

Adolescent Marijuana Use

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Learning Objectives

- Describe marijuana use amongst adolescents
- Identify the harmful effects of marijuana use in adolescents
- Formulate an approach to evaluating and intervening when an adolescent is using marijuana

Legal Status of Marijuana



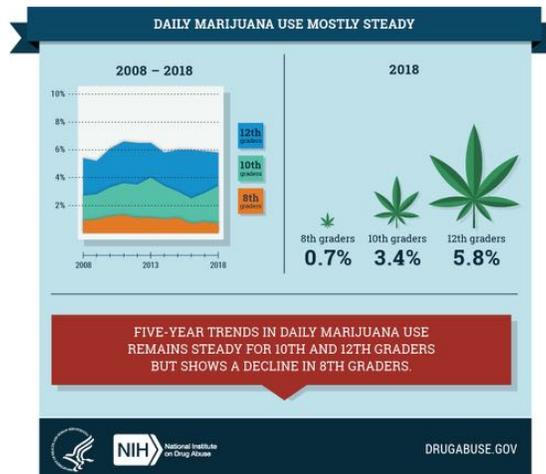
Prevalence of Adolescent MJ Use



- Most widely abused illicit drug in the US
- Most MJ use begins in adolescence
- Daily MJ use has remained steady over the past 5 years for 10th and 12th graders
- 8th graders have shown a decline in their MJ use over the past 5 years

Monitoring the Future 2018

Prevalence of MJ Use



Prevalence of MJ Use

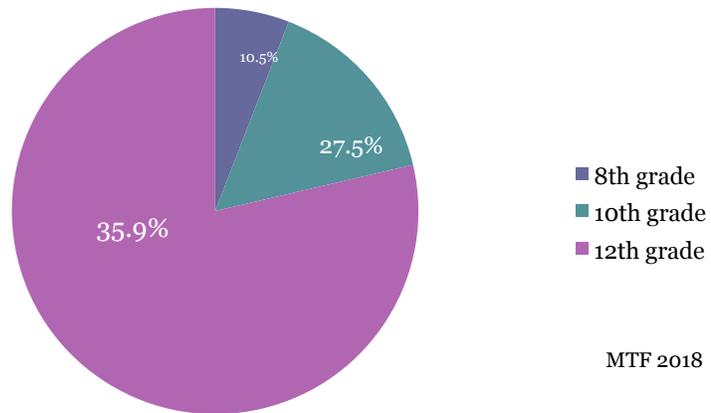


Prevalence of MJ Use

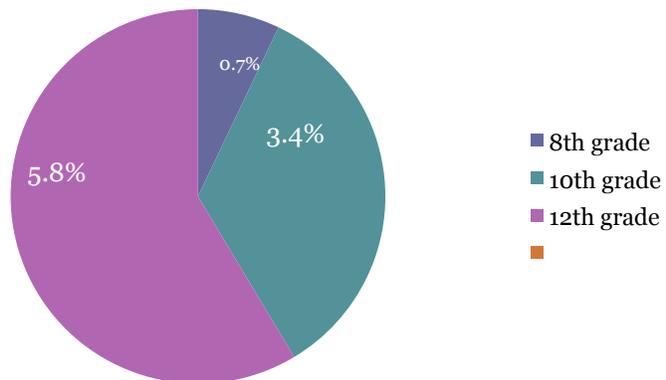
- Lowest levels of past-year use among 8th and 10th graders reached in 2016
- Perception of harm from MJ and disapproval of use are trending downward
- 26.7% of 12th graders report that regular MJ use poses a great risk
- 66.7% of 12th graders report that they disapprove of adults smoking MJ regularly

