

# Prenatal exposure to cannabis and child neurodevelopmental outcomes

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# Disclosure Statement

- I have no affiliation (financial or otherwise) with a cannabis producer, processor, distributor or communications organization.

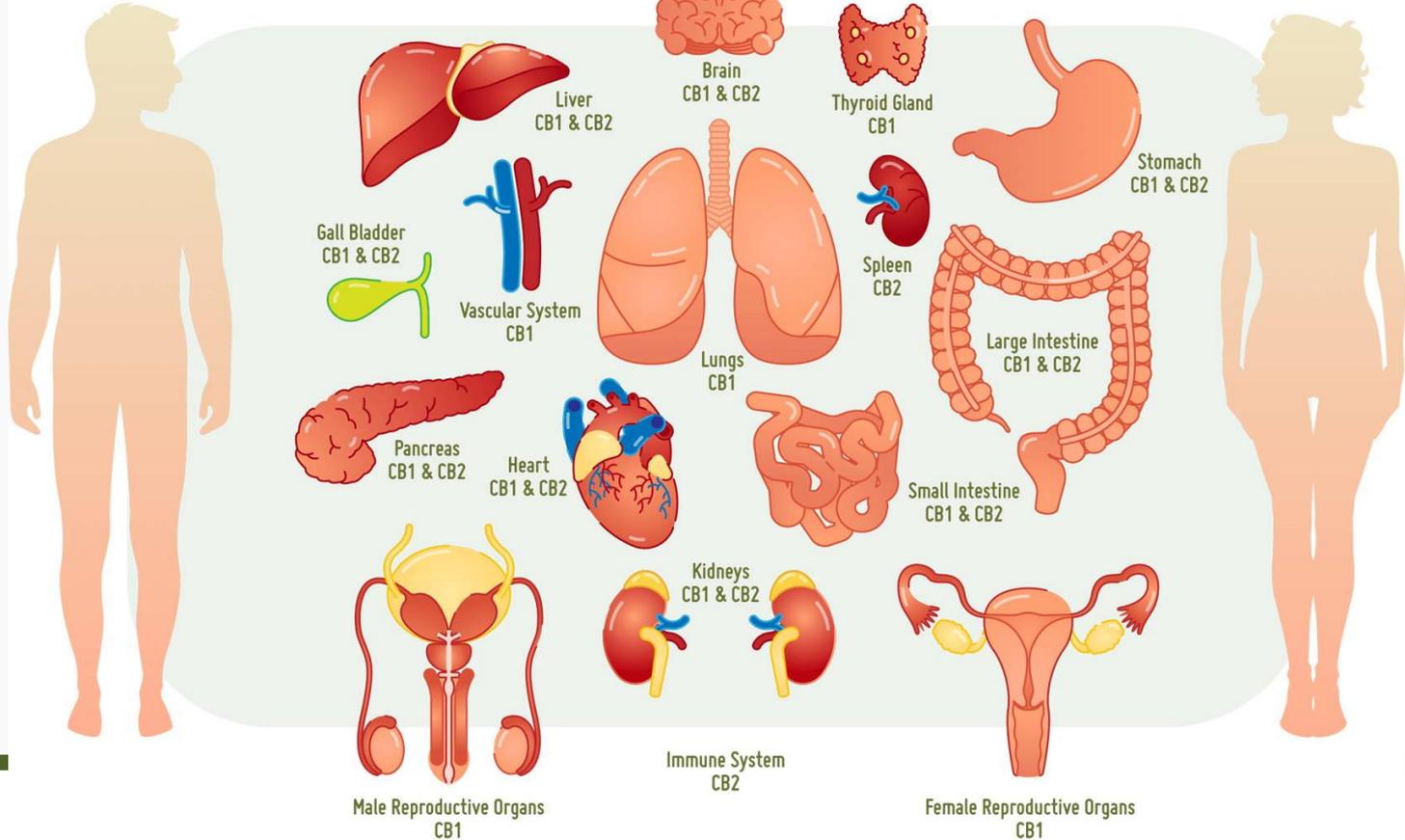
# Cannabis Basics

- Cannabis “sativa” or Cannabis “indica”
- Medicinal and psychoactive properties mediated by compounds called cannabinoids (over 60 active forms)
- Absorbed from the lungs or gastrointestinal tract
- Delta-9-Tetrahydrocannabinol (THC):
  - Small lipophilic molecule
  - Rapidly distributed to the brain and fat
  - Metabolized by the liver
  - Half life: 20-36 hours in occasional users; 4-5 days in heavy users
  - Up to 30 days for complete excretion, as detected in urine samples

