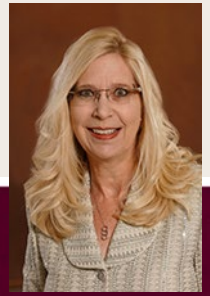
Marijuana Use in Pregnancy:

What Do We Know and How Can We Help?



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Overview

- Who is using marijuana in pregnancy?
- What are the common attitudes about using marijuana while pregnant?
- What are the known harms of pregnancy marijuana use?
- What are the best practices for addressing marijuana use in pregnancy?

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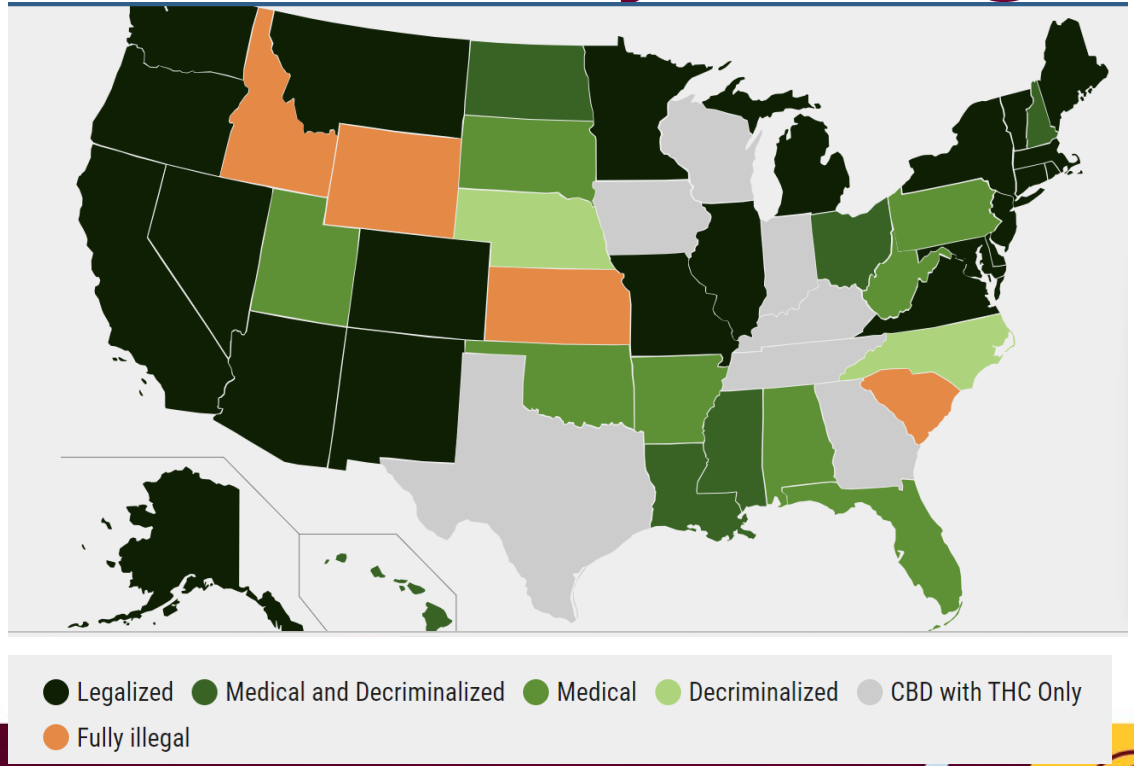
Where is marijuana legal?



https://disa.com/marijuana-legality-by-state

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What has changed?

Alaska Has Been a Trailblazer in Cannabis Policy

Alaska residents have been among the earliest supporters of cannabis policy reform. Back in 1998, Alaska voters made their state the second (tied with Washington and Oregon) to legalize medical cannabis, though there was no way for patients to legally purchase it. In 2014, Alaska became the third state (tied with Oregon) to legalize cannabis for adults' use.

