Slide 1		ו	
Slide 1			
	Marijuana		
	Sailing the Rhetorical Seas Pt. 2		
	KSAODS, July 2014		 
	PRIME		
	For Life Sponsored by Prevention Research Institute		 
	Alian Barger, MSW PRI Research Analyst	j	
Slide 2		1	
3114C 2	What are the risks?		
	Impairment     Cognitive deficits		
	Addiction     Diminished Life Outcomes		
	<ul><li>5. Not typical, but real:</li><li>A. Cardiac problems</li></ul>		 
	<ul><li>B. Heart attacks &amp; fatalities</li><li>6. Rare but devastating:</li></ul>		
	A. Schizophrenia B. Cancer		
		j	
Slide 3	Risk 1. Impairment	]	
	No. 1. Impairment		
	"Getting high is just harmless fun and a	ı	 
	great way to relax."		
	Seed of Truth:		
	Marijuana can be fun and relaxing.		
		1	 

Slide 4	Risk 1. Impairment	]		
	Cannabis is the most commonly used illegal substance in			 
	DUI.  > DUI reports on adults 18 and older:			
	• 17,876,000 DUIs - with alcohol			
	13,124,000 DUIs - with cannabis (73.4% of all DUI other than alcohol)			
	<ul> <li>2,900,000 DUIs - with cocaine (16.2% of all DUI other than alcohol)</li> <li>NOTE: Cocaine is the 2<sup>nd</sup> largest drug using/drving group</li> </ul>			
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Slide 5	Risk 1. Impairment		 	 
	Research on Cannabis and Driving		 	 
	<ul> <li>Past use of THC (24 hours earlier) – no effect on crash risks</li> </ul>			
	Recent use of THC (past 2-4 hours) - increases risks for motor vehicle accidents			 
	THC alone increases risk			
	Synergistic effect of alcohol & THC - greater impairment		 	 
	than either alone			
Slide 6	Risk 1. Impairment	]		
	Mak I. Impairment			
	Marijuana users do attempt to adjust for impairment			
	> Slower speeds			
	<ul> <li>Greater following distance</li> <li>Marijuana impairs mostly automated driving skills</li> </ul>		 	
	Weaving			
	➤ Time estimation		 	
	> Impaired ability to shift attention			
		•		

Slide 7	Risk 1. Impairment	
	Effects of Cannabis and Alcohol Combined	
	> THC & alcohol vs. same-BAL alcohol only	 
	2.9 increased odds of causing fatal crash     When both alcohol and THC was present in fatally injured	
	drivers, 95% of those drivers caused the fatal crash  > THC and alcohol combined results in:	 
	Severe driving impairment     Sharp increase in the risk of accidents and culpability	 
	Sharp increase in the risk of accidents and culpability	
Slide 8	Risk 1. Impairment	 
	Impact of THC Impairment on Fatal Crashes	
	Any level THC – 2.7 increased odds of causing a fatal crash	
	<ul> <li>≥5 ng/ml THC – 6.6 increased odds of causing a fatal crash</li> <li>THC mostly impairs automated driving skills.</li> </ul>	 
Slide 9	Risk 1. Impairment	 
	State Per Se THC Impairment Levels  None	 
	Any Illegal substance or metabolite in the blood	
	(defined in state code)  • Per se THC levels ranging from 1 ng/ml – 10 ng/ml	

Slide 10	Risk 1. Impairment		 
	·		
	➤ Pennsylvania has a 1 ng/ml per se THC law		 
	Ohio and Nevada have 2 ng/ml in blood per se THC laws		
	Three states have per se THC laws at 5ng/ml in blood		 
	✓ Colorado ✓ Washington		
	✓ Montana		
Slide 11	Risk 1. Impairment – Are they impaired?	]	
	Max 1. Impairment – Are trey impaired:		
	Why Measuring THC Impairment is Complex		 
	<ul> <li>Not like alcohol in its effects</li> <li>Unlike alcohol, impairment does not follow blood</li> </ul>		
	levels		 
	<ul> <li>We need to know what we're measuring</li> <li>THC, Hydroxy-THC, Carboxy-THC</li> </ul>		
		J	 
Slide 12	Risk 1. Impairment – Are they impaired?		
	Why Measuring THC Impairment is Complex		 
	<ul> <li>Δ<sup>9</sup>-THC (THC) – psychoactive, persists in blood 1-4 hours</li> </ul>		
	<ul> <li>11-Hydroxy-Δ<sup>9</sup>-THC (hydroxy) psychoactive, persists in blood 2-6 hours</li> </ul>		 
	> 11-Nor-9-Carboxy-THC (carboxy) non-psychoactive, persists in blood for a number of days		
	passad in 2002 to 2 than 200 or 22/3		

