

*Smokers, Vapers, and Tokers*  
*Even more is..... “Up in the Air”*

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Mutual of Omaha Companies,

# *Tobacco facts and factoids*

- Cultivated since 6000 B.C
  - Grows natively in the Americas
    - Native Americans have used tobacco for 3000 years
    - Gifted to Christopher Columbus in 1492
      - Introduced tobacco to Europe upon his return
      - Popular in Europe by the 1600's
    - 1760 commercial processing of tobacco in the colonies
      - P. Louillard- oldest tobacco company in the U.S.
    - 1776, helped fund the Revolutionary War
      - Used as collateral for loans from France

# *Tobacco facts and factoids*

- Tobacco's history
  - 1954, RJ Reynolds introduces filtered “Winstons”
  - 1964, Surgeon General's “Smoking and Health”
    - 50<sup>th</sup> anniversary in 2014
    - U.S. smoking rate in 1965, was 43% of the population
  - 1971, cigarette ads removed from television
- Current smoking rates in the U.S.
  - 21.5% of men
  - 17.3 % of women

# *Tobacco facts*

- Tobacco demographics
  - Most smokers start before age 18
    - 2100 become regular smokers each day
      - Commonly that occurs by age 15
      - The earlier one starts the greater the likelihood it persists in adulthood
    - Since 2005, *little decrease* in smoking prevalence
  - 78% of smokers do so daily
    - Tobacco use defined by education, income and ethnicity
    - Inverse relationship influenced
      - Income
      - Education

# Tobacco facts



- Tobacco demographics
  - Racial differences in tobacco-related disease
    - Blacks
      - Smoke fewer cigarettes / day but have *higher levels* of serum cotinine
        - Tobacco smoke and cotinine intake per cigarette is 30% higher
        - Total and non-renal clearance of cotinine 10-15% lower
  - Prevalence of smoking nearly equal between whites and Africans-Americans
    - Lower rates in Asians and Hispanics

# *Tobacco's Global impact*

- Smoking is the single most important cause of premature mortality on the planet
  - 98% of tobacco-related deaths are related to combustible tobacco
  - In active users, 50% can expect die from tobacco-related causes
- About 6 million tobacco-related deaths annually
  - 80% of those deaths will occur in developing countries
    - Cigarette use is actually increasing
  - About 500,000 die annually in the U.S.
    - 1300 per day
    - 10% will die from second hand smoke exposure

# *Tobacco's Global impact*

- Mortality in active smokers
  - 2 to 3 times higher than those who have never smoked
  - Deaths primarily from
    - Lung cancer
      - 30% of cancers in the U.S. are tobacco-related
  - Coronary artery disease (CAD)
    - Cigarette smokers (Accounts for 85% of U.S. tobacco use)
    - Incidence of MI *6 times higher in women*, and *3 fold* in men
      - In those who smoked at least 20 cigarettes per day
      - Female smokers are 25% more likely than men to develop CHD
      - Women have more adverse events after ACS

# *Tobacco's Global impact*

- Smoking impact after re-vascularization on CAD
  - CABG: greater risk of all-cause mortality /cardiac death
    - Relative risks RR of 1.68/ 1.75
  - After percutaneous coronary intervention (PCI)
    - Risk of death RR of 1.76
    - RR for a Q wave MI 2.08
- Other primary causes of tobacco-related deaths
  - Stroke
  - COPD

# *Electronic Cigarettes- “Vaping”*



# *Electronic cigarettes (E-cigs)*

- E-cig history
  - First patented 1963
  - Enter the Chinese market in 2003
  - Marketed in the U.S. and Europe since 2006
- Electronic nicotine delivery system (ENDS)
  - Battery powered vaporizer heats a solution producing an aerosol which is inhaled- “vaping”

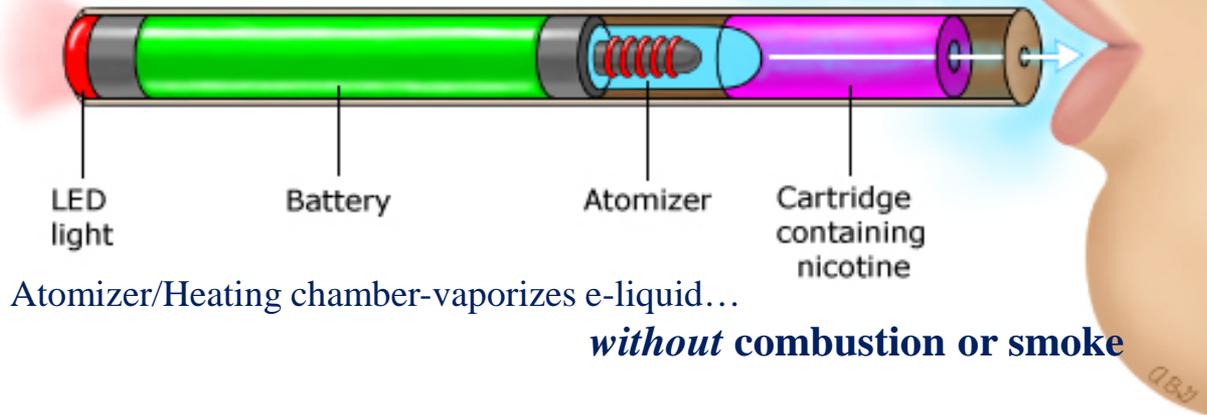


# E-cigs and Vaping

E-cig activated by drawing or “puffing” on the device

Smart chip-controller

Vapor



Atomizer/Heating chamber-vaporizes e-liquid...