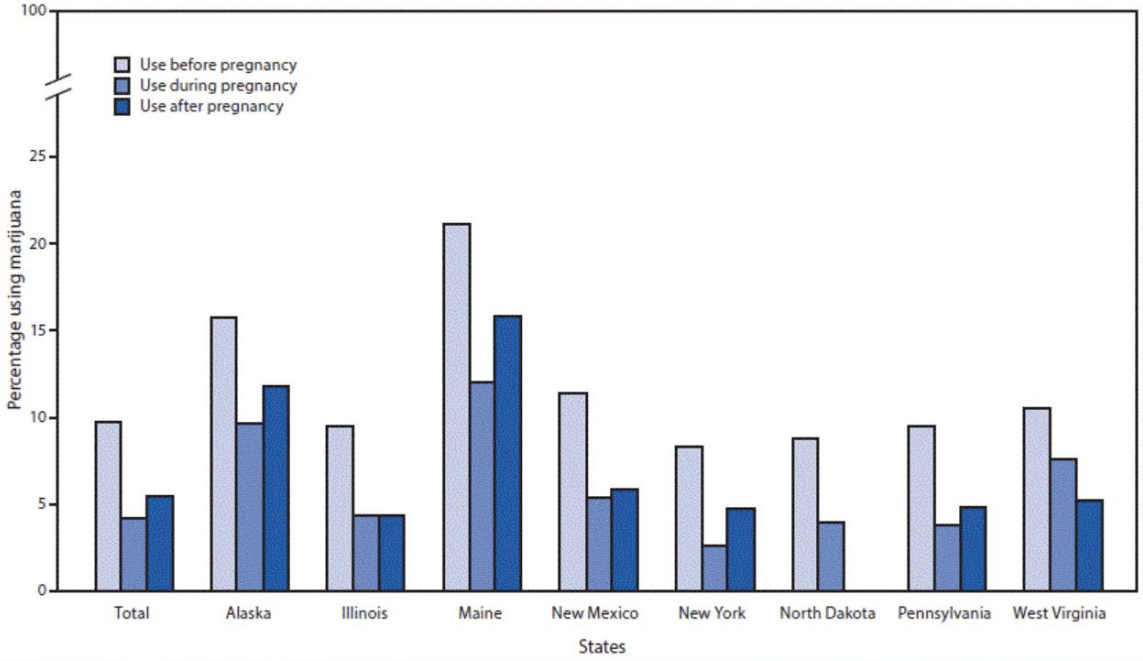
On November 4, 2014, 53% of Alaska voters approved Ballot Measure 2, legalizing cannabis for adults' use. Residents 21 and older can now legally grow up to six plants at home and purchase up to one ounce of flower or seven grams of concentrate. However, Alaska still has no way for patients under 21 to purchase medical cannabis, and medical patients over 21 are not exempt from cannabis taxes.

While some cities and towns have banned retail sales, Anchorage, Juneau, and Fairbanks are among the many jurisdictions that have retail cannabis stores.

https://www.mpp.org/states/alaska/

How does that translate to pregnancy ?

FIGURE 1. Prevalence* of marijuana use before, during, and after pregnancy (N = 6,236)† — eight states, Pregnancy Risk Assessment Monitoring System (PRAMS), 2017§,¶



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7440118/

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Additional pregnancy use numbers

- Marijuana - most commonly used illicit drug during pregnancy
- 2017 PRAMS – **4.2%** of pregnant women nationally report use
- National Survey on Drug Use & Health – pregnant women subsample:
  - 2002-2014: *past year* self-report of any use = **11.6%**
  - 2007-2012: *past year* self-report of daily/almost daily use = **16.2%**
- Biochemical testing – rates **30%+** (ex: Klebanoff et al 2021)

