



# Alcohol use and self-perceived mental health status among pregnant and breastfeeding women in Canada: a secondary data analysis

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Accepted 28 April 2015. Published Online 6 September 2015.

**Objective** To estimate the prevalence of alcohol consumption during pregnancy and while breastfeeding in Canada from 2003 to 2010, and to test the relation between self-perceived mental health status and alcohol consumption during pregnancy and while breastfeeding.

**Design** Secondary analysis of four cycles of the Canadian Community Health Survey, a population-based cross-sectional survey.

**Setting** Canada.

**Sample** A total of 18 612 pregnant and 15 836 breastfeeding women.

**Methods** The prevalence of alcohol consumption during pregnancy and while breastfeeding and 95% confidence intervals (CI) were calculated by province and territory, and cycle. The relation between self-perceived mental health status and alcohol consumption during pregnancy and while breastfeeding was explored using quasi-Poisson regression models.

**Main outcome measures** Alcohol consumption during pregnancy and while breastfeeding, and self-perceived mental health status.

**Results** In Canada, between 2003 and 2010, approximately one in every ten pregnant women (9.9%; 95%CI 9.2–10.5%) and two in every ten breastfeeding women (20.3%; 95%CI 19.4–21.2%) women consumed alcohol. Women with a lower self-perceived mental health status (i.e. 'good') were 1.40 (95%CI 1.18–1.67,  $P < 0.001$ ) times more likely to have consumed alcohol during pregnancy, compared with women with an 'excellent' self-perceived mental health. There were no notable differences between the categories of mental health status in regard to alcohol consumption while breastfeeding.

**Conclusion** Despite public health efforts in Canada, a significant proportion of pregnant and breastfeeding women consume alcohol. It is imperative that a standard screening protocol be initiated among pregnant and breastfeeding women, especially in high-risk populations (e.g. women utilising substance abuse treatment programs).

**Keywords** Alcohol use, breastfeeding, Fetal Alcohol Spectrum Disorder, mental health, pregnancy, prevalence.

**Tweetable abstract** In Canada in 2003–2010, approximately 10% of pregnant and 20% of breastfeeding women consumed alcohol.

Please cite this paper as: Lange S, Quere M, Shield K, Rehm J, Popova S. Alcohol use and self-perceived mental health status among pregnant and breastfeeding women in Canada: a secondary data analysis. BJOG 2016;123:900–909.

## Introduction

Alcohol use during pregnancy has been linked to numerous adverse health consequences for both the mother and developing fetus, and is an established cause of Fetal Alcohol Spectrum Disorder (FASD).<sup>1–4</sup> FASD is

associated with a broad array of physical defects, as well as cognitive, behavioural, emotional, and adaptive functioning deficits.<sup>1</sup> The effects of prenatal alcohol exposure may be permanent and in many cases, people with FASD require life-long support, which is costly for any society.<sup>5</sup>

Due to the solubility and low molecular weight of ethanol (the main active ingredient in alcoholic beverages), alcohol also passes into breast milk at concentrations similar to those found in the mother's blood. Alcohol intake while breastfeeding has been shown to inhibit lactation, disrupt the infant's sleep-wake pattern, and reduce the amount of breast milk an infant will consume.<sup>6,7</sup> Furthermore, alcohol intake of more than one drink daily while breastfeeding has been reported to produce a measurable decrease in motor function development at 1 year of age,<sup>8</sup> although this finding has not been duplicated.<sup>9</sup> It has also been shown that women who consume alcohol during lactation breastfeed for a shorter duration.<sup>10</sup> However, it should be noted that the blood alcohol concentration of an infant exposed to alcohol via breast milk is unknown, and is likely dependent on a number of factors (e.g. the amount of alcohol consumed by the mother and the weight of the infant).

During pregnancy the majority of women who are not alcohol-dependent significantly cut down the amount consumed and/or the frequency at which it is consumed, or they abstain from alcohol altogether.<sup>11</sup> However, once their child is born, women tend quickly to resume their accustomed drinking patterns, even while breastfeeding.<sup>12,13</sup> Further, it is conceivable that women who consume alcohol during pregnancy will also consume alcohol while breastfeeding.

Research on the effects of low to moderate levels of alcohol intake during pregnancy has shown inconsistent results,<sup>14</sup> while heavy or binge drinking has been shown to increase the risk for a wide range of adverse outcomes.<sup>15</sup> Therefore, in many countries, including Canada, it is recommended to abstain from alcohol (any amount and any type) during the entire pregnancy.<sup>16</sup>

In contrast to alcohol consumption during pregnancy, the adverse consequences of alcohol use while breastfeeding are not well researched; however, the Society of Obstetricians and Gynaecologists of Canada is of the opinion that heavy alcohol consumption or binge drinking while breastfeeding should be completely avoided<sup>17</sup> and that nursing after consumption of alcohol should be withheld for at least 2 hours per standard drink to avoid unnecessary infant exposure.<sup>18</sup>

