MARIJUANA USE IN ADOLESCENTS

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Critical Conversations Conference
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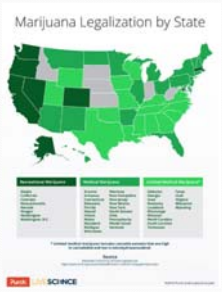
Marijuana Use in Adolescents

- No disclosures
- No conflicts of interest

Marijuana Use in Adolescents

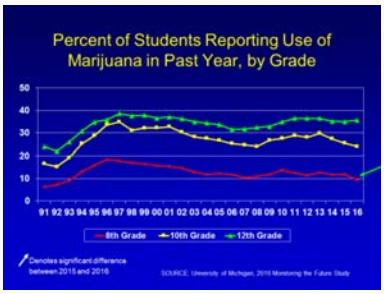
- Goals:
  - 1. Provide data about cannabis
  - 2. Review adolescent brain development
  - 3. Delineate specific concerns re cannabis in young populations
  - 4. Review synthetic marijuana

Marijuana Use in Adolescents



Marijuana Use in Adolescents: Statistics

NIDA. Monitoring the Future: 2016 Survey



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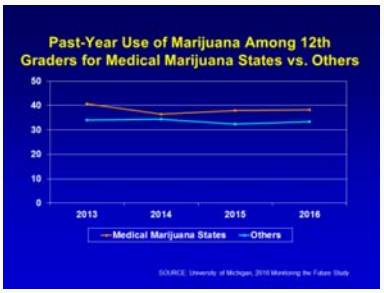
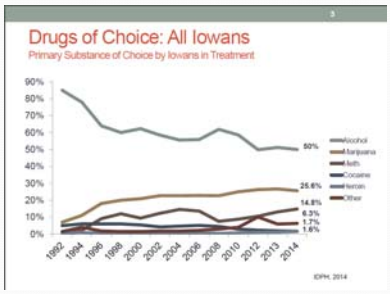


Marijuana Use in Adolescents: Iowa Statistics



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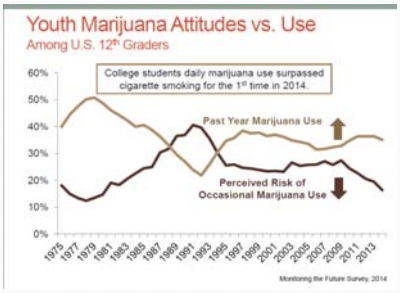

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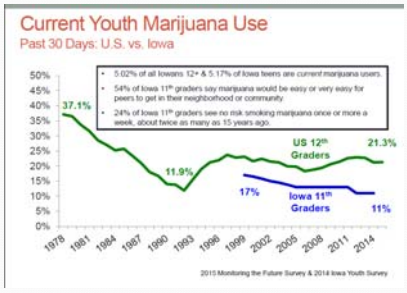

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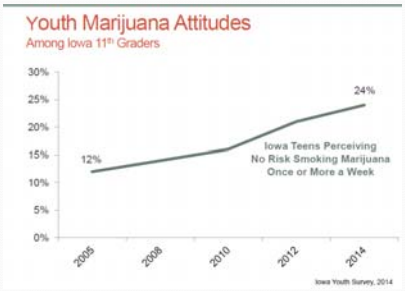

Marijuana Use in Adolescents: Vocabulary

Marijuana Use in Adolescents: Vocabulary

- Vocabulary associated with cannabis
  - Synonyms: Marijuana, pot, reefer, buds, grass, weed, dope, ganja, herb, boom, gangster, Mary Jane, sinsemilla, joint, blow, blunt, green, doobie, kilobricks, Thai sticks, hash

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  - Synonyms: BHO, wax, shatter, crumble, honey oil, dabs, budder

Marijuana Use in Adolescents: Science

- Cannabis
  - Genus of flowering plants with 3 species: Cannabis sativa, Cannabis indica and Cannabis ruderalis
  - Contains several cannabinoids and several isomers of THC (delta-9-tetrahydrocannabinol)
  - THC: principal psychotropic substance (@20% by wgt)
  - Medical marijuana debate in Iowa: Medical treatment with cannabidiol for epilepsy (Dravet syndrome)

Marijuana Use in Adolescents: Consumption

- Cannabis Consumption
  - Smoked as dried flowers and seeds
  - Concentrated into a waxy substance
  - Ingested as food product (eg, brownies, truffles)
  - Taken in liquid or mouth spray as medication

Marijuana Use in Adolescents: Iowa Statistics

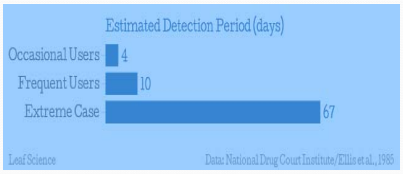
Marijuana Use in Adolescents Pharmacokinetics

- Absorption
  - Faster if smoking/vaping
    - Tar, CO, NO, cyanide: 3-5x > tobacco smoker
    - Ammonia: >20 x >tobacco smoker
  - Slower if eaten
    - (Moir et al. Chem Res Toxicol. 2008)