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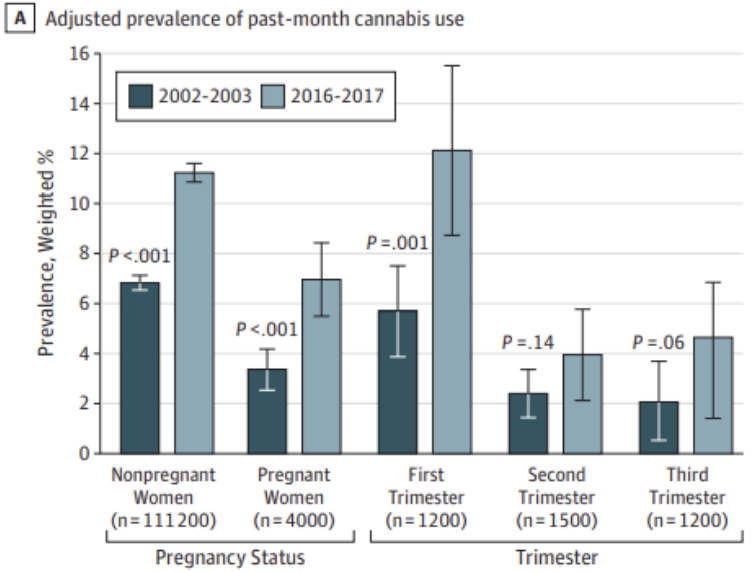
Additional pregnancy use numbers

Figure. Adjusted Prevalence of Cannabis Use in Women Aged 12 to 44 Years Based on National Survey on Drug Use and Health (NSDUH) Data



Still another study:

Increase in use (not just reporting) with legalization – 10.4% increase in THC-positive meconium specimens in Colorado 2 yrs after legalization

Jones et al, 2015

https://jamanetwork.com/journals/jama/fullarticle/2736582

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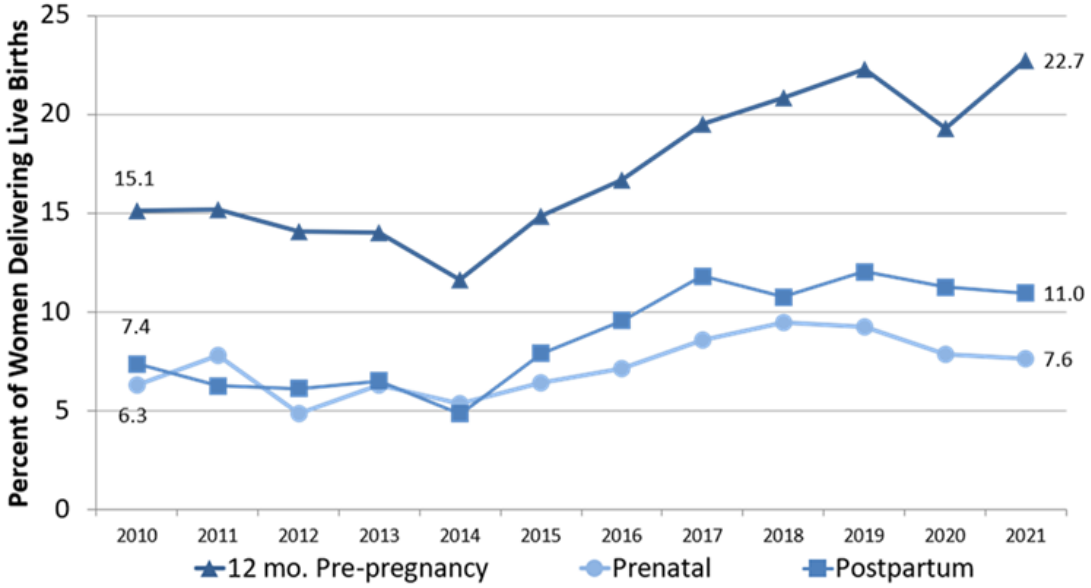
Alaska-specific numbers

Pre-Pregnancy, Prenatal, and Postpartum Marijuana Use
Alaska, 2010-2021
Data Source: PRAMS, Alaska Division of Public Health



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Who uses marijuana in pregnancy?

