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International Comparison of Common Risk Factors of Preterm Birth Between the U.S. and Canada, Using PRAMS and MES (2005–2006)

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Abstract

Preterm birth (PTB) is a leading cause of newborn deaths and morbidities. The pregnancy risk assessment monitoring system (PRAMS) from the U.S., and the maternity experiences survey (MES) from Canada, which was modeled from PRAMS, were used to examine between-country differences in risk factors of preterm birth. The adjusted risk ratio and population attributable fraction (PAF) were calculated for modifiable and semi-modifiable risk factors of PTB, and all measures were compared between the U.S. and Canada. PTB was defined here as a live singleton birth between 28 and 37 completed weeks gestation (using the clinical gestational age estimate) where the baby was living with the mother at the time of the survey. The PTB risk was 7.6 % (SE = 0.2) in the U.S. and 4.9 % (SE = 0.3) in Canada. The a priori high risk category of factors was almost always more prevalent in the U.S. than Canada, suggesting broad social differences, but individually most of these differences were not associated with PTB. The underlying risk of PTB was generally higher in the U.S. in both the higher risk and referent categories, and the risk ratios for most risk factors were similar between the countries. The primary exception was for recurrence

of PTB, where the risk ratio (RR) and PAF were much higher in Canada. We observed between-country differences in both the prevalence of risk factors and the adjusted RR. Further between-country comparisons may lead to important inferences as to the influence of modifiable risk factors contributing to PTB.

Keywords

Preterm birth; United States; Canada; Recurrent preterm birth; BMI; Maternal age; Stress

Introduction

Preterm birth (PTB; a birth before 37 completed weeks gestation) is a leading cause of neonatal deaths [1], and also leads to a number of other problems including, but not limited to, jaundice, breathing problems, longer hospital stays, feeding and digestive problems, vision and hearing loss, cerebral palsy, intellectual disabilities, and decreased academic performance [2]. Globally, about 15 million babies, representing more than 10 percent of all births, are born preterm each year [3].

Substantial between-country variation exists in the reported preterm birth rate, even between countries that are perceived as having similar population demographics and geography; for example, the preterm birth rate is 12.0 % in the United States (U.S.) compared to 7.9 % in Canada [4, 5]. Some of this difference can be explained by differences in reporting of gestational age [6], but a significant portion of the variation remains unexplained.

Studying within-country temporal changes in PTB has contributed to an understanding of important modifiable risk factors affecting PTB in both the U.S. and Canada [7–10], and studying between-country contemporaneous differences in PTB may also be helpful in characterizing inter-country differences in the relative contribution of known risk factors. International comparisons of risk factors for PTB have been limited by heterogeneity in how and which variables are collected, and by incompleteness or inadequacy of data [11]. The Pregnancy Risk Assessment Monitoring System (PRAMS) from the U.S. and the Canadian maternity experiences survey (MES) are separate complex sample surveys designed to measure a variety of maternal attitudes, experiences, perceptions, practices, and knowledge before, during, and shortly after pregnancy. As PRAMS was a partial model for the development of MES [12, 13], a U.S.-Canada comparison of risk factors for preterm birth is possible allowing for inclusion of variables not available in vital statistics datasets.

We aimed to compare the distributions and magnitude of association of common risk factors for preterm birth in the U.S. and Canada.

Methods

Surveys

PRAMS is an ongoing, multiple-year (1988-present) surveillance project that samples mothers of live born infants from U.S. birth certificates [14]. For this study, we used data from the PRAMS Phase 5 questionnaire for 2006 to align with MES. A stratified systematic

sample of 100 to 250 new mothers per month (1,000 to 3,400 per year per state) was drawn from all eligible birth certificates in each participating state, with oversampling of certain higher risk populations and low birth weight infants, and with many states stratifying on mother's race or ethnicity. Women were mailed a questionnaire, and women that did not complete the mailed questionnaire were then contacted to complete an interviewer-administered questionnaire by telephone. In 2006, 23 states and New York City were participating in PRAMS, representing about a third of all U.S. births. All participating PRAMS states had at least a 70 % response rate, totaling 34,020 U.S. respondents in 2006.

