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# Non-Medical Marijuana II: Rite of Passage or Russian Roulette?

## A CASA White Paper

April 2004

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White House Office of National Drug Control Policy

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## Accompanying Statement by Joseph A. Califano, Jr., Chairman and President

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In 1999, CASA released the White Paper *Non-Medical Marijuana: Rite of Passage or Russian Roulette*, which described American marijuana policy and reviewed the likely consequences of legalization of marijuana on the extent of use. CASA's 1999 White Paper concluded that proponents of decriminalization and legalization underestimate the role of the law in discouraging the number of users and frequency of use, and misperceive the dangers of marijuana use. This paper, *Non-Medical Marijuana II*, updates the 1999 White Paper and reports new findings about marijuana use and its consequences.

This report focuses on non-medical marijuana. As the Institute of Medicine's 1999 report, *Marijuana and Medicine: Assessing the Science Base*, indicates, the risks and benefits of medical marijuana are matters for physicians, scientists, the National Institutes of Health and the Food and Drug Administration to address. These issues should not be resolved by referenda; pharmaceutical prescription is a matter for physicians, not politicians.

Politicization of the medical marijuana issue confuses compassionate concern for the needs of the sick and dying with tolerance for non-medical use of marijuana. Such tolerance is unjustified, as we have known for some time that marijuana is a dangerous drug. In 1979, as Secretary of Health, Education and Welfare, I asked the Institute of Medicine (IOM) to conduct a comprehensive study on the health effects of marijuana. Based on 15 months of research, the 188-page 1982 IOM study, *Marijuana and Health*, concluded that marijuana has a broad range of psychological and biological consequences--including adverse effects on the nervous system and behavior, the cardiovascular and respiratory systems, and the reproductive system--that the

IOM found to be a matter of “serious national concern.”

This paper explores recent research on the dangers of non-medical marijuana and cautions against complacency about use of the drug. The marijuana available to today’s children is far more potent than what many of their parents smoked and, as is the case with nicotine cigarettes, we have accumulated considerable additional evidence of the dangers of its use. While marijuana use is leveling off, the drug’s increased potency appears to be sending more teens into treatment facilities and emergency rooms.

- From 1992 to 2001, the proportion of children and teenagers in treatment for marijuana dependence and abuse jumped 142 percent.
- From 1999 to 2002, emergency room admissions among 12- to 17-year olds where marijuana was implicated jumped 48 percent.
- Evidence of a connection between the use of marijuana and the later use of other illegal drugs continues to accumulate, as does evidence of the adverse effects of marijuana on the brain, heart and lungs.

Against mounting indications of its dangers, marijuana remains a pervasive presence in the lives of American children and teens. That is why CASA decided to issue this White Paper with the most current information about non-medical marijuana. We seek to alert teenagers and their parents to the dangers of marijuana and curb teen use of the drug. The non-medical use of marijuana is a matter of special concern for teens and parents, since CASA’s research has consistently found that an individual who gets through age 21 without using the drug is virtually certain never to use it or other illegal drugs.

I want to express CASA’s appreciation to everyone who worked on this White Paper. Elizabeth Planet, Special Assistant to the

President at CASA, led the research effort. Glen R. Hanson, PhD, DDS, Professor of Pharmacology and Toxicology at the University of Utah, Herbert D. Kleber, MD, Professor of Psychiatry at Columbia University, Alan I. Leshner, PhD, Chief Executive Officer of the American Association for the Advancement of Science, John Demers and I have reviewed the paper and edited it. Others have read it and made suggestions. But, as always, CASA is responsible for its content.



# Chapter I

## Non-Medical Marijuana--Then and Now

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In 1999, CASA released the White Paper *Non-Medical Marijuana: Rite of Passage or Russian Roulette*, which described American marijuana policy and reviewed the likely consequences of marijuana legalization on the extent of use. CASA's 1999 White Paper concluded that proponents of decriminalization and legalization underestimate the role of the law in discouraging the number of users and frequency of use, and misperceive the dangers of marijuana use. This paper, *Non-Medical Marijuana II*, updates the 1999 White Paper and reports new findings about marijuana use and its consequences.

The message from national statistics on marijuana use by teens is somewhat mixed. The Monitoring the Future Study shows a downward trend in marijuana use among teenagers since 1999: in its 2003 survey, 46.1 percent of twelfth graders report that they have tried marijuana, compared with 49.7 percent in 1999.<sup>1</sup> Tenth and eighth graders report similar declines. (Table 1.1)

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Table 1.1  
**The Monitoring the Future Study, 1999-2003:**  
**Lifetime Marijuana Use**  
**Among 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> Graders**  
**(by percent)**

Grade	1999	2000	2001	2002	2003
12 <sup>th</sup>	49.7	48.8	49.0	47.8	46.1
10 <sup>th</sup>	40.9	40.3	40.1	38.7	36.4
8 <sup>th</sup>	22.0	20.3	20.4	19.2	17.5

The message from the National Survey on Drug Use and Health (formerly the National Household Survey on Drug Abuse) on marijuana use by 12- to 17-year olds is less clear. There is an upward trend in marijuana use among 12- to 17-year olds, from 19.7 percent in 1999 to 20.6 percent in 2002;

however, use among such teens decreased slightly between 2001 and 2002 (from 21.9 percent to 20.6 percent).<sup>2</sup> (Table 1.2) It is not clear whether these differences are statistically significant, especially the decline from 2001 to 2002, since the National Survey on Drug Use and Health notes that methodological changes in the 2002 survey may make comparisons to past years unreliable.

Table 1.2  
**National Household Survey on Drug Abuse/National Survey on Drug Use and Health  
Lifetime Marijuana Use Among  
12- to 17-Year Olds: 1999-2002  
(by percent)**<sup>3</sup>

1999	2000	2001	2002
19.7	20.4	21.9	20.6

In any case, both these surveys likely underestimate marijuana use among teenagers since they are based on self-reports of marijuana use. In self-report surveys, young people typically underreport their substance use.<sup>4</sup> The National Survey on Drug Use and Health is based on personal interviews performed in a household and children are only interviewed when a parent is in the home, increasing the likelihood that the children will underreport risky behaviors such as substance use. The Monitoring the Future survey questionnaires are group administered in classrooms during a normal class period, reducing the likelihood that respondents will provide accurate answers to questionnaire items.

