



Women's cannabis use before, during, and after pregnancy in New Hampshire

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ABSTRACT

Cannabis use in the United States has been steadily increasing. Much more is known about cannabis users in states where recreational cannabis is legal, compared to states yet to legalize. Further, there is little information known about reasons for cannabis use during critical maternal and child health periods. To address this gap, we examined cannabis use among New Hampshire women during the preconception, prenatal, and postpartum periods, and explored reasons for use. We analyzed data from the 2016–2017 Pregnancy Risk Assessment Monitoring System (PRAMS) in the Spring of 2020. For women delivering a live-born infant, PRAMS collects behavior and experience data before, during, and after pregnancy. Using data from New Hampshire, we estimated the weighted prevalence of self-reported cannabis use during the preconception, prenatal, and postpartum periods, and reasons for use during each period. Of the 1147 women included in the analysis, 16.8% (unweighted $n = 186$) reported preconception cannabis use, 5.5% (unweighted $n = 68$) reported prenatal cannabis use, and 6.6% (unweighted $n = 73$) reported postpartum cannabis use. About one-fifth (20.3%) of women who reported cannabis use reported use during all three periods. The top reason for cannabis use during preconception and postpartum was for stress or anxiety relief (64.88% and 73.06, respectively), and during the prenatal period was for its' antiemetic properties (84.1%). Our findings support that women's healthcare providers should screen patients for cannabis use, addressing underlying reasons (e.g., mental health issues, nausea/vomiting) for use as part of the screening process.

1. Introduction

There is no known safe level of cannabis use during preconception, pregnancy, or lactation (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2017). Cannabis use during the preconception, prenatal, or postpartum period (or any combination thereof) may bring with it a unique set of adverse health outcomes. The female reproductive system is influenced by the endocannabinoid system, meaning that repeated cannabis exposure during the preconception period may interfere with normal ovulation and menstrual cycles (Walker et al., 2019). As the main psychoactive component of cannabis, Δ -9-tetrahydrocannabinol (THC), readily crosses the placenta, there are likely adverse effects of in-utero exposure (Volkow et al., 2017). Indeed, there is evidence to support adverse birth outcomes associated with prenatal cannabis use, such as low birth weight (National Academies of Sciences, Engineering, and Medicine, 2017). Additionally, there is heightened risk of impaired child neurodevelopment associated with in-

utero cannabis exposure or exposure via breast milk (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2017; Ryan et al., 2018; Reece-Stremtan and Marinelli, 2015). A combination of insufficiency of evidence and the potential for adverse health effects of exposure have led the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics to recommend women abstain from cannabis use during pregnancy (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2017; Ryan et al., 2018). Limited research suggest postpartum cannabis use may be harmful to infants, especially among breastfeeding dyads, as THC is detectable in breast milk for up to 6 days after use (Bertrand et al., 2018). As a result, both the Academy for Breastfeeding Medicine and ACOG recommend that women abstain from cannabis use while breastfeeding (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2017; Reece-Stremtan and Marinelli, 2015). Postpartum cannabis use may also bring heightened risk for accidental child ingestion of cannabis containing

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products as infants become mobile.

Despite these recommendations, cannabis use prevalence in the United States (US) has been steadily increasing over the past several years (Brown et al., 2017; Young-Wolff et al., 2017; Volkow et al., 2019). Data from the National Survey on Drug Use and Health estimate that about 13.7% of non-pregnant women of reproductive age used cannabis in 2018 (McCance-Katz, 2017). Prenatal cannabis use prevalence estimates in the US have more than doubled from 3.4% in 2002 to 7.0% in 2016 (Volkow et al., 2019). A recent analysis of the 2017 PRAMS Marijuana Supplement, which included data from 8 states, found that 9.8% of women self-reported cannabis use before pregnancy, 4.2% during pregnancy, and 5.5% after pregnancy (Ko et al., 2020). Given the risks of adverse health outcomes associated with cannabis use, increases in cannabis use during these critical maternal and child health periods raise concern.