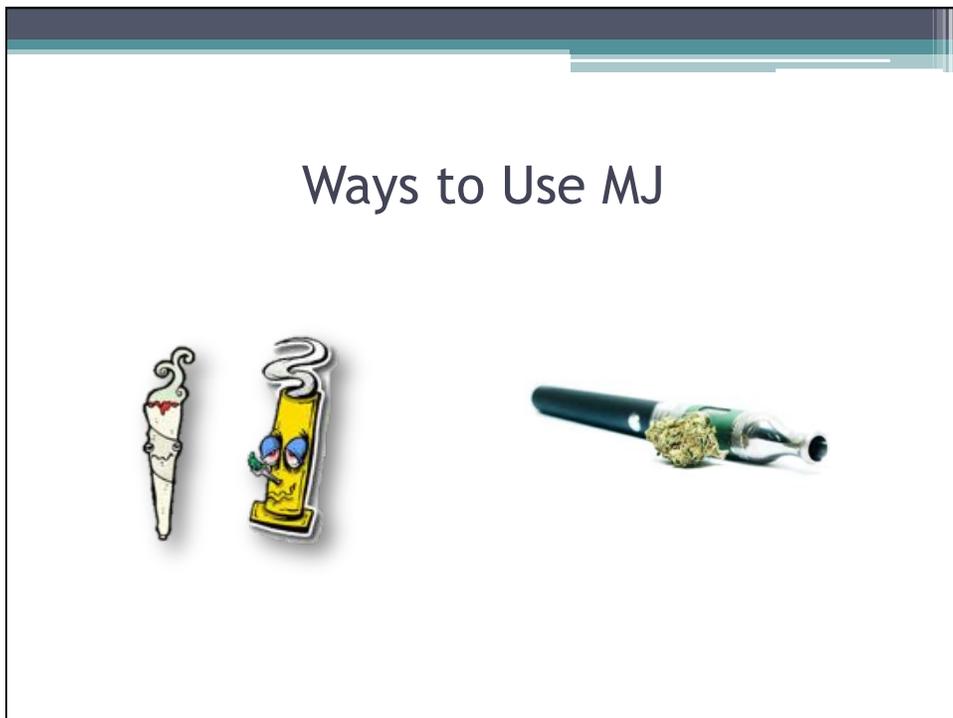
◦ MTF 2018

Prevalence of Annual MJ Use

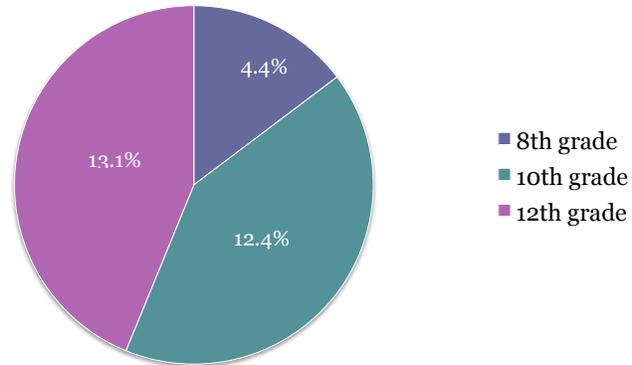


Daily Use of MJ



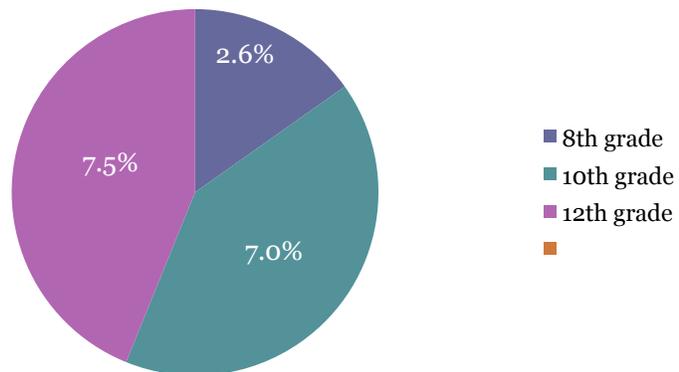


Prevalence of Vaping MJ Over the Past Year



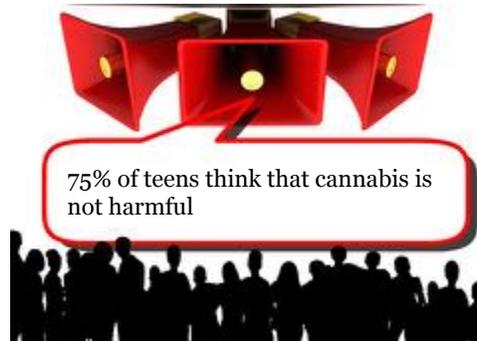
MTF 2018

Prevalence of Vaping MJ Over the Past Month



MTF 2018

Do Adolescents Think MJ is Harmful?



