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Marijuana and Its Impact on Adolescent and Perinatal Populations

G. Sam Wang MD
Assistant Professor of Pediatrics
Section of Emergency Medicine, Medical Toxicology
University of Colorado Anschutz Medical Campus
Children’s Hospital Colorado
The Pediatric Environmental Health Specialty Units exist across all the Federal regions in the United States and serve to protect the environmental health of children. The PEHSUs typically bring together pediatricians, occupational medicine providers, toxicologists, nurses, and other disciplines such as industrial hygienists to provide an evidence-based approach to children with environmental concerns. Poison Centers often provide call center services and toxicology expertise. The current PEHSU program is divided into East and West groupings with PEHSU-East administrated by the American Academy of Pediatrics (AAP) and PEHSU-West administrated under the American College of Medical Toxicologists (ACMT). Funding for the program is based in the Agency for Toxic Substances and Disease Registry (ATSDR) within the Centers for Disease Control. Each PEHSU must be an academic center, have 24-hour Hotline access, and have capacity to provide medical services as needed.

Disclaimer: This presentation was supported by the American College of Medical Toxicology (ACMT) and funded (in part) by the cooperative agreement award number 1 U61TS000238-01 from the Agency for Toxic Substances and Disease Registry (ATSDR).

Acknowledgement: The U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-92301301-9. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications

- Royalties from UpToDate
- CDPHE Med MJ Grant RFA acceptance
- CDPHE committees:
  - Retail advisory
  - Edible work group
  - Educational campaign
Objectives

• At the end of the presentation, the participant will be able to:
  • Describe the how marijuana effects the prenatal/breast feeding, and adolescent population
  • Describe how cannabidiol is being used for epilepsy
Marijuana and Adolescents
Epidemiology

Disapproval
% disapproving of using regularly

Availability
% saying "fairly easy" or "very easy" to get

Source. The Monitoring the Future study, the University of Michigan.
Monitoring the Futures Study

Past-Year Use of Various Drugs by 12th Graders (Percent)

- Marijuana/Hashish: 36.4%
- Synthetic Marijuana: 7.9%
- Adderall: 7.4%
- Vicodin: 5.3%
- Cough Medicine: 5.0%
- Tranquilizers: 4.6%
- Hallucinogens: 4.5%
- Sedatives*: 4.8%
- Salvia: 3.4%
- OxyContin: 3.6%
- MDMA (Ecstasy): 4.0%
- Inhalants: 2.5%
- Cocaine (any form): 2.6%
- Ritalin: 2.3%

SOURCE: University of Michigan, 2013 Monitoring the Future Study
Figure 3. Trends in Perception of Great Risk from Smoking Marijuana Once or Twice a Week and Past Month Marijuana Use among Adolescents Aged 12 to 17: 2002 to 2011

Permcent

2002 2003 2004 2005 2006 2007 2008 2009 2010 2011

- Difference between estimate and estimate for 2011 is statistically significant at the .05 level.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Surveys on Drug Use and Health (NSDUHs), 2002 to 2011 (revised March 2012).
Figure 26. Perception of great risk for using marijuana once a month, 12–17 years old, 2006–2014: NSDUH

Note: The 95% confidence intervals are represented by the bars above and below the estimate for each year. These indicate that 95 times out of 100 the true value should fall within that range.

**Figure 3. Past Month Marijuana Use among People Aged 12 or Older, by Age Group: Percentages, 2002-2014**

![Graph showing past month marijuana use](image)

+ Difference between this estimate and the 2014 estimate is statistically significant at the .05 level.

