

**Research Letter** | Substance Use and Addiction

# Association of Depression, Anxiety, and Trauma With Cannabis Use During Pregnancy

Kelly C. Young-Wolff, PhD, MPH; Varada Sarovar, PhD; Lue-Yen Tucker, BA; Nancy C. Goler, MD; Stacey E. Alexeeff, PhD; Kathryn K. Ridout, MD, PhD; Lyndsay A. Avalos, PhD

## Introduction

Prenatal cannabis use is increasing,<sup>1,2</sup> and several qualitative studies<sup>3,4</sup> indicate that pregnant women self-report using cannabis to manage stress and mood. However, few epidemiological studies have examined whether pregnant women with mental health disorders and trauma are at increased risk of using cannabis during pregnancy. Data from the Kaiser Permanente Northern California (KPNC) large integrated health care system, which provides universal screening for prenatal cannabis use by self-report and urine toxicology testing, were used in this cross-sectional study to examine the association of depression, anxiety, and trauma diagnoses and symptoms with prenatal cannabis use.

## + Supplemental content

Author affiliations and article information are listed at the end of this article.

## Methods

Pregnant women with live births at KPNC who completed a self-reported questionnaire on prenatal substance use and a urine toxicology test at their first prenatal visit (at approximately 8 weeks' gestation) during standard prenatal care from 2012 to 2017 were included. Confirmatory tests were performed for positive toxicology tests. Of 219 071 pregnancies, 1042 (0.5%) without the date of the last menstrual period, 21 115 (9.6%) without a toxicology test, and 892 (0.4%) with no answer to the question about self-reported cannabis use were excluded.

The KPNC institutional review board approved this study and waived the need for informed consent. This study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Depressive and anxiety disorders and trauma diagnoses during pregnancy were ascertained from the electronic health record. *International Classification of Diseases, Ninth Revision, Clinical Modification* and *International Statistical Classification of Diseases, Tenth Revision, Clinical Modification* diagnosis codes used to identify depressive disorders, anxiety disorders, and trauma diagnoses during pregnancy (ie, from last menstrual period through date of live birth) are provided in the eAppendix in the [Supplement](#). Self-reported depression symptoms (based on the Patient Health Questionnaire-9<sup>5</sup>; score <5, none; score 5-9, mild depression; score 10-14, moderate depression; score ≥15, moderately severe to severe depression) and intimate partner violence were assessed via universal screening at the first prenatal visit. The 3 self-reported questions used to identify intimate partner violence at the first prenatal visit are shown in the eAppendix in the [Supplement](#).

We compared demographic and mental health characteristics of pregnant women with and without any prenatal cannabis use (by self-report and/or a positive toxicology test). *P* values were calculated using separate generalized estimating equation models to account for some women having more than 1 pregnancy during the study period. Next, the adjusted odds ratios (aORs) and 95% CIs of any prenatal cannabis use by mental health diagnoses or symptoms were estimated using generalized estimating equation models to account for women with multiple pregnancies during the study, adjusting for year, median neighborhood annual household income, age, and self-reported race/ethnicity. Two-sided *P* < .05 was considered statistically significant. Data analysis was performed using SAS statistical software version 9.4 (SAS Institute) from June 2019 to October 2019.

**Open Access.** This is an open access article distributed under the terms of the CC-BY License.

Results

Of the 196 022 pregnancies, 69 925 (35.7%) were white, 29 486 (15.0%) were aged less than 25 years (mean [SD] age, 30.3 [5.4] years), and the median (interquartile range) neighborhood annual household income was \$70 859 (\$51 893-\$93 036); 11 681 pregnancies (6.0%) screened positive for prenatal cannabis (Table). The prevalence of mental health conditions ranged from 1.9% (intimate partner violence) to 11.0% (depression symptoms of at least moderate severity). Women who used cannabis, compared with those who did not use cannabis, were younger (age <25 years, 4904 [42.0%] vs 24 582 [13.3%]), had lower annual household incomes (income <\$51 893, 4697 [40.3%] vs 44 251 [24.0%]), were more likely to be African American (2296 [19.7%] vs 8185 [4.4%]) or Hispanic (3652 [31.3%] vs 51 052 [27.7%]), and were less likely to be Asian (333 [2.9%] vs 34 001 [18.4%]) (Table). Women who used cannabis were also more likely than those who did not use cannabis to have an anxiety disorder (969 [8.3%] vs 8728 [4.7%]), depressive disorder (1235 [10.6%] vs 7892 [4.3%]), anxiety disorder and depressive disorder (975 [8.4%] vs 5682 [3.1%]), depression symptoms (mild, 3419 [32.2%] vs 41 279 [24.5%]; moderate, 1415 [13.3%] vs 11 744 [7.0%]; and moderately severe to severe, 875 [8.3%] vs

