Chronic Perinatal Pain as a Risk Factor for Postpartum Depression Symptoms in Canadian Women

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ABSTRACT

OBJECTIVE: To examine whether problematic perinatal pain is associated with postpartum depression (PPD) symptoms in a large nationally representative sample of Canadian mothers.

METHODS: We conducted a secondary data analysis using the 2006 Canadian Maternity Experiences Survey data (n=5,614). The main exposures of interest were the presence of problematic perinatal pain at three months postpartum, the duration of problematic perinatal pain, and the number of types of perinatal pain (vagina, caesarean incision site, breasts, back, severe headaches) at the time of interview (mean=7.3 months, range 5-14 months). For each exposure, full multivariate logistic regression models as well as six submodels were fitted.

RESULTS: Odds of screening positive for PPD symptoms for respondents reporting problematic perinatal pain in the first three months postpartum were 1.7 (95% CI 1.2-2.5). Compared to respondents without problematic perinatal pain, the odds of PPD symptoms for women reporting problematic perinatal pain at the time of interview was 2.4 (95% CI 1.6-3.6). A dose–response association between the number of types of perinatal pain at the time of interview and PPD symptoms was also observed.

CONCLUSION: Mothers reporting persistent perinatal pain are at increased risk of developing PPD, and pain control services for these women may be needed.

KEY WORDS: Postpartum depression; chronic pain; perinatal care; risk factors; maternal health

La traduction du résumé se trouve à la fin de l'article.

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Postpartum depression (PPD) is a mood disorder that can occur after childbirth. Using the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders, PPD is classified as a major depressive disorder with a ''peripartum'' onset specifier if symptoms occur during pregnancy or within 4 weeks postpartum.[1] However, research demonstrates that PPD onset can be anywhere from pregnancy to late postpartum.[2,3] PPD can be a challenge to detect as its symptoms are similar to normal consequences of childbirth.[4] It is therefore unfortunately often missed by clinicians, and many women may remain undiagnosed.[5] Mothers who are diagnosed with PPD may not be treated as adequately as others receiving treatment for depression.[5] Left untreated, PPD can result in important and pervasive consequences. Depressed mothers are less likely to return to their pre-pregnancy levels of function, partners of depressed mothers may have difficulties adjusting, and their children may have poorer health outcomes.[6-8]

There is a wide range of estimates of PPD due to the varying methodologies and PPD definitions used in research.[2] The most widely reported prevalence of PPD is 13%.[9] However, a recent systematic review reveals that the prevalence of depression (minor and major) at three months after childbirth could be as high as 19.2%.[10] Data from the Maternity Experience Survey reveal that the national prevalence of PPD symptomatology (undiagnosed PPD) in Canada is approximately 8.7%, and varies from province to province ranging from 5% in New Brunswick to 15.9% in the territories.[11]

The aetiology of PPD is complex. Many psychological, psychosocial, socio-economic and obstetric risk factors have been reported to be associated with this disorder. Meta-analyses revealed that the psychological and psychosocial risk factors such as prenatal depression, stress, anxiety, and low social support are among the strongest risk factors for PPD.[9,12,13] It is surprising that these reviews do not identify pain as a risk factor for PPD as the association between pain and depression is well known and consistently observed across a variety of diagnostics.[14] Evidence suggests that the association between pain and depression could be of a causal nature.[14]

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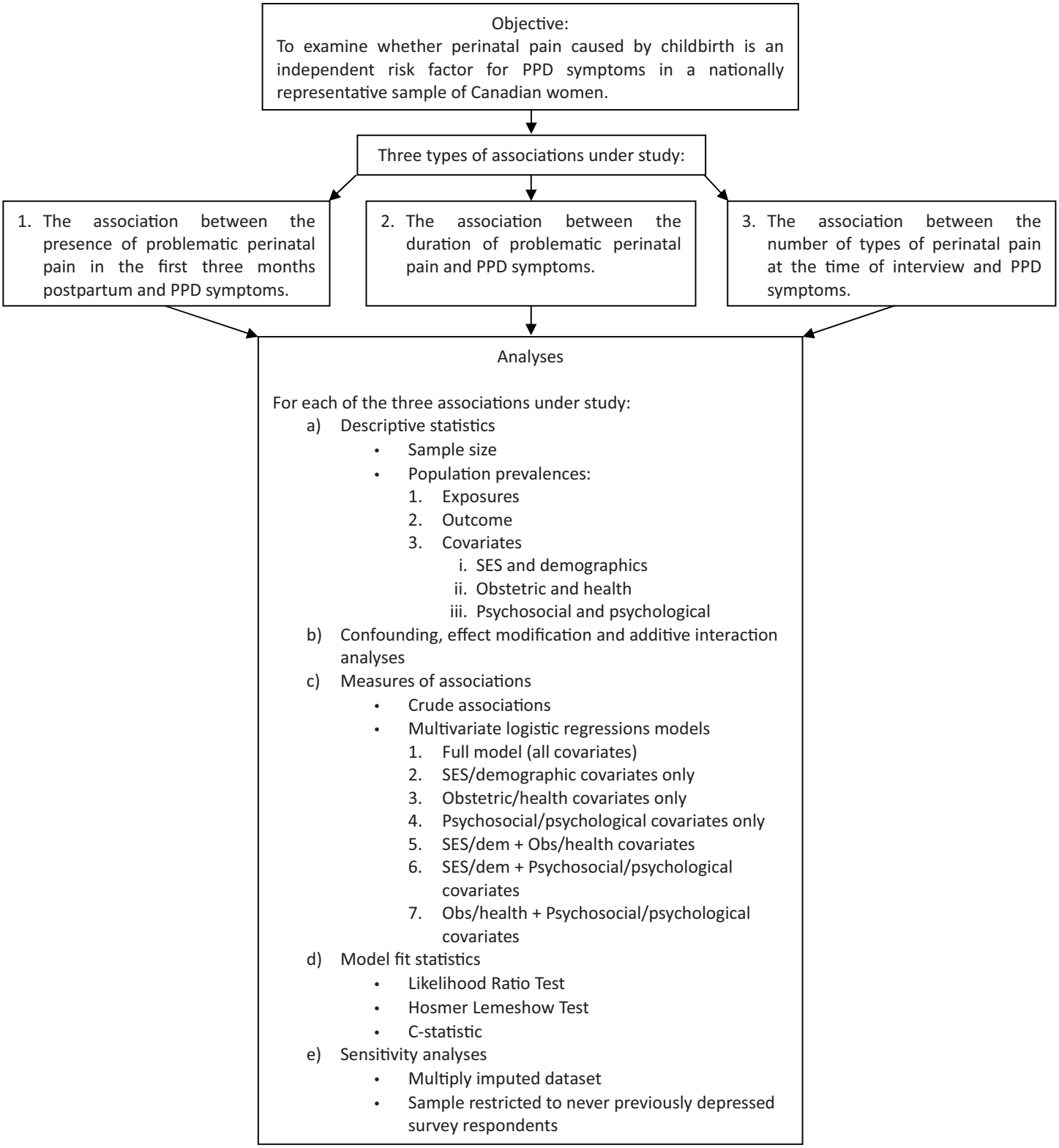
Conflict of Interest: None to declare.

Figure 1. Study analytical plan



There are three main causal hypotheses to describe the nature of the pain–depression association. In the "antecedent" hypothesis, depression precedes and causes pain whereas in the "consequence" hypothesis, pain precedes and causes depression.[14] The third hypothesis is the "scar" hypothesis according to which "episodes of depression occurring before the onset of pain predispose to a depressive episode after pain onset".[14] Of all three hypotheses, the ''consequence'' and "scar" hypotheses are the most supported by evidence while the antecedent hypothesis is mainly refuted.[14,15]

The association between chronic pain and depression is thought to be universal.[14] However, it remains unknown whether chronic pain caused by pregnancy and childbirth is associated with PPD symptoms. The objective of this study was to examine whether

pain caused by pregnancy and childbirth is an independent risk factor for PPD symptoms in a nationally representative sample of Canadian women.

