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Leisure-Time Physical Activity Patterns and Correlates Among Pregnant Women in Ontario, Canada

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Abstract Physical activity significantly impacts public health as it reduces the risk of chronic diseases and provides numerous protective factors during pregnancy. Although Canadian guidelines recommend regular physical activity for healthy pregnant women, little is known about their leisure-time physical activity patterns. This study compared the physical activity levels of pregnant and non-pregnant women and examined socio-demographic and health correlates of physical activity during pregnancy. Canadian Community Health Survey data (2005–2008) from 623 pregnant women and 20,392 non-pregnant women aged 15–49 years in Ontario, Canada were examined. The prevalence of regular physical activity (15 or more minutes on at least 3 days of the week) was 58.3 % [95 % CI 52.9, 63.4], among pregnant women and 66.9 % [95 % CI 65.8, 68.0] among non-pregnant women. However, the prevalence of meeting Canadian guidelines for physical activity during pregnancy (30 or more minutes on at least 4 days of the week) was only 23.3 %, [95 % CI 19.4, 27.7] among pregnant women and 33.6 % [95 % CI 32.7, 34.6] among non-pregnant women. Pregnant women were less likely to be meeting guidelines if they were single, divorced, separated or widowed, a visible minority, had a household income between $20,000 and $79,999, and reported being in good or fair/poor health; when it came to education, women who had completed high school were more likely to be meeting guidelines. Few pregnant women in Ontario are meeting guidelines for physical activity during pregnancy. Results indicate that promoting physical activity during pregnancy should remain a public health priority.

Keywords Exercise in pregnancy · Maternal health · Population characteristics · Social determinants of health · Public health

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Introduction

Physical activity is a key protective factor across the lifespan and has a significant impact on public health. It reduces the risk of cardiovascular disease, diabetes, cancer, hypertension, obesity, depression, and osteoporosis [1]. Physical activity during pregnancy is also important as it maintains or increases cardiovascular fitness, helps manage pregnancy-related musculoskeletal issues, helps prevent excessive weight gain, positively impacts mood and mental health, and accelerates postpartum weight loss [2]. Furthermore, pregnant women who engage in recommended amounts of moderate intensity physical activity significantly reduce their risk of gestational diabetes and pre-eclampsia [3, 4]. Gestational diabetes and pre-eclampsia are both associated with numerous negative maternal and perinatal outcomes including preterm delivery, Caesarean section, and the necessity for immediate delivery [4–6].

Physical activity thus represents an important component of reproductive health and may be particularly relevant in light of current population and public health trends. For example, while women over 35 accounted for only 4 % of first time mothers in 1983, this figure had nearly tripled to 11 % by 2005 [7]. In addition, obesity rates among Canadian adult women have more than doubled over the

last 20 years [8] and research indicates that inactivity remains a strong predictor of obesity even when factors such as age, diet, and socioeconomic status are controlled for [9]. Obesity and maternal age greater than 35 have both been identified as important risk factors in the development of gestational diabetes and pre-eclampsia [10], and physical activity can play an important role in reducing a woman's risk of developing such complications [4]. Thus, given the numerous benefits and protective factors associated with physical activity during pregnancy, Canadian guidelines recommend that all pregnant women without contraindications engage in regular aerobic and strength training exercises [11].

While current guidelines were jointly established by the Society of Obstetricians and Gynecologists of Canada and the Canadian Society for Exercise Physiology in 2003 [11], to the best of our knowledge no study has ever examined the extent to which pregnant Canadian women are meeting these recommendations. It is also unclear what characteristics are associated with physical activity during pregnancy among Canadian women. In a recent review, Gaston and Cramp [12] reported that prevalence rates for physical activity during pregnancy were low; however, there was little consistency with regard to how physical activity was measured, and population-based studies which did examine prevalence or correlates of meeting guidelines were conducted with US samples and examined adherence to US guidelines (>150 min of moderate activity per week; [13]).