Table. Characteristics of 196 022 Pregnancies at Kaiser Permanente Northern California, 2012 to 2017, Overall and by Prenatal Cannabis Use

Characteristics	Total Pregnancies, No. (%) (N = 196 022)	Prenatal Cannabis Use, Pregnancies, No. (%)		P Value <sup>b</sup>
		Yes (n = 11 681 [6.0%]) <sup>a</sup>	No (n = 184 341 [94.0%])	
Age range, y				
13-17	1628 (0.8)	321 (2.8)	1307 (0.7)	<.001
18-24	27 858 (14.2)	4583 (39.2)	23 275 (12.6)	
25-34	124 176 (63.4)	5491 (47.0)	118 685 (64.4)	
>34	42 360 (21.6)	1286 (11.0)	41 074 (22.3)	
Race/ethnicity				
White	69 925 (35.7)	4047 (34.7)	65 878 (35.7)	<.001
African American	10 481 (5.4)	2296 (19.7)	8185 (4.4)	
Hispanic	54 704 (27.9)	3652 (31.3)	51 052 (27.7)	
Asian	34 334 (17.5)	333 (2.9)	34 001 (18.4)	
Other	26 578 (13.6)	1353 (11.6)	25 225 (13.7)	
Annual household income, median, \$ <sup>c</sup>				
<\$1 893	48 948 (25.0)	4697 (40.3)	44 251 (24.0)	<.001
≥\$1 893 to <70 859	48 915 (25.0)	3020 (25.9)	45 895 (24.9)	
≥70 859 to <93 036	48 938 (25.0)	2325 (19.9)	46 613 (25.3)	
≥93 036	48 947 (25.0)	1619 (13.9)	47 328 (25.7)	
Mental health characteristics				
Depressive or anxiety disorders <sup>d</sup>				
No anxiety or depressive disorder	170 541 (87.0)	8502 (72.8)	162 039 (87.9)	<.001
Anxiety disorder only	9697 (5.0)	969 (8.3)	8728 (4.7)	
Depressive disorder only	9127 (4.7)	1235 (10.6)	7892 (4.3)	
Anxiety and depressive disorder	6657 (3.4)	975 (8.4)	5682 (3.1)	
Self-reported depression symptoms <sup>e</sup>				
None	114 537 (64.0)	4902 (46.2)	109 635 (65.2)	<.001
Mild	44 698 (25.0)	3419 (32.2)	41 279 (24.5)	
Moderate	13 159 (7.4)	1415 (13.3)	11 744 (7.0)	
Moderately severe to severe	6483 (3.6)	875 (8.3)	5608 (3.3)	
Trauma diagnosis <sup>d</sup>				
No	191 337 (97.6)	10 715 (91.7)	180 622 (98.0)	<.001
Yes	4685 (2.4)	966 (8.3)	3719 (2.0)	
Self-reported intimate partner violence <sup>f</sup>				
No	176 503 (98.1)	10 266 (95.6)	166 237 (98.2)	<.001
Yes	3489 (1.9)	473 (4.4)	3016 (1.8)	

<sup>a</sup> Six percent of pregnancies screened positive for prenatal cannabis use: 0.9% by self-report only, 3.4% by toxicology testing only, and 1.7% by both methods.

<sup>b</sup> P values were calculated using separate generalized estimating equation models to account for some women having more than 1 pregnancy during the study period.

<sup>c</sup> Median neighborhood annual household income was missing for 274 pregnancies (0.1%).

<sup>d</sup> *International Classification of Diseases, Ninth Revision, Clinical Modification and International Statistical Classification of Diseases, Tenth Revision, Clinical Modification* diagnosis codes were used to identify depressive disorders, anxiety disorders, and trauma diagnoses during pregnancy (ie, from last menstrual period through date of live birth).

<sup>e</sup> Self-reported depression symptom categories are based on the Patient Health Questionnaire-9,<sup>5</sup> which is given during standard prenatal care starting in 2012 (score <5, none; score 5-9, mild depression; score 10-14, moderate depression; score ≥15, moderately severe to severe depression); 17 145 pregnancies (8.8%) did not have data on Patient Health Questionnaire-9 depression symptoms.

<sup>f</sup> Three self-reported questions were used to identify intimate partner violence at the first prenatal visit; 16 030 pregnancies (8.2%) did not have data on self-reported intimate partner violence.

