

# Discussing Marijuana on Campus: Lessons Learned, Research Questions, and Prevention Needs



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## Overview of this presentation

- Review emerging research questions
- Discuss prevention and intervention developments
- Consider possible roles for peers and professionals
- Consider lessons learned (with an eye toward implications for your campuses)

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## Marijuana legalization status



<http://www.governing.com/gov-data/safety-justice/state-marijuana-laws-map-medical-recreational.html>

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# Questions/Challenges

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## Research questions related to a changing legal climate

- How will use by youth and adolescents be affected?
  - 19% of seniors said they would try mj or increase use if legalized

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Source: Kilmer & Lee (2013)

**Marijuana News**

### More pot at school since law passed, superintendent says



**KING 5**  
12/11/12

by TRAVIS PITTMAN / KING 5 News  
Posted on December 11, 2012 at 11:04 AM  
Updated Tuesday, Dec 11 at 1:40 PM

Washington's school superintendent is sending a reminder to students and parents. Just because the state has legalized marijuana possession, you still can't have it or use it at school.

Superintendent Randy Dorn said Tuesday that there are reports from school districts indicating an increase of pot possession and use by young people, especially since voters passed

**Marijuana News**

### Two middle school students arrested for pot

by Associated Press and KING 5 News  
Posted on December 10, 2012 at 12:14 PM  
Updated Thursday, Dec 14 at 12:11 PM

WALLA WALLA, Wash. — Two 13-year-old middle school students in Walla Walla have been arrested for marijuana possession.

A school resource officer at Pioneer Middle School arrested one student Wednesday after a small amount of marijuana was found in his locker the previous day.

**KING 5**  
12/6/12

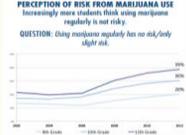
**Healthy Youth Survey**  
March, 2013

**Marijuana: perception of harm continues to go down**

Because the availability of marijuana will increase if the legalization initiative is implemented (there are still questions about the federal government's reaction), we were very interested to see if the survey would reveal changes in marijuana consumption. So far, based on this new data release, marijuana use rates are relatively stable. However the survey includes a question that may foreshadow future changes in consumption. The question asks, "How much do you think people risk harming themselves if they smoke marijuana regularly (at least once or twice a week)?" A national study of long term trends shows that when youth do not perceive harm in marijuana use, they are more likely to use it. As we see in the table, the number of youth who say "no risk" or "very slight risk" has been growing. Other survey items question the youth about their perceptions of the opinions of others, if and when youth perceive greater community acceptance of marijuana use, a change that could already be in motion based on the passage of the Initiative 502, attitudes about their own use could change.

**PERCEPTION OF RISK FROM MARIJUANA USE**  
Increasingly more students think using marijuana regularly is not risky.

QUESTION: Using marijuana regularly has no risk/very slight risk.



Year	Percentage
2005	15%
2006	16%
2007	17%
2008	18%
2009	19%
2010	20%
2011	21%
2012	25%

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## Research questions related to a changing legal climate

- How will use by youth and adolescents be affected?
  - 19% of seniors said they would try mj or increase use if legalized
- How is DUI reliably measured, and how long after use should one wait before driving?

Source: Kilmer & Lee (2013)

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## Impaired driving and duration of effects

- Effects on the brain
  - Reaction time is impacted
    - DUI implications
    - Grotenhermen, et al., (2007) suggest it takes 3 hours for THC levels to drop to 4.9 ng THC/ml among 70 kg men
    - From a public health standpoint, Hall (2013) recommends waiting up to 5 hours after use before driving




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## Driving (among 18-25 year olds who reported using at least once in the past 30 days)

• <b>OBSERVED</b>		• <b>WEIGHTED</b>	
• Driving within 3 hours of using		• Driving within 3 hours of using	
◦ 0 times	52.5%	◦ 0 times	50.59%
◦ 1 time	14.2%	◦ 1 time	14.13%
◦ 2-3 times	12.7%	◦ 2-3 times	13.28%
◦ 4-5 times	6.4%	◦ 4-5 times	6.43%
◦ 6 or more times	14.2%	◦ 6 or more times	15.57%

Source: Washington Young Adult Health Survey  
 UW CSHRB & Washington DBHR  
 PI: Kilmer (March, 2015)

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## Research questions related to a changing legal climate

- How will use by youth and adolescents be affected?
  - 19% of seniors said they would try mj or increase use if legalized
- How is DUI reliably measured, and how long after use should one wait before driving?
- Will increased availability result in increased use (regardless of age group)?