Whether or not teen marijuana use has declined and to what extent, the reality is that at least five million teens have tried marijuana, including almost half of high school seniors. Next to alcohol and tobacco, marijuana is the drug of choice for American teens.<sup>5</sup> It is by far the most widely used illicit drug: about six times as many teens have tried marijuana as have tried Ecstasy or cocaine. (Table 1.3)

Table 1.3  
**Percentage of 12<sup>th</sup> Graders Who Have Tried  
Alcohol, Cigarettes, Illicit Drugs<sup>6</sup>  
(by percent)**

Substance	1999	2003
Alcohol	80.0	76.6
Cigarettes	64.6	53.7
<b>Marijuana</b>	<b>49.7</b>	<b>46.1</b>
MDMA (Ecstasy)	8.0	8.3
Cocaine	9.8	7.7
Crack	4.6	3.6
Heroin	2.0	1.5

Even if we take the optimistic view that marijuana use among children and teens is declining, the troubling fact is that marijuana remains a pervasive and persistent presence in the lives of American teens. In CASA's 2003 survey of 1,987 teens aged 12 to 17, 34 percent reported that marijuana was the easiest substance to buy (compared with cigarettes<sup>7</sup> and beer), up from 27 percent in 1999.<sup>8</sup>

Nearly 40 percent of teens--about 10 million--reported in 2003 that they could buy marijuana within a day; 20 percent could buy the drug within an hour.<sup>9</sup> This measure of availability is down from 1999, when 44 percent of teens reported they could buy marijuana within a day and 30 percent could buy the drug within an hour.<sup>10</sup>

Most people use marijuana for the first time when they are teenagers. Teenage initiates to the drug start using it at very young ages: among youths aged 12 to 17 who have ever tried marijuana, the mean age of initiation is 13 and a half.<sup>11</sup> The mean age of initiation among adults aged 18 to 25 who have ever tried marijuana is 16.<sup>12</sup> (Table 1.4)

Table 1.4  
**Average Age of First Use of Marijuana, by  
Age Group<sup>13</sup>**

Age Group	Average Age of First Use
12-17	13.61
18-25	16.08

With marijuana use among teens so common, the age of initiation so low and such large numbers of youngsters able to get the drug with relative ease, it is crucial that teens, parents, teachers and policymakers have the most up-to-date information about marijuana--including the drug's potency, its health consequences and other risks associated with its use, and that they understand the impact of teen and adult perceptions and attitudes about the drug on likelihood of use.





## Chapter II

# Today's Marijuana--What It Is and How It Works

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### **Form**

A mixture of the dried, shredded leaves, stems, seeds and flowers of the hemp plant *Cannabis sativa*, marijuana is usually smoked in hand-rolled cigarettes (joints) and pipes or water pipes (bongs). It is also smoked in blunts, which are made by slicing open cigars and replacing the tobacco with marijuana, often combined with another drug such as crack cocaine, PCP or methamphetamines.<sup>14</sup> Joints contain an average of 500 milligrams of marijuana; blunts may contain as much as six times this amount.<sup>15</sup> Marijuana may also be mixed into foods, such as brownies, or brewed as a tea.

### **Psychoactive Ingredient**

The marijuana plant contains more than 400 different chemical compounds, 66 of which--the cannabinoids--are unique to the plant; its main psychoactive or mind-altering ingredient is delta-9-tetrahydrocannabinol (THC).<sup>16</sup> When a person smokes marijuana, THC passes from the lungs into the bloodstream, which carries the chemical to the brain and other organs. THC attaches to cannabinoid receptors on nerve cells in the brain and influences the activity of those cells. The number of cannabinoid receptors varies in the different regions of the brain; they are particularly abundant in the parts of the brain that influence coordinated movement, learning, memory, higher cognitive functions, pleasure, and sensory and time perception (the cerebellum, hippocampus, cerebral cortex, nucleus accumbens, and basal ganglia).<sup>17</sup> Appendix A contains a chart and diagram of marijuana's effects on the brain, published by the National Institute on Drug Abuse (NIDA).

## Potency

Marijuana's impact on the user is influenced by the strength or potency of the THC it contains.<sup>18</sup> Since the mid-1980s, the University of Mississippi Potency Monitoring Project, the U.S. government program sponsored by the National Institute on Drug Abuse, has analyzed the THC content of commercial-grade marijuana. NIDA's Potency Monitoring Project tracks the strength of marijuana by measuring the average amount of THC in samples that law enforcement agencies confiscate.

The THC content in commercial-grade marijuana has risen by 50 percent, from an average of 3.71 percent in 1985 to an average of 5.57 percent in 1998.<sup>19</sup> The THC content in sinsemilla (the more potent, unpollinated flowering tops of the female plant) has jumped 70 percent over the same period, from 7.28 percent in 1985 to 12.32 percent in 1998.<sup>20</sup> Higher THC content can make psychotic and other reactions to marijuana (anxiety, agitation, delusions, amnesia, confusion and hallucinations) more likely; marijuana with higher THC content can also increase users' risk of developing dependence on the drug and increase the risk of traffic accidents.<sup>21</sup> Increases in potency have been found to be "a primary factor in transforming the low-dose, self-experimentation type of marijuana use typical of the 1960s to high-potency, high-reward/reinforcement marijuana use and dependence."<sup>22</sup>



## Chapter III

# Health Consequences of Using Marijuana

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Research on the risks and dangers of using marijuana is ongoing, and we do not yet fully understand all of the implications of using marijuana and its effects on organ systems and behavior. But the more researchers study the drug and the consequences of its use, the clearer it becomes that smoking pot is a dangerous game of Russian roulette, not a harmless rite of passage.

Marijuana-related medical emergencies are on the rise among young people. According to the Drug Abuse Warning Network Survey (DAWN), emergency department mentions of marijuana increased 37.2 percent between 1999 and 2002, from 87,068 to 119,472. The increase among 12- to 17-year olds was 48 percent. (Table 3.1)

Patients age 6 to 25 accounted for half (47 percent) of the emergency department mentions of marijuana in 2002.<sup>24</sup> (Table 3.2)

Table 3.1  
**Emergency Department Mentions of Marijuana, 1999-2002<sup>23</sup>**

	1999	2002	% Change
Ages 12-17	12,730	18,845	48.0
All ages	87,068	119,472	37.2

Marijuana was the second most frequently mentioned illicit substance in emergency rooms in 2002 (accounting for 18 percent of mentions), following cocaine (30 percent of mentions). The third most frequently mentioned illicit substance in 2002 was heroin (14 percent of mentions).<sup>25</sup>

Marijuana may be the only drug mentioned or one of five drugs mentioned. What is of concern is the comparative data--the significant increase in the number of mentions over a three-year period and the likelihood that this

increase is related to the increased potency of the drug. For a summary of DAWN data collection methodology, see Appendix B.

