From:
To: Select Committee into Cannabis and Hemp
Subject: Select Committee into Cannabis and Hemp
Date: Wednesday, 10 November 2021 9:03:56 AM
Attachments: Assoc comorbid cond w cannbis in pregnancy jamapsychiatry_meinhofer_2021.pdf

November 11 2021

Select Committee into Cannabis and Hemp
Parliament House
4 Harvest Tce
West Perth WA 6005

Select Committee into Cannabis and Hemp Re: term of reference

the potential benefits and risks of permitting industrial hemp for human consumption.

It does appear that the Select committee may not be aware of the big picture regarding THC.
Mothers using pot during pregnancy and the link not only to Autism but many other prolong problems for that child.
Dr Reece paper regarding pregnancy and Autism in Canada. Note Canadian researcher peer review his paper and they support his outcome.

1. Canadian Cannabis Consumption and Patterns of Congenital Anomalies: An Ecological Geospatial Analysis Albert Stuart Reece, MBBS(Hons), FRCS(Ed), FRCS(Glas), FRACGP, MD(UNSW), and Gary Kenneth Hulse, BBSc(Hons), MBSc, PhD

   https://journals.lww.com/journaladdictionmedicine/Abstract/publishahead/Canadian_Cannabis_Consumption_and_Patterns_of.99248.aspx
   Mapping showed cannabis use was more common in the northern Territories of Canada in the Second National Survey of Cannabis Use 2018. Total congenital anomalies, all cardiovascular defects, orofacial clefts, Downs syndrome and gastroschisis were all found to be more common in these same regions and rose as a function of cannabis exposure.
   When Canada was dichotomized into high and low cannabis use zones by Provinces v Territories the Territories had a higher rate of total congenital anomalies 450.026 v 390.413 (O.R.=1.16 95%C.I. 1.08-1.25, P=0.000058; attributable fraction in exposed 13.25%, 95%C.I. 7.04–19.04%). In geospatial analysis in a spreml spatial error model cannabis was significant both alone as a main effect ($P<2.0x10^{-16}$) and in all its first and second order interactions with both tobacco and opioids from $P<2.0x10^{-16}$.
   Conclusion: These results show that the northern Territories of Canada share a higher rate of cannabis use together with elevated rates of total congenital anomalies, all cardiovascular defects, Down's syndrome and gastroschisis.
   This is the second report of a significant association between cannabis use and both total defects and all cardiovascular anomalies and the fourth published report of a link with Downs syndrome and thereby direct major genotoxicity.
   The correlative relationships described in this paper are confounded by many features of social disadvantage in Canada's northern territories. However, in the context of a similar broad spectrum of defects described both in animals and in epidemiological reports from Hawaii, Colorado, USA and Australia they are cause for particular concern and indicate further research.

2.

Cannabis Consumption Patterns Parallel the East-West Gradient in Canadian Neural Tube Defect Incidence - An Ecological Study

https://www.researchgate.net/publication/337911618_Cannabis_Consumption_Patterns_Explain_the_East-West_Gradient_in_Canadian_Neural_Tube_Defect_Incidence_An_Ecological_Study

Whilst a known link between prenatal cannabis exposure (PCE) and anencephaly exists, the relationship of PCE with neural tube defects (NTD's) generally has not been defined. Published data from Canada Health and Statistics Canada was used to assess this relationship. Both cannabis use and NTDs were shown to follow an east-west and north-south gradient. Last year cannabis consumption was significantly associated ($P<0.0001$; Cannabis use:time interaction $P<0.0001$). These results were confirmed when estimates of termination for anomaly were used. Canada Health population data allowed the calculation of an NTD O.R.=1.27 (95%C.I. 1.19-1.37; $P<10^{-11}$) for high risk provinces v. the remainder with an attributable fraction in exposed populations of 16.52% (95%C.I. 12.22-20.62). Data show a robust positive statistical association between cannabis consumption as both a qualitative and quantitative variable and NTDs on a background of declining NTD incidence. In the context of multiple mechanistic pathways these strong statistical findings implicate causal mechanisms.

82 References - click on this link to access.
https://www.researchgate.net/publication/337911618_Cannabis_Consumption_Patterns_Explain_the_East-West_Gradient_in_Canadian_Neural_Tube_Defect_Incidence_An_Ecological_Study

Another new 2020 study showed that using pot during pregnancy is associated with autism in children
Published: 10 August 2020

3. **(Maternal cannabis use in pregnancy and child neurodevelopmental outcomes)**

- Daniel J. Corsi, Jessy Donelle, Ewa Sucha, Steven Hawken,
- Helen Hsu, Darine El-Chaâr, Lise Bisnaire, Deshayne Fell, Shi Wu Wen & Mark Walker
-

Another new 2020 study showed that using pot during pregnancy is associated with autism in children

4. **(Associations Between Prenatal Cannabis Exposure and Childhood Outcomes)** Results From the ABCD Study

A new 2020 study of over 11,489 children found that prenatal cannabis use by mothers was associated with greater psychopathology of kids during middle childhood and psychotic-like experiences.

5. **(Broad Spectrum epidemiologica contribution of cannabis and other substances to the teratological profile of northern New South Wales: geospatial and causal inference analysis**.)

Albert Stuart Reece1,2,3* and Gary Kenneth Hulse1,2
This study is based around Nimbin. and It is all based straight out of QLD Government files – it is Government data.
Dr. Reece Research data at this very important link
https://www.dropbox.com/sh/v45uyms8jzas0vb/AADMJqHo3l9ORCX1cKuyiAu

7a?dl=0

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JAMA Psychiatry | Original Investigation

Association of Comorbid Behavioral and Medical Conditions With Cannabis Use Disorder in Pregnancy

Angélica Meinhofer, PhD; Jesse M. Hinde, PhD; Katherine M. Keyes, PhD, MPH; Claudia Lugo-Candelas, PhD

IMPORTANCE Prenatal cannabis use continues to increase, yet studies of the demographic, psychiatric, and medical characteristics associated with cannabis use in pregnancy are limited by size and use of self-report, and often do not consider cannabis use disorder (CUD) or concomitant substance use disorders (SUDs). Understanding the factors associated with CUD in pregnancy is paramount for designing targeted interventions.

OBJECTIVE To examine the prevalence of co-occurring psychiatric and medical conditions of US pregnant individuals hospitalized with and without CUD by concomitant SUDs.

DESIGN, SETTING, AND PARTICIPANTS The study analyzed restricted hospital discharge data from the 2010 to 2018 Healthcare Cost and Utilization Project State Inpatient Databases in 35 states. Data were analyzed from January to August 2021. Weighted linear regressions tested whether the prevalence of psychiatric and medical conditions differed between individuals with and without a CUD diagnosis at hospitalization. Inpatient hospitalizations of pregnant patients aged 15 to 44 years with a CUD diagnosis were identified. Pregnant patients aged 15 to 44 years without a CUD diagnosis were identified for comparison. Patients were further stratified based on concomitant SUD patterns: (1) other SUDs, including at least 1 controlled substance; (2) other SUDs, excluding controlled substances; and (3) no other SUDs.

EXPOSURES CUD in pregnancy.

MAIN OUTCOMES AND MEASURES Prevalence of demographic characteristics, psychiatric disorders (eg, depression and anxiety), and medical conditions (eg, epilepsy and vomiting).

RESULTS The sample included 20 914 591 hospitalizations of individuals who were pregnant. The mean (SD) age was 28.24 (5.85) years. Of the total number of hospitalizations, 249 084 (1.19%) involved CUD and 20 665 507 (98.81%) did not. The proportion of prenatal hospitalizations involving CUD increased from 0.008 in 2010 to 0.02 in 2018. Analyses showed significant differences in the prevalence of almost every medical and psychiatric outcome examined between hospitalizations with and without CUD diagnoses, regardless of concomitant SUDs. Elevations were seen in depression (0.089; 95% CI, 0.083-0.095), anxiety (0.072; 95% CI, 0.066-0.076), and nausea (0.036; 95% CI, 0.033-0.040]) among individuals with CUD only at hospitalization compared with individuals with no SUDs at hospitalization.

CONCLUSIONS AND RELEVANCE Considerable growth was observed in the prevalence of CUD diagnoses among individuals hospitalized prenatally and in the prevalence of depression, anxiety, nausea, and other conditions in individuals with CUD at hospitalization. This study highlights the need for more screening, prevention, and treatment, particularly in populations with co-occurring CUD and psychiatric disorders. Research on the determinants and outcomes associated with CUD during pregnancy is needed to guide clinicians, policy makers, and patients in making informed decisions.

JAMA Psychiatry. doi:10.1001/jamapsychiatry.2021.3193
Published online November 3, 2021.

Supplemental content

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Prenatal cannabis use continues to increase despite potential adverse effects on pregnancy and offspring.[1] Cannabis is the most common illicit drug used during pregnancy, with an estimated 7.1% of pregnant people reporting past-month use in 2017.[2-4] Among pregnant people who reported past-month cannabis use, 60%, 40%, and 17% also reported past-month tobacco, alcohol, and other illicit drug use, respectively.[5] Individuals who use cannabis regularly may develop clinically significant impairment or distress as well as other general diagnostic features of a substance use disorder (SUD).[6,7] Cannabis use disorder (CUD) generally develops over an extended period and is commonly observed as the only SUD experienced by an individual; however, it also frequently occurs concurrently with other SUDs.[7,8] As US states move toward legalization and cannabis becomes increasingly available, a better understanding of the demographic, psychiatric, and medical characteristics associated with CUD in pregnancy will be paramount for guiding research and targeted public health interventions.

To date, studies are few and have important data limitations. Several studies documented increased prevalence of mood-related disorders in people reporting prenatal cannabis use.[9-12] For example, a recent study documented increased prevalence of anxiety, depression, and trauma in 11 681 patients who used cannabis prenatally.[13] However, most studies have been limited by relying on self-reported cannabis use and mood-related disorders, by examining cannabis use and not CUD, or by not considering concomitant SUDs. As the prevalence of polysubstance use among pregnant people who use cannabis is substantial,[5] it is critical to consider whether it may obfuscate factors specifically associated with CUD.

A smaller body of literature has begun elucidating medical conditions associated with cannabis use in pregnancy, documenting that managing nausea and vomiting during pregnancy is a common reason for use. Studies have mostly comprised small surveys examining cannabis use[14-16] (which, although important, are limited in determining prevalence); to our knowledge, larger studies have not considered concomitant SUDs.[17] Furthermore, studies have not examined the prevalence of chronic medical conditions, including pain disorders, epilepsy, multiple sclerosis, hepatitis C, and HIV/AIDS.[18]

This study leveraged the largest collection of all-payer US hospital discharge records to examine the prevalence of CUD at hospitalization among pregnant individuals and factors associated with presence of CUD. We examined individuals with and without CUD at hospitalization for differences in demographic characteristics and co-occurring psychiatric and medical conditions for which medical cannabis is often recommended. We implemented an inverse probability weighted regression adjustment approach using the propensity score to test whether the prevalence of such conditions was associated with CUD while controlling for sociodemographic characteristics. We stratified hospitalizations based on concomitant SUDs and compared hospitalizations of individuals with and without CUD within each stratum, accounting for group differences driven by co-occurring SUDs.

Key Points

Question What are the key demographic, psychiatric, and medical conditions associated with cannabis use disorder (CUD) in individuals who are hospitalized prenatally?

Findings In this cross-sectional study of 20 914 591 female individuals in 35 US states, the proportion of prenatal hospitalizations involving CUD increased substantially between 2010 and 2018. There was a higher prevalence of depression, anxiety, and nausea disorders in prenatal hospitalizations with CUD compared with those without CUD, regardless of concomitant substance use disorders.

Meaning The high prevalence of co-occurring mental health and medical disorders with CUD in prenatal hospitalizations highlights a critical need for treatment and support in this vulnerable population.