Hughes A et al State Estimates of adolescent marijuana use and perceptions of risk of harm from marijuana 2015

Every day, 3,287 Teens Use MJ for the 1st Time



Risk Factors for MJ Use

- Genetic factors
- Family history
- Minimal parental supervision
- Drug availability
- High risk peer group
- Need for thrill seeking activities



Impact of Medical Marijuana Laws



- Exposure to MJ advertising associated with both intention to use and use of MJ 1 year later
- Teens living in states that have passed MML are less likely to view MJ as harmful
- Rates of MJ use have not increased significantly in states that have passed MML



What is Marijuana?



- Cannabis indica
 - Relaxation
 - Lethargy
 - Sleep
- Cannabis sativa
 - Increased alertness
 - Increased energy

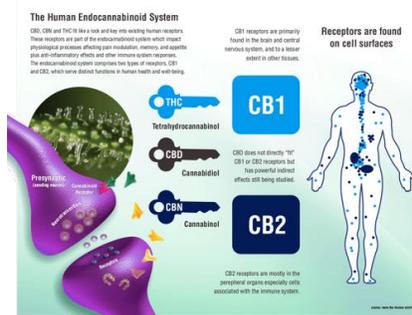
What Is Marijuana?

- Delta-9-THC: psychoactive
- THC: dried leaves, seeds, stems, oil, and flowers of the plant
- Euphoria lasts minutes to hours



Cannabinoids

- C sativa contains 60 cannabinoids, as well as 400 other chemicals
- Cannabinoids: cannabidiol (CBD), cannabigerol (CBG), and cannabinol (CBN)
 - Are not psychoactive (phytocannabinoids)
- CB1 receptors: CNS
- CB2 receptors: immune cells and throughout the body



Marijuana Potency



- 1960s-1970s: MJ contained 1-2% THC
 - Hawaiian sensimilla: 3%
- THC content has increased by 2-7 times
- **Potency in the US increased to 20%**

Types of Marijuana

- **Hashish**: derived from dried exudate from the top and underside of *C sativa* leaves
 - Potency ranges from 10%-20%
- **Hashish oil**: concentrated hashish distillate
 - Potency ranges from 15%-30%
- **Sensimilla**: made from the seedless female flower of the cannabis plant
- **Blunt**: cigarette or cigar that is filled with marijuana
- **Sherms (or water or wet)**: a joint is dipped into PCP and dissolved in an organic solvent, such as formaldehyde

Marijuana Extracts

- Solvent-based and solvent-less MJ concentrates are much more potent than the flower alone
- Solvents used to extract the THC include CO₂, butane, or alcohol
- Cannabis oils are used in vape pens and capsules



Marijuana Extracts



- Hash oil or honey oil-gooey liquid
- Shatter – hard, amber colored solid
- Shatter is easy to manipulate and less messy

Marijuana Extracts

- Pull and snap: honey colored with a taffy-like consistency
- Distillate: refined, or distilled, version of cannabis
 - It is run through a purification process several times
 - Looks like honey in color and consistency



Marijuana Extracts: Crystalline



- Solid extract
- Processes involving filters used to destroy the plant matter remaining in the extract, preserve the THC, and remove left over solvents
- Clear crystals
- 99% THC

THC Extracts: Wax

- Texture of candle wax
- Budder/badder: gooey, viscous wax
- Crumble: crumbled wax
- Honeycomb: wax with holes, resembles a honeycomb
- Potency ranges from 50%-90%

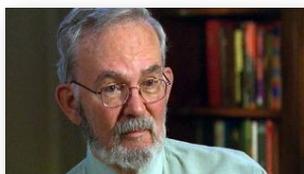


Dabbing

- Flash vaporization of cannabis extracts by applying to a hot surface and inhaling the vapor



Synthetic Cannabinoids



- John W. Huffman, professor of organic chemistry, developed synthetic marijuana to study the interaction between drugs and brain receptors.
- No cannabinoids listed in the ingredients
- Marketed as incense
- Contains HU-210, which is a synthetic cannabinoid that is 50-400 times more potent than THC and lasts longer

Synthetic MJ Adolescent Use

- 3.5% of 12th graders
- 2.9% of 10th graders
- 1.6% of 8th graders
- Lowest rates in 7 years



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Adverse Effects of Synthetic Cannabinoids



- Psychotic episodes
- Agitation & anxiety
- Tachycardia: 110-150 bpm
- Elevated blood pressure: 140-160/100-110 range
- Suicidal ideation and attempts
- Seizures
- Intense hallucinations
- **MI and CVAs in young people**

Is MJ Beneficial?