# The Human Endocannabinoid System

**CB1** Receptors are mostly found in the Nervous System and Brain

**CB2** Receptors are mostly found in the peripheral organs, especially immune cells



# Cannabis Basics

- Both THC and Cannabidiol (CBD) may have medicinal properties
  - CBD may help some forms of pain and spasticity
  - THC and CBD may help nausea
- THC levels have rose dramatically from 1% in 1975, to 4% in 1995, to 12% in 2014
  - Some strains have concentrations as high as 30%
  - 1 joint today = 17 joints in 1975!!!
- Misconception: concentrated substances (oil, edibles) are healthier alternatives
  - These often have butanes present from the processing

# The Colorado Experience

- Only 49% of pregnant women surveyed at 3 University affiliated clinics thought that marijuana could “pass to the baby”

## MARIJUANA AND YOUR BABY



March 18, 2015

Marijuana is now legal for adults over 21. But this doesn't mean it is safe for pregnant or breastfeeding moms and babies.

***There is no known safe amount of marijuana use during pregnancy.***

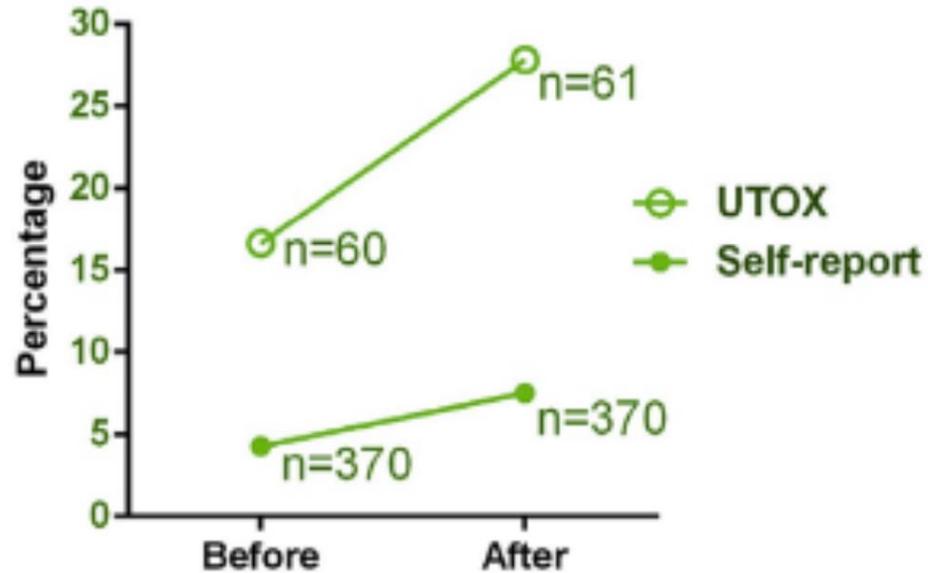
You should not use marijuana while you are pregnant, just like you should

not use alcohol and tobacco.

Tetrahydrocannabinol (THC) is the chemical in marijuana that makes you feel “high.”

***Using marijuana while you are pregnant passes THC to your baby.***

## Rates of Marijuana Use During Pregnancy Before and After Recreational Legalization in Colorado





The American College of  
Obstetricians and Gynecologists  
WOMEN'S HEALTH CARE PHYSICIANS

INTERIM UPDATE

# ACOG COMMITTEE OPINION

Number 722 • October 2017

*(Replaces Committee Opinion No. 637, July 2015)*

## Committee on Obstetric Practice

*This document reflects emerging clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed.*

**INTERIM UPDATE:** This Committee Opinion is updated as highlighted to reflect a limited, focused change in the language and supporting evidence regarding marijuana use and neonatal outcomes.

