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## Q/What effects—if any—does marijuana use during pregnancy have on the fetus or child?

### EVIDENCE-BASED ANSWER

**A/** THE EFFECTS ARE UNCLEAR. Marijuana use during pregnancy is associated with clinically unimportant lower birth weights (growth differences of approximately 100 g), but no differences in preterm births or congenital anomalies (strength of recommendation [SOR]: **B**, prospective and retrospective cohort studies with methodologic flaws).

Similarly, prenatal marijuana use isn't associated with differences in neurodevelopmental outcomes (behavior problems,

intellect, visual perception, language, or sustained attention and memory tasks) at birth, in the neonatal period, or in childhood through age 3 years. However, it may be associated with minimally lower verbal/quantitative IQ scores (1%) at age 6 years and increased impulsivity and hyperactivity (1%) at 10 years. Prenatal use isn't linked to increased substance use at age 14 years (SOR: **B**, conflicting long-term prospective and retrospective cohort studies with methodologic flaws).

### Evidence summary

A large systematic review of prospective and retrospective cohort studies found little or no effect of maternal marijuana use on birth weight, stillbirths, preterm births, or congenital anomalies (TABLE<sup>1-8</sup>). Some studies found lower birth weights and some found higher birth weights. The authors couldn't perform a meta-analysis because of heterogeneity, but estimated a clinically insignificant difference of 100 g. Most studies were limited by failure to account for concurrent maternal tobacco smoking.

Moreover, all studies used interview data to determine maternal prenatal marijuana use, which can be subject to large recall bias. A multicenter prospective study of 585 pregnant women that compared interview data with serum screening to identify tetrahydrocannabinol (THC) found poor correlation between history and laboratory validation, for example.<sup>1</sup> Only 31% of pregnant women with positive THC testing self-reported marijuana use (31% sensitivity), and only 43% of women

who reported marijuana use had a positive THC screen (43% specificity). Most studies didn't quantify marijuana use well and didn't associate use with trimester of exposure.

The authors also point out that marijuana potency has increased substantially since the 1980s when many of the studies were done (THC content was 3.2% in 1983 and 13% in 2008); prenatal marijuana use in the present day may expose the fetus to larger amounts of THC.<sup>1</sup>

A 2016 retrospective cohort study of 56 mothers who reported prenatal marijuana use found no differences in preterm birth, low birth weight, or Apgar scores.<sup>2</sup>

### Neurodevelopmental effects on infants, long-term effects on children, teens

Three prospective cohort studies evaluated neurodevelopmental outcomes in neonates and infants, and 2 studies continued to follow children into adolescence.<sup>1,3</sup> All found essentially no differences associated with prenatal marijuana at birth, throughout infancy, and