***without combustion or smoke***

# *E-cigs and Vaping*

- E-cig technology is changing rapidly
  - 3 generations now of E-cigarettes

First generation



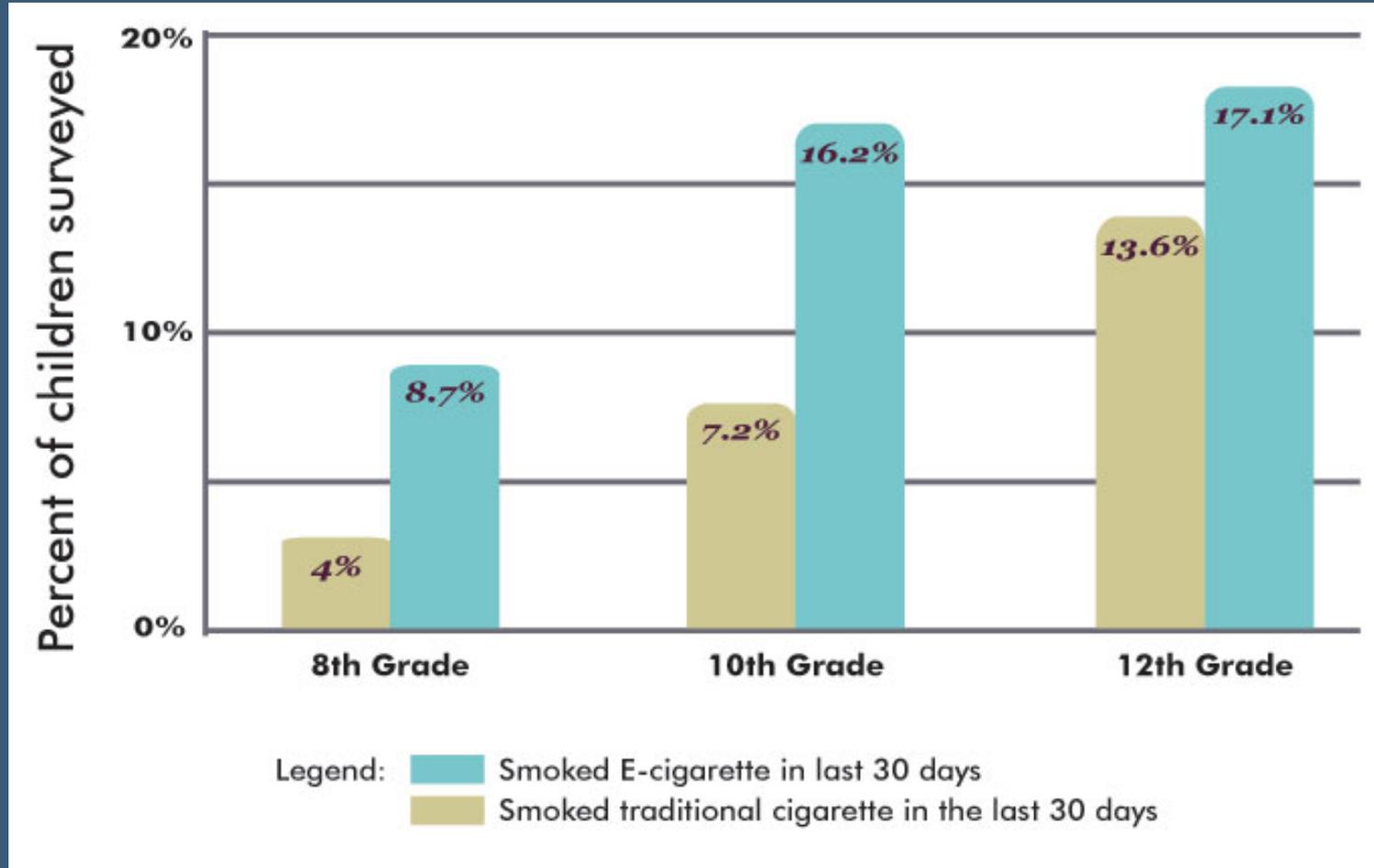
Personalized vaporizers

# *E-cigs and Vaping*

- E-cig liquid components
  - Nicotine (although some are nicotine-free)
    - Nicotine content up to 36mg/ml
    - Common concentrations 6, 12, 18, 24 mg/ml
      - Concentrations are not regulated and are inconsistent with package labeling, even when nicotine-free
  - Propylene glycol and glycerol
    - Humectants that are the main components of e-liquids
  - Flavoring
    - More than 7000 available
    - May increase the attractiveness of e-cigs to youths



# Vaping in teenagers



# E-cigs and Vaping

- E-liquid components cont.

- Other compounds

- Metals tin, lead, nickel, chromium, and trace amounts of hemiacetals and other carcinogens

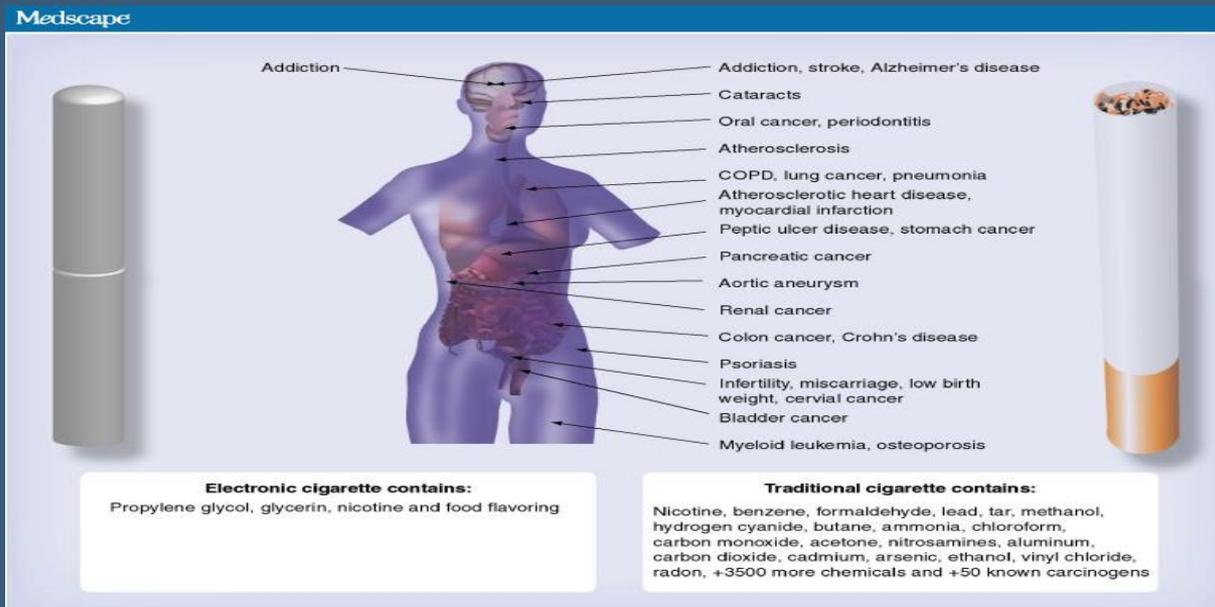
Vapor

Cigarette smoke

Known Carcinogens

Nitrosamines  
Formaldehyde  
Diethylene glycol

**Medscape**



Electronic cigarette	Traditional cigarette
<p><b>Electronic cigarette contains:</b> Propylene glycol, glycerin, nicotine and food flavoring</p>	<p><b>Traditional cigarette contains:</b> Nicotine, benzene, formaldehyde, lead, tar, methanol, hydrogen cyanide, butane, ammonia, chloroform, carbon monoxide, acetone, nitrosamines, aluminum, carbon dioxide, cadmium, arsenic, ethanol, vinyl chloride, radon, +3500 more chemicals and +50 known carcinogens</p>

Health conditions associated with traditional cigarette smoke (indicated by arrows in the infographic):

- Addiction
- Addiction, stroke, Alzheimer's disease
- Cataracts
- Oral cancer, periodontitis
- Atherosclerosis
- COPD, lung cancer, pneumonia
- Atherosclerotic heart disease, myocardial infarction
- Peptic ulcer disease, stomach cancer
- Pancreatic cancer
- Aortic aneurysm
- Renal cancer
- Colon cancer, Crohn's disease
- Psoriasis
- Infertility, miscarriage, low birth weight, cervical cancer
- Bladder cancer
- Myeloid leukemia, osteoporosis