Benefits of Marijuana in Adults

- Management of neuropathic pain
- Management of hypertension
- Post-stroke neuroprotection
- Management of multiple sclerosis
- Cannabinoids inhibit cancer growth, angiogenesis, and metastasis
- Remedy for inflammation
- Remedy for diarrhea in Crohn's Disease
- Treatment for dystonia,
- Treatment for rheumatoid arthritis
- Treatment for glaucoma
- Treatment for N/V (chemo)
- Treatment of epilepsy
- Treatment of wasting/cachexia
- Treatment for Huntington's Chorea
- Block negative memories in PTSD
- Adjuvant treatment for prostate CA

Medical Marijuana: High Quality Evidence for Treatment of Health Conditions



- Chronic pain
- Neuropathic pain
- Spasticity due to multiple sclerosis

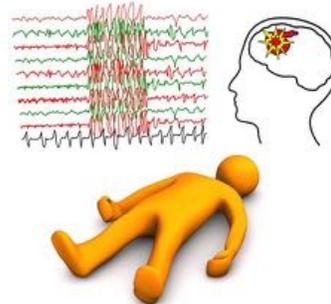
Medical Marijuana: Low-Quality Evidence to Treat Health Conditions

- Nausea and vomiting due to chemotherapy
- Weight gain in HIV infected patients
- Sleep disorders
- Tourette's syndrome



Childhood Seizures

- Promising evidence that CBD oil is effective



Adolescent Use of Medical Marijuana

- ADD/ADHD
- Anxiety and depression
- Autism
- Anorexia
- Chronic pain
- N/V related to chemotherapy
- No evidence on efficacy/harms



Ammerman S & Tau G Weeding Out the Truth: Adolescents and Cannabis 2016

What Are the Health Impacts of MJ Use?



Short-term Side Effects of MJ

- Dizziness
- Dry mouth
- Nausea
- Fatigue
- Somnolence/drowsiness
- Euphoria
- Vomiting
- Disorientation
- Confusion
- Loss of balance
- Hallucinations
- Short-term memory loss
- Anxiety/panic attacks
- Delayed reaction times

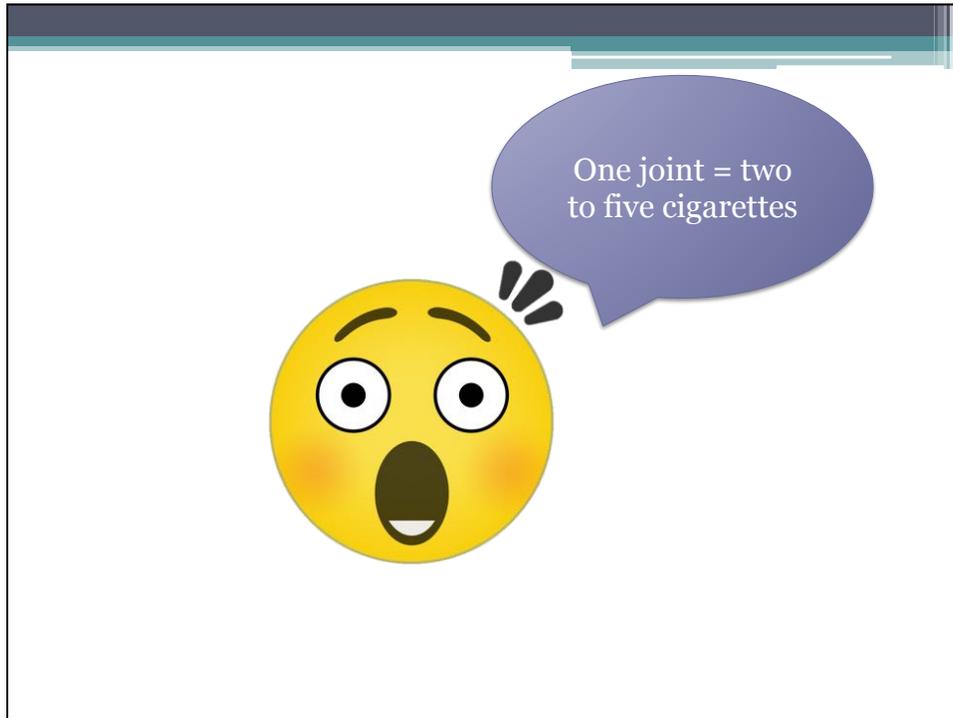


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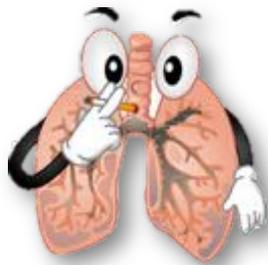
Wang et al 2008; Borgelt et al 2013

Marijuana and the Lungs





MJ and the Lungs



- MJ smoke contains volatile chemicals and tar
- Large airway inflammation
- Increased airway resistance
- Lung hyperinflation
- Chronic bronchitis/increased cough
- Increased outpatient medical visits for respiratory problems

Is There Evidence That MJ Causes Lung Cancer?