TABLE

## Prenatal marijuana use and outcomes at birth and beyond\*

Outcome	Number of cohort studies (type)	Number of women reporting marijuana use during pregnancy	Findings (compared with nonusers)	Comments
Birth weight <sup>1,2</sup>	12 (prospective)	4026	Approximately 100 g less	Most studies considered socioeconomic status, standard demographics, obstetric history, use of other drugs, tobacco, alcohol
	8 (retrospective)	7573		
Preterm birth <sup>1,2</sup>	7 (prospective)	2524	Most studies found no association	Same as above
	7 (retrospective)	3175		
Major congenital anomalies <sup>1</sup>	2 (prospective)	1338	No association	Same as above
	2 (retrospective)	1638		
Neurodevelopment (neonatal) <sup>1,3</sup>	2 (prospective)	704	No significant associations with differences in newborn behavior	Same as above
Neurodevelopment (infancy to age 3 yrs) <sup>1,3</sup>	3 (prospective)	924	Conflicting associations with development: "advanced motor skills" (OPPS), "lower memory and verbal scores" (MHPCD), and "no differences" (Gen-R)	High drop-out rate with total (N=115) at age 3 yr
Neurodevelopment (school age, 5 or 6 yrs) <sup>4,5</sup>	2 (prospective)	63	<b>OPPS:</b> No association with cognitive or language differences <b>MHPCD:</b> 5%-10% differences in verbal and/or quantitative components of Stanford-Binet IQ test, comparing marijuana use of $\geq 1$ time/day vs $< 1$ time/day	<b>MHPCD:</b> Authors estimated that 10% of score differences were attributable to marijuana, using statistical compensation for differences in socioeconomic status
Neurodevelopment (age 9-12 yrs) <sup>6,7</sup>	2 (prospective)	54	<b>OPPS:</b> No association with impulsivity or hyperactivity <b>MHPCD:</b> Association with 10% greater scores for impulsivity and hyperactivity among children exposed to heaviest prenatal use	<b>MHPCD:</b> Authors estimated that 10% of score difference was attributable to marijuana, using statistical compensation for differences in socioeconomic status
Neurodevelopment (age 14 yrs) <sup>8</sup>	1 (prospective)	79	<b>MHPCD:</b> No significant association between maternal prenatal marijuana use and marijuana use by adolescent children	

Gen-R, Generation R study;<sup>1-3</sup> MHPCD, Maternal Health Practices and Child Development study;<sup>1-5,7,8</sup> OPPS, Ottawa Prenatal Prospective Study.<sup>1-4,6</sup>

\*All data about frequency of use are from maternal history by interview or questionnaire.

through age 3 years. The studies had the same limitations as those described previously (potential recall bias for identifying which children were exposed to marijuana prenatally and poorly quantified marijuana use not well-associated with trimester of exposure).

The Ottawa Prenatal Prospective Study

(OPPS) examined 140 low-risk pregnancies in white women of higher socioeconomic status who used marijuana during pregnancy.<sup>1,3-7</sup>

Investigators considered: socioeconomic status, standard demographics, obstetric history, and use of other drugs, tobacco, and alcohol. Using a standardized newborn as-

assessment scale, they found subtle behavioral differences at one week but not 9 days. Investigators evaluated children again at 3 years of age, school entry (5 or 6 years), and 9 to 12 years.

The Maternal Health Practices and Child Development study (MHPCD) of 564 high-risk pregnancies in predominantly minority women of low socioeconomic status followed infants from birth through 14 years of age.<sup>1,3-5,7,8</sup> It found some small differences in outcomes among children exposed to marijuana prenatally. Of note, when investigators evaluated marijuana use at age 14 years, they compared adolescent self-report history with urine THC testing (specificity 78%).

The MHPCD study was limited because, compared with the nonusing group, mothers who used marijuana were also 20% to 25% more likely to be single and poor, to live in poorer quality homes, and to use alcohol, tobacco, and other drugs. Investigators used statistical modeling to account for these environmental differences and estimated that 10% of the difference in outcomes was attributable to prenatal marijuana exposure.

The Generation R study (Gen R) enrolled 220 lower-risk pregnancies in multiethnic European women of higher socioeconomic status, followed children to 3 years of age, and found no marijuana-associated differences in any parameter.<sup>1,3,4</sup> The final assessment included only 51 children.

## Recommendations

The American College of Obstetricians and Gynecologists (ACOG) recommends screen-

ing all women for tobacco, alcohol, and drug use (including marijuana) during early pregnancy.<sup>9</sup> Women who report marijuana use should be counseled regarding potential adverse consequences to fetal health and be encouraged to discontinue use.

ACOG says that insufficient data exist to evaluate the effects of marijuana use on infants during lactation and breastfeeding and recommends against it.

The American Society of Addiction Medicine also recommends screening pregnant women for drug use and making appropriate referrals for substance use treatment.<sup>10</sup> **JFP**

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➤ **Marijuana potency has increased substantially since the 1980s, when many of the studies were done. (THC content was 3.2% in 1983 and 13% in 2008.)**

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