METHODS

We received ethics approval from the Ottawa Hospital Research Ethics Board to perform secondary data analyses of the Canadian Maternity Experiences Survey (MES), a cross-sectional study conducted by Statistics Canada on behalf of the Public Health Agency of Canada in 2006.[16] The MES population included 6,421 respondents who represented a total of 76,508 puerperal Canadian women.[16] Respondents were "birth mothers 15 years and older who had a singleton live birth in Canada, between February 15, 2006 and May 15, 2006 in the provinces or between November 1, 2005 and February 1, 2006 in the territories and who lived with their infants at the time of data collection".[16] The survey was conducted at an average of 7.3 months postpartum (range: 5 to 14 months postpartum).[17] Data were collected through computer-assisted telephone interview (CATI) in the provinces and territories, and through in-person interviews in the territories when it was not possible to do the survey by phone.[16]

The outcome of interest was a positive screen for PPD symptoms, defined as a score of 13 or higher on the Edinburgh Postnatal Depression Scale (EPDS).[18] A score of 13 or higher on the EPDS is the recommended cut-off to use for identifying probable major depression postnatally.[18,19] The EPDS is a 10-item scale that has been validated for research and for use in the community to screen for PPD.[18] It has a sensitivity of 86%, a specificity of 78%, and its positive predictive value is 73%.[18]

There were three exposures of interest pertaining to problematic perinatal pain: 1) the presence of problematic perinatal pain in the first three months postpartum, 2) the duration of problematic perinatal pain, and 3) the number of types of perinatal pain at the time of interview.

Presence of problematic perinatal pain in the first three months postpartum

The first exposure of interest was the presence of problematic perinatal pain in the first three months postpartum. It was a binary variable and was created with the respondent's answers to the MES questions about the experience of five types of problematic pain within the first three months postpartum (vagina, caesarean incision site, breasts, back, and severe headaches). For each of these types of pain, the respondents were asked: ''during the first three months after the birth of your baby, how much of a problem was pain (in this body area)?'' The choices of response were: 1) not a problem, 2) somewhat of a problem, and 3) a great deal of a problem. Answering ''somewhat of a problem'' or ''a great deal of a problem'' to any of the pain-related questions would classify a respondent as being exposed.[20]

Duration of problematic perinatal pain

The second exposure of interest was the duration of problematic perinatal pain. It was a three-level exposure variable: no pain, acute pain only, and chronic pain. Respondents who reported problematic perinatal pain in the first three months postpartum but no problematic perinatal pain at the time of interview were considered to have had acute pain only. Respondents who still reported problematic pain at the time of interview (range: 5-14 months postpartum) were classified as having chronic perinatal pain.

Number of types of perinatal pain at the time of interview

The third exposure of interest was the number of types of perinatal pain reported by the participants at the time of interview. The range was from 0 to 5. However, to comply with Statistics Canada disclosure control policy, categories with too few respondents were collapsed. This variable has four categories: 1) none, 2) one, 3) two, and 4) three or more.

Covariates

The covariates included in this study were selected from studies on the risk factors of PPD and pain. In order to ensure meaningful interpretation of the results, the variables were grouped according to three main categories: 1) socio-demographics, 2) obstetric and health, and 3) psychosocial and psychological factors. Please refer to Appendix A for more information on the covariates.

We assessed each risk factor for confounding. First, we compared prevalences of perinatal pain and PPD symptoms for respondents with the risk factor and for those without the risk factor. We then obtained and analyzed the crude odds ratio for the association between the risk factor and perinatal pain, and the risk factor and PPD symptoms. Confounding was suspected if the prevalence of pain and PPD symptoms were higher when the risk factor was present, and if the crude odds ratios were statistically significant for each association. Results from the confounding analyses are available in Appendix B.

A few selected variables were suspected effect modifiers and were analyzed for effect modification. These variables were: maternal nativity status, birthing method, sex of the baby, use of non-medical pain relief methods, use of medical pain relief, maternal body mass index, maternal smoking, and social support. The authors can be contacted for further information on the selection of these potential effect modifiers.

Figure 1 presents the study analytical plan. Analyses included full multivariate logistic regression models as well as six submodels that were fitted for each of the three main pain exposures of interest. The six submodels contained different combinations of the three groups of covariates (socio-demographic, obstetric/health, and psychological/psychosocial) in order to assess the different impact of these three groups of variables on the association between perinatal pain and PPD symptoms. Unbiased weighted analyses were obtained using Statistics Canada's BOOTVAR program (version 3.1) and the bootstrap weights.[21] Multiple imputations by means of regression analysis were done using the IVEware Imputation and Variance Estimation software available online.[22] All logistic regression analyses were performed on SAS 9.2.[23]

A complete subject approach to the analyses was implemented. Due to incomplete information, 12.6% of the respondents were eliminated, resulting in a final sample size of 5,614. To address potential bias, sensitivity analyses were performed on a full multiply imputed dataset as well as in a subsample of respondents who were never previously depressed.

Table 1. Maternity Experiences Survey Respondent Characteristics (n=5,614)

Main Exposure Variables	**n**	**%**
1) Presence of problematic perinatal pain in the first three months postpartum	4553	81.7%
2) Duration of problematic perinatal pain		
None* (reference)	1061	18.3%
Acute pain only	3085	54.6%
Chronic pain	1468	27.1%
3) Number of types of perinatal pains at the time of interview		
None (reference)	4146	72.9%
One	1193	21.8%
Two	241	4.6%
Three or more	34	0.6%*
Socio-demographic variables	**n**	**%**
Maternal age (years)		
15-19*	155	1.8%
20-24	680	11.2%
25-29 (reference)	1693	31.0%
30-34	1962	35.3%
35-39	921	16.8%
≥40*	203	3.8%
Maternal education		
No high school	452	7.2%
High school graduation	786	13.3%
Post-secondary	2423	43.4%
Bachelors (reference)	1953	36.2%
Maternal marital status		
Married/common law (reference)	5085	92.2%
Divorced/widowed*	102	1.8%
Single	427	6.0%
Household annual income		
<$20,000	503	8.0%
$20,000-$39,999	998	16.6%
$40,000-$59,999	1088	19.2%
$60,000-$79,999	1016	18.4%
$80,000-$99,999*	716	13.4%
≥$100,000 (reference)	1034	19.8%
Unknown*	259	4.7%
Maternal region of residence		
Atlantic	1016	6.2%
Quebec	1035	22.6%
Ontario (reference)	1667	40.0%
Prairies	1175	19.1%
British Columbia	552	11.7%
Territories	169	0.4%
Rural dwelling	1255	18.2%
Maternal nativity status (foreign-born)	975	22.2%
Maternal Aboriginal status	329	4.1%

Obstetric and Health Variables	**Total Sample Size**	**Proportion**
Caesarean birth	1480	26.4%
Operative delivery - Forceps	291	5.3%
Operative delivery - Vacuum	490	9.0%
Operative delivery - Episiotomy	900	17.0%
Maternal stitches	2973	53.6%
Maternal parity		
One (reference)	2550	45.3%
Two	2067	37.1%
Three	693	12.3%
Four+	304	5.2%
No postpartum contact by public health nurse	367	6.9%
Female baby	2729	48.7%
No maternal prenatal education	3711	67.3%
No maternal use of non-medical pain relief	1290	23.3%
No maternal use of medical pain relief	1083	19.9%
Postpartum period of interview		
Early postpartum	1592	28.9%
Mid postpartum	2750	50.5%
Late postpartum (reference)	1272	20.7%
Infant neonatal intensive care unit admission	720	12.8%
Maternal previous no-live birth	1785	32.3%
Maternal smoking	1032	16.1%
Maternal pre-pregnancy health problems	893	15.2%
Maternal new health problems	1389	24.4%
Maternal body mass index		
Underweight	274	5.3%
Normal (reference)	3205	58.9%
Overweight	1287	21.9%
Obese	848	13.9%
Psychosocial and Psychological Variables	**n**	**%**
Negative reaction to pregnancy	408	6.6%
High perceived stress	3203	56.9%
Stressful events		
None (reference)	2170	39.6%
One event	1546	28.4%
Two events	912	15.7%
Three events	497	8.6%
Four events or more	489	7.7%
Inadequate social support	624	12.0%
History of depression	895	15.4%
Alcohol use (pregnancy)	534	10.7%
Drug use (pregnancy) *	51	0.9%
History of abuse	674	10.8%

* Interpret with caution, 16.6<CV≤33.3: high sampling variability.