**Figure 3 Table. Past Month Marijuana Use among People Aged 12 or Older, by Age Group: Percentages, 2002-2014**

<table>
<thead>
<tr>
<th>Year</th>
<th>12 or Older</th>
<th>12 to 17</th>
<th>18 to 25</th>
<th>26 or Older</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>6.2+</td>
<td>8.2+</td>
<td>17.3+</td>
<td>4.0+</td>
</tr>
<tr>
<td>2003</td>
<td>6.2+</td>
<td>7.9+</td>
<td>17.0+</td>
<td>4.0+</td>
</tr>
<tr>
<td>2004</td>
<td>6.1+</td>
<td>7.6+</td>
<td>16.1+</td>
<td>4.1+</td>
</tr>
<tr>
<td>2005</td>
<td>6.0+</td>
<td>6.8+</td>
<td>16.6+</td>
<td>4.1+</td>
</tr>
<tr>
<td>2006</td>
<td>6.0+</td>
<td>6.7+</td>
<td>16.3+</td>
<td>4.1+</td>
</tr>
<tr>
<td>2007</td>
<td>5.8+</td>
<td>6.7+</td>
<td>16.5+</td>
<td>4.2+</td>
</tr>
<tr>
<td>2008</td>
<td>6.1+</td>
<td>6.7+</td>
<td>16.7+</td>
<td>4.2+</td>
</tr>
<tr>
<td>2009</td>
<td>6.9+</td>
<td>7.4+</td>
<td>18.2+</td>
<td>4.6+</td>
</tr>
<tr>
<td>2010</td>
<td>7.0+</td>
<td>7.4+</td>
<td>18.5+</td>
<td>4.8+</td>
</tr>
<tr>
<td>2011</td>
<td>7.3+</td>
<td>7.2+</td>
<td>19.0+</td>
<td>5.3+</td>
</tr>
<tr>
<td>2012</td>
<td>7.5+</td>
<td>7.1+</td>
<td>19.6+</td>
<td>5.6+</td>
</tr>
<tr>
<td>2013</td>
<td>8.4</td>
<td>7.4+</td>
<td>19.1+</td>
<td>6.6</td>
</tr>
<tr>
<td>2014</td>
<td>8.4</td>
<td>7.4+</td>
<td>19.1+</td>
<td>6.6</td>
</tr>
</tbody>
</table>

+ Difference between this estimate and the 2014 estimate is statistically significant at the .05 level.
Youth (ages 12 to 17 years) Past Month Marijuana Use, 2014

- 7.4% ~ 1.8 million used in past month

Colorado:
- Average for youth – 12.6% (up from 11.2%)
- 1st in the nation
- 14th in the nation (2006)
Youth (Ages 12 to 17 Years)
Past Month Marijuana Use
National vs. Colorado

<table>
<thead>
<tr>
<th>Year</th>
<th>National Average</th>
<th>Colorado Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>6.75</td>
<td>7.60</td>
</tr>
<tr>
<td>2007</td>
<td>6.69</td>
<td>8.15</td>
</tr>
<tr>
<td>2008</td>
<td>6.70</td>
<td>9.13</td>
</tr>
<tr>
<td>2009</td>
<td>7.03</td>
<td>10.17</td>
</tr>
<tr>
<td>2010</td>
<td>7.38</td>
<td>9.91</td>
</tr>
<tr>
<td>2011</td>
<td>7.64</td>
<td>10.72</td>
</tr>
<tr>
<td>2012</td>
<td>7.55</td>
<td>10.47</td>
</tr>
</tbody>
</table>

SOURCE: Data from SAMHSA.gov, National Survey on Drug Use and Health 2013
### Healthy Kids Colorado Survey

<table>
<thead>
<tr>
<th>Colorado High School Pot Use</th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Month</td>
<td>25 percent</td>
<td>22 percent</td>
<td>20 percent</td>
</tr>
<tr>
<td>Ever</td>
<td>45 percent</td>
<td>39 percent</td>
<td>37 percent</td>
</tr>
</tbody>
</table>

*(Healthy Kids Colorado Survey)*

<table>
<thead>
<tr>
<th>National High School Pot Use</th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past Month</td>
<td>20.8 percent</td>
<td>23.1 percent</td>
<td>23.4 percent</td>
</tr>
<tr>
<td>Ever</td>
<td>36.8 percent</td>
<td>39.9 percent</td>
<td>40.7 percent</td>
</tr>
</tbody>
</table>

*(Youth Risk Behavior Survey)*
Healthy Kids Colorado Survey (HKCS)

Figure 1. Marijuana Use among High School Students – U.S.* and Colorado**, 2005-2013