Table 3.2  
**Emergency Department Mentions of Marijuana by Age, 1999-2002<sup>26</sup>**

Age	1999	2002
<b>6-11 years</b>	<b>199</b>	<b>31</b>
<b>12-17 years</b>	<b>12,730</b>	<b>18,845</b>
<b>18-19 years</b>	<b>9,176</b>	<b>11,457</b>
<b>20-25 years</b>	<b>18,090</b>	<b>25,439</b>
26-29 years	9,816	12,723
30-34 years	11,595	12,556
35 yrs & up	25,387	38,327
Unknown	75	94
<b>Total</b>	<b>87,068</b>	<b>119,472</b>

## Marijuana and the Brain

Recent research findings indicate that long-term use of marijuana produces changes in the brain similar to those seen after long-term use of other drugs of abuse, such as cocaine and opiates.<sup>27</sup> THC, the main psychoactive or mind-altering ingredient in marijuana, binds to and activates receptors in the brain called cannabinoid receptors, changing the way sensory information gets into the brain and is processed there. There are cannabinoid receptors in different regions of the brain, including the cerebellum (responsible for balance and coordination of movement) and the hippocampus (crucial for learning and memory). THC affects memory by activating cannabinoid receptors in the hippocampus and decreasing the activity of neurons in this area of the brain.

Long-term marijuana use causes temporary cognitive defects, particularly with respect to attention and memory, lasting as long as a few days after smoking marijuana.<sup>28</sup> The cognitive impairments that marijuana causes have been found to worsen with increasing years of use.<sup>29</sup> Even short-term losses of cognitive functions as a result of marijuana use are detrimental, especially to the developing minds of children and adolescents.<sup>30</sup> A study of college students reveals that critical skills related to attention,

memory and learning are impaired among those who use marijuana heavily (an average of 29 out of 30 days), even after discontinuing its use for at least 24 hours.<sup>31</sup> The U.S. Department of Education notes that the use of marijuana is detrimental to young people not only because the drug affects the ability to concentrate and, therefore, master important academic skills, but also because “teens who rely on marijuana as a chemical crutch and refuse to face the challenges of growing up never learn the emotional, psychological, and social lessons of adolescence.”<sup>32</sup> Researchers have found a relationship between marijuana and schizophrenia, psychosis and depression; further work is necessary to determine whether marijuana triggers the onset of schizophrenia or depression in otherwise vulnerable people, whether it causes these conditions in non-predisposed people, or whether it does both.<sup>33</sup>

## Marijuana and the Lungs

Regular marijuana smokers display many of the respiratory problems of tobacco smokers, including daily cough and phlegm, symptoms of chronic bronchitis, more frequent chest colds and damage to lung tissue.<sup>34</sup> Habitual use of marijuana is associated with frequent respiratory symptoms, including chronic bronchitis, acute bronchitis and wheezing.<sup>35</sup>

Regardless of the THC content, the amount of tar inhaled by marijuana smokers and the level of carbon monoxide absorbed are three to five times greater than among tobacco smokers. This may be due to marijuana users inhaling more deeply and holding the smoke in their lungs.<sup>36</sup> Another recent finding is that marijuana use can interfere with tobacco cessation attempts: one study found that tobacco smokers who also smoke marijuana may be less likely to quit smoking tobacco--and even less likely to try to quit--than those who do not smoke marijuana.<sup>37</sup>

## Marijuana and the Heart

Marijuana use causes a 20 percent to 100 percent increase in heart rate, starting during

the ten minutes or so it takes to smoke a marijuana cigarette and lasting two to three hours,<sup>38</sup> as well as increases in cardiac output (the volume of blood pumped by the heart per minute).<sup>39</sup> Cardiac function is altered for some hours after marijuana use.<sup>40</sup>

Within the first hour of smoking, marijuana users have been found to be five times likelier to have a heart attack than non-marijuana smokers; within the second hour, the risk declines to 1.7 times normal and returns to an average risk after two hours.<sup>41</sup>

Scientists believe smoking marijuana puts a strain on your heart but are not sure whether it is the active ingredient THC itself or other substances within the inhaled smoke, such as carbon monoxide and burnt plant particles, that have such negative effects.<sup>42</sup> Further research is necessary to understand the relationship of marijuana use to cardiovascular disease.

## **Marijuana, Fertility and Pregnancy**

Chronic marijuana use has been shown to shorten women's menstrual cycles and can impact the female reproductive system by elevating prolactin hormone levels and depressing testosterone levels.<sup>43</sup> Men who smoke marijuana about four times a week have been found to have reduced volumes of semen and sperm, and to have sperm that move at abnormally high velocity; such sperm may burn out quickly and reduce fertility in men.<sup>44</sup>

Women who smoke marijuana during pregnancy often have children with low birth weights,<sup>45</sup> and researchers have observed that "there is evidence that infants exposed in utero to cannabis [may] have behavioral and developmental effects during the first few months after birth. Between the ages of four and nine years, exposed children have showed deficits in sustained attention, memory and higher cognitive functioning."<sup>46</sup>

## **Drugged Driving**

Marijuana has adverse effects on the skills needed for safe driving. The short-term effects of marijuana use can include difficulty in thinking and problem solving, loss of coordination, increased heart rate, greater likelihood of anxiety and panic attacks. The Substance Abuse and Mental Health Services Administration of the U.S. Department of Health and Human Services reports that marijuana can also make it difficult to judge distances and to react to signals and sounds on the road; these effects can last up to 24 hours after smoking marijuana.<sup>47</sup> A National Highway Traffic Safety Administration (NHTSA) study concluded that marijuana, even in low doses, negatively affects driving performance.<sup>48</sup> The Center for Substance Abuse Prevention of the U.S. Department of Health and Human Services' Substance Abuse and Mental Health Services Administration notes that the danger of driving under the influence of marijuana is magnified for inexperienced teen drivers and their passengers.<sup>49</sup>

