

# **Module I**

## **Chemical Use, Misuse, Abuse, Dependence & Recovery**

### **Module Objectives**

By the end of these modules, the learner will have a better understanding of:

- Relevant alcohol and drug terminology
- Signs and symptoms of chemical dependency
- The alcohol continuum (nonuse to recovery)
- The diseases of alcoholism and drug addiction
- The recovery process

### **PowerPoints included:**

Substance Abuse Overview

Signs of Drug Use

### **Training Resources included:**

5-10 Rule Legos

### **Handouts included:**

World Health Organization: Alcohol and Drug Terms

Signs of Use

Addiction Process

Chemical Use/Abuse/Dependence

Enabling Patterns

National Institutes of Health Fact Sheet: Alcohol Dependence

NIDA InfoFacts: Understanding Drug Abuse and Addiction

NIDA InfoFacts: Treatment Approaches for Drug Addiction

Drugs, Brains and Behavior: The Science of Addiction

# SUBSTANCE ABUSE

## An Overview



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For more information, visit their website:  
[www.coaf.org](http://www.coaf.org)

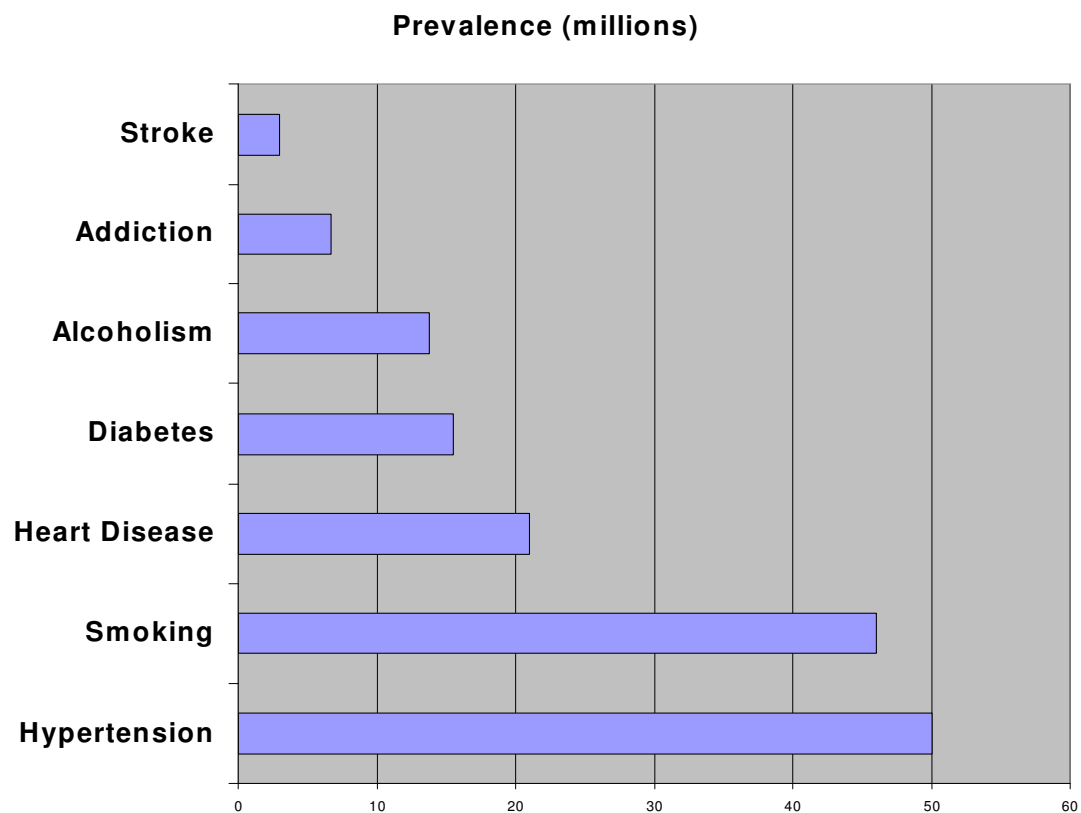


# Introduction

Substance abuse is a major  
public health problem

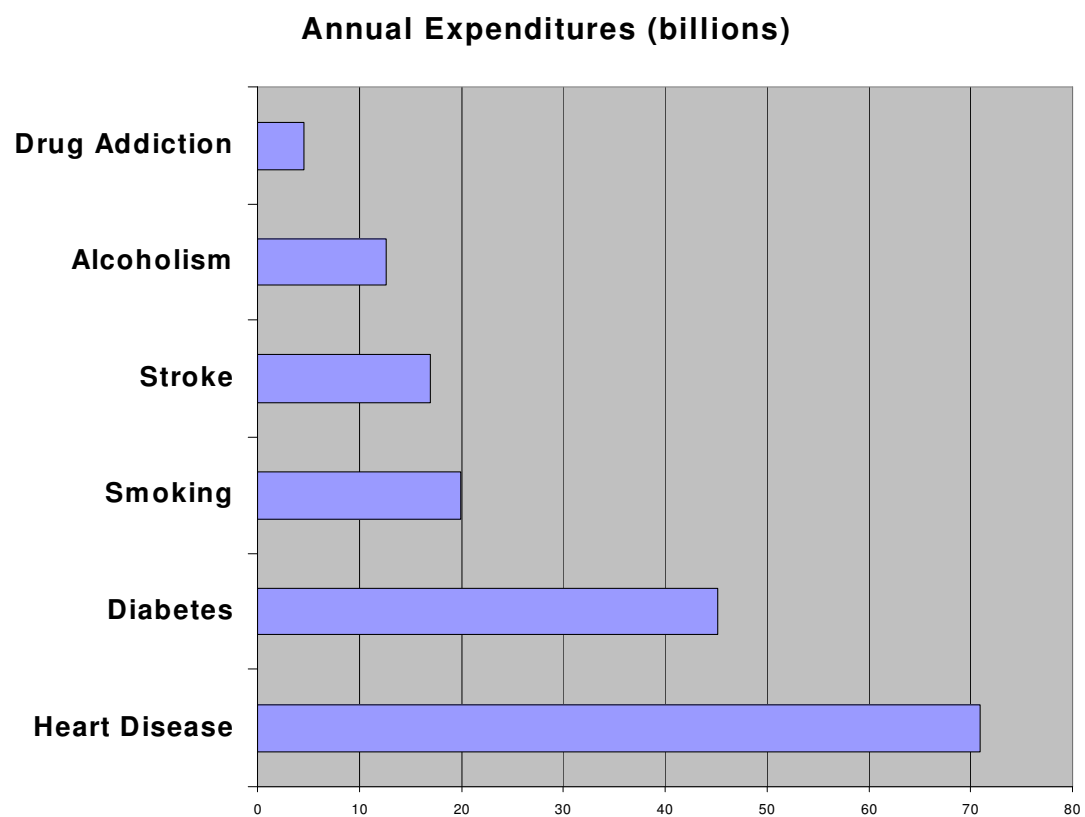


# Chronic Illness Prevalence





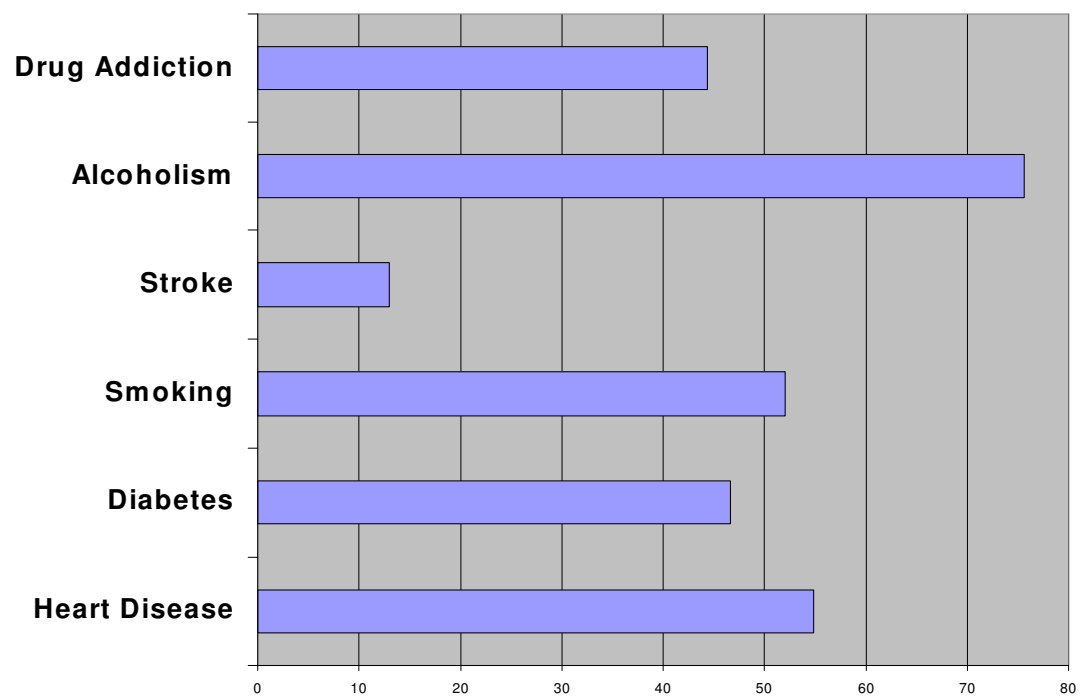
# Costs of Chronic Illnesses





# Productivity Losses

**Productivity Losses Due to Chronic Illnesses  
(\$billions)**



# Basic Drug Facts





# Basic Drug Facts

## Drugs Are:

- Licit and illicit
- Substances affecting the way a person
  - Thinks
  - Feels
  - Acts



# Six Types of Psychoactive Substances

- Narcotics
- Stimulant
- Depressants
- Hallucinogens
- Inhalants
- Cannabis

# The Continuum of Use





# The Continuum of Use

Drug use can be mapped out on a continuum:

- Experimentation and recreational use
- Habituation and abuse
- Dependence/addiction



# The Continuum of Use

The following factors are considered:

- Frequency of use
- Sources of drug
- Reasons for use
- Effects of drug use



# The Continuum of Use

## Experimental and Recreational

- Experimental – user tries drug out of curiosity
- Recreational – use is infrequent but the user seeks out the drug



# The Continuum of Use

## Habituation and Abuse

- Habituation - use becomes a definite pattern.
- Abuse – use continues in spite of impaired functioning.



# The Continuum of Use

## Dependence/Addiction

- Dependence /Addiction– use increases with continued use in spite of impaired functioning



# Recovery

Addiction does not have to be the last point on the spectrum!