Statistically speaking, those most likely to use marijuana in pregnancy are:

- Non-Hispanic white
- Unmarried
- High school education or less
- Less than 25 years of age
- Also using cigarettes
- Mental health diagnoses

Attitudes toward pregnancy marijuana use

Perception of Benefit

- **For nausea/morning sickness**
  - Antiemetic properties widely accepted; nausea common in pregnancy
  - 68% of pregnant marijuana users reported doing so to alleviate nausea (Westfall et al, 2006)
  - Dispensaries have recommended marijuana to pregnant women for this purpose (Dickson et al, 2018): 69%, with 36% saying it was completely safe in pregnancy, and only 32% saying should talk to HC provider
- **For sleep disturbance**
  - Some research suggests marijuana helps in falling asleep faster and better sleep quality, but research is mixed (Suraev et al, 2020); no sleep benefits found for pregnant women (Murnan et al, 2022)
- **For physical pain and mental health issues**
  - Qualitative study in Washington state found this the most common reason for using marijuana during pregnancy (Macario et al, 2022)

Attitudes toward pregnancy marijuana use

(Mis) Perception of Safety

- Qualitative study with pregnant marijuana users found a common theme in that they described marijuana as “natural” and “safe” compared to other substances such as alcohol, tobacco, and other recreational and prescription drugs (Chang et al, 2019)
- Comparison of those using and not using marijuana during pregnancy – 90% of non-users felt it could be harmful to the baby, only 26% of users did (Mark et al, 2017); in another study, only 17% of pregnant non-users but 65% of pregnant marijuana users reported no anticipated health risk with pregnancy marijuana use (Jarlenski et al 2017)

Attitudes toward pregnancy marijuana use

(Mis) Perception of Safety

- National survey of U.S. adults in 2017 – 92% believed marijuana use in pregnancy was somewhat or completely unsafe (Keyhani et al, 2018)
- Survey of pregnant women who have used marijuana (Cameron et al, 2022):

Using marijuana while pregnant…	% Disagree	% Uncertain	% Agree
Has no lasting harms for baby	68.8%	16.7%	14.6%
Lowers child's IQ	24.0%	22.6%	53.4%
Increases risk of behavioral problems	20.7%	23.4%	55.9%
Increases risk of damage to baby's brain	18.8%	19.4%	61.8%
Increases risk of preterm birth	24.0%	24.7%	51.4%
Increases risk of low birth weight	26.0%	24.0%	50.0%
Increases risk of pregnancy complications for mom	18.1%	25.0%	56.9%

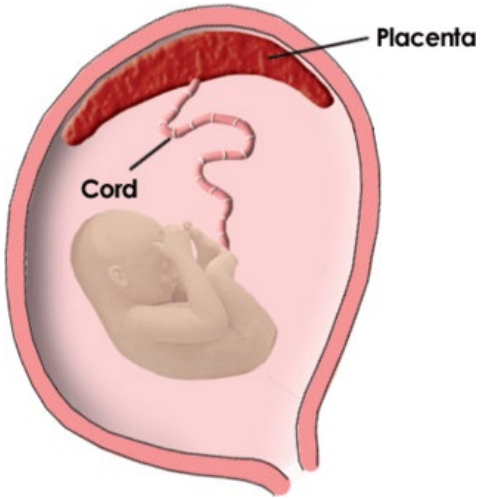
What do we mean by “marijuana”?

- Marijuana is derived from cannabis plants
- Phytocannabinoids – pharmacologically active compounds in marijuana that interact with cannabinoid receptors
- Cannabinoid receptors – most abundant in CNS and immune cells
- Most common phytocannabinoids in marijuana
  - THC
  - CBD

How do people “use” marijauna?

How might marijuana impact the prenatal environment?

- Cannabis is lipid-soluble and crosses the placental and blood-brain barrier
- THC rapidly crosses the placenta; concentrations in fetal blood similar to maternal blood
- CBD crosses less efficiently, producing lower fetal levels; BUT increases placental permeability to other substances
- Route of administration has an impact – highest fetal concentrations for inhaled and IV administration
- All result in diminished blood flow to the placenta
- Animal studies have shown structural brain and biochemical changes



What are the challenges for research?