In light of current trends and the need to reduce the public health burden associated with maternal-fetal disease during pregnancy, an understanding of the physical activity patterns of Canadian women is essential for implementing and evaluating effective population-level interventions. Thus, the purpose of this study was to (1) compare the extent to which pregnant and non-pregnant Canadian women are meeting current Canadian physical activity recommendations for physical activity during pregnancy and (2) examine what factors are associated with physical activity participation during pregnancy. A comparison of pregnant and non-pregnant women is vital for informing practice and exploring when physical activity promotion should begin (i.e., during pregnancy or, alternately, as part of preconception health care). Furthermore, a better understanding of what factors are associated with inactivity will help identify those population groups which should be the focus of prenatal physical activity interventions. Based on the results of previous research [12], the following two hypotheses were advanced (1) pregnant women will report lower levels of activity compared to non-pregnant women, and (2) women who are younger, married, pregnant with their first child, white, employed, more highly educated, have a higher income, and are in good health will report the highest levels of activity.

Methods

Data Source

The Canadian Community Health Survey (CCHS) is a general cross-sectional health survey covering household populations aged 12 or older. The survey excludes residents of Indian Reserves or Crown lands, institutions, full-time members of the Canadian Forces, and residents of certain remote regions. As a result, it represents approximately 98 % of Canadians living in the provinces, and 71, 90, and 97 % of individuals living in Nunavut, Yukon and Northwest Territories, respectively. Random digit dialing is used to select participants and the interviews are conducted using computer-assisted telephone interviewing methods. More information about the survey is available through Statistics Canada's Web site (www.statcan.ca).

This study was based on data collected between January 2005 and December 2008 in Ontario, Canada from women aged 15–49 years. Approximately 2 % of records were dropped because of non-response to questions on physical activity behaviors or socio-demographic variables of interest. The final analysis consisted of 623 pregnant women and 20,392 non-pregnant women.

Dependent Variables (Physical Activity Measures)

Participation in physical activities was assessed by asking participants whether they had done any leisure time physical activities over the past 3 months (yes or no). Participants who responded 'yes' were then queried regarding 22 different activities (yes or no). With the exception of a single category (gardening or yard work), all activities were recreational physical activities such as walking, swimming, bicycling, and tennis. 'Other' was used to capture any unspecified activities and a category termed 'no physical activity' was included to identify participants who had not engaged in any leisure activity. All 22 activities had a minimum MET value (metabolic equivalent) of 3 METS, an intensity level recognized as 'moderate' physical activity during pregnancy and thus appropriate to be counted towards meeting physical activity guidelines [14]. If a participant answered yes to having performed a particular activity, they were asked to report the frequency (open-ended) and duration of each activity (1–15, 16–30, 31–60 min, or more than 1 h). In addition to descriptive physical activity information, the main variables of interest were meeting or not meeting the following two physical activity cut-off levels: (1) 'regular physical activity'—leisure activity done at least 3 times per week for at least 15 min each time; and (2) 'meeting guidelines'—leisure activity done at least 4 times per week for more than 30 min each time. These two categories were

chosen to reflect current Canadian guidelines for physical activity during pregnancy which state that: (1) all women without contraindications should engage in regular moderate intensity aerobic exercise for a minimum of 15 min at least 3 days per week, and (2) women should gradually increase to 30-min sessions 4 times per week [11, 15]. Participants were classified as 'meeting' or 'not meeting' these two physical activity levels based on their responses to the aforementioned physical activity questions.

Independent Variables

Pregnancy status was determined by asking all women aged 15–49 years the question 'Are you pregnant?' The following socio-demographic and health characteristics were examined as potential physical activity correlates: age; marital status; cultural origin; socio-economic status (e.g., education, employment, household income); and number of children under 12 years. Marital status, employment, and cultural origin were grouped into two categories: married/common-law or single/divorced/separated/widowed; employed or not employed (out of work, homemaker, student, or unable to work); and white or visible minority (Chinese, Black, South Asian, Latin American, Arab, etc.). General health was assessed by asking, 'In general, would you say your health is: excellent, very good, good, fair, or poor?' These specific variables were selected based on current Canadian social determinants of health [16] and previous research on correlates of physical activity during pregnancy [12].

