



Prevalence and correlates of cannabis use in pregnancy and while breastfeeding in Hamilton, Ontario following national legalization

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Keywords:	Obstetrics and gynecology, Reproductive health, Public health, Addiction medicine
More Detailed Keywords:	
Abstract:	<p>Background: Recreational cannabis use was legalized nationwide in Canada in October 2018. This study aimed to determine the prevalence and correlates of cannabis use among pregnant women in a Canadian city following national legalization.</p> <p>Methods: An anonymous cross-sectional survey was distributed in May-October 2019 to 478 pregnant patients attending family practice, midwifery, low-risk and high-risk obstetrical clinics in Hamilton, Ontario. The survey included questions regarding lifetime and in-pregnancy cannabis use, intent for postpartum use and patterns of use. Demographic information was also collected. Inclusion criteria were English literacy and current pregnancy. Descriptive statistics were calculated, and logistic regression analyses were performed to explore relationships between cannabis use and demographic variables.</p> <p>Results: Among 478 respondents, 11.3% (n=54) had used cannabis at some point in pregnancy and 4.2% (n=20) were currently using. Among those who intended to breastfeed (n=460), 5.0% (n=23) planned to use cannabis postpartum. Of 20 current users, 65% (n=13) reported using</p>

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	<p>at least weekly and 95% (n=19) reported nausea, sleep, or anxiety as reasons for use. Women reporting partner cannabis use had 3.3-fold greater odds of prenatal cannabis use (OR 3.3; 95% CI 1.77-6.17; p<0.001) and women without post-secondary education had 8.6-fold greater odds of prenatal use than university-educated women (OR 8.6; 95% CI 3.78-19.52; p<0.0001). Interpretation: Partner cannabis use and lower educational attainment predict likelihood of in-pregnancy cannabis use and intent for postpartum use. These results may help inform early intervention strategies to decrease cannabis use during this vulnerable period of fetal and neonatal development.</p>



STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1, 3
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3-4
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	n/a
		(e) Describe any sensitivity analyses	7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8, 21
		(c) Consider use of a flow diagram	21
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	18-19
Outcome data	15*	Report numbers of outcome events or summary measures	9-10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-10

		(b) Report category boundaries when continuous variables were categorized	7
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12-13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13
Generalisability	21	Discuss the generalisability (external validity) of the study results	8
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	n/a

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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10 4 **ABSTRACT**
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12 5 **Background:** Recreational cannabis use was legalized nationwide in Canada in
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14 6 October 2018. This study aimed to determine the prevalence and correlates of cannabis
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16 7 use among pregnant women in a Canadian city following national legalization.
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19 8 **Methods:** From May-October 2019, 478 pregnant patients were recruited from family
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21 9 practice, midwifery, low-risk and high-risk obstetrical clinics in Hamilton, Ontario. The
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23 10 anonymous questionnaire included questions regarding lifetime and in-pregnancy
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25 11 cannabis use, intent for postpartum use and patterns of use. Demographic information
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27 12 was also collected. Inclusion criteria were English literacy and current pregnancy.
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29 13 Descriptive statistics were calculated, and logistic regression analyses were performed
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31 14 to explore relationships between cannabis use and demographic variables.
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35 15 **Results:** Among 478 respondents, 11.3% (n=54) had used cannabis at some point in
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37 16 pregnancy and 4.2% (n=20) were currently using. Among those who intended to
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39 17 breastfeed (n=460), 5.0% (n=23) planned to use cannabis postpartum. Of 20 current
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41 18 users, 65% (n=13) reported using at least weekly and 95% (n=19) reported nausea,
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43 19 sleep, or anxiety as reasons for use. Women reporting partner cannabis use had 3.3-
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45 20 fold greater odds of prenatal cannabis use (OR 3.3; 95% CI 1.77-6.17; p<0.001) and
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47 21 women without post-secondary education had 8.6-fold greater odds of prenatal use than
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49 22 university-educated women (OR 8.6; 95% CI 3.78-19.52; p<0.0001).
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23 Interpretation: Partner cannabis use and lower educational attainment predict
24 likelihood of in-pregnancy cannabis use and intent for postpartum use. These results
25 may help inform early intervention strategies to decrease cannabis use during this
26 vulnerable period of fetal and neonatal development.

Confidential

46 INTRODUCTION

47 The Cannabis Act, passed in October 2018, legalized recreational cannabis use
48 nationwide.¹ Prior to legalization, the proportion of Canadian women reporting past-year
49 cannabis use increased from 6.6% in 2004 to 11.1% in 2017.² Following legalization,
50 women's rates of use during the previous 3 months rose from 11.1% in the fourth
51 quarter of 2018 to 14.0% in the third quarter of 2019.^{3,4} Further, rates of antenatal
52 cannabis use are also rising.^{5,6,7} For example, an Ontario study revealed that 1.2% of
53 pregnant women used cannabis in 2012 compared to 1.8% in 2017.⁸ Trends in
54 antenatal cannabis use post-legalization have not been reported.