## Marijuana Use During Pregnancy and Lactation

**ABSTRACT:** *Cannabis sativa* (marijuana) is the illicit drug most commonly used during pregnancy. The self-reported prevalence of marijuana use during pregnancy ranges from 2% to 5% in most studies. A growing number of states are legalizing marijuana for medicinal or recreational purposes, and its use by pregnant women could increase even further as a result. Because of concerns regarding impaired neurodevelopment, as well as maternal and fetal exposure to the adverse effects of smoking, women who are pregnant or contemplating pregnancy should be encouraged to discontinue marijuana use. Obstetrician–gynecologists should be discouraged from prescribing or suggesting the use of marijuana for medicinal purposes during preconception, pregnancy, and lactation. Pregnant women or women contemplating pregnancy should be encouraged to discontinue use of marijuana for medicinal purposes in favor of an alternative therapy for which there are better pregnancy-specific safety data. There are insufficient data to evaluate the effects of marijuana use on infants during lactation and breastfeeding, and in the absence of such data, marijuana use is discouraged.

# ACOG Committee Opinion, October 2017 (#722)

- Before pregnancy and in early pregnancy, all women should be asked about their use of tobacco, alcohol, and other drugs, including marijuana and other medications used for non medical reasons.
- Women reporting marijuana use should be counseled about concerns regarding potential adverse health consequences of continued use during pregnancy.
  - Encourage to discontinue
- Pregnant women or women contemplating pregnancy should be encouraged to discontinue use for medicinal purposes in favor of an alternative therapy for which there are better pregnancy-specific safety data.
- There are insufficient data to evaluate the effects of marijuana use on infants during lactation and breast feeding and therefore, use is discouraged.

Drug	Antenatal complications	Neonatal effects	Long-term effects
Nicotine	<ul style="list-style-type: none"> <li>• SA</li> <li>• PTL, PROM</li> <li>• Placenta previa and placental abruption</li> <li>• IUGR, LBW</li> </ul>	<ul style="list-style-type: none"> <li>• Increased perinatal mortality</li> <li>• SIDS</li> </ul>	<ul style="list-style-type: none"> <li>• Childhood asthma</li> <li>• Behavioural problems</li> <li>• ADHD</li> </ul>
Marijuana	<ul style="list-style-type: none"> <li>• Inconsistent effects</li> </ul>	<ul style="list-style-type: none"> <li>• Neurobehavioural effects: decreased self-quieting ability, increased fine tremors and startles, increased hand-to-mouth activity, sleep pattern changes</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbed nocturnal sleep</li> <li>• Behaviour problems: inattention, impulsivity and hyperactivity, delinquency and externalizing problems self-reported depressive and anxiety symptoms</li> </ul>
Heroin	<ul style="list-style-type: none"> <li>• Premature labour</li> <li>• IUGR, LBW</li> <li>• Toxemia</li> <li>• Antepartum and postpartum hemorrhage</li> </ul>	<ul style="list-style-type: none"> <li>• Increased perinatal mortality rate</li> </ul>	<ul style="list-style-type: none"> <li>• Increased inattention, hyperactivity and behavioural problems</li> <li>• Difficulty in physical, social, and self-adjustment and learning processes</li> </ul>
Methadone		<ul style="list-style-type: none"> <li>• NAS</li> <li>• Strabismus</li> </ul>	
Cocaine	<ul style="list-style-type: none"> <li>• Spontaneous abortion</li> <li>• PROM, PTL</li> <li>• IUGR</li> <li>• Placental abruption</li> </ul>	<ul style="list-style-type: none"> <li>• Congenital anomalies: genitourinary malformations</li> <li>• Transient increase in central and autonomic nervous system symptoms and signs</li> <li>• Lower birth weight, length and head circumference (dose-dependent)</li> </ul>	<ul style="list-style-type: none"> <li>• Expressive language delays</li> </ul>
Amphetamines	<ul style="list-style-type: none"> <li>• Maternal hypertension</li> <li>• Fetal demise (at any gestational age)</li> <li>• IUGR</li> </ul>	<ul style="list-style-type: none"> <li>• Congenital anomalies: central nervous system, cardiovascular, oral clefts, limbs</li> <li>• Neurobehavioural effects: decreased arousal, increased stress and poor quality of movement (dose-response relationship)</li> </ul>	<ul style="list-style-type: none"> <li>• Behavioural problems</li> </ul>
Hallucinogens (MDMA, LSD)		<ul style="list-style-type: none"> <li>• Congenital anomalies: cardiovascular, MSK defects</li> </ul>	

ADHD: attention-deficit hyperactivity disorder; IUGR: intrauterine growth restriction; LBW: low birth weight; LSD: lysergic acid diethylamide; MDMA: 3,4-methylenedioxymethamphetamine; MSK: medullary sponge kidney; PTL: preterm labour; PROM: premature rupture of membranes; SA: spontaneous abortion; SIDS: sudden infant death syndrome.