Source: Kilmer & Lee (2013)

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## Impact of Outlet Density for Alcohol

- **Restrictions on alcohol retail outlet density.**
  - Higher density of alcohol outlets is associated with higher rates of consumption, violence, other crime, and health problems.
  - Higher level of drinking rates associated with larger number of businesses selling alcohol within one mile of campus

From: "A Call to Action: Changing the Culture of Drinking at U.S. Colleges,"  
NIAAA Task Force

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## Research questions related to a changing legal climate

- How will use by youth and adolescents be affected?
  - 19% of seniors said they would try mj or increase use if legalized
- How is DUI reliably measured, and how long after use should one wait before driving?
- Will increased availability result in increased use (regardless of age group)?
- What, if any, are the guidelines for moderate or low-risk use (e.g., harm reduction strategies) for marijuana use?
- Will an illegal market truly be avoided through legalization & sales through state-regulated stores?

Source: Kilmer & Lee (2013)

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What do the data tell us about rates of use right now?

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### Substance Use Data from Monitoring the Future Study

- Any illicit drug
  - 38.9% report past year use
- Marijuana
  - 35.5% report past year use
- Any illicit drug other than marijuana
  - 19.0% report past year use Source: Johnston, et al (2014)
- Important to keep abstainers abstaining
  - 12.8% who first tried marijuana at age 14 or younger meet criteria for dependence or abuse, compared to 2.6% who first used after 18 (SAMHSA, 2011)



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Considering Responses:  
What Works and What  
Lessons Can We Learn  
From Alcohol?

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**Lesson Learned Number One?  
How we discuss marijuana with  
students matters...a lot...**

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**OARS:  
Building Blocks for a Foundation**

- **Ask Open-Ended Questions**
  - Cannot be answered with yes or no
  - We, as the ones asking the question, do not know where answer will lead
    - “What do you make of this?”
    - “Where do you want to go with this now?”
    - “What ideas do you have about things that might work for you?”
    - “How are you feeling about everything?”
    - “How’s the school year going for you?”
    - “Tell me more about that.”
    - This is different than the closed-ended “Can you tell me more about that?” or “Could you tell me more about that?”

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**What open-ended questions could  
you ask that might prompt...  
...consideration of “consequences”?  
...change talk?  
...consideration of strategies for  
making changes?**

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## Finding potential hooks, change talk, and behavior change strategies: An Example

- “What are the good things about marijuana use for you?”
- “What are the ‘not-so-good’ things about marijuana use?”
- “What would it be like if some of those not-so-good things happened less often?”
- “What might make some of those not-so-good things happen less often?”

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## Discussing marijuana...word choice matters

- “Do you smoke marijuana?”
  - A person who uses edibles daily can honestly say “no”
  - If screening with a yes/no, consider “do you use marijuana?”
- “Do you use marijuana?” or “have you used marijuana?” followed by, “What does your marijuana use look like?”

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We can improve our assessment of what college students and young adults experience

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## MARIJUANA CONSEQUENCES MEASURES

- Most college student marijuana consequence measures adapted from established alcohol measures
- May not adequately capture experiences of students
- Particularly important to capture unwanted effects if hoping to provide feedback on “consequences” in motivational enhancement programs.
- Students (n=207) were asked to identify up to five effects of marijuana use that “may not have been so good”
  - 805 separate effects identified
  - 193 students listed at least one consequence/effect
    - 88% of these listed 3 or more consequences

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### Top 10 Endorsed Marijuana Consequences: Study 1

1. Eating (e.g., eating too much)
2. Sleep problems
3. Productivity, apathy, motivation issues, or boredom
4. Cognitive abilities, attention, or concentration problems
5. Memory problems
6. Problems with lungs or coughing
7. Feeling antisocial or experiencing social awkwardness
8. Physical difficulties outside of lungs, cough, mouth, or throat (e.g., feeling dizzy, sick, uncoordinated, etc.)
9. Not getting things done
10. Spending too much money

*Notes.* Preliminary analyses suggested that among the top ten types of consequences generated by participants, only two (not getting things done and financial impact) were reflected in items from the RMPPI, and these two were the ninth and tenth most mentioned consequences.

Walter, Kilmer, Logan, & Lee (2012)  
Lee, Kilmer, Neighbors, Walters, Garberson, & Logan (in prep)

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## MEASURE DEVELOPMENT

- 22 item College Marijuana Consequence Scale was developed
- Compared responses to the 18-item Rutgers Marijuana Problem Index (RMPPI)
- 410 students who used marijuana at least once in the past 30 days

### College Marijuana Consequence Scale

- 376 listed at least one consequence
- 85.3% listed 3 or more consequences
- Average number of consequences = 6.8

### Rutgers Marijuana Problem Index

- 290 listed at least one consequence
- 56.9% listed 3 or more consequences
- Average number of consequences = 3.3

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## CONCLUSIONS/NEXT STEPS

Current version is 26 items combining the most face valid items for both measures

Relevant consequences may not be captured on other measures of YA harms/risks

Independent of what studies say about "negative effects," if there's a consequence/harm/effect identified by a student as unwanted, this can prompt consideration of change

Understand the relevance and salience of consequences to the population we're working with

Future studies can test usefulness with non-college samples

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## What are we doing about intervention and prevention?