Marijuana Use in Adolescents: Pharmacokinetics

- Distribution
  - Half-life in blood and urine: 3-4 days
    - Highly lipid soluble – deposits in fat cells
    - Average duration of positive drug testing
      - Dependent on frequency and intensity of use
      - Heavy user can test positive for up to 60 days
    - Average results of UDS
      - Peak levels: 100-200 ng/mL (10-25 min after smoking)
      - After 3 hours: <5 ng/mL

Marijuana Use in Adolescents: Detection



Marijuana Use in Adolescents: THC Concentration

- THC Concentration
  - Average THC concentration in dried seeds/flowers: 3-5%
  - Average THC in hashish oil: 20%
  - "Medicinal marijuana"/Dabs: THC up to 80-90%

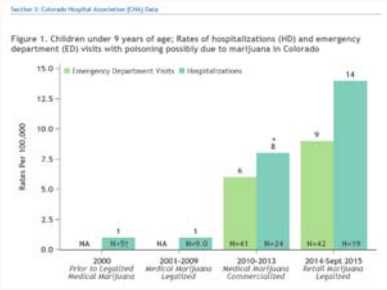
http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm (National Highway Traffic Safety Administration)

Marijuana Use in Adolescents Edible Marijuana

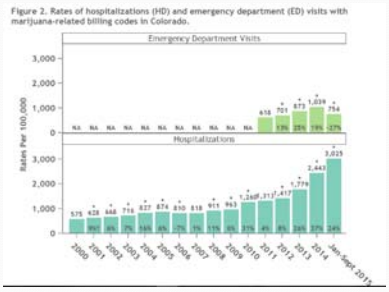
- 20-40% of all sales in Colorado ($25-50MM)
- Problems with edibles:
  - Tolerance from smoking doesn't apply
  - GI absorption: Higher than lung absorption
  - Effect may not kick in 1-2 hours
  - Marijuana Enforcement Division: Recommended serving size is 10 mg of THC
  - ASE: High heart rate, mouth dryness, paranoia

Marijuana Use in Adolescents

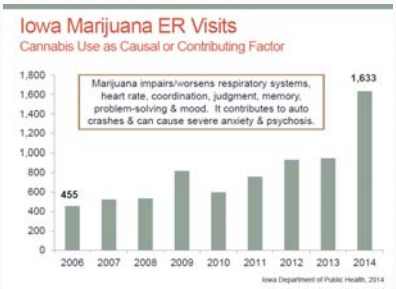
Marijuana Use in Adolescents Colorado Hospital Statistics



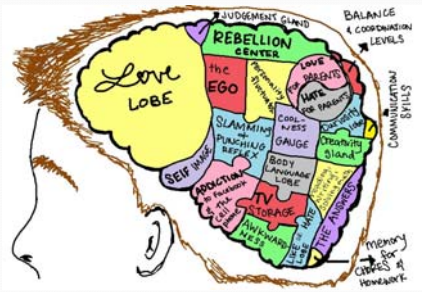
Marijuana Use in Adolescents Colorado Hospital Statistics



Marijuana Use in Adolescents Iowa Statistics



Marijuana Use in Adolescents



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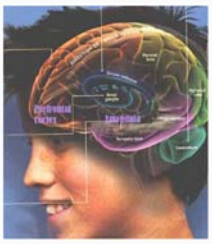

Marijuana Use in Adolescents: Adolescent Development

- Physiological Changes: Delayed sleep and awakening
- Pubertal Changes: Primary and secondary sex characteristics
- Cognitive Changes: Increased emotionality and risk taking, especially in early/middle adolescence
- Social Changes: Distancing from parents and increased time with peers Windle. Pediatrics. 2008.

Marijuana Use in Adolescents: Adolescent Brain Development

- Adolescent Brain Processes:
  - 1. Proliferation
  - 2. Pruning
  - 3. Myelination
- Processes enable functional maturation of neural pathways in cortex and subcortical areas Alcohol. 2010. 44:15-26

Marijuana Use in Adolescents: Adolescent Brain Development

- Proliferation: Rapid growth of gray matter and formation of new connections
  - Maximal Frontal/Parietal Lobe Gray Matter Volume
    - 10-11 yrs in females, 12 yrs in males
  - Maximal Temporal Lobe Gray Matter Volume
    - 16.7 yrs in females, 16.5 yrs in males
  - Maximal Prefrontal Cortex Gray Matter Volume
    - Occurs in late adolescence (>21yrs) Trends in Neuroscience. 2006

Marijuana Use in Adolescents: Adolescent Brain Development

- Pruning: Gray matter maturation in which new synaptic connections are formed and others are eliminated
  - Inverted U-shaped developmental curve from childhood to adolescence to adulthood
  - Decreased gray matter volume, especially in PFC
  - Influenced by environmental experiences
    - Trends in Neuroscience. 2006

Marijuana Use in Adolescents: Adolescent Brain Development

- Myelination: Progressive enclosure of axons with myelin to speed communication among neurons and stabilize connections
  - Significantly increased cortical white matter from adolescence and into adulthood
  - Increased connectivity of subcortical regions (hippocampus, amygdala, areas with high sex steroid receptors) Guerri. Alcohol. 2010.