# Trends and correlates of Cannabis use in Pregnancy: 2012 to 2017 in Ontario

- Among all women, prevalence was 1.5% (N=10,731)
- Relative increase of 60% between 2012 (1.2%) and 2017 (1.8%) ( $p < 0.001$ )
- Prevalence substantially higher among 15-24 y and lowest income (6.7%) vs highest income and 35+ year (0.3%)
- Majority of users were 15-24 y (52%) and in lowest 2 income quintiles (55%)

**Source:** Corsi, D. J., Hsu, H., Weiss, D., Fell, D.B., & Walker, M. (2018) Trends and correlates of Cannabis use in Pregnancy: A population-based study in Ontario, Canada from 2012 to 2017 *Can J Public Health*, In Press.



Cannabis &  
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# Pregnancy is a Window of Opportunity

- Change in lifestyle
- Provide resources and support
- Community resources
  - Parenting training
- Integrative, multidisciplinary programs
  - ORACLE – Dr Gaudet and Amy McGee



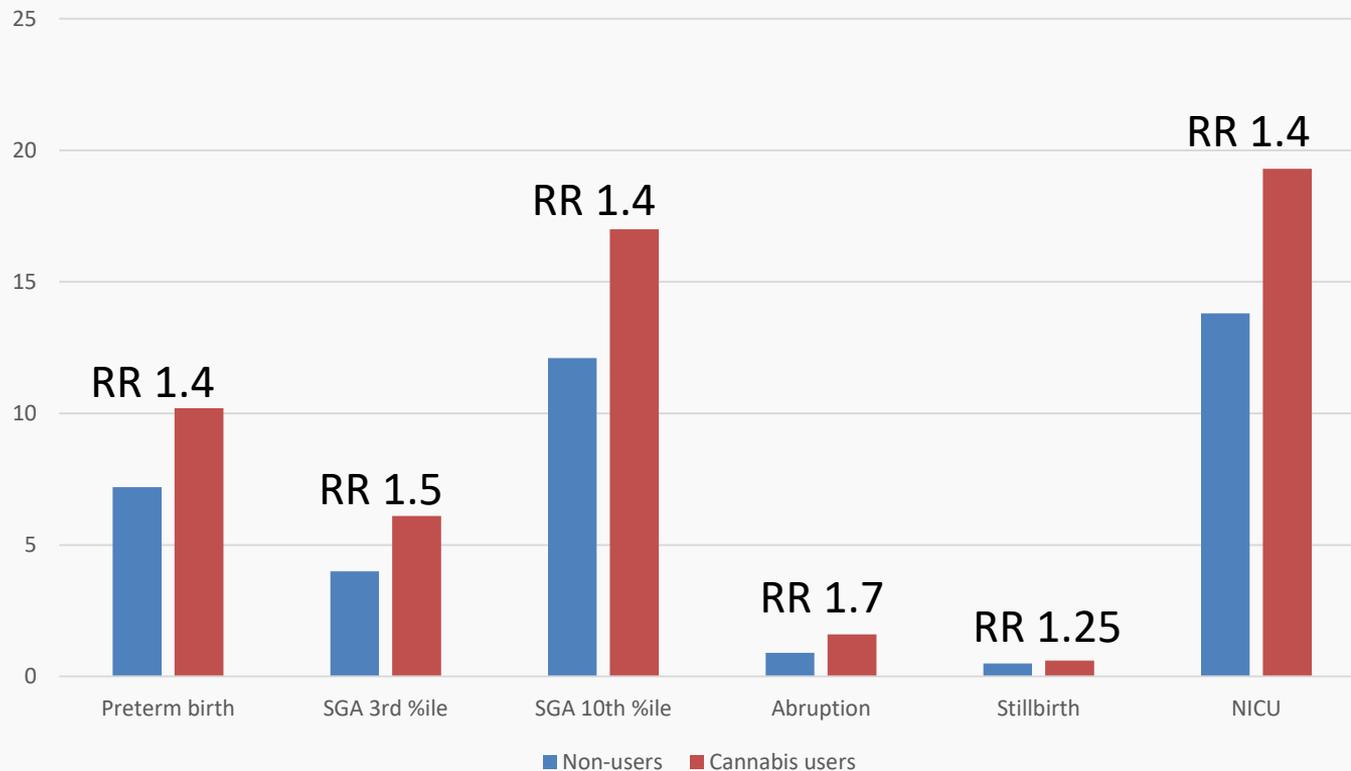
# Current Research

- Research questions:
  - What are the associations with cannabis use and adverse maternal, perinatal, and neonatal outcomes?
  - Are rates of neurodevelopmental problems including cognitive, emotional, and behavioural disorders different in children born to mothers with and without cannabis use in pregnancy?

# Methods

- **Data:** Niday Perinatal Database (2007-2012); BORN Information System (BIS) from 2012 to 2017
- **Study population:** Women aged 15-49 y with a singleton live birth in an Ontario hospital at GA  $\geq$ 20 weeks, BW  $\geq$ 500 grams
- **Sample size:** 1.2 Million women
- **Exposure:** Self-reported cannabis use in pregnancy
- **Outcomes:** Pregnancy outcomes (pre-term birth), ASD, intellectual disabilities, ADHD
- **Analysis:** Matching techniques to control for confounding.
- **Advantages:** One of the largest population-based studies on cannabis use in pregnancy; comparable over time and provincially representative

# Findings – Pregnancy Outcomes



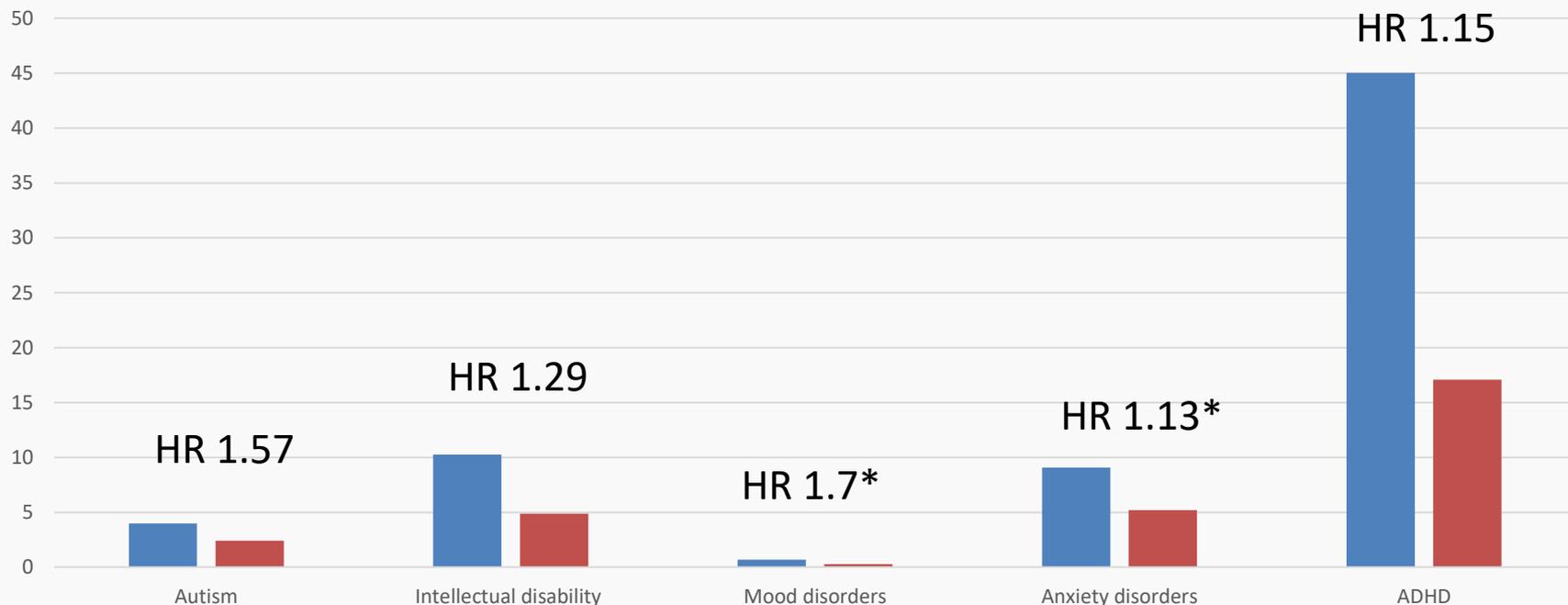
RR, Relative risk; matched data\*, 2012-2017