### What are the risks?

- 1. Impaired Driving
  - 2.7 increased odds of causing a fatal crash with any THC blood level
  - 6.6 increased odds of causing a fatal crash with <u>></u>5 ng/ml blood level

### **Executive Brain Functions -**

- Attention
- Concentration/Persistence to Task
- Decision Making (especially with new information)
- Impulsivity/Inhibition

### Slide 15

### **Executive Brain Functions -**

- Reaction Time
- Risk Taking
- Verbal fluency
- Working (or Short-term) Memory


Slide 16	Risk 1. Impairment	 	
	While IMPAIRED, multiple studies find deficits in :	 	
	<ul><li>Attention (in light but not heavy users)</li><li>Concentration</li></ul>	 	
	<ul><li>Inhibition</li><li>Impulsivity</li></ul>		
	* Increased Risk-taking	 	
Slide 17	Risk I: Acute Impairment & Injury	 	
	Does Cannabis Protect from Overall Injury?     Two studies found an inverse relationship between injury and marijuana use.	 	
	Results widely promoted by NORML	 	
	Does this make what we teach wrong? No  Marijuana users are more likely to do nothing – reducing their day for injury.		
	their risk for injury.  • When they drive or do other activities, they are <b>MORE</b> likely to be injured.	 	
Slide 18	Risk I: Acute Impairment & Injury	 	
	Macii aa aa liala da isaa aa aa af isi aa aa ah isaa ah		
	Marijuana use linked to increased rates of injury requiring hospitalization     Increased risk for cannabis users vs. nonusers:	 	
	Any Vehicular Assault Self-Inflicted Injury Injury Injury Injury	 	
	Males 1.5 Increased Odds Odds Odds Odds Odds		
	Females 2.1 Increased Odds	 	

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### Risk 1 - Impairment

They may!

- Acute effect is *decreased* ability to shift attention, i.e. more focus on one thing.
   Rebound effect is decreased ability to focus on one thin while not using, increasing the felt need to use to
- Rebound effect may increases with duration of use.

### What are the risks?

- 2. Cognitive deficits
  - a) lowered IQ in heavy using adolescents
  - b) attentional deficits
  - c) Impaired executive brain functions

### Slide 21

### Risk 1. Impairment

### The New View

- · Those using cannabis do injure themselves and others.
- Cannabis use decreases the ability to shift attention among multiple tasks.
- Impairs impulse control with more impulsive behavior
- · Impairs working memory
- · Increases risky decision-making


Slide 22	Risk 2 – Lingering Effects		 
	"It's better than alcohol. I don't have a	-	 
	hangover; I get high, I come down.		
	Everything is fine."	-	
	Seed of Truth:  • People don't have obvious hangovers		
	from using marijuana.	-	
		_	 
		_	
		_	
Slide 23	Risk 2 – Lingering Effects	_	
	Deficits in:	-	 
	Short-term memory		
	<ul><li>Attention</li><li>Decision making / Risk Taking</li></ul>	-	 
	Verbal Fluency		
	Reduced IQ (in those starting in adolescence)	-	
		_	 
		_	
		_	 
Slide 24	Risk 2 – Lingering Effects	_	
	Mon 2 Lingdining Endote		
	Executive Brain Functions help us:	-	 
	• Plan		
	<ul><li>Organize new information</li><li>Integrate the info into new approaches</li></ul>	-	 
	Persistence to task		
		-	
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		-	 

Slide	25
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### Risk 2 - Lingering Effects - Psychosis

Subthreshold psychosis can also be a problem

- Becoming more asocial
- Loss of motivation/energy/concentration
- Drop in functioning
- Increased suspicion and/or exaggerated beliefs
- Odd behaviors

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### Risk 2 - Lingering Effects Summary

### **The New View**

- Cannabis users over time can develop subtle, but significant, cognitive problems including impaired:
  - · decision-making,
  - · integration and use of new information,
  - · Problem solving, and
  - With early onset, a potentially lower IQ

Marijuana is different from alcohol; but that doesn't make it "safe."