Marijuana Use in Adolescents: Adolescent Brain Development

- Brain development progresses from
  - Lower to higher brain centers
  - Brain stem to the cerebral cortex
  - Caudal to rostral direction
- In adolescence, "mismatch" occurs
  - "Bottom-up" thinking trumps "top-down" thinking
  - "Reward" areas of brain trump "decision-making" areas
    - Casey and Jones. JAACAP. 2010.

Marijuana Use in Adolescents: Adolescent Brain Development

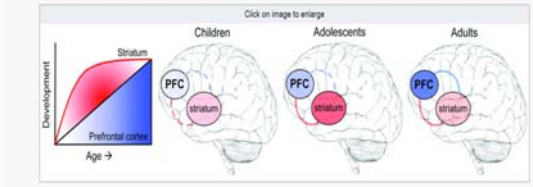

Figure 1

Cartoon model of ventral striatal and prefrontal cortex (PFC) interactions across development. Deeper color indicates greater regional signaling. Line represents functional connectivity, with solid line indicating mature connection and dotted line indicating immaturity (from [10]).

Marijuana Use in Adolescents: Adolescent Development

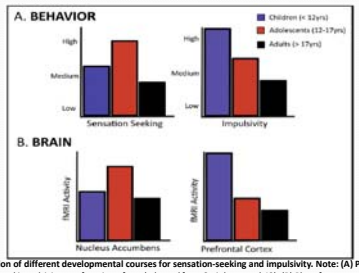

FIGURE 2 Illustration of different developmental courses for sensation-seeking and impulsivity. Note: (A) Plot of sensation-seeking and impulsivity as a function of age (adapted from Steinberg et al.43). (B) Plot of patterns of activity in brain regions sensitive to reward outcomes during a cognitive control task across development (adapted from Galvan et al.6 and Galvan et al.16). fMRI functional magnetic resonance imaging.

Marijuana Use in Adolescents: Adolescent Development

- What happens when a potentially vulnerable adolescent brain is exposed to substances?
- Research shows:
  - 1. Gateway Drug Theory
  - 2. Serious Biopsychosocial Consequences
  - 3. Disconnect between Adolescent Views and Parental/Guardian Views

Marijuana Use in Adolescents: Gateway Theory

- Definition: Use of a less dangerous drug leads to use of and dependence on harder drugs
- **Younger** age of onset of alcohol/tobacco/MJ :
  - Increased probability of alcohol dependence as adult
  - Increased probability of cannabis dependence as adult
  - Increased probability of progression to "party" drugs or "hard" drugs NIH Longitudinal Alcohol Epidemiologic Survey. 1992

Marijuana Use of Adolescents: Gateway Theory

- Confounding Factors:
  - Parental substance use
  - Parental divorce
  - Gender of child
  - Childhood sexual abuse
  - Disruptive behavior diagnoses (ADHD/ODD/CD)
  - Peer influences
  - Socio-cultural influences NIH Longitudinal Alcohol Epidemiologic Survey. 1992

Marijuana Use of Adolescents: Gateway Theory:

- Evidence supporting Gateway Theory:
  - Australian Twin Register Study
    - Volunteer sample of twins born between 1964-1971
    - Interviewed by phone re lifetime substance use/dependence, age of onset and comorbidities
    - 4010 pairs in 26-34 yo range
    - 622 MZ and DZ same-sex twins discordant for THC use

Marijuana Use in Adolescents: Gateway Theory

- Australian Twin Register Study: Results
  - Twin with early cannabis abuse relative to co-twin:
    - Elevated lifetime rates of other drug use: OR 2.34-5.15
    - Elevated lifetime illicit drug abuse/dependence: OR 1.96-3.98
    - Elevated lifetime alcohol dependence: OR 1.85
      - Lynskey et al. JAMA. 2003.

Marijuana Use in Adolescents: Gateway Theory

- Similar results in other studies
  - Netherlands Twin Register: 6228 twins born between 1965-1980
    - 219 same-sex twin pairs discordant re MJ use
    - Higher rate of alcohol, party, and other drugs
    - At time of interviews, THC was legal in Netherlands but not in Australia, so associations between THC and drug use outcomes NOT solely due to legal status Lynskey. Behavioral Genetics. 2006.

Marijuana Use in Adolescents: Gateway Theory

- Similar results in other studies
  - Christchurch, NZ, Study: 1265 children born in 1977
    - 25-year Longitudinal Study
    - Association between THC and illicit drug use: dose dependent
    - Younger users more susceptible to THC effects
    - Other factors: Sexual abuse and novelty seeking: Fergusson et al. Addiction. 2006.