56 Although the literature is heterogenous,⁹ several studies have found associations
57 between prenatal cannabis use and adverse outcomes such as low birth weight,
58 preterm delivery, placental abruption and admission to the neonatal intensive care
59 unit.¹⁰⁻¹³ Multiple organizations advise against the use of cannabis in pregnancy and
60 breastfeeding, including the Society of Obstetricians and Gynecologists of Canada
61 (SOGC)¹⁴ and the American College of Obstetricians & Gynecologists (ACOG).¹⁵
62 Awareness of prevalence and correlates of in-pregnancy cannabis use would facilitate
63 appropriate screening and counselling practices. Our study aims were to: estimate the
64 prevalence of in-pregnancy cannabis use; identify demographic correlates of prenatal
65 cannabis use; and characterize patterns of prenatal cannabis use, including frequency,
66 methods, and reasons for use.

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69 **METHODS**

70 **Questionnaire Design**

71 An anonymous 15-item questionnaire was developed with questions pertaining to
72 lifetime and in-pregnancy cannabis use as well as demographic data (age, education,
73 annual household income and relationship status). Four additional items were added if
74 the participant answered “yes” to current use of cannabis in pregnancy, which assessed
75 reasons for use, frequency of use and methods of use (Appendix S1). The
76 questionnaire was developed using the REDCap secure web-based application and
77 was pilot tested internally before administration. The study participants accessed the
78 questionnaire through the McMaster REDCap web portal, which was not password
79 protected. However, the questionnaire was not advertised or posted on any external
80 websites and was not considered to be an “open survey”. Data stored on the REDCap
81 database is password protected, only available to one of the investigators (AS). No
82 personal or identifying information was collected or stored.

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84 **Setting and Data Collection**

85 Data collection was conducted from May to October 2019 via electronic tablet.
86 Researchers attended in-person at antenatal clinics in Hamilton, Ontario with care
87 models of family practice, midwifery, low-risk and high-risk obstetrics. The inclusion
88 criteria were current pregnancy and English literacy. Post-partum patients and non-
89 English speakers were excluded. Participants gave informed consent electronically on
90 the tablet without providing any identifying information, which was followed by the
91 questionnaire.

92 **Statistical Analysis**

93 Highest educational attainment was separated into 3 categories, thought to be most
94 indicative of cumulative years of formal education: high school or less, college/trade
95 school and university/graduate school. Annual household income (CA\$) was stratified
96 into 3 categories: <\$40 000, \$41 000 - \$100 000, >\$100 000. Income categories were
97 based on tax bracket quintiles in Ontario. The two upper and lower quintiles were
98 pooled, however, due to small sample sizes in both the highest and lowest tax
99 quintiles. Educational attainment was used as the indicator of socioeconomic status in
100 analyses, given that educational attainment and income were highly correlated
101 ($p < 0.00001$).

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103 All analyses were performed on R software.¹⁶ Using backward model selection, logistic
104 regressions were used to evaluate possible relationships between variables relating to
105 participant cannabis use (i.e. use at some point in pregnancy, current use, and intent to
106 use while breastfeeding) and demographic variables (i.e. education, relationship status,
107 partner cannabis use, and age). Overdispersion was not found in any of the models.

108 Following model selection, planned orthogonal contrasts were used to compare groups
109 within a categorical predictor; therefore, no post-hoc adjustments were needed.^{17,18}

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111 **Ethics Approval**

112 The study protocol (#7131) was reviewed and approved by the Hamilton Integrated
113 Research Ethics Board on May 6, 2019.

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115 RESULTS

116 Study Population

117 The response rate was 90.0% among women asked to participate in our study
118 (n=478/531) (Fig. 1). The final study sample, comprising 478 respondents, represented
119 women from a range of backgrounds regarding educational attainment, household
120 income and partner cannabis use (Table 1). Regarding relationship status, however, the
121 vast majority of respondents, 91.6% (n=437/477), were married/common law/living with
122 a partner; only 8.4% (n=40/477) were single/dating.

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124 Overall, our study sample was representative of urban Canadian women. The 2016
125 Canadian census demonstrated that 74.3% of women aged 25 to 34 had completed
126 either university, college, or an apprenticeship program, similar to the 81.2%
127 (n=388/478) of women in our sample.¹⁹ Regarding household income, Hamilton is
128 similar to other urban communities. The median annual household income in Hamilton
129 is \$75 464, compared to \$78 373 in Toronto, \$72 662 in Vancouver and \$70 336 in
130 Canada generally.²⁰ Finally, the age distribution of pregnant women in our study was
131 similar to that of pregnant Ontarians in 2016-2017 (Fig. S1).²¹

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133 The median age of our sample was 33 years (19 to 44 years), though only 40.0%
134 (n=191/478) of respondents reported their age. The survey required manual input of
135 age, while all other questions were multiple-choice; this may explain the missing age
136 information. To test whether the subset of our sample with age information was
137 representative of our total study sample, we looked for differences between individuals

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3 138 who reported their age compared to those who did not. This was done across all
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5 139 categorical predictors and dependent variables using the Chi-squared test of
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7 140 independence. We found no significant differences (all $p > 0.20$; $\alpha_{adj} = 0.007$). This
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9 141 suggests that, although a significant proportion of surveys had missing age information,
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11 142 data relating to respondents who reported their age were representative of our total
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13 143 study sample.
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19 145 **Descriptive Findings**