Increased cannabis use during critical maternal and child health periods can be attributed to both decreased risk perceptions associated with cannabis use and increasing social acceptance of the drug (Jarlenski et al., 2017; McGinty et al., 2017; Passey et al., 2014). This is supported by a recent study that found approximately 70% of pregnant women perceived slight or no risk of harm from using cannabis once or twice per week (Ko et al., 2015). Prior studies have demonstrated that women who experience nausea and vomiting in pregnancy are more likely to use cannabis, compared to those without (Young-Wolff et al., 2019a; Roberson et al., 2014). Among prenatal cannabis users, cannabis dependency may be an important driver of use, as data from a national survey found that of pregnant women who used cannabis in the past year, 18.1% met criteria for abuse, dependence, or both (Ko et al., 2015). More broadly, cannabis users have reported mental health issues, including stress, anxiety, and depression as a reasons for use (Hyman and Sinha, 2009). What remains unknown is if motives for cannabis use differ across the preconception, prenatal, and postpartum periods.

Increases in cannabis use at the national level make perinatal cannabis use a pressing public health issue, regardless of legality of cannabis at a state level. Yet, much more is known about perinatal cannabis users in states where recreational cannabis is legal (Akhigbe et al., 2018; Crume et al., 2018; Gnofam et al., 2019; Metz et al., 2019; Siega-Riz et al., 2020; Skelton et al., 2020; Young-Wolff et al., 2020, 2018, 2019a, 2019b), compared to those states yet to legalize (Ko et al., 2020). It is important to understand maternal cannabis use prevalence and associated reasons for use for women, including women who reside in states yet to legalize. Moreover, few studies have examined underlying reasons for cannabis use among women (Young-Wolff et al., 2018; Chang et al., 2019; Latuskie et al., 2019). Therefore, to address this evidence gap, we aimed to examine self-reported cannabis use among women before, during, and after pregnancy and explore reasons for use in New Hampshire, a state where recreational cannabis was illegal at the time of data collection.

2. Methods

To assess cannabis use before, during and after pregnancy in New Hampshire, we used data from the 2016 and 2017 Pregnancy Risk Assessment Monitoring System (PRAMS), a population-based surveillance system of the Centers for Diseases Control and Prevention (CDC) (Shulman et al., 2018). Participating PRAMS states randomly survey mothers annually via mail or telephone between 2 and 6 months postpartum about maternal behavior and experience before, during, and after pregnancy (Shulman et al., 2018). PRAMS data are weighted to account for the complex sample design, as well as non-response and non-coverage (Shulman et al., 2018). For analysis, we combined New Hampshire data from 2016 and 2017, the two most recent years for which data are available. To maximize data availability, we did not exclude any respondents. At the time of PRAMS data collection in 2016 and 2017, recreational cannabis was illegal and medicinal cannabis was legal in New Hampshire.

In 2016 and 2017, New Hampshire PRAMS asked women about “marijuana or hash use in any form” in any of the following time periods: preconception (12 months prior to becoming pregnant); prenatal (during their most recent pregnancy); or postpartum (since their new baby was born). Women who reported cannabis use during any period were also asked, “Why did you use marijuana products?” and provided with specified response options that were not mutually exclusive. These included: to relieve nausea; to relieve vomiting; to relieve stress or anxiety; to relieve symptoms of a chronic condition; to relieve pain; for fun or to relax; and other, with an option to write in a response.

We performed data analysis in the spring of 2020. First, we used descriptive statistics to estimate weighted prevalence estimates of self-reported cannabis use, examining cannabis use by maternal socio-demographic characteristics. There was a low level of missingness for our outcome of interest; in the preconception, prenatal, and postpartum periods, there were 7, 15, and 18 women who were missing data in the corresponding period, respectively. We included women in analyses for each period in which they had self-reported cannabis use data. We used Pearson χ^2 tests to examine differences in perinatal cannabis use by these sociodemographic characteristics, setting a significance level of $\alpha = 0.05$. The results of the χ^2 comparisons for each group are presented as p -values in Tables 1 and 2. Next, we examined reasons for use for each time period, calculating weighted proportions. We used Stata 14.1 (StataCorp) for all analyses. The CDC Institutional Review Board (IRB) approved this secondary data analysis; the Johns Hopkins Bloomberg School of Public Health IRB determined this research exempt.