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## Risk Perception

- **43% of marijuana users experienced a past year academic consequence**
  - Only 20% perceived risk for a future academic consequence, compared to 71% of abstainers
- **35% of marijuana users experienced a past year social consequence**
  - Only 9% perceived risk for a future social consequence compared to 55% of abstainers

Kilmer, et al. (2007)

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## Tier 1: Evidence of Effectiveness Among College Students

- **Combining cognitive-behavioral skills with norms clarification and motivational enhancement interventions.**
  - Reductions in drinking rates and associated problems (e.g., ASTP)
- **Offering brief motivational enhancement interventions.**
  - Reductions in drinking rates and associated problems (e.g., BASICS)
- **Challenging alcohol expectancies.**
  - Reductions in alcohol use

From: "A Call to Action: Changing the Culture of Drinking at U.S. Colleges," NIAAA Task Force

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## Goals of a Brief Intervention

- Prompt consideration of change
- Prompt commitment to change
- Reduce resistance/defensiveness
- Plant seeds
- Explore behavior change strategies

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## Personalized Feedback Interventions

Lee, C.M., Kilmer, J.R., Neighbors, C., Atkins, D.C., Zheng, C., Walker, D.D., & Larimer, M.E. (2013). Indicated prevention for college student marijuana use: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 81*, 702-709.

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*individualized* College Health for Alcohol  
and Marijuana Project  
(R21DA025833)



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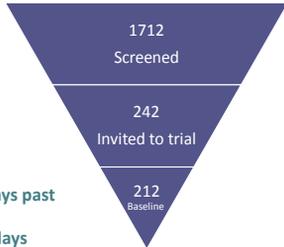
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Participants



- Two public PNW universities/colleges
- Screening criteria:
  - 5+ days use MJ past month
- Demographics (N = 212)
  - 45.3% Female
  - 74.8% White
- Mean Use at Screening
  - 7.6 joints per week / 14.2 days past month (Campus 1)
  - 10.5 joints per week / 18.3 days past month (Campus 2)



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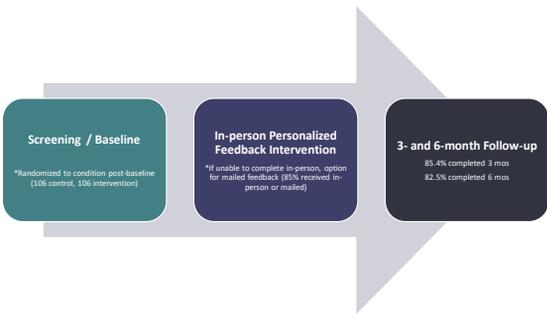
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Procedures



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### Feelings About Reducing Use or Quitting Marijuana

You noticed feeling confident enough in reducing or not using in 3 out of 20 situations.



You had less confidence in your ability to avoid smoking in these situations:

- o Having to do some monotonous (boring) work
- o Seeing someone else smoking marijuana and enjoying it
- o Drinking alcohol
- o Feeling like celebrating some good news or accomplishment
- o Feeling angry about something or someone
- o Have some time to yourself, free of responsibilities
- o Using other drugs recreationally
- o At a party where people were smoking marijuana
- o With a date or close friend who was smoking marijuana
- o In an uncomfortable situation
- o Offered marijuana by someone
- o Bored with nothing to do
- o Stressed out with nothing to do

### Family History

We consider your risk based on family history to be:




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### Your Social Network

Let's explore who's important to you and who you can count on for help or support.



Person's name or initials	Does this person know you smoke marijuana?	How does (or would) this person feel about your marijuana use?

### Your Goals

You listed these as your 5 most important goals.



Very Negatively 1	Negatively 2	Not Positively or Negatively 3	Positively 4	Very Positively 5
Goal				
How, if at all, does marijuana use affect attainment of this goal?		How, if at all, would reducing marijuana use affect attainment of this goal?		
Trying to build a new and better society for all.				
Trying to always be there fully for my friends.				
Trying to keep learning to my full capability.				
Trying to meet new friends and be an open person.				
Trying to live to my fullest.				

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## Our Findings

3 Month Outcomes

6 Month Outcomes

# Days in last 30

# Days in last 30

# Joints per week

# Joints per week

Hours high per week

Hours high per week

Consequences

Consequences

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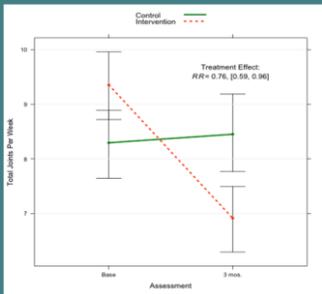
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At 3 months, intervention participants reported 24% fewer joints smoked per week relative to control participants.