### Slide 27

### Risk 2 - Lingering Effects Summary

### **The New View**

- > Most people using marijuana will not develop a psychosis disorder, but risk is there for some.
- > Predictors of psychosis disorders:
  - family history of psychosis,
  - daily use in adolescence
- episodes of toxic psychosis.
- > Long-term or high-potency use may cause subthreshold psychosis symptoms.

-	 	

Slide 28	Risk 3 – Dependence & Addiction	] .	 	
	"Cannabis is not addictive.		 	
	Or if it is, it's so mild it doesn't matter."			
	Seed of Truth:		 	
	Many people who smoked marijuana			
	were not addicted and quit easily.		 	
		-	 	
		_		
Slide 29	Risk 3 - Dependence & Addiction	] .	 	
	Is Marijuana Addictive?  > A New Understanding – Addiction is centered in brain		 	
	Can marijuana use meet criteria for dependence and addiction?			
	Withdrawal	-	 	
	Loss of control			
		-	 	
		J		
		-	 	
		<b>ה</b>		
Slide 30	Risk 3 - Dependence & Addiction	-	 	
	What we do know:  • Addiction is not just defined by physical dependence	1 :	 	
	leading to withdrawal.			
	<ul> <li>Medical withdrawal does not lead to loss of control.</li> <li>Withdrawal may play a role in continued use and relapse.</li> </ul>	·		
		<b>⊒</b>	 	
		-		

Slide 31	Risk 3 - Dependence & Addiction  One View of Addiction: Same as the eleven DSM-V Substance Use Disorders  > 3 Biological Symptoms  1. Tolerance - need increased amounts or get diminished effect  2. Withdrawal  1. Typical substance withdrawal syndrome or  2. Substance or analog taken to relieve or avoid withdrawal  3. Craving - strong desire to use a particular substance	
Slide 32	Risk 3 - Dependence & Addiction  One View of Addiction: Same as DSM-V Dependence  > Elght Behavloral Symptoms  > Recurrent use with failure to engage in life roles  > Recurrent use despite social or interpersonal problems  > Recurrent use in physically hazardous situations  > Using more or longer than intended  > Desire or have unsuccessful efforts to cut down/control use  > Spend a lot of time obtaining, using, or recovering  > Decrease or give up important activities due to drug  > Recurrent use despite knowledge of physical or psychological problems caused or made worse	
Slide 33	Risk 3 - Dependence & Addiction  Another View of Addiction: Homeostasis to Allostasis  > High blood pressure is an allostatic state.  > Drug-driven brain changes lead to addiction as the brain tries to maintain stability in the brain's reward systems.  > Persistent vulnerability to relapse and addiction  > Addiction is an allostatic state characterized by the  • Compulsion to seek and take drug  • Loss of control in limiting intake	

Koob & Le Moal, 2008

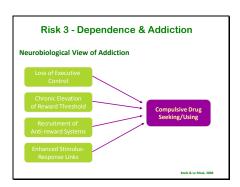
### Risk 3 - Dependence & Addiction

## Addiction - A New Understanding from the Latest Brain Research

- $\,\,>\,\,$  group of behaviors arising from an altered brain
- > characterized by
  - · A compulsion to seek and take drug
  - The loss of control in limiting intake
  - The emergence of a negative emotional state when access to the drug is blocked

Kooh & Le Moal 2008

### Slide 35

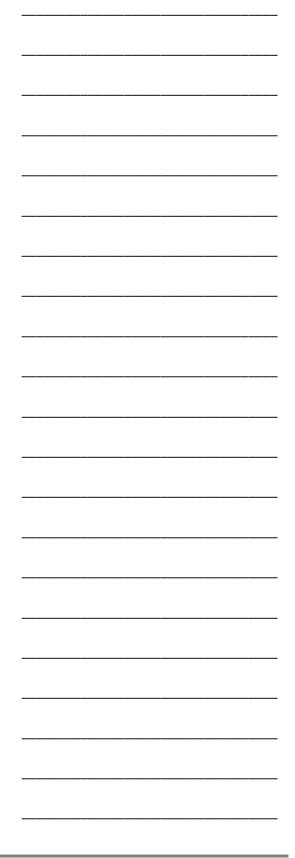


### Slide 36

## Risk 3 - Dependence & Addiction Loss of Executive Control Lingering Deficits in Executive brain functions Planning Organizing Focused attention Persistence to task


# Risk 3 - Dependence & Addiction Loss of Executive Control Chronic Elevation of Reward Threshold Let's explore the second brain change...