Analysis

The prevalence of physical activity among pregnant and non-pregnant women was calculated using cross tabulations. *T*-test and Chi-square analyses were used to determine if significant differences existed among the physical activities of pregnant and non-pregnant women. Multivariable logistic regression models provided adjusted odds ratios (OR) and 95 % confidence intervals (CIs) to address the association of several socio-demographic and health factors with physical activity for pregnant women only. Participants categorized as 'not meeting guidelines' or 'not engaging in regular physical activity' served as the reference group. PASW Statistics 18, Release Version 18.0 (©SPSS, Inc., 2009, Chicago, IL) with complex samples was used for all statistical analyses to account for the survey design effect of the CCHS. In order to produce comparable results, our statistical analyses followed that of previously published studies based on US population-based data [17, 18].

Results

Leisure-Time Physical Activity Patterns of Pregnant and Non-Pregnant Women

Approximately 85 % of pregnant women reported engaging in at least some leisure activity, 58 % reported engaging in regular physical activity (>15 min, ≥3 sessions per week), and 23 % reported meeting guidelines (>30 min, ≥4 sessions per week). Physical activity prevalence rates are presented for pregnant and non-pregnant women in Table 1. Participation in any leisure activity (regular physical activity and meeting guidelines) was lower among pregnant women than among non-pregnant women (all p-values < 0.05). The greatest proportion of pregnant women reported engaging in 1 activity compared to 5 or more activities for non-pregnant women. Although the majority of pregnant and non-pregnant women reported similar session lengths (i.e., either between 16 and 30 min or 31 and 60 min per session), a significantly larger percentage of pregnant women reported engaging in short sessions (i.e., <15 min) compared to non-pregnant women ($p < 0.05$).

The types of activities reported by pregnant and non-pregnant women meeting guidelines (>30 min, ≥4 sessions per week) are presented in Fig. 1. The most common physical activity reported by both pregnant and non-pregnant women was walking (97 and 90 %, respectively), followed by gardening/yard work (57 and 51 %, respectively), home exercises (44 and 55 %, respectively), and swimming (43 and 44 %, respectively). Except for gardening/yard work and swimming ($p > 0.05$), all activities differed significantly between groups (all $p < 0.05$).

Factors Related to Physical Activity During Pregnancy

Both the unadjusted weighted prevalence and the multivariable adjusted odds ratios predicting regular physical activity and meeting guidelines by socio-demographic and health characteristics for pregnant women are presented in Table 2. The following variables were included in the adjusted models: age; marital status; number of children; cultural origin; education; employment status; household income; and general health. Women who were older (35–49 years), had a household income between $20,000–$39,999 and reported being in fair/poor health were all significantly less likely to be engaging in regular physical activity (>15 min, ≥3 sessions per week) compared to those in each reference group (odds ratios 0.2–0.4). Marital status, number of children, cultural origin, education, and employment status were not associated with engaging in regular activity.

Table 1 Weighted prevalence of physical activity levels of pregnant and non-pregnant women aged 15–49 in Ontario, 2005–2008 CCHS