3. Results

The final unweighted analytic cohort included 1147 women, which included 954 women who did not report any cannabis use. Due to a minimal amount of missing data, the final sample size for each period varied: 1140 women were included in the preconception sample, 1132 in the prenatal analyses, and 1129 in the postpartum sample. The total population size represented for each time period was 23,766 women in the preconception period, 23,563 women in the preconception period, and 23,532 women in the postpartum period. A total of 17.11% (unweighted $n = 193$) women reported any cannabis use. Of the entire sample, 16.8% (unweighted $n = 186$) used cannabis in the preconception period, 5.5% (unweighted $n = 68$) in the prenatal period, and 6.6% (unweighted $n = 73$) in the postpartum period (Table 1). Non-married status, younger maternal age ($<35y$), lower annual household income ($<\$40,000$), lower level of maternal education, and health insurance status were all significantly associated with higher prevalence of maternal cannabis use during each period ($p < 0.01$). Cigarette smoking during the corresponding time period was significantly associated with preconception and prenatal cannabis use only ($p < 0.01$). About one-fifth (20.3%, unweighted $n = 44$) of women who reported any cannabis use reported using during all three periods. Of preconception cannabis users, 66.3% (unweighted $n = 121$) reported cessation of cannabis use during pregnancy, while 33.7% (unweighted $n = 65$) reported continuing cannabis use while pregnant. Very few women (1.0%, unweighted $n = 2$) reported cannabis use during pregnancy only.

The top reason for cannabis use during preconception and postpartum was for stress or anxiety relief (65% and 73%, respectively; Table 2). During pregnancy, the most common reason was as an anti-emetic (84.1%). Approximately 11.5% of women reported additional reasons for cannabis use via the write in option, which included: to increase appetite, as a sleep aid, and to help with pain, depression, and post-traumatic stress disorder. Using cannabis to relieve nausea was significantly associated with higher prevalence of use in the prenatal and postpartum periods ($p < 0.01$). Use of cannabis to relieve nausea was more commonly reported by women during the prenatal period (84.08%). Using cannabis for fun or to relax was significantly associated with lower self-reported use in the prenatal period only ($p < 0.01$).

Table 1
Sample characteristics of PRAMS women in New Hampshire by self-reported cannabis use, 2016–2017^a.

Maternal characteristic	Total (N = 1147)	Preconception user (n = 186)		Prenatal user (n = 68)		Postpartum user (n = 73)	
	n(%)	n(%)	p-value ^b	n(%)	p-value ^b	n (%)	p-value ^b
Married	805 (68.7)	67 (35.75)	<0.001	20 (31.78)	<0.001	32 (45.14)	<0.001
Age (y)			<0.001		0.01		<0.001
≤17	3 (0.6)	1 (1.14)		0 (0.00)		0 (0.00)	
18–24	183 (16.0)	62 (30.29)		27 (35.87)		27 (39.48)	
25–34	744 (65.0)	106 (57.14)		36 (53.59)		40 (50.01)	
≥35	217 (18.4)	17 (11.44)		5 (10.55)		6 (10.51)	
Income^c			<0.001		<0.001		<0.001
<\$40,000	381 (34.9)	115 (64.12)		54 (82.16)		45 (65.31)	
≥\$40,000	728 (65.1)	65 (35.88)		11 (17.84)		25 (34.70)	
Race			0.03		<0.001		0.39
White	1030 (89.1)	172 (95.32)		65 (98.96)		67 (93.92)	
Black	20 (1.8)	1 (0.11)		1 (0.35)		1 (0.29)	
Other race	87 (9.1)	10 (4.57)		2 (0.69)		3 (5.80)	
Ethnicity			0.43		0.004		0.89
Hispanic	35 (2.7)	5 (1.57)		1 (0.35)		1(3.07)	
Non-Hispanic	1107 (97.3)	179 (98.43)		67 (99.65)		71 (96.93)	
Education			<0.001		<0.001		<0.001
<high school	45 (5.0)	18 (9.51)		9 (12.98)		5 (4.32)	
Completed high school	193 (20.1)	60 (40.3)		28 (51.91)		25 (46.25)	
Some college	319 (26.5)	57 (25.1)		23 (23.87)		29 (31.72)	
≥4-year college	586 (48.4)	50 (3.79)		8 (11.24)		14 (17.70)	
WIC participation	933 (82.3)	120 (66.21)	<0.001	34 (42.71)	<0.001	48 (68.55)	0.013
Health insurance^d			<0.001		<0.001		<0.001
Public	136 (12.3)	44 (18.49)		(37.74)		22 (24.90)	
Private/military	908 (78.9)	107 (61.00)		(42.38)		36 (47.88)	
No insurance	93 (8.9)	35 (20.51)		(19.88)		15 (27.22)	
Ever breastfed	1035 (92.5)	153 (87.45)	0.03	48 (78.68)	<0.001	58 (84.2)	0.02
Still breastfeeding	682 (68.3)	76 (52.95)	0.001	18 (43.88)	0.002	26 (53.99)	0.03
Cigarette smoking^e		101 (52.84)	<0.001	38 (55.50)	<0.001	38 (55.50)	0.02

WIC: Special Supplemental Nutrition Program for Women, Infants, and Children.