YES

NO

MJ and Lung Cancer: Unclear

- MJ smoke contains carcinogenic combustion products
- 50% more benzoprene and 75% more benzathracene than cigarette smoke
- Higher amounts of ammonia, hydrogen cyanide, and polycyclic aromatic hydrocarbons than cigarette smoke
- **MJ smoke is inhaled deeper and held for longer than cigarette smoke**
 - Four times more tar deposition



Owen KP et al Marijuana: Respiratory Tract Effects 2013

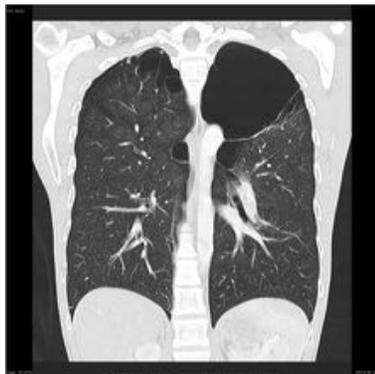
MJ Smoking and Lung Cancer

- Well-designed population studies have failed to find an increased risk of lung cancer associated with marijuana use
- Comorbid use of MJ and tobacco
- Evidence for antineoplastic effects of MJ – can be protective against CA



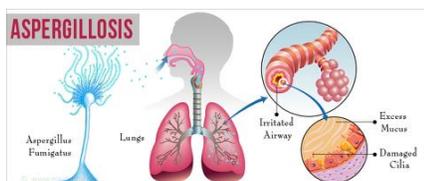
Owen KP et al Marijuana: Respiratory tract effects 2013

Marijuana and Barotrauma



- Upper lobe bullous disease has been described in young MJ smokers
- Smoking MJ involves taking a deep breath and holding it
- Valsalva maneuver
- Pneumothorax (“bong lung”)
- Pneumomediastinum and pneumorachis (air in the spinal canal) have occurred

Aspergillus and MJ



- Aspergillus fumigatus can contaminate MJ
- Immunosuppressed patients (on chemotherapy, renal transplant, and AIDS) have developed chronic pulmonary aspergillosis
- Uncommon

Owen KP et al Marijuana: Respiratory tract effects 2013

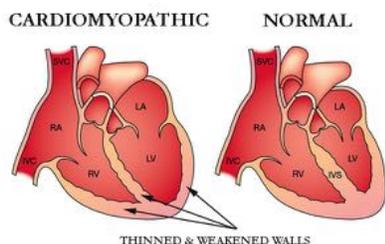
Cardiac Effects of MJ

- THC targets CB1 receptors, which are found in the myocardium, vascular smooth muscle, and endothelium
- Bradycardia
- Vasodilation
- Hypotension
- Negative inotropic effects
- Synthetic cannabinoids (Spice, K2) have 100x the potency of delta-THC



Hill GED, et al Chronic MJ and synthetic cannabinoid-induced toxic myocarditis and end-stage cardiomyopathy: Management with mechanical circulatory support as a bridge-to-transplantation 2018

Cardiac Effects of MJ



- Acute or chronic MJ or synthetic cannabinoid abuse linked to major adverse cardiovascular events
- Myocardial infarction
- Arrhythmias
- Stroke
- Cardiomyopathy
- Sudden cardiac death

Cardiovascular Emergencies Associated With MJ Use

- Acute coronary syndrome
- Cardiac arrhythmias
- Ischemic stroke
- Stress cardiomyopathy
- Sudden death
- Acute myocardial infarction
- Vasculopathy
 - Cannabis arteritis
 - Migratory thrombophlebitis
 - Renal artery dissection



Singh et al Cardiovascular complications of marijuana and related substances: A review 2017