RESULTS

Descriptive statistics

Among the respondents included in the final analysis, 449/5614 (7%) screened positive for PPD symptoms. The characteristics of the MES respondents are described in Table 1.

Problematic perinatal pain in the first three months postpartum

Most of the respondents (4553/5614, 81.7%) reported problematic perinatal pain within the first three months postpartum. Among women who underwent caesarean section, incisional pain was the most common (927/1480, 62.6%). Among women who had a vaginal delivery, perineal pain was most commonly reported (2144/4134, 51.9%). Other common types of pain in the study population included breast pain (2819/5614, 50.5%), back pain (1915/5614, 35.5%), and severe headaches (556/5614, 10.4%).

Problematic perinatal pain at the time of interview

Twenty-seven percent (1468/5614) of the respondents reported problematic perinatal pain at the time of interview. Once again, caesarean incision pain was the most often reported problematic perinatal pain for women who had had a caesarean section (298/1480, 20.1%). The second most common, back pain, was reported by 16.1% (853/5614) of all respondents. Perineal pain was still present in 7.1% (294/4134) of women who had had a vaginal delivery. Severe headaches (174/5614, 3.3%) and breast pain (161/5614, 2.8%) were the least common types of pain at the time of interview.

Multivariate logistic regressions

Table 2 presents the results from the multivariate logistic regressions, as well as the sensitivity analyses.

Presence of problematic perinatal pain in the first three months postpartum

When all study variables were held constant, odds of screening positive for PPD symptoms for respondents who reported any problematic perinatal pain in the first three months postpartum were 1.7 (95% CI 1.2-2.5) compared to respondents who did not report problematic perinatal pain.

Duration of problematic perinatal pain

Compared to their counterparts who did not report any problematic perinatal pain, odds of screening positive for PPD symptoms for

Table 2. Descriptive Statistics As Well As Crude and Adjusted Odds Ratios (OR) and 95% Confidence Intervals for the Associations Between the Main Pain Exposures of Interest and Postpartum Depression Symptoms in Canadian Women (n=5,614)

Exposure	n	PPD Symptoms Prevalence†	Crude OR	Adjusted OR: SES /demographic	Adjusted OR: Obstetric /health	Adjusted OR: Psychological /psychosocial	Adjusted OR: SES/dem., obstetric /health	Adjusted OR: SES/dem., psychological /psychosocial	Adjusted OR: Obst./health, psychological /psychosocial	Final Model: OR Adjusted for All Variables	Final Model: Multiply Imputed Dataset	Final Model: Never Previously Depressed Subsample
Presence of problematic perinatal pain												
No (ref)	1061	3.7%										
Yes	4553	7.7%	2.2 (1.5-3.1)	2.1 (1.5-3.1)	2.2 (1.6-3.2)	1.8 (1.3-2.7)	2.1 (1.4-3.1)	1.7 (1.2-2.5)	1.8 (1.3-2.6)	**1.7 (1.2-2.5)**	1.8 (1.4-2.1)	2.0 (1.2-3.2)
Duration of problematic perinatal pain												
None (ref)*	1061	3.7%										
Acute only	3085	5.3%	1.5 (1.0-2.1)	1.7 (1.0-2.2)	1.5 (1.0-2.2)	1.3 (0.9-1.9)	1.5 (1.0-2.2)	1.3 (0.9-1.9)	1.3 (0.9-2.0)	**1.3 (0.9-1.9)**	1.4 (0.6-2.2)	1.5 (0.9-2.5)
Chronic	1468	12.7%	3.8 (2.6-5.6)	3.4 (2.3-5.1)	3.8 (2.6-5.7)	2.5 (1.6-3.7)	2.4 (2.3-5.0)	2.5 (1.6-3.7)	2.7 (1.8-4.0)	**2.4 (1.6-3.6)**	2.4 (1.6-3.2)	2.8 (1.7-4.7)
Number of types of perinatal pains at the time of interview												
None	4146	4.9%										
One	1193	10.0%	2.2 (1.7-2.8)	1.55-2.58	2.1 (1.6-2.7)	1.7 (1.3-2.3)	1.9 (1.5-2.5)	1.7 (1.3-2.2)	1.7 (1.3-2.3)	**1.7 (1.3-2.2)**	1.6 (1.4-1.9)	1.7 (1.2-2.3)
Two	241	22.6%	5.7 (4.0-8.1)	4.7 (3.3-6.8)	5.7 (3.9-8.2)	3.7 (2.5-5.5)	4.7 (3.2-6.9)	3.1 (2.1-4.7)	3.8 (2.6-5.7)	**3.2 (2.1-4.9)**	2.6 (2.2-3.0)	3.4 (2.1-5.7)
Three +	34	33.5%	9.8 (4.6-21.1)	7.1 (3.1-16.0)	8.7 (3.6-21.0)	5.9 (1.9-17.9)	6.5 (2.5-16.7)	4.4 (0.9-21.0)	5.5 (1.4-22.7)	**4.2 (0.7-25.0)**	4.1 (3.0-5.1)	5.1 (0.0-8.5)

* Interpret with caution, 16.6<CV≤33.3: high sampling variability.
† All prevalences and odds ratios as well as 95% CI were obtained using bootstrap weights.

women who reported problematic perinatal pain in the first three months postpartum were 1.3 (95% CI 0.9-1.9) while the odds for those who reported problematic perinatal pain at the time of delivery were 2.4 (95% CI 1.6-3.6).

Number of types of perinatal pain at the time of interview

A dose–response association was observed between the number of types of perinatal pain at the time of interview and PPD symptoms, with increasing odds of screening positive for PPD symptoms with more types of perinatal pain. Odds of screening positive for PPD symptoms in respondents reporting one type of perinatal pain were 1.7 (95% CI 1.3-2.2) while the odds were 3.2 (95% CI 2.1-4.9) for respondents with two types of perinatal pain and 4.2 (95% CI 0.7-0.25) for respondents with three or more types of perinatal pain.

Only a few study variables remained independent predictors of PPD symptoms when all variables were included in the regression models. Along with the pain variables, the covariates that consistently remained independent predictors of PPD symptoms were: 1) maternal nativity status, 2) perceived stress, 3) number of past stressful life events, 4) lack of social support, 5) a history of depression, and 6) a history of abuse.

The results from the investigations into effect modifications are presented in Table 3. No statistically significant effect modification or biological interaction was found, although trends were observed. The association between problematic perinatal pain and PPD symptoms was stronger for respondents who were foreign-born, had had a caesarean delivery, were obese, reported having adequate social support, were non-smokers, and did not use any pain relief method.

The sensitivity analyses revealed that the final model estimates were robust. The estimates from the multiply imputed dataset were slightly higher than the estimates from the complete subject sample, suggesting that our final estimates are conservative.

