Marijuana and Pregnancy/Breastfeeding

Tracy Foo MD, MPH
Preventive Medicine Resident
University of Colorado
Significance

• According to the 2012 National Household Survey on Drug Use and Health, approximately **5.0%** of 12-44 year old **pregnant** women used marijuana in the past month.

• A study of 200 women in a private practice in Wisconsin showed **7% of women** had urine tests **positive for marijuana at prenatal intake visit** (Schauberger 2014).

• **4.7%** of 239 new mothers selected as controls had exposed their infant to marijuana **after pregnancy**, either by using **while breastfeeding** or using **in the vicinity of the infant**. (Klonoff-Cohen 2001, California)
Significance

• There are anecdotal reports of the use of marijuana products by women for pregnancy-related nausea and babies with colic.

• Current Colorado regulations require this statement be included on any marijuana product packaging:
  – “There may be additional health risks associated with the consumption of this product for women who are pregnant, breastfeeding, or planning on becoming pregnant.”
Agenda

- Goals of the literature review process for the committee
- Review current CDPHE surveillance efforts
- Overview of literature review process
- Overview of 3 large prospective studies evaluating prenatal marijuana exposure
- Review of literature and statements
  - Birth outcome risks
  - Health effects on exposed offspring
- Literature review summary
- Research gaps
- Public health messages
- Public health recommendations
Goals for this committee

- Public health statements
- Surveillance recommendations
- Policy recommendations
- Research priorities
Current CDPHE Surveillance Efforts

• PRAMS
• Tri-County WIC
• Birth defects registry
PRAMS 2014

• During any of the following time periods, did you use marijuana or hashish?
  – 3 months before becoming pregnant
  – First 3 months of pregnancy
  – Last 3 months of pregnancy
  – At any time during pregnancy
  – Since baby was born

• Data expected to be available October 2015
Tri-County WIC Survey

• Collect data from all 10 Tri-County WIC clinics
• Overall sample size of at least 50 per clinic (likely more in the larger clinics)
• Survey Monkey administered on IPADs
  – will have a QR option available for smart phones
• Approximately 15 questions on the survey to establish prevalence of use, form of product, storage, and need for educational materials about marijuana
• Data collected July and August 2014
  – results expected by September 2014
Birth Registry Surveillance

• Surveillance to determine if marijuana could be a factor in the development of adverse birth outcomes
  – infants (birth to age 3) diagnosed with one or more of the 23 major anomalies which are reportable to the state birth defects registry
  – thorough review of maternal medical records
Literature Review Strategy

• Conduct a search of peer-reviewed journals (mainly utilized PubMed)
• General search strategy:
  – [ marijuana or cannabis ] +
  – [ pregnant or pregnancy or fetal or infant ] +
  – [ health effect of interest ] +
• Review titles and abstracts for relevance
• Download selected articles and sort by focus
• While reviewing these, note referenced articles that may be important to add:
  – Opposing findings
  – More specific focus
  – Referenced in multiple articles
Literature Review Procedures

• Rate evidence based on strengths and limitations of each study
  – Low, medium or high quality

  • **Substantial evidence:**
    – at least 1 high quality finding, plus supporting findings, with no opposing findings
    – at least 3 medium quality findings, with no opposing findings

  • **Moderate evidence:**
    – a single high quality finding only
    – at least one medium quality finding, plus supporting findings with no opposing findings
    – mixed findings, heavily favoring one conclusion (opposing findings must be low quality)
Evidence Review

• **Limited evidence:**
  – a single medium quality finding only
  – two or more low quality findings in agreement
  – mixed findings, most favoring one conclusion

• **Insufficient evidence:**
  – a single low quality finding

• **Mixed evidence:**
  – mixed findings, with neither direction dominating
  – mixed findings, with a medium or high quality study on each side
Common Limitations

- Most studies utilize self-report of marijuana use
- Many with no standardization of doses/use
- Many studies are older (current marijuana sold is likely different)
- Unknown amount of publication bias
Placental Transfer of THC

- Biologic evidence shows that THC crosses the human placenta and is found in fetal cord blood.
  - THC is highly lipophilic and therefore has a high transfer potential.
  - Multiple animal studies show placental transfer of THC to fetus (rat, mice, hamster, sheep, monkey)
  - Biological study showed that THC crosses the human placenta and is found in fetal cord blood after recent maternal exposure (Blackard and Tennes 1984)
Overview of 3 Large Prospective Studies