*Data source: Youth Risk Behavioral Survey prevalence estimates.
** Data source: Healthy Kids Colorado Survey prevalence estimates.
***The 2007 estimates are unweighted and therefore no confidence intervals are calculated.
Figure 2. Marijuana Use among Students in Colorado 2005-2013

*Middle School current use only 2013. The 2007 estimates are unweighted and therefore no confidence intervals are available. Data source: YRBS data 2005 to 2009, HCKS data 2011, 2013*
Figure 21. Past 30-day marijuana use, by grade level, 2013: HKCS

### Table 2. Marijuana offenses and offense rates in Colorado, 2012–2014

<table>
<thead>
<tr>
<th>Age group</th>
<th>Total marijuana offenses</th>
<th>% change 2012-2014</th>
<th>Marijuana offenses per 100,000 population</th>
<th>% change 2012-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2013</td>
<td>2014</td>
<td>% change</td>
</tr>
<tr>
<td>Total</td>
<td>19,346</td>
<td>9,784</td>
<td>10,814</td>
<td>-44%</td>
</tr>
<tr>
<td>Offense type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possession</td>
<td>18,278</td>
<td>9,068</td>
<td>9,983</td>
<td>-45%</td>
</tr>
<tr>
<td>Producing</td>
<td>434</td>
<td>176</td>
<td>331</td>
<td>-24%</td>
</tr>
<tr>
<td>Sales</td>
<td>612</td>
<td>500</td>
<td>474</td>
<td>-23%</td>
</tr>
<tr>
<td>Smuggling</td>
<td>22</td>
<td>40</td>
<td>26</td>
<td>18%</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 to 17 years old</td>
<td>4,886</td>
<td>4,522</td>
<td>5,158</td>
<td>6%</td>
</tr>
<tr>
<td>18 to 20 years old</td>
<td>5,237</td>
<td>3,365</td>
<td>3,363</td>
<td>-36%</td>
</tr>
<tr>
<td>21 years or older</td>
<td>9,049</td>
<td>1,781</td>
<td>2,214</td>
<td>-76%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15,344</td>
<td>7,788</td>
<td>8,428</td>
<td>-45%</td>
</tr>
<tr>
<td>Female</td>
<td>3,926</td>
<td>1,935</td>
<td>2,337</td>
<td>-40%</td>
</tr>
</tbody>
</table>

Note: Race/ethnicity of suspect is not captured accurately for offenses and is not reported in this table.

Source: Colorado Bureau of Investigation, National Incident-Based Reporting System data.
High School Students’ Use of Electronic Cigarettes to Vaporize Cannabis

Meghan E. Morean, Grace Kong, Deepa R. Camenga, Dana A. Cavallo, Suchitra Krishnan-Sarin

Abstract

BACKGROUND AND OBJECTIVES: Electronic cigarette (e-cigarette) use is increasing rapidly among high school (HS) students. Of concern, e-cigarettes can be used to vaporize cannabis, although use rates among adolescents are unknown. We evaluated lifetime rates of using e-cigarettes to vaporize cannabis among all lifetime e-cigarette users (27.9%), all current e-cigarette users (29.4%), and a subset of current users who also smoked cigarettes (24.6%). Among adolescents, the use of vaporizing devices is of increasing concern.
Cannabis Vaporization

- Vaporizing cannabis using e-cigarettes was common: e-cigarette 18.0%, cannabis 18.4%, dual users 26.5%.
- Hash oil and wax infused with THC, and using portable electronic vaporizers to vaporize dried cannabis leaves.
- There is significant concern for the use of “alternative” methods of marijuana (including edibles and vaporizers).
Adolescent Use

- More likely to have impaired cognitive and academic abilities after 28 days of abstinence
- Less likely to graduate high school
  - Fergusson 2003, 2008, Horwood 2010
Adolescent Use

- More likely to be addicted to other illicit drugs after adolescence
- Psychotic symptoms or disorders like schizophrenia (risk with higher concentrated THC)
- Quitting have lower risks of negative cognitive and mental health outcomes
  - Swift 2012
Limited or Mixed Evidence