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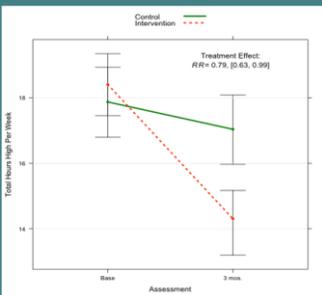
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At 3 months, intervention participants reported 21% fewer hours being high per week relative to control participants.




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## Thoughts from iCHAMP

- **Very encouraging results!**
- **No difference in # of days used, but how students are using within day**
- **Six months?**
  - Assessment effects?
  - Seasonal effects?
  - Need for booster sessions?
- **Attendance rates**
  - 85% received feedback; 55% in-person
  - How do we get non-treatment seeking, non-mandated individuals to attend an intervention?

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## Mandated students

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## Interventions for marijuana use

- The limited number of studies involving college students nevertheless suggest motivational framework in an in-person intervention is promising (e.g., McCambridge & Strang, 2004; Miller, et al., 2001; White, et al., 2006)
- However, motivational interviewing-based interventions work with a range of drugs other than alcohol within the general adult dependent population, including in groups (e.g., Stephens, Roffman, & Curtin, 2000; Budney, et al., 2000; Longshore & Grills, 2000; Baker, Boggs, & Lewin, 2001; Van Horn & Bux, 2001)

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## Interventions for marijuana use

- Need for group had been established.
- No “Tier I” type of interventions for marijuana use
- Motivational-enhancement based interventions have demonstrated success with mandated students for alcohol
- Motivational-enhancement based groups can impact drug use in the general adult population
- MOD was developed using ASTP as a model

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## Intervention follow-up

- In research studies, randomized controlled trials with behavioral outcomes are ideal (i.e., inclusions of comparisons to a control group with longitudinal follow-up)
- Not ideal, however, for judicial/conduct needs, nor realistic
- Measure to assess intent to change and contemplation
- Using that exact measure, pilot data were collected to see if the workshop “performs” the way a motivational-enhancement based program should



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## MOD Content

- Elicit the “good” things and the “not-so-good” things about marijuana use from students
- Where applicable, bring in what the science says about the consequences students have identified
- Where applicable, highlight ways in which these “not-so-good” things can be reduced or eliminated
- Explore what would make some of those “not-so-good” things happen less often
- Review other substances when relevant and/or of interest to the participants



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## Next steps...

- Now that post-intervention surveys have been collected as pilot data, move toward follow-up with behavioral outcomes
- Continue to incorporate new scientific findings into conversations with students
- Examine elements/components contributing to intent to change and/or actual change
- Further identify strategies for reducing harm

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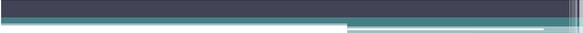
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**Some topics and potential roles  
for peers and professionals**

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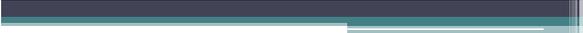
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**Norms**

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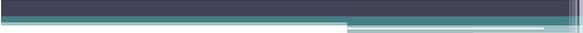
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**Role of peers**

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### Social norms: Perception versus reality

- People are influenced by their subjective interpretation of a situations rather than by the actual situation (Lewin, 1943).
- We are influenced by our perception of others' attitudes, behaviors, and expectations rather than by their actual attitudes, behaviors, or expectations.
- Our perceptions and interpretations are often inaccurate.

Source: Neighbors & Kilmer (2008)

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### Norms Clarification

- Examines people's perceptions about:
  - Acceptability of excessive behavior
  - Perceptions about the prevalence of drinking among peers
  - Perception about the rates of drinking by peers



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### Norm Perception

- In survey of 5990 participants, 67.4% of students said the hadn't used MJ in the past year
  - Thus, "most" students don't use marijuana
- Only 2% of students got this right!
  - 98% of students perceived the typical student to use at least once per year
- Misperceptions were related to use and consequences

Kilmer, et al. (2006)

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Consider the following as it applies to peer leaders...

- We know that student perceptions of the substance use decisions made by peers impacts that student's own use
- However, student perceptions of substance use decisions by leaders are even more impactful
- What does this mean for peer health educators, RAs, campus officers, and others?