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21 146 During pregnancy, 11.3% ($n = 54/478$) of women had used cannabis at some point in
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23 147 time, including before knowing they were pregnant, and 4.2% ($n = 20/476$) were currently
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25 148 using cannabis. Among 96.2% ($n = 460/478$) who planned to breastfeed, 5.0%
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27 149 ($n = 23/460$) intended to use cannabis during that time. Of the 20 individuals reporting
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29 150 current cannabis use, 9 planned to use while breastfeeding, 8 did not plan to use while
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31 151 breastfeeding and 3 did not intend to breastfeed. Partner cannabis use was reported by
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33 152 37.4% ($n = 178/476$) of respondents. Within this subset, 22.6% ($n = 40/177$) of women
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35 153 reported that their partner had used cannabis around them during the pregnancy.
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42 155 Among those reporting current cannabis use, 65% ($n = 13/20$) used at least weekly. The
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44 156 most common reasons were nausea/vomiting, sleep and nerves/anxiety, with one or
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46 157 more of these being reported by 95% ($n = 19/20$) of current users. Only one individual
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48 158 reported social use as her sole reason for use. Regarding methods of use, 95%
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50 159 ($n = 19/20$) reported smoking cannabis in joint-form. Most users ($n = 17/20$) consumed
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3 160 tetrahydrocannabinol (THC)-containing products and none used cannabidiol (CBD)-only
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5 161 products; the remainder (n=3/20) were unsure which type of cannabis they used.
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9 10 163 **Correlates of Cannabis Use**

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12 164 We analyzed the effects of age, education, partner cannabis use and relationship status
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14 165 on cannabis use at some point in pregnancy, current cannabis use, and intent to use
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16 166 cannabis while breastfeeding. Partner cannabis use and education were significant
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18 167 predictors of cannabis use at some point in pregnancy and intent to use cannabis while
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20 168 breastfeeding (Table 2). Individuals with an elementary or high school education had
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22 169 8.6-fold greater odds (OR 8.6; 95% CI 3.8-19.5) of using cannabis in pregnancy than
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24 170 individuals who attended university/graduate school. Compared to individuals whose
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26 171 partners did not use cannabis, individuals who reported partner cannabis use had 3.3-
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28 172 fold greater odds (OR 3.3; 95% CI 1.8-6.2) of using cannabis in pregnancy. The effects
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30 173 of education and partner cannabis use were found to be additive (Fig. 2). Education was
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32 174 the only significant predictor for current cannabis use.
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40 176 Partner cannabis use was not a significant predictor of current cannabis use and
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42 177 relationship status was not a significant predictor in any of the three models. Although
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44 178 trends suggested that these factors may be correlated with cannabis use, sample sizes
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46 179 of current cannabis users and those who were single/dating may have been too low to
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48 180 detect an effect (Table 1). We found no relationship between age and cannabis use in
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50 181 any of the predictive models.
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183 INTERPRETATION

184 Our survey found that 11.3% (n=54/478) of women had used cannabis at some point in
185 pregnancy and 4.2% (n=20/476) were currently using cannabis. Lower educational
186 attainment and partner cannabis use were found to be significant predictors of cannabis
187 use in pregnancy and intent to use while breastfeeding, but age was not. Regarding
188 relationship status, a greater proportion of single/dating women used cannabis in
189 pregnancy and intended to use while breastfeeding when compared to women who
190 were married/common law/living with a partner, but the effect was not significant.

191
192 Lower educational attainment as a predictor of prenatal cannabis use corroborates
193 previous findings associating lower socioeconomic status with cannabis consumption
194 during pregnancy.^{5,6,8,22} Data from the Better Outcomes Registry and Network in Ontario
195 revealed that 54.7% of pregnant cannabis users were in the lowest two income
196 quintiles.⁸ In our study, 30% (n=27/90) of women who had completed only high school
197 or elementary school used cannabis at some point in pregnancy, compared to only
198 4.1% (n=9/218) of university-educated women (Table 1).

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200 Partner cannabis use was also found to predict maternal cannabis use in pregnancy.
201 Several studies have found that pregnant women are less likely to discontinue
202 substance use if their partners currently use.²³⁻²⁵ We found that individuals whose
203 partners smoked cannabis had 3.3 times greater odds of using cannabis during
204 pregnancy than women whose partners did not smoke. Beyond increasing the likelihood
205 of maternal cannabis use, partner cannabis use could also cause direct harm. Among

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3 206 37.4% (n=178/476) of respondents who reported partner cannabis use in our study,
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5 207 22.6% (n=40/177) reported that their partner smoked cannabis around them. Given
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8 208 known risks of maternal second-hand tobacco smoke exposure to the developing
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10 209 fetus,^{26,27} second-hand exposure to cannabis smoke and THC are cause for concern.

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14 211 Regarding frequency of use, 65% (n=13/20) of pregnant cannabis users consumed
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17 212 cannabis at least weekly. Antenatal cannabis use at least once per week has been
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19 213 associated with low birth weight in exposed neonates.⁹ The most common reasons for
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21 214 use in our study were nausea/vomiting, sleep and nerves/anxiety, with one or more of
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24 215 these being reported by 95% (n=19/20) of current cannabis users. Nausea has
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26 216 previously been reported as a common reason for cannabis use in pregnancy.²⁸

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30 218 Our study reported the prevalence of cannabis use among pregnant women in an urban
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33 219 centre and identified important correlates of antenatal cannabis use. Large-scale
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35 220 studies will be needed over time to identify trends in antenatal cannabis use following
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38 221 national legalization. Also, further inquiry into pregnant women's perceptions and
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40 222 reasons for cannabis use could help improve health counseling and outcomes.