Methods

Procedures

We analyzed restricted hospital discharge data from the Healthcare Cost and Utilization Project (HCUP), a family of national and state health care databases developed through a federal-state-industry partnership sponsored by the Agency for Healthcare Research and Quality. HCUP includes the largest collection of hospital data in the US with all-payer encounter-level information. We relied on the 2010 to 2018 HCUP State Inpatient Databases (HCUP-SID). HCUP-SID contains a near census of hospital inpatient discharges in participating states and collects sociodemographic characteristics (race, ethnicity, age, sex, and expected payer), geographic (state and county), and clinician-reported *ICD-9* and *ICD-10* diagnostic and procedure codes (primary and secondary) associated with the discharge. Some states that do not participate in HCUP directly provide researchers with access to their inpatient records. We combined HCUP-SID with data from nonparticipating states (Louisiana, Delaware, Pennsylvania, and Tennessee) for a total of 35 states. As data were deidentified, this study was considered exempt from review by Weill Cornell Medicine's Institutional Review Board.

Participants

Hospitalizations of pregnant individuals aged 15 to 44 years (mean [SD] age, 28.24 [5.85] years) were identified using *ICD-9* and *ICD-10* diagnostic and procedure codes indicating pregnancy or childbirth (eMethods in the Supplement). Of all included individuals, 2 837 139 (14.31%) were Hispanic, 3 649 649 (18.41%) were non-Hispanic Black, 11 505 695 (58.05%) were non-Hispanic White, and 1 828 159 (9.22%) were of another non-Hispanic race (including individuals identified by HCUP or the state hospital discharge record as Asian or Pacific Islander, Native American, or other). Race and ethnicity data varied across states. We analyzed categories that could be better harmonized across states according to identification and reporting practices and included these data to elucidate the sociodemographic factors associated with CUD at hospitalization among

pregnant individuals. Most hospitalizations examined (92%) were for childbirth. The sample was stratified into mutually exclusive subgroups based on CUD and concomitant SUD diagnoses. Among 20 914 591 prenatal hospitalizations, a total of 249 084 hospitalizations involving CUD were stratified as follows: (1) 115 953 hospitalizations with CUD diagnosed but no other SUDs diagnosed (ie, CUD only diagnosed at hospitalization); (2) 48 939 hospitalizations with CUD and other SUDs diagnosed, including at least 1 other controlled substance; and (3) 84 192 hospitalizations with CUD and other SUDs diagnosed, excluding other controlled substances (ie, only alcohol or tobacco). Respective prenatal hospitalizations without a CUD diagnosis were stratified as follows: (4) 19 281 026 hospitalizations with no CUD diagnosed and no other SUDs diagnosed; (5) 278 958 hospitalizations with no CUD diagnosed but with other SUDs diagnosed, including at least 1 other controlled substance; and (6) 1 105 523 hospitalizations with no CUD diagnosed but with other SUDs diagnosed, excluding other controlled substances.

Statistical Analysis

We calculated the proportion of prenatal hospitalizations involving CUD overall and for subgroups with SUD diagnoses. To examine state-level patterns, we calculated the prevalence of CUD for each state using the 2 most recent data years (2017 and 2018). We then examined the prevalence of outcomes of interest by CUD and concomitant SUDs. Outcomes of interest included SUDs, demographic characteristics, and psychiatric and medical conditions authorized for medical cannabis use or associated with SUDs in previous studies.[18] Psychiatric conditions included specific disorders (eg, depression, anxiety, trauma, or attention-deficit/hyperactivity disorder) and a broader category (mood-related disorders). The mood-related disorders category was defined so as to capture broader *ICD* codes that have been previously used to identify mental health conditions in prenatal populations.[13,19-23] Medical conditions examined included epilepsy, multiple sclerosis, HIV/AIDS, hepatitis C, nausea, vomiting, and chronic pain. Outcomes were defined with codes established by the Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse and previous studies (eMethods in the Supplement).[13,24]

Weighted linear regressions[25-28] were used to examine differences in the prevalence of behavioral and medical outcomes between hospitalizations of individuals with and without CUD. These analyses tested whether any differences in prevalence (ie, mean treatment effect sizes) associated with CUD were statistically significant for each concomitant SUD subgroup, controlling for potential confounders. An inverse probability-weighted regression adjustment approach using propensity scores was used to reduce systematic differences between hospitalizations with and without CUD diagnoses.[26] A notable strength of inverse probability-weighted regression adjustment is its double-robust property, which offers protection against mismodeling.[29] We estimated propensity scores with a logistic model that regressed CUD status on sociodemographic, time, and geographic characteristics (age, age squared, expected payer, race, ethnicity, county of residence, and year-quarter) and generated weights for each individual. Each individual's weight was equal to the inverse of the probability of treatment. Robust sandwich standard errors[25] were estimated to account for sampling variability in the weights. All weighted linear regressions controlled for the same sociodemographic, time, and geographic characteristics used to estimate propensity scores. We reported mean treatment effect sizes, 95% CIs, and estimated prevalence in non-CUD groups. Mean treatment effect sizes capture the difference in the prevalence of a given outcome between the CUD and non-CUD group and can be interpreted as percentage point changes when multiplied by 100. Two-tailed *P* values were considered significant at < .05.

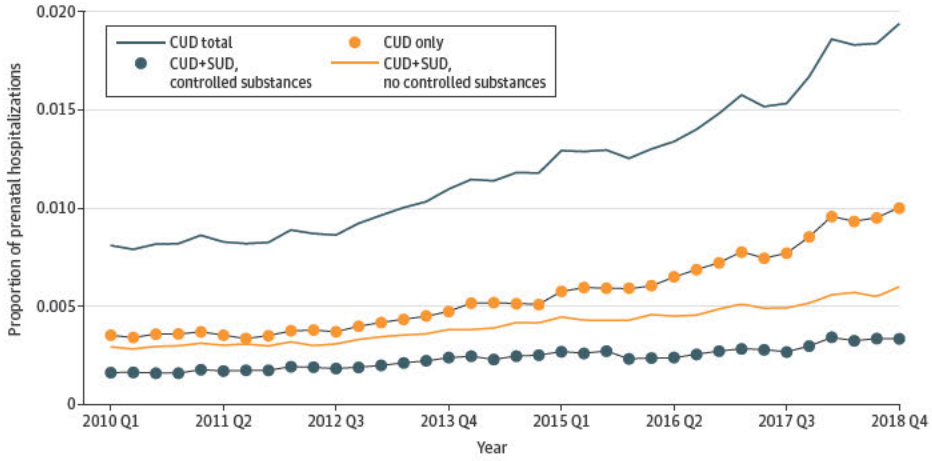
Results

The proportion of prenatal hospitalizations with any CUD diagnosis increased from 2010 to 2018 (0.008 to 0.02, respectively) (**Figure 1**). Although increases occurred across all CUD subgroups, hospitalizations with a CUD diagnosis only displayed the sharpest growth (from 0.003 in 2010 to 0.01 in 2018). Sensitivity analyses documented similar increases across prenatal hospitalizations of individuals with diagnosed depressive disorders or with any concomitant SUDs, suggesting increases in the proportion of hospitalizations with CUD diagnoses are not solely a by-product of increases in physician awareness of prenatal SUD (eFigure 1 in the Supplement) or an increase in the prevalence of disorders in pregnancy (eg, prenatal depression; eFigure 2 in the Supplement). Of the 35 states analyzed, Alaska, Oregon, New Mexico, Michigan, West Virginia, Vermont, and Maine had the highest prevalence of CUD diagnoses among prenatal hospitalizations (**Figure 2**).

Prevalence patterns of concomitant SUDs differed between hospitalizations of individuals with and without CUD (**Table 1**). Among individuals hospitalized with other SUDs, including controlled substances, those with CUD diagnoses showed higher rates of cocaine, amphetamine, tobacco, and alcohol use disorders, but lower rates of opioid use disorders compared with hospitalizations without CUD diagnoses. Among hospitalizations of individuals with other SUD diagnoses excluding controlled substances, alcohol use disorders were higher among hospitalizations of individuals with CUD diagnoses, but tobacco use disorders were slightly higher in hospitalizations of individuals without diagnosed CUD.

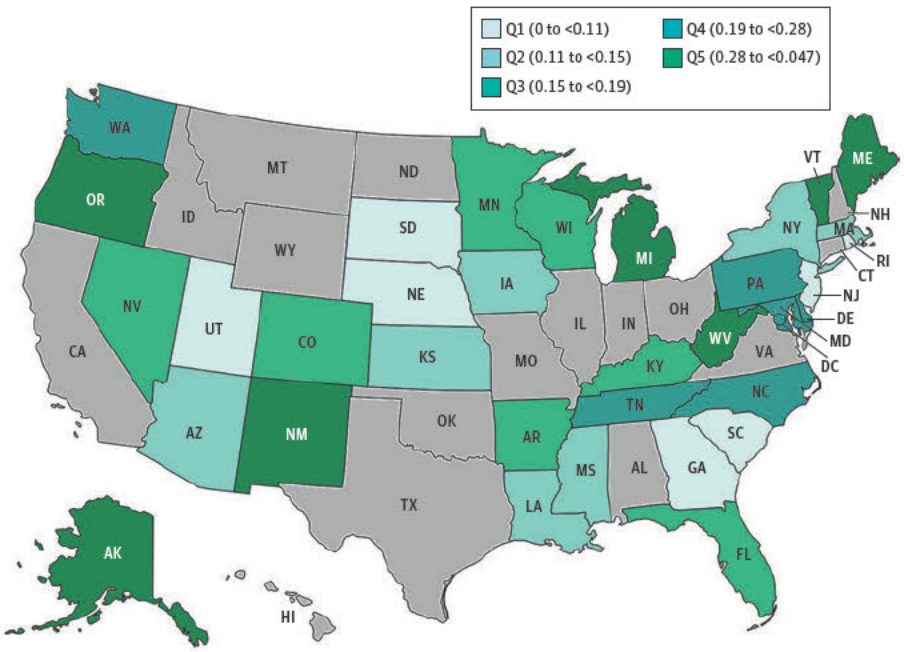
The prevalence of mood-related disorders was considerably higher for all CUD subgroups, regardless of concomitant SUDs. Compared with 928 132 of 19 281 026 individuals (5%) with neither SUDs nor CUD at hospitalization, mood-related disorders were present in 67 184 of 115 953 individuals (58%) with only CUD at hospitalization. Mood-related disorders were also higher in individuals with CUD and alcohol or tobacco disorders at hospitalization (54 709 of 84 192; 65%) compared with individuals with only alcohol or tobacco disorders at hospitalization (177 395 of 1 105 523; 16%). Similarly, higher rates of mood-related disorders were found in individuals with CUD and SUDs including other controlled substances, at hospitalization (32 472 of 48 939; 66%) than in individuals with SUDs

Figure 1. Cannabis Use Disorder (CUD) Among Prenatally Hospitalized Individuals, 2010-2018



CUD total indicates prenatally hospitalized individuals with any CUD; CUD only, prenatally hospitalized individuals with CUD and no other substance use disorder (SUD); CUD+SUD, controlled substances, prenatally hospitalized individuals with CUD and other SUDs including at least 1 controlled substance; CUD+SUD, no controlled substances, prenatally hospitalized individuals with CUD and other SUDs excluding any other controlled substance (alcohol and tobacco only); Q, quintile. Controlled substances include opioids, stimulants, hallucinogens, sedatives, hypnotics, and other drugs. Data are from the Healthcare Cost and Utilization Project State Inpatient Databases, 2010-2018.