MES is a representative survey of Canadian women who gave birth in late 2005 to mid 2006 [12, 13]. MES used a stratified random sample of the 2006 Canadian Census, to find eligible women. Specifically, all mothers 15 years of age and older who had a recent singleton live birth from which the infant was still living with the mother at the time of data collection (in 2006 and 2007) were randomly sampled, with the sample stratified by province and territory. The majority of surveys were conducted by telephone, and 78 % of the women contacted completed an interview, totaling 6,421 Canadian respondents.

Both PRAMS and MES used non-response weighting, based on demographic information available in birth certificates or the census, respectively, in an attempt to reduce non-response bias [14, 15]. The assumption of non-response weighting is that non-respondents would have provided similar responses as respondents within similar demographic groups. Although it is possible that non-responders could be different in unmeasured characteristics associated with that outcome, the relatively high response rates (of 70 and 78 %) should be helpful in minimizing bias.

Ethics Approval

Our project was deemed “not human subjects” research by the Emory Institutional Review Board (IRB00068675) and was approved by the Conjoint Health Research Ethics Board at the University of Calgary (E-24851). We are in compliance with the Tri-Council Policy and Aboriginal Ethical research guidelines (Page 17, article 2.2; Pages 113–114, Section 7 and 8).

Variables

Most of the variables that were used came directly from questions on the MES or PRAMS questionnaires, although several variables in the U.S. dataset came from birth certificates linked to PRAMS. Variables of interest were chosen a priori, including variables which indicate race/ethnicity, maternal age, parity, previous PTB, income, number of stressful life events, body mass index (BMI), maternal smoking during pregnancy, marital status, pregnancy intention, barriers to prenatal care, maternal education, and maternal alcohol use during pregnancy. Continuous or multi-category variables were recategorized into meaningful groups in terms of both the risk of preterm birth and also meaningful public health goals (e.g. graduating from high school). We were primarily interested in those variables that are modifiable, at least in part. The race/ethnicity variable is not modifiable, and was included only as an important confounder. Data on other races/ethnicities in Canada, were not available. Data on other races/ ethnicities in the U.S. were available, but

preliminary analyses showed that only blacks were found to have appreciable differences in preterm birth, so we combined race/ethnicity categories.

Specific wording of survey questions are shown in the supplementary table 1. Because MES was in part modeled after PRAMS [12, 13], the variables were often similar and sometimes identical in wording. However, some variables, including marital status, pregnancy intention, barriers to prenatal care initiation, maternal education, and maternal alcohol use were not included in our final analyses due to either problems of comparability between the PRAMS and MES wording of the survey question, or because the data suggested that they were not important confounders or risk factors of preterm birth. We show data on this group of variables only in the supplementary table 2). Our data did not allow us to differentiate between medically indicated and elective Cesarean sections, and due to this limitation we do not include the Cesarean section variable in our primary analysis. Elective Cesarean section may be of importance in PTB, as others have observed elective Cesarean sections before 37 completed weeks gestational age, although most elective Cesarean sections occur after 37 weeks [16]. Temporal increases in Cesarean section rates within both the U.S. and Canada have also coincided with rises in PTB rates [7–10], until recently, when in 2007 PTB rates began to decline in the U.S., followed by Cesarean section rates beginning to decline in 2010 [5]. Because of its possible importance, we also ran a separate sensitivity analysis that included the Cesarean section variable in the adjusted model (supplementary table 2).

Outcome Variable

Our outcome of interest was preterm birth, defined in this study as live singleton birth between 28 and 37 completed weeks gestation where the baby was also alive at the time of the survey. We limited the lower cut off to 28 weeks because coding of gestational age is more consistent after 28 weeks, and the majority of preterm infants are born after 28 weeks. We limited the PRAMS data to cases where the infant was living at the time of the survey to correspond with the MES sampling frame. Furthermore, in PRAMS, the clinical estimation of gestational age was used instead of the last menstrual period estimation, as it has been shown to more accurately represent the clinical estimate which is used in Canada [6].