According to the 2002 National Survey on Drug Use and Health, almost 11 million people age 12 or older drove under the influence of illegal drugs in the past year.<sup>50</sup> NHTSA reports marijuana is the second most frequently found drug (after alcohol) in crash-involved drivers.<sup>51</sup> In 1996, more than 1.5 million 16- to 20-year olds reported driving within two hours following marijuana use.<sup>52</sup>

Young drivers are almost three times likelier to drive after using illegal drugs such as marijuana: 13 percent of 16- to 20-year olds report driving within two hours after drug use, compared to five percent of those over 20.<sup>53</sup> A recent study of trends from the Monitoring the Future study found that in 2001, 16 percent of high school seniors reported having driven at least once in the past two weeks after drinking alcohol, and nearly the same number--15 percent--reported having driven at least once in the past two weeks after smoking marijuana.<sup>54</sup>

The misconception that driving under the influence of marijuana is a harmless behavior is widespread. Most drivers (56 percent) over the age of 16 claimed that driving within two hours of marijuana use did not affect their ability to drive safely.<sup>55</sup> The frequency of this dangerous behavior may be influenced by perceptions about law enforcement: two-thirds of these drivers (65 percent) thought they were no more likely to be stopped by police within two hours of marijuana use than on other occasions.<sup>56</sup>

Despite evidence of the relationship between marijuana use and road accidents, many people still consider it a safe practice. Detractors of zero tolerance for driving under the influence of marijuana argue that, while drivers high on cannabis tend to be impaired, they are highly aware of their impaired state and drive cautiously to try and compensate. This is an untenable position: an impaired driver is a dangerous driver who should not be on the road. In fact, people smoking marijuana show the same lack of coordination on standard drunk driving tests as do people who have had too much to drink.<sup>57</sup> Second only to alcohol, marijuana is the drug most detected in impaired drivers, fatally injured drivers and motor vehicle crash victims.<sup>58</sup>



## Chapter IV Marijuana, Dependence and Addiction

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Numerous studies have demonstrated marijuana dependence.<sup>59</sup> Individuals will often seek treatment for marijuana dependence when they are unable to stop or decrease their marijuana use despite experiencing sleepiness, depression, inability to concentrate and memorization difficulties that they attribute to their marijuana use.<sup>60</sup>

Since 1992, there have been more treatment admissions among children and teens under age 18 for marijuana than for alcohol or any other drug.<sup>61</sup> (Table 4.1)

Marijuana was the primary substance of abuse for more than 170,000 adolescent and college-age admissions reported to the Treatment Episode Data Set (TEDS) in 2001.<sup>62</sup> TEDS is sponsored by the Office of Applied Studies at the Substance Abuse and Mental Health Services Administration of the U.S. Department of Health and Human Services to provide information on individuals admitted to alcohol and drug treatment. For a summary of TEDS data limitations, see Appendix C.

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Table 4.1  
**Percentage of Treatment Admissions for Alcohol, Marijuana and Other Drugs Among Children and Teens Under Age 18: 1992-2001<sup>63</sup>**

	1992	1994	1996	1998	2000	2001
<b>Marijuana</b>	<b>25.9</b>	<b>47.3</b>	<b>55.3</b>	<b>59.4</b>	<b>61.5</b>	<b>62.6</b>
Alcohol	63.4	43.1	28.8	26.4	24.2	22.9
Drug Other Than Marijuana	10.7	9.6	8.7	9.3	10.4	10.6
Unspecified	0.0	0.0	0.0	0.0	3.9	3.9

The percentage of treatment admissions among children and teens under age 18 for marijuana jumped 142 percent between 1992 and 2001. During the same period, treatment admissions for alcohol *decreased* by 177 percent.

Admissions for drugs other than marijuana remained about the same.

According to TEDS, two-thirds (62.6 percent) of treatment admissions among youths under age 18, where marijuana was the primary substance of abuse, met the DSM-IV<sup>64</sup> criteria for dependence on or abuse of marijuana in 2001, up 12 percent from the prior year.<sup>65</sup> The Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition (DSM-IV), published by the American Psychiatric Association, is the main diagnostic reference of mental health professionals in the United States. DSM-IV criteria for substance dependence include tolerance, withdrawal, and inability to discontinue use of the substance; DSM-IV criteria for substance abuse include recurrent use of the substance despite its interference with work, school, home or other obligations. The fact that two-thirds of marijuana treatment admissions among teens are for dependence or abuse indicates that most kids who are in treatment for marijuana are there for clinically diagnosed drug problems. For a complete list of DSM-IV criteria for substance dependence and substance abuse, see Appendix D.

Research has shed light on marijuana's potential for physical addiction. In 1997, researchers at Scripps Research Institute in California and Complutense University in Madrid found that rats subjected to immediate cannabis withdrawal exhibited changes in behavior similar to those seen after withdrawal of cocaine, alcohol and opiates.<sup>66</sup> By demonstrating that marijuana produces changes in the brain similar to those seen after long-term use of other major drugs of abuse, the researchers found "the first neurological basis for marijuana withdrawal syndrome, and one with a strong emotional component that is shared by other drugs."<sup>67</sup> More recent biomedical research has confirmed that cannabinoids, like other addictive drugs, influence brain reward processes and reward-related behaviors such as drug-seeking and drug-taking behaviors.<sup>68</sup> Furthermore, electrophysiological and biochemical evidence suggests that cannabinoid withdrawal activates

the same brain withdrawal processes as other addictive drugs.<sup>69</sup> These studies point to the addictive power of marijuana.



## Chapter V

# The Association of Marijuana Use to Use of Other Drugs

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The association between the use of marijuana and other drugs is well established: most current cocaine and heroin users have already used marijuana,<sup>70</sup> and people who use marijuana are at higher risk for using other illegal drugs.<sup>71</sup> The Institute of Medicine's 1999 report, *Marijuana and Medicine: Assessing the Science Base*, states: "Not surprisingly, most users of other illicit drugs have used marijuana first. In fact, most drug users begin with alcohol and nicotine before marijuana--usually before they are of legal age. In the sense that marijuana use typically precedes rather than follows initiation of other illicit drug use, it is indeed a 'gateway' drug. But because underage smoking and alcohol use typically precede marijuana use, marijuana is not the most common, and is rarely the first, 'gateway' to illicit drug use."<sup>72</sup>