Figure 2. Prevalence of Cannabis Use Disorder Among Prenatally Hospitalized Individuals by State, 2017-2018



Q indicates quintile. Figure shows the proportion of prenatally hospitalized individuals with a diagnosis of cannabis use disorder for each state included in analyses. Color shading denotes prevalence during 2017-2018, grouped by quintiles for easier interpretation. States not included in analyses are shaded in gray. Data are from the Healthcare Cost and Utilization Project State Inpatient Databases, 2010-2018.

including other controlled substances but without CUD at hospitalization (146 977 of 278 958; 53%). Similarly, individually examined, depression, anxiety, trauma, and attention-deficit/hyperactivity disorder were higher in all CUD subgroups, regardless of concomitant SUDs. Differences were most remarkable when comparing individuals with only CUD at hospitalization and individuals with neither SUDs nor CUD at hospitalization, where the prevalence of depression and anxiety disorders was more than 3 times higher in individuals with CUD only at hospitalization (depression, (11 953 of 115 953 [10%] vs 518 283 of 19 281 026 [3%]; anxiety, 10 044 of 115 953 [9%] vs 494 757 of 19 281 026 [3%]).

Most of the medical conditions examined were higher in individuals with CUD at hospitalization regardless of concomitant SUDs. The highest prevalence was detected for vomiting disorders, especially when comparing hospitalized individuals with neither SUDs nor CUD (196 016 of 19 281 026; 1%) and those with CUD only (5634 of 115 953; 5%). Multiple sclerosis

Table 1. Characteristics of Prenatally Hospitalized Patients by Cannabis Use Disorder (CUD), 2010-2018[a]

Characteristic	No. (%)						
	CUD (yes)			CUD (no)			
		With other SUDs			With other SUDs		
	No other SUDs (n = 115 953)	Including controlled substances[b] (n = 48 939)	Excluding controlled substances[b] (n = 84 192)	No SUDs (n = 19 281 026)	Including controlled substances[b] (n = 278 958)	Excluding controlled substances[b] (n = 1 105 523)	Total sample (N = 20 914 591)
SUDs							
Cannabis	115 953 (100)	48 939 (100)	84 192 (100)	0	0	0	249 084 (1.19)
Opioids	0	21 213 (43.35)	0	0	169 331 (60.70)	0	190 544 (0.91)
Cocaine	0	17 927 (36.63)	0	0	38 156 (13.68)	0	56 083 (0.27)
Amphetamine	0	13 936 (28.48)	0	0	36 931 (13.24)	0	50 867 (0.24)
Other drugs	0	8644 (17.66)	0	0	68 168 (24.44)	0	76 812 (0.37)
Tobacco	0	29 664 (60.61)	81 538 (96.85)	0	144 042 (51.64)	1 093 208 (98.89)	1 348 452 (6.45)
Alcohol	0	4411 (9.01)	5678 (6.74)	0	11 665 (4.18)	19 621 (1.77)	41 375 (0.20)
Mental health conditions							
Mood-related disorders	67 184 (57.94)	32 472 (66.35)	54 709 (64.98)	928 132 (4.81)	146 977 (52.69)	177 395 (16.05)	1 406 869 (6.73)
Depression	11 953 (10.31)	8532 (17.43)	11 087 (13.17)	518 283 (2.69)	42 104 (15.09)	89 525 (8.10)	681 484 (3.26)
Anxiety	10 044 (8.66)	7793 (15.92)	9330 (11.08)	494 757 (2.57)	40 809 (14.63)	80 037 (7.24)	642 770 (3.07)
Trauma	2869 (2.47)	2919 (5.96)	2826 (3.36)	56 280 (0.29)	10 755 (3.86)	12 614 (1.14)	88 263 (0.42)
ADHD	1674 (1.44)	1367 (2.79)	1761 (2.09)	49 101 (0.25)	5473 (1.96)	12 184 (1.10)	71 560 (0.34)
Physical health conditions							
Epilepsy	1600 (1.38)	1247 (2.55)	1467 (1.74)	85 033 (0.44)	6177 (2.21)	12 534 (1.13)	108 058 (0.52)
Multiple sclerosis	118 (0.10)	6 (0.14)	84 (0.1)	16 883 (0.09)	400 (0.14)	1372 (0.12)	18 926 (0.09)
Chronic pain	3065 (2.64)	2464 (5.03)	2597 (3.08)	217 700 (1.13)	16 704 (5.99)	27 666 (2.50)	270 196 (1.29)
Vomiting	5634 (4.86)	1481 (3.03)	2599 (3.09)	196 016 (1.02)	5187 (1.86)	12 709 (1.15)	223 626 (1.07)
Nausea	956 (0.82)	422 (0.86)	594 (0.71)	48 420 (0.25)	1926 (0.69)	3952 (0.36)	56 270 (0.27)
HIV/AIDS	516 (0.45)	513 (1.05)	382 (0.45)	24 136 (0.13)	1945 (0.70)	2366 (0.21)	29 858 (0.14)
Hepatitis C	779 (0.67)	5255 (10.74)	1546 (1.84)	27 710 (0.14)	45 355 (16.26)	16 902 (1.53)	97 547 (0.47)
Sociodemographic characteristics							
Age, y							
15-19	16 814 (14.51)	2604 (5.33)	8996 (10.69)	1 279 257 (6.64)	7829 (2.81)	85 303 (7.72)	1 400 803 (6.70)
20-24	46 522 (40.14)	13 915 (28.47)	30 869 (36.69)	4 144 833 (21.5)	65 407 (23.52)	348 910 (31.6)	4 650 456 (22.24)
25-29	32 088 (27.69)	16 834 (34.45)	25 032 (29.76)	5 544 449 (28.76)	99 834 (35.90)	339 660 (30.76)	6 057 897 (28.97)
30-34	14 677 (12.67)	10 450 (21.38)	13 298 (15.81)	5 223 168 (27.09)	70 073 (25.20)	215 332 (19.50)	5 546 998 (26.53)
35-44	5784 (4.99)	5067 (10.37)	5930 (7.05)	3 086 097 (16.01)	34 977 (12.58)	115 078 (10.42)	3 252 933 (15.56)
Race and ethnicity[c]							
Hispanic	10 676 (9.61)	3598 (7.70)	3961 (4.96)	2 755 922 (15.09)	18 243 (6.83)	44 739 (4.27)	2 837 139 (14.31)
Non-Hispanic							
Black	48 951 (44.04)	10 700 (22.89)	25 282 (31.67)	3 379 060 (18.50)	29 937 (11.21)	155 719 (14.85)	3 649 649 (18.41)
White	45 286 (40.74)	29 735 (63.62)	46 935 (58.8)	10 367 976 (56.76)	206 003 (77.14)	809 760 (77.22)	11 505 695 (58.05)
Other[d]	6237 (5.61)	2705 (5.79)	3639 (4.56)	1 764 310 (9.66)	12 862 (4.82)	38 406 (3.66)	1 828 159 (9.22)
Medicaid	89 443 (77.14)	38 432 (78.53)	67 315 (79.95)	7 975 189 (41.36)	215 071 (77.10)	779 891 (70.54)	9 165 341 (43.82)
Private insurance	19 907 (17.17)	5181 (10.59)	10 911 (12.96)	10 011 715 (51.93)	37 261 (13.36)	253 781 (22.96)	10 338 756 (49.43)
Other insurance	6606 (5.70)	5326 (10.88)	5966 (7.09)	1 294 150 (6.71)	26 627 (9.55)	71 852 (6.50)	1 410 527 (6.74)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; SUDs, substance use disorders.

[a] Data are from the Healthcare Cost and Utilization Project State Inpatient Databases, 2010-2018.

[b] Controlled substances include opioids, stimulants, hallucinogens, sedatives, hypnotics, and other drugs.

[c] Race and ethnicity data varied across states. We analyzed categories that could be better harmonized across states owing to states' identification and reporting practices and included these data to elucidate the sociodemographic factors associated with CUD at hospitalization among pregnant individuals.

[d] Other includes individuals identified by the Healthcare Cost and Utilization Project or the state hospital discharge record as Asian or Pacific Islander, Native American, or other. These categories were consolidated owing to differences in how categories were reported across states.

Table 2. Differences in the Prevalence of Behavioral and Medical Conditions Between Prenatally Hospitalized Individuals With and Without Cannabis Use Disorder by Concomitant Substance Use Disorder (SUD)[a]

	Other SUD								
	Including controlled substances[b]			Excluding controlled substances[b]			No other SUD		
Condition	MTE (95% CI)[c]	*P* value	Estimated prevalence[d]	MTE (95% CI)[c]	*P* value	Estimated prevalence[d]	MTE (95% CI)[c]	*P* value	Estimated prevalence[d]
Mental health conditions									
Mood-related disorders	0.151 (0.145 to 0.157)	<.001	0.528	0.551 (0.546 to 0.554)	<.001	0.160	0.631 (0.625 to 0.637)	<.001	0.048
Depression	0.035 (0.029 to 0.040)	<.001	0.151	0.052 (0.048 to 0.056)	<.001	0.080	0.089 (0.083 to 0.095)	<.001	0.027
Anxiety	0.025 (0.019 to 0.030)	<.001	0.146	0.043 (0.038 to 0.046)	<.001	0.071	0.072 (0.066 to 0.076)	<.001	0.026
Trauma	0.022 (0.019 to 0.026)	<.001	0.039	0.021 (0.019 to 0.023)	<.001	0.011	0.020 (0.018 to 0.023)	<.001	0.003
ADHD	0.008 (0.006 to 0.011)	<.001	0.019	0.008 (0.007 to 0.009)	<.001	0.011	0.011 (0.009 to 0.013)	<.001	0.003
Physical health conditions									
Epilepsy	0.003 (0.001 to 0.005)	.006	0.021	0.005 (0.003 to 0.006)	<.001	0.011	0.008 (0.006 to 0.010)	<.001	0.004
Multiple sclerosis	0.000 (−0.000 to 0.001)	.41	0.001	−0.000 (−0.000 to 0.000)	.29	0.001	0.000 (0.000 to 0.001)	.04	0.000
Pain	−0.010 (−0.013 to −0.007)	<.001	0.060	0.006 (0.003 to 0.008)	<.001	0.025	0.016 (0.014 to 0.019)	<.001	0.011
Vomiting	0.011 (0.009 to 0.014)	<.001	0.019	0.017 (0.014 to 0.018)	<.001	0.011	0.036 (0.033 to 0.040)	<.001	0.010
Nausea	0.002 (0.001 to 0.003)	.001	0.007	0.003 (0.002 to 0.004)	<.001	0.004	0.005 (0.004 to 0.007)	<.001	0.002
HIV/AIDS	0.001 (0.000 to 0.003)	.02	0.007	0.002 (0.001 to 0.002)	<.001	0.002	0.002 (0.001 to 0.003)	<.001	0.001
Hepatitis C	−0.026 (−0.032 to −0.021)	<.001	0.157	0.008 (0.006 to 0.009)	<.001	0.015	0.006 (0.005 to 0.007)	<.001	0.001

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; MTE, mean treatment effect.

[a] Data are from the Healthcare Cost and Utilization Project State Inpatient Databases, 2010-2018. We drew a 50% sample of the overall population for computational efficiency.

[b] Controlled substances include opioids, stimulants, hallucinogens, sedatives, hypnotics, and other scheduled drugs.

[c] MTE is interpreted as a difference in prevalence between the CUD group compared with the non-CUD group. MTEs, 95% CIs, and estimated prevalence were generated with weighted linear regression models. An inverse probability–weighted regression adjustment approach using propensity scores was used to reduce systematic differences between prenatal hospitalizations with and without a CUD diagnosis.