Given the known and potential adverse consequences of alcohol consumption during pregnancy and while breastfeeding, respectively, an understanding of the risk factors underlying these behaviours is warranted. A common finding in the literature is that poor mental health status is a risk factor for alcohol consumption.<sup>19–24</sup> For instance, a recent study found that individuals with a better mental health status tend to consume less alcohol over time.<sup>24</sup> Similar findings have also been reported for women of childbearing age and pregnant women.<sup>25,26</sup> In a study of approximately 25 000 women of childbearing age, it was found that women who experienced serious psychological distress were 1.7 times more likely to be heavy alcohol

users (7+ drinks per week in the past year) than non-alcohol users, compared with women who had not experienced such distress.<sup>25</sup> Further, Leis et al.<sup>27</sup> found an association between symptoms of depression and anxiety at 18 weeks' gestation and binge drinking at 32 weeks' gestation [odds ratio (OR) 1.28, 95% confidence interval (CI) 1.06–1.54 and OR 1.22, 95%CI 1.00–1.52, respectively]. In addition, Kvigne and colleagues<sup>28</sup> found that mothers of children with Fetal Alcohol Syndrome, the most severe and identifiable form of FASD, were more than twice as likely to have coexisting mental health problems (OR 2.48, 95%CI 1.05–6.34) than were mothers of healthy children.

Therefore, it was hypothesised that pregnant and breastfeeding women with a lower self-perceived mental health status are more likely to consume alcohol, compared to pregnant and breastfeeding women with a higher self-perceived mental health status. As such, the purpose of the current analysis was to obtain an estimate of the prevalence of alcohol consumption during pregnancy and while breastfeeding in Canada from 2003 to 2010, and to test the relation between self-perceived mental health status and alcohol consumption during pregnancy and while breastfeeding.

## Methods

The current study utilised secondary data and combined four cycles (2003, 2005, 2007/2008, and 2009/2010) of the Canadian Community Health Survey (CCHS). The CCHS is a cross-sectional population-based survey of a nationally representative sample of individuals aged 12 years and over living in a private household in any one of the ten provinces and three territories of Canada. The CCHS collects information related to health status, health care utilization and health determinants for the Canadian population. Excluded from the sampling frame are individuals living on Indian Reserves and on Crown Lands, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions. See Beland<sup>29</sup> for a methodological overview of the CCHS.

The method of combining cycles of the CCHS was chosen because the outcomes of interest (particularly, alcohol use during pregnancy) are rare. Therefore, using a single cycle alone would have resulted in the inability to detect a relationship, if a relationship actually exists (i.e. there would be insufficient statistical power). Furthermore, this inherent problem was exacerbated by the fact that in 2007/2008 'Maternal Experience' became an optional module of the CCHS (optional modules are chosen according to regional public health priorities, meaning that provinces and territories now have the option of whether or not to administer the questions contained within this module). This methodological change in the CCHS resulted in a drastic drop in the number of individuals with the outcomes of interest.

The feasibility of combining cycles was verified beforehand by taking into consideration any changes in content, coverage, geography, and mode of administration across cycles, and the pooled approach to combining CCHS cycles was adopted (i.e. cycles were merged to obtain a single sample).<sup>30</sup> It should be noted that the combined samples are not representative of the population of one single cycle at one point in time but rather are a combined population of Canadian women who participated in the CCHS over time.

### Inclusion criteria

Two non-independent samples were used in the current analysis: (1) women who had given birth within the 5 years preceding the interview and who had responded to the question regarding their use of alcohol during pregnancy, and (2) women who had breastfed or tried to breastfeed, even if only for a short period of time, their last baby and who had responded to the question regarding their use of alcohol while breastfeeding.

### Measures and definitions

As indicated by the objectives stated above, the outcome variables of interest in the present analysis were alcohol consumption during pregnancy and while breastfeeding, and the main predictor variable was current self-perceived mental health status. Pregnancy status was ascertained by asking participants: 'Have you given birth in the past 5 years?' Breastfeeding status was ascertained by asking: 'Did you breastfeed or try to breastfeed (your last baby), even if only for a short time?' Alcohol consumption during pregnancy was measured by asking the respondents: 'Did you drink any alcohol during your last pregnancy?' Alcohol consumption while breastfeeding was measured by asking the respondents: 'Did you drink any alcohol while you were breastfeeding (your last baby)?' Both questions on alcohol consumption resulted in binary variables. A question pertaining to the frequency of alcohol use during pregnancy and while breastfeeding was also asked – 'How often did you drink?' – which had seven potential responses: less than once a month, once a month, two to three times per month, once per week, two to three times per week, four to six times per week, and every day. Current self-perceived mental health was assessed by asking: 'In general, would you say your mental health is excellent, very good, good, fair, or poor?'