- **Limited**
  - Lower IQ after short abstinence
  - College achievement

- **Mixed**
  - Anxiety
  - Depression
  - Suicidal thoughts or attempts
Prenatal and Breastfeeding Exposure
10-week administration of survey
3,137 clients had an on-site WIC appointment at the TCHD primary or satellite WIC clinics.
1,749 were completed resulting in an overall 60.2% response rate.
- 1,308 (74.8%) surveys were completed in English
- 441 (25.2%) were completed in Spanish
### Table 2. Proportion of WIC mothers by age who were ever, current, or past marijuana users

<table>
<thead>
<tr>
<th>Survey respondents - WIC mothers</th>
<th>Ever users(^1)(^5)</th>
<th>Current users(^1)</th>
<th>Past users(^1)(^5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIC mothers ≤ 30 years</td>
<td>12.0%</td>
<td>7.4%</td>
<td>4.6%</td>
</tr>
<tr>
<td>WIC mothers &gt; 30 years</td>
<td>5.7%</td>
<td>4.0%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

\(^1\) Percent of WIC mothers in the age group

\(^5\) Statistically significant difference between older and younger WIC mothers

### Table 3. Timing of marijuana use during most recent pregnancy among ever, current, or past marijuana users

<table>
<thead>
<tr>
<th>Survey respondents - WIC mothers</th>
<th>Ever users(^1)</th>
<th>Current users(^1)</th>
<th>Past users(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used marijuana during pregnancy</td>
<td>10.9%</td>
<td>35.8%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Used marijuana since the baby was born</td>
<td>9.6%</td>
<td>41.1%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Used marijuana while breastfeeding</td>
<td>3.0%</td>
<td>13.7%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

\(^1\) Percent of WIC mothers in the marijuana user group
Table 4. Reason for marijuana use  

<table>
<thead>
<tr>
<th>Survey respondents - WIC mothers</th>
<th>Ever users</th>
<th>Current users</th>
<th>Past users</th>
</tr>
</thead>
<tbody>
<tr>
<td>To help with depression/anxiety/stress</td>
<td>35%</td>
<td>63%</td>
<td>28%</td>
</tr>
<tr>
<td>To help with pain</td>
<td>29%</td>
<td>60%</td>
<td>21%</td>
</tr>
<tr>
<td>To help with nausea/vomiting</td>
<td>23%</td>
<td>48%</td>
<td>17%</td>
</tr>
<tr>
<td>For fun/recreation</td>
<td>59%</td>
<td>39%</td>
<td>65%</td>
</tr>
<tr>
<td>Other reason</td>
<td>16%</td>
<td>14%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Other reasons (write in response) included: sleep, cancer, seizures, migraines, and increase appetite. A couple of direct quotes from respondents were:

“To help with nausea and vomiting in first trimester of pregnancy”

“All the reasons above and plus when I was pregnant, it helped me want to eat
Biological evidence shows that THC is present in the breast milk of women who use marijuana.

Biological evidence shows that infants who drink breast milk containing THC absorb and metabolize the THC.

Effects of maternal use during pregnancy and breastfeeding

- Decreased IQ scores
  - Day 1994, Goldschmidt 2000
- Attention problems
- Decreased growth
- Decreased cognitive function and academic ability
Limited, Insufficient, or Mixed Evidence

Limited
- Stillbirth
- SIDS
- Depression
- Delinquent behavior
- VSD

Insufficient
- Psychosis
- Future marijuana use

Mixed
- Preterm
- LBW/SGA
- Motor development
Second Hand Smoke
Respiratory Effects

- Same carcinogens in marijuana smoke as tobacco smoke
- Associated with chronic bronchitis with cough/wheeze/sputum
- Pre-malignant lesions in airways
  - Fligiel 1997.
- Acute use improves airflow, while heavy use increases airflow obstruction
- No data on second hand smoke risks
Insufficient or Mixed Evidence

- Insufficient
  - Emphysema
  - Respiratory infections
- Mixed
  - COPD
  - Lung cancer
Marijuana Exposure in Children Hospitalized for Bronchiolitis