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## Role of professionals

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## Norms

- Not clear guidelines for social norms mass marketing
- But...
  - Can collect data on what is happening for use in personalized normative feedback
  - Can be careful about statements or messages that feed into a misperceived norm
  - Take steps to ensure abstainers and/or those in recovery know they're not alone and feel supported in decision to not use

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## Policies

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## Role of peers

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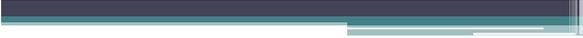
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## Rubington's R.A. Research

Rubington (1993, 1996)

- Studied trends in sanction/violation data
  - Suggested that if decrease in violations occur...
    - Some new policy or program might be working
    - Students might be “wising up” as to where and when to do their drinking
    - Residents and R.A.s might negotiate what will and will not be sanctioned
      - R.A.s might get less strict in their enforcement

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## Rubington's R.A. Research

Rubington (1993, 1996)

- Different R.A. styles (“by the book,” “laid back,” or “in between”), and there is variability in styles of enforcement depending on the site of the offense
  - Too laid back can cause loss of control on one’s floor
  - Too strict can result in efforts to circumvent the policy

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## Role of professionals

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## Support for policies and enforcement is there!

- A small group students may be quite vocal on campus to the point administrators withhold policy changes assumed to be unsupported by the student body (Lavigne, et al., 2008)
- Among students, Saltz (2007) found a “universal tendency” to underestimate student support for policies

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**Saltz (2007) conclusions (p. 459)**

- "...campuses would actually have more incipient support for a variety of alcohol prevention policies than is likely to be perceived by the students themselves, and, by extension, administrators and others belonging to the campus community. "
- "...Unless students are persuaded that such support is not limited to a fringe element, new policies are likely to be met with at least passive, if not active, resistance."

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**Saltz (2007) conclusions (p. 459)**

- "...This then, suggests that today's campus prevention interventions, which now often comprise campaigns to correct students' perception of peer alcohol consumption, may want to incorporate a parallel effort to correct their perception of peer support for policies as well."
- "This information may prove revelatory to some, and critical to the chances of having a significant impact on alcohol-related problems on campus, which is the ultimate target."

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**Raise awareness  
and clarify  
expectations as  
soon as possible**

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**E-mail sent to all students on 12/3/12  
(legalization began 12/6/12)**

From: Eric S. Godfrey [<mailto:egodfrey@u.washington.edu>]  
Sent: Monday, December 03, 2012 11:41 AM  
To: 'egodfrey@uw.edu'  
Subject: FW: Update on Initiative 502 - Use and Possession of Marijuana

Dear Students:

As most of you I presume already know, State Initiative 502 (I-502) - legalizing, under state law, the possession of a small quantity of marijuana - was adopted in the November 2012 general election and takes effect December 6, 2012. I-502 revised state law regarding the regulation, taxation and criminal and civil penalties for the production, distribution and possession of marijuana. While I-502 decriminalized the possession and use of small quantities of marijuana for those 21 and over, it is important to note that under federal law, the possession and use of even small amounts of marijuana remain a federal crime. **Though voters in the state passed the initiative, possessing and using marijuana on or in any University facilities will remain against the law.**

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As a recipient of federal funds, such as financial aid and federal grants and contracts, the University of Washington must comply with the Safe & Drug Free Schools and Communities Act and the Drug-Free Workplace Act. Compliance requires maintaining a drug-free campus. If the University does not comply with federal laws and regulations on marijuana possession and use on campus, it risks losing federal funds. Accordingly the passage of I-502 will not change current University of Washington policies prohibiting production, distribution, possession or use of marijuana on University property or during University-sponsored activities. (see:<http://www.washington.edu/admin/rules/policies/APS/13.07.html>). **A violation of these policies may lead to sanctions under the student conduct code, the general code of conduct or the University rules applicable to faculty and staff.**

It is also important to note that even I-502 continues to make it unlawful for anyone, whatever their age, to open a package containing marijuana or consume marijuana in a public place. **And I want to emphasize to you that policies and procedures prohibiting the use of marijuana at the University will not change as a result of I-502.** For students who feel marijuana is causing problems for themselves or their friends, feel free to contact:

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**Health and mental health**

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## Role of peers

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## Many students might be slipping through the cracks

- **96.1% with an alcohol use disorder do not receive services** (Wu, et al., 2007)
- **Only 36% who screen positive for depression receive medication or services** (Eisenberg, et al., 2007)
- **Of 125 suicides reported by Counseling Centers, only 14% were current or past clients** (Gallagher, 2014)

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### The Jed Foundation:

Promoting emotional health and preventing suicide

[ABOUT US](#)   [PROGRAMS](#)   [LEARN MORE](#)   [GET INVOLVED](#)   [PRESS ROOM](#)



**OVER 75% OF STUDENTS WOULD TURN TO FRIENDS IF THEY WERE STRUGGLING.**

Need help now?  
Call 1-800-275-TALK (8255)

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## Role of professionals

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## Talk to counseling and health center providers about what this could mean on their end