Statistical Methods

We reported the overall population weighted distributions for each of the risk factors and the category specific preterm birth risk in both the U.S. and Canada. We calculated both the unadjusted and adjusted risk ratios for PTB using log-binomial regression. The fully adjusted model was chosen based on previous literature, and based on the associations observed in bivariate analyses. The preterm birth population burden of each risk factor was measured using the population attributable fraction (PAF for single level exposure = (proportion of exposed among the cases)* ((RR – 1)/RR)); the equation allows for an adjusted risk ratio to be used [17]. The PAF is a measure of the portion of PTB that would be eliminated if a modifiable causal risk factor were to be eliminated, and so we reported the PAF only if the variable was: (1) modifiable (at least in part), and (2) plausibly causal. Because the modifiability and the causality of some variables may be debatable or not well understood, we interpret the PAF more loosely than is often used in the literature, and use it

as a relative indicator of the population impact. The primary goal of our study was to compare and contrast all the aforementioned measures between the U.S. and Canada.

In all analyses, the complex sampling from PRAMS and MES was accounted for, so as to be representative of participating U.S. states and of the 2006 Canadian census, respectively. All MES analyses were computed in STATA (Stata Corp, College Station, Texas) and the corresponding PRAMS analyses were computed in STATA and SUDAAN (RTI, Chapel Hill, NC).

Results

The U.S. almost always had a higher prevalence than Canada of the a priori high risk category across risk factors (Table 1). Specifically, U.S. mothers were more likely than Canadian mothers to be in their teens (10 vs. 3 %), to have reported a lower dollar income at each of the tertile cut-points (dollar incomes shown below Table 1), to have experienced three or more stressful life events in the 12 months before delivery (29 vs. 17 %), or to have been overweight or obese (overweight: 24 vs. 22 %; obese: 19 vs. 14 %). The notable instances where U.S. women had a lower prevalence of the a priori risk category were for maternal age 35 and older (12 vs. 18 %) and for underweight BMI (4.9 vs. 6.1 %). This trend of the U.S. having a higher prevalence of the a priori high risk category was also seen across other risk factors of secondary interest, including marital status, pregnancy intention, barriers to prenatal care initiation, maternal education, and Cesarean section (see supplementary table 2).

The overall population weighted risk of preterm birth (using a restricted definition of PTB) was 7.6 % (SE = 0.2) in the U.S. and 4.9 % (SE = 0.3) in Canada. When comparing the PTB percentage by risk factor, the overall trend was that the PTB risk in the U.S. was consistently several percentage points higher than in Canada. The only instance where the U.S. had a lower PTB risk than Canada in any category was among women with a history of previous PTB (22.0 vs. 26.0 %).

In spite of the differences in the distribution of risk factors between these two countries, there were considerable similarities between the U.S. and Canada when comparing the unadjusted risk ratios. The primary exceptions, where the unadjusted risk ratios were very different between the U.S. and Canada, were for women with a history of preterm birth (US: RR = 3.9, 95 % CI 3.4–4.4; Canada: RR = 25.7 95 % CI 16.5–40.0) and for primiparous women (US: RR = 1.4; 95 % CI 1.2–1.5; Canada: RR = 5.1; 95 % CI 3.6–8.5).

The fully adjusted model accounted for race/ethnicity, maternal age, parity/PTB history, income, stressful life events, BMI, and smoking. The adjusted RRs that differed most notably between countries, were for women with a history of preterm birth (US: RR = 3.9; 95 % CI 3.4–4.6; Canada: RR = 25.4; 95 % CI 14.6–43.9), and for primiparous women (US: RR = 1.5; 95 % CI 1.3–1.7; Canada: RR = 7.1; 95 % CI 4.2–11.9). A number of other variables had statistically significant associations on one or both countries. Having three or more stressful life events was associated with PTB in both countries (US: RR = 1.1; 95 % CI 1.0–1.3; Canada: RR = 1.3; 95 % CI 1.0–1.9). The RR was statistically significant in the

U.S. (but not Canada), for underweight BMI (RR = 1.3; 95 % CI 1.0–1.6), and smoking (RR = 1.4; 95 % CI 1.2–1.6), although it should be noted that the point estimates were similar for Canada, which had a smaller sample size. Finally, the RR for maternal age over 35 was marginally significant only in Canada (RR = 1.4; 95 % CI 1.0–2.0).