- 1 mo – 2 yo
- Jan 2013 – April 2014 with bronchiolitis
- Parents completed questionnaire
- Of children identified been exposed to marijuana smokers, 16% had trace amounts of THC metabolites
- 21% vs 10% before and after legalization

Wilson, K et al. Pediatric Academic Societies Annual Meeting. 2016. Baltimore, MD
Retail Marijuana Public Health Advisory Committee

We established the Retail Marijuana Public Health Advisory Committee per CRS 25-1.5-110. The committee meets regularly, and all meetings are open for public attendance and comment.

https://www.colorado.gov/pacific/cdphe/retail-marijuana-public-health-advisory-committee
Medical Use of Marijuana in Pediatrics
Why I changed my mind on weed

By Dr. Sanjay Gupta, CNN Chief Medical Correspondent
updated 8:44 PM EDT, Thu August 8, 2013

Dr. Sanjay Gupta: I've tried marijuana

(CNN) -- Over the last year, I have been working on a new documentary called "Weed." The title "Weed" may sound cavalier,
Marijuana stops child's severe seizures

By Saundra Young, CNN
updated 4:51 PM EDT, Wed August 7, 2013

Charlotte Figi had her first seizure when she was 3 months old. Over the next few months, the girl, affectionately called Charlie, had frequent seizures lasting two to four hours, and she was hospitalized repeatedly.

Charlotte's Web
Multiple animal studies describe anticonvulsant properties of cannabidiol

Newer Studies


Parental Reports


- Survey presented to parents belonging to a Facebook group dedicated to sharing info about the use of CBD for seizures.

- 19 responses, 2 (11%) reported complete seizure freedom, 8 (42%) reported a 80% reduction, 16 (84%) reported a reduction in seizure frequency, 6 (32%) reported 25-60% reduction

Real Oil (Charlotte's Web) CBD ratio of 16:1

11 of 13 parents interviewed: 4 Doose, 2 Dravet, 1 Lennox-Gastaut, 1 metachromic leukodystrophy, 1 cortical dysplasia, 2 idiopathic epilepsy. Ave 10 AED’s.

100% reported reduction in weekly frequency of motor type seizures, 5 of 11 are seizure free.
Cochrane Review

- 4 randomized reports
- Total of 48 patients, used cannabidiol as the treatment agent (1 abstract, 1 letter to the editor).
  - Anti-epileptic drugs were continued in all.
  - No details of randomization.
  - No comparisons between control and treatment groups.
  - All low quality.
  - None of the patients in the treatment groups suffered adverse effects.
- No reliable conclusions can be drawn at present regarding the efficacy of cannabinoids as a treatment for epilepsy.
  - The dose of 200 to 300 mg daily of cannabidiol was safely administered to small numbers of patients, for generally short periods of time, and so the safety of long term cannabidiol treatment cannot be reliably assessed.
Recent Research

- A pharmaceutical grade cannabidiol is being trialed for treatment of pediatric epilepsy.
- 2015 American Epilepsy Society annual meeting.
  - 23 patients with treatment-resistant epilepsies, average age of 10 years, demonstrated 39% of patients had a greater than 50% reduction in seizures with a median reduction of 32% after 3 months of therapy.
  - Seizure freedom occurred in 3 of 9 Dravet patients and 1 of 14 patients with other forms of epilepsy.
  - Adverse effects were mostly mild or moderate: somnolence, fatigue, AED level increases, decreased appetite, weight gain, diarrhea, increased appetite and weight loss.
  - A subset of patients experienced an increase in clobazam concentrations that was thought to be causing sedation and required a dose adjustment.

Other Medical Uses in Pediatrics

- Spasticity
- Chronic Pain
- Anorexia
- Neuro-oncology
- Inflammatory Bowel Disease
Adolescent population vulnerable, need continued surveillance to evaluate impact of legalization

More data needed on prenatal and breastfeeding exposures

Concern for second hand smoke exposure

More rigorous studies need to be performed to evaluate any medical benefits
Questions?

George.Wang@childrenscolorado.org
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