- Reliance on self-report of use – 50%+ denial
- Potential role of route, timing, amount, potency, and chemicals of use
- Associations, not causation, and confounders:
  - Polysubstance use
  - Demographic and medical correlates
- Impacts of legalization
  - Potency increase 2-3 fold (Elsohly et al, 2016)
  - Amount of use (50% more often)
  - Use of marijuana only

Impact of marijuana use on the pregnancy

Adverse maternal outcomes

- Gestational diabetes – 32% increased risk (Luke et al, 2022)
- Cannabinoid hyperemesis syndrome (Roberson et al, 2014)
- Other effects seen: increased risk of pregnancy induced hypertension, pre-eclampsia, placenta previa
  - BUT – these could be attributed to tobacco and alcohol use in pregnancy due to how studies have been done

Results are Largely Equivocal

Impact of marijuana use on the pregnancy

Pregnancy loss

- Biochemically confirmed marijuana use/abstinence was linked to a more than doubled risk of stillbirth, but effect was partially confounded by tobacco use (Varner et al, 2014)
- Biochemically confirmed marijuana only use predicted a 12-fold increased risk of miscarriage/stillbirth compared with non-users (Coleman-Cowger et al, 2018)
- A few studies have not found an increased risk, but most were small scale or relied on self-report of substance use

Link established

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Impact of marijuana use on the pregnancy

Preterm birth

- PTB - 80% increased risk; VPTB – 73% increased risk (Luke et al, 2022)
- PTB – 79% increased risk – large multi-site sample (Bailey et al, 2020)
- Other studies even larger risk – 2.3 (Dekker et al, 2012; Leemaqz et al, 2016)
- Large systematic review (Gunn et al, 2016)– pooling data from dozens of studies (recent and older) – 29% increased risk; confirmed in more recent review (Hayer et al, 2023)
- Older, small, and confounded studies yielded more inconsistent results

Link established

Impact of marijuana use on fetal and later growth

Birth size

- Early research – minimal effect of prenatal marijuana on size at birth (Fergusson; Linn; Fried)
- Since legalization, results very different:
  - 109g birth weight deficit in meta-analysis in 2016 (Gunn et al) – older and newer studies
  - 50% increased risk for LBW (Crume et al, 2018)
  - 218g deficit, 82% increased risk for LBW (Bailey et al, 2020)
  - Only a few studies have found reductions in length (Day et al, 1992) or head circumference (Nadolski et al, 2023)

Link established for birth weight; other size parameters equivocal

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Impact of marijuana use on earlier fetal growth

Table 2
Regression results predicting birth and fetal size in percentiles for gestational age and gender from cannabis exposure

Outcome[a]	Unstandardized Regression Coefficient (standard error)	*t*	*p*
Birth[b]			
Weight	−12.4 (3.7)	3.66	<0.001
Length	−7.1 (4.0)	1.76	0.079
Head circumference	−14.2 (4.0)	3.55	<0.001
Second Trimester (18–24 weeks)[b]			
Weight	−3.9 (3.8)	1.03	0.304
Femur length	−3.9 (3.7)	1.05	0.294
Head circumference	−13.7 (3.7)	3.70	<0.001
Third trimester (30–36 weeks)[c]			
Weight	−7.6 (5.0)	1.53	0.129
Femur length	−8.5 (5.3)	1.60	0.112
Head circumference	−10.5 (5.1)	2.06	0.041

[a]All potentially significant factors ($p < 0.10$) in Table 1 (mother's age, mother's marital status, mother's highest level of education, mother's medical insurance, pregnancy weight gain) were considered as confounders in regression analyses. [b]N = 280. [c]N = 172.

- Women biochemically confirmed to use no substances other than marijuana
- Background differences controlled for

Nadolski et al, 2023

Cranial size - Link preliminarily established

Impact of early marijuana use on fetal growth

Outcome predictors	Adjusted mean difference ± standard error	t	p
Weight (gm)			
Marijuana 1st trimester only	−154.0 +/− 75.4	2.04	.043
Marijuana 1st and 2nd trimester only	−164.1 +/− 104.3	1.57	.117
Marijuana throughout gestation	−185.1 +/− 68.1	2.72	.007
Length (cm)			
Marijuana 1st trimester only	−.27 +/−.45	.60	.557
Marijuana 1st and 2nd trimester only	−.61 +/−.38	1.61	.109
Marijuana throughout gestation	−.94 +/−.57	1.65	.101
Head circumference (cm)			
Marijuana 1st trimester only	−.47 +/−.27	1.73	.086
Marijuana 1st and 2nd trimester only	−.83 +/−.41	2.01	.046
Marijuana throughout gestation	−.79 +/−.32	2.47	.014

- Women biochemically confirmed to use no substances other than marijuana
- Background differences controlled for

Dodge et al, 2023

https://www.cnn.com/2023/05/16/health/marijuana-harm-early-pregnancy-wellness/index.html

https://www.usnews.com/news/health-news/articles/2023-05-16/marijuana-can-affect-fetal-development-even-if-used-early-in-pregnancy

Link preliminarily established

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Why are effects on size important?