DISCUSSION

In our study, problematic perinatal pain was strongly associated with PPD symptoms in a large representative sample of Canadian women. These findings are consistent with other studies that examined the association between various types of perinatal pain and PPD.

In a large study on 1,288 women who had vaginal and caesarean deliveries, acute pain at 36 hours postpartum was associated with both persistent pain and PPD at eight weeks after giving birth.[24] Lumbopelvic pain at three months postpartum was associated with PPD symptoms in a small cohort study,[25] and back pain at six months postpartum was associated with PPD symptoms (OR 2.2) in an Australian population-based study.[26] Finally, in a study on early breastfeeding experiences, women who experienced severe breastfeeding pain at one day, one week, and two weeks postpartum were more likely to be depressed at two months postpartum.[27]

One study reports findings suggesting that pain is a confounding factor in PPD screening.[28] PPD status at 8 weeks postpartum was not associated with postpartum pain measured between the 3rd and 5th day postpartum.[28] It is possible that pain measurements in the study were taken too early to capture the suffering associated with pain that becomes chronic, and this may explain why they did not find an association between postpartum pain and PPD. As Gatchel[15] explains, "one of the consequences of dealing with chronic pain is

the development of emotional reactions such as anxiety and dysphoria produced by the long term "wearing down" effects and drain of psychological resources".

The design of this study does not allow for any conclusion regarding causality. However, this study does give important clues that merit further examination. The fact that the association between pain and PPD symptoms in the subsample of respondents who were never previously depressed was stronger than in the full sample is one clue that deserves further attention. According to the antecedent hypothesis, excluding study subjects who were previously depressed should weaken the pain–PPD symptoms association, not strengthen it. In reality, all three causal hypotheses probably describe the association between pain and PPD in a Canadian puerperal population to some degree. Fishbain et al.[14] believe that "the scar hypothesis may apply more to patient with major depression, and the consequence hypothesis to pain of the neuropathic type (ex: caesarean section or operative vaginal deliveries)".[14] Further prospective studies are needed to confirm whether or not pain can be placed on a direct pathway to postpartum depression and be considered as one of the causes of PPD.

There were no significant effect modifications or biological interactions found in this study, possibly due to the lack of power required to detect an effect modification or interaction. However, interesting trends were observed. For example, the association between perinatal pain and PPD symptoms appears to be stronger for women who report adequate social support. The protective effect of social support on PPD symptoms is well established. However, evidence suggests that social support may not have the same protective effect on pain, as it could act as a positive reenforcer of pain behaviours.[29]

To our knowledge, this is the first large-scale study to directly examine the association of perinatal pain with PPD symptoms in Canadian women. The MES was conducted in a nationally representative sample of Canadian women. The results can therefore be generalized to the puerperal population in Canada. Rich social-demographic, clinical, and psychological information collected by the MES allowed a thorough adjustment of potential confounding factors. We have also been able to perform sensitivity analyses. Results from the main analyses, stratified analyses, and sensitivity analyses were consistent and suggest that our study findings are robust.

Our study was probably somewhat affected by misclassification bias. Both perinatal pain and PPD symptoms were subjective measures, and the tool used to classify respondents according to PPD symptom severity, the EPDS, is a screening tool, not a diagnostic tool. Also, it was not possible to find out for each respondent when exactly pain subsided. However, the misclassifications were likely non-differential. This would have biased the results towards the null.

There is also a non-negligible risk that recall bias was introduced in the study as some respondents might have been depressed at the time of interview and their memory and assessment of pain and other symptoms from the previous months might have been distorted. It is highly likely that their recall of pain and other symptoms could differ significantly from the recall of healthy respondents. Differential recall of pain and other symptoms in the postpartum period in turn could have led to reverse causality bias and could offer an alternative interpretation of the association

Table 3. Investigation of the Modification Effect of Selected Variables on the Associations Between the Main Exposures and Postpartum Depression Symptoms (n=5,614)

Variables	n	Presence of Problematic Perinatal Pain in the First Three Months Postpartum		Duration of Problematic Perinatal Pain				Number of Sites of Problematic Perinatal Pain at the Time of Interview					
				Acute Pain Only		Chronic Pain		One Site of Pain		Two+ Sites of Pain			
		Crude OR	Adjusted OR	Crude OR	Adjusted OR	Crude OR	Adjusted OR	Crude OR	Adjusted OR	Crude OR	Adjusted OR		
Maternal nativity status													
Foreign-born	975	4.0 (1.3-12.2)	3.8 (1.0-13.8)	2.6 (0.8-8.1)	2.6 (0.7-9.6)	6.3 (2.0-19.5)	5.5 (1.4-21.0)	2.3 (1.5-3.7)	2.22 (1.2-4.0)	4.6 (2.7-8.1)	3.5 (1.5-8.1)		
Canadian-born	4639	1.72 (1.2-2.6)	1.3 (0.8-1.9)	1.2 (0.8-1.8)	1.0 (0.6-1.6)	3.0 (2.0-4.5)	1.8 (1.1-2.7)	2.0 (1.5-2.7)	1.4 (1.0-1.9)	6.3 (4.3-9.2)	3.8 (2.3-6.1)		
Type of birth													
Caesarean delivery	1480	2.9 (1.0-7.8)	2.4 (0.7-7.4)	1.8 (0.6-5.1)	1.7 (0.5-5.6)	4.5 (1.6-12.9)	3.2 (1.0-10.1)	1.7 (1.0-2.3)	1.5 (0.8-2.8)	7.0 (3.9-12.7)	4.3 (1.8-10.4)		
Vaginal delivery	4134	2.1 (1.4-3.1)	1.6 (1.0-2.4)	1.4 (0.9-2.1)	1.2 (0.8-1.9)	3.7 (2.4-5.7)	2.3 (1.5-3.7))	2.4 (1.8-3.1)	1.8 (1.3-2.4)	6.0 (4.0-8.9)	3.2 (1.9-5.3)		
Sex of baby													
Female	2729	2.9 (1.6-5.4)	2.4 (1.3-4.7)	1.9 (1.0-3.5)	1.8 (0.9-3.5)	5.4 (2.9-10.0)	3.6 (1.8-7.2)	2.6 (1.8-3.6)	1.9 (1.3-2.9)	6.5 (4.1-10.3)	3.8 (2.1-6.8)		
Male	2885	1.7 (1.1-2.8)	1.3 (0.8-2.3)	1.2 (0.7-2.0)	1.0 (0.6-1.8)	2.9 (1.7-4.7)	1.8 (1.0-3.2)	1.8 (1.3-2.6)	1.4 (0.9-2.1)	5.8 (3.7-9.0)	3.4 (1.9-6.2)		
Non-medical pain relief													
Use	4324	1.9 (1.3-2.9)	1.5 (1.0-2.3)	1.4 (0.9-2.1)	1.2 (0.8-1.9)	3.3 (2.1-5.0)	2.1 (1.3-3.3)	2.1 (1.5-2.7)	1.6 (1.1-2.2)	5.4 (3.6-7.9)	3.0 (1.8-4.8)		
No use	1290	3.4 (1.1-10.7)	2.9 (0.7-10.9)	1.9 (0.6-6.3)	1.8 (0.4-7.1)	6.1 (1.9-19.5)	4.6 (1.2-18.1)	2.5 (1.5-4.2)	2.1 (1.1-4.1)	8.1 (4.4-14.7)	7.3 (2.6-20.2)		
Medical pain relief													
Use	4531	1.9 (1.3-2.8)	1.6 (1.0-2.4)	1.3 (0.9-2.0)	1.3 (0.8-2.0)	3.0 (2.0-4.6)	2.1 (1.3-3.3)	1.8 (1.3-2.4)	1.4 (1.0-1.9)	5.6 (4.0-7.9)	3.2 (2.1-4.9)		
No use	1083	3.7 (1.4-10.1)	2.3 (0.6-9.3)	2.0 (0.7-5.7)	1.6 (0.4-6.8)	9.0 (3.2-25.2)	4.8 (1.0-22.6)	4.8 (2.7-8.5)	3.1 (1.1-8.4)	9.1 (3.5-24.1)	4.5 (0.8-26.7)		
Maternal smoking													
Smoker	1032	1.1 (0.6-2.0)	0.7 (0.3-1.7)	0.7 (0.3-1.3)	0.5 (0.2-1.3)	1.8 (0.9-3.6)	1.1 (0.4-2.8)	1.6 (0.9-2.8)	1.2 (0.5-2.6)	7.1 (3.7-13.7)	5.6 (1.8-17.6)		
Non-smoker	4582	3.0 (1.9-4.6)	2.3 (1.4-3.8)	2.0 (1.2-3.2)	1.8 (1.1-2.9)	5.1 (3.2-8.2)	3.3 (2.0-5.6)	2.3 (1.8-3.1)	1.8 (1.3-2.5)	5.9 (4.0-8.9)	3.3 (2.0-5.3)		
Maternal body mass index													
Underweight to normal	3479	1.7 (1.1-2.6)	1.2 (0.8-2.0)	1.1 (0.7-1.7)	0.9 (0.6-1.5)	2.9 (1.8-4.7)	1.8 (1.1-3.1)	2.1 (1.5-2.9)	1.7 (1.1-2.4)	5.8 (3.8-8.7)	3.3 (1.9-5.6)		
Obese to overweight	2135	3.8 (1.9-7.6)	3.2 (1.5-6.7)	2.6 (1.3-5.3)	2.5 (1.1-5.3)	6.4 (3.1-12.9)	4.5 (2.1-9.8)	2.2 (1.5-3.3)	1.7 (1.1-2.8)	6.8 (4.0-11.5)	4.7 (2.3-9.5)		
Social support													
Adequate	4990	2.4 (1.5-3.7)	1.8 (1.1-2.9)	1.7 (1.1-2.7)	1.4 (0.9-2.3)	3.9 (2.5-6.3)	2.5 (1.6-4.2)	2.0 (1.4-2.6)	1.5 (1.1-2.0)	6.3 (4.4-9.2)	4.2 (2.7-6.6)		
Inadequate	624	1.7 (0.9-3.4)	1.5 (0.6-3.9)	1.0 (0.5-2.2)	0.9 (0.3-2.7)	2.7 (1.3-5.5)	2.2 (0.8-6.3)	2.3 (1.4-3.8)	2.3 (1.1-4.9)	3.4 (1.8-6.3)	2.3 (0.7-7.1)		

