing evidence that midwives provide more lifestyle counselling than other healthcare provider disciplines. The impact of counselling by a midwife as compared with other disciplines on the health outcomes for women is an area for future exploration.

Strengths and limitations
A major strength of this study is the use of mixed research methods. This allowed for some verification of findings between methods, and provided a broader picture of ‘who is doing what’, as well as ‘why and how are they doing it’. To our knowledge, this is the largest and most comprehensive survey on this topic to date. While prenatal care varies between countries, the topics covered in this survey are considered routine and are undertaken as part of standard prenatal care in most developed countries.

This study has limitations that should be considered. It was not possible to calculate a true response rate for the survey since the survey was distributed using email lists and social media through professional associations and networks. While this method of recruitment allowed for a wider reach, and ultimately more responses, those who responded may be more likely to engage in activities related to GWG counselling. This could lead to inflation of the reported frequency of specific GWG counselling practices. This is concerning as they are already quite low for some counselling practices and further highlights the need for targeted interventions in this area.

The qualitative interviews were only conducted in two provinces, and there is the potential that this does not accurately capture the practices and predictors in other geographic areas. However, the congruency of the qualitative and quantitative findings suggests that this is unlikely. Furthermore, a recent systematic review found few differences in barriers and facilitators to pregnancy weight management in studies from around the world, suggesting that the findings of the current study may help inform practice in various healthcare systems.

Recommendations
Interventions to implement the best practices should consider the multilevel influences on GWG counselling practices, as well as the discipline of the healthcare provider, in order to be effective at changing healthcare provider behaviours. Providers across disciplines require knowledge of GWG, physical activity and nutrition guidelines and some may need system-level changes such as more time in an appointment to help them make it a priority in their practice. A different model for dissemination of this knowledge needs consideration. Multidisciplinary clinics that include professionals with a background in nutrition and physical activity, and group educational sessions may be important in this regard. The latter approach could allow participants to discuss these issues among themselves and may provide positive reinforcement of new knowledge and help to shift old beliefs. Furthermore, discussion of healthy GWG and maintenance of a healthy weight trajectory with women by health providers is a missed opportunity for positive feedback for a healthy and potentially long-term behaviour.

Expanding discussions on GWG to a healthier lifestyle is highly relevant given the growing body of evidence related to its impact on disease in later life. Healthcare providers are well positioned to help women identify plans to change behaviour and improve health outcomes. Strong communication between healthcare providers and pregnant women is a key component to moving forward. Supporting healthcare providers to better counsel their pregnant patients on appropriate GWG is one important step towards breaking the intergenerational cycle of obesity, and improving the health of generations to come.

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