Guided by the current literature,<sup>31</sup> the following variables were identified as important covariates to consider as potential confounders: age, level of education, employment status, ethnicity, marital status, household income, smoking status during pregnancy/breastfeeding, self-perceived stress, and binge drinking behaviour in the 12 months prior to the interview (five or more drinks per single occasion; used as a proxy to identify at-risk drinkers).

### Missing values

Using a 5% criterion, records with missing values were removed. If missing values exceeded 5%, the variable was not included in the analysis. Missing data were considered missing completely at random for all variables, except for household income. The records that had 'not stated' recorded as the response for household income remained in the data set, and were treated as their own category.

### Data re-coding

To eliminate small cell counts and increase the likelihood of obtaining meaningful estimates, the following categories were collapsed: the two lowest age categories ('18–20' and '21–24'), the three highest age categories ('40–44', '45–49', and '50–55'), the two lowest categories of self-perceived mental health status ('fair' and 'poor'), and the three highest frequency categories for alcohol consumption during pregnancy and while breastfeeding ('two to three times a week', 'four to six times a week', and 'every day').

### Statistical analysis

A descriptive analysis was performed on each of the two data sets in their entirety, and the frequencies of all categorical variables were computed. Chi-square tests were used to compare women who consumed alcohol (1) during pregnancy with those who did not, and (2) while breastfeeding with those who did not.

To account for the complex multistage sample design, robust estimation was used to estimate the variance. Further, to adjust for the study design and the pooling of data, the original CCHS weights were rescaled using the following formula:

$$\text{standard weight} = (\text{weight} / \sum_{i=1}^n \text{weight}_i) * n$$

The prevalence of alcohol consumption during pregnancy and while breastfeeding and 95%CI were calculated by cycle and by province and territory. The Wald test was used to determine whether the prevalence of alcohol use (1) during pregnancy and (2) while breastfeeding has increased or decreased over time.

To explore the relationship between self-perceived mental health status and alcohol consumption during pregnancy and while breastfeeding, regression analyses were performed using a quasi-Poisson model to produce prevalence ratios and 95%CI (all regression analyses took into account survey design).<sup>32</sup> The forward model building strategy<sup>33</sup> was used as a guide in the current study. A change of  $\geq 0.10$  in the focal relation was used as an indicator for including hypothesised confounding variables in the final model.

All statistical analyses were carried out using SAS 9.3, and statistical significance ( $\alpha$ ) was set at 0.01.

### Sensitivity analysis

Two sensitivity analyses were conducted to test: (1) the relation between self-perceived mental health status, as a binary predictor variable ('fair/poor' and 'good/very good/excellent'), and alcohol consumption during pregnancy and while breastfeeding; and (2) the relation between self-perceived mental health status and the frequency of alcohol consumption during pregnancy and while breastfeeding using multinomial logistic regression.

## Results

Applying the above inclusion criteria, following data cleaning and re-coding, resulted in two combined samples consisting of: (1) 18 612 women who had given birth within the 5 years preceding the interview and who had responded to the question regarding their use of alcohol during pregnancy, and (2) 15 836 women who had breastfed or tried to breastfeed, even if only for a short period of time, their last baby and who had responded to the question regarding their use of alcohol while breastfeeding. See Figure S1 for a schematic of how the two combined samples were obtained.

### Sample characteristics

The analysis revealed that women who consumed alcohol (1) during pregnancy and (2) while breastfeeding were significantly different from women who did not. Women who consumed alcohol during pregnancy, compared with those who did not, were more likely to be older (>35 years of age; 36 versus 29%), white (90 versus 82%), employed (73 versus 68%), have a higher education (post secondary; 70 versus 63%) and a household income (\$80 000 and above; 33 versus 27%), were less likely to be married (55 versus 65%), and rated their self-perceived mental health status as 'excellent' (32 versus 39%). In addition, women who consumed alcohol during pregnancy were more likely to practise binge drinking in the 12 months prior to their interview (50 versus 32%) and smoke (either occasionally or daily) during pregnancy (24 versus 18%; Table S1).

Similarly, women who consumed alcohol while breastfeeding, compared with those who did not, were more likely to be older (>35 years of age; 37 versus 29%), white (90 versus 79%), employed (74 versus 68%), have a higher education (post secondary education; 77 versus 64%) and household income (\$80 000 and above; 42 versus 26%), and were more likely to practise binge drinking in the 12 months prior to their interview (42 versus 30%), and smoke (either occasionally or daily) during pregnancy (17 versus 15%; Table S1). However, unlike women who consumed alcohol while pregnant,

women who consumed alcohol while breastfeeding were more likely to be married (71 versus 65%) than were women who did not. Also, there was no difference in terms of self-perceived mental health status between women who consumed alcohol while breastfeeding and those who did not.