^a Raw n with weighted percentages

^b p-values presented are for χ^2 comparisons of each group with the total sample.

^c Annual household income.

^d Public insurance included Medicaid, CHIP, or other government health insurance. Private insurance included TRICARE or other military insurance, private health insurance, health insurance through parents, and health insurance through the health care exchange. No insurance included women who reported no insurance or Indian Health Service only.

^e reflects cigarette smoking during corresponding period.

Table 2
Self-reported reasons for cannabis use by PRAMS women in New Hampshire in 2016 and 2017 (n = 193)^a.

Reasons for use	Percent (Number)		Preconception (n = 186)		Prenatal (n = 68)		Postpartum (n = 73)	
	Total (n = 193)	n %	n %	p-value ^b	n %	p-value ^b	n %	p-value ^b
To relieve stress or anxiety	123 (61.75)		119 (64.88)	0.46	53 (78.32)	0.18	54 (73.06)	0.07
For fun or to relax	90 (48.92)		87 (50.02)	0.57	17 (28.90)	0.001	31 (44.82)	0.21
To relieve nausea	67 (32.42)		63 (33.34)	0.27	54 (84.08)	<0.001	40 (56.51)	<0.001
To relieve vomiting	47 (9.77)		43 (19.75)	0.22	40 (56.75)	<0.001	25 (28.11)	0.563
To relieve symptoms of a chronic condition	19 (7.34)		19 (7.88)	0.57	9 (10.02)	0.59	10 (11.35)	0.30
Other	32 (11.47)		30 (11.07)	0.31	19 (15.58)	0.4768	13 (8.44)	0.40

^a Raw n with weighted proportions.

^b p-values presented are for χ^2 comparisons of each group with the total sample.

(Table 2).

4. Discussion

In this cross-sectional study of maternal cannabis use in New Hampshire, we found the highest prevalence of cannabis use in the preconception period; fewer women reported cannabis use in the prenatal and postpartum periods. The top reason for cannabis use before and after pregnancy was for stress or anxiety relief. During pregnancy, women most frequently reported use of cannabis to help alleviate nausea or vomiting. This study is one of only a few to examine underlying reasons for cannabis use during critical maternal and child health periods.

Estimates of preconception use in this study were higher than other

studies using self-reported data. We found that 16.8% of women reported cannabis use prior to pregnancy in New Hampshire — a slightly higher prevalence than a recent study that estimated preconception cannabis use to be 14.73% using 2016 PRAMS data from four states (Skelton et al., 2020). In comparison to a recently published study using 2016 PRAMS data from 5 states (not including New Hampshire), we found nearly doubled estimates of preconception use; 8% versus 16%, respectively (Short et al., 2020). The higher prevalence of preconception use found in this study may be due to the inclusion of data from a single state, as compared to multiple states. It may also be due to the fact that New Hampshire border states have legalized recreational cannabis, making it more geographically accessible for residents.

Prenatal cannabis rates in this study (5.5%) were lower than the national average of 7.0% in 2016, which was estimated using data from

the National Survey on Drug Abuse and Health (Volkow et al., 2019). However, in comparison to a recently published article by Ko et al (Ko et al., 2020) that uses data from the 2017 PRAMS Marijuana Supplement from 8 states, we found approximately a 1.3% higher prevalence estimate of prenatal cannabis use. Although there was a low prevalence of prenatal cannabis use, approximately 33.7% of women who used prior to pregnancy reported continued use during pregnancy. On this note, it is important to state that we are unable to get at cannabis dependency, which is a point of future research in this population. In keeping with clinical recommendations, healthcare providers — even in states where recreational cannabis is not yet legal — should ask women about cannabis use before, and during pregnancy, and encourage women who are contemplating pregnancy, currently pregnant, or breastfeeding to discontinue cannabis use (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2017; Reece-Stremtan and Marinelli, 2015). Additionally, healthcare providers could offer counseling and other evidence-based resources to encourage cessation (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2017; Reece-Stremtan and Marinelli, 2015).