Marijuana Use in Adolescents: Biopsychosocial Consequences

Marijuana Use in Adolescents: Biopsychosocial Consequences

- Consequences of Marijuana Intoxication:
  - Euphoria and disinhibition
  - Anxiety/Agitation
  - Altered sense of time
  - Distorted perceptions/Derealization
  - Impaired coordination/reaction time
  - Difficulty with thinking/problem solving
  - Problems with learning/memory
  - Mistrust/Paranoid delusions/Hallucinations

Marijuana Use in Adolescents: Biopsychosocial Consequences

- Consequence of Teen Marijuana Dependence:
  - Decreased motivation
  - Increased likelihood of dropping out of school/job
  - Persistent problems with learning and memory

Marijuana Use in Adolescents: Biopsychosocial Consequences

- Possible Physical Consequences from THC:
  - Cannabinoid Hyperemesis Syndrome
  - Tachycardia, arrhythmias, HTN
  - Deaths from cardiac/cerebral ischemia
  - Chronic bronchitis, COPD
  - Elevated visceral fat deposition/insulin resistance
  - Gingival proliferation
  - Nasopharyngeal tumors Hoch. Dtsch Arztebl Int. 2015.

Marijuana Use in Adolescents: Colorado Statistics

Colorado Dept of Public Health & Environment. Monitoring Health ConcernsRelated to Marijuana in Colorado: 2016.

Marijuana use and driving (p.149)

* = applies only to less-than-weekly users. → = results in/produces.

	Substantial	Moderate
Impairment and crash risk	Increased motor vehicle crash risk with recent use	THC blood level and motor vehicle crash risk
	Increased risk of driving impairment at blood THC of 2-5 ng/mL*	Higher blood THC in impaired drivers now than in the past
	Smoking >10 mg THC leads to driving impairment*	
	Orally ingesting >10 mg THC leads to driving impairment*	
	Combined use with alcohol increases crash risk	
Time to wait before driving	Waiting ≥ 6 hrs after smoking < 18 mg → driving impairment resolves/nearly resolves*	Waiting ≥ 6 hrs after smoking about 35 mg → driving impairment resolves/nearly resolves*
	Waiting ≥ 8 hrs after orally ingesting < 18 mg → driving impairment resolves/nearly resolves*	

* = applies only to less-than-weekly users.
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Marijuana Use in Adolescents: Biopsychosocial Consequences

- Marijuana and Driving in Adolescence
  - 2/3 of US trauma center admissions: MVAs with 60% of patients positive for drugs and/or alcohol Ronen. Accid Anal Prev. 2010.
  - DUI with marijuana surpassed rates of DUI with alcohol within past 5 years Kelly et al. Drug and Alcohol Review. 2004.
  - One joint/blunt equivalent to BAC of 0.5
  - Driving features most impacted by MJ: Reaction time/Divided-attention tasks/Lane-positioning Hartman. Clin Chem. 2013.
  - Increased fatalities when EtOH + THC combined

Marijuana Use in Adolescents: Biopsychosocial Consequences

- Marijuana and Driving:
  - CO statistics
    - Legal limit for impaired driving with MJ: 5ng/ml
    - Positive cannabinoid screens: Increased from 28% in 2011 to 71% in 2014 Couper. J Analytical Tox. 2014.

Marijuana Use in Adolescents: Biopsychosocial Consequences

- Marijuana and Driving:
  - WA statistics
    - 2009-2013: Number of positive THC/carboxy-THC screens increased from 19-28% to 25-40%
    - 56% of positive results were >5ng/ml
    - Couper. J Analytical Tox. 2014.

Marijuana Use in Adolescents: Colorado Statistics

Colorado Dept of Public Health & Environment. Monitoring Health ConcernsRelated to Marijuana in Colorado: 2016.

Marijuana use during pregnancy and breastfeeding (p.197)		
	Substantial	Moderate
Effects on exposed offspring		Attention problems
		Decreased IQ scores in young children
		Decreased cognitive function
		Decreased growth

Marijuana Use in Adolescents: Colorado Statistics

Colorado Dept of Public Health & Environment. Monitoring Health ConcernsRelated to Marijuana in Colorado: 2016.

Marijuana use and neurological, cognitive, mental health effects (p.183)

	Substantial	Moderate
Cognitive effects	Impaired memory for at least 7 days (daily or near-daily users)	
Mental health effects	Acute psychotic symptoms during intoxication	Psychotic disorder in adulthood (daily or near-daily users)
Substance use and addiction	Can develop marijuana addiction[1]	
	Daily or near-daily users may experience withdrawal symptoms	
	Treatment of marijuana addiction[1] can reduce use and dependence	

Marijuana Use in Adolescents: Biopsychosocial Consequences

Marijuana Use in Adolescents: Colorado Statistics

Colorado Dept of Public Health & Environment. Monitoring Health ConcernsRelated to Marijuana in Colorado: 2016.