- Low birth weight predicts:
  - Poor neurocognitive development
  - Increased rates of post-neonatal mortality
  - Ongoing growth failure
  - Attention disorders
  - Non-communicable diseases (ex: cardiometabolic disorders)
- Small cranial size at birth predicts:
  - Cognitive and psychosocial deficits
  - Delayed physical and neurological development

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Do growth deficits remain into childhood or later?

- Interestingly, there is not a lot of data…
- The Pittsburgh study did measure their participants longitudinally
  - Generally growth catch up by entry into school
  - Exception was children born to teenage mothers – still shorter compared to peers born to teenagers not using marijuana in pregnancy

No Link/ link equivocal

Marijuana use and neonatal effects

- Increased rates of NICU admission
  - Review of older and newer studies – doubled risk (Gunn et al, 2016)
  - Recent review of newer studies – 50%+ increased risk (Hayer et al, 2023)
  - Rigorous control for other substances – 45% increased risk (Bailey et al, 2020)
- No evidence for effects on (Thompson et al, 2019):
  - Newborn withdrawal (but see Gray et al, 2010)
  - Apgar scores
  - Jaundice
  - Resuscitation/respiratory distress/intubation
  - Hypoglycemia
  - Sepsis

Link established only for NICU admission

Marijuana use and structural defects

- Mixed results:
  - Cardiac
  - Gastrointestinal
  - Central nervous system
  - Anencephaly
  - Diaphragmatic hernia
- Limited negative findings:
  - Orofacial
  - Eye
  - Genitourinary
  - Musculoskeletal
- More research needed (vanGelder et al, 2014; reviewed in Sujan et al, 2020)

Results are Equivocal

Longer term impact of prenatal marijuana exposure: Animal studies

- Attention deficit and hyperactivity disorders
- Decrease in motor activity and exploratory behavior
- Cognitive impairment
- Emotional issues:
  - Dysregulation
  - Anxiety
  - Depression
- Increased drug seeking behavior

As reviewed in Roncero et al, 2020

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Prenatal marijuana and cognitive development

- Do not appear to be global IQ deficits
- **Poorer language comprehension**
- **Poorer executive function** (higher order thinking and reasoning)
- **Memory deficits** – especially visual & short-term memory
- Largest effects seen for **attention/hyperactivity/impulsivity**
- Effects increase with age, persisted to adulthood
- Effects largest with heavier use of marijuana
- Studies – Ottawa, Pittsburgh, Rotterdam

Prenatal marijuana and social/emotional development

- Increased rates of **depression**
- Increased rates of **anxiety**
- Increased rates of **aggression**, especially in girls
- Increased rates of **early substance use and dependence**, especially marijuana use
- Effects increase with age, persisted to adulthood
- Effects largest with heavier use of marijuana
- Studies – Ottawa, Pittsburgh, Rotterdam

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Prenatal marijuana and early cognition

	No Marijuana exposure	1st Trimester marijuana	Marijuana throughout gestation	Adjusted OR for ANY marijuana exposure[a]	Adjusted OR for marijuana exposure THROUGHOUT gestation[b]
Auditory	28.9%	26.3%	29.8%	.87 (.30–2.58)	1.04 (.51–2.13)
Visual	39.0%	47.4%	55.3%	1.41 (.54–3.66)	1.94 (1.01–3.72)
Tactile	25.2%	27.7%	36.8%	1.14 (.55–2.37)	1.74 (.94–2.71)
Vestibular	37.1%	31.6%	38.3%	.78 (.28–2.17)	1.05 (.54–2.06)
Oral	13.2%	10.5%	17.0%	.77 (.17–3.59)	1.35 (.55–3.78)

Percentages represent rate of those who scored more than 1 standard deviation above the mean, considered to engage in those behaviors "More than Others" or "Much More than Others". Odds ratios adjusted for maternal age, maternal education, maternal marital status, family income, and prenatal tobacco exposure.