- Many people enter recovery
- Recovery means that the substance abuser is not using drugs
- Relapse is a normal part of recovery



# Relapse

- Relapse is a normal, predictable part of the recovery process
- Not all relapses are the same
- Relapse can occur at any time

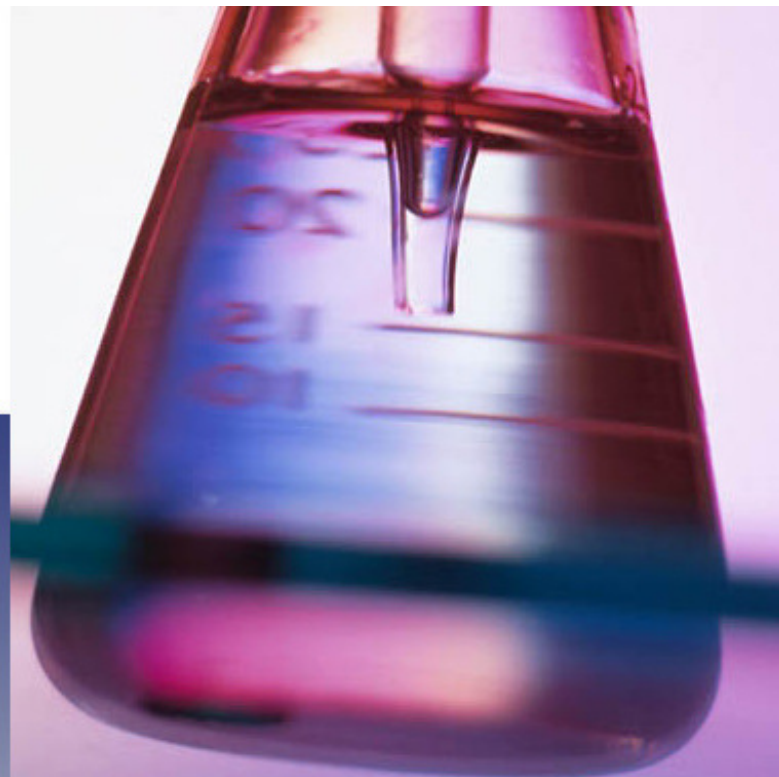


# The Role of Treatment

Treatment does work!

Treatment has been shown to:

- Reduce drug use
- Improve mental/physical health
- Reduce criminal activity
- Reduce high-risk sexual behavior
- Improve financial self-sufficiency



# Signs of Drug Use



# Overview

- All of the following information comes from [streetdrugs.org](http://streetdrugs.org) and the US Department of Health and Human Services' Substance Abuse & Mental Health Services Administration ([SAMHSA](http://SAMHSA)). Please visit these websites for additional resources.



# Alcohol

Signs and symptoms of this drug include:

- Slurred speech, impaired judgment and motor skills, incoordination, confusion, tremors, drowsiness, agitation, nausea and vomiting, respiratory ailments, depression



# Depressants

Signs and symptoms of these drugs include:

- Drowsiness, confusion, incoordination, tremors, slurred speech, depressed pulse rate, shallow respiration, dilated pupils



# Cocaine/Crack Cocaine

Signs and symptoms of this drug include:

- Excitability, euphoria, talkativeness, anxiety, increased pulse rate, dilated pupils, paranoia, agitation, hallucinations



# Hallucinogens

Signs and symptoms of these drugs include:

- Trance-like state, excitation, euphoria, increased pulse rate, insomnia, hallucinations



# Inhalants

Signs and symptoms of these drugs include:

- Slurred speech, incoordination, nausea, vomiting, slowed breathing



# Marijuana

Signs and symptoms of this drug include:

- Mood swings, euphoria, slow thinking and reflexes, dilated pupils, increased appetite, dryness of mouth, increased pulse rate, delusions, hallucinations



# Narcotics

Signs and symptoms of these drugs include:

- Lethargy, drowsiness, euphoria, nausea, constipation, constricted pupils, slowed breathing



# Stimulants

Signs and symptoms of these drugs include:

- excitability, tremors, insomnia, sweating, dry mouth and lips, bad breath, dilated pupils, weight loss, paranoia, hallucinations



# Tobacco

Signs and symptoms of this drug include:

- Smelly hair, clothes, and breath; yellowing of teeth; coughs; increased asthma attacks; shortness of breath and poorer athletic performance. After only a few weeks, users of spit tobacco can develop cracked lips, white spots, sores, and bleeding in the mouth



# Behavioral Signs

Behavioral signs of substance use include all aforementioned physiological signs and symptoms AND:

- Change in overall personality; changes in friends and activities; drop in grades and/or tardiness at school; unexplained need for money; difficulty paying attention in class or forgetfulness; stealing money or other items; paranoia

### Task: 5-10 Rule Legos

As a large group, listen to an enhanced lecture on the 5 to 10 Rule.

On average, it takes:

- 5 to 10 years of heavy use for an adult to develop and addiction to alcohol
- For a high school age youth, 5 to 10 months
- For a middle school age youth, 5 to 10 weeks

Think of the brain as a set of Lego blocks:

- For an adult all the Legos have been built up (all brain development has occurred), so it takes a long time to knock the Legos down and “wire In” the addiction (think of knocking down the grey blocks and then adding in a strand of red blocks).
- A high school student’s brain is still developing, but many of the Legos are in place. It doesn’t take as long to knock down the blocks to add in the addiction strand.
- A middle school student doesn’t have many Legos in place. It doesn’t take long to knock down the Legos and add in the addiction strand.

Training Task Design: Marta Koonz



## Alcohol and Drug Terms

**abstinence** Refraining from drug use or (particularly) from drinking alcoholic beverages, whether as a matter of principle or for other reasons. Those who practice abstinence from alcohol are termed "abstainers", "total abstainers", or-in a more old-fashioned formulation-"teetotalers". The term "current abstainer", often used in population surveys, is usually defined as a person who has not drunk an alcoholic beverage in the preceding 12 months; this definition does not necessarily coincide with a respondent's self-description as an abstainer.

**abuse** (drug, alcohol, chemical, substance, or psychoactive substance) A group of terms in wide use but of varying meaning. In DSM-III-R\*, "psychoactive substance abuse" is defined as "a maladaptive pattern of use indicated by ...continued use despite knowledge of having a persistent or recurrent social, occupational, psychological or physical problem that is caused or exacerbated by the use [or by] recurrent use in situations in which it is physically hazardous". It is a residual category, with dependence taking precedence when applicable. The term "abuse" is sometimes used disapprovingly to refer to any use at all, particularly of illicit drugs. Because of its ambiguity, the term is not used in ICD-10 (except in the case of non-dependence-producing substances- see below); harmful use and hazardous use are the equivalent terms In WHO usage, although they usually relate only to effects on health and not to social consequences. " Abuse" is also discouraged by the Office of Substance Abuse Prevention (OSAP, now CSAP - Center for Substance Abuse Prevention) in the USA, although terms such as "substance abuse" remain in wide use in North America to refer generally to problems of psychoactive substance use.

\* Diagnostic and statistical manual of mental disorders, 3rd ed.(revised).Washington, DC, American Psychiatric Association,1987.

In other contexts, abuse has referred to non-medical or unsanctioned patterns of use, irrespective of consequences. Thus the definition published in 1969 by the WHO Expert Committee on Drug Dependence was "persistent or sporadic excessive drug use inconsistent with or unrelated to acceptable medical practice"

\*WHO Expert Committee on Drug Dependence. Sixteenth report. Geneva, World Health Organization ,1969 (WHO Technical Report Series, No.407

**addiction, drug or alcohol** Repeated use of a psychoactive substance or substances, to the extent that the user (referred to as an addict) is periodically or chronically intoxicated, shows a compulsion to take the preferred substance (or substances), has great difficulty in voluntarily ceasing or modifying substance use, and exhibits determination to obtain psychoactive substances by almost any means. Typically, tolerance is prominent and a withdrawal syndrome frequently occurs when substance use is interrupted. The life of the addict may be dominated by substance use to the virtual exclusion of all other activities and responsibilities. The term addiction also conveys the sense that such substance use has a detrimental effect on society, as well as on the individual; when applied to the use of alcohol, it is equivalent to alcoholism. Addiction is a term of long-standing and variable usage. It is regarded by many as a discrete disease entity, a debilitating disorder rooted in the pharmacological effects of the drug, which is remorselessly progressive. From the 1920s to the 1960s attempts were made to

differentiate between addiction ; and "habituation", a less severe form of psychological adaptation. In the 1960s the World Health Organization recommended that both terms be abandoned in favour of dependence, which can exist in various degrees of severity. Addiction is not a diagnostic term in ICD-10, but continues to be very widely employed by professionals and the general public alike. *See also:* dependence; dependence syndrome

**Alcoholic** An individual who suffers from alcoholism. Note that this noun has a different meaning from the adjective in alcoholic beverage..

**alcoholism** A term of long-standing use and variable meaning, generally taken to refer to chronic continual drinking or periodic consumption of alcohol which is characterized by impaired control over drinking, frequent episodes of intoxication, and preoccupation with alcohol and the use of alcohol despite adverse consequences. The term alcoholism was originally coined in 1849 by Magnus Huss. Until the 1940s it referred primarily to the physical consequences of long-term heavy drinking. A narrower concept is of alcoholism as a disease (*see* alcoholism, disease concept of) marked by loss of control over drinking, caused by a pre-existing biological abnormality, and having a predictable progressive course. Later, the term was used by Jellinek and others to denote the consumption of alcohol leading to any type of harm (physical, psychological, or social; individual or societal). Despite its ambiguous meaning, alcoholism is still widely employed as a diagnostic and descriptive term. For instance, in 1990 the American Society of Addiction Medicine defined alcoholism as "a primary, chronic disease with genetic, psychosocial, and environmental factors influencing its development and manifestations. The disease is often progressive and fatal. It is characterized by continuous or periodic: impaired control over drinking, preoccupation with the drug alcohol, use of alcohol despite adverse consequences, and distortions in thinking, most notably denial."

**alcoholism, disease concept of**, The belief that alcoholism is a condition of primary biological causation and predictable natural history, conforming to accepted definitions of a disease. They lay perspective of Alcoholics Anonymous (1939)-that alcoholism, characterized by the individual's loss of control over drinking and thus over his or her life, was a "sickness"-was carried into the scholarly literature in the 1950s in the form of the disease concept of alcoholism. The concept was rooted in 19th-century medical and lay conceptions of inebriety as a disease.

**blood alcohol level (BAL)** The concentration of alcohol (ethanol) present in blood. It is usually expressed as mass per unit volume, but different countries may express it differently or use different units; examples include milligrams per 100 milliliters (mg/100 ml or, incorrectly, mg percent), milligrams per litre (mg/l), grams per 100 milliliters (g/100 ml), grams percent, and millimoles per litre. A concentration of 8 parts per thousand would be expressed in legal terminology in USA as .08%, in Scandinavia as 0.8 promille, and in Canada and elsewhere as 80 mg/100 ml. National differences also exist in the BAL set as the legal limit for driving under "per se" laws (*see* drinking-driving), with most limits in the range 50-100 mg/100 ml.

The BAL is often extrapolated from measurements made on breath or urine or other biological fluids in which the alcohol concentration bears a known relationship to that in the blood. The Widmark calculation is a technique for estimating BAL at a given time after alcohol ingestion by extra polating from BALs at known times and assuming a fixed rate of alcohol elimination (zero order kinetics). In some jurisdictions this is considered a dubious assumption, and estimates of BALs at previous points in time are not accepted.

**brief intervention** A treatment strategy in which structured therapy of short duration (typically 5-30 minutes) is offered with the aim of assisting an individual to cease or reduce the use of a psychoactive substance or (less commonly) to deal with other life issues. It is designed in particular for general practitioners and other primary health care workers. To date, brief intervention-sometimes known as

minimal intervention-has been applied mainly to cessation of smoking and as therapy for harmful use of alcohol.