Table 1. Substantial and moderate findings from systematic literature review

Marijuana use among adolescents and young adults (p.97)

	Substantial	Moderate
Cognitive and academic	Less high school graduation	Impaired cognitive abilities and academic performance after 28 days abstinence
Mental health	Psychotic symptoms in adulthood	Psychotic disorder in adulthood (daily or near-daily users)
Substance use, abuse and addiction	Can develop marijuana addiction[1]	Increased marijuana use and addiction[1] after adolescence
	Other illicit drug use and addiction[1] after adolescence	Alcohol or tobacco use and addiction[1] after adolescence
Benefits of quitting	Treatment for marijuana addiction[1] can reduce use and dependence	Quitting marijuana lowers risk of cognitive and mental health effects

Marijuana Use in Adolescents: Biopsychosocial Consequences

- Cannabis and Psychosis: Early Research
  - FA Ames in 1950s:
    - Exposed medical staff to controlled doses of cannabis
    - Delusions/VH at lower doses
    - Paranoia at higher doses Ames. J Ment Sci. 1958.

Marijuana Use in Adolescents: Cannabis and Psychosis

- Andreasson Study (Sweden):
  - Longitudinal study of 45, 570 male Swedish conscripts
  - Followed 15 years
  - Evaluated for frequency of cannabis use
  - Controlled for other psychiatric diagnoses and socioeconomic level
- Results:
  - High consumers of cannabis (>50 uses): RR of schizophrenia = 6.0, 95% CI 4.0-8.9 Andreasson. Lancet. 1987.

Marijuana Use in Adolescents: Cannabis and Psychosis

- Van Os Study (Netherlands):
  - Longitudinal population-based study 1997-99
    - 4045 individuals psychosis-free at baseline
    - 59 with psychotic symptoms at baseline
  - Any baseline use of THC predicted psychosis: OR=2.76, 95% CI 1.18-6.47 and severe psychotic symptoms: OR=24.17, 95% 5.44-107.46
  - Effect of baseline THC increased over time, with >50% of psychotic symptoms attributed to THC use
  - If baseline psychosis AND THC: Risk 54.7% cf to 2.2% without THC Van Os. Am Jnl Epidemiology. 2002

Marijuana Use in Adolescents: Cannabis and Psychosis

- Arseneault, et al Study (Dunedin, New Zealand)
  - General population birth cohort study from 1972-73
  - 1037 individuals born with 96% F/U at age 26
  - Tertiles for cannabis use at ages 15 and 18
  - Cannabis use <15 yo:
    - Four times more likely to have schizophreniform dx at age 26
    - BUT nonsignificant when controlled for psychotic sx at age 11

Marijuana Use in Adolescents: Cannabis and Psychosis

- Henquet Study, Germany:
  - Four-year prospective study
  - 2,437 14-24yo rated as with or without predisposition for psychosis on M-CIDI
  - Results:
    - Increasing cannabis consumption associated with increased risk of psychosis
    - Adjusted for age, sex, SES, urbanicity, childhood trauma, baseline predisposition for psychosis, use of other drugs - OR=1.53 Henquet. BMJ. 2005.

Marijuana Use in Adolescents: Cannabis and Psychosis

- Stefanis Study, Greece
  - Longitudinal prospective study from 1983 birth cohort
  - 3500 19-yo self-reported via Community Assess- ment of Psychic Experiences
  - Controlled for traumatic life events
  - First use of cannabis < 16 yo associated with much stronger positive/negative psychotic symptoms than after 16 yo Stefanis et al. Addiction. 2004

Marijuana Use in Adolescents: Cannabis and Psychosis

- Adjacic-Gross et al Study, Switzerland
  - Prospective community study within 1978 birth cohort
  - 292 males and 299 females sampled initially at 20 yo and again at 30 yo
  - Schizotypal symptoms associated with regular cannabis use in adolescence: OR=2.29, 95% CI 1.32-2.97
  - Schizophrenia nuclear symptoms mainly related to alcohol: OR =1.84 or polysubstance abuse OR=2.35
  - Adjacic-Gross et al. Schizophrenia Research. 2007

Marijuana Use in Adolescents: Cannabis and Psychosis

- Miettunen Study, Finland
  - 6330 15-16yo adolescents
  - Self-reported questionnaire of prodromal psychotic symptoms and drug use (PROD)
  - Controlled for disruptive behavior disorders
  - Cannabis abuse correlated with having >2 positive and negative symptoms of schizophrenia: OR=2.23, 95% CI 1.70-2.94
  - IF onset of THC use <16yo, much stronger effect INDEPENDENT of lifetime use frequency Miettunen et al. Br J Psychiatry. 2008

Marijuana Use in Adolescents: Cannabis and Psychosis

- Meta-Analysis
  - 11 studies of psychosis
    - 5 adult population-based cohorts
    - 2 birth cohorts
  - Conclusions:
    - Increased risk of any psychotic outcome if cannabis ever used: OR: 1.41, 95% CI 1.20-1.65 (pooled adjusted OR)
    - Results consistent with dose-response effect with most frequent cannabis use conferring OR=2.09, 1.54-2.84 Moore et al. Lancet. 2007.