- Ottawa Prenatal Prospective Study
  - Ottawa, Ontario
- Maternal Health Practices and Child Development Study
  - Pittsburgh, PA
- Generation R Study
  - Rotterdam, Netherlands
Ottawa Prenatal Prospective Study (OPPS)

- Study initiated in 1978 to evaluate the effects of cannabis, alcohol and tobacco use during pregnancy
- 698 women volunteered
  - Mostly middle class, average age 28.9, 66% had >HS education
- Interviewed women during each trimester regarding drug use
- Cannabis use described as number of joints used per week
- After 1980, a cohort of 190 children was selected for long term follow up
  - 140 children of women who reported any use of marijuana, drank alcohol (>daily average of 0.85 oz) or smoked an average of at least 16mg nicotine per day
  - 50 children of women randomly selected who were non-smokers, non-users of marijuana and abstained or drank little alcohol
Maternal Health Practices and Child Development Study (MHPCD Study)

- Data collection began May 1983, delivery interviews completed January 1986
- Randomly selected women for initial interview from outpatient prenatal clinic
  - All women who reported marijuana use >2 joints per month in 1st trimester were chosen
  - An equal number of women using less was selected randomly
  - Women were predominantly lower SES, median age 22, 57% black, 43% white, 60% completed HS
  - Resulted in 519 live singleton births which were followed long-term
- Assessed women in each trimester for drug use
- Marijuana use expressed as average daily joints (by trimester)
Generation R Study

• Multi-ethnic population-based prospective cohort study to identify early environmental and genetic determinants of growth, development and health
• Enrolled participants April 2002-January 2006
• 7452 pregnant women included in analysis
• Self report timing (before pregnancy, early pregnancy, throughout pregnancy) and frequency (daily, weekly, monthly) of marijuana use assessed at enrollment
• Assessed fetal growth with up to 3 ultrasounds and recorded birth weight
Research Topics

• Birth outcome risks:
  – Stillbirth, preterm delivery, low birth weight, small for gestational age, birth weight, birth defects

• Health effects of prenatal use on exposed offspring:
  – SIDS, newborn behavior, IQ scores, attention problems, growth, academic ability, depression symptoms, psychosis symptoms, use of marijuana, cognitive function, delinquent behavior
Birth Outcome Risks

- Stillbirth
- Preterm Delivery
- Low Birth Weight (birth weight < 2500g regardless of gestational age)
- Small for Gestational Age (birth weight less than 10th percentile for gestational age)
- Birth Weight
- Birth Defects
Stillbirth

• We found limited evidence that maternal use of marijuana during pregnancy is linked with an increased risk of stillbirth.
  – 1 study, medium quality
    ❖ Varner et al 2014 (Stillbirth Collaborative Research Network)
      – Positive THC in umbilical cord blood was associated with an OR 2.34 (95%CI 1.13-4.81, p=0.021) for stillbirth (partial confounding by cotinine)
Preterm Delivery

• We found **mixed** evidence that maternal use of marijuana during pregnancy is linked with preterm delivery.
  
  – 7 studies, 2 medium, 5 low quality

• Medium quality
  
  ❖ Hayatbakhsh et al 2012: significant association of cannabis use and preterm birth (aOR 1.5, 95%CI 1.1-1.9)
  
  – Shiono et al 1995: no significant association with cannabis use and preterm birth (OR 1.1, 95%CI 0.8-1.3)
Preterm Delivery

• Low Quality

  ❖ Dekker et al 2012: pre-pregnancy marijuana use was an independent risk factor for spontaneous preterm birth (OR 2.34, 95% CI 1.22-4.52)

  ❖ Saurel-Cubizolles et al 2014: nonsignificant aOR 1.24 (95% CI 0.44-3.49) for cannabis use <1x/month and preterm birth in tobacco nonusers, but aOR 2.68 (95% CI 1.16-6.20) for cannabis users who were also tobacco smokers and preterm birth

  – Bada et al 2005: No significant association of marijuana and prematurity (aOR 0.9, 95% CI 0.73-1.11)

  – Fergusson 2002: no significant association between cannabis before and during pregnancy and preterm delivery