70 known carcinogens

> 7000 chemicals

# *E-cigs and Vaping*

- E-cigs and E-liquid components cont.
  - Exhaled vapor is more than just “water vapor”
    - Vaping products are *un-regulated* for purity, sterility, or known toxicities
  - Small amounts of carcinogens/toxicants
    - Less than tobacco smoke, though unknown if actual exposure is lower
    - Particulate size in vapor similar to conventional cigarettes which allows deep alveolar deposition

# *E-cigs and Vaping*

- E-liquid components cont.
  - *Average vaper* using 3 ml of e-liquid daily
    - May have a lifetime cancer risk
      - That is *5 times* higher than the one pack/day smoker of cigarettes
  - Propylene glycol
    - Short-term effects of vapor include eye and respiratory irritation
    - Known to aggravate bronchitis or exacerbate asthma
    - Chronic effects an unknown

# *E-liquid- Nicotine a “Gateway” Drug*

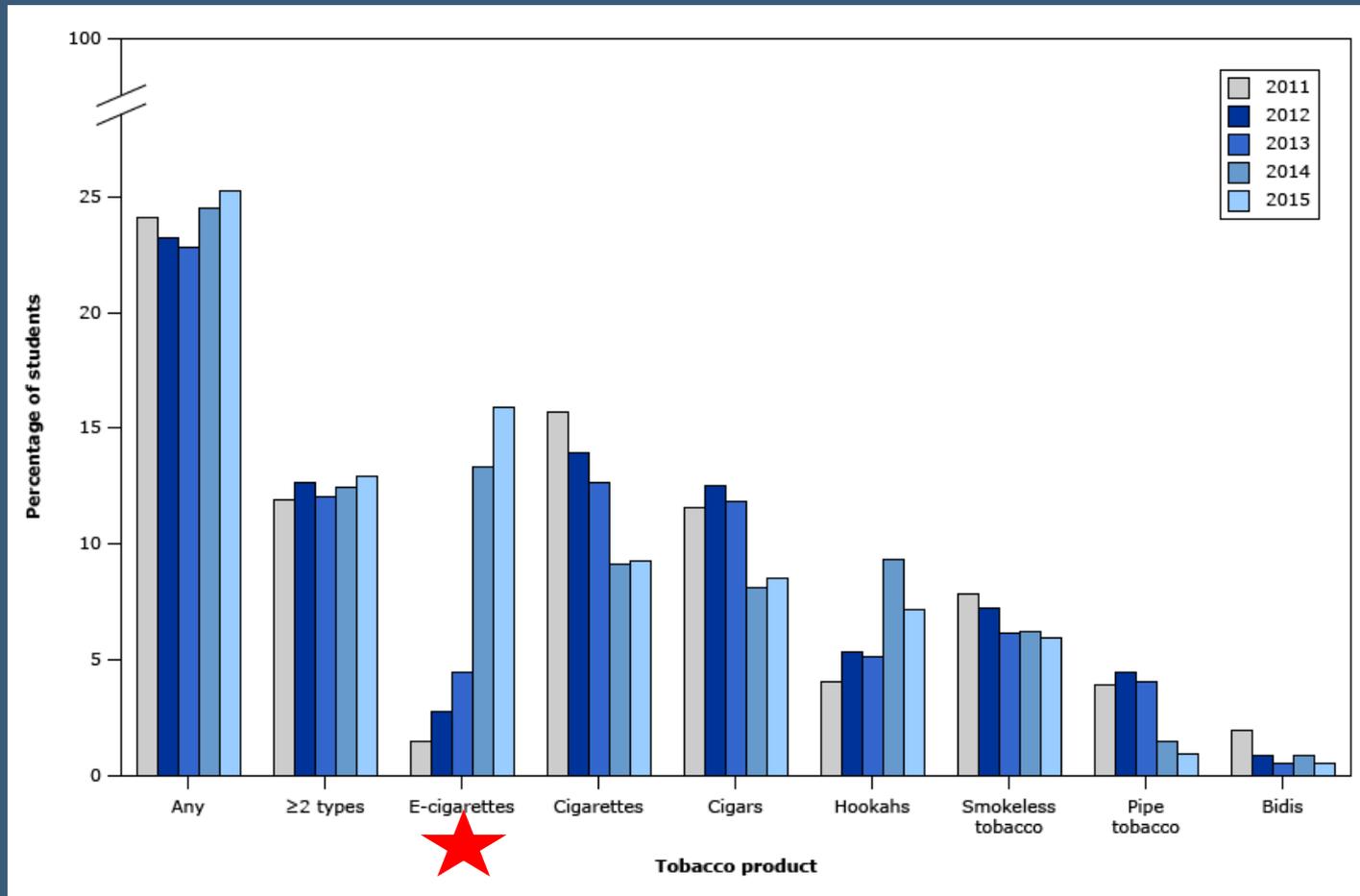


- Epidemiologic studies have shown nicotine use is a “gateway” to the use of other drugs
  - A molecular mechanism impacting gene transcription
    - Cyclic AMP-REB
      - Response-element binding protein (CREB)
        - Acts as a “*switch*” converting short-time memory to long-term
        - Memory is learned from a sequence in molecular biology
      - CREB activation by nicotine
        - Influences target gene transcription and “primes” the brain to drug use susceptibility
        - Nicotine to ...marijuana,... and potentially ...cocaine



# A “Gateway” for the vulnerable

Prevalence of high school students tobacco use 2011 to 2015



# *The Pharmacology of Nicotine*

- Naturally-occurring alkaloid found in tobacco
  - Acts upon
    - Cholinergic nicotinic receptor (CHRN) genes
      - Genetic subunits impact
        - Nicotine's *addiction* potential
        - Nicotine's association with smoking-related diseases- vascular, COPD and cancer risks
- Nicotine's molecular and genetic impact reinforces our concern for its role in *behavior* and *disease*

# *The Physiologic Risks of Nicotine*

- A ganglionic and CNS stimulant
  - Nicotinic receptors in the CNS, neuromuscular junctions and the adrenals
    - A sympathomimetic that releases adrenal catecholamines
      - Epinephrine, norepinephrine, dopamine
      - Vasopressin, serotonin, acetylcholine
  - Detrimental physiologic effects of catecholamines
    - Increases myocardial work by increasing BP, HR (BP by 5-10 torr, HR 10-20 beats/min)
    - Increases contractility, and coronary vasoconstriction
    - Endothelial dysfunction

# *The Physiologic Risks of Nicotine*

- Detrimental physiologic effects of catecholamines
  - Promotes a hypercoaguable state
  - Adversely impacts lipids
  - Reduces insulin sensitivity- “diabetogenic”
- 1/3 of tobacco-related deaths are cardiac
  - .....it is very likely that *Nicotine* is the key factor
- Implicated in tumor development
  - Promotes angiogenesis and alters normal apoptosis
  - Known association with an increased incidence of numerous tumors

# *The Psychologic Risks of Nicotine*

- Nicotine meets criteria as an addictive agent
  - Origins in molecular biology and genetics
- Psychoactive properties
  - Beneficial impact on concentration, attention and mood
- Foster drug-reinforced behaviors
- Withdrawal symptoms with abstinence
- Promotes physical tolerance and dependence

# *E-cigs and Vaping*

- Prevalence and utilization
  - Use of E-cigs increasing since 2010 in the U.S.
    - Current use about 2 to 6% s/t the study used
      - Highest in current cigarette smokers at 16%
      - Former smokers within the last 12 months- 22%
- Demographics of vapers
  - Younger, more educated, and have higher incomes
    - More males > females
    - Whites > non-whites

# *E-cigs and Vaping*

- Factors influencing their popularity
  - *Aid to reduce or stop smoking*
    - Marketed for that purpose
      - Television ads, and the internet
      - Vaping shops have become commonplace
    - Currently *no more effective* than available FDA approved nicotine patches/gum, or prescription deterrents
  - *Used to manage nicotine withdrawal symptoms*
    - Public and workplace smoking restrictions
    - 24 states limit or ban e-cig usage, as do 800 municipalities

# *E-cigs and Vaping*

- Influences on popularity, cont.