Marijuana Use in Adolescents: Cannabis and Psychosis

- Meta-Analysis Conclusions:
  - "The evidence is consistent with the view that cannabis increases risk of psychotic outcomes independently of confounding and transient intoxication effects…We conclude that there is now sufficient evidence to warn young people that using cannabis could increase their risk of developing a psychotic illness later in life." Moore et al. Lancet. 2007.

Marijuana Use in Adolescents: Cannabis and Psychosis Moore et al. Lancet. 2007.

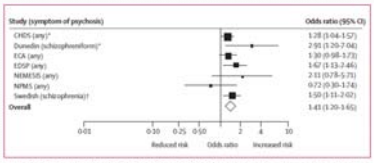

Figure 1: Forest plot showing adjusted odds ratios and 95% CI for any psychosis outcome according to ever use of cannabis in individual studies
Exposure was ever use of cannabis in all studies except for the NPMS, in which the measure was ever use over the past 1 year only. *Additional data were provided by investigators in these studies.[6,9] †Results were unaltered when the 4% of cases with simplex schizophrenia were omitted.

Marijuana Use in Adolescents: Cannabis and Psychosis Moore et al. Lancet. 2007.

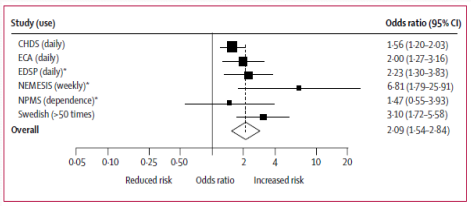

Figure 2: Forest plot showing adjusted odds ratios and 95% CI for any psychosis outcome according to most frequent use of cannabis in individual studies
*Results were not adjusted for other drug use.

Marijuana Use in Adolescents: Drug Interactions

- Cannabis Drug Interactions
  - THC + Uppers (amphetamines/cocaine): ↑heart rate/blood pressure, possible heart damage
  - THC + Downers (BZD/BBT/EtOH/Opioids/Muscle relaxants/CNS depressants/Antihistamines): ↑sedation and CNS depression
  - THC + EtOH: Significantly ↑ rate of fatal MVAs Stout. Drug Metabolism Reviews. 2014.

Marijuana Use in Adolescents: Medical Marijuana EBM

- Promising EBM
  - CBD for epilepsy (Dravet syndrome)
- Low-to-Moderate-Quality Evidence:
  - Chronic pain (diabetic neuropathy/cancer)
  - Multiple sclerosis/Paraplegia Whiting. JAMA. 2015. Volkow. NEJM. 2014.
- Low-Quality Evidence:
  - Nausea from chemotherapy
  - Tourette syndrome
  - Irritable bowel disease

Marijuana Use in Adolescents: Medical Marijuana EBM

- Very-low Quality Evidence:
  - Depression/Anxiety
  - Sleep disorders Whiting. JAMA. 2015.
- No Evidence:
  - Glaucoma
  - AIDS-associated anorexia/cachexia/Wasting syndrome Whiting. JAMA. 2015. Volkow. NEJM. 2014.

Marijuana Use in Adolescents

- Scientific Evidence re Marijuana: Adverse Effects
  - Long-term Use:
    - Diminished life satisfaction and achievement
    - Chronic bronchitis
    - Increased risk of chronic psychotic disorders, including schizophrenia, primarily in persons with vulnerabilities and/or heavy users Volkow. NEJM. 2014.

Marijuana Use in Adolescents

- Possible Cannabis Drug Interactions
  - THC + SSRI: Mania
  - THC + TCA: ↑HR, delirium
  - THC + Lithium: ↑ lithium concentration
  - THC + Antabuse: Hypomania
  - THC + AIDS drugs: ↓ effectiveness
  - THC + Viagra: Myocardial infarction Lindsey. Amer J Drug and Alcohol Use. 2012.

Marijuana Use in Adolescents

Marijuana Use in Adolescents: Synthetic Cannabinoids

TEST YOUR KNOWLEDGE ON DRUGS AND DRUG ABUSE BY TAKING THE: 2017 National Drug & Alcohol IQ Challenge

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Marijuana Use in Adolescents: Synthetic Cannabinoids

6 **Synthetic cannabinoids are also called what? Check all that apply:**

A. Bath salts
B. Medical marijuana
C. K2
D. Cannabis

Marijuana Use in Adolescents: Synthetic Cannabinoids

6 **C.** Synthetic cannabinoids, also called K2, spice, or sometimes herbal incense, refer to a growing number of man-made, mind-altering chemicals that are either sprayed on dried, shredded plant material so they can be smoked or sold as liquids to be vaporized and inhaled in e-cigarettes and other devices. Because they often act on the same brain cell receptors as marijuana, some people call synthetic cannabinoids "fake weed," but they affect the brain more powerfully and differently than marijuana. You can learn more about synthetic cannabinoids at drugabuse.gov/publications/drugfacts/synthetic-cannabinoids.