between pain and PPD symptoms in this study. As a result, caution should be applied in the interpretation of these study findings.

CONCLUSION

In summary, our analysis based on a large national representative sample of postpartum women revealed that problematic perinatal pain was a major risk factor for PPD symptoms. Although postpartum experience of pain is very common, excessive pain should not be dismissed as a normal consequence of childbirth. Women who report considerable amounts of pain postpartum should be systematically screened for PPD symptoms and should be offered the opportunity of pain control measures such as counselling and pain-relieving therapies.

REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders,* Fifth ed. Arlington, VA: American Psychiatric Publishing, 2013.
2. O'Hara MW, McCabe JE. Postpartum depression: Current status and future directions. *Annu Rev Clin Psychol* 2013;9:379-407.
3. Stowe ZN, Hostetter AL, Newport DJ. The onset of postpartum depression: Implications for clinical screening in obstetrical and primary care. *AJOG* 2005;192(2):522-26.
4. Epperson NC. Postpartum major depression: Detection and treatment. *Am Fam Physician* 1999;59(8):2247-54,2259-60.
5. Nonacs R, Cohen LS. Postpartum mood disorders: Diagnosis and treatment guidelines. *J Clin Psychiatry* 1998;59(Suppl 2):34-43.
6. Posmontier B. Functional status outcomes in mothers with and without postpartum depression. *J Midwifery Womens Health* 2008;53(4):310-18.
7. Larsen KE, O'Hara MW. *The Effects of Postpartum Depression on Close Relationships*. Hillsdale, NJ: Lawrence Erlbaum Associates, 2002.
8. Grace SL, Evindar A, Stewart DE. The effects of postpartum depression on child cognitive development and behavior: A review and critical analysis of the literature. *Arch Womens Ment Health* 2003;6(4):263-74.
9. O'Hara MW, Swain AM. Rates and risk of postpartum depression–A meta-analysis. *Int Rev Psychiatr* 1996;8:37-54.
10. Gavin NI, Gaynes BN, Lohr KN, Meltzer-Brody S, Gartlehner G, Swinson T. Perinatal depression: A systematic review of prevalence and incidence. *Obstet Gynecol* 2005;106(5 Pt 1):1071-83.
11. Lanes A, Kuk JL, Tamim H. Prevalence and characteristics of postpartum depression symptomatology among Canadian women: A cross-sectional study. *BMC Public Health* 2011;11:302.
12. Beck CT. Predictors of postpartum depression: An update. *Nurs Res* 2001;50(5):275-85.
13. Robertson E, Grace S, Wallington T, Stewart DE. Antenatal risk factors for postpartum depression: A synthesis of recent literature. *Gen Hosp Psychiat* 2004;26(4):289-95.
14. Fishbain DA, Cutler R, Rosomoff HL, Rosomoff RL. Chronic pain-associated depression: Antecedent or consequence of chronic pain? A review. *Clin J Pain* 1997;13(2):113-37.
15. Gatchel RG, Dersh J. Psychological approaches and chronic pain: Are there cause-and-effect relationships? In: Turk DC, Gatchel RJ (Eds.), *Psychological Approaches to Pain Management: A Practitioner's Handbook,* 2nd Edition. New York, NY: Guilford Press, 2002.
16. Public Health Agency of Canada. What Mothers Say: The Canadian Maternity Experiences Survey. Ottawa, ON: PHAC, 2009.
17. Chalmers B, Dzakpasu S, Heaman M, Kaczorowski J. The Canadian maternity experiences survey: An overview of findings. *J Obstet Gynaecol Can* 2008;30(3):217-28.
18. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987;150:782-86.
19. Matthey S, Henshaw C, Elliott S, Barnett B. Variability in use of cut-off scores and formats on the Edinburgh Postnatal Depression Scale - Implications for clinical and research practice. *Arch Womens Ment Health* 2006;9:309-15.
20. Public Health Agency of Canada. Maternity Experiences Survey - Code book. Ottawa: PHAC, 2009.
21. Statistics Canada. Bootvar: User guide. (Bootvar 3.1 - SAS version) Ottawa: Statistics Canada, 2005.
22. Raghunathan TE, Solenberger PW, Van Hoewyk J. IVEware: Imputation and variance estimation software: User guide. March 2002. Available at: ftp://ftp.isr.umich.edu/pub/src/smp/ive/ive_user.pdf (Accessed September 24, 2009).
23. SAS Institute Inc. SAS® 9.2. Cary, NC: SAS Institute Inc., 2009.
24. Eisenach JC, Pan PH, Smiley R, Lavand'homme P, Landau R, Houle TT. Severity of acute pain after childbirth, but not type of delivery, predicts persistent pain and postpartum depression. *Pain* 2008;140(1):87-94.
25. Gutke A, Josefsson A, Oberg B. Pelvic girdle pain and lumbar pain in relation to postpartum depressive symptoms. *Spine* 2007;32(13):1430-36.
26. Brown S, Lumley J. Physical health problems after childbirth and maternal depression at six to seven months postpartum. *BJOG* 2000;107(10):1194-201.
27. Watkins S, Meltzer-Brody S, Zolnoun D, Stuebe A. Early breastfeeding experiences and postpartum depression. *Obstet Gynecol* 2011;118(2 Pt 1):214-21.
28. Jardri R, Maron M, Delion P, Thomas P. Pain as a confounding factor in postnatal depression screening. *J Psychosom Obstet Gynecol* 2010;31(4):252-55.
29. Gil KM, Keefe FJ, Crisson JE, Van Dalfsen PJ. Social support and pain behavior. *Pain* 1987;29(2):209-17.