  – Day et al 1991: nonsignificant relationship between prenatal marijuana use and preterm delivery
Low Birth Weight (LBW)

• We found mixed evidence that maternal use of marijuana in pregnancy is linked with low birth weight infants.
  – 4 studies, 3 medium, 1 low quality
• Medium quality
  ❖ Hayatbakhsh et al 2012: significant association of cannabis use with LBW (OR 1.7, 95%CI 1.3-2.2)
  – Schempf et al 2008: aOR 1.07 (95%CI 0.60-1.92) for marijuana use and LBW
  – Shiono et al 1995: nonsignificant association with marijuana use and LBW (OR 1.1, 95% CI 0.9-1.5)
• Low quality
  – Bada et al 2005: aOR 1.21 (95%CI 0.9-1.61) for LBW with use of marijuana
Small for Gestational Age (SGA)

- We found **mixed** evidence that maternal use of marijuana during pregnancy is linked with infants being born small for gestational age.
  - 3 studies, 1 medium, 2 low quality
  - medium quality
    - Hayatbakhsh et al 2012: Significant association of cannabis use with SGA, aOR 2.2 (95%CI 1.8-2.7)
  - low quality
    - Saurel-Cubizolles et al 2014: no significant association between cannabis use <1x/month and SGA in cannabis users who do not smoke tobacco
    - Day et al 1991 (MHPCD study): non-significant relationship between marijuana use and SGA
Birth Weight

- We found mixed evidence that maternal use of marijuana during pregnancy is associated with decreased birth weight.
  - 9 studies (2 medium quality, 7 low quality)
  - Medium quality
    - El Marroun et al 2009 (Gen R):
      - Continued cannabis use through pregnancy significantly associated with decreased birth weight (-277.27g, 95%CI -409.15g to -145.39g)
      - Use in early pregnancy significantly associated with decreased birth weight (-156.51g, 95%CI -224.0g to -89.23g)
    - Fried et al 1987 (OPPS):
      - No significant effect of cannabis use during pregnancy on birth weight
Birth Weight (cont.)

• Low quality

  ❖ Janisse et al 2014: maternal marijuana use was negatively related to growth ($p<0.004$) and effect on infant birth weight was due to restricted fetal growth

  ❖ Gray et al 2010: Cannabis exposure (+ meconium test) was associated with significantly decreased birth weight as compared to non-exposed infants. When exposure was expanded to self-report/+test, no longer significant difference.

  ❖ English et al 1997 (meta-analysis): pooled estimates for decrease in mean birth weight associated with any cannabis use during pregnancy varied from 35-48g.

  ❖ Hingson et al 1982: infants of mothers who used marijuana averaged 105g smaller than infants of non-users
Birth Weight (cont.)

• Low quality (cont.)
  – Fergusson et al 2002: after adjustment, significant increase in birth weight for women who used once per week before or during but not throughout pregnancy (89.22g, 95% CI 12.98-165.3) and for use <1x/week before and throughout pregnancy (58.6g, 95% CI 12.91-165.32)
  – Day et al 1991 (MHPCD study): no significant effect of prenatal marijuana use on birth weight
  – Linn et al 1983: adjusted analysis showed no significant effect of maternal marijuana use during pregnancy and birth weight (OR 1.07, 95% CI 0.87-1.31)
Neural tube defects

• We found mixed evidence that maternal use of marijuana during pregnancy is linked with neural tube defects such as anencephaly.
  – 3 studies, 2 medium, 1 low quality
  – Medium quality
    ❖ van Gelder et al 2009 (National Birth Defects Prevention Study data): significant association with cannabis use in 1st month of pregnancy and anencephaly (aOR 2.5, 95% CI 1.3-4.9)
    - Shaw et al 1996: California case-control study, marijuana/hash use associated with non-significant aOR 0.74 (95%CI 0.46-1.2) for a NTD-affected pregnancy
  – Low quality
    ❖ Forrester et al 2007: rates of prenatal marijuana use were significantly higher than expected for encephalocele
Gastroschisis