Among women who were pregnant (in the last 5 years) and breastfed their last baby (who reported their alcohol use during pregnancy and while breastfeeding;  $n = 15\ 398$ ), 628 (4.1%) reported consuming alcohol during pregnancy only, 2158 (14.0%) reported consuming alcohol while breastfeeding only, 909 (5.9%) reported consuming alcohol both during pregnancy and while breastfeeding, and 11 703 (76.0%) did not consume alcohol during pregnancy or while breastfeeding (see Table S2 for the characteristics of each of these groupings).

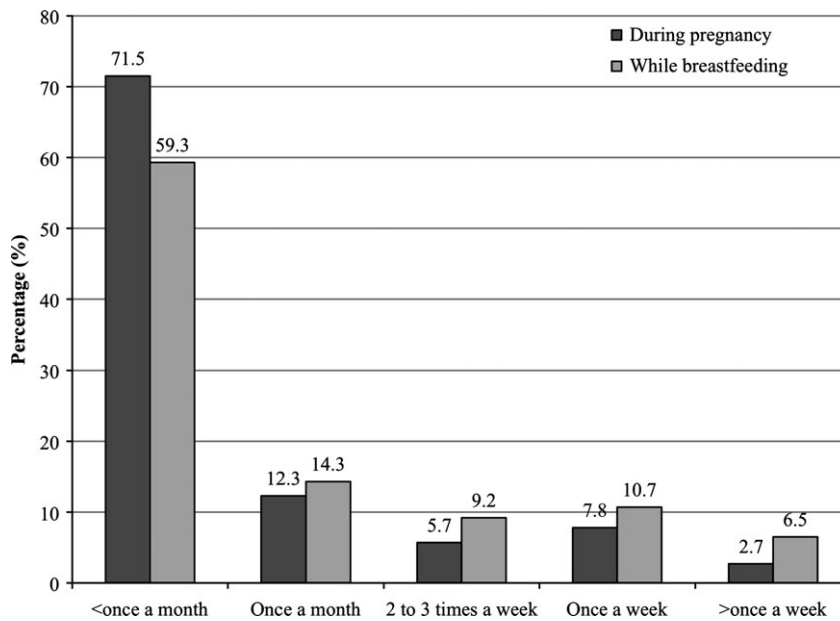
### Pooled prevalence and frequency of alcohol consumption during pregnancy and while breastfeeding in Canada

The pooled prevalence of alcohol consumption during pregnancy among women who had given birth in the past 5 years (from the time of their interview) was estimated to be 9.9% (95%CI 9.2–10.5%) in Canada between 2003 and 2010 (Table S3). Among those women who consumed alcohol during pregnancy, 71.5% reported consuming alcohol less than once a month, 12.3% once a month, 5.7% two to three times a month, 7.8% once a week, and 2.7% more than once a week some point during their pregnancy ( $n = 1788$ ; Figure 1).

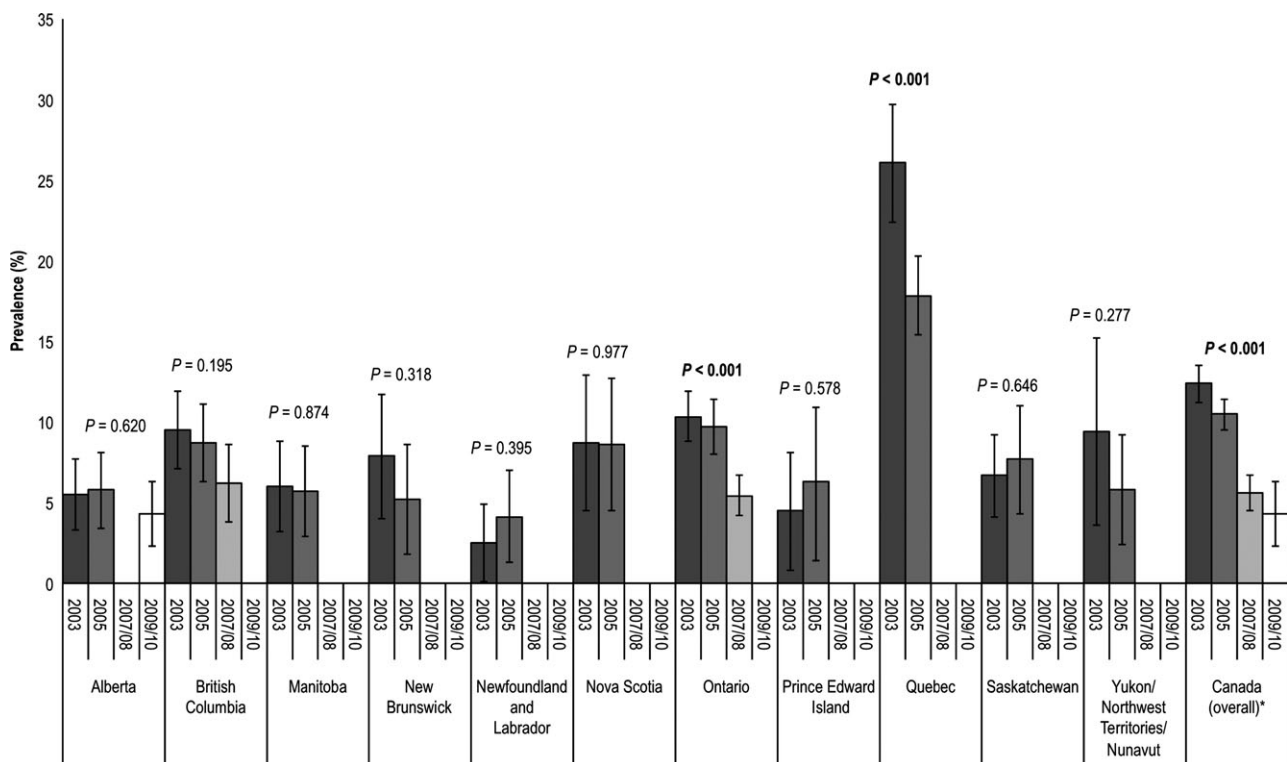
The prevalence was the lowest in Newfoundland and Labrador at 3.3% (95%CI 1.4–5.1%) and the highest in Quebec at 21.8% (95%CI 19.6–24.0%; Table S3). Between 2003 and 2010 the prevalence of alcohol use during pregnancy has decreased significantly over time in Ontario ( $P < 0.001$ ) and Quebec ( $P < 0.001$ ) only (from 2003 to 2008 and from 2003 to 2005, respectively), as well as in Canada ( $P < 0.001$ ) as a whole (see Figure 2). However, the latter has to be interpreted with extreme caution, as data were not available for all provinces and territories in 2007/2008 and 2009/2010.