[a]Reference group is those unexposed to marijuana during gestation.

[b]Reference group is those unexposed to marijuana or exposed only in the first trimester.

Bailey & Osborne, 2023

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Outcomes related to prenatal marijuana exposure

- Pregnancy loss
- Preterm birth
- Decreased size at birth: weight, and potentially length and cranial size
- NICU admission
- Potential structural defects
- Cognitive effects including language, executive function, memory, and inattention/hyperactivity
- Social/emotional effects including depression, anxiety, aggression, substance use
- Even first trimester only use may have effects, but greatest impact seen with use continued through pregnancy and at greater levels of use
- Developmental effects increase with age
- Unclear if route or THC vs CBD plays a role

So, How can we help?

- Screening
- Education
- Intervention and support

https://www.statnews.com/2019/12/23/pregnant-women-providers-how-to-talk-marijuana/

Best practices for addressing marijuana use in pregnancy

- ACOG: guidelines recommend that women be counseled against using marijuana while trying to get pregnant, during pregnancy, and while they are breastfeeding
- CDC: recommends against the use of marijuana in pregnancy because it can potentially result in adverse fetal development
- There is currently no recognized “safe” amount, type, or route of administration of marijuana in pregnancy, and there are many established risks following use, especially since marijuana used now is more potent

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Screening

- Current recommendation – health care providers should verbally screen all women for marijuana use at prenatal intake and consider rescreening later in pregnancy
- How to ask? Avoid yes/no questioning and give a range of options

1) WHICH STATEMENT BEST DESCRIBES YOU NOW?

a. You smoke regularly now – about the SAME amount as before you found out you were pregnant
b. You smoke regularly now, but MORE THAN before you found out you were pregnant
c. You smoke some now, but have CUT DOWN since you found out you were pregnant
d. You stopped smoking AFTER you found out you were pregnant, and are not smoking now
   # Weeks Quit: _____
e. You stopped smoking BEFORE you found out you were pregnant, and are not smoking now
   # Weeks/Years Quit: _____
f. You have NEVER smoked, or smoked fewer than 100 cigarettes in your life

Screening

- As many as 1 in 5 pregnancy marijuana users meet criteria for marijuana abuse/dependence (Ko et al, 2015)

TABLE 1. Cannabis Use Disorder—DSM5

A problematic pattern of cannabis use leading to clinically significant impairment or distress manifested by at least 2 of the following occurring in a 12-month period
Cannabis taken in larger amounts over longer times than intended
Persistent desire or unsuccessful attempts at cutting down or controlling use
A great deal of time is spent in activities necessary to obtain cannabis, use cannabis, or recover from use
Craving, or strong desire to use cannabis
Recurrent use resulting in a failure to fulfill obligations at home, work, or school
Continued use despite persistent or recurrent social or interpersonal problems caused or made worse by the effects of cannabis
Social, occupational, or recreational activities are given up or reduced because of cannabis use
Recurrent use in situations in which it is physically hazardous
Cannabis use is continued despite knowledge of having a persistent or recurrent physical or psychologic problem that is caused or exacerbated by cannabis
Tolerance as defined by a need for markedly increased cannabis to achieve intoxication or markedly diminished effect with continued use of the same amount
Withdrawal as manifested by either the characteristic withdrawal syndrome for cannabis or cannabis is taken to relieve or avoid withdrawal

Created with data from the American Psychiatric Association.[22]

- Screen for other substances due to high rates of co-use (50%+)
- Consider screening and addressing other psychosocial risk factors

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Screening

- What about biochemical testing?
  - Universal
  - Targeted for high risk
- Pregnant women do not always admit to use – in one study 50-60% of pregnant marijuana users denied use
  - Misclassification was not random – those who did report use were less frequent users or users who just quit
  - Shiono et al, 1995; Young-Wolff et al, 2019; Rodriguez et al, 2019
- How accurate is it?
  - Most detection methods (urine, serum) – use in last 24-48 hours
  - It may not detect low level of use, may detect high second hand exposure
- How does this impact the clinical relationship?