[d] Indicates estimated prevalence in the comparison group.

was an exception, as prevalence was similar across groups with and without CUD. Further, although the prevalence of chronic pain and hepatitis C was elevated in hospitalized individuals with CUD with either no other SUDs or alcohol or tobacco disorders, both disorders were more prevalent in hospitalized individuals without CUD but with other SUDs including controlled substances. The demographic characteristics of prenatal patients varied across CUD subgroups. Compared with groups without CUD, groups with CUD had a higher proportion of younger patients (15 to 19 years and 20 to 24 years) and non-Hispanic Black patients. Hospitalized individuals with CUD were also more frequently expected to be covered by Medicaid and less frequently by private insurances, especially when comparing hospitalized individuals with CUD only to those with no CUD and no other SUDs.

Weighted linear regressions showed statistically significant differences in the prevalence of almost every medical and psychiatric outcome examined between hospitalized individuals with and without CUD, even when controlling for covariates (**Table 2**). In general, mean treatment effect sizes were largest when comparing hospitalized individuals with CUD only and those with no CUD and no other SUDs, followed by comparisons of hospitalized individuals with alcohol or tobacco disorders. That is, the prevalence of psychiatric and medical disorders was most similar across hospitalized individuals with and without CUD in the presence of other SUDs including controlled substances.

The most marked effect sizes were seen in mood-related disorders, depression, anxiety, and vomiting. The prevalence of depression was 0.089 (95% CI, 0.083-0.095) percentage points higher among individuals with CUD at prenatal hospitalization in the subgroup with no other SUDs. Compared with the prevalence in the comparison group (ie, no CUD and no other SUD), CUD was associated with a 329.6% (0.089/0.027) increase in prevalence of depression. When comparing hospitalized individuals with CUD and other SUDs, there was a 65% (0.052/0.080) increase in prevalence of depression in hospitalized individuals with CUD and other SUDs excluding controlled substances, and a 23% (0.035/0.151) increase in prevalence of depression in hospitalized individuals with CUD and other SUDs including controlled substances. The prevalence of anxiety also increased significantly in hospitalized individuals with CUD, showing a 277% (0.072/0.026) increase in the group with no other SUDs, 61% (0.043/0.071) in the group

with other SUDs excluding controlled substances, and 17% (0.025/0.146) in the group with other SUDs including controlled substances. Differences in the prevalence of vomiting disorders were most marked in hospitalized individuals with no other SUDs, where CUD was associated with a 360% (0.036/0.010) increase in prevalence.

Discussion

This study leveraged the largest collection of US hospital discharge records to examine CUD in pregnancy and characteristics associated with CUD in prenatally hospitalized individuals. Findings showed considerable increases in the prevalence of prenatal hospitalizations involving CUD and indicated that mood-related disorders and some medical disorders, particularly vomiting, were significantly more prevalent in individuals with CUD at hospitalization. Even when examining hospitalized individuals with comparable patterns of concomitant SUDs, hospitalized individuals with CUD still showed higher prevalence of these disorders, suggesting prevalence increases were not exclusively a function of increases in overall SUDs. Our findings highlight the dire need for more research on the mechanisms underlying associations between CUD and psychiatric and medical disorders.

Documented growth in CUD prevalence among prenatal hospitalizations is in line with previous studies finding increases in self-reported cannabis use during pregnancy.[2,9,30,31] Cannabis liberalization policies may be an important factor leading to increased cannabis use among existing users and growth in new users.[32-34,46] We found that among the 7 states with highest CUD prevalence, 5 (Alaska, Oregon, Michigan, Vermont, and Maine) had legalized recreational cannabis. Notably, many states adopting cannabis liberalization policies are silent regarding cannabis use during pregnancy.[35] Decreases in the perception of harmfulness, risk, and stigma associated with prenatal cannabis use may be another contributing factor. Studies have documented that some pregnant patients believe that safe levels of cannabis use during pregnancy exist.[5,36] One study suggests that up to 74% of people who use cannabis during pregnancy believe there to be no potential harm[14] and that many patients report thinking that cannabis is safer than other substances, including prescribed medications.[15]

Mental health disorders were elevated among hospitalized individuals with CUD, including depression and anxiety, even when considering concomitant SUDs. This is of concern, given prenatal distress can have ongoing effects on mother and child.[37] Our findings highlight a population in critical need of interventions, yet the association between CUD and psychiatric disorders requires elucidation. Psychiatric distress might be exacerbated by cannabis, prenatal populations in distress may use cannabis in attempts to assuage symptomatology,[17] or both. Addressing directionality will necessitate longitudinal studies with assessments that commence prior to the onset of psychiatric disorders and are able to rule out reverse causation.[38] Even then, other common factors (genetic or biological, social, or environmental) may be responsible for risk of both psychiatric illness and CUD.[39] Studies that control for polygenic risk for psychiatric illness or twin studies discordant for CUD and/or depression could address causality. At minimum, our propensity score methods mitigate bias from sociodemographic and geographic factors associated with CUD.

The study findings showed increased prevalence of a range of medical conditions in individuals with CUD at hospitalization, regardless of comorbid SUDs. Most notably, vomiting disorders were elevated in hospitalized individuals with CUD, particularly among those with only CUD. It is possible that cannabis has antiemetic properties that help alleviate nausea and vomiting, which are common conditions in pregnancy. In fact, in most states legalizing medical cannabis, cannabis can be recommended for nausea and vomiting.[47] As such, pregnant persons may be turning to cannabis to assuage these symptoms.[16,17,40] Alternatively, long-term CUD may result in cannabinoid hyperemesis syndrome.[41] Apart from multiple sclerosis, all other medical disorders examined in this study were overrepresented in the CUD groups, suggesting that CUD is not only associated with the conditions that typically arise in pregnancy (eg, nausea). Understanding the specific needs of pregnant persons with both preexisting medical disorders and with conditions that typically arise in pregnancy will be important for developing targeted interventions. Interventions offering alternatives (eg, medications for hyperemesis gravidarum) may be more suitable for one group and quantity-reduction strategies more appropriate for others.

In sum, our study suggests that CUD is on the rise among prenatally hospitalized individuals. One key contribution of the present study is identifying subgroups of pregnant people who might be at the highest need for support and treatment. Younger patients and patients receiving Medicaid were overrepresented in hospitalizations with CUD. Psychoeducation may be appropriate here, as young age and suboptimal access to medical care may translate into limited knowledge regarding alternatives. Our findings further suggest that practitioners should routinely screen for CUD among pregnant patients and those contemplating pregnancy and offer treatment and support. Screening is recommended by the American College of Obstetricians and Gynecologists, yet ethical considerations must be made, especially in states with mandatory reporting requirements.[42,43] Simultaneously, findings suggest detection of CUD in pregnancy should immediately trigger close monitoring of mental health and treatment. Until the outcomes of CUD in pregnancy are understood, practitioners should consider discussing treatment choices with patients, including nonpharmacological alternatives (eg, perinatal interpersonal therapy). However, designing and implementing interventions will continue to be limited by our lack of understanding of the determinants and outcomes of CUD in pregnancy. For example, identifying critical windows of exposure could be useful in guiding interventions, as it may be more feasible to work with patients around decreasing cannabis use in one trimester as opposed to the entire pregnancy.

Limitations

There are several limitations in this study. Because most hospitalizations examined were for childbirth, findings may not

generalize to patients earlier in pregnancy or those with home deliveries. We were also unable to examine when the CUD emerged, as our data were limited to the 1 hospital encounter analyzed. This information is vital to understanding transitions from cannabis use to misuse disorder. Data also included 35 US states, limiting generalizability to states not included, US territories, and other countries. Additionally, as with all medical record–based studies, error and bias in diagnosis is possible. Subthreshold use might be coded as disorder and vice versa. Clinicians may assess other disorders (psychiatric or medical) in the presence of SUDs, introducing bias to the estimates of groups with SUDs. Further, because we examined hospitalizations for all causes and not just SUDs or psychiatric disorders, physicians may have been less attentive to these problems in this general prenatal population and our results may underestimate the true scope of the issue. Moreover, increased awareness around CUD in pregnancy may contribute to growth in CUD diagnoses, as physicians may be more inclined to assess use and patients more inclined to report it. Studies are needed that directly examine how changes in physicians' awareness of CUD in pregnancy and other sources of bias, including racial and socioeconomic bias,[44] impact prevalence estimates.

Conclusions

To our knowledge, this study is the largest to date to examine the prevalence of cannabis use disorders and associated factors in prenatal hospitalizations. Careful consideration of concomitant SUDs allowed us to more directly examine factors specifically associated with CUD. By not considering SUD comorbidity, prior literature has been limited, providing little guidance to policy makers and clinicians, who have reported lacking sufficient knowledge about CUD in pregnancy.[45] Our study highlights the need for more treatment and support and research that empowers pregnant patients to make the best decisions for themselves and their offspring.

ARTICLE INFORMATION

Accepted for Publication: September 14, 2021.

Published Online: November 3, 2021. doi:10.1001/jamapsychiatry.2021.3193

Author Contributions: Dr Meinhofer 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.
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Acquisition, analysis, or interpretation of data: Meinhofer, Hinde, Lugo-Candelas.
Drafting of the manuscript: Meinhofer.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: All authors.
Obtained funding: Meinhofer.
Administrative, technical, or material support: Meinhofer, Hinde, Lugo-Candelas.
Supervision: Meinhofer, Lugo-Candelas.

Conflict of Interest Disclosures: None reported.

Funding/Support: This work was supported by Gerber Foundation grant GF192350; Robert Wood Johnson Foundation grant RWJF77962; National Institute on Drug Abuse grants K01DA051777, P30DA040500, and R01DA054722; and National Institute of Mental Health grant K08MH117452.

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.

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From:
To: Select Committee into Cannabis and Hemp
Subject: Medical Marijuana being used by pregnant women as a sedative,
Date: Wednesday, 10 November 2021 9:13:57 AM
Attachments: Scan 780028.pdf
A Review of Cases of Marijuana and Violence.pdf
Association Between the Use of Cannabis and Physical Violence in Youths A Meta Analytical Investigation.pdf
Cannabis use and violence in patients with severe mental illnesses A meta-analytical investigation.pdf
Marijuana May Actually Worsen PTSD Symptoms.docx
Marijuana Use and PTSD Among Veterans.docx
Review of 47 studies PTSD.docx

November 11 2020

Select Committee into Cannabis and Hemp
Parliament House
4 Harvest Tce
West Perth WA 6005

Select Committee into Cannabis and Hemp Re: term of reference

the potential benefits and risks of permitting industrial hemp for human consumption.

Is West Australia going to have another Thalidomide disaster with Medical Marijuana CBD and THC being used by pregnant women as a sedative, painkiller and morning sickness. Evidence by Dr. Reece and researchers in Canada that marijuana smoking during pregnancy has strong links to Autism https://www.nature.com/articles/s41591-020-1002-5 and many other Mental Health problems e.g. **physical violence** and marijuana can be harmful to individuals with **PTSD.**

All Australian states and Federal governments must take their responsibility for public safety more seriously and take the legal enforcement actions necessary to stop is happening here in Australia.

Dr. Reece Research data at this very important link
https://www.dropbox.com/sh/v45uyms8jzas0vb/AADMJqHo3l9ORCX1cKuyiAu7a?dl=0

Herschel Baker

Herschel Baker
International Liaison Director,

Survivors of danger drug to get payouts

ROSIE LEWIS

Australian thalidomide survivors will receive one-off compensation payments of between $75,000 and $500,000 from the federal government after six years of appealing for assistance.

The government has also confirmed it will offer a national apology and establish a public memorial in recognition of victims, with work under way to choose an appropriate site.

Tabled in parliament on Monday, the government's response to a Senate inquiry into support for thalidomide survivors also agrees to ongoing annual payments, which will increase over time, so they can buy required services.

The extent of the one-off payment will depend on a person's level of disability, but will be paid to all Australian thalidomide survivors who have been recognised by Diageo, a UK company that bought thalidomide's Australian distributer, Distillers, in the 1990s.

An extraordinary assistance fund to help meet major expenses, such as home and vehicle modifications, will be established and a healthcare card developed so survivors can access a broad range of services.