CASA established a statistical relationship between current use of marijuana--in and of itself--and the use of harder drugs such as cocaine, heroin, methamphetamines, LSD and Ecstasy. For this study, CASA conducted a special analysis of data from the 2001 U.S. Centers for Disease Control and Prevention Youth Risk Behavior Survey of 11,000 ninth through twelfth graders, and isolated teen use of these gateway drugs from other problem behaviors such as fighting, drunk driving, carrying a weapon and attempting suicide. The conclusion: among teens aged 12 to 17 with no other problem behaviors, those who used marijuana at least once in the past 30 days are 13 times likelier than those teens who have not used marijuana in the past 30 days (33.5 percent vs. 4.4 percent) to use another drug like cocaine, heroin, methamphetamines, LSD or Ecstasy, and almost 26 times likelier than those teens who have never used marijuana (33.5 percent vs. 1.3 percent) to use another drug like cocaine, heroin, methamphetamines, LSD or Ecstasy.<sup>73</sup> To appreciate the significance of

this relationship, consider this: the first U.S. Surgeon General's report on cigarette smoking and health in 1964 found a nine to 10 times greater risk of lung cancer among cigarette smokers, and the early results of the extensive Framingham heart study found that individuals with high cholesterol were two to four times likelier to suffer heart disease.

Some have argued that the association between marijuana and other drugs may be explained by drug use propensity--that is, that marijuana and other drug initiation are correlated because both are influenced by individuals' unique propensities to try drugs--rather than by a causal or "gateway" effect.<sup>74</sup> However, a recent study of 311 same-sex twin pairs from Australia found that early marijuana use by itself significantly increased the likelihood of other drug use, even after controlling for genetic and environmental influences.<sup>75</sup> Individuals who used marijuana by age 17 were up to 3.9 times likelier to use other drugs and up to 6 times likelier to experience alcohol dependence and other drug abuse/dependence, relative to their twin who had not used marijuana by age 17.<sup>76</sup> By controlling for environmental and genetic factors, this study is a compelling indicator that the use of marijuana in and of itself is predictive of, and may even cause, the later use of other illicit drugs.

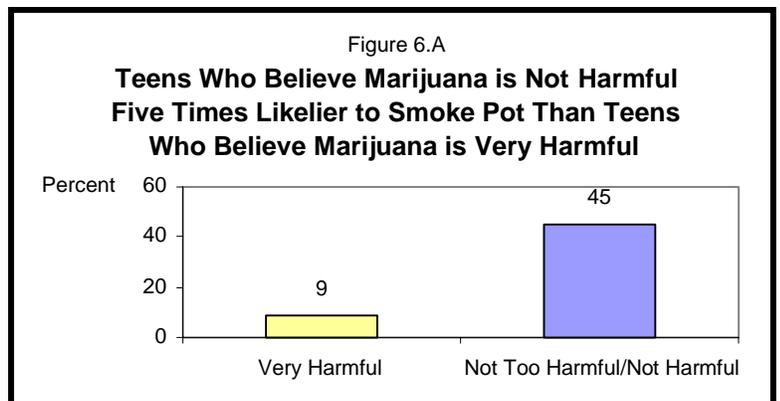
For parents of teens and those teachers, clergy and coaches who work with teens, the message is clear: marijuana use is not only dangerous in and of itself, it is an alarm that signals a higher risk of other drug use.



## Chapter VI Misperceptions About Marijuana

Marijuana is more potent than in the past, there is more data than ever on the short- and long-term health impacts of using marijuana, more emergency room mentions and treatment admissions are associated with the use of marijuana, and the evidence continues to mount for a connection between the use of marijuana and the later use of other illegal drugs. Yet perceptions among teens and their parents about marijuana use often do not reflect these realities.

CASA's 2003 survey of 1,987 teens aged 12 to 17 demonstrates that perception of harm is a crucial factor in a teenager's decision to use marijuana. Among teens who see marijuana as "very harmful," nine percent admit to having tried it, while among those who regard marijuana as "not too harmful" or "not harmful," 45 percent--five times as many--admit to having tried it.<sup>77</sup> (Figure 6.A) The high rate of prevalence and early initiation of marijuana use among teenagers is attributable in part to the impression of teens that marijuana is not a harmful substance.<sup>78</sup>



Perceptions of risk associated with smoking marijuana are decreasing, and this may signal future increases in use. The 2002 National Survey on Drug Use and Health reports that 32.4 percent of youths aged 12 to 17 indicated that smoking marijuana once a month was a

“great risk,”<sup>79</sup> down from 37.2 percent in 1999. (Table 6.1)

Table 6.1  
**Perceived Great Risk of Smoking Marijuana  
 Once a Month Among Teens Aged 12 to 17:  
 1999-2002 (by percent)**<sup>80</sup>

1999	2000	2001	2002
37.2	37.7	35.7	32.4

Decreases in perceived risk tend to precede future increases in use, and increases in perceived risk tend to precede decreases in use.<sup>81</sup> For instance, at tenth and twelfth grades, perceived risk began to decline a year before use began to rise in the 1990s; the decline in perceived risk halted in 1996 in eighth and tenth grades, and use began to decline a year or two later.<sup>82</sup>

Teens’ own perceptions of risk are not the only factors in their drug use behavior. Parents’ perceptions that marijuana is harmless can have a significant impact on their children’s behavior. Children who do not receive strong and consistent messages of parental disapproval of substance use are more likely to engage in substance use themselves.<sup>83</sup> Almost six times as many teens (30.2 percent) who say their parents would “somewhat disapprove” or “neither approve nor disapprove” of their trying marijuana once or twice have used marijuana in the past month compared to teens who say their parents would “strongly disapprove” (5.5 percent).<sup>84</sup>

The Partnership for a Drug-Free America reports a softening in parent reactions to a child’s marijuana use: before 2001-02, slightly more than half of parents of teens in grades seven through 12 (53 or 54 percent) said they would be “extremely upset” if their child tried marijuana, compared with only 49 percent in 2003.<sup>85</sup> This softening in parental concern about marijuana use suggests that many parents do not realize that pot today is more potent than it was in the past and that this increased potency may result in more adverse health consequences to their children.

Some parents may be reluctant to disapprove of their children’s marijuana use because of their own experience with the drug. Such reluctance is unwarranted. Many of today’s parents smoked cigarettes years ago, before they understood the dangers associated with tobacco; but given all of the information available today about tobacco’s devastating effects, and despite their past experiences with smoking, most parents today do all they can to get their children not to smoke cigarettes. With all that we know about the dangers of using marijuana, parents--even those who smoked marijuana in their youth--should take a strong stand against their children’s use of the drug.