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### Cannabis Use Associated with Risk of Psychiatric Disorders (Hall & Degenhardt, 2009; Hall, 2009; Hall 2013)

- **Schizophrenia**
  - Those who had used cannabis 10+ times by age 18 were 2.3 times more likely to be diagnosed with schizophrenia
  - “13% of schizophrenia cases could be averted if cannabis use was prevented (Hall & Degenhardt, 2009, p. 1388)”
- **Depression and suicide**
  - “Requires attention in cannabis dependent” (Hall, 2013)
- **Screening suggestions**
  - Revised CUDIT-r
  - <http://www.otago.ac.nz/nationaladdictioncentre/pdfs/cudit-r.pdf>



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# Considering withdrawal (and management of withdrawal)

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## Motivations for Use

• Research team utilized qualitative open-ended responses for using marijuana among incoming first year college students to identify which motivations were most salient to this population.

Lee, Neighbors, & Woods (2007)

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## Motivations for Use

Motive Category	Proportion of participants endorsing motive	Proportion of primary motives
Enjoyment/fun	82.14%	24.03%
Social enhancement	42.81%	16.40%
Boredom	41.25%	29.36%
Altered perception	26.71%	8.66%
Activity enhancement	25.08%	4.15%
Food enhancement	24.64%	6.97%
Image enhancement	18.14%	5.10%
Celebration	13.74%	2.23%
Medical use	10.68%	0.95%
Habit	10.58%	1.81%
Rebellion	5.68%	0.80%
Alcohol intoxication	5.21%	0.32%
Anxiety reduction	4.42%	0.47%
Relaxation	3.79%	0.00%
Conformity	3.31%	0.00%
Confidence	2.85%	0.32%
Conformity	1.26%	0.16%
Confidence	1.26%	0.16%
Confidence	0.95%	0.00%

Lee, Neighbors & Woods (2007)

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## As we move forward on college campuses...

- Are “smoke free” policies enough?
  - Edibles, vaporizers, e-cigarettes
  - What focus do we need to put (if any) on messages about food at parties (e.g., we warn about not accepting a drink when students don’t know what’s in it)?
- How might applications/enrollment be impacted (if at all)?
- What message about enforcement are students getting (and are they seeing mixed messages)?
- What is the impact of off-campus businesses that see an opportunity?
- What is impact on border states/provinces (and campus visitors)?

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## Future directions

- Current grant supplement to study effects of marijuana legalization
- Recently completed Washington Young Adult Health Survey – 2,101 18-25 year olds across the state
- Continue to evaluate prevention efforts
- Realize that any one thing you do (or any one drug you target) is part of an overall prevention puzzle
- We’re all in this together – learn from successes and challenges



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## Lessons Learned

- Any one thing we do is a part of an overall puzzle.
  - Consider where your particular piece fits
  - Identify the other pieces in your community when considering a strategic plan or approach
    - Policies/Enforcement Efforts
    - Environmental approaches
    - Partnerships/Coalitions
    - Prevention/Intervention Efforts
    - Screening
    - Outreach
    - Bystander approaches
  - Find the missing pieces



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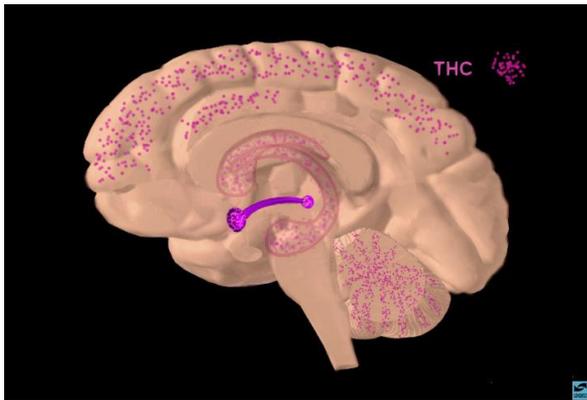
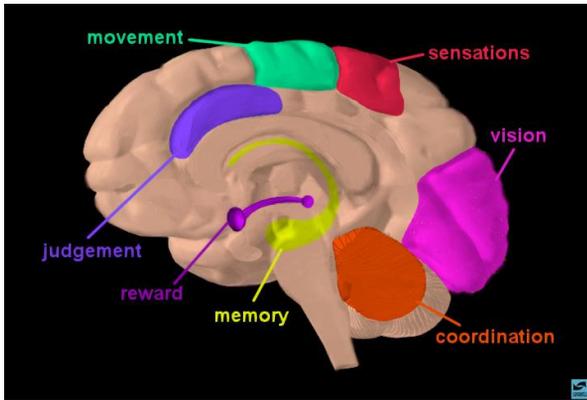
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## Some Basics on Marijuana



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### MARIJUANA USE – onset

- **When smoked...**
  - Effects begin immediately
  - Last 1-3 hours
- **When consumed in food or drink...**
  - Effects begin 30-60 minutes
  - Last up to 4 hours