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43 44 224 **Limitations**

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47 225 The survey did not include questions about participants' ethnicity or use of other
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49 226 substances, which have previously been noted to influence prenatal cannabis
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51 227 use.^{5,6,8,22,29,30} Also, women who were non-fluent or non-literate in English were
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54 228 excluded from this study because the survey was written in English, which may have led

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3 229 to selection bias. Finally, the small numbers of current cannabis users (n=20) and
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5 230 individuals who were single/dating (n=40) may have reduced the power of analyses
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8 231 involving these variables.
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11 233 **Conclusion**

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14 234 Our results have important implications for clinical practice, especially given the
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17 235 expanding legalization and decriminalization of cannabis internationally. Given that
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19 236 partner cannabis use predisposes pregnant women to use cannabis while pregnant,
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21 237 including partners in discussions about cannabis risks in pregnancy could reduce
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24 238 prenatal cannabis consumption and potential harm to the fetus. In our study, a greater
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26 239 proportion of women intended to use cannabis while breastfeeding than used cannabis
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28 240 in pregnancy, highlighting the need to counsel abstinence from cannabis not only during
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31 241 pregnancy but also while breastfeeding. Finally, awareness of patterns of cannabis use
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33 242 and reasons for use might aid healthcare providers in more focused counseling.
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35 243 Proposing evidence-based, safer alternatives for coping with bothersome symptoms,
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38 244 including nausea, sleep issues and anxiety, may reduce rates of cannabis use in
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345 **Table 1.** Summary of sample cohort and outcomes.

Variable	All Women	Cannabis at Some Point in Pregnancy	Current Cannabis Use During Pregnancy	Intent to Use Cannabis While Breastfeeding*
All Women	100 (478)	11.3% (54/478)	4.2% (20/478)	5% (23/460)
Education				
Elementary/High School	18.8% (90/478)	30% (27/90)	16% (14/90)	14% (12/83)
College/Trade School	35.6% (170/478)	10.6% (18/170)	2.4% (4/170)	3.7% (6/164)
University/Graduate School	45.6% (218/478)	4.1% (9/218)	0.9% (2/218)	2.3% (5/213)
Income (CA\$)				
\$0-40,000	19.7% (94/478)	27% (25/94)	15% (14/94)	9% (8/88)
\$41,000-100,000	36.8% (176/478)	7.2% (15/208)	1.0% (2/208)	3.5% (7/198)
\$101,000+	43.5% (208/478)	7.9% (14/176)	2.3% (4/176)	4.6% (8/174)
Partner Cannabis Use†				

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3					
4	Yes	37.4% (178/476)	20.2% (36/178)	7.3% (13/178)	8.9% (15/169)
5					
6	No	62.6% (298/476)	6.0% (18/298)	2.3% (7/298)	2.8% (8/289)
7					
8	Relationship Status[†]				
9					
10	Single/Dating	8.4% (40/477)	18% (7/40)	10% (4/40)	9% (3/34)
11					
12					
13	Married/Living Together	91.6% (437/477)	10.8% (47/437)	3.7% (16/437)	4.7% (20/425)
14					
15	Age[§] (years)	32.3 ± 4.6	30.4 ± 6.0	31.1 ± 4.2	30.5 ± 5.3
16					

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18 347 Data are % (n) or mean ± SD.

19 348 Percentages represent the proportion of women with the outcome for a given level of a
 20 349 categorical variable (e.g. 30% of women with a high school education, n=27/90, used
 21 350 cannabis during pregnancy).

22 351 Means represent the mean age of women with the outcome (e.g. the mean age of
 23 352 women that smoked cannabis during pregnancy was 30.4± 6.0).

24 353 *Statistics in this column are calculated from the subset of respondents who intended to
 25 354 breastfeed (those who did not intend to breastfeed were excluded from calculations).

26 355 † Two observations removed due to missingness.

27 356 ‡ One observation removed due to missingness.

28 357 §Statistics are calculated from the n=191 participants who reported their age.

29 358 ||Statistics are calculated from the n=185 participants who reported their age and
 30 359 intended to breastfeed.

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Table 2. Logistic regression model results.

Characteristic	Cannabis Use at Some Point in Pregnancy	Current Cannabis Use During Pregnancy	Intent to Use Cannabis While Breastfeeding
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Education			
Elementary/High School	8.6 (3.8- 19.5)	19.9 (4.4-89.5)	5.9 (2.0-17.7)
College/Trade School	2.5 (1.1-5.8)	2.6 (0.47-14.4)	1.43 (0.4-4.8)
University/Graduate School	Ref.	Ref.	Ref.
Partner Cannabis Use†			
Yes	3.30 (1.8-6.2)	NS	2.8 (1.1-6.9)
No	Ref.	NS	Ref.

373 OR, odds ratio; CI, confidence interval; Ref., reference value; NS, not significant.

374 †Two observations removed due to missingness.