• We found mixed evidence that maternal use of marijuana during pregnancy is linked with gastroschisis.
  – 3 studies, 1 medium, 2 low quality
  – Low quality
    ❖ Forrester 2006 (Hawaii birth defects registry data): the prenatal marijuana use rate was higher among gastroschisis cases than the total cases in the study
    ❖ Forrester 2007: prenatal marijuana rates were significantly higher than expected for gastroschisis cases
  – Medium quality
    - van Gelder et al 2009 (National Birth Defects Prevention Study): nonsignificant aOR 1.3 (95%CI 0.8-1.8) for having a child with gastroschisis with periconceptional use of cannabis
Heart defects

• We found limited evidence that maternal use of marijuana during pregnancy is linked with isolated, simple ventricular septal defects.
  – 2 studies, 1 medium, 1 low quality
  – Medium quality
    ◆ Williams et al 2004 (Metropolitan Atlanta Congenital Defects Program):
      – significant crude OR of 2.35 (95% CI 1.43-3.86) for maternal cannabis use and association with isolated, simple VSD
      – Adjusted OR 1.90 (95% CI 1.29-2.81) for maternal heavy cannabis use (≥3 days per week) as compared to no use/light use (<3 days per week) and association with isolated, simple VSD
  – Low quality
    ◆ Forrester et al 2007: Prenatal marijuana rates were significantly higher than expected for VSD
Birth Defects

We found mixed evidence that maternal use of marijuana during pregnancy is linked with birth defects.

- 3 studies, low quality
  - Forrester and Merz 2007: rates of prenatal marijuana use were significantly higher than expected for 19 of the 54 types of birth defects
  - Day et al 1991 (MHPCD study): no significant association between marijuana use and minor physical anomalies (insufficient major anomalies in study for analysis)
  - Linn et al 1983: adjusted analysis showed OR 1.36 (95% CI 0.97-1.91) for major malformations in users vs non-users
Draft summary statement

• There is evidence to suggest that maternal use of marijuana during pregnancy may be related to negative birth outcomes, such as stillbirth.
Health Effects of Maternal Prenatal Marijuana Use on Exposed Offspring

• SIDS
• Newborn behavior
• Growth
• IQ scores
• Cognitive function
• Academic ability
• Attention problems
• Depression symptoms
• Psychosis symptoms
• Delinquent behavior
• Future use of marijuana
SIDS

• Based on limited evidence, there does not appear to be a link between maternal use of cannabis during and after pregnancy and SIDS.
  – 2 low quality studies
    - Scragg et al 2001: maternal use of cannabis in pregnancy (multivariate aOR 1.18, 95%CI 0.76-1.85) and since birth (multivariate aOR 1.38, 95%CI 0.90-2.12)
    - Klonoff-Cohen et al 2001: SIDS outcome not significantly associated with maternal cannabis use during conception (OR 1.1, 95% CI 0.6-2.0), pregnancy (OR 0.6, 95%CI 0.3-1.6) or postnatally (OR 0.6, 95%CI 0.2-1.8) – tobacco smoking was a confounder
Newborn behavior

• We found mixed evidence of maternal use of marijuana during pregnancy and a link to newborn behavior.

  – 4 studies, 1 medium, 3 low quality
  – Medium quality
    - Richardson et al 1989: prenatal marijuana use was not a significant predictor of Neonatal Behavioral Assessment Scale performance on day 2 of life
Newborn Behavior

• Low quality

  - Barros et al 2006: After adjustment, exposed infants had significantly higher excitability and arousal scores than non-exposed infants at 24-72 hours of life (more irritable and cry more during exam, less responsive to calming maneuvers by the examiner)

  - Dreher et al 1989: Infants of women who used marijuana during pregnancy had a higher-pitched and more variable cry as compared to non-users

  - Dreher et al 1994: no significant difference at day 3 in performance on Brazelton Neonatal behavioral Assessment Scale between exposed and non-exposed infants. Significant difference at 1 month of age, which was confounded by maternal education status.
Growth

- We found moderate evidence that maternal use of marijuana during pregnancy is linked with decreased growth in exposed offspring.
  - 2 studies, 1 medium, 1 low quality
  - Medium quality
    - Cornelius et al 2002:
      • 2nd trimester marijuana use predicted lower height at age 6 (-1.13 inches, p<0.01)
      • No significant effect of prenatal exposure on BMI, ponderal index or weight for height z scores
  - Low quality
    - Fried et al 1999 (OPPS 9-12 year f/u)
      • After adjustment, average scores for head circumference were significantly smaller for children of heavy users, intermediate for moderate users and largest for non-users
IQ scores