The rationale for brief intervention is that, even if the percentage of individuals who alter their substance use after a single intervention is small, the public health impact of large numbers of primary health care workers providing these interventions systematically is considerable. Brief intervention is often linked to systematic screening testing for hazardous and harmful substance use, particularly of alcohol and tobacco.

### **detoxification**

(1) The process by which an individual is withdrawn from the effects of a psychoactive substance.

(2) As a clinical procedure, the withdrawal process carried out in a safe and effective manner, such that withdrawal symptoms are minimized. The facility in which this takes place may be variously termed a detoxification centre, detox centre, or sobering-up station.

Typically, the individual is clinically intoxicated or already in withdrawal at the outset of detoxification. Detoxification may or may not involve the administration of medication. When it does, the medication given is usually a drug that shows cross-tolerance and cross-dependence to the substance(s) taken by the patient. The dose is calculated to relieve the withdrawal syndrome without inducing intoxication, and is gradually tapered off as the patient recovers. Detoxification as a clinical procedure implies that the individual is supervised until recovery from intoxication or from the physical withdrawal syndrome is complete. The term "self-detoxification" is sometimes used to denote unassisted recovery from a bout of intoxication or withdrawal symptoms.

**diversion program** A program of treatment or re-education for individuals referred from criminal courts (criminal diversion) after being charged with driving under the influence of alcohol (drinking-driver diversion) or another drug, with the sale or use of drugs (drug diversion), or with a general crime not defined in terms of drugs or alcohol. In strict legal use of the term, individuals are assigned to diversion programs in lieu of prosecution, which is usually held in abeyance pending successful completion of the diversion program. "Diversion" is also used more broadly for any pattern of referral from the court at any stage of processing, including as a sentence or condition of probation.

**drinking, binge** A pattern of heavy drinking that occurs in an extended period set aside for the purpose. In population surveys, the period is usually defined as more than one day of drinking at a time. The terms "bout drinking" and "spree drinking" are also used for the activity, and "drinking bout" for the occasion. A binge drinker or bout drinker is one who drinks predominantly in this fashion, often with intervening periods of abstinence. *Synonyms:* bout drinking; spree drinking *See also:* Jellinek's typology (epsilon alcoholism)

**drinking, controlled** Drinking that is moderated to avoid intoxication or hazardous use. The term is applied especially when there is a reason to question the ability to drink in a controlled fashion at all times, as in the case of individuals who have exhibited signs of alcohol dependence or harmful drinking. When applied to the use of other psychoactive substance, the analogous term "controlled drug use" refers to the maintenance of regular, non-compulsive substance use that does not interfere with ordinary functioning, and to methods of use that minimize untoward drug effects. *Compare* impaired control. *See also:* drinking, moderate

**drinking, excessive** Currently a non-preferred term for a pattern of drinking considered to exceed some standard of moderate drinking or acceptability. Hazardous drinking is a rough equivalent in current use. The Eighth Revision of the International Classification of Diseases distinguished two

types of excessive drinking: episodic and habitual, where excessive drinking was apparently equivalent to intoxication. Episodic excessive drinking includes relatively brief bouts of excessive consumption of alcohol occurring at least a few times a year. These bouts may last for several days or weeks (see binge drinking). Habitual excessive drinking includes regular consumption of quantities of alcohol large enough to be detrimental to the individual's health or social functioning. *See also:* drinking, heavy; harmful use.

### **drinking, social**

- (1) Literally, drinking in company, as opposed to solitary drinking.
- (2) Often used loosely to mean a drinking pattern that is not problem drinking.
- (3) More prescriptively, the use of alcoholic beverages in compliance with social custom, primarily in the company of others, and then only for socially acceptable reasons and in socially acceptable ways. (Also known as "integrated drinking".)

Social drinking is not necessarily moderate drinking. In certain South American societies, for example, individuals engage in communally approved "fiesta" drinking, often to the point of intoxication. (*Compare* moderate drinking, recreational use.) *Synonyms (sense 2):* responsible drinking; sensible drinking

**drug** A term of varied usage. In medicine, it refers to any substance with the potential to prevent or cure disease or enhance physical or mental welfare, and in pharmacology to any chemical agent that alters the biochemical physiological processes of tissues or organisms. Hence, a drug is a substance that is, or could be, listed in a pharmacopoeia. In common usage, the term often refers specifically to psychoactive drugs, and often, even more specifically, to illicit drugs, of which there is non-medical use in addition to any medical use. Professional formulations (e.g. "alcohol and other drugs") often seek to make the point that caffeine, tobacco, alcohol, and other substances in common non-medical use are also drugs in the sense of being taken at least in part for their psychoactive effects.

**early intervention** A therapeutic strategy that combines early detection of hazardous or harmful substance use and treatment of those involved. Treatment is offered or provided before such time as patients might present of their own volition, and in many cases before they are aware that their substance use might cause problems. It is directed particularly at individuals who have not developed physical dependence or major psychosocial complications. Early intervention is therefore a pro-active approach, which is initiated by the health worker rather than the patient. The first stage consists of a systematic procedure for early detection. There are several approaches: routine enquiry about use of alcohol, tobacco, and other drugs in the clinical history, and the use of screening tests, for example, in primary health care settings. Supplementary questions are then asked in order to confirm the diagnosis. The second component, treatment, is usually brief and takes place in the primary health care setting (lasting on average 5-30 minutes). Treatment may be more extensive in other settings. *See also:* brief intervention

**Jellinek's typology** Jellinek's classification of alcoholism, as outlined in *The disease concept of alcoholism* (1960).\*\*

- *alpha alcoholism*—characterized by psychological dependence, with no progression to physiological dependence; also called problem drinking, escape drinking.
- *beta alcoholism*—characterized by physical complications involving one or more organ systems, with a general undermining of health and shortened life span.

- *gamma* alcoholism—characterized by increasing tolerance, loss of control, and precipitation of a withdrawal syndrome on cessation of alcohol intake; also called "Anglo-Saxon" alcoholism.
- *delta* alcoholism—characterized by increasing tolerance, withdrawal symptoms, and inability to abstain, but not loss of control of the amount of intake on any occasion. (See alcoholization.)
- *epsilon* alcoholism--paroxysmal or periodic drinking, binge drinking; sometimes referred to as dipsomania.

**misuse, drug or alcohol** Use of a substance for a purpose not consistent with legal or medical guidelines, as in the non-medical use of prescription medications. The term is preferred by some to abuse in the belief that it is less judgmental.

**overdose** The use of any drug in such an amount that acute adverse physical or mental effects are produced. Deliberate overdose is a common means of suicide and attempted suicide. In absolute numbers, overdoses of licit drugs are usually more common than those of illicit drugs. Overdose may produce transient or lasting effects, or death; the lethal dose of a particular drug varies with the individual and with circumstances. *See also:* intoxication; poisoning

**recovery** Maintenance of abstinence from alcohol and/or other drug use by any means. The term is particularly associated with mutual-help groups, and in Alcoholics Anonymous (AA) and other twelve-step groups refers to the process of attaining and maintaining sobriety. Since recovery is viewed as a lifelong process, an AA member is always viewed internally as a "recovering" alcoholic, although "recovered" alcoholic may be used a description to the outside world.

**recreational use** Use of a drug, usually an illicit drug, in sociable or relaxing circumstances, by implication without dependence or other problems. The term is disfavoured by those seeking to define all illicit drug use as a problem. *Compare* social drinking

**rehabilitation** In the field of substance use, the process by which an individual with a substance use disorder achieves an optimal state of health, psychological functioning, and social well-being. Rehabilitation follows the initial phase of treatment (which may involve detoxification and medical and psychiatric treatment). It encompasses a variety of approaches including group therapy, specific behaviour therapies to prevent relapse, involvement with a mutual-help group, residence in a therapeutic community or half-way house, vocational training, and work experience. There is an expectation of social reintegration into the wider community.

**relapse** A return to drinking or other drug use after a period, of abstinence, often accompanied by reinstatement of dependence symptoms. Some writers distinguish between relapse and lapse ("slip"), with the latter denoting an isolated occasion of alcohol or drug use. *See also:* relapse prevention

**self-help group** A term that refers to two kinds of therapeutic groups, but is most commonly used for what is more properly called a mutual-help group. It also refers to groups that teach cognitive behavioral and other techniques of self- management.

**sobriety** Continued abstinence from alcohol and psychoactive drug use (*see* recovery).

(2) As often used in Alcoholics Anonymous and other mutual-help groups, refers also to the individual's achievement and maintenance of control over and equilibrium in his or her life in general. Synonyms for sober, particularly referring also to illicit drugs, include "clean" and "straight".

(3) Now less frequently, moderation or habitual moderation in drinking patterns, as in the earlier meaning of temperance.

**tolerance** A decrease in response to a drug dose that occurs with continued use. Increased doses of alcohol or other drugs are required to achieve the effects originally produced by lower doses. Both physiological and psychosocial factors may contribute to the development of tolerance, which may be physical, behavioral, or psychological. With respect to physiological factors, both metabolic and/or functional tolerance may develop. By increasing the rate of metabolism of the substance, the body may be able to eliminate the substance more readily. Functional tolerance is defined as a decrease in sensitivity of the central nervous system to the substance. Behavioural tolerance is a change in the effect of a drug as a result of learning or alteration of environmental constraints. Acute tolerance is rapid, temporary accommodation to the effect of a substance following a single dose. Reverse tolerance, also known as sensitization, refers to a condition in which the response to a substance increases with repeated use. Tolerance is one of the criteria for the dependence syndrome.

**withdrawal syndrome** (Flx.3) A group of symptoms of variable clustering and degree of severity which occur on cessation or reduction of use of a psychoactive substance that has been taken repeatedly, usually for a prolonged period and/ or in high doses. The syndrome may be accompanied by signs of physiological disturbance. A withdrawal syndrome is one of the indicators of a dependence syndrome. It is also the defining characteristic of the narrower psycho-pharmacological meaning of dependence.

The onset and course of the withdrawal syndrome are time-limited and are related to the type of substance and dose being taken immediately before cessation or reduction of use. Typically, the features of a withdrawal syndrome are the opposite of those of acute intoxication.

The alcohol withdrawal syndrome is characterized by tremor, sweating, anxiety, agitation, depression, nausea, and malaise. It occurs 6-48 hours after cessation of alcohol consumption and, when uncomplicated, abates after 2-5 days. It may be complicated by grand mal seizures and may progress to delirium (known as delirium tremens).

Sedative withdrawal syndromes have many features in common with alcohol withdrawal, but may also include muscle aches and twitches, perceptual distortions, and distortions of body image.

Opioid withdrawal is accompanied by rhinorrhoea (running nose), lacrimation (excessive tear formation), aching muscles, chills, gooseflesh, and, after 24-48 hours, muscle and abdominal cramps. Drug-seeking behaviour is prominent and continues after the physical symptoms have abated.