## Chapter VII Conclusion

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We know more today than we ever have about the dangers of marijuana use to America's teens and children. The drug is more potent than it was in the past, there is more data on the short- and long-term health impacts of using marijuana, and more emergency room mentions and treatment admissions are associated with the use of marijuana. The evidence continues to mount for a connection between the use of marijuana and the later use of other illegal drugs.

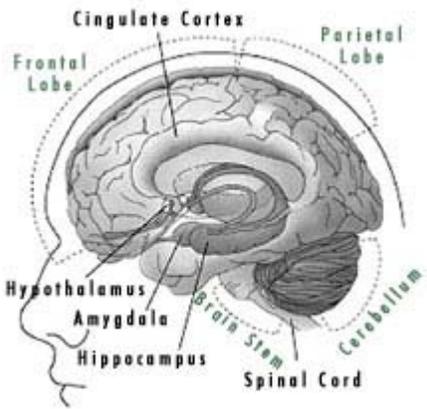
Most people who smoke pot do not move on to other drugs, but then only five to seven percent of cigarette smokers get lung cancer. The point is that those youngsters who smoke pot are at vastly greater risk of moving on to other drugs. The potential of marijuana as a dangerous drug in and of itself, and as a gateway to other drug use, is a matter of serious concern for American parents, especially in light of the drug's pervasive presence in their teenagers' lives.

Nonetheless, many teens and their parents view marijuana use as a harmless recreation. This perception is inaccurate and dangerous, because perceptions and attitudes among teens and their parents are a key factor in teens' decisions about using drugs. It is imperative that teens, parents, teachers, communities and policymakers be made aware of the most current information about marijuana use and its consequences. Research on the risks and dangers of using marijuana is ongoing, and we do not yet fully understand all of the implications of using marijuana and its effects on organ systems and behavior. But the more researchers study the drug and the effects of its use, the clearer it becomes that smoking pot is a dangerous game of Russian roulette, not a harmless rite of passage.



# Appendix A

## Marijuana's Effects on the Brain

Marijuana's Effects on the Brain <sup>86</sup>		
	Brain Region	Functions Associated With Region
	<b>Brain regions in which cannabinoid receptors are abundant</b>	
	Cerebellum	Body movement coordination
	Hippocampus	Learning and memory
	Cerebral cortex, especially cingulate, frontal, and parietal regions	Higher cognitive functions
	Nucleus accumbens	Reward
	Basal ganglia <ul style="list-style-type: none"> <li>› Substantia nigra pars reticulata</li> <li>› Entopeduncular nucleus</li> <li>› Globus pallidus</li> <li>› Putamen</li> </ul>	Movement control
	<b>Brain regions in which cannabinoid receptors are moderately concentrated</b>	
	Hypothalamus	Body housekeeping functions (body temperature regulation, salt and water balance, reproductive function)
	Amygdala	Emotional response, fear
	Spinal cord	Peripheral sensation, including pain
	Brain stem	Sleep and arousal, temperature regulation, motor control
	Central gray	Analgesia
	Nucleus of the solitary tract	Visceral sensation, nausea and vomiting



## Appendix B

# Drug Abuse Warning Network (DAWN) Data Collection Methodology<sup>87</sup>

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Since the early 1970s, DAWN has collected information on patients seeking hospital emergency department treatment related to their use of an illegal drug or the non-medical use of a legal drug. The survey provides data that describe the impact of drug use on hospital emergency departments in the United States. Data are collected by trained reporters (nurses and other hospital personnel) who review medical charts for indications--noted by hospital staff who treated the patients--that drug use was the reason for the emergency department visit.

To be included in DAWN, the person presenting to the emergency department (i.e., the patient) must be aged six years and older and meet the following criteria:

- the patient was treated in the hospital's emergency department;
- the patient's presenting problem(s) was induced by or related to drug use, regardless of when the drug ingestion occurred;
- the case involved the non-medical use of a legal drug or any use of an illegal drug; and
- the patient's reason for taking the substance(s) included one of the following: (1) dependence, (2) suicide attempt or gesture, or (3) psychic effects.

DAWN excludes cases involving alcohol as the sole substance of abuse. Information is presented on the characteristics of decedents by gender, race/ethnicity, age, and manner of death, along with this information by type of drugs mentioned.

Hospitals eligible for the DAWN study are non-Federal, short-stay general hospitals that have a 24-hour emergency department. Since 1988, the DAWN emergency department data have been collected from a representative sample of these hospitals located throughout the coterminous United States, including 21 oversampled metropolitan areas. The data from this sample are used to generate estimates of the total number of emergency department drug episodes and drug mentions in all such hospitals. A methodology was developed for generating comparable estimates for the years 1978 through 1987, taking advantage of historical data available on the characteristics of the universe of eligible hospitals and the extensive data files of drug-related episodes compiled over the years by DAWN. These estimates are useful in providing a context for the analysis of recent trends in drug-related emergency department episodes.

Approximately 13,000 drug abuse episodes are processed monthly through DAWN. Data accuracy is ensured through a combination of quality assurance activities. For example, adherence to DAWN reporting guidelines is monitored through periodic record reviews and reabstracting studies. Particular emphasis is placed on training and on continuing support and followup provided by the field liaisons and central office data monitors.

Within each facility participating in DAWN, a designated reporter, usually a member of the emergency department or medical records staff, is responsible for identifying drug-related episodes and recording and submitting data on each case. An episode report is submitted for each patient visiting a DAWN emergency department whose presenting problem(s) was related to their own drug use. In each facility (hospital ED or medical examiner's office) that participates in DAWN, the reporter is assigned to data collection activities. Ideally, an ED nurse (or other medical personnel) reviews all ED records daily and

completes a one-page DAWN form on each drug abuse-related case. This report records basic patient demographic data and detailed substance abuse information. When ED staff are not available, other service departments (such as social services, medical records, pharmacy, poison control, volunteer departments) may be recruited to participate in the reporting process. In some cases, the hospital may designate an independent reporter (i.e., not a hospital staff person) to report DAWN data. The DAWN staff are bound by Federal laws protecting patient confidentiality. The data collection form does not include any patient identifying information.