The PAFs varied both in magnitude and in the relative order of importance in the U.S. and Canada (Table 2). The most notable differences were for women with a history of preterm birth (13.8 vs. 36.9 %, respectively), and for advanced maternal age (1.1 vs. 6.2 %). In both countries, but especially in the U.S., much of the PTB risk remains unexplained.

In the sensitivity analysis including the Cesarean section variable, we found U.S. mothers were more likely than Canadian mothers to have delivered their baby via Cesarean section (30 vs. 26 %; supplementary table 2). In the adjusted analyses we found associations between Cesarean section and PTB in both the U.S. and Canada (US: RR = 1.7; 95 % CI 1.5–1.9; Canada: RR = 1.3; 95 % CI 1.0–1.7) and the PAFs were also higher in the U.S. than Canada (17.1 vs. 8.5; supplementary table 3).

Discussion

We observed that Canadian women with a history of PTB had a much higher PTB risk than similar U.S. women. Using the adjusted PAF%, the ‘drivers’ of PTB were very different in the U.S. and Canada, with the most notable difference being again in the risk of PTB among women with a history of PTB.

It was already known that recurrence of PTB was an important contributor to the PTB burden in both countries [18–20]. Several population-based studies in the U.S. have measured the risk of recurrent PTB at between 19 and 26 %, or about a three to seven fold increase when comparing to a referent group [18–21]. Our risk estimates in both countries were similar to previously reported risk estimates, but the Canadian RR of 25.7 (95 % CI 16.5–40.0) is well outside previous estimates for the RR. The high RR for recurrence (and also primiparity) in Canada is primarily driven by the low observed risk of PTB of only 1 % in the referent group—multiparous women with no PTB history—and presents a stark contrast to the 5.7 % baseline risk for this group of women in the U.S. It is possible that the PAF and the low PTB risk in the reference group may indicate that factors related to biology or heritability influence the risk of recurrence in the absence of other environmental and lifestyle factors known to influence PTB. We were not able to find any other study or national dataset from Canada that reported the risk of PTB risk among this subset of multiparous women with no PTB history.

The PRAMS and MES questionnaires varied in their measures of PTB history, with PRAMS asking about the preceding pregnancy, and MES asking about any PTB history. For six of the participating PRAMS states, we also had access to a birth certificate variable that captured PTB history from any previous pregnancy (these states used a different version of the birth certificate), and using these data we performed a sensitivity analysis to understand how the estimates might change with different recurrence definitions. We observed that the magnitude of the risk ratio and the PAF in the sensitivity analysis were not meaningfully

different from our original U.S. estimates, suggesting that important between-country differences in PTB recurrence persist.

The emphasis of the paper was on risk factors that are at least in part modifiable, and for most of these risk factors, the U.S. had a higher prevalence of women in the a priori risk category than Canada, and the baseline risk of PTB also tended to be several percentage points higher in the U.S. than Canada. While the modifiability of some of the risk factors under study is debatable, between-country differences in prevalence suggests modifiability in some way. Even though some of the modifiable factors under study were not associated with PTB in this study, they still may represent areas of public health emphasis, as these risk factors are not unique to PTB.