Stimulant withdrawal (the "crash") is less well defined than syndromes of withdrawal from central nervous system depressant substances; depression is prominent and is accompanied by malaise, inertia, and instability. *See also:* hangover *Synonyms:* abstinence syndrome; withdrawal reaction; withdrawal state

*\*\* Jellinek EM. The disease concept of alcoholism. New Haven, CT, Hillhouse, 1960.*

## **Behavioral Signs of an Adolescent Who May Be Abusing Alcohol or Other Drugs**

- **Absenteeism** – Excuses are usually forged or students may make many appointments to see the nurse.
- **Becoming More Secretive** – Not sharing any, or very little, of their personal problems.
- **Bloodshot or Glassy Eyes** – This is not always a reliable diagnostic tool, but a sign to be on the lookout for.
- **Change in Physical Hygiene** – Becoming more sloppy, wearing same clothes frequently.
- **Constantly Late for Class** – Student usually has poor excuses for being late, may come late with a group of other students.
- **Defensive Behavior** – When confronted about behavior or other concerns.
- **Defiance of Rules and Regulations** – Pushing limits, not following rules.
- **Drop in Grades** – This could be a slow decrease or a drastic drop.
- **Drug-Related Jewelry, Clothing** – Clips, spoons, pacifiers. T-shirts with drug-related messages; also may show up as drawing drug-related material on clothing, books, desks, and self.
- **Emotional Highs and Lows** – Easily upset, emotional state changes rapidly, doesn't seem as happy as s/he used to.
- **Frequent Visits to Bathroom/Nurse/Counselor**
- **Isolating Themselves** – Spending a lot of times alone, not with their friends.
- **Leaving School Grounds** – This happens usually during the lunch period or when dropped off in the morning before class starts.
- **Loss of Initiative** – Less energy, sleeping more than usual.
- **Not Informing Parents of School Activities** – Open house times, parent conferences.
- **Not Responding in Class** – lack of concern regarding class and school in general. Difficult to motivate student.
- **Other Students Express Concern**
- **Peers** – Students will hang out with a crowd of known users.
- **Self-Mutilation**
- **Selling Possessions** – Clothing, records, gifts, seems to have money but no job.
- **Short-Tempered** – Becomes angry often, short fuse.
- **Skipping Class and/or School** – This usually comes out in chronic skipping of classes or the entire school day.
- **Sitting in the Back of Class** – Sleeping, daydreaming, laughing, lots of talk regarding drugs or parties.
- **Sleeping in Class**
- **Smell of Alcohol or Marijuana** – This could be the smell of recent use or the after-effects of continued use.
- **Sunglasses in Class / At School**
- **Switching Friends** – Usually seen as a different set of friends, often users.
- **Vandalism** – To school property or teacher's property.
- **Wearing Sunglasses in Class**
- **Weight Changes** –drastic loss or gain.
- **Work not Completed** – Student usually has poor excuses for not getting work done on time or at all.
- **Verbal Abuse** – This is usually directed towards teachers, and/or anyone that represents authority.
- **Withdrawing from Activities** – After school activities, sports, clubs, etc.

### **Progression of Drug Dependency and Addiction**

<b>Experimental Use</b>	<b>Low-Risk Use</b>	<b>Abusive Use</b>	<b>Harmful use</b>	<b>Dependency</b>	<b>Addiction</b>
<ul style="list-style-type: none"> <li>• Use unplanned</li> <li>• Usually done in secret with others</li> <li>• AOD obtained from older siblings or friends</li> <li>• Up to 3 experiences comprise this stage</li> <li>• Some kids go no further</li> </ul>	<ul style="list-style-type: none"> <li>• Use is planned</li> <li>• Complete control of self and intake of drug</li> <li>• Not upset if no drugs available</li> <li>• The social event is the focus</li> <li>• Alcohol and marijuana are the drugs of choice</li> <li>• Don't usually get drunk or wasted</li> <li>• Almost always use AOD behind adults' backs</li> </ul> <p>Use involves rules:</p> <ul style="list-style-type: none"> <li>• Sometimes at parties</li> <li>• Weekends only</li> <li>• For fun</li> </ul>	<ul style="list-style-type: none"> <li>• Drink to get drunk / excessive use of drug</li> <li>• Have drug of choice, pattern of use, and would be upset if no drugs were available</li> <li>• Typically use once or twice a week, usually at parties, sometimes before or after school</li> <li>• Begin to use to escape problems and cope with pressure</li> <li>• May arrive at school and school functions under the influence</li> <li>• May change peer groups</li> <li>• Inconsistent, erratic efforts at school</li> <li>• May need outside help to stop</li> </ul>	<ul style="list-style-type: none"> <li>• Use to feel comfortable and normal</li> <li>• May not look like they are under the influence</li> <li>• Use regularly during the week</li> <li>• Use alone</li> <li>• Use more</li> <li>• Have integrated AOD as part of their lifestyle</li> <li>• Have and use their own paraphernalia</li> <li>• Believe use helps them cope with stress, pressure, and problems</li> <li>• Attempt to justify use</li> <li>• Probably need outside help to stop</li> </ul>	<ul style="list-style-type: none"> <li>• Use daily</li> <li>• Need urgently to repeat getting high</li> <li>• Are obsessed with AOD – AOD and intoxication are the most important elements of life</li> <li>• Often turn to harder drugs and heavier use</li> <li>• Will use any means to get money for drugs</li> <li>• Hide and protect their supplies</li> <li>• Develop significant problems at home, in school, in the community</li> <li>• Cannot stop AOD use</li> <li>• Must have outside help to stop</li> <li>•</li> <li>• (Use negatively affecting self or others; relationships, grades, sports or other extracurricular activities; attitude)</li> <li>• (Dependent on for fun, using as a crutch)</li> <li>• (Loss of control, zero use only option to recovery)</li> </ul>	

### Progression of Drug Dependency and Addiction

<b>Experimental Use</b>	<b>Low-Risk Use</b>	<b>Abusive Use</b>	<b>Harmful use</b>	<b>Dependency</b>	<b>Addiction</b>
<i>Contrary to common perception, experimentation is not automatic and does not need to happen. If kids never experiment, they can't develop substance use problems. Preventing or delaying experimentation starts with adults' refusal to accept that all kids experiment</i>	<i>Social/recreational use means just that and does not condone AOD use or imply that it is expected and acceptable behavior</i>	<i>Youth seek the AOD high and opportunities to get high</i>	<i>It takes a professional AOD counselor to assess and determine whether an adolescent is harmfully involved or dependent. Educators need only to determine that AOD use is causing significant problems and is, therefore, the problem that must be addressed. An indistinct line separates these stages and their indicators.</i>		
Late Elementary / Middle School	Middle / High School	Middle / High School			
<b>Parents and school</b> are usually unaware of kids' experimentation	<b>Parents and school</b> are usually unaware of kids' use	<b>Parents and school</b> may think kids are experimenting	<b>Parents and school:</b> <ul style="list-style-type: none"> <li>• Know something is wrong</li> <li>• Tend to deny what they see</li> <li>• Often blame one another</li> <li>• May enable use due to fear of confrontation</li> </ul>	<b>Parents and school:</b> <ul style="list-style-type: none"> <li>• Feel out of control</li> <li>• May give up on the youth</li> <li>• May feel relieved if s/he moves out and/or drops out</li> </ul>	

## **CHEMICAL USE/ABUSE/DEPENDENCE**

### **Social/Recreational Use**

- Use is planned
- Use is for relaxation or euphoria
- Use is usually social
- Use is limited to 1 or 2 drinks
- Use exceeding above limit causes ill effects (ie: headache, nausea, vomiting, hang over)

### **ABUSE**

- Increase in tolerance: can drink more than 1 or 2 without feeling any ill effects
- Use is for the purpose of getting high or drunk
- Use is for recreation but usually results in getting inebriated
- Use purposely to alter feeling state or to escape feelings or stress
- Use despite negative consequences (ie: missing school or work, DWI or other legal involvement, relationship strains, etc.)

*2 ways to acquire tolerance*

1 – inherited

2 – practice

Increased tolerance means you need more of a chemical to attain the same high. With increased tolerance comes a corresponding low or rebound effect thereby setting the stage for the development of addiction. The more frequent the use, the larger the quantity of use and the more regular the pattern of use the more likely one is to become addicted. If there is a positive family history of dependence the more likely and the more quickly this process occurs.

### **DEPENDENCE**

- No longer have consistent control
- Drinks more than intended
- Drinks when not intended
- Activities are planned around accessibility and availability of alcohol
- Drinking continues despite negative consequences
- Memory lapses (blackouts)
- Don't stop drinking until drunk or passed out (or out of booze or money)
- Other social activities which do not include alcohol diminish or disappear
- Sometimes need a drink to feel normal
- Sometimes feel out of control

**Physical consequences of continued use once dependent lead to serious illness and death.**

### **Enabling Patterns**

- 1) Avoiding places in the building or its grounds where students are known to use alcohol, tobacco, or other drugs.
- 2) Failing to recognize or confront apparent exchanges of money, and/or drugs in classrooms, halls, cafeteria, etc.
- 3) Ignoring or being reluctant to confront unacceptable behavior in the classroom.
- 4) Ignoring apparent intoxication of students in the classroom or other areas of supervision.
- 5) Ignoring, or supporting, students' verbal announcements in the class about drug use.
- 6) Having unclear standards of acceptable academic performance or classroom conduct.
- 7) Failing to report incidents of observed student alcohol/drug use to those designated to handle such issues.
- 8) Failing to refer students suspected of ATOD (alcohol, tobacco or other drug) involvement, who have a pattern of unacceptable performance or conduct to those designated to handle such problems (Student Assistance Program).
- 9) Attempting to affect the ATOD-related behavior of individual students by "counseling" them oneself.
- 10) Believing that a given student couldn't possibly be alcohol/drug involved because s/he gets good grades, is an athlete, is a "good kid", etc.
- 11) Lowering expectations for some students.

# National Institutes of Health



## *Fact Sheet*

## *Alcohol Dependence (Alcoholism)*

### Thirty Years Ago

- Little then was known about the genetic basis of alcohol dependence, or the nervous system changes that occur as a result of prolonged heavy drinking.
- Alcohol dependence was thought to be a disease of middle age.
- Disulfiram (Antabuse®) was the only medication approved for treating alcohol dependence. Antabuse® produces acute sensitivity to alcohol. This sensitivity causes a highly unpleasant reaction when the patient ingests even small amounts of alcohol.
- Other treatments included various behavioral approaches, mostly group counseling and referral to Alcoholics Anonymous (AA). These treatments were only offered in intensive programs provided at specific locations separated from mainstream health care.
- NIH-supported research demonstrated that relatively few people with alcohol dependence ever received treatment.

### Today

- NIH-supported researchers identified genes that increase an individual's risk for becoming alcohol dependent, as well as genes that protect against alcohol problems.
- The neural basis of alcohol dependence was clarified. Research showing that drinking is influenced by multiple neurotransmitter systems, neuromodulators, hormones, and intracellular networks provides evidence of a number of potential target sites for which new medications may be developed.
- Multiple excellent animal models provide valuable tools for today's researchers.
- Clinicians have access to a wide range of treatment options that can be tailored to patients' specific needs, and a broad array of drinking problems can be effectively treated by non-specialists.