5608 [3.3%]), trauma diagnosis (966 [8.3%] vs 3719 [2.0%]), and self-reported intimate partner violence (473 [4.4%] vs 3016 [1.8%]) (Table).

Compared with women without depressive or anxiety disorders, those with anxiety disorders (aOR, 1.90; 95% CI, 1.76-2.04), depressive disorders (aOR, 2.25; 95% CI, 2.11-2.41), or both (aOR, 2.65; 95% CI, 2.46-2.86) had greater odds of cannabis use (Figure). Similarly, compared with women without depression symptoms, those with mild (aOR, 1.60; 95% CI, 1.53-1.67), moderate (aOR, 2.09; 95% CI, 1.96-2.23), and moderately severe to severe symptoms (aOR, 2.55; 95% CI, 2.35-2.77) had increased odds of cannabis use. Women with (vs without) a trauma diagnosis (aOR, 2.82; 95% CI, 2.59-3.06) and with (vs without) self-reported intimate partner violence (aOR, 1.94; 95% CI, 1.74-2.15) also had greater odds of cannabis use.

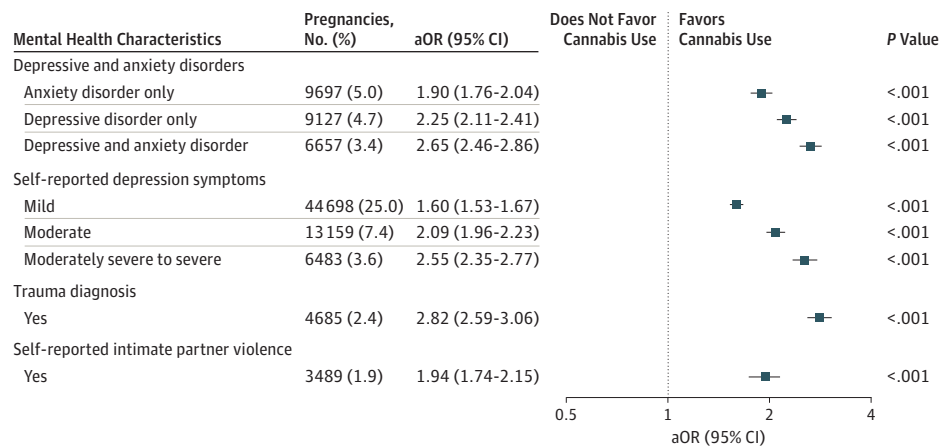
### Discussion

Depression, anxiety, and trauma diagnoses and symptoms were associated with higher odds of cannabis use among pregnant women in California. These results support previous qualitative findings that pregnant women self-report using cannabis to manage mood and stress<sup>3,4</sup> and suggest a dose-response association, with higher odds of cannabis use associated with co-occurring depressive and anxiety disorders and greater depression severity. However, research is needed to determine the direction of these associations, because cannabis use might also cause or worsen mental health problems during pregnancy.

This study has several limitations. It takes place in 1 large health care system in California, and the findings may not generalize to all pregnant women. Cannabis screening at KPNC is limited to pregnant women at approximately 8 weeks' gestation. Cannabis use may have occurred before women realized they were pregnant, and these findings do not reflect continued use throughout pregnancy. Furthermore, we are unable to determine whether our findings would differ among nonpregnant women treated at KPNC. Finally, urine toxicology tests may infrequently detect prepregnancy cannabis use.

The health risks of prenatal cannabis use to the fetus are complex and may vary with administration mode and frequency of use; however, no amount of cannabis use during pregnancy

Figure. Adjusted Odds Ratios (aORs) for Cannabis Use During Pregnancy by Mental Health Characteristics for 196 022 Pregnancies



International Classification of Diseases, Ninth Revision, Clinical Modification and International Statistical Classification of Diseases, Tenth Revision, Clinical Modification diagnosis codes were used to identify depressive disorders, anxiety disorders, and trauma diagnoses during pregnancy (ie, from last menstrual period through date of live birth). Self-reported depression symptom categories are based on the Patient Health Questionnaire-9,<sup>5</sup> which has been administered during standard prenatal care visits starting in 2012 (score <5, none; score 5-9, mild depression; score 10-14, moderate

depression; score ≥15, moderately severe to severe depression); 17 145 pregnancies (8.8%) did not have data on Patient Health Questionnaire-9 depression symptoms and were not included in analyses where depression symptoms were the variable of interest. Three self-reported questions were used to identify intimate partner violence; 16 030 pregnancies (8.2%) did not have data on self-reported intimate partner violence and were not included in analyses where intimate partner violence was the variable of interest.

has been shown to be safe.<sup>6</sup> Pregnant women should be screened for cannabis use, asked about their reasons for use, educated about potential risks, and advised to quit. Furthermore, early screening for prenatal depression, anxiety, and trauma, and linkage to appropriate interventions might mitigate the risk of prenatal cannabis use.