	Pregnant (n = 623) % [95 % CI]	Not pregnant (n = 20,392) % [95 % CI]
Any leisure-time physical activity		
Yes*	85.2 [80.0–89.1]	92.8 [92.1–93.4]
No*	14.8 [10.9–20.0]	7.2 [6.6–7.9]
Frequency of all leisure-time physical activity >15 min		
Regular (≥3 sessions per week)*	58.3 [52.9–63.4]	66.9 [65.8–68.0]
Occasional (≥1 and < 3 sessions per week)	15.0 [11.9–18.6]	16.1 [15.2–16.9]
Infrequent (<1 sessions per week)*	26.8 [22.0–32.2]	17.0 [16.2-17.9]
Meeting versus not meeting guidelines		
Meeting guidelines (≥4× per week, minimum 30 min)*	23.3 [19.4–27.7]	33.6 [32.7–34.6]
Not meeting guidelines (<4× per week, minimum 30 min)*	76.7 [72.3–80.6]	66.4 [65.4–67.3]
Number of activities reported		
1*	33.5 [28.5–38.8]	16.2 [15.3–17.2]
2	18.9 [15.5–22.9]	17.1 [16.2–18.0]
3	15.2 [12.1–18.8]	15.9 [15.1–16.7]
4	12.1 [9.4–15.5]	13.0 [12.3–13.8]
5 or more*	20.2 [16.3–24.9]	37.7 [36.7–38.8]
Total average time per session in activity		
<15 min*	10.1 [7.1–14.2]	5.9 [5.3–6.5]
≥16–30 min	45.1 [40.0–50.3]	44.4 [43.3–45.5]
≥31–60 min	39.6 [34.4–50.3]	44.0 [42.9–45.1]
>60 min	5.2 [3.0–8.9]	5.7 [5.1–6.4]

* Pregnant and not pregnant groups significantly different at the $p < 0.05$ level; *CI* confidence interval; *CCHS* Canadian Community Health Survey

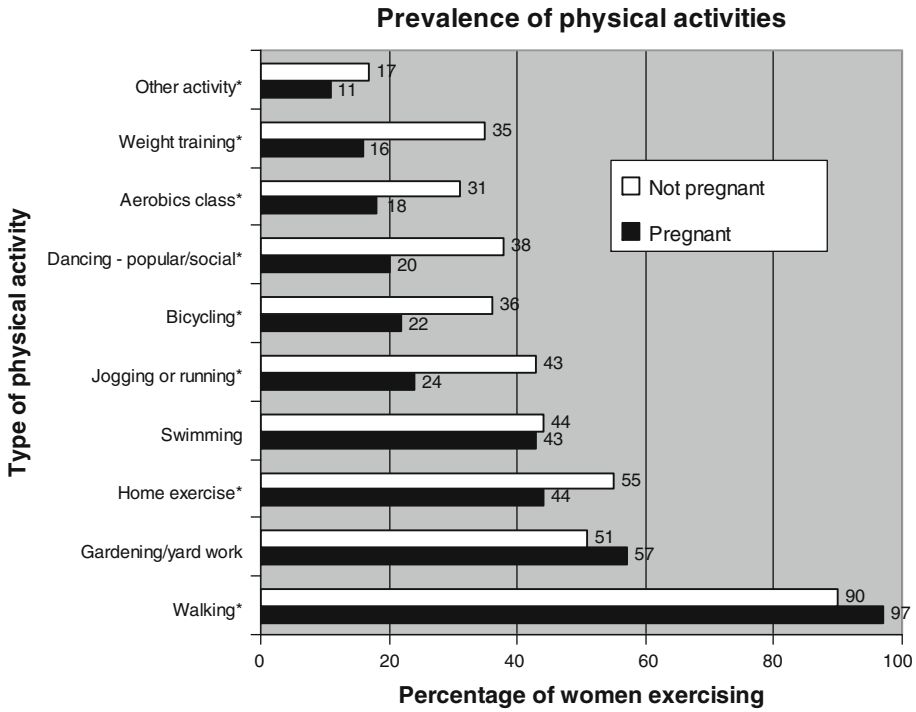

Fig. 1 Common physical activities among pregnant and non-pregnant women meeting guidelines in Ontario, 2005–2008 CCHS. *Groups significantly different at the $p < 0.05$ level

Table 2 Weighted prevalence and adjusted odds ratios (with 95 % CI) of regular physical activity and meeting physical activity guidelines among pregnant women by selected characteristics in Ontario, 2005–2008 CCHS