Thalidomide was created by the German company Gruenthal Group in the 1940s and predominantly sold over the counter in Australia between 1960 and 1961 as a sedative and painkiller.

It was also used by pregnant women for morning sickness, causing severe birth defects such as a shortening or absence of limbs and malformation of hands and fingers.

Thalidomide Group Australia first requested a meeting with relevant federal government ministers to discuss their needs at the end of 2014.

Health Minister Greg Hunt said the Morrison government had done "what no other Australian government has done" by providing lifetime support for people affected by thalidomide.

"This is a deep, personal commitment", Mr Hunt said. "While the funds can never compensate for a lifetime of hardship it is hoped they will provide recognition, support and peace of mind to Australia's thalidomide victims."

A Senate committee scrutinising compensation and support was established in

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Review

A Review of Cases of Marijuana and Violence

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Received: 9 December 2019; Accepted: 25 February 2020; Published: 29 February 2020

Abstract: Marijuana is the most consumed illicit drug in the world, with over 192 million users. Due to the current legalization push of marijuana in the United States, there has been a lack of oversight regarding its public health policies, as marijuana advocates downplay the drug's negative effects. This paper's approach is from a public health perspective, focusing specifically on the cases of violence amongst some marijuana users. Here, we present 14 cases of violence with chronic marijuana users that highlight reoccurring consequences of: marijuana induced paranoia (exaggerated, unfounded distrust) and marijuana induced psychosis (radical personality change, loss of contact with reality). When individuals suffering from pre-existing medical conditions use marijuana in an attempt to alleviate their symptoms, ultimately this worsens their conditions over time. Although marijuana effects depend on the individual's endocannabinoid receptors (which control behavioral functions, like aggression) and the potency level of tetrahydrocannabinol (THC) in the drug, scientifically documented links between certain marijuana users and violence do exist. Wider public awareness of the risks and side effects of marijuana, as well as a more prudent health policy, and government agency monitoring of the drug's composition, creation, and distribution, are needed and recommended.

Keywords: marijuana; cannabis; tetrahydrocannabinol; THC; violence; law; paranoia; delusions; psychosis; public policies

1. Introduction

In the United States, ten states have legalized the recreational use of marijuana and over 20 states have decriminalized the recreational use of it. Recent reports suggest, however, that the increase of the recreational use of marijuana is causing detrimental effects to individuals, as well as the society as a whole [1–3]. These effects include, but are not limited to, the increase of violence, the increase of thriving underground marijuana markets, and increase in car accident claims after the legalization of marijuana where the recreational use of marijuana was legalized [1–3]. This is caused by lack of oversight. Marijuana is being legally sold with high THC concentration levels without taking into account its addictive qualities and adverse effects. On the other hand, and contrary to popular belief, marijuana is still illegal in the Netherlands and it is decriminalized. However, the consumption and storage of marijuana are limited by law and the approach taken by the Netherlands is to decriminalize the drug in order to be able to help individuals struggling with marijuana use. This prudent oversight has resulted in a decreased in violence and people are able to get the care they need to deal with addiction and become less prone to violence [1–3].

Furthermore, the consumption of marijuana is associated with an increase in violent behavior over the course of an individual's lifespan, a high risk of psychosis for frequent users, an increase

of cardiovascular diseases, and deterioration in health for individuals who have pre-existing mental health issues such as Post Traumatic Stress Disorder, social anxiety, and depression [4–6].

According to research studies, marijuana use causes aggressive behavior, causes or exacerbates psychosis, and produces paranoia. These effects have been illustrated through case studies of highly publicized incidents and heightened political profiles.

These cases contain examples of repeated illustrations of aggression, psychosis and paranoia by marijuana users and intoxication. Ultimately, without the use and intoxication of marijuana, the poor judgment and misperceptions displayed by these individuals would not have been present, reducing the risk for actions that result in senseless deaths.

Import to these assertions, is that the current marijuana is far more potent in THC concentrations, the psychoactive component. Accordingly, and demonstrated in direct studies, more potent marijuana results in a greater risk for paranoid thinking and psychosis. In turn, paranoid behavior increases the risk for paranoid behaviors and predictably associated with aggressive and violent behaviors.

1. Marijuana use causes violent behavior through increased aggressiveness, paranoia, and personality changes (more suspicious, aggressive, and anger).
2. Recent illicit and "medical marijuana" (especially grown by care givers for medical marijuana) is of much high potency and more likely to cause violent behavior.
3. Marijuana use and its adverse effects should be considered in cases of acts of violence as its role is properly assigned to its high association.
4. Recognize that high potency marijuana is a predictable and preventable cause of tragic violent consequences.

2. Case Presentation

2.1. Marijuana Violence

On March 13, 2019, Anthony Comello admitted to, and subsequently was charged for, the killing of Frank Cali, a senior leader of the Gambino family in Staten Island, New York. Both men were allegedly having an altercation over Comello's romantic interest on one of Cali's relatives. Although Comello had no previous criminal encounters with law enforcement, reports suggest that he drew the attention of authorities by acting strangely in a federal courthouse when he offered to perform a citizen's arrest on New York City's Mayor, Bill De Blasio. Previously, Comello sought a U.S. Marshal to inquire how to perform a citizen's arrest on the United States Speaker of the House, Nancy Pelosi. Comello admitted that, at the time of Cali's killing, he was high on marijuana and shot Cali because he feared that the senior leader had a gun and would shoot him during their altercation [4,7].

On February 10, 2019, a man killed his 13-year-old nephew with a knife in Rustavi, Georgia. The man had a history of marijuana use. For days leading up to the killing, he was complaining about having dizziness, headaches, general weakness, nausea, and insomnia. He would also occasionally suffer from anxiety, irritability, and loss of appetite. His wife stated that he consumed and was under the influence of marijuana, which made his symptoms worse. The day before the killing, he tried to go to a clinic. However, the clinic rejected treatment by telling him to go to a psychiatric hospital. However, under the influence of drugs, he simply went home hours before killing his nephew [8].

On February 1, 2018, Nikolas Cruz killed 17 students and staff at the Marjory Stoneman Douglas High School in Parkland, Florida, and injured 17 others. Cruz was diagnosed as developmentally delayed at age three and had numerous disciplinary issues dating to middle school. From a young age, he started consuming marijuana heavily. He accounts that he would frequently "hear demon voices" and would consume large amount of marijuana to try and silence those voices. He also attempted suicide. During an interview after his mass shooting, he stated that he used "a lot of marijuana" as well as prescription tranquilizer Xanax [9,10].

On November 5, 2017, Devin Patrick Kelley carried out the deadliest mass shooting in Texas' history, resulting in the death of 27 people and injuries to 20 others, by opening fire at worshippers

who were attending regular Sunday Service at the First Baptist Church in Sutherland Springs. Kelley was later shot by bystanders and killed during a high-speed chase with law enforcement agencies. The autopsy on Kelley revealed that toxicology tests detected marijuana and anti-anxiety drugs in his system. A report from the Federal Bureau of Investigation revealed multiple past incidents where Kelley also been under the influence of marijuana. Kelley's first on-record interaction with law enforcement authorities was when he was arrested for possession of marijuana and, subsequently, expelled from his high school. Since then, the record shows that Kelley started using marijuana frequently, as well as developing mental health issues that would lead him to have problems in his employment with the United States Air Force and multiple instances where he abused his step-son and his wife at the time [11,12].

On May 22, 2017, a suicide bomber, Salaman Abedi, detonated an explosive device in an area of the Manchester Arena, United Kingdom. The blast killed over 20 people and injured over 100 others. Evidence shows that, from a very young age, Abedi was a "party animal" who heavily consumed marijuana. Furthermore, he was described as a person who would start fights in the street for no reason, would act rude, and would refuse to do his homework in school. He was also described as a "very slow, uneducated and passive person" who displayed aggressive tendencies. Eventually, he began shutting himself off from other people, started becoming more violent, and started showing paranoia by making statements against western societies and hanging out with dangerous crowds. Evidence suggests that this paranoia, furthered with aggressive tendencies, led to Abedi's suicide bombing attack that day [1,13].

On May 18, 2017, Richard Rojas purposely drove a car along three blocks of pavement in New York's Times Square, killing a teenager and injuring 22 other people. Evidence indicates that Rojas was a heavy marijuana user. He admitted on the consumption of spiced-up marijuana right before committing the attack. Further, the record show that Rojas suffered from paranoia and hallucination, which have led him to make odd statements and partake in actions that negatively affected him in the work place or while interacting with others. Paranoia and hallucination caused him to "hear voices" that led him to commit that attack [2,14].

On November 23, 2016, Arcan Cetin carried out a mass shooting that killed five people and injured many others at the Cascade Mall in Washington. Evidence indicates that Cetin was a heavy marijuana consumer. Further, he had a past of violent behavior, with some incidents including the consumption of marijuana. Although doctors prescribed him medicine for Attention Deficit Hyperactivity Disorder and other mental health issues such as Post Traumatic Stress Disorder, anxiety, and depression, he stopped taking the medicine and substituted it with by excessively consuming marijuana. This led to aggravate his mood swings and being more violent. Before the shooting, he had threatened an ex-girlfriend who lived out of state. Evidence indicates that at, while committing the attack, Cetin was shouting a woman's name [15–17].

On July 26, 2016, Satoshi Uematsu stabbed to death at least 19 people and injured at least 26 others at a care facility in Sagamihara, Japan. Months prior the shooting, Uematsu suddenly started talking and acting strangely to his coworkers, who feared he could harm someone. Consequently, Uematsu tested positive for marijuana and was diagnosed with marijuana-induced psychosis and paranoid disorder after he delivered an ominous euthanasia letter to a Japanese House of Representative and telling his co-workers and the police that he intended to kill disabled people. Although he planned the attack in detail, evidence suggests that he later seemed to showed remorse and stated that "There was something wrong with [him]". These kinds of behaviors suggest that he was suffering from psychosis and paranoia since he was in the delusion that his acts would contribute to the Japanese society and the world [18,19].

On November 27, 2015, Robert Dear killed three people and injured nine others when he carried out a mass shooting in a Planned Parenthood clinic in Colorado Springs. Dear, along with many other users, moved to Colorado after the state legalized the recreational use of marijuana. Dear was a heavy user who was described by family and friends as "an angry and occasionally violent", and "deeply

disturbed", individual who suffered from paranoia and mood swings. Moreover, he was described as a lonely religious extremist who had a history of domestic violence against his ex-wives, who gambled, and who committed adultery on multiple occasions. About a year before the shooting, he moved to Colorado where he lived in dire conditions at a squalid trailer without running water or electricity [20–22].

On July 16, 2015, Muhammad Youssef Abdulazeez killed five people and injured a couple of others in his drive-by shooting at a military recruiting center in Chattanooga, Tennessee. Prone to depression and manic episodes, he started smoking marijuana heavily in high school. This addiction was going on for many years and led his mental state to deteriorate further and cause him to fail a drug test at work. Further, he started writing suicidal notes to himself and was pulled over by a police officer for driving under the influence of marijuana and alcohol. Up until the shooting, evidence indicates that Abdulazeez had a hard time keeping a job because of his manic depressive/bipolar disorder and drug use [23,24].

On June 17, 2015, 21-year-old Dylan Roof murdered nine people who were attending a prayer service in a Church in Charleston, South Carolina. He claimed that his intentions were to start a race war. His acts were preceded by years of drug abuse. Reports reveal that Roof's drug abuse started when he was 12 years old when he would smoke marijuana three times a day. When he was 16 years old, he tried to stop smoking marijuana after telling people that his daily marijuana usage caused him to be paranoid and hear voices. According to experts, Roof started suffering panic attacks when he was 16. Nonetheless, multiple accounts claim that he kept smoking marijuana and started abusing other drugs and alcohol. During his arrest for the Charleston shooting, Roof told police officers that he abused drugs before committing such heinous act [5,25,26].