DAWN reporters submit completed forms, along with weekly log sheets listing case totals, to SAMHSA's DAWN operations contractor. Each participating facility or its designee (e.g., the reporter, nurses' fund) receives a small honorarium for submitting data. The DAWN operations contractor assumes responsibility for the other costs incurred in reporting, such as mailing reports, training facility personnel, telephone communication between facility reporters, and the contractor staff who review DAWN reports. Contractor staff review, verify, and compile DAWN data. They are supported by regional field liaison staff who travel to facilities to provide training, evaluation, and problem-solving as needed.

Each report of a drug-related emergency department episode includes demographic information about the patient and the circumstances surrounding the episode. Up to four different substances, in addition to alcohol-in-combination, can be specified for each episode. Alcohol and legal drugs are included only when they are reported as used in combination with illegal drugs. The data are then weighted to produce national and metropolitan area estimates of emergency department drug-related episodes.

A drug episode is defined as an emergency department visit that was directly related to

the use of an illegal drug or the non-medical use of a legal drug for persons aged 6 years and older. The number of emergency department episodes reported in DAWN is not synonymous with the number of individuals involved. One person may make repeated visits to an emergency department or to several emergency departments, thus producing a number of episodes. As no patient identifiers are collected, it is impossible to determine the number of individuals involved in the reported episodes.

A drug mention refers to a substance that was mentioned during a drug-related emergency department episode. In addition to alcohol-in-combination, up to four substances may be reported for each drug-related episode; thus, the total number of mentions exceeds the number of total episodes. Much of the time there is only one drug mentioned during an episode. In these cases “episode” and “mention” are synonymous. It should be noted that a particular drug mention may or may not be the confirmed “cause” of the episode when multiple drugs have been mentioned. Even when only one substance is reported for an episode, allowance should still be made for reportable drugs not mentioned or for other contributory factors. To reduce the size of the data file and to make the data more accessible to users, the DAWN Public Use File (PUF) presents data at the episode level. Total and unique numbers of mentions are included for each episode.



## Appendix C

### Treatment Episode Data Set (TEDS) Data Limitations<sup>88</sup>

Some limitations regarding the use of the TEDS files should be noted. TEDS is collected by states according to their own systems for monitoring substance abuse treatment and then crosswalked to the TEDS data elements, according to a mutually-approved protocol. Given variation among the states in how they define and collect substance abuse treatment data, the following should be considered when using these data:

- The way an admission is defined may vary from state to state such that the absolute number of admissions is not a valid measure for comparing states.
- States continually review the quality of their data processing. As states identify systematic errors, they may revise or replace historical TEDS data files. While this system improves the data set over time, reported historical statistics may change slightly from year to year.
- The number and client mix of TEDS records depends, to some extent, on external factors--including the availability of public funds. In states with higher funding levels, a larger percentage of the substance abusing population may be admitted to treatment, including the less severely impaired and the less economically disadvantaged.
- Public funding constraints may direct states to selectively target special populations, for example, pregnant women or adolescents.
- States vary in the extent to which coercion plays a role in referral to treatment. This variation derives from criminal justice practices and differing concentrations of abuser subpopulations.

- States vary in their reporting practices. For instance, drunk drivers who are referred to education or treatment are excluded from TEDS reporting in all but a few states.
- TEDS includes treatment admissions and in many states the files may include multiple admissions for the same client. Therefore, any statistics derived from the data will represent admissions, not clients. It is possible for clients to have multiple initial admissions within a state and even within providers that have multiple treatment sites within the state. A few states uniquely identify clients at the state-level and several more states are attempting to achieve this level of client identification. The TEDS provides a good national snapshot of what is seen at admission to treatment, but is currently unable to follow individual clients through a sequence of treatment episodes.
- The TEDS distinguishes between "transfer admissions" and "initial admissions." Transfer admissions include clients transferred for distinct services within an episode of treatment. Only initial admissions are included on the public use files.

# Appendix D

## DSM-IV Criteria for Substance Dependence and Substance Abuse

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DSM-IV Criteria for Substance Dependence <sup>89</sup>	DSM-IV Criteria for Substance Abuse <sup>90</sup>
<p>A maladaptive pattern of substance use, leading to clinically significant impairment or distress, as manifested by three (or more) of the following, occurring at any time in the same 12-month period:</p> <ol style="list-style-type: none"> <li>(1) tolerance</li> <li>(2) withdrawal</li> <li>(3) the substance is often taken in larger amounts or over a longer period than was intended</li> <li>(4) there is a persistent desire or unsuccessful efforts to cut down or control substance use</li> <li>(5) a great deal of time is spent in activities necessary to obtain the substance, use the substance, or recover from its effects</li> <li>(6) important social, occupational, or recreational activities are given up or reduced because of substance use</li> <li>(7) the substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance</li> </ol>	<p>A maladaptive pattern of substance use leading to clinically significant impairment or distress, as manifested by one (or more) of the following, occurring within a 12-month period:</p> <ol style="list-style-type: none"> <li>(1) recurrent substance use resulting in a failure to fulfill major role obligations at work, school, or home</li> <li>(2) recurrent substance use in situations in which it is physically hazardous</li> <li>(3) recurrent substance-related legal problems</li> <li>(4) continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance</li> </ol>