The pooled prevalence of alcohol consumption while breastfeeding among women who had breastfed their last baby was estimated to be 20.3% (95%CI 19.4–21.2%) in Canada between 2003 and 2010 (Table S3). Among those women who consumed alcohol while breastfeeding, 59.3% reported consuming alcohol less than once a month, 14.3% once a month, 9.2% two to three times a month, 10.7% once a week, and 6.5% more than once a week while breastfeeding ( $n = 3128$ ; Figure 1).

The prevalence was the lowest in New Brunswick at 11.1% (95%CI 7.2–15.0%) and the highest in British Columbia at 25.9% (95%CI 23.5–28.3%; Table S3). The



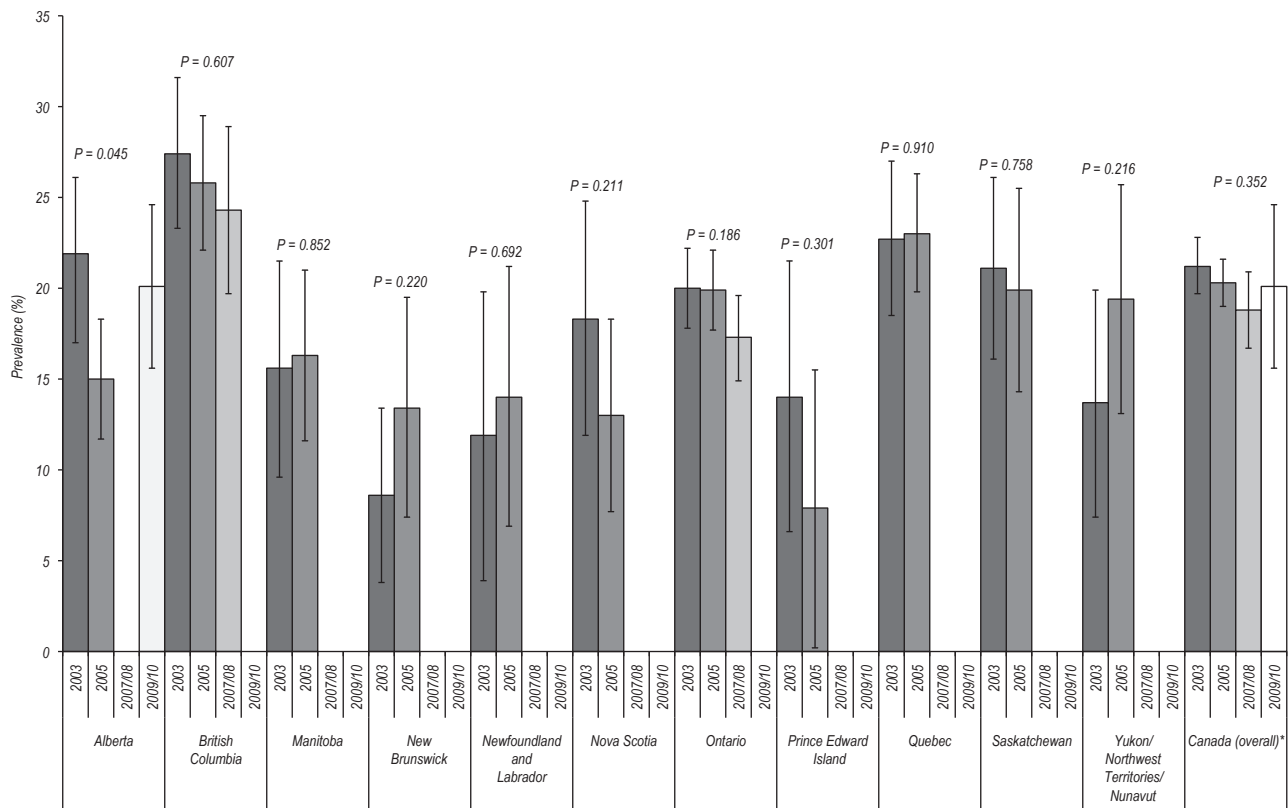
**Figure 1.** The frequency of alcohol consumption among those women who reported alcohol consumption during pregnancy and while breastfeeding in Canada, 2003–2010.