On August 9, 2014, Michael Brown was fatally shot after a physical altercation with a police officer in Ferguson, Missouri. The autopsy and toxicology report revealed that Michael Brown had THC concentration of marijuana in his blood and urine. He had five nanograms of THC on his system, which causes approximately the same level of impairment as a 0.08 percent of blood alcohol level. That much THC notably impairs someone's judgment and perception of the surrounding environment, which may lead to anxiety and paranoia. Evidence indicates that Brown tried to reach for the officer's gun during the altercations, which led to the officer shooting at him in close range. Thus, evidence suggests that Brown's behavior was most likely caused by paranoia [27,28].

On April 15, 2013, Dzhokhar Tsarnaev and his brother Tamerlan, killed three people and injured over 250 by detonating homemade pressure cooker bombs near the finish line at the Boston marathon. Both brothers were heavy marijuana users since they were young teenagers. Tamerlan was killed in a police shootout following the bombings and Dzhokhar was eventually apprehended by law enforcement officers. Several acquaintances and friends knew about both brother's marijuana consumption and sales. One of Dzhokhar friend testified that he sold marijuana to Tsarnaev days before the Boston Marathon Bombings. Unrelated to the bombings, one of Tamerlan's friends implicated Tsarnaev in the killing of three men whose bodies were found sprinkled with marijuana. Multiple accounts noticed an increase of violent behavior from Dzhokhar for some time leading up to the bombings [29–32].

On January 8, 2011, Jared Loughner shot and killed six people, while also injuring 14 others at the then-US Representative Gabrielle Giffords's constituent meeting held in Tucson, Arizona. Although friends and acquaintances described him as an "awkward but friendly" young man, they started noticing his behavior drastically change in college. In high school, Loughner smoked marijuana on most days. Moreover, he also started immersing himself in conspiracy theories displayed paranoia. He dropped out of high school during his final year, but was able to attend a community college. Some college peers described him becoming mentally unstable by saying and doing things that were frightening. Other peers feared that he would do something like what he actually did. He was suspended from college and never returned. Subsequently, he tried to join the army but he was rejected because he failed a drug test. Consequently, he engaged in paranoid behavior that led to him to

engage in anti-government speech and target then-Representative Giffords during her constituent meeting [33,34].

These are among the many nationally reported violent cases that have, among others factors, a common root to what led these young people to commit acts of violence at the detriment to society as a whole: the extensive use or abuse of marijuana. In recent years, many States within the United States, as well as some other countries around the world, have decriminalized or legalized the recreational use of marijuana [8,12,13,19].

2.2. Paranoia: Marijuana Induced

In the cases above mentioned, one of the recurring conditions that most likely led perpetrators to commit violence was paranoia. Paranoia is defined by the medical dictionary as "an unfounded or exaggerated distrust of others, sometimes reaching delusional proportions". Paranoid perceptions can co-occur with various other mental conditions as well, such as depression and dementia, and can be divided in three different psychological disorders: paranoid schizophrenia, delusional disorder (persecutory type), and paranoid personality disorder (PPD). All three conditions are similar in the sense that they all contain an "unreasonable fear" or "unreasonable belief" as the root of each condition. Hallucinations are also a common symptom on individuals who suffer from paranoia. Nonetheless, paranoia is also a likely side effect deriving from the consumption of marijuana, as well as other drugs and alcohol [3,18,31,35].

In the cases above mentioned, one of the recurring conditions that most likely led perpetrators to commit violence was paranoia. Paranoia is defined by the medical dictionary as "an unfounded or exaggerated distrust of others, sometimes reaching delusional proportions". Evidence suggests that paranoia was among the factors that contributed in the actions of Anthony Comello, Salem Abedi, Richard Rojas, Satoshi Uematsu, Robert Dear, Dylan Roof, Michael Brown, and Jared Lougher. Each one had, in respective degrees, unreasonable beliefs. Comello admittedly shot Cali because he feared Cali had a gun and was about to shoot him. Abedi displayed paranoid beliefs while making statements against Western societies. Rojas' paranoia was displayed in his statements and action witnessed by his coworkers; also, he claims he heard voices that led him to commit the attack. Uematsu was diagnosed with Paranoid disorder and psychosis, which led him to have delusion beliefs that his despicable acts would make contributions to society. Dear was described as a lonely religious extremist but also had a history of domestic violence, gambling, and adultery. Roof wanted to start a race war. Brown was likely paranoid about his surroundings based on the report. Lougher was suffering from paranoia and was immersing himself with conspiracy theories. Many of these tragedies are committed by individuals who were paranoid and were consuming marijuana. It is very likely that marijuana played an active role in these people's paranoia, considering that the chemical composition of the drug has compounds that alter a person's perception of reality as mentioned below (Table 1, [17,36–38]).

Table 1. Personality change toward aggression or violence.

Paranoid Personality Disorder
A pervasive distrust and suspiciousness of others such that their motives are interpreted as malevolent, beginning by early adulthood and present in a variety of contexts, as indicated by four (or more) of the following:
1. Suspects, without sufficient bases, that others are exploiting, harming, or deceiving him or her.
2. Is preoccupied with unjustified doubts about the loyalty or trustworthiness of friends or associates.
3. Is reluctant to confide in others because of unwarranted fear that the information will be used maliciously against him or her.
4. Reads hidden demeaning or threatening meanings into benign remarks or events.
5. Persistently bears grudges (i.e., is unforgiving of insults, injuries, or slights).
6. Perceives attacks on his or her character or reputation that are not apparent to others and is quick to react angrily or to counterattack.
7. Has recurrent suspicions, without justification, regarding fidelity of spouse or sexual partner.

2.3. Psychosis: Marijuana Induced

Another condition that is commonly present in cases like the above are psychotic conditions. Psychotic conditions affect an individual's mind in a way that causes that individual to experience loss of contact with reality. During a psychotic episode, the perception of reality is altered to the point where an individual is unable to distinguish reality from hallucinations. Psychotic individual can also experience delusions (false beliefs), incoherent speech, inappropriate behavior, depression, anxiety, sleep problems, social withdrawal, lack of motivation, and difficulty functioning overall [16,17,37].

In the above-mentioned cases, Uematsu was diagnosed with marijuana-induced psychosis. His coworkers' testimony that he would talk and act inappropriately, his paranoia, and his delusion that killing patient at a care facility would benefit the society as a whole, demonstrates that he was suffering from psychotic conditions that made him lose contact with reality and led him to commit such acts. Similar symptoms were also present in cases where perpetrators acted with delusional beliefs, such as: Abedi, who suddenly started making inappropriate statements against Western societies; Dear, who was a lonely religious extremist but also had a history of domestic violence, gambling, and adultery, which strongly indicates that he was delusional, incoherent, and lost contact with reality; Rojas, Cruz, and Roof who suffered from hallucinations while having consumed large amount of marijuana throughout their lives.

Often, individuals who suffer from pre-existing medical conditions use marijuana in an attempt to alleviate their conditions. The man in Rustavi, Cruz, Kelley, Cetin, Abdulazeez, and Cruz also consumed marijuana because they were under the illusion that it would help them cope with their conditions, whether those conditions were likely induced by marijuana or not. However, it ended up worsening their conditions as time went by. What individuals are unaware of when it comes to self-medicating, is that the marijuana they consume does not have compounds that alleviate their pain or conditions; the marijuana they consume has many compounds that negatively alter their perceptions, which leads to worse conditions (Tables 2 and 3, [2,9,10,12,39–41]).

Table 2. Psychosis.

Substance-Induced Psychotic Disorder
A. Presence of one or both of the following symptoms: Delusions. Hallucinations.
B. There is evidence from the history, physical examination, or laboratory findings of both (1) and (2): The symptoms in Criterion A developed during or soon after substance intoxication or withdrawal or after exposure to a medication.
The involved substance is capable of producing the symptoms in Criterion A.
C. The disturbance is not better explained by a psychotic disorder that is not substance-induced. Such evidence of an independent psychotic disorder could include the following:
The symptoms preceded the onset of the substance use; the symptoms persist for a substantial period of time (e.g., about 1 month) after the cessation of acute withdrawal or sever intoxication; or there is other evidence of an independent non-substance-induced psychotic disorder (e.g., a history of recurrent non-substance-related episodes).
D. The disturbance does not occur exclusively during the course of a delirium.
E. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Table 3. Paranoia.

Subtypes Delusional Disorder
Grandiose type: This subtype applies when the central theme of the delusion is the conviction of having some great (but unrecognized) talent or insight or having made some important discovery.
Persecutory type: This subtype applies when the central theme of the delusion involves the individual's belief that he or she is being conspired against, cheated, spied on, followed, poisoned or drugged, maliciously maligned, harassed, or obstructed in the pursuit of long-term goals.

3. Discussion

3.1. Marijuana: General Facts

Marijuana is the most consumed illicit drug in the world, with cannabis use and dependence continuing to increase over the past two decades as the trend of legalization persists. According to the United Nations Office on Drug and Crime, over 192 million of users (ages 15–64) worldwide regularly consume marijuana, with a lifetime use of 20% of the World's population and a significant number of individuals regularly consuming the drug [42]. In a 2017 study by the Global Burden of Disease, it estimated the age-standardized rate of cannabis use disorder, or CUD, was 289.7 per 100,000 population (95% Uncertainty Interval (UI) 248.9–339.1), affecting 22.1 million people (95% UI 19.0–25.9 million) [42]. The United States and Canada were in fact found to have among the highest age-standardized rates of CUDs in the world [42].

Cannabis is a complex plant that is made up of 400 chemical entities of which more than 60 are cannabinoid compounds, with delta-t-tetrahydrocannabinol and cannabidiol being the major compounds. Some of those cannabinoid compounds tend to have opposing effects as they affect a very important neurotransmitter system called endocannabinoid system [2]. Moreover, some cannabinoids bind to central cannabinoid receptors to control many behavioral functions, such as aggression. Furthermore, the delta-9-tetrahydrocannabinol (THC) is the chemical responsible for the intoxicating effects on individuals who consume marijuana. The THC level determines the potency of marijuana and high levels of THC likely lead to higher negative health consequences [43–45].

Researchers refer to marijuana having a "high potency" when it has a THC level of more than 10%. In the past years, the THC of confiscated marijuana samples rose from 3% in 1980 to 12% in 2012. Moreover, adolescents between 15 and 17 years old have reported significantly higher ED visits from 2005 to 2010, which is likely caused by the increase of marijuana potency during that time period [7]. Although THC levels that exceed 10% most likely cause serious negative health consequences, it is not uncommon to find marijuana, which THC content exceeds 20% and occasionally 230%, to be sold in places where marijuana is legalized, such as the state of Colorado [7,8]. Furthermore, while daily users refer to high potency marijuana as "the good stuff", it is reported that daily users are five times more likely to find themselves in the hospital for psychosis symptoms such as delusions and hallucinations caused after consuming marijuana. As this paper will mention in the following pages, however, delusions and hallucinations are not the only negative effects stemming from the consumption of marijuana. Cardiovascular diseases, depression, anxiety, and violence are also among the common negative effects of marijuana [13,14,27,34,46].

3.2. Mental and Behavioral Changes

We apply the results of the research regarding the role of marijuana in violence. We use concepts such as personality changes, perpetrator violence, and psychosis to establish our association of marijuana with the unfortunate cases. The purpose is to illustrate negative but preventable tragic outcomes due to marijuana and its role in violence. The overall objective is to identify the role of marijuana and to suggest it is avoidable and causal nature in inducing violence [47–49].

In all the cases selected, marijuana use was present. For some of the individuals, marijuana use was confirmed by a physical test. In other cases, marijuana was present on their person, identifying drug use. Moreover, some individuals of the case were identified as marijuana users by outside sources.