We measured several variables, including maternal stress, barriers to prenatal care, and mode of delivery, which might be associated with differences between the U.S. and Canada in access and delivery of prenatal and preconception health care. We found marginally significant positive associations for stressful life events and PTB in both countries, but we note that the stressful life events questions addressed in the MES and PRAMS surveys were not closely related to health care. The effects of stress on PTB are not well understood, as results have varied in previous studies [22]. We did not see evidence that barriers to prenatal care initiation were associated with PTB in either country (supplementary table 2), although the quality of this variable is uncertain. This was not surprising as other study results are conflicting as to the impact of prenatal care on PTB [22]. There is some evidence from our study of between-country differences in the association between Cesarean section and PTB. It is possible that obstetric practices and policies related to Cesarean deliveries may vary slightly between the two countries, although differing Cesarean section rates may also be due to other factors like obesity, which also increases the risk for Cesarean delivery [23]. Other aspects of these two country's health delivery systems were not captured, and results should be interpreted accordingly.

Our study has a number of other limitations. It is cross-sectional, and there is potential for unmeasured confounding. However, the primary goal of this research was to compare risk profiles using comparable models in two different countries. Another limitation is that there were slight differences in the data collection, sampling schemes, and survey questions between these countries, although the general constructs being compared were very similar, and many of the methodologies and even the wording of questions were identical. Our data are limited in that we were unable to distinguish between spontaneous or iatrogenic labor and delivery; also, for the Cesarean section sensitivity analysis, we were not able to distinguish between elective or medically indicated Cesarean sections. Our study has both strengths and limitations related to generalizability. In order to increase internal validity, we limited the PTB definition and so results should be generalized as such. We performed a sensitivity analysis including births earlier than 28 weeks and found that it did not change the adjusted risk ratios appreciably. However, the actual risks of PTB that we report will be slightly lower than what it would have been, had we also included very early preterm-births. Modifiable risk factors of PTB, including several of the risk factors under study, are thought to contribute more to later PTB than to early or moderate PTB. Although we were not able to stratify our results as either early, moderate, or late-preterm, it is likely that any observed

between-country differences in PTB would primarily be among late-preterm births. Finally, in spite of high response rates and non-response weighting, respondents may have been different than non-respondents. However, use of representative population-based samples improves generalizability and is a strength of our study.

Conclusions

To our knowledge, this is the first study to directly compare potentially modifiable PTB risk factors between the U.S. and Canada, and to use the PAF as an approximate way to compare the between-country influences of these risk factors on the burden of PTB. International comparisons may facilitate the identification of risk factors and the relative importance of drivers of preterm birth in different settings, thus indicating how preventative activities should be directed in different settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Demographic and risk factor distributions for PTB in the USA and Canada