- Screening and Brief Intervention – one to four repeated short counseling sessions focused on increasing motivation to reduce drinking – has recently emerged as an effective strategy for addressing high-risk drinking.
- Investigators developed screening tools that allow clinicians to quickly and reliably determine if their patients' alcohol consumption patterns place them at risk for future adverse consequences. Studies show that brief interventions delivered in trauma units can reduce subsequent drinking and injuries. Brief interventions with high-risk college students successfully reduce alcohol consumption and/or the related consequences.
- Efforts to develop medications for alcohol use disorders have expanded rapidly in recent years. In addition to disulfiram, naltrexone and acamprosate are now approved for use in treating alcohol dependence. Naltrexone and acamprosate reduce relapse to heavy drinking in people who want to quit by normalizing brain dysfunction caused by alcohol dependence.
- When used in conjunction with behavioral therapies, medications improve the chance for recovery and the lives of those who suffer from alcohol dependence.
- Several behavioral approaches, such as motivational enhancement therapy, cognitive-behavioral therapy, and Twelve-Step facilitation, are effective in treating alcohol dependence, offering the patient and therapist a choice of approach. Brief counseling by a health professional combined with medication recently was found to be as effective as specialized counseling. Thus, it may be possible to provide access to effective treatment to many more people in primary care and mental health clinics.

### Tomorrow

The future holds promise for substantially reducing the public health burden of heavy drinking to our society through carefully targeted behavioral and

pharmacological therapies for individuals who develop alcohol dependence.

- *Predictive and personalized treatment.* An important direction for medications development research lies in pharmacogenetic research—the identification of genetic subtypes of alcohol dependence that respond to specific pharmacologic agents. The recent discovery of specific genetic variants that may contribute to the risk for alcoholism could help define sub-sets of alcohol dependent individuals who respond to a specific therapeutic agent. Other studies will pursue biobehavioral markers of therapeutic response through human laboratory studies.
- Ongoing investigations seek to determine how best to extend treatment to the estimated 90 percent of heavy drinkers who do not seek treatment. Methods under study include making brief motivational counseling widely available, such as in primary and general mental health care settings, churches, schools, and workplaces. Innovative technologies such as internet and other computer-based methods and toll-free telephone approaches will likely play a significant role.

# NIDA INFOFACTS

www.drugabuse.gov

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## Understanding Drug Abuse and Addiction

Many people do not understand why individuals become addicted to drugs or how drugs change the brain to foster compulsive drug abuse. They mistakenly view drug abuse and addiction as strictly a social problem and may characterize those who take drugs as morally weak. One very common belief is that drug abusers should be able to just stop taking drugs if they are only willing to change their behavior. What people often underestimate is the complexity of drug addiction—that it is a disease that impacts the brain and because of that, stopping drug abuse is not simply a matter of willpower. Through scientific advances we now know much more about how exactly drugs work in the brain, and we also know that drug addiction can be successfully treated to help people stop abusing drugs and resume their productive lives.

### ***What is drug addiction?***

Addiction is a chronic, often relapsing brain disease that causes compulsive drug seeking and use despite harmful consequences to the individual that is addicted and to those around them. Drug addiction is a **brain disease** because the abuse of drugs leads to

changes in the structure and function of the brain. Although it is true that for most people the initial decision to take drugs is voluntary, over time the changes in the brain caused by repeated drug abuse can affect a person's self control and ability to make sound decisions, and at the same time send intense impulses to take drugs.

It is because of these changes in the brain that it is so challenging for a person who is addicted to stop abusing drugs. Fortunately, there are treatments that help people to counteract addiction's powerful disruptive effects and regain control. Research shows that combining addiction treatment medications, if available, with behavioral therapy is the best way to ensure success for most patients. Treatment approaches that are tailored to each patient's drug abuse patterns and any co-occurring medical, psychiatric, and social problems can lead to sustained recovery and a life without drug abuse.

Similar to other **chronic, relapsing** diseases, such as diabetes, asthma, or heart disease, drug addiction can be managed successfully. And, as with other chronic diseases, it is not uncommon for a person to relapse and begin abusing drugs again. Relapse, however,

does not signal failure—rather, it indicates that treatment should be reinstated, adjusted, or that alternate treatment is needed to help the individual regain control and recover.

## ***What happens to your brain when you take drugs?***

Drugs are chemicals that tap into the brain's communication system and disrupt the way nerve cells normally send, receive, and process information. There are at least two ways that drugs are able to do this: (1) by imitating the brain's natural chemical messengers, and/or (2) by overstimulating the "reward circuit" of the brain.

Some drugs, such as marijuana and heroin, have a similar structure to chemical messengers, called neurotransmitters, which are naturally produced by the brain. Because of this similarity, these drugs are able to "fool" the brain's receptors and activate nerve cells to send abnormal messages.

Other drugs, such as cocaine or methamphetamine, can cause the nerve cells to release abnormally large amounts of natural neurotransmitters, or prevent the normal recycling of these brain chemicals, which is needed to shut off the signal between neurons. This disruption produces a greatly amplified message that ultimately disrupts normal communication patterns.

Nearly all drugs, directly or indirectly, target the brain's reward system by flooding the circuit with dopamine. Dopamine is a neurotransmitter present in regions of the brain that control movement, emotion, motivation, and feelings of pleasure. The overstimulation of this system, which normally responds to natural behaviors that are linked to survival (eating, spending time with loved ones, etc.), produces euphoric effects in response to the drugs. This reaction sets in motion a pattern that "teaches" people to repeat the behavior of abusing drugs.

As a person continues to abuse drugs, the brain adapts to the overwhelming surges in dopamine by producing less dopamine or by reducing the number of dopamine receptors in the reward circuit. As a result, dopamine's impact on the reward circuit is lessened, reducing the abuser's ability to enjoy the drugs and the things that previously brought pleasure. This decrease compels those addicted to drugs to keep abusing drugs in order to attempt to bring their dopamine function back to normal. And, they may now require larger amounts of the drug than they first did to achieve the dopamine high—an effect known as *tolerance*.

Long-term abuse causes changes in other brain chemical systems and circuits as well. Glutamate is a neurotransmitter that influences the reward circuit and the ability to learn. When the optimal

concentration of glutamate is altered by drug abuse, the brain attempts to compensate, which can impair cognitive function. Drugs of abuse facilitate non-conscious (conditioned) learning, which leads the user to experience uncontrollable cravings when they see a place or person they associate with the drug experience, even when the drug itself is not available. Brain imaging studies of drug-addicted individuals show changes in areas of the brain that are critical to judgment, decisionmaking, learning and memory, and behavior control. Together, these changes can drive an abuser to seek out and take drugs compulsively despite adverse consequences—in other words, to become addicted to drugs.

## ***Why do some people become addicted and others do not?***

No single factor can predict whether or not a person will become addicted to drugs. Risk for addiction is influenced by a person's biology, social environment, and age or stage of development. The more risk factors an individual has, the greater the chance that taking drugs can lead to addiction. For example:

- **Biology.** The genes that people are born with—in combination with environmental influences—account for about half of their addiction vulnerability. Additionally, gender, ethnicity, and the presence of other mental

disorders may influence risk for drug abuse and addiction.

- **Environment.** A person's environment includes many different influences—from family and friends to socioeconomic status and quality of life in general. Factors such as peer pressure, physical and sexual abuse, stress, and parental involvement can greatly influence the course of drug abuse and addiction in a person's life.
- **Development.** Genetic and environmental factors interact with critical developmental stages in a person's life to affect addiction vulnerability, and adolescents experience a double challenge. Although taking drugs at any age can lead to addiction, the earlier that drug use begins, the more likely it is to progress to more serious abuse. And because adolescents' brains are still developing in the areas that govern decisionmaking, judgment, and self-control, they are especially prone to risk-taking behaviors, including trying drugs of abuse.

## ***Prevention is the key***

Drug addiction is a preventable disease. Results from NIDA-funded research have shown that prevention programs that involve families, schools, communities, and the media are effective in reducing drug abuse. Although many events and cultural factors affect drug abuse trends,

when youths perceive drug abuse as harmful, they reduce their drug taking. It is necessary, therefore, to help youth and the general public to understand the risks of drug abuse, and for teachers, parents, and healthcare professionals to keep sending the message that drug addiction can be prevented if a person never abuses drugs.

For more information on understanding drug abuse and addiction, please see our booklet, ***Drugs, Brains, and Behavior – The Science of Addiction***, at [www.nida.nih.gov/scienceofaddiction/](http://www.nida.nih.gov/scienceofaddiction/).

For more information on prevention, please visit [www.nida.nih.gov/drugpages/prevention.html](http://www.nida.nih.gov/drugpages/prevention.html).

For more information on treatment, please visit [www.nida.nih.gov/drugpages/treatment.html](http://www.nida.nih.gov/drugpages/treatment.html).

To find a publicly funded treatment center in your State, please call 1-800-662-HELP or visit [www.findtreatment.samhsa.gov](http://www.findtreatment.samhsa.gov).

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**NIDA** NATIONAL INSTITUTE  
ON DRUG ABUSE

**National Institutes of Health – U.S. Department of Health and Human Services**

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# NIDA INFOFACTS

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## Treatment Approaches for Drug Addiction

*NOTE: This is a fact sheet covering research findings on effective treatment approaches for drug abuse and addiction. If you are seeking treatment, please call 1-800-662-HELP(4357) for information on hotlines, counseling services, or treatment options in your State. This is the Center for Substance Abuse Treatment's National Drug and Alcohol Treatment Service. Drug treatment programs by State also may be found online at [www.findtreatment.samhsa.gov](http://www.findtreatment.samhsa.gov).*

Drug addiction is a complex but treatable disease. It is characterized by compulsive drug craving, seeking, and use that persist even in the face of severe adverse consequences. For many people, drug abuse becomes chronic, with relapses possible even after long periods of abstinence. In fact, relapse to drug abuse occurs at rates similar to those for other well-characterized, chronic medical illnesses such as diabetes, hypertension, and asthma. As a chronic, recurring illness, addiction may require repeated episodes of treatment before sustained abstinence is achieved. Through treatment tailored to individual needs, people with drug addiction can recover and lead productive lives.

The ultimate goal of drug addiction treatment is to enable an individual to achieve lasting abstinence, but the immediate goals are to reduce drug

abuse, improve the patient's ability to function, and minimize the medical and social complications of drug abuse and addiction. Like people with diabetes or heart disease, people in treatment for drug addiction will also need to change their behavior to adopt a more healthful lifestyle.

In 2006, 23.6 million persons aged 12 or older needed treatment for an illicit drug or alcohol use problem (9.6 percent of the persons aged 12 or older). Of these, 2.5 million (10.8 percent of those who needed treatment) received treatment at a specialty facility. Thus, 21.2 million persons (8.6 percent of the population aged 12 or older) needed treatment for an illicit drug or alcohol use problem but did not receive it. These estimates are similar to the estimates for 2005.\*

Untreated substance abuse and addiction add significant costs to families and communities, including those related to violence and property crimes, prison expenses, court and criminal costs, emergency room visits, healthcare utilization, child abuse and neglect, lost child support, foster care and welfare costs, reduced productivity, and unemployment.