• We found moderate evidence that maternal use of marijuana during pregnancy is associated with decreased IQ scores in exposed offspring.
  – 2 medium quality studies
    ♦ Day et al 1994 (MHPCD age 3 f/u)
      – For white and African-American offspring, prenatal marijuana use was associated with significantly decreased scores on the Stanford-Binet (decrease was offset by preschool attendance in white children only)
IQ scores

- Goldschmidt et al 2008 (MHPCD age 6 f/u)
  - Use of >1 joint per day in:
    - 1st trimester significantly associated with 2.6 point deficit on verbal reasoning
    - 2nd trimester significantly associated with 5 point deficit on Stanford-Binet composite, 8 point deficit on quantitative reasoning and 4.5 point deficit on short term memory subscale
    - 3rd trimester significantly associated with 5 point deficit on quantitative reasoning
Cognitive Function

• We found moderate evidence that maternal use of marijuana during pregnancy affects cognitive function in exposed offspring.
  – 3 studies, 1 medium, 2 low quality
  – Medium quality
    ❖ Wilford et al 2010 (MHPCD f/u age 16-18)
      – prenatal marijuana use was significantly associated with decrease in processing speed and interhemispheric coordination
Cognitive Function

• Low quality
  ❖ Fried et al 2003 (OPPS f/u age 13-16)
    • After adjustment, heavy users (≥6 joints/week) had statistically significant slower response times on the Abstract Designs latency section (visual memory task) than none/light users (p≤0.05)
    • After adjustment, there was a significant negative association with performance on the Peabody Spelling assessment (p≤0.05)
  ❖ Smith et al 2004 (OPPS fMRI f/u age 18-21):
    • There was a significant positive relationship between bilateral prefrontal cortex activity (mediates inhibitory functions) and the amount of prenatal marijuana exposure
    • Increased prenatal exposure to marijuana associated with attenuation of activity in the left cerebellum during response inhibition
    • After adjustment, prenatally exposed participants had significantly more errors of commission than the non-exposed group
• We found moderate evidence that maternal marijuana use during pregnancy is linked with decreased academic ability of exposed offspring.
  – 3 studies, 2 medium, 1 low quality
  – Medium quality
    ❖ Goldschmidt et al 2004 (MHPCD 10 year f/u)
      – After adjustment, 1st trimester heavy use predicted deficits in reading and spelling scores and lower rating on teacher’s evaluations (no longer significant after adjusting for self-reported depression and anxiety symptoms)
      – 2nd trimester use significantly predicted deficits in reading comprehension scores and a lower rating on the teacher’s evaluations
    • Also significantly associated with underachievement (aOR 2.0, 95%CI 1.05-3.8, p=0.04) as compared to non-exposed children
Academic Ability

• Medium quality (cont)
  - Goldschmidt et al 2012 (MHPCD 14 year f/u)
    • after adjustment, 1st trimester maternal marijuana use (>1 joint per day) was significantly associated with lower Weschsler Individual Achievement Test (WIAT) Screener (basic reading, math reasoning and spelling) composite score (-2.9 points, p<0.05)
    • 1st trimester use (>1 joint per day) significantly associated with a deficit in the basic reading subscale (-3.3 points, p<0.05)

• Low quality
  - Fried et al 1997 (OPPS 9-12 year f/u)
    • Prenatal marijuana exposure was not significantly related to the reading or language outcomes
Attention problems

• We found moderate evidence that maternal use of marijuana during pregnancy is linked with attention problems for exposed offspring.
  – 2 medium, 2 low quality studies
  ❖ Goldschimdt et al 2000 (MHPCD f/u at age 10):
    – After adjustment, 1\textsuperscript{st} trimester marijuana use remained a significant predictor (p<0.01) of the attention scale of the SNAP (elicits symptoms for ADD with hyperactivity)
    – After adjustment, 3\textsuperscript{rd} trimester marijuana use was significantly associated with higher scores on the hyperactivity (p<0.001), attention (p<0.01) and impulsivity (p<0.01) scales of the SNAP
  ❖ Fried et al 2001 (OPPS 13-16 year f/u)
    – Maternal marijuana use was significantly associated with poorer performance on the stability factor (one of the 5 factors of the model of attention)
Attention problems