	Percent (n = 623)	'Regular' physical activity (>15 min, ≥3 sessions per week)		Meeting guidelines (>30 min, ≥4sessions per week)	
		Unadjusted % (SE)	Adjusted OR [95 % CI]	Unadjusted % (SE)	Adjusted OR [95 % CI]
Age in years					
15–24	19.7	65.6 (5.6)	1.0 [Ref]	26.2 (5.0)	1.0 [Ref]
25–34	65.3	60.7 (3.4)	0.9 [0.4–1.9]	23.3 (2.7)	0.7 [0.3–1.6]
35–49	15.0	43.3 (6.1)	0.4 [0.2–0.9]*	20.7 (4.9)	0.4 [0.1–1.2]
Marital status					
Married/common-law	84.1	58.6 (2.9)	1.0 [Ref]	24.0 (2.3)	1.0 [Ref]
Single/divorced/separated/widowed	15.9	56.2 (7.3)	0.6 [0.3–1.3]	19.0 (5.2)	0.4 [0.2–1.1]†
Number of children in household under 12					
0	43.4	66.0 (3.9)	1.0 [Ref]	23.9 (3.2)	1.0 [Ref]
1	38.1	52.4 (4.5)	0.8 [0.5–1.3]	21.5 (3.4)	1.2 [0.7–2.1]
2	18.4	50.6 (5.8)	0.7 [0.3–1.4]	25.4 (5.0)	1.1 [0.5–2.3]
Cultural origin					
White	80.9	61.0 (3.0)	1.0 [Ref]	26.6 (2.6)	1.0 [Ref]
Visible minority	19.1	49.3 (5.8)	0.7 [0.4–1.2]	16.3 (4.0)	0.5 [0.3–0.9]*
Education					
<High school	11.0	59.7 (9.2)	1.0 [Ref]	22.6 (6.4)	1.0 [Ref]
High school	14.8	60.4 (6.1)	1.9 [0.6–6.7]	34.0 (6.4)	3.5 [1.2–10.1]**
Some post-secondary	4.7	66.7 (13.2)	1.1 [0.2–5.4]	31.6 (11.0)	2.6 [0.7–10.4]
Post-secondary+	69.6	57.1 (3.3)	0.9 [0.3–3.3]	21.0 (2.4)	1.1 [0.4–3.1]
Employment					
Yes	73.1	59.3 (3.2)	1.0 [Ref]	22.3 (2.4)	1.0 [Ref]
No	26.9	54.9 (5.1)	1.1 [0.7–1.9]	27.2 (4.4)	1.6 [0.8–3.0]
Household income					
<$19,999	8.6	62.0 (9.7)	1.0 [Ref]	28.9 (9.3)	1.0 [Ref]
$20,000–$39,999	15.7	37.0 (6.9)	0.3 [0.1–0.9]**	14.8 (3.8)	0.3 [0.1–0.9]*
$40,000–$59,999	17.9	52.4 (6.5)	0.6 [0.2–1.8]	18.3 (4.5)	0.4 [0.1–1.1]†
$60,000–$79,999	16.8	56.5 (6.2)	0.6 [0.2–1.8]	17.5 (5.0)	0.3 [0.1–0.9]*
$80,000+	41.1	67.3 (4.1)	1.1 [0.4–2.2]	29.1 (3.7)	0.7 [0.2–2.0]
General health					
Very good/excellent	75.9	59.7 (3.1)	1.0 [Ref]	26.3 (2.6)	1.0 [Ref]
Good	21.3	56.7 (6.0)	0.8 [0.5–1.5]	15.1 (3.6)	0.2 [0.0–1.1]†
Fair/poor	2.9	23.9 (10.0)	0.2 [0.0–0.6]*	8.3 (6.3)	0.4 [0.2–0.7]**

CI confidence interval; *CCHS* Canadian Community Health Survey; *OR* odds ratio, *SE* standard error