The cost to society of illicit drug abuse alone is \$181 billion annually.<sup>1</sup> When combined with alcohol and tobacco costs, they exceed \$500 billion including healthcare, criminal justice, and lost productivity.<sup>2,3</sup> Successful drug abuse treatment can help reduce these costs in addition to crime, and the spread of HIV/AIDS, hepatitis, and other infectious diseases. It is estimated that for every dollar spent on addiction treatment programs, there is a \$4 to \$7 reduction in the cost of drug-related crimes. With some outpatient programs, total savings can exceed costs by a ratio of 12:1.

### ***Basis for Effective Treatment***

Scientific research since the mid-1970s shows that treatment can help many people change destructive behaviors, avoid relapse, and successfully remove themselves from a life of substance abuse and addiction. Recovery from drug addiction is a long-term process and frequently requires multiple episodes of treatment. Based on this research, key principles have been identified that should form the basis of any effective treatment program:

- No single treatment is appropriate for all individuals.
- Treatment needs to be readily available.
- Effective treatment attends to multiple needs of the individual, not just his or her drug addiction.
- An individual's treatment and services plan must be assessed often and modified to meet the person's changing needs.
- Remaining in treatment for an adequate period of time is critical for treatment effectiveness.
- Counseling and other behavioral therapies are critical components of virtually all effective treatments for addiction.
- For certain types of disorders, medications are an important element of treatment, especially when combined with counseling and other behavioral therapies.
- Addicted or drug-abusing individuals with coexisting mental disorders should have both disorders treated in an integrated way.
- Medical management of withdrawal syndrome is only the first stage of addiction treatment and by itself does little to change long-term drug use.
- Treatment does not need to be voluntary to be effective.
- Possible drug use during treatment must be monitored continuously.
- Treatment programs should provide assessment for HIV/AIDS, hepatitis B and C, tuberculosis, and other infectious diseases, and should provide counseling to help patients modify or change behaviors that place themselves or others at risk of infection.

- As is the case with other chronic, relapsing diseases, recovery from drug addiction can be a long-term process and typically requires multiple episodes of treatment, including "booster" sessions and other forms of continuing care.

## Effective Treatment Approaches

Medication and behavioral therapy, alone or in combination, are aspects of an overall therapeutic process that often begins with detoxification, followed by treatment and relapse prevention. Easing withdrawal symptoms can be important in the initiation of treatment; preventing relapse is necessary for maintaining its effects. And sometimes, as with other chronic conditions, episodes of relapse may require a return to prior treatment components. A continuum of care that includes a customized treatment regimen, addressing all aspects of an individual's life, including medical and mental health services, and followup options (e.g., community- or family-based recovery support systems) can be crucial to a person's success in achieving and maintaining a drug-free lifestyle.

**Medications** can be used to help with different aspects of the treatment process.

**Withdrawal:** Medications offer help in suppressing withdrawal symptoms during detoxification. However, medically assisted withdrawal is not in itself "treatment"—it is only the first step in the

treatment process. Patients who go through medically assisted withdrawal but do not receive any further treatment show drug abuse patterns similar to those who were never treated.

**Treatment:** Medications can be used to help re-establish normal brain function and to prevent relapse and diminish cravings throughout the treatment process. Currently, we have medications for opioid (heroin, morphine) and tobacco (nicotine) addiction, and are developing others for treating stimulant (cocaine, methamphetamine) and cannabis (marijuana) addiction.

Methadone and buprenorphine, for example, are effective medications for the treatment of opiate addiction. Acting on the same targets in the brain as heroin and morphine, these medications suppress withdrawal symptoms, and relieve craving for the drug. This helps patients to disengage from drug-seeking and related criminal behavior and be more receptive to behavioral treatments.

**Buprenorphine:** This is a relatively new and important treatment medication. NIDA-supported basic and clinical research led to its development (Subutex or, in combination with naloxone, Suboxone), and demonstrated it to be a safe and acceptable addiction treatment. While these products were being developed in concert with industry partners, Congress passed the Drug Addiction Treatment Act (DATA 2000), permitting qualified physicians to prescribe narcotic

medications (Schedules III to V) for the treatment of opioid addiction. This legislation created a major paradigm shift by allowing access to opiate treatment in a medical setting rather than limiting it to specialized drug treatment clinics. To date, nearly 10,000 physicians have taken the training needed to prescribe these two medications, and nearly 7,000 have registered as potential providers.

**Behavioral Treatments** help patients engage in the treatment process, modify their attitudes and behaviors related to drug abuse, and increase healthy life skills. Behavioral treatments can also enhance the effectiveness of medications and help people stay in treatment longer.

**Outpatient behavioral treatment** encompasses a wide variety of programs for patients who visit a clinic at regular intervals. Most of the programs involve individual or group drug counseling. Some programs also offer other forms of behavioral treatment such as:

- *Cognitive Behavioral Therapy*, which seeks to help patients recognize, avoid, and cope with the situations in which they are most likely to abuse drugs.
- *Multidimensional Family Therapy*, which addresses a range of influences on the drug abuse patterns of adolescents and is designed for them and their families.

- *Motivational Interviewing*, which capitalizes on the readiness of individuals to change their behavior and enter treatment.
- *Motivational Incentives* (contingency management), which uses positive reinforcement to encourage abstinence from drugs.

**Residential treatment** programs can also be very effective, especially for those with more severe problems. For example, therapeutic communities (TCs) are highly structured programs in which patients remain at a residence, typically for 6 to 12 months. Patients in TCs may include those with relatively long histories of drug addiction, involvement in serious criminal activities, and seriously impaired social functioning. TCs are now also being designed to accommodate the needs of women who are pregnant or have children. The focus of the TC is on the re-socialization of the patient to a drug-free, crime-free lifestyle.

**Treatment Within the Criminal Justice System** can succeed in preventing an offender's return to criminal behavior, particularly when treatment continues as the person transitions back into the community. Studies show that treatment does not need to be voluntary to be effective. Research suggests that treatment can cut drug abuse in half, drastically decrease criminal activity, and significantly reduce arrests.<sup>4</sup>

## Other information sources

For more detailed information on treatment approaches for drug addiction and examples of specific programs proven effective through research, view NIDA's *Principles of Drug Addiction Treatment: A Research-Based Guide* at [www.nida.nih.gov/PODAT/PODATIndex.html](http://www.nida.nih.gov/PODAT/PODATIndex.html) (English) or [www.nida.nih.gov/](http://www.nida.nih.gov/)

## PODAT/Spanish/PODATIndex.html (Spanish).

For information about treatment for drug abusers in the criminal justice system, view NIDA's *Principles of Drug Abuse Treatment for Criminal Justice Populations: A Research-Based Guide* at [www.drugabuse.gov/DrugPages/cj.html](http://www.drugabuse.gov/DrugPages/cj.html).

## Data Sources

\* Data are from the National Survey on Drug Use and Health (formerly known as the National Household Survey on Drug Abuse), which is an annual survey of Americans age 12 and older conducted by the Substance Abuse and Mental Health Services Administration. This survey is available online at [www.samhsa.gov](http://www.samhsa.gov) and from the National Clearinghouse for Alcohol and Drug Information at 800-729-6686.

<sup>1</sup> Office of National Drug Control Policy. *The Economic Costs of Drug Abuse in the United States: 1992–2002*. Washington, DC: Executive Office of the President (Publication No. 207303), 2004.

<sup>2</sup> Harwood, H. *Updating Estimates of the Economic Costs of Alcohol Abuse in the United States: Estimates, Update Methods, and Data Report*. Prepared by the Lewin Group for the National Institute on Alcohol Abuse and Alcoholism, 2000.

<sup>3</sup> Centers for Disease Control and Prevention. *Annual Smoking–Attributable Mortality, Years of Potential Life Lost, and Productivity Losses — United States, 1997–2001*. *Morbidity and Mortality Weekly Report* 54(25):625–628, July 1, 2005.

<sup>4</sup> The National Treatment Improvement Evaluation Study (NTIES): Highlights. DHHS Publication No. (SMA) 97-3159. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment, Office of Evaluation, Scientific Analysis and Synthesis, pp. 241–242. 1997.

DRUGS, BRAINS, AND BEHAVIOR

# THE SCIENCE OF ADDICTION



**NIDA**  
NATIONAL INSTITUTE  
ON DRUG ABUSE

National Institutes of Health  
U.S. Department of Health  
and Human Services

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## How Science Has Revolutionized the Understanding of Drug Addiction

**T**hroughout much of the last century, scientists studying drug abuse labored in the shadows of powerful myths and misconceptions about the nature of addiction. When science began to study addictive behavior in the 1930s, people addicted to drugs were thought to be morally flawed and lacking in willpower. Those views shaped society's responses to drug abuse, treating it as a moral failing rather than a health problem, which led to an emphasis on punitive rather than preventative and therapeutic actions. Today, thanks to science, our views and our responses to drug abuse have changed dramatically. Groundbreaking discoveries about the brain have revolutionized our understanding of drug addiction, enabling us to respond effectively to the problem.

As a result of scientific research, we know that addiction is a disease that affects both brain and behavior. We have identified many of the biological and environmental factors and are beginning to search for the genetic variations that contribute to the development and progression of the disease. Scientists use this knowledge to develop effective prevention and treatment approaches that reduce the toll drug abuse takes on individuals, families, and communities.

Despite these advances, many people today do not understand why individuals become addicted to drugs or how drugs change the brain to foster compulsive drug abuse. This booklet aims to fill that knowledge gap by providing scientific information about the disease of drug addiction, including the many harmful consequences of drug abuse and the basic approaches that have been developed to prevent and treat the disease. At the National Institute on Drug Abuse (NIDA), we believe that increased understanding of the basics of addiction will empower people to make informed choices in their own lives, adopt science-based policies and programs that reduce drug abuse and addiction in their communities, and support scientific research that improves the Nation's well-being.



Nora D. Volkow, M.D.  
Director  
National Institute on Drug Abuse



**MEDICAL**



**SOCIAL**



**ECONOMIC**



**CRIMINAL JUSTICE**

*The consequences of drug abuse are vast and varied  
and affect people of all ages.*

## Why study drug abuse and addiction?

**A**buse and addiction to alcohol, nicotine, and illegal substances cost Americans upwards of half a trillion dollars a year, considering their combined medical, economic, criminal, and social impact. Every year, abuse of illicit drugs and alcohol contributes to the death of more than 100,000 Americans, while tobacco is linked to an estimated 440,000 deaths per year.

**People of all ages suffer the harmful consequences of drug abuse and addiction.**

- **Babies** exposed to legal and illegal drugs in the womb may be born premature and underweight. This drug exposure can slow the child's intellectual development and affect behavior later in life.
- **Adolescents** who abuse drugs often act out, do poorly academically, and drop out of school. They are at risk of unplanned pregnancies, violence, and infectious diseases.
- **Adults** who abuse drugs often have problems thinking clearly, remembering, and paying attention. They often develop poor social behaviors as a result of their drug abuse, and their work performance and personal relationships suffer.
- **Parents'** drug abuse often means chaotic, stress-filled homes and child abuse and neglect. Such conditions harm the well-being and development of children in the home and may set the stage for drug abuse in the next generation.