## Notes

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- <sup>2</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>3</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>4</sup> Cowan, C. D. (2001); Fendrich, M., & Johnson, T. P. (2001); Fowler, F. J., & Stringfellow, V. L. (2001).
- <sup>5</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>6</sup> Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2004).
- <sup>7</sup> Thirty-five percent of teens reported in The National Center on Addiction and Substance Abuse (CASA) at Columbia University (2003d) that cigarettes were the easiest to buy, compared with 47 percent in 1999.
- <sup>8</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003d).
- <sup>9</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003d).
- <sup>10</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (1999).
- <sup>11</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003b).
- <sup>12</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003b).
- <sup>13</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003b).
- <sup>14</sup> Drug Enforcement Administration. (1999).
- <sup>15</sup> Drug Enforcement Administration. (1999).
- <sup>16</sup> Earleywine, M. (2002).
- <sup>17</sup> Joy, J. E., Watson, S. J., & Benson, J. A. (Eds.). (1999).
- <sup>18</sup> Harder, S., & Rietbrock, S. (1997).
- <sup>19</sup> National Center for Natural Products Research. (2003).
- <sup>20</sup> National Center for Natural Products Research. (2003).
- <sup>21</sup> Hall, W., & Solowij, N. (1998).
- <sup>22</sup> Gold, M. S. (1998).
- <sup>23</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003a).
- <sup>24</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003a).
- <sup>25</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003a).
- <sup>26</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003a).
- <sup>27</sup> de Fonseca, F. R., Carrera, M. R. A., Navarro, M., Koob, G. F., & Weiss, F. (1997); Tanda, G., Pontieri, F. E., & Di Chiara, G. (1997).
- <sup>28</sup> Pope, H. G., Gruber, A. J., & Yurgelun-Todd, D. (1995); Pope, H. G., & Yurgelun-Todd, D. (1996); Fletcher, J. M., Page, J. B., Francis, D. J., Copeland, K., Naus, M. J., et al. (1996); Pope, H. G., Jr., Gruber, A. J., Hudson, J. I., Huestis, M. A., & Yurgelun-Todd, D. (2001); Solowij, N., Stephens, R. S., Roffman, R. A., Babor, T., Kadden, R., et al. (2002).
- <sup>29</sup> Solowij, N., Stephens, R. S., Roffman, R. A., Babor, T., Kadden, R., Miller, M., et al. (2002).
- <sup>30</sup> It has been proposed that chronic marijuana use in adolescents may result in long-term memory impairment. See Schwartz, R. H. (1993).
- <sup>31</sup> Pope, H. G., & Yurgelun-Todd, D. (1996).
- <sup>32</sup> U.S. Department of Education, Office of Elementary and Secondary Education, Safe and Drug-Free Schools Program. (1998).
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- <sup>34</sup> Tashkin, D. P. (1990).
- <sup>35</sup> Tashkin, D. P., Coulson, A. H., Clark, V. A., Simmons, M., Bourque, L. B., et al. (1987); Bloom, J. W., Kaltenborn, W. T., Paoletti, P., Camilli, A., & Lebowitz, M. D. (1987); Taylor, D. R., Poulton, R., Moffitt, T. E., Ramankutty, P., & Sears, M. R. (2000); Tashkin, D. P., Baldwin, G. C., Sarafian, T., Dubinett, S., & Roth, M. D. (2002).
- <sup>36</sup> Wu, T. C., Tashkin, D. P., Djahed, B., & Rose, J. E. (1988).
- <sup>37</sup> Ford, D. E., Vu, H. T., & Anthony, J. C. (2002).
- <sup>38</sup> Jones, R. T. (2002); Hollister, L. E. (1986); Beaconsfield, P. (1974); Beaconsfield, P., Ginsburg, J., & Rainsbury, R. (1972).

- <sup>39</sup> Jones, R. T. (2002). Note that marijuana's cardiovascular effects are not associated with serious health problems for most young, healthy users, although occasional myocardial infarction, stroke, and other adverse cardiovascular events are reported.
- <sup>40</sup> Jones, R. T. (2002).
- <sup>41</sup> Mittleman, M. A., Lewis, R. A., Maclure, M., Sherwood, J. B., & Muller, J. E. (2001).
- <sup>42</sup> If a marijuana smoker uses cocaine at the same time, more severe increases in heart rate and blood pressure can occur. See Foltin, R. W., Fischman, M. W., Pedrosa, J. J., & Pearlson, G. D. (1987).
- <sup>43</sup> Gold, M. S. (1998).
- <sup>44</sup> Burkman, L. J., Bodziak, M. L., Schuel, H., Palaszewski, D., & Gurunatha, R. (2003).
- <sup>45</sup> Gold, M. S. (1998); Park, B., McPartland, J. M., & Glass, M. (2004).
- <sup>46</sup> Hall, W., & Solowij, N. (1998).
- <sup>47</sup> Substance Abuse and Mental Health Services Administration. (2001).
- <sup>48</sup> Robbe, H. W. J., & O'Hanlon, J. F. (1999).
- <sup>49</sup> Substance Abuse and Mental Health Services Administration. (2001).
- <sup>50</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>51</sup> National Highway Traffic Safety Administration. (1993); National Highway Traffic Safety Administration. (1994).
- <sup>52</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies, & National Highway Traffic Safety Administration. (1998).
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- <sup>60</sup> Jones, R. T. (1984); Kandel, D. B., & Davies, M. (1992).
- <sup>61</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003c).
- <sup>62</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003c).
- <sup>63</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003c).
- <sup>64</sup> American Psychiatric Association. (1994) was published by the American Psychiatric Association in 1994 and contains criteria for psychiatric disorders, including abuse and dependence on various substances.
- <sup>65</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003c).
- <sup>66</sup> de Fonseca, F. R., Carrera, M. R. A., Navarro, M., Koob, G. F., & Weiss, F. (1997).
- <sup>67</sup> Wickelgren, I. (1997).
- <sup>68</sup> Gardner, E. L. (2002).
- <sup>69</sup> Gardner, E. L. (2002).
- <sup>70</sup> Kandel, D. B. (2003).
- <sup>71</sup> Kandel, D. B. (2003); Adler, I., & Kandel, D. B. (1981); Kandel, D. (1975); Blaze-Temple, D., & Lo, S. K. (1992); Stenbacka, M., Allebeck, P., & Romelsjo, A. (1993); Beenstock, M. & Rahav, G. (2002).
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- <sup>73</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003a).
- <sup>74</sup> Morral, A. R., McCaffrey, D. F., & Paddock, S. M. (2002).
- <sup>75</sup> Lynskey, M. T., Heath, A. C., Bucholz, K. K., Slutske, W. S., Madden, P. A. F., Nelson, E. C., et al. (2003).
- <sup>76</sup> Lynskey, M. T., Heath, A. C., Bucholz, K. K., Slutske, W. S., Madden, P. A. F., Nelson, E. C., et al. (2003).
- <sup>77</sup> The National Center on Addiction and Substance Abuse (CASA) at Columbia University. (2003d).
- <sup>78</sup> Bachman, J. G., Johnson, L. D., & O'Malley, P. M. (1998).
- <sup>79</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>80</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>81</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2002).
- <sup>82</sup> Johnston, L. D., O'Malley, P. M., & Bachman, J. G. (2002).

- <sup>83</sup> McMaster, L. E., & Wintre, M. G. (1996).
- <sup>84</sup> Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003b).
- <sup>85</sup> Partnership for a Drug-Free America. (2003).
- <sup>86</sup> Reprinted from National Institute on Drug Abuse. (2002).
- <sup>87</sup> Reprinted from Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (1999).
- <sup>88</sup> Reprinted from Substance Abuse and Mental Health Services Administration, Office of Applied Studies. (2003c).
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