• Low quality

✓ El Marroun et al 2011 (Generation R f/u):
  • Prenatal cannabis exposure associated with increased scores on the aggressive behavior and attention problem scale Child Behavior Checklist for toddlers (CBCL) in girls at age 18 months
    – Using cut-off score of CBCL girls had an increased odds for developing attention problems (OR 2.75, 95% CI 1.27-5.96)
  – Noland et al 2005: (4 year olds)
    • non-significant positive correlation between the average severity of marijuana exposure and the rate of omission errors on the picture deletion task (PDT)
    • severity of first trimester marijuana use was identified as the best marijuana exposure predictor of PDT omission error rate (p=0.03)
      – When adjusting for severity of current caregivers use of marijuana, 1st trimester marijuana severity of use was not longer statistically significant
Depression Symptoms

• We found limited evidence that maternal use of marijuana during pregnancy is linked with increased depression symptoms in exposed offspring.
  – 1 study, medium quality
  ❖ Gray et al 2005 (MHPCD 10 year f/u)
    • Prenatal marijuana exposure in 1st and 3rd trimesters significantly associated with higher levels of self-reported depression symptoms after adjustment in exposed children at age 10.
      – Further analysis showed that the effects in the 2nd and 3rd trimester resulted from 1st trimester exposure
Psychosis Symptoms

• There is **insufficient** evidence to suggest that maternal marijuana use during pregnancy is linked with psychosis symptoms in exposed offspring at time of adolescence.
  
  – 1 study, low quality
  
  – Zammit et al 2009
  
  • after adjustment, maternal cannabis use during pregnancy was not significantly associated with psychosis-like symptoms (adjusted OR 0.94, 95% CI 0.62-1.41, p=0.755) based on the PLIKSi (psychosis like symptoms semi-structured interview)
Delinquent Behavior

• We found limited evidence that maternal marijuana use during pregnancy is linked with delinquent behaviors in exposed offspring.

• 1 study, medium quality
  ❖ Day et al 2011: (MHPCD 14 year f/u)
  • After adjustment, offspring of heavier marijuana users (>1 joint per day) were significantly more likely to report delinquent behavior at age 14 (OR 1.76, 95% CI 1.05-2.96) as compared to non-users or those who used lower amounts
Future use of Marijuana

• We found limited evidence that maternal marijuana use during pregnancy is linked with exposed offspring frequency of use of marijuana as an adolescent.
  – 2 studies, 1 medium, 1 low quality
  – Medium quality
    ❖ Day et al 2006 (MHPCD f/u age 14):
      – When adjusted for significant current child behavioral characteristics, prenatal marijuana exposure was significantly associated with frequency of offspring marijuana use (OR 1.3 for adolescents who were exposed to 1 joint/day as compared to those with no exposure)
    – Low quality
      - Porath et al 2005 (OPPS 16-21 year f/u)
        – no significant association between prenatal exposure to marijuana and exposed offspring’s regular use of marijuana
Future use of Marijuana

• We found insufficient evidence that maternal marijuana use during pregnancy is linked with exposed offspring initiation of marijuana use as an adolescent.
  – 1 study, low quality
    ❖ Porath et al 2005 (OPPS f/u age 16-21):
      – Significant association between prenatal exposure to marijuana and offspring’s initiation of marijuana use (OR 2.76, 95%CI 1.11-6.86)
Timing/Frequency of Marijuana Use

• Effects of prenatal marijuana use by trimester
  – There were negative effects of prenatal marijuana use regardless of trimester of use.

• Frequency of Use
  – There was an increased effect on the outcome with increased amount of marijuana use.
There is some evidence to suggest that maternal use of marijuana during pregnancy may be related to negative effects on thinking, learning and attention in exposed children.
Marijuana and Breastfeeding

- Biological evidence of THC in breast milk
- Effect on motor development
- Breastfeeding and SIDS
THC in breast milk

• Biological evidence shows that THC is present in the breast milk of women who use marijuana.
  – Perez-Reyes 1982
  • Two women who used marijuana while breastfeeding had THC in their breast milk. One of them had plasma tested as well, with 8x higher concentration in the breast milk compared with plasma.