* $p < 0.05$, ** $p < 0.01$, † $p < 0.1$

Several differences emerged when examining trends related to meeting guidelines during pregnancy (>30 min, ≥4 sessions per week). Women who were single, divorced, separated or widowed, a visible minority, had a household income between $20,000 and $79,999, and reported good, fair, or poor health were significantly less likely to be meeting guidelines compared to those in each reference group (odds ratios 0.2–0.5). In addition, women who had completed high school (but not post-secondary education) were 3.5 times more likely to be meeting guidelines than women with less than a high school education. Age, marital status, number of children, and employment status were not associated with meeting guidelines.

Discussion

This is the first study to examine the prevalence of meeting physical activity guidelines during pregnancy among women in Ontario, Canada. The findings indicate that

fewer than one in four women met current Canadian guidelines for exercise during pregnancy. Because pregnant women who fail to engage in adequate amounts of physical activity are at an increased risk for several complications, these findings confirm that inactivity during pregnancy remains a significant public health concern.

Consistent with our hypotheses and previous research, these results indicate that pregnant women are less active compared to non-pregnant women [12]. Although the present study cannot draw any conclusions regarding physical activity changes from pre-pregnancy to pregnancy, these differences do mirror those of longitudinal studies which indicate that women decrease their level of physical activity from pre-pregnancy to pregnancy [12, 19]. It should be noted, however, that only 34 % of non-pregnant women reported exercising for at least 30 min on 4 or more days of the week. Because pre-pregnancy physical activity is one of the most consistent predictors of physical activity during pregnancy [12], this finding highlights the need for a lifecourse perspective in which physical activity represents an important component of preconception health.

Compared to population-based research conducted in the US, these results suggest that a higher percentage of pregnant women in Ontario may be engaging in recommended amounts of weekly physical activity compared to their US counterparts (23 vs. 11–15 %, respectively; [17, 18]). Although differences between US and Canadian recommendations make it difficult to compare the prevalence rates for meeting guidelines, pregnant women from Ontario were also more likely to report engaging in any physical activity compared to pregnant US women (85 vs. 65 %, respectively; [17, 18]). Population characteristics may, at least in part, account for this difference. For example, while only 19 % of the women in the present study reported being a visible minority, this figure ranged from 29–33 % in the US studies. Such differences are relevant given the fact that both the present results and the evidence-base to date [12] indicate that white women are more likely than non-white women to participate in physical activity during pregnancy. Furthermore, the differences in context between the two countries warrants further investigation. For instance, future examination regarding the political, environmental and socio-cultural factors that influence physical activity initiatives and behaviors among these populations is needed.

The types of activities reported by pregnant women are consistent with previous findings [19] and concur with recommendations that pregnant women choose low-impact activities (e.g., walking) [11]. Furthermore, pregnant women were more than twice as likely to report engaging in a single activity compared to non-pregnant women. Because engaging in a variety of exercises has been shown to decrease drop-out rates and lead to greater motivation and adherence [20], prenatal health care providers should emphasize that multiple activities are safe and beneficial during pregnancy.

One activity which merits individual discussion is weight training. Although weight training plays an important role in maintaining good posture, facilitating weight bearing, and strengthening the muscles of labor [21], only 16 % of pregnant women and 35 % of non-pregnant women in this study reported engaging in this type of activity. Weight training also strengthens bones and helps to prevent osteoporosis later in life. Therefore, future programming aimed at increasing awareness and promoting the benefits of weight training among all women of reproductive age will also benefit the health of women throughout the life course trajectory.

While it is encouraging to find that over 85 % of both pregnant and non-pregnant women reported engaging in sessions lasting at least 16 min, a larger percentage of pregnant women engaged in sessions lasting less than 15 min compared to non-pregnant women. Although physical activity can be accumulated throughout the day, dose–response studies have shown that bouts must be a minimum of 10 min in length to be associated with any significant health benefits [1].