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RÉSUMÉ

OBJECTIF : Examiner si la douleur périnatale problématique est associée aux symptômes de la dépression postpartum (DPP) dans un échantillon national représentatif de mères canadiennes.

MÉTHODES : Nous avons effectué une analyse secondaire des données de l'Enquête sur l'expérience de la maternité au Canada de 2006 (n=5 614). Les variables dépendantes étaient la présence de douleurs périnatales problématiques dans les trois premiers mois postpartum, la durée des douleurs périnatales problématiques, ainsi que le nombre de types de douleurs périnatales encore présentes lors de l'entrevue qui a eu lieu en moyenne à 7,3 mois postpartum (étendue : 5 à 14 mois). Un modèle de régression logistique multivariée complet ainsi que six sous-modèles ont été construits pour chacune de ces variables dépendantes.

RÉSULTATS : Les chances de répondre positivement au dépistage des symptômes de la DPP pour les répondantes ayant déclaré une douleur périnatale problématique étaient de 1,7 (IC 95% 1,2-2,5). Le rapport de cotes pour les femmes souffrant encore de douleurs périnatales problématiques lors de l'entrevue était de 2,4 (IC 95% 1,6-3,6) comparativement aux répondantes ne souffrant pas de douleurs problématiques. Une relation dose-réponse entre le nombre de types de douleurs périnatales et les symptômes de la DPP a également été observée.

CONCLUSION : Les mères qui signalent une douleur persistante périnatale ont un risque accru de DPP et pourraient nécessiter des services de contrôle de la douleur.

MOTS CLÉS : dépression post-partum; douleur chronique; santé périnatale; facteur de risque; santé maternelle

Appendix A. Variable Definition

Category	Variable Name	Definition	Type	Levels
SES and demographic	Maternal age	Age of mother at time of interview	Categorical	15-19 20-24 25-29 30-34 35-39 ≥40
	Maternal education	Mother's education level	Categorical	Less than high school High school graduation Some post-secondary Bachelors degree or +
	Maternal marital status	Mother's marital status	Categorical	Married or common law Separated/divorced/widowed Single
	Household annual income	Household income for the past 12 months	Categorical	<$19,999 $20,000-$39,999 $40,000-$59,999 $60,000-$79,999 $80,000-$99,999 ≥$100,000
	Maternal region of residence	Region of residence of respondents at time of 2006 census	Categorical	Atlantic Quebec Ontario Prairies British Columbia Territories
	Dwelling area	Size of area of residence from the 2006 census	Binary	Rural (<30,000) Urban (≥30,000)
	Maternal nativity status	Whether mother is foreign-born or not	Binary	Foreign-born Canadian-born
	Maternal Aboriginal status	First Nations, Métis or Inuit	Binary	Aboriginal status No
Obstetric and health	Type of birth	The final method of delivery: vaginal or caesarean	Binary	Vaginal Caesarean
	Operative delivery - forceps	Use of forceps to aid in delivery	Binary	Yes No
	Operative delivery - vacuum	Use of vacuum to aid in delivery	Binary	Yes No
	Operative delivery - episiotomy	A cut to enlarge vagina for delivery	Binary	Yes No
	Maternal stitches	Stitches to repair a tear or a cut	Binary	Yes No
	Maternal parity	Number of live births	Categorical	One Two Three Four +
	Postpartum contact by public health nurse	Whether respondents were contacted or not by a public health nurse	Binary	No Yes
	Sex of baby	Sex of baby	Binary	Female Male
	Maternal prenatal education	Attended prenatal education	Binary	No Yes
	Non-medical pain relief	Use of non-medical pain relief such as birthing ball, massage, positioning, etc.	Binary	No Yes
	Medical pain relief	Use of medical pain relief such as epidural, Demerol, or nitrous oxide	Binary	No Yes
	Postpartum period of interview	Age of baby at time of interview	Categorical	Early postpartum (<6.5 months) Mid postpartum (6.5 months to <8 months) Late postpartum (8 months and over)
	Infant Neonatal Intensive Care Unit (NICU) admission	Admission of the baby to NICU	Binary	Yes No
	Maternal previous no-live births	Previous pregnancies not ending in live births	Binary	No Yes
	Maternal smoking	Maternal smoking	Binary	Yes No
	Previous pre-pregnancy health problem	Health problems before pregnancy	Binary	Yes No
	Maternal new health problem	New health problem in pregnancy	Binary	Yes No

continues/

Appendix A. Variable Definition (continued)

Category	Variable Name	Definition	Type	Levels
	Maternal body mass index	Pre-pregnancy body mass index	Categorical	Underweight Normal Overweight Obese
Psychosocial and psychological	Reaction to pregnancy	First reaction to becoming pregnant	Binary	Negative Positive
	Perceived stress	Self-perceived stress during pregnancy	Binary	Stressed Not stressed
	Stressful events	Number of stressful events in the 12 months before birth of baby	Categorical	None One Two Three Four +
	Social support	Perceived social support	Binary	Inadequate Adequate
	History of depression	Previous diagnosis of depression or having been prescribed antidepressants	Binary	Yes No
	Alcohol use	Use of alcohol during pregnancy	Binary	Yes No
	Drug use	Use of street drugs in pregnancy	Binary	Yes No
	History of abuse	Experience of any type of violent abuse in the past 2 years	Binary	Yes No

Appendix B. Tables 1-3

Table 1. Descriptive Statistics and Results From the Confounding Analyses for the SES and Demographic Variables