• Biological evidence shows that infants who drink breast milk with THC in it absorb and metabolize THC.
  – Perez-Reyes 1982
  • One baby’s feces was tested, with much higher metabolite-to-THC proportion than was present in its mother’s breast milk.
Motor development

• We found mixed evidence that maternal use of marijuana while breastfeeding is linked with poorer motor development.
  – 2 studies, 1 medium, 1 low quality
  – Medium quality
  ❖ Astley 1990:
    • Infants whose mothers used MJ while breastfeeding during the first month of life (on at least 15 of 30 days) had poorer motor development at 1yr of age, but no significant difference in mental development
    • Infants whose mothers used MJ while breastfeeding during the third month of life had no significant difference in mental or motor development at 1yr of age
Motor development

• Low quality
  - Tennes 1985:
    - Infants whose mothers used MJ while breastfeeding had no significant difference in mental or motor development at 1yr of age
SIDS

• There is insufficient evidence for a statement on maternal marijuana use during breastfeeding and SIDS.
  – 1 study, low quality
  – Klonoff-Cohen 2001: Infants exposed to marijuana postnatally did not have different risk of SIDS than those not exposed.
Summary

• Due to ethical concerns and issues like poly-drug use it is difficult to study the effects of maternal marijuana use during pregnancy and breastfeeding.

• Many of the studies are older and may not be relevant to the product that is available now in Colorado.

• At this time there is limited scientific evidence available on specific topics in terms of the effects of maternal marijuana use during pregnancy and breastfeeding, however there is sufficient evidence to suggest that use results in adverse effects to the infant.
## Draft Review of Findings

<table>
<thead>
<tr>
<th><strong>Moderate evidence</strong></th>
<th><strong>Limited evidence</strong></th>
<th><strong>Insufficient evidence</strong></th>
<th><strong>Mixed evidence</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>Stillbirth</td>
<td>Psychosis symptoms</td>
<td>Preterm delivery</td>
</tr>
<tr>
<td>IQ scores</td>
<td>SIDS (no association)</td>
<td>Breastfeeding and SIDS</td>
<td>Low birth weight</td>
</tr>
<tr>
<td>Cognitive function</td>
<td>Depression symptoms</td>
<td>Initiation of future marijuana use</td>
<td>Small for gestational age</td>
</tr>
<tr>
<td>Academic Ability</td>
<td>Delinquent behavior</td>
<td></td>
<td>Birth weight</td>
</tr>
<tr>
<td>Attention problems</td>
<td>Frequency of future marijuana use</td>
<td></td>
<td>Newborn behavior</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Breastfeeding and infant motor development</td>
</tr>
</tbody>
</table>
Draft Summary Statements

• Use of marijuana during pregnancy exposes your child to THC.
• There is evidence to suggest that maternal use of marijuana during pregnancy may be related to negative birth outcomes, such as still birth, decreased fetal size and birth defects.
• There is some evidence to suggest that maternal use of marijuana during pregnancy may be related to negative effects on thinking, learning and attention in exposed children.
• There are negative effects of prenatal marijuana use regardless of trimester of use.
• Use of marijuana during breastfeeding exposes your child to THC.
Draft Public Health Messages

There likely is no safe amount of marijuana during pregnancy. THC, the chemical in marijuana that makes a person high, can pass from mother to the unborn child through the placenta. This means the unborn child is exposed to THC used by the mother. There is some evidence marijuana use during pregnancy may be related to negative birth outcomes, such as stillbirth, decreased fetal size and birth defects. There is some evidence to suggest that maternal use of marijuana during pregnancy may be related with negative effects on thinking, learning and attention in exposed children. There are negative effects of marijuana use during pregnancy regardless of which trimester it is used in. THC can also be passed from the mother’s breast milk, potentially affecting the baby.
Research gaps

• Effect of CBD and other cannabinoids
• Effect of consumption of edibles or by vaping
• Contribution of smoking to the effects of marijuana
• Effect on miscarriage
• Marijuana use and breastfeeding
• Others?

• Research priorities
Public Health Recommendations

• Better data on prevalence of marijuana use
• Enhanced surveillance for negative birth outcomes
• Collection of reported marijuana use in EHR
• Education of health care providers
• Education of pregnant women
• Public education
• Educational materials provided at dispensaries
• Data collection to identify specific target populations for public health intervention (geography, income, race, etc.)
• Others?
Thank you

Contact:
Tracy Foo
teresa.foo@state.co.us
Mike Van Dyke
mike.vandyke@state.co.us