Cannabinoid Hyperemesis Syndrome



- Cyclic episodes of vomiting, nausea, and mild abdominal pain
- Marijuana precedes most cyclic vomiting attacks by years (some cases occur after only months of MJ use)
- Reduction and/or resolution of symptoms after cannabis cessation
- Abrupt attacks with accompanying abdominal pain and ER visits and hospitalizations
- **Relief of symptoms with hot showers or baths**

Cannabinoid Hyperemesis Syndrome: Treatment

- Disruption of the thermoregulatory systems of the hypothalamus is reduced by bathing in hot water
- Supportive therapy: IV fluids, anti-emetic medications
- **Hot showers or baths work best**
- Hyperemesis phase typically lasts 24-48 hours
- Haldol has shown to be effective anecdotally
- Cessation of cannabis use prevents recurrences
- Prevalence of CHS doubled after legalization of MJ in Colorado

Is MJ Addictive?



I can't become
addicted to
MJ, right?

Cannabis Use Disorder: DSM V

- Problematic pattern of cannabis use leading to clinically significant impairment or distress
- Within a 12 month period, need at least 2 of the following:
 - Cannabis often taken at a larger dose or over a longer period of time than intended
 - There is a persistent desire or unsuccessful efforts to cut down or control use
 - A great deal of time is spent in obtaining cannabis, using cannabis, or recovering from its effects
 - Craving, or a strong desire or urge, to use cannabis
 - Recurrent use results in a failure to fulfill major role obligations at work, school, or home

Cannabis Use Disorder: DSM V

- Continued use despite having persistent or recurrent social or interpersonal problems caused by, or exacerbated by, the effects of cannabis
- Important social, occupational, or recreational activities are given up or reduced
- Recurrent cannabis use in situations where it is physically hazardous
- Continued use despite having a persistent physical or psychological problem caused by or exacerbated by use

Cannabis Withdrawal Syndrome

- Symptoms start within 48 hours of stopping use & can last up to 12 weeks
- Irritability, restlessness, anxiety, aggression, and sleep difficulties
- Worst symptoms during the 1st week of abstinence, decreases over 4 weeks
- CNR-1 (cannabis receptor) gene has been linked with cannabis withdrawal symptoms, as well as addiction and craving



MJ Use and Educational Outcomes

- Interferes with attention, motivation, memory, and learning
- Earn lower grades
- More likely to drop out of high school
- May result in an IQ drop up to 8 points
 - Evidence that genetics and family environment lead to both MJ use and lower IQ



What Can Clinicians Do?



Preventive MJ Messages

- Provide factual information
- Discuss the consequences of MJ use during adolescence
- Real stories
- Offer something better to do



How To Decrease MJ Use



- Educate about the potential negative health impacts of cannabis
- Target groups at high risk for substance abuse, including males and those with increased psychological stress
- Encourage youth to delay onset of use as long as possible after adolescence and young adulthood

MI Tools: Quadrants

Good things about using	Good things about quitting
Not so good things about using	Not so good things about quitting

SBIRT

- **Screening:** ask if the teen is using MJ
- **Brief Intervention:** provide feedback to the teen, based on what they have told you
- **Referral:** if the teen is interested in receiving help to quit
- **Treatment:** outpatient or inpatient rehab

Problem vs Solution

- Teens do not see their drug use as a problem
- Drug use is a solution to a problem/problems
- Often a solution for mood disorders, abuse, isolation, and anxiety
- Provide support to treat any underlying mental health issues



Racial Disparity In The Criminalization of MJ

- Whites and Blacks use MJ at the same rates
- Blacks are 3.7 times more likely than Whites to be arrested for possession
- Blacks are >10 times likely to go to prison, as compared to Whites



Criminalization of MJ

- Most MJ arrests are treated as misdemeanors (fines, probation)
- Arrest ends up on the person's record, whether or not it leads to prosecution or conviction
- This can influence the severity of punishment for future offenses
- In most States, MJ convictions lead to:
 - Revocation of a professional license
 - Suspension of a driver's license
 - Inability to get insurance, mortgage, bank loans
 - Denial of access to public housing
 - Loss of student financial aid

Summary



- Marijuana is widely used by US adolescents
- Evidence that MJ negatively impacts cognition and learning
- Evidence that MJ increases respiratory complaints and some diseases
- Evidence for negative cardiac effects, including myocardial infarction and sudden death
- Black adolescents are criminalized at much higher rates for their marijuana use, compared to White youth