Marijuana Use in Adolescents: Synthetic Cannabinoids

- Synthetic Cannabinoids
  - A growing number of man-made mind-altering chemical sprayed on dried, shredded plant material or vaporized to get high
  - Effects can be unpredictable and severe or even life-threatening.
  - ASE: Seizures, psychosis, death

Marijuana Use in Adolescents: Synthetic Cannabinoids

- Synthetic Cannabinoids (SCB)
  - Originally developed as potential therapeutic drugs
  - Synthesized from 2000s in clandestine labs
  - Marketed to vulnerable populations as “safe and legal alternatives to marijuana”
  - Act atypically
  - Result in tolerance, addiction, withdrawal

Marijuana Use in Adolescents: Synthetic Cannabinoids

Marijuana Use in Adolescents: Synthetic Cannabinoids

Marijuana Use in Adolescents: Synthetic Cannabinoids - Spice

- Users' reports:
  - Common: Elevated mood, relaxation, altered perception
  - Other experiences: Extreme anxiety, paranoia, hallucinations
- Poison Control Centers reports:
  - Rapid heart rate, vomiting, agitation, confusion, hallucinations
  - Elevated blood pressure, myocardial ischemia, rare myocardial infarctions NIDA. Drug Facts: Spice (Synthetic Marijuana). April 2012.

Marijuana Use in Adolescents: Synthetic Cannabinoids - Bath Salts

- Synthetic chemicals related to **cathinone**
- Abused orally, snorted or injected
- Contain 3,4-methylenedioxypyrovalerone (MDPV), mephedrone, methylene and/or other compounds
  - Chemically similar to amphetamines/MDMA (Ecstasy)
  - Raise levels of dopamine in brain similar to cocaine
  - BUT >10 times more potent NIDA. Drug Facts. Synthetic Cathinones ("Bath Salts"). November 2012.

Marijuana Use in Adolescents: Synthetic Cannabinoids-Bath Salts

- Users Reports:
  - Euphoria
  - Increased sociability
  - Increased sex drive
  - Severe Intoxication:
    - paranoia, agitation, psychosis
      - NIDA. Drug Facts. Synthetic Cathinones ("Bath Salts"). November 2012.

Marijuana Use in Adolescents: Synthetic Cannabinoids - Bath Salts

- Poison Control Centers Reports:
  - Racing heart, elevated blood pressure, chest pain
  - Paranoia, hallucinations
  - Violent behavior
  - Panic attacks
  - "Excited delirium"
    - Dehydration
    - Breakdown of skeletal muscle tissue
    - Kidney failure
    - Death NIDA. Drug Facts. Synthetic Cathinones ("Bath Salts"). November 2012.

Marijuana Use in Adolescents: Synthetic Cannabinoids - Bath Salts

- High Abuse and Addiction Potential
  - Rats: Escalation of drug intake similar to methamphetamine addiction
  - Bath salts users report intense cravings
  - Frequent use: tolerance, dependence, and strong withdrawal symptoms NIDA. Drug Facts. Synthetic Cathinones ("Bath Salts"). November 2012.

Marijuana Use in Adolescents: Other Drugs

- Drugs not included but with similar effects:
- Club Drugs: Ketamine; Ecstasy, aka NMDA; Rohypnol
- Psychodelics: Salvia, peyote buttons, 'shrooms
- Hookah flavored tobaccos

Marijuana Use in Adolescents

- Factors influencing teen opinion re marijuana:
  - Legalization of marijuana recreationally in 7 states
  - Legalization of medical marijuana in 24 states
  - Legalization of cannabidiol in 15 states
- Adolescent views of marijuana as **safe** increase with legalization
  - Ammerman. Pediatrics. 2015.

Marijuana Use in Adolescents

- Scientific Evidence re Marijuana: Adverse Effects
  - Long-term Use:
    - Addiction: 9% all users, 17% adolescent users, 25-50% daily users
    - Altered brain development
    - Poor educational outcome with increased likelihood of dropping out of school
    - Cognitive impairment
    - Lower IQ among frequent users in adolescence

Volkow. NEJM. 2014.

Marijuana Use in Adolescents: Adolescent vs Parental Views

Marijuana Use in Adolescents: Adolescent vs Parental Views

- Adolescent Views:
  - Adolescents generally over-estimate parental approval of EtOH and THC use
  - >68% of adolescents do NOT believe daily drinking or binge drinking represents "great risk" for harm Windle. Pediatrics. 2008.
  - 52.5% of adolescents do NOT perceive great risk in smoking THC once or twice a week US Dept HHS. SAMHSA. NSDUH. 2010.