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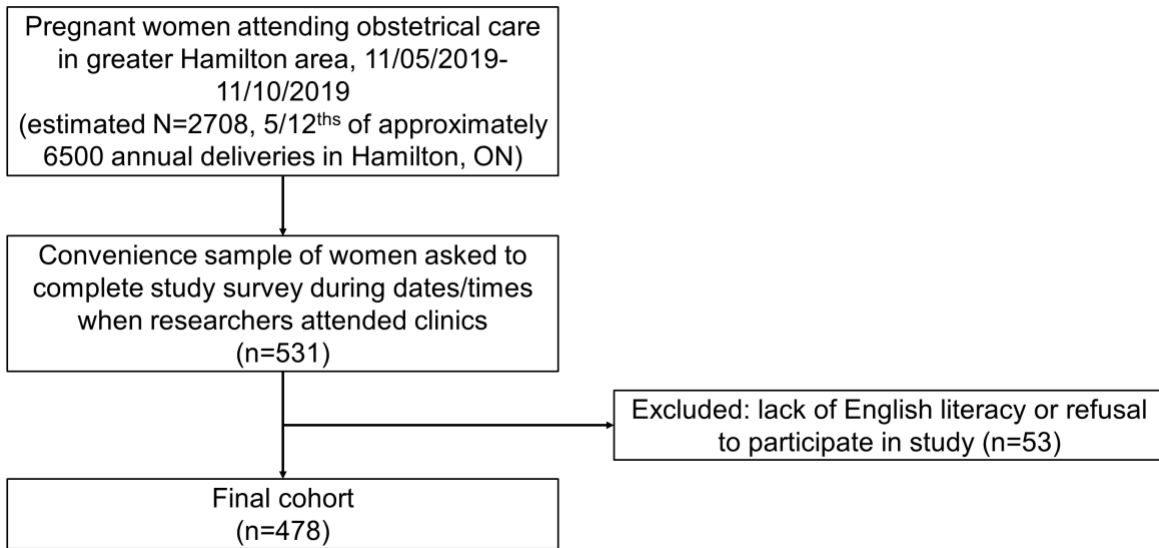


Figure 1. Description of participant accrual.

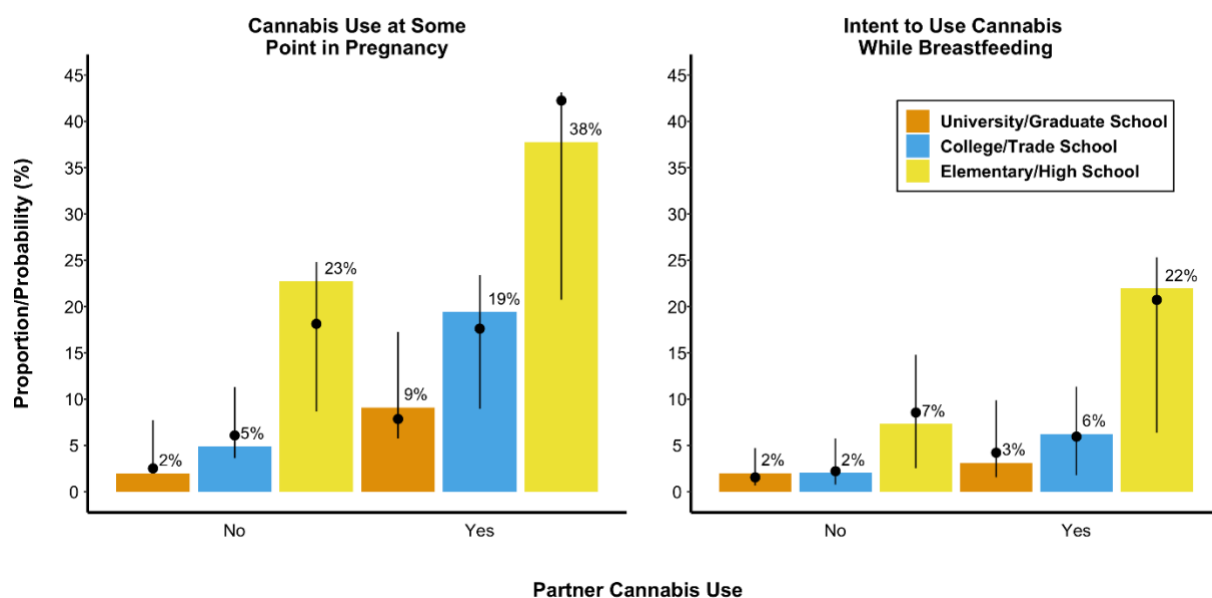


Figure 2. Predictors of cannabis use at some point in pregnancy and intent to use cannabis while breastfeeding. For each group of women, coloured bars represent the proportion of women who reported the outcome and dots represent the estimated probability of the outcome ($\pm 95\%$ CI).