## How does science provide solutions for drug abuse and addiction?

Scientists study the effects that drugs have on the brain and on people's behavior. They use this information to develop programs for preventing drug abuse and for helping people recover from addiction. Further research helps transfer these ideas into practice in our communities.



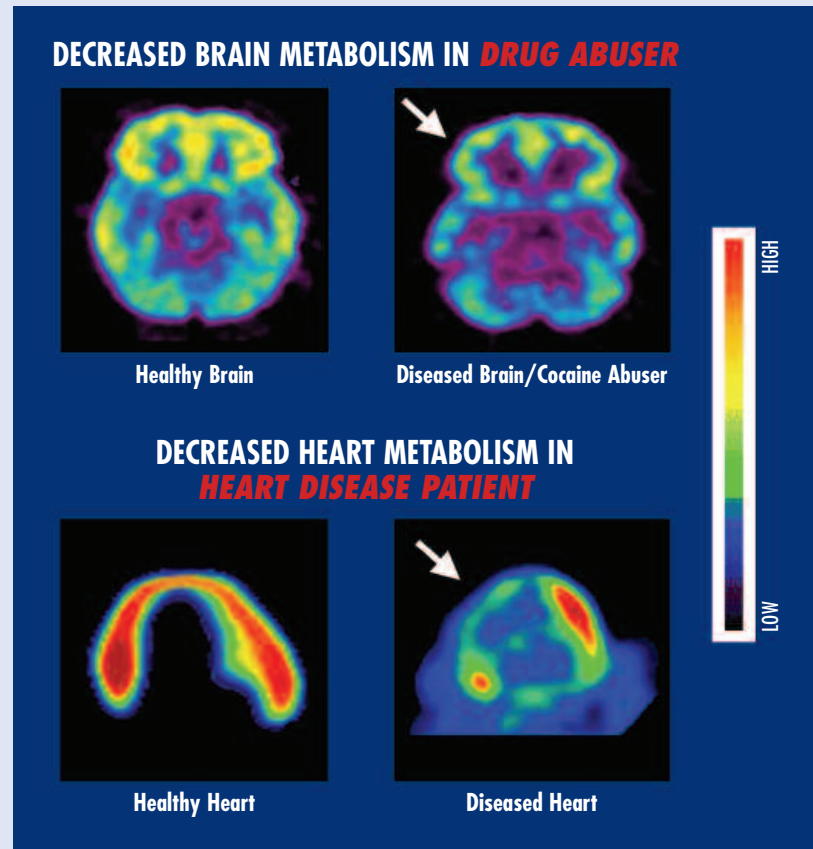
# I. DRUG ABUSE AND ADDICTION

## What is drug addiction?

Addiction is defined as a chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences. It is considered a brain disease because drugs change the brain—they change its structure and how it works. These brain changes can be long lasting, and can lead to the harmful behaviors seen in people who abuse drugs.

Addiction is similar to other diseases, such as heart disease. Both disrupt the normal, healthy functioning of the underlying organ, have serious harmful consequences, are preventable, treatable, and if left untreated, can last a lifetime.

*Source: From the laboratories of Drs. N. Volkow and H. Schelbert.*



## Why do people take drugs?

In general, people begin taking drugs for a variety of reasons:

- ***To feel good.*** Most abused drugs produce intense feelings of pleasure. This initial sensation of euphoria is followed by other effects, which differ with the type of drug used. For example, with stimulants such as cocaine, the “high” is followed by feelings of power, self-confidence, and increased energy. In contrast, the euphoria caused by opiates such as heroin is followed by feelings of relaxation and satisfaction.
- ***To feel better.*** Some people who suffer from social anxiety, stress-related disorders, and depression begin abusing drugs in an attempt to lessen feelings of distress. Stress can play a major role in beginning drug use, continuing drug abuse, or relapse in patients recovering from addiction.
- ***To do better.*** The increasing pressure that some individuals feel to chemically enhance or improve their athletic or cognitive performance can similarly play a role in initial experimentation and continued drug abuse.
- ***Curiosity and “because others are doing it.”*** In this respect adolescents are particularly vulnerable because of the strong influence of peer pressure; they are more likely, for example, to engage in “thrilling” and “daring” behaviors.



Courtesy: Vivian Felsen



## If taking drugs makes people feel good or better, what's the problem?

At first, people may perceive what seem to be positive effects with drug use. They also may believe that they can control their use; however, drugs can quickly take over their lives. Consider how a social drinker can become intoxicated, put himself behind a wheel and quickly turn a pleasurable activity into a tragedy for him and others. Over time, if drug use continues, pleasurable activities become less pleasurable, and drug abuse becomes necessary for abusers to simply feel “normal.” Drug abusers reach a point where they seek and

take drugs, despite the tremendous problems caused for themselves and their loved ones. Some individuals may start to feel the need to take higher or more frequent doses, even in the early stages of their drug use.

## Is continued drug abuse a voluntary behavior?

The initial decision to take drugs is mostly voluntary. However, when drug abuse takes over, a person's ability to exert self control can become seriously impaired. Brain imaging studies

from drug-addicted individuals show physical changes in areas of the brain that are critical to judgment, decisionmaking, learning and memory, and behavior control. Scientists believe that these changes alter the way the brain works, and may help explain the compulsive and destructive behaviors of addiction.

EXAMPLES OF RISK AND PROTECTIVE FACTORS		
Risk Factors	Domain	Protective Factors
Early Aggressive Behavior	Individual	Self-Control
Poor Social Skills	Individual	Positive Relationships
Lack of Parental Supervision	Family	Parental Monitoring and Support
Substance Abuse	Peer	Academic Competence
Drug Availability	School	Anti-Drug Use Policies
Poverty	Community	Strong Neighborhood Attachment

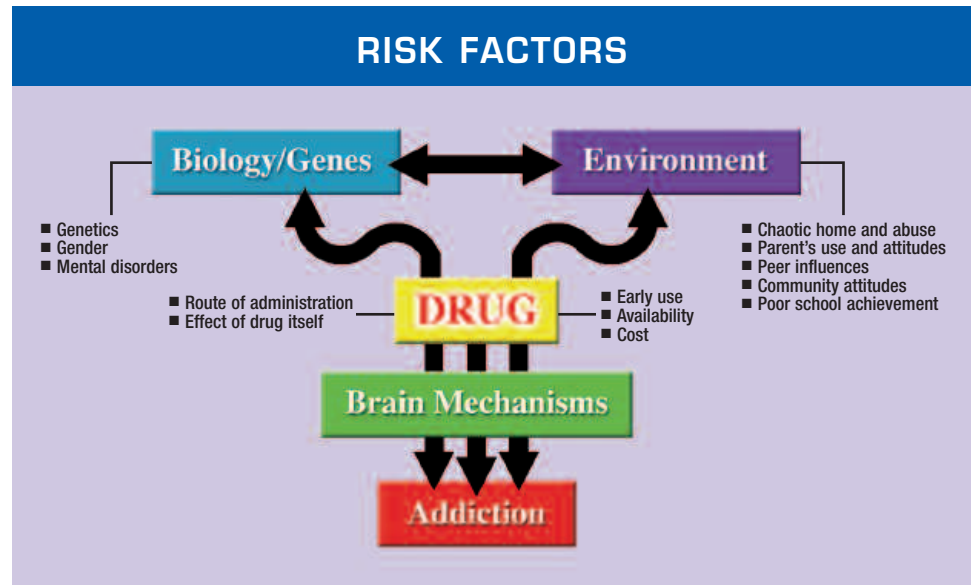
# *No single factor determines whether a person will become addicted to drugs.*

## Why do some people become addicted to drugs, while others do not?

As with any other disease, vulnerability to addiction differs from person to person. In general, the more risk factors an individual has, the greater the chance that taking drugs will lead to abuse and addiction. “Protective” factors reduce a person’s risk of developing addiction.

## What factors determine if a person will become addicted?

No single factor determines whether a person will become addicted to drugs. The overall risk for addiction is impacted by the biological makeup of the individual—it can even be influenced by gender or ethnicity, his or her developmental stage, and the surrounding social environment (e.g., conditions at home, at school, and in the neighborhood).



## Which biological factors increase risk of addiction?

Scientists estimate that genetic factors account for between 40 and 60 percent of a person’s vulnerability to addiction, including the effects of environment on gene expression and function. Adolescents and individuals with mental disorders are at greater risk of drug abuse and addiction than the general population.

# *Children's earliest interactions within the family are crucial to their healthy development and risk for drug abuse.*

Vermont Department of Education

## What environmental factors increase the risk of addiction?

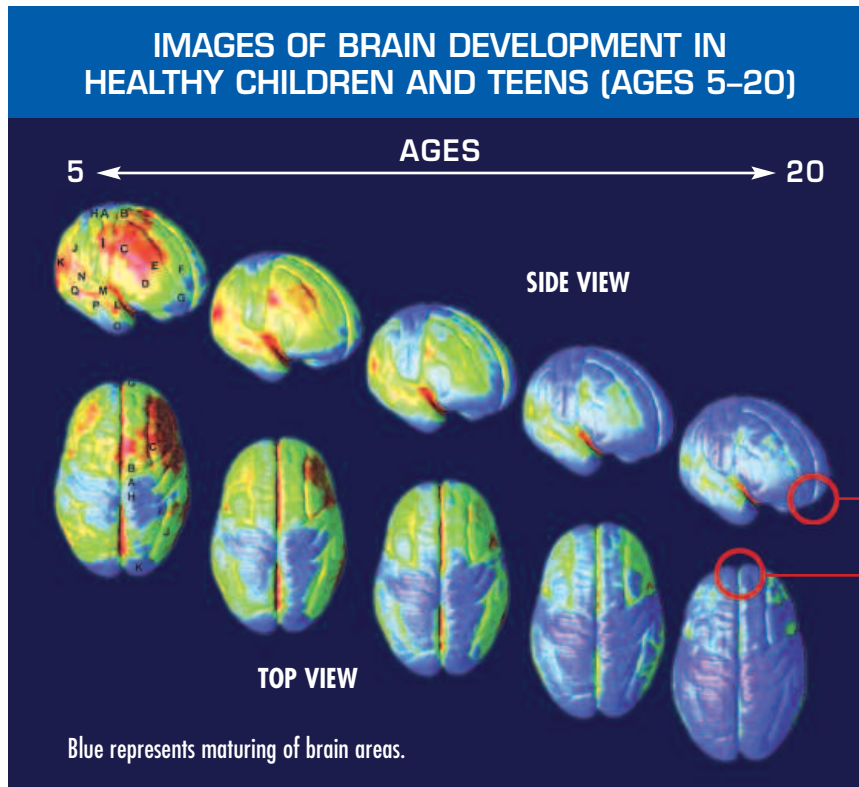
- **Home and Family.** The influence of the home environment is usually most important in childhood. Parents or older family members who abuse alcohol or drugs, or who engage in criminal behavior, can increase children's risks of developing their own drug problems.
- **Peer and School.** Friends and acquaintances have the greatest influence during adolescence. Drug-abusing peers can sway even those without risk factors to try drugs for the first time. Academic failure or poor social skills can put a child further at risk for drug abuse.