Marijuana Use in Adolescents: Adolescent vs Parental Views

- Adolescent Views:
  - 65% of 8th graders / 84% of 10th graders rate “very easy” or “fairly easy” access to EtOH Windle. Pediatrics. 2008.
  - 48.6% of 12-17 yo rate easy access to THC
  - 19.0% of 12-17 yo rate easy access to cocaine
  - 12.9% of 12-17 yo rate easy access to LSD
  - 11.6% of 12-17 yo rate easy access to heroin US Dept HHS. SAMHSA. NSDUH. 2010.

Marijuana Use in Adolescents: Adolescent vs Parental Views

- Adolescent Views:
  - 89.6% believe parents would strongly disapprove of trying MJ or hashish 1-2 times
    - 4.4% who perceive strong parental disapproval use THC
    - 32.8% who do NOT perceive strong parental disapproval use THC
      - US Dept HHS. SAMHSA. NSDUH. 2010.

Marijuana Use in Adolescents: Adolescent vs Parental Views

- High-school/College Athletes:
  - Greater acceptance of EtOH abuse by peers
  - More binge/heavy drinking than nonathletes
  - More drinks provided to them, both at home and in the community
  - Male college athletes: 75-93% use EtOH
  - Female college athletes: 71-93% use EtOH McDuff and Baron. Clin Sports Med. 2005.

Marijuana Use in Adolescents: Adolescent vs Parental Views

- High-school/College Athletes:
  - Swimming, tennis associated with low substance abuse
  - Rare "stimulant stacking" and steroids to enhance performance (cycling, track and field, baseball, gymnastics)
  - Higher risks for later abuse/dependence of alcohol and opioids (football, soccer, rugby)

Marijuana Use in Adolescents: Adolescent vs Parental Views

- >50% of parents are unaware when children are abusing substances Windle. Pediatrics. 2008
- UM Mott Children's Hospital National Poll questions:
  - 1. Nationally, what % of 10th graders do you think have used alcohol in the past 12 months (in quintiles)?
  - 2. Nationally what % of 10th graders do you think have used marijuana in the past 12 months?
  - 3. Did your [x-yo] drink alcohol in the last 12 mo?
  - 4. Did your [x-yo] use marijuana in the last 12 mo?

mottnpch.org/reports-surveys

Marijuana Use in Adolescents: Adolescent vs Parental Views

Figure 1. Parents' perceptions versus teens' report of alcohol and marijuana use

Alcohol

Did your teen drink in the last year?*
Yes-10% No-75% Unsure-15%

Teens' self-report of drinking**
Yes-52% No-48%

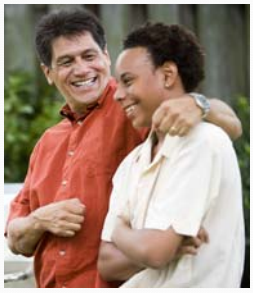
Marijuana

Did your teen use in the last year?*
Yes-5% No-85% Unsure-10%

Teens' self-report of use**
Yes-28% No-72%

*Source: C.S. Mott Children's Hospital National Poll on Children's Health, 2011 for teens 13-17 years
**Source: Monitoring the Future Study, 2010 data regarding 10th graders

Marijuana Use in Adolescents: Adolescent vs Parental Views



Marijuana Use in Adolescents: Adolescent vs Parental Views

- Parental Views:
  - Parents underestimate their own influence
    - Century Council - 2012 Report: 83% of youth cite parents as leading influence in decision to not drink or only drink occasionally, up from 55% in 2003
  - Parents seek information about teens' substance use and social norms from other parents King. Amer Jnl Health Education. 2002.

Marijuana Use in Adolescents: Adolescent vs Parental Views

- Parents often unaware of their parenting style and its **effect of teen behaviors**
- Four basic types of parenting:
  - Authoritarian
  - Permissive
  - Uninvolved
  - Authoritative

Marijuana Use in Adolescents: Adolescent vs Parental Views

	Supportive Parent is accepting and child-centered	**Unsupportive** Parent is rejecting and parent-centered
Demanding Parent expects much of child	**Authoritative Parenting** Relationship is reciprocal, responsive; high in bidirectional communication	**Authoritarian Parenting** Relationship is controlling, power-assertive; high in unidirectional communication
Undemanding Parent expects little of child	**Permissive Parenting** Relationship is indulgent; low in control attempts	**Rejecting-Neglecting Parenting** Relationship is rejecting or neglecting; uninvolved

Marijuana Use in Adolescents: Authoritarian Parenting

Marijuana Use in Adolescents: Adolescent vs Parental Views

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Marijuana Use in Adolescents: Adolescent vs Parental Views

- Parenting Styles:
  - Authoritarian, Permissive, and Uninvolved Styles:
    - Associated with increased disruptive behavior disorders
    - Associated with higher risk of substance abuse
  - Authoritarian Style
    - Associated with better communication/relationships
    - Associated with better self-esteem/health in teens
    - Associated with increased high school/college graduation
    - Associated with decreased substance use McGilloway. Evid Based Child Health. 2012.

Marijuana Use in Adolescents: Realistic Expectations

- Valid, reliable information provided to children, adolescents, parents and the community can make a change!

Questions???