- *E-cigs are less costly*

- 1/5 to 1/3 that of popular tobacco cigarettes

- 10 nicotine cartridges are < \$20 = 10 packs of cigarettes (\$5-7/pack)

- Starter kit

- E-cig, car charger, 2 lithium batteries, and 10 cartridges - \$50

- Personal E-cig

- \$25 to \$300

- Once purchased only cost is for e-liquid cartridges

- *Avoids the social stigma of “smoking”*

- I am “vaping” not smoking which has become perverse



# *E-cigs and Vaping*

- Vaping economics
  - A growing \$ 3 billion market
    - > 450 companies
    - 62 countries ( 50% of the world's population)
    - Forecast to be a \$10 billion market
      - \$ 85 billion is spent on combustible tobacco
  - Big “tobacco” already heavily invested in E-cigs
    - P. Lorillard, #3 in U.S.
      - Owns Blu e-cigs and will spend \$45 million on advertizing

# *E-cigs and Vaping Risks*

- Nicotine poisoning and overdose
  - American Association of Poison Control Centers
    - 219% increase in reported exposures
      - Events are clearly under-reported
      - In past 5 years the number of calls to Poison Control Centers up 41%
    - 50% of the reported events in children under the age of 6
      - Typical 5 ml vial of e-liquid has about 100mg/vial of nicotine
        - Lethal dose of nicotine about 10mg in children

# *E-cigs and Vaping Risks*

- Areas of principal concern:
  - Long-term health effects from vaping or second-hand vapor inhalation are *unknown*
  - The “Vaping” industry is currently *un-regulated*
    - Lack of standardized manufacturing procedures to maintain purity, e-liquid concentrations, and sterility
    - Most of the available data is provided by the
      - “Vaping” industry or marketing organizations for e-cigs
      - “Big tobacco”

# *E-cigs and Vaping*

- The FDA has no current policy
  - Studying a proposal to extend existing tobacco regulation authority to the e-cig industry
    - Including novel tobacco forms and new delivery systems
- Recent action to limit sales to those 18 and older
- 2016 legislation passed to require e-liquid nicotine refills to have child-resistant packaging.

# *E-cigs- What should concern us?*

- A growing and un-regulated industry
- Influence of “Big Tobacco”
- No credible data on the medical risks of use
- Vulnerability of youth
  - Nicotine’s
    - Addiction potential
    - Role as a “gateway” drug
- E-liquid overdoses
- E-cig fires or explosions

# *Cannabis sativa*



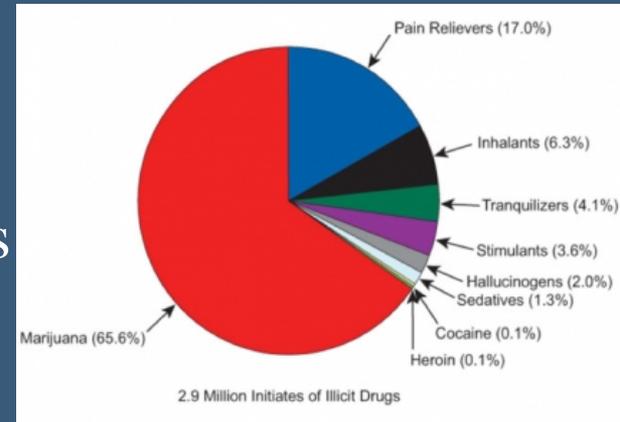
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# *Cannabis sativa*

- Marijuana in the U.S.
  - 7000 try marijuana (MJ) for first time each day
    - About 17.5 million Americans are smokers of MJ each month
      - Males account for 75% of its use
        - 37% are *both* cotinine and MJ positive
  - Used by ~ 6% of the U.S. population
    - 4% worldwide (> 160 million)
  - MJ is the first illicit drug used in 2/3's
  - MJ accounts for > 3/4's
    - Illicit drug use

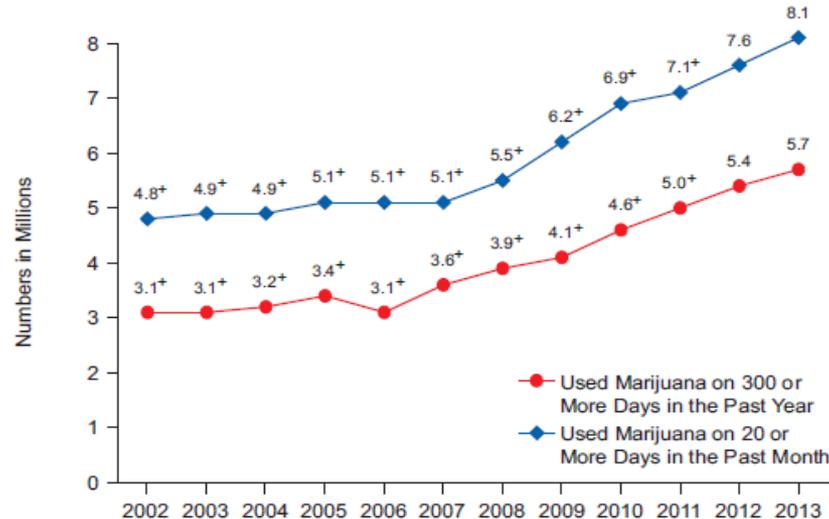




# Marijuana use- 2013 NSDUH

- 8.1 million used MJ 20 or more days in the past month
  - Increasing steadily since 2007

**Figure 2.15 Daily or Almost Daily Marijuana Use in the Past Year and Past Month among Persons Aged 12 or Older: 2002-2013**