NIDA (2012)

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### MARIJUANA USE – effects after use

- Feel euphoric or “high” due to action in the reward system of the brain
- After euphoria passes, may feel sleepy or depressed
- Occasionally produces anxiety, fear, distrust, panic

NIDA (2012)

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### MARIJUANA USE – effects after use

- **With high doses, may experience acute toxic psychosis**
  - Hallucinations
  - Delusions
  - Depersonalization
- **Seem more likely when high dose is consumed in food/drink rather than smoked**
- **Specific causes of symptoms unknown**

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## Impact on sleep (and, importantly, subsequent days)

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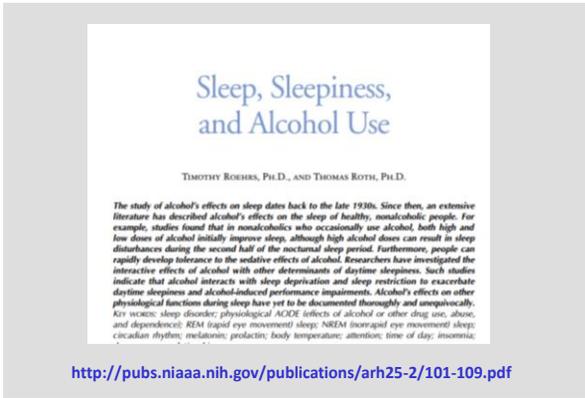
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## Absorption and Oxidation of Alcohol

- Factors affecting absorption
  - What one is drinking
  - Rate of consumption
  - Effervescence
  - Food in stomach
- Factors affecting oxidation
  - Time!
  - We oxidize .016% off of our blood alcohol content per hour

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## Time to get back to .000%

- .08%?
  - 5 hours  
(.080%.....064%.....048%.....032%.....016%.....000%)
- .16%?
  - 10 hours  
(.160%.....144%.....128%.....112%.....096%.....080%.....064%.....048%.....032%.....016%.....000%)
- .24%?
  - 15 hours  
(.240%.....224%.....208%.....192%.....176%.....160%.....144%.....128%.....112%.....096%.....080%.....064%.....048%.....032%.....016%.....000%)

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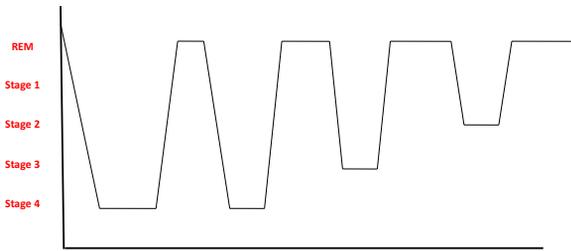
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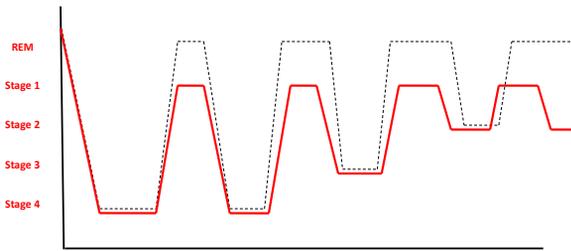
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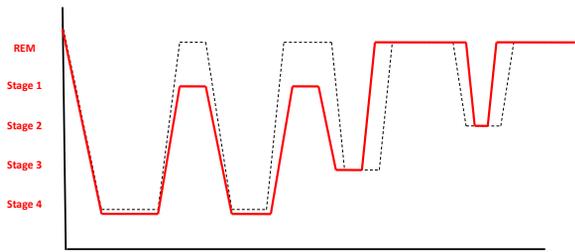
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Next day, increase in:  
 •Daytime sleepiness  
 •Anxiety  
 •Irritability  
 •Jumpiness

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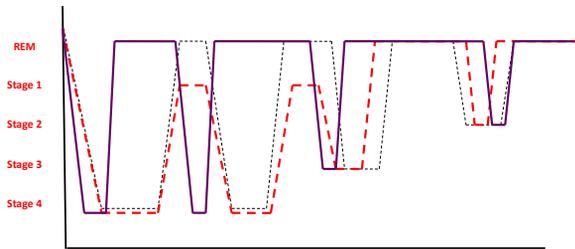
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Next day, increase in:  
 •Daytime sleepiness  
 •Anxiety  
 •Irritability  
 •Jumpiness  
 Next day, feel:  
 •Fatigue