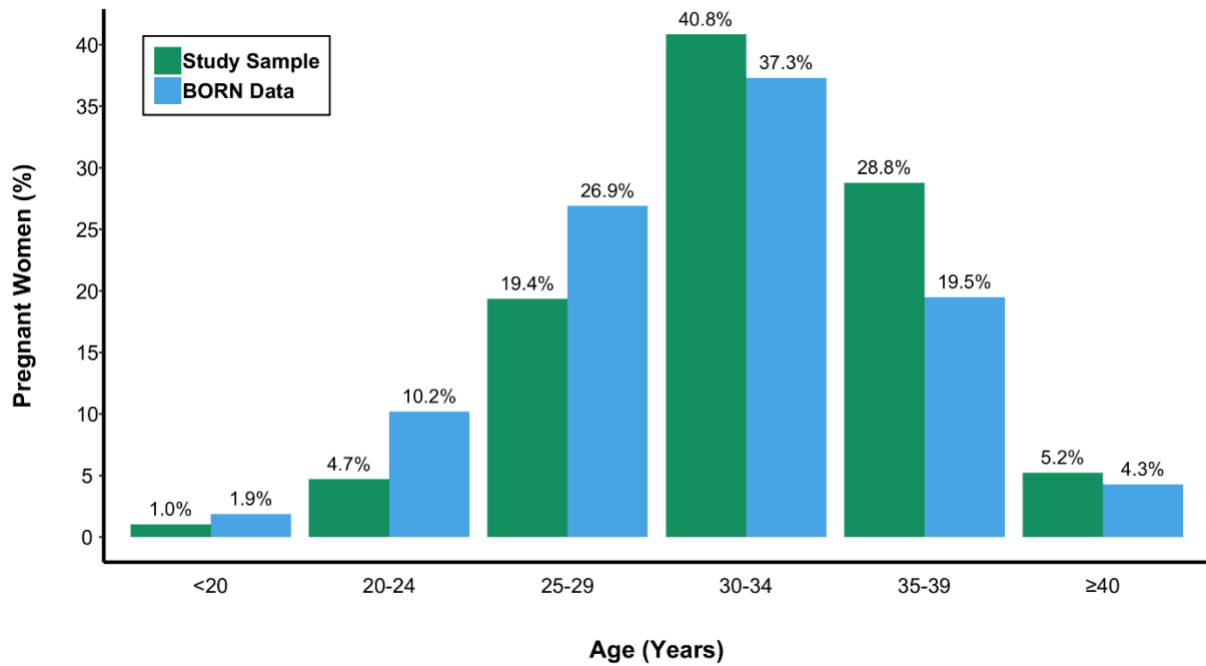


Figure S1. Age distribution of our study sample compared to the distribution of maternal age at birth in the Better Outcomes Registry and Network (BORN) from Ontario in 2016-2017.

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Appendix S1. Survey questions and response options.
Sample “Yes” responses were entered to trigger additional questions about partner cannabis use and characteristics of current cannabis use.

Confidential

Table 1. Summary of sample cohort and outcomes.

Variable	All Women	Cannabis at Some Point in Pregnancy	Current Cannabis Use During Pregnancy	Intent to Use Cannabis While Breastfeeding*
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Yes	37.4% (178/476)	20.2% (36/178)	7.3% (13/178)	8.9% (15/169)
No	62.6% (298/476)	6.0% (18/298)	2.3% (7/298)	2.8% (8/289)
Relationship Status[‡]				
Single/Dating	8.4% (40/477)	18% (7/40)	10% (4/40)	9% (3/34)
Married/Living Together	91.6% (437/477)	10.8% (47/437)	3.7% (16/437)	4.7% (20/425)
Age[§] (years)	32.3 ± 4.6	30.4 ± 6.0	31.1 ± 4.2	30.5 ± 5.3

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5 Percentages represent the proportion of women with the outcome for a given level of a
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7 categorical variable (e.g. 30% of women with a high school education, n=27/90, used
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9 cannabis during pregnancy).
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11 Means represent the mean age of women with the outcome (e.g. the mean age of
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13 women that smoked cannabis during pregnancy was 30.4 \pm 6.0).
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17 *Statistics in this column are calculated from the subset of respondents who intended to
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19 breastfeed (those who did not intend to breastfeed were excluded from calculations).
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Table 2. Logistic regression model results.

Characteristic	Cannabis Use at Some Point in Pregnancy	Current Cannabis Use During Pregnancy	Intent to Use Cannabis While Breastfeeding
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Education			
Elementary/High School	8.6 (3.8- 19.5)	19.9 (4.4-89.5)	5.9 (2.0-17.7)
College/Trade School	2.5 (1.1-5.8)	2.6 (0.47-14.4)	1.43 (0.4-4.8)
University/Graduate School	Ref.	Ref.	Ref.
Partner Cannabis Use†			
Yes	3.30 (1.8-6.2)	NS	2.8 (1.1-6.9)
No	Ref.	NS	Ref.

OR, odds ratio; CI, confidence interval; Ref., reference value; NS, not significant.

†Two observations removed due to missingness.

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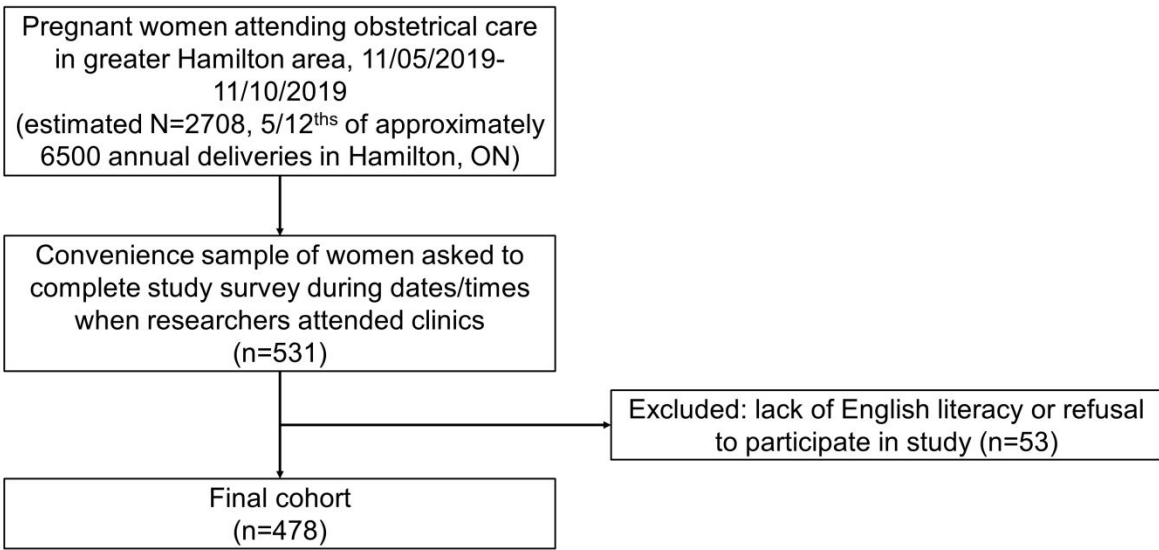