Among postpartum women, about 6.6% reported using cannabis, in alignment with prior prenatal cannabis use estimates from PRAMS, ranging from 5.0 to 5.5% (Crume et al., 2018; Ko et al., 2018). In this study, cannabis use rates after birth did not rise to preconception levels, indicating that women may be quitting, rather than simply abstaining from cannabis during pregnancy. However, longitudinal research is needed to examine cannabis use during the transition from preconception to pregnancy and then into the postpartum period. Moreover, most women reporting postpartum cannabis use (84.2%) in our sample ever breastfed their infant.

In this study, we found a majority of women who reported prenatal cannabis use reported using the drug as an antiemetic, with 84.08% and 56.75% of women reporting use of the drug to relieve nausea and vomiting, respectively. A recent rapid review of women's perceptions of prenatal cannabis use concluded that women perceived a lack of communication regarding cannabis use from providers as an indication that outcomes of in-utero cannabis exposure were insignificant (Weisbeck et al., 2020). Thus, thorough communication about potential adverse health effects of prenatal cannabis use may be key in reducing prevalence during this critical period. Additionally, prenatal care providers should also screen for nausea and vomiting during pregnancy, proactively offering safe alternatives to cannabis. Future research should examine best practices for healthcare providers in screening for, and communicating with patients regarding cannabis.

We also found that the most frequently reported reason for cannabis use before and after pregnancy was maternal stress and anxiety. This is consistent with previous studies that have identified maternal stress and anxiety as a driver for cannabis use (Chang et al., 2019; Latuskie et al., 2019). Further, this finding is also stable with the broader field of cannabis, where stress and anxiety are primary motives for cannabis use in the general population (Hyman and Sinha, 2009). Interventions to reduce stress and anxiety during these periods, such as mindfulness, prenatal yoga, or postpartum support groups and referral to appropriate mental health professionals, may be helpful in reducing cannabis use among women. Future research should examine effective strategies to address women's mental health issues, including stress, anxiety, and depression, among all women of childbearing age as a potential preventive measure to stop uptake of cannabis use. Concentrating cannabis preventive efforts on women's mental health during the preconception period may prove effective in not only reducing initial uptake of cannabis to cope with mental health issues, but it may also reduce fetal and child exposure to cannabis for women continuing to use during pregnancy and after birth. State-level women's health organizations should ensure that women's health care providers and community partners are equipped to answer cannabis-related questions and remain up-to-date on emerging evidence on risks of cannabis use on maternal and child health outcomes.

New Hampshire legalized medical cannabis in 2013 and decriminalized cannabis in 2017. In February 2020, the New Hampshire House of Representatives passed HB 1648, but was defeated in the Senate. The bill would have legalized possession and limited cultivation of cannabis for adults 21 and over, but not have allowed for retail sales (Walker et al., 2019). It is possible that the legislature may revisit this issue in the next few years. Given that recreational cannabis legalization in other states has been associated with increased cannabis use among women during critical periods, such as during pregnancy and postpartum (National Academies of Sciences, Engineering, and Medicine, 2017; Volkow et al., 2017), it is important for New Hampshire policymakers to ensure any future cannabis legislation includes provisions to safeguard maternal and child health.

4.1. Limitations

This study has limitations. The PRAMS data collection methods rely on retrospective recall and self-report. Self-reported cannabis use is under-reported compared to biological measures (e.g., urine screening, umbilical cord sampling), even in states where recreational cannabis is legal (Young-Wolff et al., 2017; Metz et al., 2019). These, in combination with fear of punitive action and social desirability bias indicate that the prevalence estimates presented in this paper are likely conservative.

5. Conclusions

In a state where recreational cannabis is illegal, we found that almost one-sixth of women reported using cannabis prior to pregnancy. However, fewer women reported use in pregnancy and postpartum. The most commonly cited reason for use during pregnancy was as an antiemetic. Our findings underscore the importance of women's healthcare providers as vital partners in addressing cannabis use before, during, and after pregnancy through non-punitive education about the risks associated with contemporary use. Although additional research is needed on the maternal and child health effects of cannabis exposure, there is currently no safe level of cannabis use for pregnant or breastfeeding women — a point of consideration for policymakers when proposing legalization. Given that recreational cannabis legislation is likely imminent in the state, New Hampshire policymakers should consider provisions to safeguard women and young children, such as strict regulation of cannabis containing products and providing cessation resources that include evidence-based stress and anxiety reduction interventions for women who are contemplating pregnancy or currently pregnant.

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Kara R. Skelton: Conceptualization, Methodology, Software, Writing - original draft. **Amelie A. Hecht:** . **Sara E. Benjamin-Neelon:** Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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