**Figure 2.** Prevalence (%) of alcohol use during pregnancy by province and territory in Canada in 2003, 2005, 2007/2008, and 2009/2010. \*Prevalence for 2007/2008 is based on data from Ontario and British Columbia only, and prevalence for 2009/2010 is based on data from Alberta only.

prevalence of alcohol use while breastfeeding has not increased or decreased significantly in any province or territory over time (see Figure 3).

Unfortunately, data on the amount of alcohol consumed during pregnancy or while breastfeeding were not collected by the CCHS. However, notably,



**Figure 3.** Prevalence (%) of alcohol use while breastfeeding by province and territory in Canada in 2003, 2005, 2007/2008, and 2009/2010.

\*Prevalence for 2007/2008 is based on data from Ontario and British Columbia only, and prevalence for 2009/2010 is based on data from Alberta only.

approximately 50% of women who consumed alcohol during pregnancy and 42% of women who consumed alcohol while breastfeeding reported binge drinking at least once in the 12 months prior to their interview, which can be used as a proxy for identifying heavy drinkers (Table S1).

### Self-perceived mental health status and alcohol consumption during pregnancy

Women who rated their mental health status as 'good' were 1.40 (95%CI 1.18–1.67,  $P < 0.001$ ) times more likely to have consumed alcohol during pregnancy, compared with women who rated their mental health status as 'excellent', after adjusting for potential confounders (age, household income, education, smoking status during pregnancy, and cycle). The relation between the other categories of self-perceived mental health status and alcohol consumption during pregnancy was not statistically significant: women who rated their mental health status as 'fair/poor' or 'very good' were 1.34 (95%CI 1.01–1.78,  $P = 0.044$ ) and 1.19 (95%CI 1.04–1.37,  $P = 0.015$ ) times more likely to have consumed alcohol during pregnancy, compared with women who reported an 'excellent' mental health status (see Tables 1 and S4).

### Self-perceived mental health status and alcohol consumption while breastfeeding

There were no notable differences between the categories of self-perceived mental health status in regard to alcohol consumption while breastfeeding (Tables 1 and S4).

### Sensitivity analysis

Analyses of the relationship between self-perceived mental health status, as a binary predictor variable, and alcohol consumption during pregnancy and while breastfeeding were not statistically significant: women who rated their mental health status as 'fair/poor' were 1.15 (95%CI 0.87–1.50,  $P = 0.327$ ) times and 1.04 (95%CI 0.85–1.27,  $P = 0.717$ ) times more likely to have consumed alcohol during pregnancy and while breastfeeding, respectively, compared with women who reported a 'good/very good/excellent' mental health status (Table S5).

Women who reported a 'good' mental health status were more likely to consume alcohol once a week during pregnancy and less likely to consume alcohol once a month while breastfeeding compared with women who reported an 'excellent' mental health status (OR, 1.94; 95%CI 1.17–3.24,  $P = 0.011$  and OR, 0.64; 95%CI 0.46–0.88,  $P = 0.006$ , respectively; Tables S6 and S7).

**Table 1.** Unadjusted and adjusted prevalence ratios for alcohol consumption (a) during pregnancy and (b) while breastfeeding by category of self-perceived mental health

Variable	Category	Alcohol consumption among pregnant women								Alcohol consumption among breastfeeding women							
		Unadjusted				Adjusted*				Unadjusted				Adjusted**			
		PR	LE	UE	P-value	PR	LE	UE	P-value	PR	LE	UE	P-value	PR	LE	UE	P-value
Self-perceived mental health status	Excellent	1	–	–	–	1	–	–	–	1	–	–	–	1	–	–	–
	Very good	1.21	1.04	1.39	0.012	1.19	1.04	1.37	0.015	1.10	0.99	1.21	0.074	1.09	0.99	1.20	0.091
	Good	1.38	1.15	1.66	<0.001	1.40	1.18	1.67	<0.001	0.98	0.87	1.12	0.787	1.08	0.96	1.22	0.202
	Fair/Poor	1.34	1.01	1.78	0.039	1.34	1.01	1.78	0.044	1.00	0.79	1.25	0.982	1.09	0.89	1.35	0.409

CCHS, Canadian Community Health Survey; LE, lower estimate; PR, prevalence ratio; UE, upper estimate.