Figure 1. Description of participant accrual.

Confidential

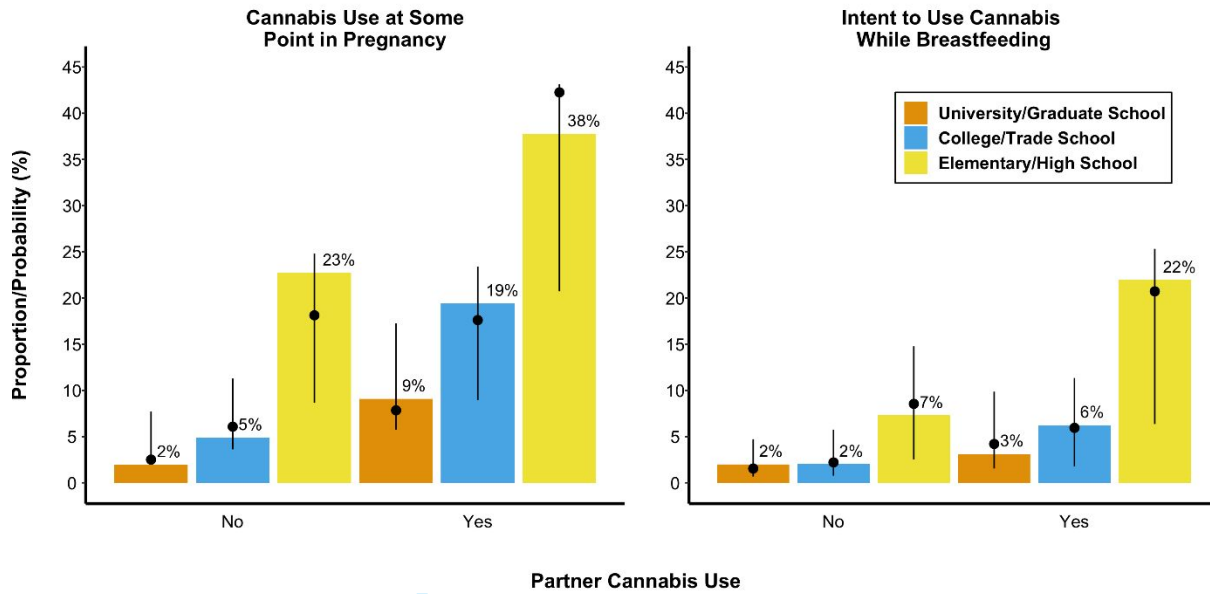


Figure 2. Predictors of cannabis use at some point in pregnancy and intent to use cannabis while breastfeeding. For each group of women, coloured bars represent the proportion of women who reported the outcome and dots represent the estimated probability of the outcome ($\pm 95\%$ CI).