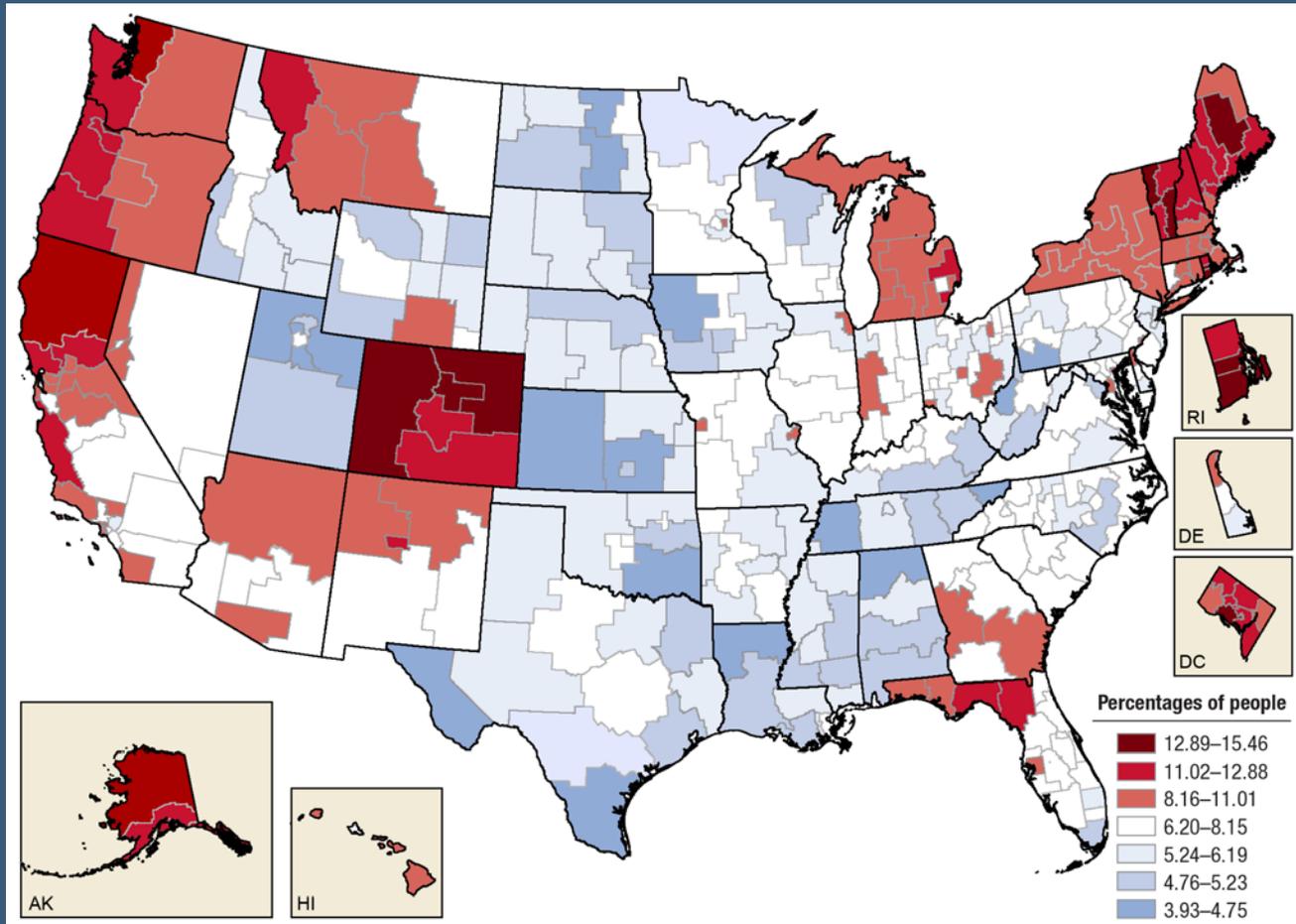
<sup>+</sup> Difference between this estimate and the 2013 estimate is statistically significant at the .05 level.

- 5.7 million used **MJ 300 days or more** in the past 12 months
  - Increasing yearly since 2006



# MJ use by state

Marijuana use in the past month in people aged 12 or older



# Magazine marketing of MJ

*High Quality*

# MARIJUANA

*Sold at two locations*

**ISSAQUAH  
CANNABIS CO**

ISSAQUAHCANNABISCOMPANY.COM

230 NE JUNIPER ST. SUITE 201  
ISSAQUAH, WA



*The*  
**WEST SEATTLE  
MARIJUANA  
STORE**



WESTSEATTLEMARIJUANA.COM

10825 MYERS WAY S.  
SEATTLE, WA

FOR USE ONLY BY ADULTS TWENTY-ONE AND OLDER. KEEP OUT OF REACH OF CHILDREN. MARIJUANA CAN IMPAIR CONCENTRATION, COORDINATION AND JUDGEMENT. DO NOT OPERATE VEHICLE OR MACHINERY UNDER THE INFLUENCE OF THIS DRUG. THERE MAY BE HEALTH RISKS ASSOCIATED WITH CONSUMPTION OF THIS PRODUCT. THIS PRODUCT HAS INTOXICATING EFFECTS AND MAY BE HABIT-FORMING.

# *Marijuana demographics*

- Race and ethnicity
  - Prevalence higher in blacks than whites or Hispanics
- Education
  - No significant association between educational attainment and lifetime prevalence of MJ use
- Marital status
  - Lifetime use significantly higher in those separated or divorced

# *Marijuana demographics*

- Predictors of continued MJ use
  - Early onset of use- the adolescent vulnerability
  - Male sex
  - Frequent use
  - Using cannabis to enhance positive feelings
  - Using other illegal substances
- About 60% of users between ages 23 to 30, eventually *stop using the drug*

# *Marijuana historically*

- Used for over 5000 years
  - Origins of medical use from Central and Eastern Asia
  - Derived from leaves, flowers and stems of MJ plant
    - Grown in nearly every country in the world
- In the U.S.
  - 1937- Marijuana Tax Act, stops use in medical practice
  - 1970- Schedule I drug, no medical use, high abuse potential

# *Marijuana in the U.S.*

- 1996- CA first state to permit medical use
- 23 states and the D.C. now permit medical use
- 4 states have legalized recreational MJ
  - CO, WA, AK, and OR currently
    - Regulating sales and taxation
  - District of Columbia
- 6 more states considering legalization

# *Processed MJ- yields 3 products*

- Herbal cannabis
  - Dried leaves and flowers- choice of North America
- Hashish
  - A pressed resinous secretion- favored in Europe
    - Thick sticky brown
      - Concentrations can approach *90% THC*
- Hash oil
  - Significant fire hazard during production
    - Colorado experience
      - Alarming rate of home fires and serious burn injuries

# *How MJ is used*

- Smoked
  - In hand-rolled cigarettes (joints)
    - 20-50% of the THC content is absorbed by the lungs
      - Peak concentrations in ~ 15 minutes
      - Peak clinical effects in 30 minutes
      - Most medical users do so via smoking, for the ease of titration
  - In pipes, or water pipes (bongs)
  - In cigars with a mixture of MJ and tobacco (blunts)

# *How MJ is used*

- Ingested
  - Mixed in food or brewed as a tea
  - Edibles make up 45% of CO's legal pot market
- Oral use reduces bioavailability due to the hepatic first pass effect
  - Similar physiologic effects as being smoked
  - Slower and more erratic absorption
    - Peak concentrations in 1-3 hours
    - Triples the half-life to 8-12 hrs



# *Edible Marijuana*



JAMA Pediatrics:

Rate of marijuana exposure in children increased 150% since 2014 in CO

# *MJ's addiction potential*

- Potency has increased
  - Delta-9-tetrahydrocannabinol (THC)
    - 1980's concentration of THC about 4 %
  - Since 2012- averages 15% nationally
    - Colorado potency testing (3/15) reveal concentrations of 18-30%
    - Higher concentrations *directly* impact addiction potential
  - Use and addiction potential
    - Occasional user- 9% become addicted
    - Adolescent with weekly use- 17%
    - Daily user- 25-50% risk

# *Marijuana pharmacology*

- Composition of MJ
  - Over 400 active chemicals, >115 varied cannabinoids
  - Major active ingredients
    - Delta 9-THC
      - Psychoactive
      - Potency varies with the origin of the cannabis plant
    - Cannabidiol
      - More peripheral physiologic effects
      - Non-psychoactive
      - May have role in seizure therapy

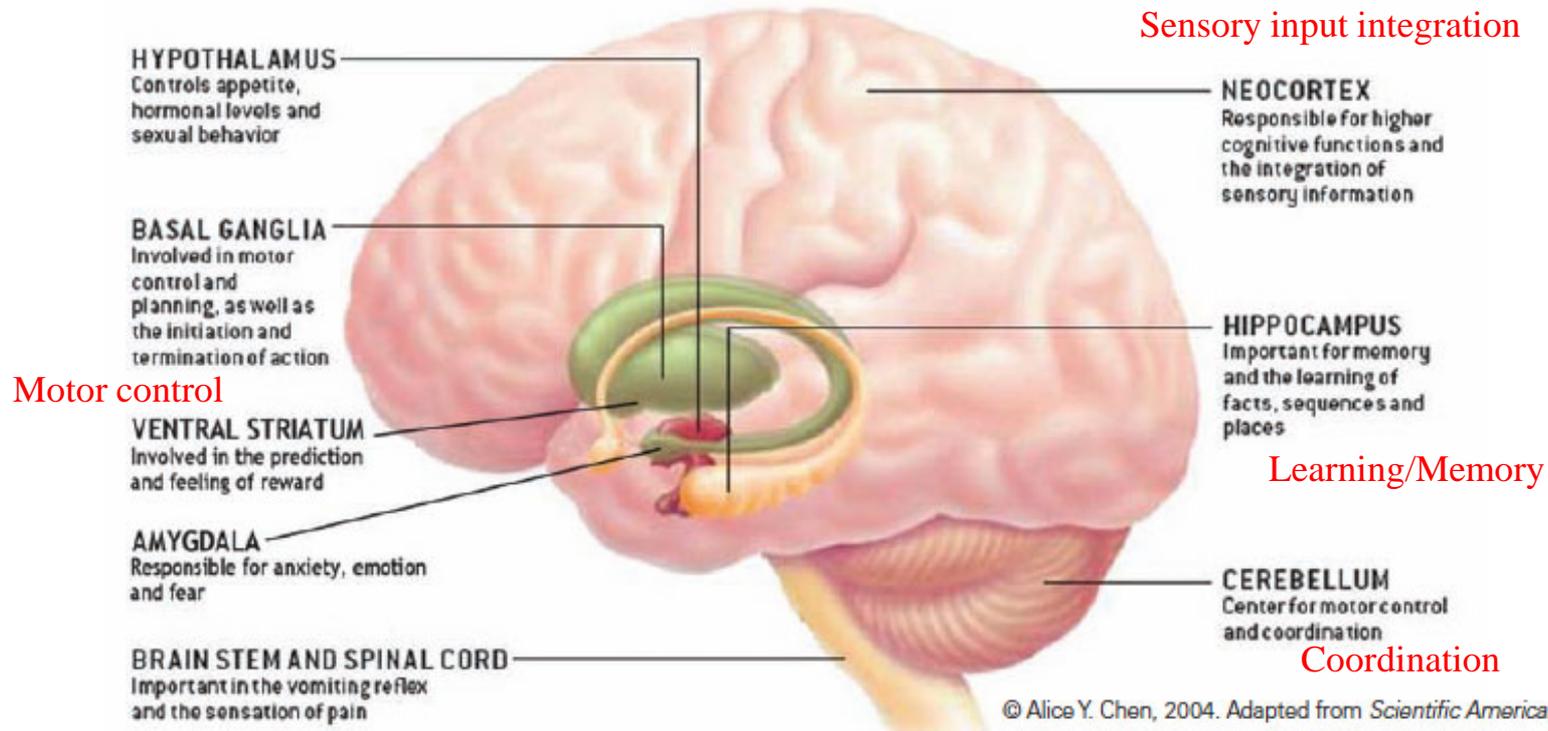
# *Marijuana pharmacology*

- THC reaches the brain within minutes following absorption
  - Readily crosses the blood brain barrier and binds to
    - *Endocannabinoid* system- a neural communication network
  - CB1 receptors in the mesolimbic dopamine system
    - CB1 receptors mediate the *psychoactive effects* of THC
      - THC *over activates* the system, causing the “high”
    - CB1 receptors primarily found in brain areas that influence:
      - Pleasure, memory, concentration and cognitive function
      - Sensory and time perception
      - Coordination



# Marijuana affects on the brain

## Marijuana's Effects on the Brain



When marijuana is smoked, its active ingredient, THC, travels throughout the body, including the brain, to produce its many effects. THC attaches to sites called cannabinoid receptors on nerve cells in the brain, affecting the way those cells work. Cannabinoid receptors are abundant in parts of the brain that regulate movement, coordination, learning and memory, higher cognitive functions such as judgment, and pleasure.

# *Marijuana pharmacology*

- CB2 receptors
  - Present in immune cells, and low levels within the CNS
  - Influence
    - Pain perception
    - Host defense and immunosuppression
    - Anti-inflammatory effects
- FDA-approved synthetic marijuana drugs
  - THC versions: Dronabinol ( Marinol), Nabilone (Cesamet)
    - Used in chemo-induced N&V, or in wasting diseases- Ca or HIV
    - Glaucoma
    - Pain syndromes- migraines, neuropathic, musculoskeletal disorders
    - Neurologic spasticity- MS, Parkinsonism, SCI



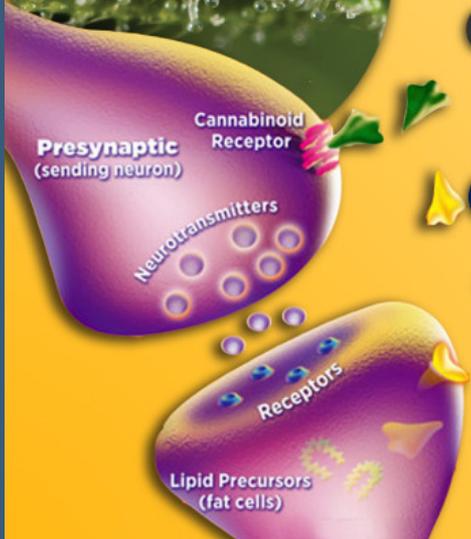
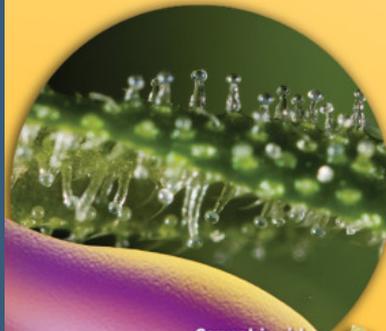
# Endocannabinoid System

## The Human Endocannabinoid System

THC and CBN are known to "fit" like lock and key into network of existing receptors. The Endocannabinoid System exists to receive cannabinoids produced inside the body called "Anandamide" and "2-Arachidonyl-glycerol". Stimulating the ECS with plant-based cannabinoids restores balance and helps maintain symptoms.