**Reward Rebound** 



Slide 39

Slide 38

Reward Rebound

What we experience as euphoria, the brain and its neurons experience as a threat.

• The brain responds to protect itself by making its reward system less sensitive to all reward.

• This is the first reason we have a reward rebound – the brain is acting to protect itself.

Risk 3 - Dependence & Addiction

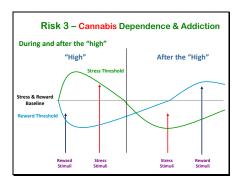
While "buzzed," drunk or high, the brain's reward threshold is temporarily lowered.
 Following the "high," the reward threshold is temporarily raised.

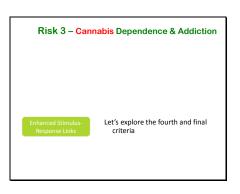
Slide 40	Risk 3 - Dependence & Addiction	
	Nisk o - Dependence & Addiction	
	Chronic Elevation of Reward Threshold  The second reason for reward	 
	Recruitment of Anti-reward Systems rebound is activation of the anti-reward system.	
Slide 41	Bill o Boundary of Addition	
	Risk 3 - Dependence & Addiction	
	Reward Rebound	
	> Many anti-reward chemicals help moderate and shut down the reward system.	
	➤ Loss of reward response leads to a:  • Shift in values	 
	Shift in behaviors	
	➤ Flip side of reward is stress.	 
Slide 42		
311ac +2	Risk 3 - Dependence & Addiction	 
	Chronic Elevation of Reward Threshold Let's see the outcomes of these	
	Recruitment of Anti-reward Systems	

Slide 43	Risk 3 – Dependence & Addiction	]	
	Altered Reward & Stress Systems > Loss of reward leads to a shift in values and behaviors		
	<ul> <li>Less rewarding = less valuable,</li> <li>Less rewarding = less time &amp; energy invested</li> <li>Small stressors:</li> </ul>		
	have <i>more</i> power to trigger our stress responses		
Slide 44	Risk 3 – Dependence & Addiction	]	
	Altered Reward & Stress Systems > Leads to a shift in values and behaviors to		
	> avoid stress > seek reward		
Slide 45	Risk 3 – Cannabis Dependence & Addiction	]	
	Does marijuana use acutely LOWER reward threshold (more pleasure)? $\succ$ Lowered reward threshold by $\Delta^0$ -THC has been		 
	demonstrated by:  Rate-frequency paradigm  Reward-threshold paradigm		
	Similar to all other abused drugs     Cannabis produces conditioned place preference in lab animals.     Self-administration studies find both animals and humans		
	will self administer cannabis.		 

Slide 46	Pick 3 Cannabia Danandanaa 8 Addiation	
	Risk 3 – Cannabis Dependence & Addiction	
	Does marijuana use acutely RAISE stress threshold	
	(reduce stress)?  Multiple studies report:	
	Cannabis stimulates the production and release of opioids, calming the brain and reducing pain (emotional	
	or physical).  • Marijuana users state enhanced relaxation as the #1	
	reason they use.	
		·
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Slide 47	Risk 3 – Cannabis Dependence & Addiction	
	A LOWER stress threshold after a marijuana "high"?	
	Multiple studies report:  • Irritability (87%)	
	Nervousness (80%)	
	<ul><li>Depression (76%)</li><li>Restlessness (76%)</li></ul>	
	• Anger (74%)	
Slide 48	Risk 3 – Cannabis Dependence & Addiction	
	A LOWER stress threshold after a marijuana "high"?	
	Multiple studies find:	
	<ul> <li>More aggressive responses during times of abstinence</li> </ul>	

Slide 49





### Slide 51

Risk 3 – Cannabis Dependence & Addiction

Enhance Stimulus Response

• Compared to non-users, cannabis users:

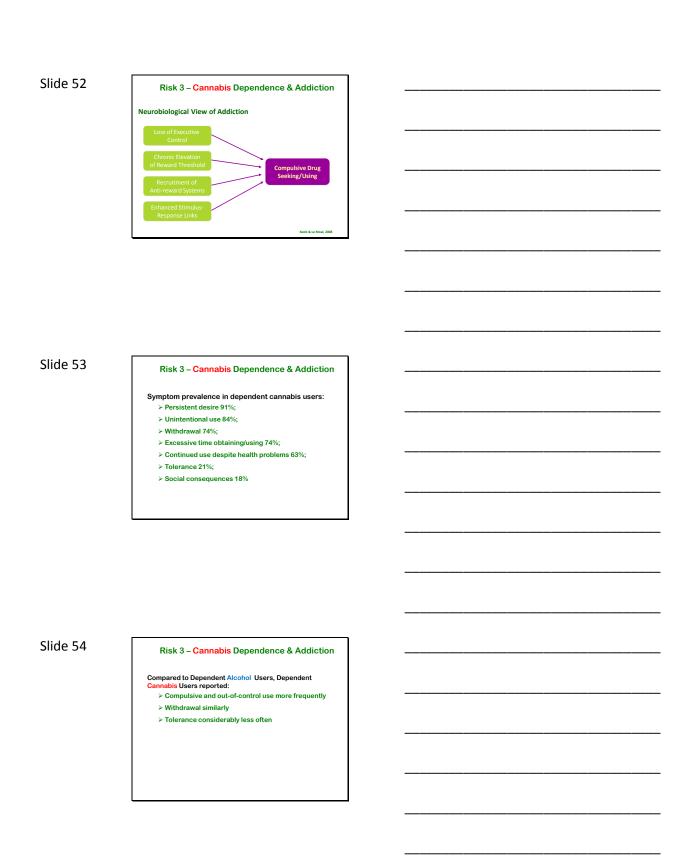
• More quickly focused on cannabis cues

• Spent more time looking at those cues

• Rated the cues as more pleasurable

• Increased craving increased the stimulus response

	 <u>-</u>	



Slide 55	Risk 4 – Cannabis Dependence & Addiction	
	·	
	Most Powerful Predictive Risk Factor of	
	Dependency at Age 21	
	<ul><li>➤ Frequency of cannabis use at age 18</li><li>• Even after controlling for pre-existing</li></ul>	
	psychological or social factors	
	<ul><li>Nonusers who began use – 1.8 odds</li><li>Odds nearly double at each level of use.</li></ul>	
		1
Slide 56	Risk 3 – Cannabis Dependence & Addiction	
	Summary	
	Marijuana has the ability to create: - Social dependence	
	Psychological dependence     Physical dependence	
	Behavioral Loss of Control     Marijuana is addictive, characterized by:	
	A compulsion to seek & take drug     Loss of control in limiting intake	
	The emergence of a negative emotional state when access to the drug is blocked	
Slide 57	Risk 4 – Life Outcomes	
	"People smoking marijuana do just as well in life as those who don't."	
	Seed of Truth:	
	Many people who use marijuana have	
	functional lives.	
		· 

Slide 58	Risk 4 – Life Outcomes	
	Mak 4 - Elie Gutodilies	
	Life Outcomes of Cannabis Users Ages 24-37	
	> Multiple studies of users vs. non-using peers	
	found among cannabis users:  • More with only a high school education or less	
	<ul> <li>More who are unemployed</li> <li>More with lower income</li> </ul>	
	More episodes of use predict greater risk of these outcomes	
Slide 59	Risk 4 – Life Outcomes	
	Life Outcomes of Cannabis Users Ages 24-37	
	Multiple studies of users vs. non-using peers found among cannabis users:	
	<ul> <li>More who never married or are divorced</li> <li>More who are disabled</li> </ul>	
	More who use alcohol, tobacco, or other drugs	
		1
Slide 60	Risk 4 – Life Outcomes	
	Are other drugs the real problem?	
	> Cannabis-only dependent users in treatment vs.	
	other drug-dependent users in treatment  • Cannabis users had more:	
	Depression     Personality disorders	
	Psychosis/schizophreniform disorders	