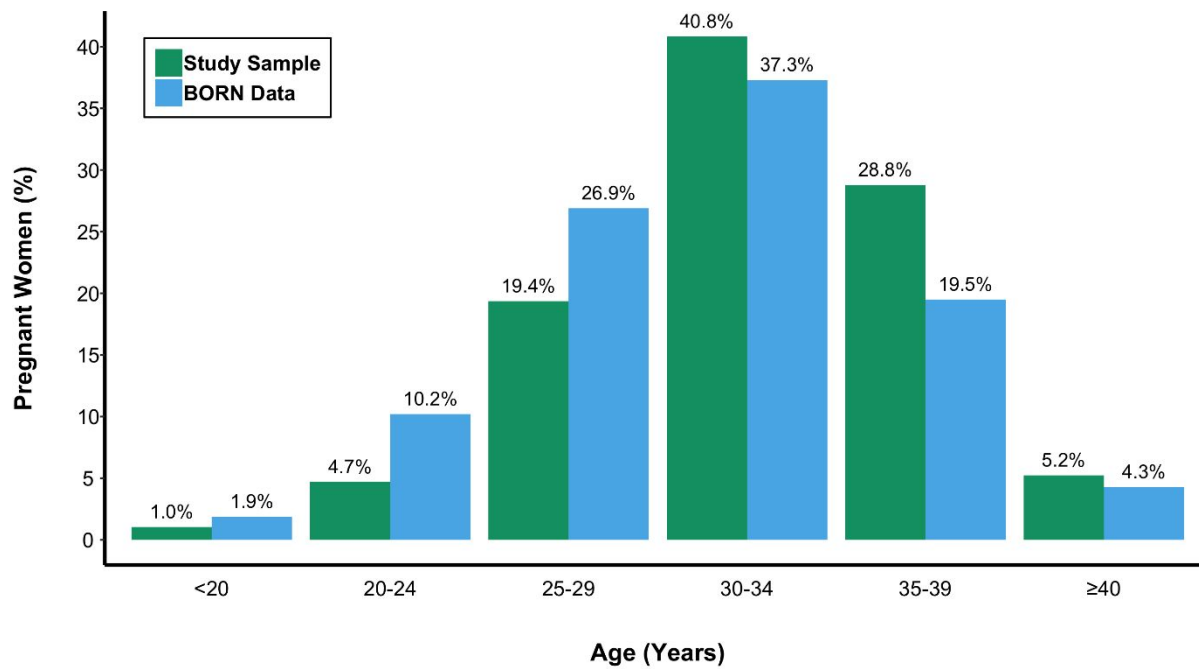


Figure S1. Age distribution of our study sample compared to the distribution of maternal age at birth in the Better Outcomes Registry and Network (BORN) from Ontario in 2016-2017.

Resize font:



Cannabis and Pregnancy

How old are you?

What is the highest level of education that you have completed?

- elementary/middle school
- high school
- trade schooling
- college
- university undergrad degree
- graduate/professional school

reset

What is your annual household income?

- under \$20,000
- \$20,000 - \$40,000
- \$41,000 - \$60,000
- \$61,000 - \$80,000
- \$81,000 - \$100,000
- over \$100,000

reset

What is your relationship status?

- single/divorced/widowed
- in a relationship but not living together
- married/common law/living together

reset

Have you *ever* smoked marijuana or used any cannabis products?

- Yes
- No

reset

Does your partner smoke marijuana or use cannabis products?

- Yes
- No

reset

Has your partner smoked marijuana around you during your pregnancy?

- Yes
- No

reset

1 **Have you smoked marijuana or used cannabis**
2 **products at any point during this pregnancy?**
3 **(including during the time before you knew you**
4 **were pregnant)**

Yes

No

reset

7 **Are you currently smoking marijuana or using**
8 **cannabis products?**

Yes

No

reset

13 **How do you use it? (check all that apply)**

smoking flower/joints

using a pipe or water bong

edibles

oils

vaporizing (vaping) with a device

24 **What type do you use?**

THC

CBD

combination

not sure

reset

34 **How often do you smoke marijuana or use**
35 **cannabis product?**

occasionally (once a month or less)

a few times a month

once a week

2-3 times per week

4-6 times per week

daily

reset

46 **Please indicate the reason you find cannabis**
47 **helpful (check all that apply)**

nausea and/or vomiting

pain

sleep

nerves/anxiety

social

other

1 **Do you think that you will smoke marijuana or**
 2 **use cannabis products after giving birth, while**
 3 **breastfeeding?**

- Yes
 No
 I don't plan to breastfeed

4
5
6
7 reset

8 **Have you ever received information about**
 9 **cannabis and pregnancy from a healthcare**
 10 **professional?**

- Yes
 No

11
12 reset

13 **Do you think marijuana/cannabis can pass**
 14 **through to the baby when you're pregnant?**

- Yes
 No

15
16
17
18 reset

19 **Do you think that marijuana/cannabis can be**
 20 **transmitted to the baby through breast milk?**

- Yes
 No

21
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23
24 reset

25 **Has your choice to use or not use cannabis during**
 26 **pregnancy or breastfeeding been influenced by**
 27 **the recent legalization?**

- Yes
 No

28
29
30 reset

31 **Have you ever looked for information about how**
 32 **cannabis can affect your pregnancy?**

- Yes
 No

33
34
35
36 reset

37 **If you wanted to find information on how**
 38 **cannabis affects pregnancy, where would you**
 39 **look?**

- from healthcare professionals
 on the internet
 from cannabis dispensaries/sellers
 from pregnancy groups
 from family/friends
 other

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57 Submit

Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

<i>Item Category / Checklist Item</i>	<i>Explanation</i>	<i>Location in paper</i>
Design		
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	Page 4, 6, Figure 1
IRB (Institutional Review Board) approval and informed consent process		
IRB approval	Mention whether the study has been approved by an IRB.	Page 7
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	Page 4
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	Page 4
Development and pre-testing		
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	Page 4
Recruitment process and description of the sample having access to the questionnaire		
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	Page 4
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	Page 4
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	N/A Not advertised Page 4
Survey administration		
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	Page 4
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on an anti-immunization Web site will have different results from a Web survey conducted on a government Web site	N/A
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	no
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	no
Time/Date	In what timeframe were the data collected?	Page 4

<i>Item Category / Checklist Item</i>	<i>Explanation</i>	<i>Location in paper</i>
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	N/A
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	Page 4
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	One page only Appendix S1
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	One page only Appendix S1
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JavaScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	No was not done
Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	No, one page only Appendix S1
Response rates		
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	N/A
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	N/A
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	N/A
Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)	N/A
Preventing multiple entries from the same individual		
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	N/A
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address	N/A

<i>Item Category / Checklist Item</i>	<i>Explanation</i>	<i>Location in paper</i>
	were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	N/A
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	N/A
Analysis		
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	N/A
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	Not done
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	N/A