Present in all the cases, as a result of marijuana use, was the change in personality, aggressive behavior, paranoia, and/or psychosis. All these symptoms have been documented by scientific research to be the result of marijuana use and intoxication. Another symptom, victimization, has a positive correlation with cannabis use, and the cases illustrate marijuana users and victimization. In other words, marijuana users become victims of aggression in response to their perpetration under the influence of marijuana (Table 4, [50,51]).

Table 4. What did the cases have in common?

Cases of Marijuana Use and Symptoms	
Case	**Symptom**
Anthony Comello	Paranoia
Man in Rustavi	Aggressiveness, Personality Change
Nikolas Cruz	Psychosis, Hallucinations
Devin Patrick Kelley	Aggressiveness, Personality Change
Salaman Abedi	Aggressiveness, Personality Change, Paranoia
Richard Rojas	Paranoia, Hallucinations
Arcan Cetin	Aggressiveness, Personality Change
Stoshi Uematsu	Psychosis, Paranoia
Robert Dear	Aggressiveness, Paranoia
M.Y. Abdulazeez	Aggressiveness, Paranoia
Dylan Roof	Paranoia, Hallucinations
Michael Brown	Aggressiveness, Personality Change, Paranoia
Dzhokar Tsarnaev	Aggressiveness, Personality Change
Tamerlan Tsarnaev	Aggressiveness, Personality Change
Jared Loughner	Paranoia, Psychosis

The DSM V provides diagnostic categories for paranoid personality, paranoia and psychosis associated with marijuana use [52].

3.3. Marijuana and Violence

As mentioned above, some compounds found in marijuana have an effect on central endocannabinoid receptors that control many behavioral functions, including aggression. Although there are some instances where marijuana consumption causes mild euphoria and relaxation on users, adverse acute psychopharmacological effects are very likely to occur. A study that collected data from half a century points out that even a single dose of cannabis may cause "impairments in behavioral control that may underlie impulsive, violent behavior" by altering "the normal functioning of its underlying natural substrate, the ventrolateral prefrontal cortex in man". Furthermore, the results collected in that study provide a strong indication that chronic marijuana use suggests a possible causal effect with predicting future violence. More studies have reported that panic attacks, confusion, hallucinations, suspiciousness, and paranoia often occur in chronic marijuana users, affecting their cognition in ways that enhance aggressive responses to perceived provocations. Further, recent studies have proven causal connections between marijuana and psychosis [38,39,53].

Studies Show Violence and Aggression Associated with Marijuana Use

Marijuana intoxication results in panic reactions and paranoid feelings whose symptoms lead to violence [49]. The sense of fear, loss of control, and panic is associated with violence [4,54,55]. Also marijuana use increases heart rate, which may be associated with violent behavior [34,47,56,57].

When people stop using marijuana they may experience a variety of withdrawal symptoms, including sleep disturbance, irritability or restlessness, loss of appetite, anxiety, and sweating [46,58]. Experiencing any of these symptoms can make a person angry, ranging from mild irritation to violent rage. Marijuana withdrawal can lead to intimidating violent or bullying behavior, endangering the perpetrator or other people and property [59].

In incarcerated subjects, studies found that one-third of the subjects that committed homicide had used marijuana twenty-four hours before the homicide. Further, three-quarters of those subjects were experiencing at least one mental or physical effect from marijuana intoxication when the homicide occurred.

Similarly, individuals in remote Aboriginal Australian Communities who reported current cannabis use were nearly four times more likely than nonusers to present at least once for violent

trauma. Homicide offenses have been repeatedly documented to be connected to drug use, and marijuana is often one of those drugs [60].

Marijuana use is also indicative of intimate partner violence [61]. Consistent use of marijuana during adolescence was the most predictive indicator of intimate partner violence [31]. Also, marijuana use during adolescence was associated with perpetration or both perpetration and victimization by an intimate partner in early adulthood [62].

There is also a positive association between peer victimization and cannabis use in adolescents. Cannabis use is likely to be associated with perpetrator victims, those who initiate violence while using marijuana and experience retaliation to their aggressive acts. This trend suggests that cannabis use might be strongly related to outward aggression by the user [1].

Cannabis use also increases an adolescent's own likelihood of being victimized by peers. In particular, mental effects of cannabis has the potential to decrease the ability to accurately identify, evaluate, or avoid potentially dangerous persons or situations [59].

3.4. Psychosis

Psychosis is defined by the medial journal as "a symptom or feature of mental illness typical characterized by radical changes in personality, impaired functioning, and a distorted or nonexistent sense of objective reality". Psychosis causes individuals to have an impaired perception of reality, consisting of hallucinations and paranoia [2,8,16]. Consumption of marijuana also proportionally increased the risk of other mental illnesses, such as schizophrenia and other types of psychoses. These marijuana use disorders are often associated with its dependence, since a user's brain requires more and more substance use to keep the desired euphoric effect in the brain. Thus, a user is most likely to experience withdrawal symptoms when not taking the drug. Irritability, anger, and aggression are common withdrawal symptoms that former marijuana users, or marijuana users who try to quit the consumption, experience [46]. Although marijuana advocates generally state that the consumption of the drug helps individuals who suffer from PTSD or other psychiatric conditions, studies suggest that the consumption of marijuana in patients with PTSD, and in patients following a psychiatric discharge, increases the likelihood of those patients being prone to violence compared to patients who do not consume the drug [4,37]. A 50 year-span study on adult patients in the United Kingdom indicated that continued cannabis use by an individual leads is associated with a 7-fold greater odds for commission of subsequent violent crimes. The authors of that study suggest that marijuana consumption would cause impairments in neurological circuits controlling behavior that makes a user prone to violent behavior [36].

Marijuana advocates downplay the risks associated with its unrestricted consumption by saying that the drug is safe, which is a similar approach adopted by Big Tobacco years ago to downplay the risks of smoking. Yet, despite tobacco being legal, people today are well aware of the risks associated with its consumption. Stating that consuming marijuana is safe goes against many studies and researches performed that prove negative health consequences associated with the consumption of marijuana due to the multitude of compounds present and high THC levels being consumed by individuals [9–11,19,21].

Studies Show Psychosis and Paranoia

Cannabis intoxication leads to acute psychosis in many individuals and can produce short-term exacerbations of preexisting psychotic diseases [63–66]. Cannabis use also causes symptoms of depersonalization, fear of dying, irrational panic and paranoid ideas which coincide with acute intoxication and remit quickly [67].

It was reported that 15% of cannabis users identified psychotic-like symptoms, the most common being hearing voices or having unwarranted feelings of intimidation and persecution or paranoid thoughts [38].

The potency of the marijuana has varying effects on users. A study analyzed the proportion of patients in South London with first episode psychosis attributable to high-potency cannabis use and found that the use of high-potency cannabis (skunk) confers an increased risk of psychosis compared with traditional low-potency cannabis (hash) [68].

The risk of individuals having a psychotic disorder showed a roughly three times increase in users of skunk-like cannabis (high-potency) compared with those who never used cannabis. Use of skunk-like cannabis everyday conferred the highest risk of psychotic disorders compared with no use of cannabis [69]. Potency in these studies is similar to marijuana currently available in the U.S. Direct administration of cannabis resulted in predictable increased occurrence of paranoia in comparison to those who received placebo.

Epidemiological studies showed that cannabis is the most frequently used drug among those diagnosed with bipolar disorder [70]. Studies have also shown that as the frequency of cannabis use increases, so does the risk for psychotic disorders, such as schizophrenia [71]. The investigators of Schizophrenia Commission concluded that cannabis use is the most preventable risk factor for psychosis [72–77]. High proportions of persons with schizophrenia report regular cannabis use and meet criteria for cannabis use disorder [78].

Findings suggest that activity in the basal lateral medulla is involved in marijuana-induced paranoia (state of becoming afraid of things that would normally trigger fear) [77]. That means marijuana is actually enhancing type of learning about fear, leading the brain to jump to conclusions about the mild experiences, perceiving them as scarier and more strongly connected to other scary situations than they are. This marijuana induced fear-based learning helps explain why marijuana users tend to see patterns in events that are not real, such as conspiracies [78].

In a study analyzing a college population, heavy users of marijuana displayed significantly greater impairment than light users on intentional/executive functions. This led to the conclusion that heavy marijuana use is associated with residual neuropsychological effects even after a day of supervised abstinence from the drug [53,79].

3.5. Public Policies

These negative effects of marijuana need to be taken into account for public policy in order to treat people with addiction and possibly avoid the tragedies above mentioned. The public should know the negative consequences associated with the compounds present within the marijuana products they consume. The current legalization push in the United States lacks prudent public policy and control over the process. A prudent public policy would be to decriminalize the drug and have its composition, creation, and distribution controlled by an agency that would keep THC levels at a minimum. Moreover, studies that try to find ways to treat individuals addicted to marijuana and ways to make the drug safer by pinpointing each compound and determine whether some compounds may indeed help people who have curable health conditions. This approach would reduce the negative effects of high THC on the human body and would decrease violence occurring during marijuana deals in the black market. Furthermore, this approach will likely decrease the violence caused by marijuana and, most importantly, it would prevent tragedies such as the ones mentioned above [8,13,31,80].

4. Conclusions

The main scope of this paper was to inform the general public about the relationships between marijuana and violence in the general population and in individuals with mental illnesses, as recent findings do link marijuana with cases where psychosis was present. This article is a case review and not a research study; therefore, the chief limitations regard inferences that can be made from a case study. However, the findings suggest a further need for research on marijuana and violence. The authors of this paper did not intend to take sides regarding the legalization of marijuana. The focus was public health in regards to marijuana [2,11,14,18,36].

Author Contributions: Conceptualization, N.S.M.; supervision, N.S.M.; writing—original draft, N.S.M. and R.I.; research, R.I.; writing—review and editing, T.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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Association Between the Use of Cannabis and Physical Violence in Youths: A Meta-Analytical Investigation

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Published Online:27 May 2020https://doi.org/10.1176/appi.ajp.2020.19101008

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Abstract

Objective:

The aim of this meta-analysis was to investigate the extent to which cannabis use among youths is associated with the risk of perpetrating physical violence.

Methods:

Searches were conducted in PubMed, PsycINFO, Web of Science, and Google Scholar for articles published from the inception of each database to July 2019. All studies that examined both cannabis use and the perpetration of physical violence in a sample of

youths and young adults <30 years old were included. The meta-analysis was performed with a random-effects model. Risk of publication bias was assessed with Egger's test. Guidelines from the Meta-Analysis of Observational Studies in Epidemiology were followed.

Results:

After screening 11,348 potential studies, 30 study arms were included, yielding a total of 296,815 adolescents and young adults. The odds ratio for the pooled studies was 2.11 (95% CI=1.64, 2.72). The pooled odds ratios were 2.15 (95% CI=1.58, 2.94) and 2.02 (95% CI=1.26, 3.23) for the cross-sectional and longitudinal studies, respectively. Preliminary evidence suggests that the risk of violence was higher for persistent heavy users (odds ratio=2.81, 95% CI=1.68, 4.74) compared with past-year users (odds ratio=2.05, 95% CI=1.5, 2.8) and lifetime users (odds ratio=1.94, 95% CI=1.29, 2.93). The odds ratio for unadjusted studies was 2.62 (95% CI=1.89, 3.62), and for studies using odds ratios adjusted for potential confounding factors, 2.01 (95% CI=1.57, 2.56).

Conclusions:

These results demonstrate a moderate association between cannabis use and physical violence, which remained significant regardless of study design and adjustment for confounding factors (i.e., socioeconomic factors, other substance use). Cannabis use in this population is a risk factor for violence.

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Cannabis use and violence in patients with severe mental illnesses: A meta-analytical investigation

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Highlights

- Findings showed a moderate cannabis-violence association in severe mental illness.
- The association was higher for cannabis misuse in comparison to cannabis use.
- Cannabis use should be considered in violence risk prevention and management.