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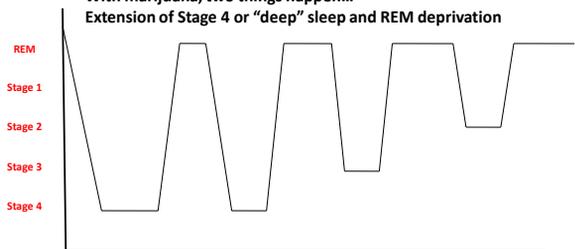
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**With marijuana, two things happen...**  
**Extension of Stage 4 or "deep" sleep and REM deprivation**



Sleep impairment documented as  
 persistent effect of marijuana use  
 NIDA (2012)

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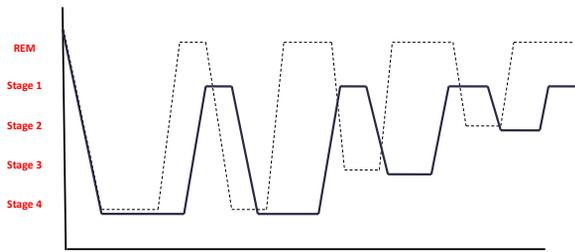
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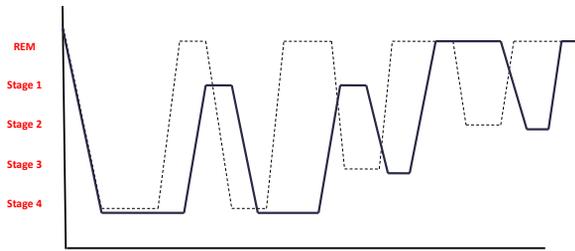
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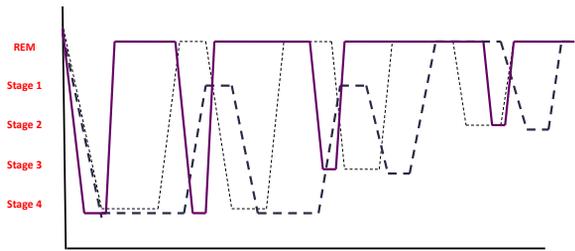
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Next day, just like with alcohol, increase in:  
 •Daytime sleepiness  
 •Anxiety (note that there is a Cannabis Induced Anxiety Disorder)  
 •Irritability  
 •Jumpiness




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Next day, just like with alcohol, increase in:  
 •Daytime sleepiness  
 •Anxiety (note that there is a Cannabis Induced Anxiety Disorder)  
 •Irritability  
 •Jumpiness  
 Next day, feel:  
 •Fatigue

## Marijuana and cognitive abilities



- **Effects on the brain**
  - **Hippocampus**
    - Attention, concentration, and memory
  - **Research with college students shows impact on these even 24 hours after last use (Pope & Yurgelun-Todd, 1996)**
  - **After daily use, takes 28 days for impact on attention, concentration, and memory to go away (Pope, et al., 2001)**
  - **Hanson et al. (2010):**
    - Deficits in verbal learning (at 3 days, not 2 weeks or 3 weeks)
    - Deficits in verbal working memory (at 3 days, at 2 weeks, not 3 weeks)
    - Deficits in attention (still present at 3 weeks)

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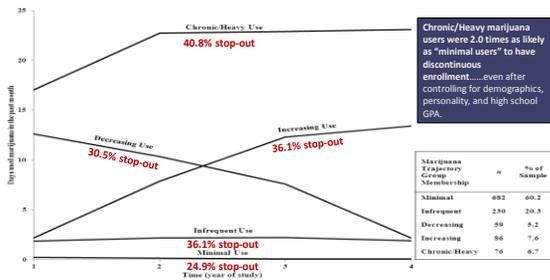
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## Marijuana use trajectories: relationship to “discontinuous” enrollment

Source: Arria, 2013




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## Marijuana’s impact on the body...

- **Effects on heart rate and blood pressure**
  - **Increases heart rate** NIDA (2012)
    - On average, 29 beats per minute increase
  - **Raises blood pressure**
- **Effects on lungs**
  - **Vital lung capacity** NIDA (2012); Tashkin, Calvarese, & Simmons (1978)
  - **Symptoms of chronic bronchitis** Volkow, et al., (2014)
  - **Carcinogen exposure** Cohen (1981); NIDA (2012)
    - 70% more benzopyrene in mj smoke than tobacco smoke
    - 50% more polyaromatic hydrocarbons in mj smoke than tobacco smoke




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## Marijuana's impact on the body...

- **A word about impact on motivation**
  - Definitely hard to measure but it could be any one (or more) of the following (or a yet to be determined additional factor)...
  - Hippocampus impacts motivation
  - Marijuana's impact on sleep
  - Block passage of nutrients between cells



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## Marijuana's impact on the body...

- **"The munchies"** (Mahler et al., 2007)
  - Stimulation of anandamide

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Thank you!

Special thanks to Cherise Murphy and Eric Davidson

Jason Kilmer  
jkilmer@uw.edu



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