\*Estimates are adjusted for age, household income, education, smoking status during pregnancy, and cycle.

\*\*Estimates are adjusted for age, household income, ethnicity, employment status, education, marital status, smoking status while breastfeeding, and cycle.

## Discussion

### Main findings

The results indicate that one in every ten pregnant, and two in every ten breastfeeding women consume alcohol in Canada despite public health efforts. Of the 13 provinces and territories of Canada, the prevalence of alcohol consumption during pregnancy has decreased at statistically significant levels in only two provinces (Ontario and Quebec, from 2003 to 2008 and from 2003 to 2005, respectively). Further, the data show that the prevalence of alcohol consumption during pregnancy has, as a whole, decreased overtime in Canada. Although this should be interpreted with extreme caution (as data were not available for all provinces and territories in 2007/2008 and 2009/2010), as noted above, the observed decrease could be due to increased public health prevention efforts targeting alcohol consumption during pregnancy in Canada. However, the prevalence of alcohol use while breastfeeding has remained consistently high in all provinces and territories of Canada between 2003 and 2010.

The higher prevalence of alcohol consumption during breastfeeding, compared with during pregnancy, could be due to a lack of awareness among the general population regarding the potentially harmful effects of alcohol via breast milk on infant development, as well as a lack of sufficient effort towards the prevention of this behaviour on the part of health care providers.<sup>34</sup>

As hypothesised, women with a lower self-perceived mental health status were more likely to have consumed alcohol during pregnancy than were women who rated their mental health status as 'excellent'. Although the relationship between the 'fair/poor' and 'very good' categories

of self-perceived mental health status and alcohol consumption during pregnancy was not statistically significant, it was in the predicted direction and approaching significance ( $P = 0.044$  for 'fair/poor' and  $P = 0.015$  for 'very good'). It is conceivable that women whose mental health status is 'fair/poor' would actually rate it as 'good', due to the general tendency of survey respondents to answer questions in a manner that will be viewed favourably by others (social desirability bias); this is a plausible explanation of the current findings.

Unfortunately, the temporal relation between self-perceived mental health status and alcohol consumption during pregnancy cannot be determined due to limitations of the CCHS, and thus causality cannot be established in the current study. However, a recently published cohort study reported that among a sample of 18 824 pregnant women, having mental health problems (depression and anxiety) in early pregnancy increased the likelihood of binge drinking in late pregnancy.<sup>27</sup>

This study did not find a relation between self-perceived mental health status and alcohol consumption while breastfeeding. It is possible that the risk factors associated with alcohol consumption during pregnancy are different from those associated with alcohol use while breastfeeding. Clearly, alcohol use while breastfeeding deserves further research.

### Strengths and limitations

The current study has several strengths. First, it is the first study to estimate the prevalence of alcohol consumption while breastfeeding in Canada. Secondly, utilising four consecutive cycles of the CCHS not only resulted in a large sample size, but also allowed for the estimation of

the prevalence of alcohol use during pregnancy and while breastfeeding over time. Thirdly, to the best of the authors' knowledge, this is the first study to explore the relation between self-perceived mental health status and alcohol consumption during pregnancy and while breastfeeding.

Nevertheless, the data utilised are limited in a number of ways, which likely had an impact on the results.

- The CCHS does not utilise a standardised instrument for ascertaining the alcohol use data used in the current analysis, and measurement error likely exists.
- The CCHS does not capture data from more marginalised populations (e.g. individuals living on Indian Reserves and on Crown Lands, institutional residents, and residents of certain remote regions), which could potentially affect the estimates obtained.
- As stated above, 'Maternal Experience' became an optional module in the 2007/2008 cycle of the CCHS. For this reason, data were not available for all provinces and territories in 2007/2008 and 2009/2010.
- The variables of interest are highly stigmatised and therefore are likely underreported.
- The data on alcohol consumption during pregnancy and while breastfeeding were collected retrospectively and thus, are subject to recall bias.
- The respondents were asked to rate their mental health status at the time of the interview, which may not be accurate and reflective of the respondents' mental health status at the time of pregnancy and/or breastfeeding.
- Data on the amount of alcohol consumed during pregnancy or while breastfeeding were not collected by the CCHS.

It is clear that more rigorous epidemiological studies exploring the relation between severity of mental health problems and different patterns of alcohol consumption are needed to advance our knowledge on this matter.