Consistent with previous research [12] and our hypotheses, maternal age greater than 35 and fair or poor health were associated with not engaging in regular activity; and being single, divorced, separated or widowed, a visible minority, and in good, fair or poor health were associated with not meeting guidelines. Despite the demographic differences between Canada and the US, these findings indicate that similar at-risk populations exist as far as physical inactivity is concerned. Differences in physical activity levels by employment level or number of children were not found. While the results of previous research are equivocal as far as employment status is concerned, previous studies have consistently demonstrated that first time mothers are more likely to be active compared to women with other children at home [12].

In contrast to previous research [12], this study found that women who had completed high school but not university and who had a household income of $19,999 or less or $80,000 or greater were *most* likely to be meeting guidelines. Given the relationship between education and income, these two findings may be related. For example, participants with lower incomes and a high school education may be more likely to report bouts of walking for transportation while those with a household income greater than $80,000 may be more likely to have gym memberships and greater leisure time.

From a public health perspective, these results have important research, practice, and policy implications.

Future studies should focus on increasing our understanding of physical activity barriers during pregnancy and the preconception period and exploring ways in which this population could be motivated to become more active. With respect to practice, the variability among pregnant women's physical activity levels supports the importance of stage-matched interventions [22]. For example, different intervention strategies should focus on promoting physical activity initiation among inactive women, increasing activity among those who are exercising but not yet meeting guidelines, and encouraging maintenance among women who are already active. Physical activity should also be addressed during preconception care, particularly for women who are obese, older, or have a history of gestational diabetes.

In terms of policy, professional organizations such as the Society of Obstetricians and Gynecologists of Canada and the Canadian Society for Exercise Physiology need to remain vigilant in ensuring that their members stay up-to-date with respect to current guidelines for physical activity during pregnancy. A recent US study, for example, found that 60 % of family physicians and 86 % of obstetricians were not familiar with the current guidelines [23]. Prenatal providers also need to be aware of the socio-demographic characteristics associated with inactivity in order to provide early behavioral counseling to those women who are at an increased risk.

While this study is the first to examine physical activity among pregnant women in Ontario, Canada, several limitations must be acknowledged. First, the self-reported nature of these data serves as a limitation. Objective physical activity measures (i.e., accelerometers) should be used whenever possible to reduce social desirability and recall bias [24]. Second, it is unknown to what extent our decision to preserve the original CCHS groupings could have affected our analyses. For example, categorizing women who were homemakers as 'not employed' overlooks the possibility that these women may not have any more free time than their employed counterparts. Third, CCHS uses random digit dialing and this data collection method excludes individuals who do not have a telephone or who exclusively rely on a cell phone. Fourth, gestational age was not collected, and the homogenous grouping of pregnant women masks any differences of physical activity throughout the trimesters. Fifth, while marital status emerged as a predictor of physical activity during pregnancy, future research should also examine the relationship between pregnancy intentions (i.e., intended vs. unintended pregnancy, happiness with pregnancy) and physical activity, particularly since at least 40 % of pregnancies in Canada are unintended (or unplanned) [25]. Sixth, the sample size of the present study was smaller than that of other cross-sectional, population-based reports examining physical activity during pregnancy [17, 18]. Lastly, the cross-sectional nature of the CCHS precludes any inferences about causality or physical activity changes over time. For instance, this study was not able to ascertain whether lower levels of physical activity lead to poor/fair general health or whether poor/fair health leads to lower levels of physical activity. Future longitudinal studies are needed in order to address these limitations as well as compare women's physical activity before and during pregnancy.

Few Canadian women are meeting guidelines for physical activity during pregnancy. Lack of physical activity represents a modifiable behavioral risk factor which can impact the health of women and babies. Given the adverse consequences associated with inactivity, these findings have significant implications for public health and suggest that continued efforts to promote physical activity among pregnant women and those planning to start families should remain a public health priority.

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