Slide 61	Risk 4 – Life Outcomes Summary	
	The New View - As a group, marijuana users report  > Poorer quality of life than nonusers, even after controlling for many background factors and other drug	
	use - Lower educational levels	
	Less employment / lower income     More never married or divorced     Less overall life satisfaction	
	➤ Marijuana does not contribute to improved quality of life.	
Slide 62		
Slide 02	Risk 5 – Health Problems	
	Acute Cardiac Problems & Heart Attack     Schizophrenia or Other Psychosis Disorder     Testicular Cancer - nonseminomous germ	
	cell cancer	
Slide 63		
Silue 05	Risk 5 – Heart Disease and Death  The research says:	
	Marijuana use increases heart rate by 30- 100% of normal (up to 160 beats per minute)	
	Supine hypertension, orthostatic hypotension     & fainting     4.8x increased risk of myocardial infarction	

 4.8x increased risk of myocardial infarction (heart attack) in the first hour after smoking

• Reduced experience of angina (12% vs 25%)

Slide 64	Risk 5 – Heart Disease and Death  The research says:  • Among young users there are occasional sudden heart problems  • Atrial fibrillation  • Ventral fibrillation (more serious)	
Slide 65	Risk 5 – Heart Disease and Death  The research says:  There were two recent fatalities reported in young men using cannabis  Concern that the problem is under-recognized and reported, especially as the population ages	
Slide 66	Risk 5 – Heart Disease and Death The prospective research says: Comparing marijuana users to nonusers in those with known heart disease: Doubled (1.9x) increased risk of fatal heart attack in 4 years with any use 2.5x increased risk for less than weekly users 4.9x increased risk for weekly or more users	

### Risk 5 - Heart Disease and Death

### Researchers share concerns:

- The problem is seldom recognized and may be unreported
- Physicians should inquire about marijuana use particularly in heart problems in young adults
- As the population ages, use the marijuana may be contraindicated in those with heart disease

### Slide 68

### Risk 6 - Schizophrenia (rare but devastating)

Studies show cannabis use linked to development of schizophrenia

- Swedish conscript study (n=50.087 males)
- Cannabis use associated with dose-response curve
- · Persisted after controlling for stimulant use

5-10 times 11-50 times > 50 times ose-Response Curve and Developing Schizophrenia .1% Developed Schizophreni

1.9% Developed Schizophrenia 2.2 increased odds 3.8% Developed Schizophrenia 3.1 increased odds

Similar findings from other research

### Slide 69

### Risk 6 - Schizophrenia (rare but devastating)

- Most people using marijuana will not develop a psychosis disorder, but risk is there for some.
- Long-term or high-potency use may cause subthreshold psychosis symptoms.
- > Predictors of psychosis disorders:
  - family history of psychosis,
  - daily use in adolescence
  - personal history of high-potency marijuana use
  - episodes of toxic psychosis


au 1 = a		
Slide 70	Risk 7 – Cancer	 
	> It is suggested the marijuana cures cancer.	
	> This implies that smoked or inhaled marijuana	
	will cure cancer, which is not true.	
	➤ Pure THC and some other cannabinoids	
	applied to some tumors reduce the size of the	
	tumors	
	> This is a promising area that should be	
	pursued	
	➤ Other evidence suggests marijuana may	
	impair immune response to tumors	
Slide 71		
Silde / I	Risk 7 – Testicular Cancer (rare but devastating)	
	> Three independent studies implicate	
	marijuana use as a risk factor for a particular	
	form of testicular cancer (Testicular germ cell tumor or	
	TGCT)	
	Most commonly occurring in young adults aged 18 to 45	
	Doubled the risk (1.7 to 2.2 increased odds)	
Slide 72	Overall Research Conclusions	 
	1. Acute impairment is hazardous.	
	2. Lingering effects do happen.	 
	3. Dependence and addiction happen	
	and quantity/frequency of use	
	predict it.	 
	4. Life outcomes are not improved by	
	the use of cannabis	

### **Overall Research Conclusions**

- 5. There is increased risk for heart disease for some
- Marijuana seems to be an environmental risk factor for schizophrenia
- 7. Marijuana use, particularly daily use, may increase risk for testicular cancer in young men

### Slide 74