	Distribution of covariates (SE) ^a		% of births born preterm (SE) ^a		Distribution of covariates among preterm births (SE) ^{a,b}	
	USA	Canada	USA	Canada	USA	Canada
Number of respondents	34,020	6,421				
Overall PTB (28–37 weeks) ^c	7.6 (0.2)	4.9 (0.3)	7.6 (0.2)	4.9 (0.3)		
<i>Race/ethnicity</i>						
Non-aboriginal		94.5 (0.3)		5.0 (0.3)		92.5 (1.7)
Aboriginal		5.5 (0.3)		6.9 (1.6)		7.5 (1.7)
Black	17.0 (0.2)		10.2 (0.4)		22.9 (0.9)	
White	73.2 (0.3)		7.0 (0.2)		67.4 (1.1)	
Other	9.9 (0.2)		7.5 (0.6)		9.8 (0.7)	
<i>Maternal age</i>						
19	10.0 (0.3)	3.0 (0.1)	8.8 (0.6)	5.5 (1.5)	11.6 (0.7)	3.3 (0.9)
20–24	24.6 (0.4)	13.1 (0.4)	7.5 (0.4)	5.7 (0.9)	24.5 (1.1)	15.1 (2.2)
25–34	53.1 (0.4)	66.4 (0.6)	7.3 (0.2)	4.5 (0.3)	51.4 (1.2)	61.2 (3.0)
35+	12.3 (0.3)	17.6 (0.5)	7.7 (0.5)	5.7 (0.8)	12.5 (0.8)	20.4 (2.4)
<i>Parity/previous PTB</i>						
First live birth	41.3 (0.4)	45.8 (0.4)	7.8 (0.3)	5.6 (0.4)	42.6 (1.2)	51.9 (3.0)
Previous live birth (no history of PTB)	52.3 (0.4)	47.0 (0.5)	5.7 (0.2)	1.0 (0.2)	39.0 (1.2)	9.7 (1.9)
History of PTB	6.4 (0.2)	7.2 (0.3)	22.0 (1.1)	26.0 (2.2)	18.4 (0.9)	38.4 (3.0)
<i>Income^d</i>						
Lower tertile	20.4 (0.4)	17.1 (0.5)	8.4 (0.4)	5.6 (0.8)	22.7 (1.0)	19.3 (2.5)
Middle tertile	43.4 (0.4)	49.5 (0.7)	8.1 (0.3)	4.7 (0.4)	46.4 (1.3)	47.9 (3.2)
Upper tertile	36.2 (0.4)	33.4 (0.6)	6.4 (0.3)	4.7 (0.5)	30.9 (1.2)	32.8 (3.0)
<i>Stressful life events^e</i>						
<3 stressful events	71.4 (0.4)	82.9 (0.4)	7.0 (0.2)	4.7 (0.3)	65.8 (1.2)	79.9 (2.2)
3 stressful events	28.6 (0.4)	17.1 (0.4)	9.1 (0.4)	5.8 (0.7)	34.2 (1.2)	20.1 (2.2)
<i>BMI (4 groups)</i>						
<18.5	4.9 (0.2)	6.1 (0.3)	9.8 (0.9)	7.2 (1.4)	6.4 (0.6)	9.0 (1.7)

	Distribution of covariates (SE) ^a		% of births born preterm (SE) ^b	Distribution of covariates among preterm births (SE) ^{a,b}	
	USA	Canada		USA	Canada
18.5–24.9	52.0 (0.4)	58.6 (0.7)	7.3 (0.3)	49.9 (1.2)	50.4 (2.9)
25–29.9	23.8 (0.4)	21.7 (0.5)	7.3 (0.4)	22.7 (1.1)	23.7 (2.6)
>30	19.3 (0.3)	13.6 (0.5)	8.3 (0.4)	21.1 (1.0)	17.1 (2.1)
<i>Smoking during pregnancy</i>					
No	88.3 (0.3)	89.5 (0.4)	7.2 (0.2)	83.8 (0.9)	84.9 (2.1)
Yes	11.7 (0.3)	10.5 (0.4)	10.5 (0.6)	16.2 (0.9)	15.1 (2.1)

^a All percentages, standard errors, risk ratios, and confidence intervals account for the complex sample design

^b The probability of exposure among the cases of PTB. This is a component of the PAF equation. (PAF = (probability of exposure among cases)*((RR–1)/RR)))

^c PTB was defined in this study as live singleton births between 28 and 37 completed weeks gestation, where the baby was also alive at the time of the survey

^d We were constrained by our choices for cut points to use the approximate 20th percentile for both countries as the low income cut point, which translates to an income of 10,000 U.S. dollars and 30,000 Canadian dollars, and the approximate 66th percentile for the upper income cut point, which translates to an income of 50,000 U.S. dollars and 80,000 Canadian dollars

^e The stressful life events scale was dichotomized similar to Kingston et al. (24)