CB1 receptors are concentrated in the brain and central nervous system but also sparsely populates other parts of the human body.

Receptors are found on cell surfaces



Tetrahydrocannabinol



Cannabidiol

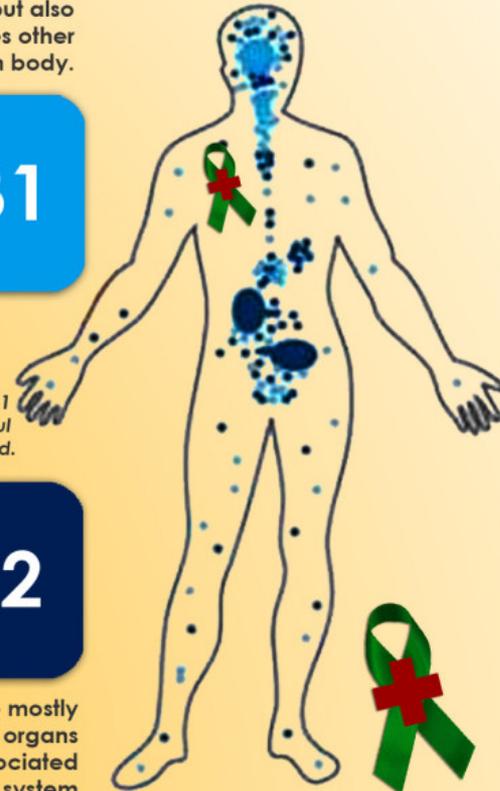
CBD does not directly "fit" CB1 or CB2 receptors but has powerful indirect effects still being studied.



Cannabinol



CB2 receptors are mostly in the peripheral organs especially cells associated with the immune system.



# *Marijuana pharmacology*

- In FDA trials
  - Cannabidiol (CBD) based
    - Epidiolex for childhood epilepsy
  - THC and CBD derivatives
    - Sativex, approved in the UK
      - Used for cancer analgesia and the spasticity of MS
- NIH research with THC and CBD in
  - Autoimmune disease, as anti-inflammatories, analgesics
  - Anti-epileptics, substance abuse, psychiatric disorders

# *Adverse Physiologic effects of MJ*

- Immune system

- Suppresses function
  - Could it impede immune surveillance ?
  - Could it increase your risk of infection?

- Pulmonary

- Bronchial inflammation
  - Acute and chronic bronchitis
- Squamous metaplasia of tracheobronchial epithelium
- Low or occasional use *not* shown to be adverse to PFTs

- Impairs bone metabolism

- Osteoporosis risk

- Lung cancer risk

- 50-70% more carcinogens than combustible tobacco
- MJ
  - 3 times more tar than tobacco
  - 1/3 more tar retention in lungs
  - Lung cancer risk
    - 1 joint a day nearly equivalent to 1 pack of cigarettes per day

- Reproductive

- Women: increases Prolactin
  - Risk of galactorrhea
- Men: reduces testosterone
  - Impact upon libido, potency, gynecomastia
  - Lessens fertility, motility/counts 52

# *Adverse physiologic effects of MJ*

- Cardiovascular
  - MJ *increases* sympathetic activity and *reduces* parasympathetic activity
    - Results in tachycardia- 20-100% increase in HR and cardiac output (workload)
      - May last up to 3 hours
  - Causes reversible EKG abnormalities
    - P and T wave
    - ST segment
    - Atrial and ventricular extra-systoles
    - Ventricular tachycardia

# *Adverse Cardiovascular risks*

- MJ smokers
  - MI risk nearly 5 times higher in the first hour after smoking
  - May similarly double the risk of stroke
    - Via cerebral vasospasm
    - Arteritis from chronic use

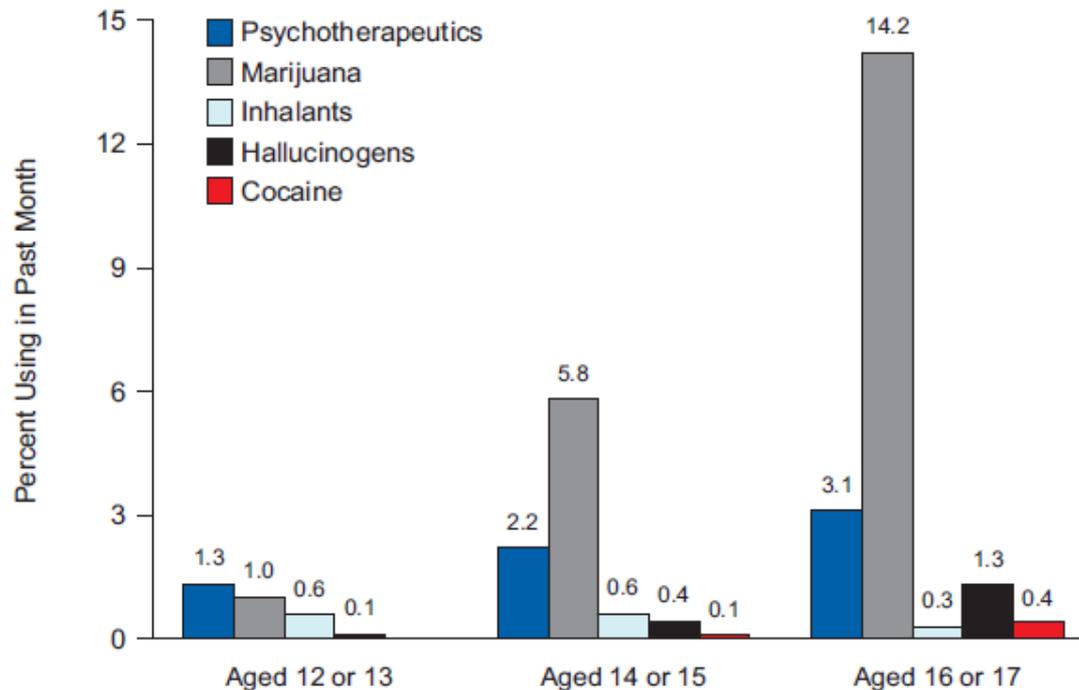
# *Adverse physiologic effects of MJ*

- Psychiatric
  - About 60% of the likelihood of developing a MJ use disorder is due to *genetic factors*
    - Based upon multi-national twin studies
      - Linked to regions on chromosomes 3 & 9, + possibly 4 others
  - Data shows that for every (1) user who develops dependence, there (10) who do not
  - Increases risk of schizophrenia, bipolar disorder and depression
    - Particularly in the developing adolescent
    - May unmask risk in those predisposed
    - Risk proportion to dose and THC concentration

# Teen Use of Marijuana

- Reported teen use of marijuana within the past month

**Figure 2.8 Past Month Use of Selected Illicit Drugs among Youths Aged 12 to 17: 2013**



Note: The prevalence of past month cocaine use among youths aged 12 or 13 rounds to less than 0.1 percent and is not shown.