	Outcome: Presence of Problematic Pain				Outcome: Postpartum Depression								
SES and Demographics Variables	**Total Sample Size**	**Pain Prevalence†**	**Pain Crude OR**	**95% CI**	**PPD Prevalence**	**PPD Crude OR**	**95% CI**	**Adjusted OR: Model 1‡**	**95% CI**	**Adjusted OR: Model 2§**	**95% CI**	**Adjusted OR: Model 3‖**	**95% CI**
Maternal age (years)													
15-19*	155	87.4%	1.6	1.0-2.7	14.5%	2.7	1.6-4.3	1.4	0.7-2.7	1.4	0.8-2.8	1.4	0.7-2.6
20-24	680	85.7%	1.4	1.1-1.8	8.4%	1.4	1.0-2.0	0.9	0.6-1.4	0.9	0.6-1.4	0.9	0.6-1.4
25-29 (ref)	1693	80.9%			6.0%								
30-34	1962	81.4%	1.0	0.9-1.2	6.4%	1.1	0.8-1.4	1.1	0.8-1.5	1.1	0.8-1.5	1.1	0.8-1.6
35-39	921	81.5%	1.0	0.8-1.3	7.9%	1.3	1.0-1.7	1.1	0.8-1.7	1.2	0.8-1.7	1.2	0.8-1.8
≥40*	203	76.7%	0.8	0.6-1.1	8.7%	1.5	0.8-2.7	1.0	0.5-2.0	1.0	0.5-2.0	1.0	0.5-2.0
Maternal education													
No high school	452	81.9%	1.0	0.8-1.3	13.0%	2.5	1.7-3.6	1.5	0.9-2.5	1.4	0.8-2.4	1.4	0.8-2.4
High school graduation	786	81.5%	1.0	0.8-1.2	8.9%	1.7	1.2-2.3	1.3	0.8-2.0	1.3	0.8-1.9	1.3	0.8-2.0
Post-secondary	2423	81.6%	1.0	0.8-1.2	6.6%	1.2	0.9-1.5	1.0	0.7-1.3	1.0	0.7-1.3	1.0	0.7-1.3
Bachelors (ref)	1953	81.8%			5.6%								
Maternal marital status													
Married/common law (ref)	5085	81.5%			6.5%								
Divorced/widowed*	102	77.9%	0.8	0.5-1.3	16.3%	2.8	1.5-5.2	1.0	0.5-2.1	1.1	0.5-2.2	1.1	0.5-2.3
Single	427	85.5%	1.3	1.0-1.8	11.1%	1.8	1.3-2.5	0.7	0.5-1.2	0.8	0.5-1.2	0.8	0.5-1.3
Household annual income													
<$20,000	503	82.2%	1.0	0.8-1.4	14.1%	3.3	2.2-5.1	1.6	0.9-2.7	1.5	0.9-2.5	1.4	0.8-2.5
$20,000-$39,999	998	83.1%	1.1	0.9-1.4	9.7%	2.2	1.5-3.2	1.5	0.9-2.3	1.4	0.9-2.2	1.3	0.8-2.2
$40,000-$59,999	1088	82.1%	1.0	0.8-1.3	6.3%	1.4	0.9-2.1	1.0	0.6-1.6	1.0	0.6-1.5	0.9	0.6-1.5
$60,000-$79,999	1016	81.7%	1.0	0.8-1.3	5.4%	1.2	0.8-1.8	1.1	0.7-1.6	1.0	0.7-1.6	1.0	0.6-1.5
$80,000-$99,999*	716	79.2%	0.8	0.7-1.1	5.0%	1.1	0.6-1,7	1.1	0.7-1.9	1.1	0.7-1.8	1.1	0.6-1.8
≥$100,000 (ref)	1034	81.8%			4.7%								
Unknown*	259	80.1%	0.9	0.6-1.3	9.7%	2.2	1.2-3.8	1.4	0.7-2.7	1.3	0.7-2.6	1.3	0.6-2.5
Maternal region of residence													
Atlantic	1016	80.3%	0.8	0.7-1.0	6.0%	0.8	0.6-1.1	1.0	0.7-1.4	1.0	0.7-1.4	1.0	0.7-1.4
Quebec	1035	82.8%	1.0	0.8-1.2	7.5%	1.0	0.8-1.3	1.4	1.0-1.9	1.4	1.0-1.9	1.4	1.0-2.0
Ontario (ref)	1667	82.9%			7.5%								
Prairies	1175	79.7%	0.8	0.7-1.0	6.1%	0.8	0.6-1.1	0.9	0.6-1.3	0.9	0.6-1.2	0.9	0.6-1.2
British Columbia	552	79.3%	0.8	0.6-1.0	6.2%	0.8	0.6-1.2	0.9	0.6-1.4	0.9	0.6-1.4	0.9	0.6-1.4
Territories	169	77.4%	0.7	0.5-0.9	9.9%	1.4	0.9-2.0	1.2	0.7-2.1	1.3	0.7-2.3	1.3	0.7-2.3
Rural dwelling	1255	80.0%	0.9	0.7-1.0	5.8%	0.8	0.6-1.1	0.9	0.6-1.2	0.8	0.6-1.2	0.9	0.6-1.2
Urban dwelling (ref)	4359	82.0%			7.2%								
Maternal nativity status													
Yes	975	84.2%	1.3	1.0-1.5	11.2%	2.1	1.6-2.6	2.6	1.9-3.5	2.5	1.8-3.3	2.4	1.7-3.2
No (ref)	4639	81.0%			5.8%								
Maternal Aboriginal status													
Yes*	329	80.0%	0.9	0.7-1.2	10.5%	1.6	1.1-2.4	1.2	0.7-1.9	1.2	0.7-2.0	1.2	0.7-1.9
No (ref)	5285	81.7%			6.8%								

* Interpret with caution, 16.6<CV≤33.3: high sampling variability.
† All prevalences and odds ratios as well as 95% CI were obtained using bootstrap weights.
‡ Model 1: Multivariate logistic regression predicting PPD with presence of postpartum pain as main exposure.
§ Model 2: Multivariate logistic regression predicting PPD with the duration of pain as main exposure.
‖ Model 3: Multivariate logistic regression predicting PPD with the number of chronic pains as main exposure.

Appendix B. Tables 1-3 (continued)

Table 2. Descriptive Statistics and Results From the Confounding Analyses for the Obstetric and Health Variables

	Outcome: Presence of Problematic Pain				Outcome: Postpartum Depression								
Obstetric and Health Variables	**Total Sample Size**	**Pain Prevalence†**	**Pain Crude OR**	**95% CI**	**PPD Prevalence**	**PPD Crude OR**	**95% CI**	**Adjusted OR: Model 1‡**	**95% CI**	**Adjusted OR: Model 2§**	**95% CI**	**Adjusted OR: Model 3‖**	**95% CI**
Type of birth													
Vaginal birth (ref)	4134	81.2%			7.2%								
Caesarean birth	1480	83.0%	1.1	1.0-1.3	6.3%	0.9	0.7-1.1	0.8	0.5-1.3	0.8	0.5-1.3	0.8	0.5-1.2
Operative delivery - Forceps													
Yes	291	87.0%	1.5	1.1-2.2	8.4%	1.2	0.8-2.0	1.1	0.6-2.0	1.1	0.6-1.9	1.1	0.6-1.9
No (ref)	5323	81.4%			6.9%								
Operative delivery - Vacuum													
Yes	490	87.5%	1.6	1.2-2.2	5.4%	0.7	0.5-1.2	0.7	0.4-1.1	0.7	0.4-1.1	0.6	0.4-1.1
No (ref)	5124	81.1%			7.1%								
Operative delivery - Episiotomy													
Yes	900	87.2%	1.6	1.3-2.0	8.3%	1.3	0.9-1.7	1.1	0.8-1.7	1.2	0.8-1.7	1.1	0.8-1.6
No (ref)	4714	80.5%			6.7%								
Maternal stitches													
Yes	2973	84.4%	1.5	1.3-1.7	7.1%	1.0	0.8-1.3	1.1	0.8-1.6	1.1	0.8-1.6	1.2	0.8-1.6
No (ref)	2641	78.5%			6.9%								
Maternal parity													
One (ref)	2550	86.2%			6.0%								
Two	2067	79.5%	0.6	0.5-0.7	6.9%	1.2	0.9-1.5	1.2	0.8-1.7	1.2	0.8-1.7	1.1	0.8-1.6
Three	693	76.8%	0.5	0.4-0.7	9.2%	1.6	1.2-2.2	1.3	0.8-2.1	1.3	0.8-2.1	1.3	0.8-2.0
Four +	304	70.0%	0.4	0.3-0.5	10.7%	1.9	1.2-2.9	1.2	0.7-2.3	1.2	0.7-2.3	1.2	0.7-2.3
Postpartum contact by public health nurse													
Yes (ref)	5247	81.7%			6.7%								
No	367	81.0%	1.0	0.7-1.3	10.2%	1.6	1.1-2.3	1.5	1.0-2.3	1.5	0.9-2.3	1.4	0.9-2.3
Sex of baby													
Male (ref)	2885	81.6%			7.0%								
Female	2729	81.7%	1.0	0.9-1.2	7.0%	1.0	0.8-1.2	1.0	0.8,1.3	1.0	0.8-1.3	1.0	0.8-1.3
Maternal prenatal education													
Yes (ref)	1903	85.5%			5.6%								
No	3711	79.8%	0.7	0.6-0.8	7.7%	1.4	1.1-1.7	1.1	0.8-1.5	1.1	0.8-1.5	1.1	0.8-1.6
Maternal use of non-medical pain relief													
Yes (ref)	4324	81.4%			6.7%								
No	1290	82.7%	1.1	0.9-1.3	7.8%	1.2	0.9-1.5	1.2	0.9-1.8	1.2	0.9-1.8	1.2	0.9-1.8
Maternal use of medical pain relief													
Yes (ref)	4531	83.5%			7.2%								
No	1083	74.4%	0.6	0.5-0.7	6.3%	0.9	0.7-1.2	0.8	0.6-1.1	0.8	0.6-1.2	0.8	0.6-1.2
Postpartum period of survey													
Early postpartum	1592	81.1%	0.9	0.7-1.1	6.3%	0.8	0.7-1.1	0.9	0.6-1.2	0.9	0.6-1.2	0.9	0.6-1.2
Mid postpartum	2750	81.7%	1.0	0.8-1.2	7.2%	1.1	0.9-1.3	1.0	0.7-1.4	1.0	0.8-1.4	1.0	0.8-1.4
Late postpartum (ref)	1272	82.4%			7.5%								
Infant neonatal intensive care unit admission													
Yes	720	82.3%	1.1	0.8-1.3	8.2%	1.2	0.9-1.7	1.1	0.7-1.5	1.0	0.7-1.5	1.0	0.7-1.5
No (ref)	4894	81.6%			46.5%								
Maternal previous no-live birth													
Yes	1785	80.8%	0.9	0.8-1.1	8.3%	1.3	1.1-1.6	1.0	0.8-1.3	1.0	0.8-1.4	1.1	0.8-1.4
No (ref)	3829	82.1%			6.4%								
Maternal smoking													
Yes	1032	82.1%	1.0	0.8-1.3	9.9%	1.6	1.2-2.1	1.0	0.7-1.5	1.0	0.7-1.5	1.0	0.7-1.5
No (ref)	4582	81.6%			6.4%								
Maternal pre-pregnancy health problems													
Yes	893	81.7%	1.0	0.8-1.2	10.2%	1.7	1.3-2.1	1.4	1.0-1.9	1.3	1.0-1.8	1.3	1.0-1.8
No (ref)	4721	81.7%			6.4%								