Table 2

Unadjusted RR, adjusted RR, and adjusted PAF for PTB in the U.S. and Canada

	Unadjusted RR (95 % CI) ^d		Adjusted ^a RR (95 % CI) ^b		Adjusted ^a PAF ^c %	
	USA	Canada	USA	Canada	USA	Canada
<i>Race/ethnicity</i>						
Other	Ref	Ref	Ref	Ref		<i>d</i>
Aboriginal		1.4 (0.9–2.2)		1.3 (0.7–2.2)		<i>d</i>
Black	1.5 (1.3–1.6)		1.4 (1.2–1.6)		<i>d</i>	
White	Ref		Ref			
Other	1.1 (0.9–1.3)		1.1 (0.9–1.3)		<i>d</i>	
<i>Maternal age</i>						
19	1.2 (1.0–1.4)	1.3 (0.9–1.8)	0.9 (0.7–1.1)	0.8 (0.3–1.8)	<i>d</i>	<i>d</i>
20–24	1.0 (0.9–1.2)	1.2 (0.7–2.2)	0.8 (0.7–0.9)	1.1 (0.7–1.7)	<i>d</i>	<i>d</i>
25–34	Ref	Ref	Ref	Ref		
35+	1.1 (0.9–1.2)	1.3 (0.9–1.7)	1.1 (0.9–1.3)	1.4 (1.0–2.0)	1.1	6.2
<i>Parity/previous PTB</i>						
First live birth	1.4 (1.2–1.5)	5.1 (3.6–8.5)	1.5 (1.3–1.7)	7.1 (4.2–11.9)	<i>d</i>	<i>d</i>
Previous live birth (no history of PTB)	Ref	Ref	Ref	Ref		
History of PTB	3.9 (3.4–4.4)	25.7 (16.5–40.0)	3.9 (3.4–4.6)	25.4 (14.6–43.9)	13.8	36.9
<i>Mode of delivery</i>						
Vaginal						
Cesarean						
<i>Income^e</i>						
Lower tertile	1.0 (0.9–1.2)	1.2 (0.9–1.7)	1.0 (0.8–1.1)	0.8 (0.6–1.2)	<i>d</i>	<i>d</i>
Middle tertile	Ref	Ref	Ref	Ref		
Upper tertile	0.8 (0.7–0.9)	1.0 (0.8–1.3)	0.9 (0.8–1.0)	1.2 (0.9–1.6)	<i>d</i>	<i>d</i>
<i>Stressful life events^f</i>						
<3 stressful events	Ref	Ref	Ref	Ref		
3 stressful events	1.3 (1.2–1.4)	1.2 (0.9–1.6)	1.1 (1.0–1.3)	1.3 (1.0–1.9)	3.5	5.1
<i>BMI (4 groups)</i>						

	Unadjusted RR (95 % CI)		Adjusted ^a RR (95 % CI) ^b		Adjusted ^d PAF ^c %	
	USA	Canada	USA	Canada	USA	Canada
<18.5	1.3 (1.1–1.6)	1.7 (1.1–2.6)	1.3 (1.0–1.6)	1.3 (0.7–2.2)	1.4	1.9
18.5–24.9	Ref	Ref	Ref	Ref		
25–29.9	1.0 (0.9–1.1)	1.3 (0.9–1.7)	0.9 (0.8–1.1)	1.1 (0.8–1.5)	<i>d</i>	<i>d</i>
>30	1.1 (1.0–1.3)	1.5 (1.1–2.0)	1.1 (0.9–1.1)	1.0 (0.7–1.4)	<i>d</i>	<i>d</i>
<i>Smoking during pregnancy</i>						
No	Ref	Ref	Ref	Ref		
Yes	1.5 (1.3–1.7)	1.5 (1.1–2.1)	1.4 (1.2–1.6)	1.2 (0.8–1.7)	4.3	2.3

^a Adjusted for race/ethnicity maternal age, parity/PTB history, mode of delivery, income, stressful life events, BMI, and smoking

^b All risk ratios account for the complex sample design

^c PAF = probability of exposure among the cases*((RR – 1)/RR), and uses the adjusted RR

^d PAF was not reported if the RR was null or preventive, or if the variable is not at all modifiable (e.g. Race)

^e We were constrained by our choices for cut points to use the approximate 20th percentile for both countries as the low income cut point, which translates to an income of 10,000 U.S. dollars and 30,000 Canadian dollars, and the approximate 66th percentile for the upper income cut point, which translates to an income of 50,000 U.S. dollars and 80,000 Canadian dollars

^f The stressful life events scale was dichotomized similar to Kingston et al. [24]