\*Matched for age, parity, income, BMI, gestational weight gain, Substance use, smoking, antenatal care

# Findings – Neurodevelopment

## Incidence

(per 1000 person years)



HR, Hazard ratio; matched data\*\*, 2007-2012

■ Cannabis exposed ■ Unexposed

\*\*Matched for age, education, income, pre-existing health conditions, Substance use, parity, smoking, prenatal care, obstetric complications, preterm birth

\*Mood and anxiety disorders not statistically different

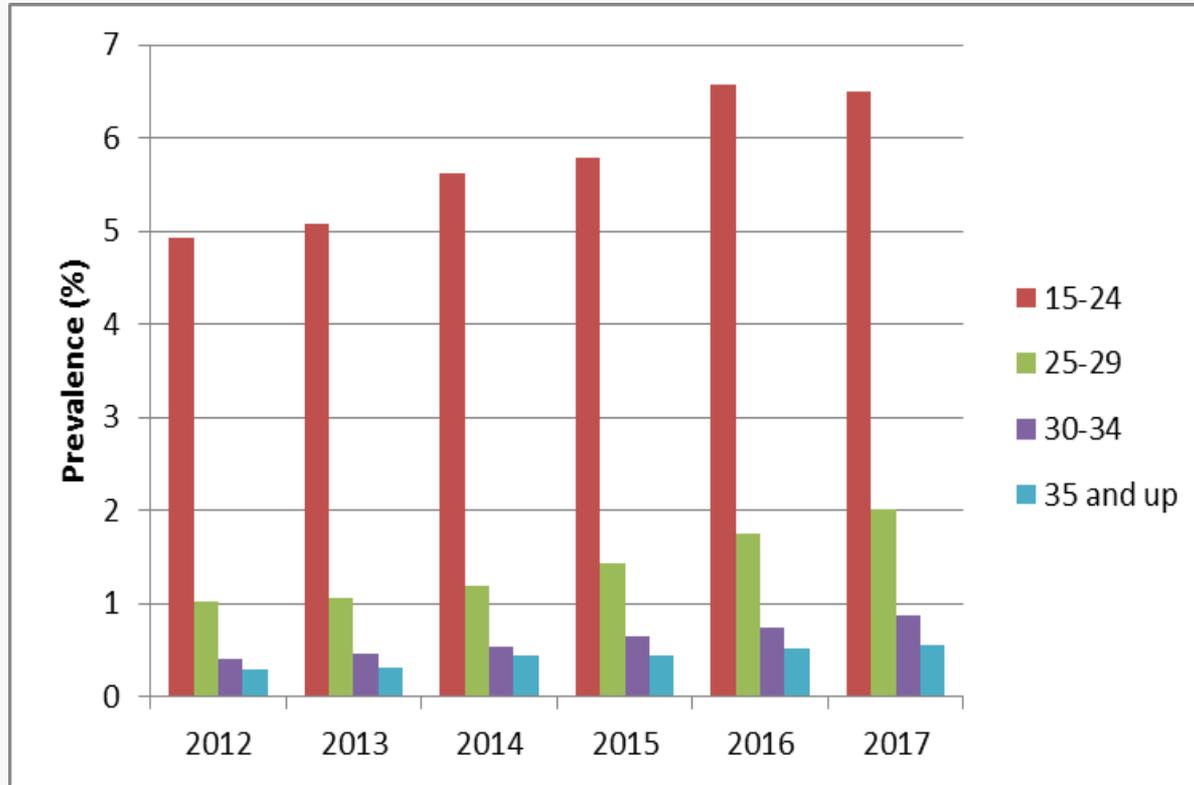
# Take Home Messages

- Cannabis use has increased, with younger ages and lower SES accounting for half of users
  - changes to legislation and societal trends which normalize the usage of cannabis could lead to further increases and in vulnerable groups.
- Cannabis use in pregnancy appears to have an inverse social gradient
  - Communication with patients and practitioners will be important to understand use patterns and promote cessation in pregnancy
  - Self-reported data likely underestimates true prevalence
- Cannabis use associated with an increased risk of adverse perinatal and some neurodevelopmental outcomes.
  - Further study on the amount and timing of use is needed.