Abstract

Background

The relationship between cannabis and violence remains unclear, especially amid those with severe mental illnesses (SMI). The objective of this meta-analysis was to investigate the cannabis-violence association in a population of individuals with a SMI.

Method

A systematic search of literature using PubMed, PsychINFO, Web of Science and Google scholar was performed (any time-August 2018). All peer-reviewed

publications assessing both cannabis use and the perpetration of violence in an SMI sample were included. Data on several key study characteristics such as the proportion of SMI in the sample as well as the number of cannabis users and violent participants were extracted. Odds ratios (OR) were likewise extracted and aggregated with random-effects models.

Results

Of the potential 2449 articles that were screened for eligibility, 12 studies were analyzed using a random-effect meta-analysis. Results showed a moderate association between cannabis use and violence (OR = 3.02, CI = 2.01–4.54, $p = 0.0001$). The association was significantly higher when comparing cannabis misuse (OR = 5.8, CI = 3.27–10.28, $p = 0.0001$) to cannabis use (OR = 2.04, CI = 1.36–3.05, $p = 0.001$).

Conclusion

These findings are clinically relevant for violence prevention/management and highlight the necessity of further investigations with methodologically-sound studies. Thus, longitudinal studies adjusting for important confounding factors (i.e., psychopathic traits and stimulant use) are warranted.

Marijuana May Actually Worsen PTSD Symptoms

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the Psychiatry Advisor take:

Treating post-traumatic stress disorder (PTSD) with medical marijuana may lead to worsened symptoms and increased violent behavior.

The number of states that have approved marijuana for PTSD treatment is on the rise, but a new study shows that it may actually worsen symptoms, according to Samuel T. Wilkinson, MD, of the Yale University School of Medicine in New Haven, Connecticut, and colleagues.

The observational study included 2,276 participants who had been admitted to specialized Veterans Administration treatment programs for PTSD between 1991 and 2011. Participants were split into four groups: 831 who started taking marijuana ("starters"), 850 who never used marijuana ("never used"), 296 who used marijuana at admission and after discharge ("continuing use"), and 299 who stopped using marijuana after treatment ("stoppers").

Each participant was evaluated at admission and four months after discharge, with measurements taken using the short version of the Mississippi Scale (MISS) to evaluate PTSD symptom severity, the drug and alcohol subscales of the Addiction Severity Index (ASI), and reports of violent behavior.

Those in the "never used" group had significantly lower MISS scores than those in the "starters" and the "continuing use" groups, the researchers reported at the recent American Academy of Addiction Psychiatry meeting. The "stoppers" had significantly lower MISS scores at follow-up than they did at baseline. Those in the "starters" group also had the highest level of violent behavior and the highest ASI scores. The "stoppers" group had significantly lower ASI scores than the other three groups.

Slideshow

Although a growing number of states have approved post-traumatic stress disorder (PTSD) as a qualifying condition for medical marijuana use, new

research shows that the drug may actually worsen symptoms and increase violent behavior.

A large observational study of more **2000 participants** who were admitted to specialized Veterans Administration treatment programs for PTSD showed that those who never used marijuana had significantly lower symptom severity 4 months later than those who continued or started use after treatment. Veterans who were using marijuana at treatment admission but quit after discharge (“stoppers”) also had significantly lower levels of PTSD symptoms at follow-up.

Marijuana Use and PTSD Among Veterans

https://www.ptsd.va.gov/professional/treat/cooccurring/marijuana_ptsd_vets.asp

Marcel O. Bonn-Miller, Ph.D. and Glenna S. Rousseau, Ph.D.

Marijuana use for medical conditions is an issue of growing concern. Some Veterans use marijuana to relieve symptoms of PTSD and several states specifically approve the use of medical marijuana for PTSD. However, controlled studies have not been conducted to evaluate the safety or effectiveness of medical marijuana for PTSD. Thus, there is no evidence at this time that marijuana is an effective treatment for PTSD. In fact, research suggests that marijuana can be harmful to individuals with PTSD.

Epidemiology

Marijuana use has increased over the past decade. In 2013, a study found that 19.8 million people reported using marijuana in the past month, with 8.1 million using almost every day (1). Daily use has increased 60% in the prior decade (1). A number of factors are associated with increased risk of marijuana use, including diagnosis of PTSD (2), social anxiety disorder (3), other substance use, particularly during youth (4), and peer substance use (5).

Cannabis Use Disorder among Veterans Using VA Health Care

There has been no study of marijuana use in the overall Veteran population. What we do know comes from looking at data of Veterans using VA health care, who may not be representative of Veterans overall. When considering the subset of Veterans seen in VA health care with co-occurring PTSD and substance use disorders (SUD), cannabis use disorder has been the most diagnosed SUD since 2009. The percentage of Veterans in VA with PTSD and SUD who were diagnosed with cannabis use disorder increased from 13.0% in fiscal year (FY) 2002 to 22.7% in FY 2014. As of FY 2014, there are more than 40,000 Veterans with PTSD and SUD seen in VA diagnosed with cannabis use disorder (6).

https://www.ptsd.va.gov/professional/treat/cooccurring/marijuana_ptsd_vets.asp

Problems Associated with Marijuana Use

Marijuana use is associated with medical and psychiatric problems. These problems may be caused by using, but they also may reflect the characteristics of the people who use marijuana. Medical problems include chronic bronchitis, abnormal brain development among early adolescent initiators, and impairment in short-term memory, motor coordination and the ability to perform complex psychomotor tasks such as driving. Psychiatric problems include psychosis and impairment in cognitive ability. Quality of life can also be affected through poor life satisfaction, decreased educational attainment, and increased sexual risk-taking behavior (7). Chronic marijuana use also can lead to addiction, with an established and clinically significant withdrawal syndrome (8).

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Active Ingredients and Route of Administration

Marijuana contains a variety of components (cannabinoids), most notably delta-9-tetrahydrocannabinol (THC) the primary psychoactive compound in the marijuana plant. There are a number of other cannabinoids, such as cannabidiol (CBD), cannabinol (CBN), and cannabigerol (CBG). Marijuana can vary in cannabinoid concentration, such as in the ratio of THC to other cannabinoids (CBD in particular). Therefore, the effects of marijuana use (e.g., experience of a high, anxiety, sleep) vary as a function of the concentration of cannabinoids (e.g., THC/CBD). In addition, the potency of cannabinoids can vary. For example, the concentration of THC in the marijuana plant can range in strength from less than 1% to 30% based upon strain and cultivation methods. In general, the potency of THC in the marijuana plant has increased as much as 10-fold over the past 40 years (9,10). Recently, cannabis extract products, such as waxes and oils, have been produced and sold in which the concentration of THC can be as high as 90%. Thus, an individual could unknowingly consume a very high dose of THC in one administration, which increases the risk of an adverse reaction.

Marijuana can be consumed in many different forms (e.g., flower, hash, oil, wax, food products, tinctures). Administration of these forms also can take different routes: inhalation (smoking or vaporizing), ingestion, and topical application.

Given the same concentration/ratio of marijuana, smoking or vaporizing marijuana produces similar effects (11); however, ingesting the same dose results in a delayed onset and longer duration of effect (12). Not all marijuana users may be aware of the delayed effect caused by ingestion, which may result in greater consumption and a stronger effect than intended.

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Neurobiology

Research has consistently demonstrated that the human endocannabinoid system plays a significant role in PTSD. People with PTSD have greater availability of cannabinoid type 1 (CB1) receptors as compared to trauma-exposed or healthy controls (13,14). As a result, marijuana use by individuals with PTSD may result in short-term reduction of PTSD symptoms. However, data suggest that continued use of marijuana among individuals with PTSD may lead to a number of negative consequences, including marijuana tolerance (via reductions in CB1 receptor density and/or efficiency) and addiction (15). Though recent work has shown that CB1 receptors may return after periods of marijuana abstinence (16), individuals with PTSD may have particular difficulty quitting (17).

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Marijuana as a Treatment for PTSD

The belief that marijuana can be used to treat PTSD is limited to anecdotal reports from individuals with PTSD who say that the drug helps with their symptoms. There have been no randomized controlled trials, a necessary "gold standard" for determining efficacy. Administration of oral CBD has been shown to decrease anxiety in those with and without clinical anxiety (18). This work has led to the development and testing of CBD treatments for individuals with social anxiety (19), but not yet among individuals with PTSD. With respect to THC, one open trial of 10 participants with PTSD showed THC was safe and well tolerated and resulted in decreases in hyperarousal symptoms (20).

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Treatment for Marijuana Addiction

People with PTSD have particular difficulty stopping their use of marijuana and responding to treatment for marijuana addiction. They have greater craving and withdrawal than those without PTSD (21), and greater likelihood of marijuana use

during the six months following a quit attempt (17). However, these individuals can benefit from the many evidence-based treatments for marijuana addiction, including cognitive behavioral therapy, motivational enhancement, and contingency management (22). Thus, providers should still utilize these options to support reduction/abstinence.

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Hi All
Review of 47 studies PTSD.

Medical Marijuana No Panacea for Those Suffering With Mood and Anxiety Disorders and PTSD

Marijuana use is very prevalent among people suffering from mood and anxiety disorders (AD's). Rates of problematic use and addiction are much higher than in the general population. After performing a **review that included 47 studies, researchers confirmed that there is strong evidence suggesting that marijuana** use is linked to onset and poorer clinical course in bipolar disorder and **PTSD.**

Dr. Sharif Mohr, epidemiologist for Drug Free America Foundation remarked, "It is the tragic height of irony that PTSD is an approved condition for medical marijuana recommendations in many states. More and more evidence continues to emerge that marijuana is actually adverse for people suffering from mental health disorders—especially PTSD. But what do you expect when politicians and lobbyists collude and, under a clever veneer of compassion, allow voters to circumvent

the FDA and approve untested, potentially harmful medical treatments?"

https://pubmed.ncbi.nlm.nih.gov/31577377/

Am J Addict

. 2020 Jan;29(1):9-26.
doi: 10.1111/ajad.12963. Epub 2019 Oct 2.

Cannabis and Cannabinoids in Mood and Anxiety Disorders: Impact on Illness Onset and Course, and Assessment of Therapeutic Potential

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- PMID: 31577377
- PMCID: PMC6925309 (available on 2021-01-01)
- DOI: 10.1111/ajad.12963

Abstract

Background and objectives: Cannabis use is common in people with and mood and anxiety disorders (ADs), and rates of problematic use are higher than in the general population. Given recent policy changes in favor of cannabis legalization, it is important to understand how cannabis and cannabinoids may impact people with these disorders. We aimed to assess the effects of cannabis on the onset and course of depression, bipolar disorder, ADs, and post-traumatic stress disorder (PTSD), and also to

explore the therapeutic potential of cannabis and cannabinoids for these disorders.

Methods: A systematic review of the literature was completed. The PubMed® database from January 1990 to May 2018 was searched. We included longitudinal cohort studies, and also all studies using cannabis or a cannabinoid as an active intervention, regardless of the study design.

Results: Forty-seven studies were included: 32 reported on illness onset, nine on illness course, and six on cannabinoid therapeutics. Cohort studies varied significantly in design and quality. The literature suggests that cannabis use is linked to the onset and poorer clinical course in bipolar disorder and PTSD, but this finding is not as clear in depression and anxiety disorders (ADs). There have been few high-quality studies of cannabinoid pharmaceuticals in clinical settings.

Conclusions and scientific significance: These conclusions are limited by a lack of well-controlled longitudinal studies. We suggest that future research be directed toward high-quality, prospective studies of cannabis in clinical populations with mood and ADs, in addition to controlled studies of cannabinoid constituents and pharmaceuticals in these populations. (Am J Addict 2019;00:00-00).

Conflict of interest statement

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.