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Education

- Firm and clear recommendation to quit, no safe level, quit as soon as possible
- How to share the science
  - Make sure you can clearly articulate the risks and can refer to reputable resources
  - As much as one third of searchable online content portrays the benefits of marijuana use in pregnancy as outweighing the risks (Jarlenski et al, 2018)
- Quotes from a study of pregnant women using marijuana when asked about trusted sources for information about dangers of marijuana (Macario et al, 2022)
- "Typically, I would go based off experience from people that I know."
- "I default to other mothers…social media through forums through the computer…I would go first to other mothers and their experiences and then to my doctors."

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Education

- Need to also consider and directly address (mis)perception of safety:
- “I talked to my doctor while I was pregnant, and we discussed marijuana usage…”And once more studies are produced, and we have the knowledge and all that,” but so I had to make that choice alone.”
- “I smoked marijuana with all my kids and they don’t have any developmental problems. They’re doing great. They are smart. They’re coming along with everyone else.”
- “Of course, we would never want to see a pregnant woman drinking or smoking cigarettes excessively, but with cannabis, I do not think you can really overdo it.”

Education

- Need to also consider and address why women use marijuana in pregnancy:
- “I felt better using marijuana than a prescription, opioid, or even like Tylenol. Because it seems like it is more natural, to me. And when you smoke a flower, are you kidding me? That seems way better than some refined and processed pill. I don’t know what’s in the pill. I don’t know where it comes from, I don’t know the side effects for that. So, I felt a lot more responsible.”
- “I started shortly after my first pregnancy for morning sickness. I have continued my usage, so about 10 years now. I use mine for bipolar disorder and Borderline Personality Disorder, which are co-morbid. It kind of did a little better for me than medication. I went through a lot of different medications and that doctor just couldn’t find anything that was helping with the chemistry. Everything that I needed was such a high dose that they just didn’t feel comfortable having me on it.”

Does every pregnancy involving marijuana have bad outcomes?

- No!
- The research has found increased risk for poor outcomes, in many cases substantially increased risk
- BUT – it is not universal
- Just because a women used marijuana in a previous pregnancy and had no identified poor outcomes, does not mean that will be the same for a later pregnancy:
  - Different amount, potency, and timing of use
  - Increased maternal age
  - Different levels of psychosocial risk
  - Different levels of other exposures
- This is an important point to make for second and later pregnancies

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Intervention & Support

- Address other issues including cannabis use disorder, other substance use, other mental health concerns, social emotional needs
- Refer for outside counseling or support if needed (Nordstrom, et al, 2007; Ordean et al, 2017)
  - Treatment programs for pregnant women are limited
  - No single method shown to be most effective
  - Any treatment appears better than no treatment
  - No pharmacotherapy demonstrated effective or safe in pregnancy to mitigate withdrawal
- Continue to follow up and offer support
- Have discussions about potential negative impacts on breastfeeding if marijuana use continues or resumes post-partum

Intervention & Support

- A few additional points to consider:
- A study of motivations to quit using marijuana in pregnancy from those who quit or cut down (Mark et al, 2017):

	Percent
To avoid being a bad example	74%
To avoid CPS involvement	66%
To save money	63%
To prove to myself that I can quit	63%
Because it could hurt the pregnancy	62%

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So, What did we learn?

- Marijuana use in pregnancy is common, and certain women are at higher risk
- There are many reasons why women use marijuana during pregnancy, and many misconceptions about the risks
- Marijuana use in pregnancy has many known harms to fetal and child growth, health, and development, and many more that still need to be better studied and understood
- Those who work with and care for pregnant women can play an important role in supporting cessation of their marijuana use

Share your experiences?

Questions or Comments?

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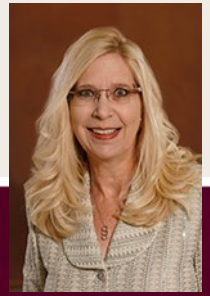
Marijuana Use in Pregnancy:

What Do We Know and How Can We Help?



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