# Questions/Comments

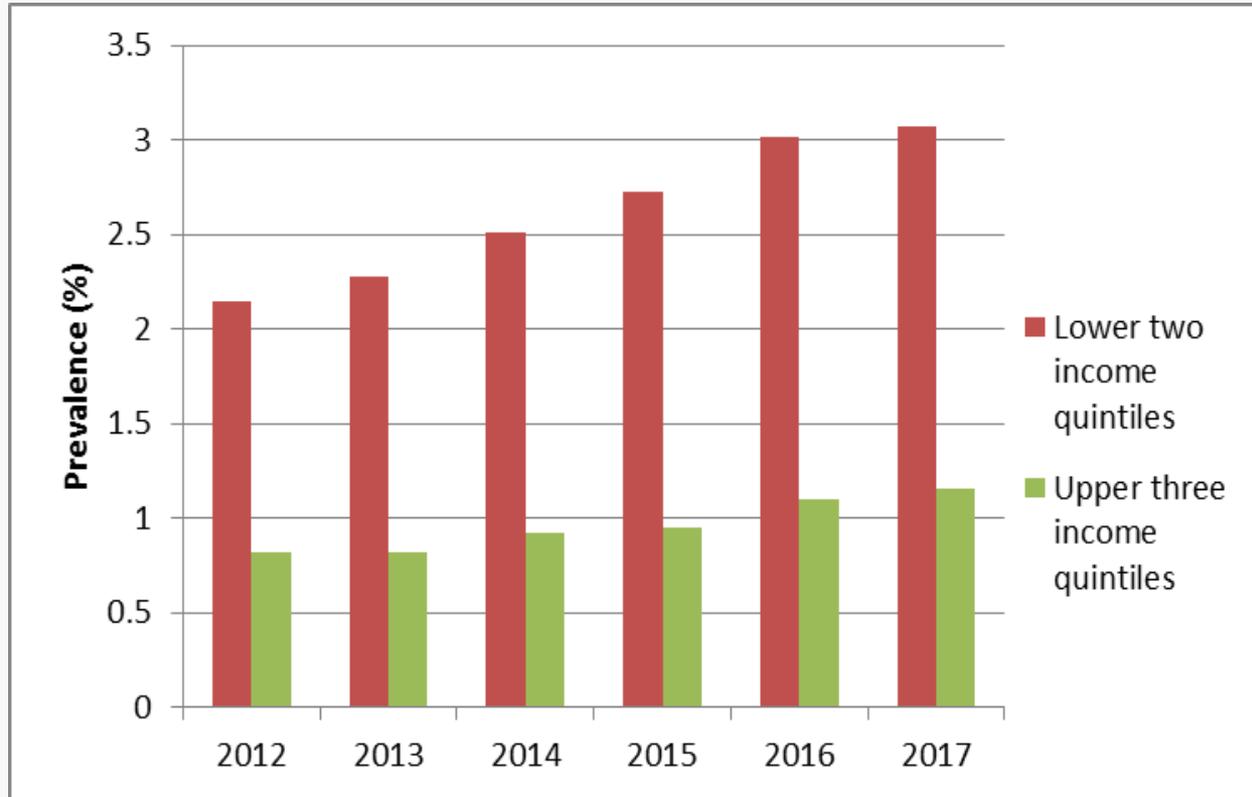


# Trends by Age



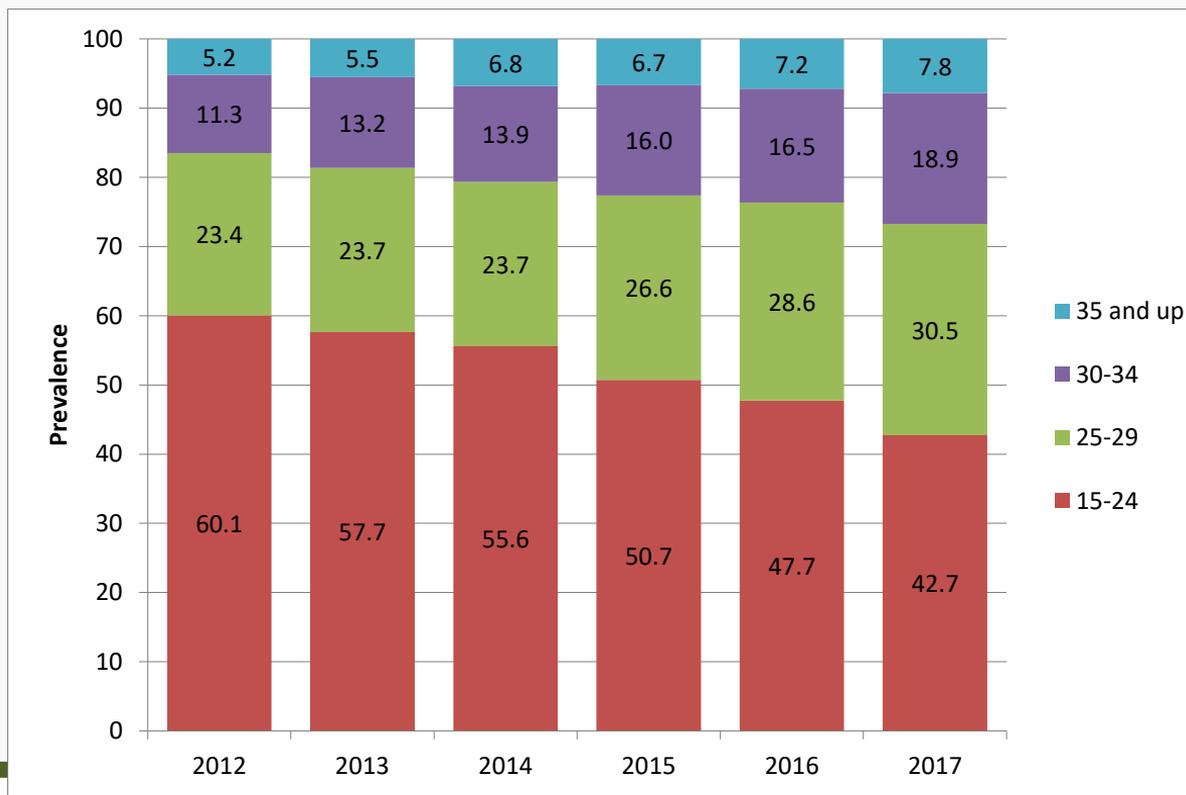
p-trend <0.001; p<0.001 age\*year interaction

# Trends by Income



p-trend <0.001; p<0.001 area-level income\*year interaction

# Age Distribution of Women Using Cannabis in Pregnancy (Ontario)



**Source:** Corsi, D. J., Hsu, H., Weiss, D., Fell, D.B., & Walker, M. (2018) Trends and correlates of Cannabis use in Pregnancy: A population-based study in Ontario, Canada from 2012 to 2017 *Can J Public Health*.

# Previous cohorts investigating health outcomes in childhood following prenatal cannabis exposure

Study	Year	Location	Sample size	Findings
Ottawa Prenatal Prospective Study	1978	Ottawa, Canada	190	Significantly <b>lower</b> scores on verbal and memory at 4 y, but no effects at age 5-6, 6-9, 9-12, and 13-16 y after adjusting for home environments.
Maternal Health Practices and Child Development Study	1982	Pittsburgh, USA	519	At 3 y, significant <b>negative</b> effects on intelligence. Second trimester exposure associated with <b>increased</b> impulsivity, hyperactivity and delinquency; <b>decreased</b> concentration, IQ score, verbal and visual reasoning at 6 and 10 y
Generation R Study	2002	Rotterdam, NL	7,450	Among children with prenatal exposure, girls had significant <b>increase</b> in attention problems and <b>increased</b> aggression at 18mo.