## ARTICLE INFORMATION

**Accepted for Publication:** December 14, 2019.

**Published:** February 19, 2020. doi:[10.1001/jamanetworkopen.2019.21333](https://doi.org/10.1001/jamanetworkopen.2019.21333)

**Open Access:** This is an open access article distributed under the terms of the [CC-BY License](https://creativecommons.org/licenses/by/4.0/). © 2020 Young-Wolff KC et al. *JAMA Network Open*.

**Corresponding Author:** Kelly C. Young-Wolff, PhD, MPH, Division of Research, Kaiser Permanente Northern California, 2000 Broadway, Oakland, CA 94612 ([kelly.c.young-wolff@kp.org](mailto:kelly.c.young-wolff@kp.org)).

**Author Affiliations:** Division of Research, Kaiser Permanente Northern California, Oakland (Young-Wolff, Sarovar, Tucker, Alexeeff, Avalos); Weill Institute for Neurosciences, Department of Psychiatry, University of California, San Francisco (Young-Wolff); Regional Offices, Kaiser Permanente Northern California, Oakland (Goler); Department of Psychiatry, Kaiser Permanente San Jose, San Jose, California (Ridout).

**Author Contributions:** Dr Young-Wolff had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Concept and design:* Young-Wolff, Sarovar, Goler, Avalos.

*Acquisition, analysis, or interpretation of data:* Sarovar, Tucker, Goler, Alexeeff, Ridout, Avalos.

*Drafting of the manuscript:* Young-Wolff, Sarovar, Ridout.

*Critical revision of the manuscript for important intellectual content:* All authors.

*Statistical analysis:* Young-Wolff, Sarovar, Alexeeff.

*Obtained funding:* Young-Wolff.

*Administrative, technical, or material support:* Young-Wolff, Sarovar, Tucker.

*Supervision:* Young-Wolff.

**Conflict of Interest Disclosures:** None reported.

**Funding/Support:** This study was supported by National Institutes of Health National Institute on Drug Abuse K01 Awards DA043604 and R01 DA047405 and National Institutes of Health National Institute of Mental Health K01 Award MH103444.

**Role of the Funder/Sponsor:** The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

## REFERENCES

1. Agrawal A, Rogers CE, Lessov-Schlaggar CN, Carter EB, Lenze SN, Gruzca RA. Alcohol, cigarette, and cannabis use between 2002 and 2016 in pregnant women from a nationally representative sample. *JAMA Pediatr*. 2019;173(1):95-96. doi:[10.1001/jamapediatrics.2018.3096](https://doi.org/10.1001/jamapediatrics.2018.3096)
2. Young-Wolff KC, Tucker LY, Alexeeff S, et al. Trends in self-reported and biochemically tested marijuana use among pregnant females in California from 2009-2016. *JAMA*. 2017;318(24):2490-2491. doi:[10.1001/jama.2017.17225](https://doi.org/10.1001/jama.2017.17225)
3. Latuskie KA, Andrews NCZ, Motz M, et al. Reasons for substance use continuation and discontinuation during pregnancy: a qualitative study. *Women Birth*. 2019;32(1):e57-e64. doi:[10.1016/j.wombi.2018.04.001](https://doi.org/10.1016/j.wombi.2018.04.001)
4. Chang JC, Tarr JA, Holland CL, et al. Beliefs and attitudes regarding prenatal marijuana use: perspectives of pregnant women who report use. *Drug Alcohol Depend*. 2019;196:14-20. doi:[10.1016/j.drugalcdep.2018.11.028](https://doi.org/10.1016/j.drugalcdep.2018.11.028)
5. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606-613. doi:[10.1046/j.1525-1497.2001.016009606.x](https://doi.org/10.1046/j.1525-1497.2001.016009606.x)
6. Committee on Obstetric Practice. Committee Opinion No. 722: marijuana use during pregnancy and lactation. *Obstet Gynecol*. 2017;130(4):e205-e209. doi:[10.1097/AOG.0000000000002354](https://doi.org/10.1097/AOG.0000000000002354)

## SUPPLEMENT

**eAppendix.** ICD-9-CM and ICD-10-CM Diagnosis Codes Used to Identify Depressive Disorders, Anxiety Disorders, and Trauma Diagnoses in Our Sample and Questions About Intimate Partner Violence (IPV)