### Interpretation

The prevalence of alcohol use during pregnancy reported in the current study is consistent with the results of other population-based Canadian surveys. For instance, the Maternity Experiences Survey reported a prevalence of 10.5% in 2006<sup>35</sup> and the National Longitudinal Survey of Children and Youth revealed that in 1998–99, 14.4% of women reported drinking at some point during their pregnancy.<sup>36</sup> The prevalence of alcohol use while breastfeeding has not been previously reported in Canada; however, when compared with the prevalence reported in other countries (e.g. 35.9% in the USA in 2007<sup>37</sup> and 43.0% in Australia in 2011<sup>38</sup>), the prevalence in Canada, as reported in the current study, appears lower.

Further, it has also been reported previously that women who consume alcohol during pregnancy are more likely to be older,<sup>39–42</sup> white,<sup>11,39,40,42–44</sup> married/common-law,<sup>11</sup>

employed,<sup>11,39–45</sup> smokers,<sup>41,42,44,46,47</sup> and have a higher income<sup>48,49</sup> than women who did not consume alcohol during pregnancy. Although studies on alcohol use while breastfeeding are scarce, one study has reported that older age and higher education are significantly associated with alcohol use while breastfeeding.<sup>38</sup>

Based on the current literature, which supports the link between mental health and alcohol use,<sup>19–26</sup> special attention should be paid to women of childbearing age with mental health issues, as they could be at higher risk for pre- and postnatal (via breast milk) alcohol consumption. Attention should also be drawn to the fact that 24 and 17% of those who consumed alcohol during pregnancy and while breastfeeding, respectively, were also smoking. This is a concern given that maternal smoking has been found to be associated with a number of adverse outcomes, including stillbirth, fetal mortality, preterm birth, infant and child mortality, and morbidity.<sup>50–52</sup>

### Conclusion

Alarming, alcohol consumption is prevalent in Canada, and levels of consumption are increasing among young women and women of childbearing age.<sup>53</sup> As such, the risk for infants to be exposed pre- and postnatally to alcohol remains high. Thus, it is imperative that prevention efforts be put in place to reduce the occurrence of alcohol consumption not only during pregnancy but also while breastfeeding. The prevalence findings of the current study highlight that there is an urgent need to: (1) educate all women of childbearing age about the potential detrimental effects of pre- and postnatal alcohol exposure on the developing fetus and infant; (2) enhance access to substance abuse treatment programs for pregnant women, women of childbearing age, and mothers of children with FASD; (3) increase the effectiveness of substance abuse treatment programs for women of childbearing age; this could provide an important opportunity to prevent the occurrence and/or recurrence of prenatal and postnatal alcohol exposure within families and across generations, and (4) establish universal screening, using a standard screening protocol, and the provision of brief interventions, where appropriate, to all pregnant women and women of childbearing age, especially for at-risk populations; ideally, at-risk drinking could be identified before pregnancy, allowing for change.

### Disclosure of interests

None declared. Completed disclosure of interests form available to view online as supporting information.

### Contribution to authorship

SL and SP contributed to the conception and design of the study; SL and MQ acquired the data; SL, MQ, KS, JR and



SP analysed and interpreted the data; SL and SP drafted the article; and KS and JR revised it critically for important intellectual content. SP supervised the study and is the guarantor. All authors approved the final version of the article.

### Details of ethics approval

The current study is a secondary data analysis that utilised the Canadian Community Health Survey public use micro-data files, which are processed by Statistics Canada to ensure confidentiality. Therefore, it was not necessary to obtain research ethics approval.

### Funding

No external funding was sought for the current study.

### Acknowledgements

The authors would like to thank Tamara Arenovich from the Centre for Addiction and Mental Health for her assistance with this project.

### Supporting Information

Additional Supporting Information may be found in the online version of this article:

**Table S1.** Demographic characteristics, current self-perceived mental health status, current binge drinking behaviour, and smoking status during pregnancy of women who (a) had given birth in the past 5 years and (b) breastfed their last baby, by alcohol use status in Canada, 2003–2010.

**Table S2.** Demographic characteristics and current self-perceived mental health status of women who had reported (a) consuming alcohol during pregnancy only, (b) consuming alcohol while breastfeeding only, (c) consuming alcohol both during pregnancy and while breastfeeding, and (d) no alcohol consumption during pregnancy or while breastfeeding in Canada, 2003–2010.

**Table S3.** Pooled prevalence of alcohol use during pregnancy and while breastfeeding in Canada between 2003–2010 by province and territory.

**Table S4.** Unadjusted and adjusted prevalence ratios for alcohol consumption (a) during pregnancy and (b) while breastfeeding by category of self-perceived mental health.

**Table S5.** Unadjusted and adjusted prevalence ratios for alcohol consumption (a) during pregnancy and (b) while breastfeeding by category of self-perceived mental health (as a binary outcome).

**Table S6.** Unadjusted and adjusted odds ratios for frequency of alcohol consumption during pregnancy by category of self-perceived mental health.

**Table S7.** Unadjusted and adjusted odds ratios for frequency of alcohol consumption while breastfeeding by category of self-perceived mental health.

**Figure S1.** Schematic diagram depicting the steps involved in pooling the two non-independent samples. ■

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