# *Adverse Psychiatric effects*

- Psychiatric, cont.
  - Psychosocial functioning
    - Proven outcomes
      - School dropout rates increase
        - THC impact on the developing adolescent brain
      - Early and frequent exposure does *lower IQ* and *alter behaviors*
    - German data: use of other drugs in those who use MJ frequently
      - Alcohol in 90%
      - Nicotine in 68%
      - Cocaine in 12%
      - Stimulants and hallucinogens 6-9%
      - Opioids 3%

# *Adverse Psychiatric effects*

- Psychosocial functioning
  - New Zealand study: Incidence of crime
    - Direct relationship between frequency of MJ use and number of crimes, vs. non-users
      - Use < monthly committed 1.6 times more crimes
      - Use at *least weekly*, committed 3.7 times more crimes
  - Lasting adverse effects in users weekly or more
    - Reduced attention and processing speed
    - Memory deficits
    - Abnormal social behavior
    - Increased susceptibility to anxiety and depression
    - Known risk of poly-drug dependence

# *Adverse Physiologic effects of MJ*

- Slurred speech, delayed reaction times
- Decreased concentration
- Lethargy
- Reduced muscle tone, difficulty with coordination
- Transient psychosis
- Paranoia, panic disorder, fear
- Hallucinations

# *Marijuana testing*

- Urine testing for THC
  - Most commonly used
    - Positivity dependent upon cutoff used, drug absorption, “quality of MJ”, and frequency of use
      - Acute /recent use- positive 1-3 days
        - MJ is fat soluble and is deposited in adipose tissue
      - As long as a month or more, in chronic users
- Blood, oral fluids and hair
  - Bodily fluids only + a few hours in most
  - Hair can be positive up to 3 months

# *Marijuana testing*

- Mutual's experience
  - Tested for THC and blood alcohol since 2004
    - On all cases at \$100k or higher
    - 2 to 2.5% of samples test + for THC through 2014
  - Hit rate in 2015..... up 165% over 2014
    - 2016 up another 15% over 2015
      - 690 (+'s) in first 7 months
    - 5 fold greater incidence than a + BAC
    - Majority are in middle class or above
      - Average age in the low 40's

# *Medical Marijuana*

- Most medical MJ patients are
  - Heavy regular smokers- for the ease of titration
- Legitimate areas of concern
  - Laws are vague on valid indications for medical MJ
- Most states only require a prescription
  - Readily available, with minimal requirements
    - \$50 fee to a provider *plus* “I have pain” as justification
  - No established physician relationship in > 85%

# *Marijuana, a “cash crop”*



\$4500+ of revenue per plant every 6-8 weeks

# *The impact of Marijuana*

- Colorado- first to legalize recreational sales

- By August of 2014

- 300 retail outlets- MJ sales \$34.1 million

- Over 500 medicinal outlets- \$33.4 million

- Has become America's "*Pot Lab*"

- Medical MJ in Colorado

- 320,229 have applied since the Registry began in 2001

- Population of CO ~ 5.4 million

- Only 13.3% have a designated MD or medical MJ center

- 64.8% are males, average age 41.5 yrs



# *Colorado's Experience*

- Top 3 medical conditions requiring medical MJ
  - Some patients report more than one debilitating condition
  - Severe pain 93%
  - Muscle spasms 21.3%
  - Severe nausea 11.8%
- CO tax revenue from recreational MJ
  - \$76 million in 2014
  - \$87 million through August of 2015
- Legal sales of recreational/medical MJ in CO
  - In 2015, nearly \$ 1 billion

# *Colorado's Experience*

- MJ use demographics
  - 13.6% of adults (18+ years old)
  - 1/3 of users do so daily
  - 18.5% report driving after using MJ
  - Highest use in
    - Men
    - Younger adults 18 to 24 years old
    - Those with less than a HS education, and a lower income
    - Black
    - LGBTQ community

# *Colorado's experience*

- In 2014, when retail MJ sales began
  - MJ-related traffic deaths increased 32%
- MJ-related traffic deaths where driver tested + 19.3%
  - Rated had nearly doubled in the past 5 yrs
  - Driving under the influence of cannabis (DUIC)
    - CO limit of 5ng of THC/ml
      - Difficult to assess since THC not metabolized in a linear fashion like alcohol
      - Levels dependent upon fat deposition, THC concentration, how used
  - MJ used likely increases MVA risk by 2 to 4 fold

# *Colorado's Experience*

- In 2014, when retail sales began
  - MJ-related hospitalizations up 38% in only 1 year
    - 11,439 admissions
  - MJ-related ER visits up 29%
- Children ages 0 to 5 years
  - MJ-related exposures up 138%
  - Ingestions of MJ < 12 yrs 16 in 2014 vs. (2 in 2009)

# *Colorado's Experience*

- Growing physician concern
  - Obstetrics/Pediatric professionals
    - Mothers quit tobacco, but continue to use MJ during their pregnancy
      - but...“Marijuana is legal”
      - Lethargic newborns who take 2-3 days to normalize
        - What is the impact on that neonate's brain development/psyche?
  - Adolescent males
    - MJ exposure leads to
      - School truancy/absenteeism and the “amotivational syndrome”
      - Expression of mal-adaptive behaviors or psychiatric illness<sup>69</sup>

# *Underwriting Marijuana*

- Marijuana-related deaths
  - 3 in Colorado through March of 2015
    - All from edibles
  - Mortality statistics on the rise with growing experience in
    - Washington
    - Alaska
    - Oregon .....and as other states liberalize the use of MJ
- MJ use is associated with a higher probability of risk taking behavior

# *Underwriting Marijuana*

- Keep MJ risk in perspective with “the company it keeps”
  - *Direct risks inherent of MJ + impact upon pre-existing disease*
    - Cardiopulmonary, psychiatric, tobacco-related cancers
    - Concomitant use of alcohol
      - Nicotine, and other illicit drugs
  - Unstudied perils of more frequent and chronic use
    - Largely due to the Class 1 status of MJ with the DEA
      - Very limited funding to date directed at MJ’s behavioral impact

# *Underwriting Marijuana*

## Instances where particular caution is indicated

- A current, or past history of
  - Significant psychiatric disorders
  - Alcohol or substance abuse, including chronic narcotic analgesics
  - Notably adverse driving history
- No attending physician
- Most legitimate medical MJ use is in *uninsurable medical* situations
  - Exceptions
    - Non-malignant pain management
    - HIV
    - Glaucoma



Mutual of Omaha

# Marijuana “fact or fiction?”



# *Smokers, Vapers, and Tokers*

- We test and price for tobacco
- Even more is.....”Up in the air”
  - Well beyond that of just vaper and smoke of MJ
  - Multi-faceted and unstudied risks of
    - Vaping
    - Liberalization of marijuana

• Q&A