...continues

Appendix B. Tables 1-3 (continued)

Table 2. Descriptive Statistics and Results From the Confounding Analyses for the Obstetric and Health Variables (continued)

	Outcome: Presence of Problematic Pain				Outcome: Postpartum Depression								
Obstetric and Health Variables	**Total Sample Size**	**Pain Prevalence†**	**Pain Crude OR**	**95% CI**	**PPD Prevalence**	**PPD Crude OR**	**95% CI**	**Adjusted OR: Model 1‡**	**95% CI**	**Adjusted OR: Model 2§**	**95% CI**	**Adjusted OR: Model 3‖**	**95% CI**
Maternal new health problems													
Yes	1389	84.4%	1.3	1.1-1.5	9.3%	1.5	1.2-1.9	1.3	1.0-1.7	1.3	1.0-1.7	1.3	1.0-1.7
No (ref)	4225	80.8%			6.3%								
Maternal body mass index													
Underweight	274	82.1%	1.0	0.7-1.3	7.5%	1.1	0.7-1.9	0.8	0.5-1.4	0.8	0.5-1.4	0.8	0.5-1.4
Normal (ref)	3205	82.4%			6.6%								
Overweight	1287	80.0%	0.9	0.7-1.0	6.8%	1.0	0.8-1.3	1.0	0.7-1.3	1.0	0.7-1.3	1.0	0.7-1.3
Obese	848	81.0%	0.9	0.7-1.1	8.6%	1.3	1.0-1.8	1.0	0.7-1.4	1.0	0.7-1.4	1.0	0.7-1.4

* Interpret with caution, 16.6<CV≤33.3: high sampling variability.
† All prevalences and odds ratios as well as 95% CI were obtained using bootstrap weights.
‡ Model 1: Multivariate logistic regression predicting PPD with presence of postpartum pain as main exposure.
§ Model 2: Multivariate logistic regression predicting PPD with the duration of pain as main exposure.
‖ Model 3: Multivariate logistic regression predicting PPD with the number of chronic pains as main exposure.

Appendix B. Tables 1-3 (continued)

Table 3. Descriptive Statistics and Results From the Confounding Analyses for the Psychosocial and Psychological Variables

	Outcome: Presence of Problematic Pain				Outcome: Postpartum Depression								
Psychosocial and Psychological Variables	**Total Sample Size**	**Pain Prevalence†**	**Pain Crude OR**	**95% CI**	**PPD Prevalence**	**PPD Crude OR**	**95% CI**	**Adjusted OR: Model 1‡**	**95% CI**	**Adjusted OR: Model 2§**	**95% CI**	**Adjusted OR: Model 3‖**	**95% CI**
Reaction to pregnancy													
Negative	408	82.1%	1.03	0.8-1.4	13.7%	2.3	1.7-3.1	1.3	0.9-1.9	1.2	0.8-1.8	1.2	0.8-1.9
Positive (ref)	5206	81.6%			6.5%								
Perceived stress													
High	3203	84.9%	1.6	1.4-1.9	10.0%	3.5	2.6-4.6	2.5	1.8-3.4	2.5	1.8-3.4	2.4	1.8-3.3
Low (ref)	2411	77.4%			3.1%								
Stressful events													
None (ref)	2170	79.9%			3.3%								
One event	1546	82.3%	1.2	1.0-1.4	6.3%	2.0	1.4-2.8	1.5	1.1-2.2	1.5	1.0-2.1	1.5	1.0-2.1
Two events	912	80.7%	1.1	0.9-1.3	7.9%	2.5	1.7-3.7	1.9	1.3-2.8	1.8	1.2-2.7	1.9	1.2-2.8
Three events	497	84.6%	1.4	1.1-1.8	13.8%	4.7	3.2-7.0	2.7	1.8-4.3	2.7	1.7-4.1	2.7	1.7-4.2
Four events or more	489	87.1%	1.7	1.2-2.3	19.0%	6.9	4.8-9.8	3.3	2.1-5.2	3.1	1.4-4.9	3.1	2.0-5.0
Social support													
Adequate (ref)	4990	81.5%			5.8%								
Inadequate	624	83.1%	1.1	0.9-1.4	16.1%	3.1	2.4-4.0	1.9	1.4-2.5	1.8	1.3-2.4	1.7	1.2-2.3
History of depression													
Yes	895	84.3%	1.3	1.0-1.5	13.4%	2.5	1.9-3.2	2.0	1.5-2.7	2.0	1.5-2.6	1.9	1.5-2.6
No (ref)	4719	81.2%			5.8%								
Alcohol use (pregnancy)													
Yes	534	83.9%	1.2	0.9-1.5	8.0%	1.2	0.8-1.7	1.2	0.8-1.8	1.2	0.8-1.8	1.2	0.8-1.8
No (ref)	5080	81.4%			6.9%								
Drug use (pregnancy)*													
Yes	51	93.8%	3.4	1.0-11.6	25.0%	4.5	2.1-9.7	2.1	0.8-5.5	2.1	0.8-5.4	2.2	0.8-5.6
No (ref)	5563	81.6%			6.8%								
History of abuse													
Yes	674	87.2%	1.6	1.2-2.0	15.3%	2.8	2.2-3.6	1.6	1.2-2.3	1.6	1.1-2.2	1.6	1.1-2.2
No (ref)	4940	81.0%			6.0%								

* Interpret with caution, 16.6<CV≤33.3: high sampling variability.
† All prevalences and odds ratios as well as 95% CI were obtained using bootstrap weights.
‡ Model 1: Multivariate logistic regression predicting PPD with presence of postpartum pain as main exposure.
§ Model 2: Multivariate logistic regression predicting PPD with the duration of pain as main exposure.
‖ Model 3: Multivariate logistic regression predicting PPD with the number of chronic pains as main exposure.