## What other factors increase the risk of addiction?

- **Early Use.** Although taking drugs at any age can lead to addiction, research shows that the earlier a person begins to use drugs the more likely they are to progress to more serious abuse. This may reflect the harmful effect that drugs can have on the developing brain; it also may result from a constellation of early biological and social vulnerability factors, including genetic susceptibility, mental illness, unstable family relationships, and exposure to physical or sexual abuse. Still, the fact remains that early use is a strong indicator of problems ahead, among them, substance abuse and addiction.
- **Method of Administration.** Smoking a drug or injecting it into a vein increases its addictive potential. Both smoked and injected drugs enter the brain within seconds, producing a powerful rush of pleasure. However, this intense "high" can fade within a few minutes, taking the abuser down to lower, more normal levels. It is a starkly felt contrast, and scientists believe that this low feeling drives individuals to repeated drug abuse in an attempt to recapture the high pleasurable state.

# *Addiction is a developmental disease— it typically begins in childhood or adolescence.*



Source: PNAS; 101:8174–8179. 2004.

**The brain continues to develop into adulthood and undergoes dramatic changes during adolescence.**

One of the brain areas still maturing during adolescence is the prefrontal cortex—the part of the brain that enables us to assess situations, make sound decisions, and keep our emotions and desires under control. The fact that this critical part of an adolescent's brain is still a work-in-progress puts them at increased risk for poor decisions (such as trying drugs or continued abuse). Thus, introducing drugs while the brain is still developing may have profound and long-lasting consequences.

**Prefrontal Cortex**

## II. PREVENTING DRUG ABUSE: THE BEST STRATEGY

### Why is adolescence a critical time for preventing drug addiction?

**A**s noted previously, early use of drugs increases a person's chances of more serious drug abuse and addiction. Remember, drugs change brains—and this can lead to addiction and other serious problems. So preventing early use of drugs or alcohol may reduce the risk of progressing to later abuse and addiction.

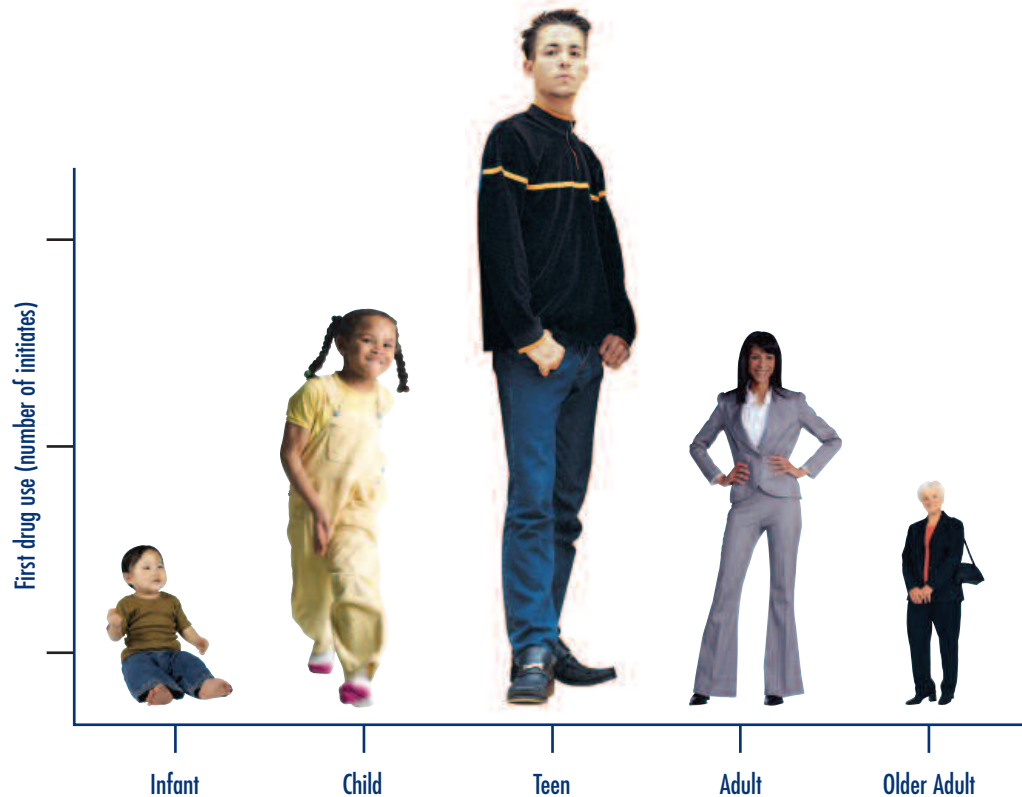
Risk of drug abuse increases greatly during times of transition, such as changing schools, moving, or divorce. If we can prevent drug abuse, we can prevent drug addiction. In early adolescence, when children advance from elementary through middle school, they face new and challenging social and academic situations. Often during this period, children are exposed to abusable substances such as cigarettes and alcohol for the first time. When they enter high school, teens may encounter greater availability of drugs, drug abuse by older teens, and social activities where drugs are used.

At the same time, many behaviors that are a normal aspect of their development, such as the desire to do something new or risky, may increase teen tendencies to experiment with drugs. Some teens may give in to the urging of drug-abusing friends to share the experience with them. Others may think that taking drugs (such as steroids) will improve their appearance or their athletic performance or that abusing substances such as alcohol or Ecstasy (MDMA) will ease their anxiety in social situations.

Teens' still-developing judgment and decisionmaking skills may limit their ability to assess risks accurately and make sound decisions about using drugs. Drug and alcohol abuse can disrupt brain function in areas critical to motivation, memory, learning, judgment, and behavior control. So, it is not surprising that teens who abuse alcohol and other drugs often have family and school problems, poor academic performance, health-related problems (including mental health), and involvement with the juvenile justice system.

## *National drug use surveys indicate some children are already abusing drugs by age 12 or 13.*

Drug abuse starts early and peaks in teen years



### **Can science-validated programs prevent drug addiction in youth?**

Yes. The term “science-validated” means that these programs have been rationally designed based on current knowledge, rigorously tested, and shown to produce positive results. Scientists have developed a broad range of programs that positively alter the balance between risk and protective factors for drug abuse in families, schools, and communities. Research has shown that science-validated programs, such as those described in NIDA’s *Preventing Drug Use among Children and Adolescents: A Research-Based Guide for Parents, Educators, and Community Leaders*, can significantly reduce early use of tobacco, alcohol, and illicit drugs. Other programs reduce drug abuse among youngsters who have already begun abusing drugs and alcohol.

## How do science-validated prevention programs work?

These prevention programs work to boost protective factors and eliminate or reduce risk factors for drug use. The programs are designed for various ages and can be designed for individual or group settings, such as the school and home. There are three types of programs—

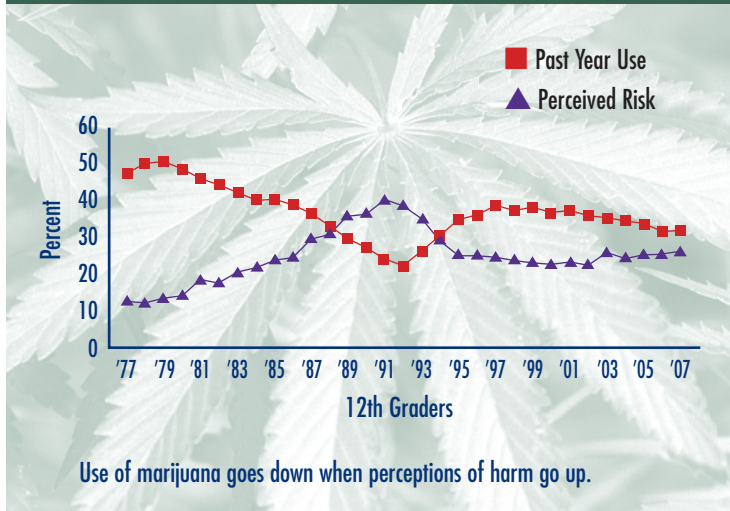
- **Universal programs** address risk and protective factors common to all children in a given setting, such as a school or community.
- **Selective programs** target groups of children and teens who have factors that further increase their risk of drug abuse.
- **Indicated programs** are designed for youth who have already begun abusing drugs.

## Are all prevention programs effective in reducing drug abuse?

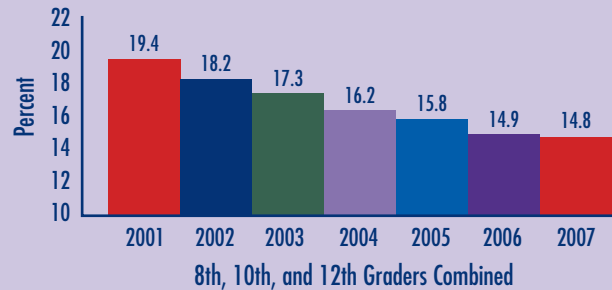
When science-validated substance abuse prevention programs are properly implemented by schools and communities, alcohol, tobacco, and illicit drug abuse are reduced. Such programs help teachers, parents, and healthcare professionals shape youths' perceptions about the risks of drug abuse. While many events and cultural factors affect drug abuse trends, when youths perceive drug abuse as harmful, they reduce their level of abuse.

# Drug use decreases when drugs are perceived as harmful.

## PREVENTION IS THE BEST STRATEGY



## STUDENTS REPORTING PAST MONTH USE OF ANY ILLICIT DRUG



**Good news!**  
Teen illicit drug use declined by 24% from 2001 to 2007. Prevention plays a critical role in the decline of drug use.

Source: 2007 Monitoring the Future survey. University of Michigan, with funding from the National Institute on Drug Abuse.

For more information on prevention, see NIDA's most recent edition of *Preventing Drug Use among Children and Adolescents: A Research-Based Guide for Parents, Educators, and Community Leaders*, at [www.drugabuse.gov/Prevention/Prevopen.html](http://www.drugabuse.gov/Prevention/Prevopen.html).

# III. DRUGS AND THE BRAIN

## Introducing the Human Brain

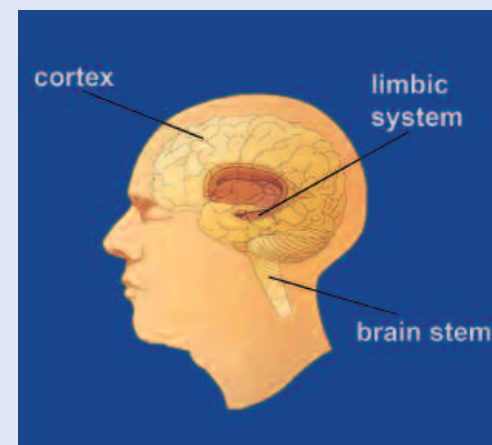
**T**he human brain is the most complex organ in the body. This three-pound mass of gray and white matter sits at the center of all human activity—you need it to drive a car, to enjoy a meal, to breathe, to create an artistic masterpiece, and to enjoy everyday activities. In brief, the brain regulates your basic body functions; enables you to interpret and respond to everything you experience; and shapes your thoughts, emotions, and behavior.

The brain is made up of many parts that all work together as a team. Different parts of the brain are responsible for coordinating and performing specific functions. Drugs can alter important brain areas that are necessary for life-sustaining functions and can drive the compulsive drug abuse that marks addiction. Brain areas affected by drug abuse—

- **The brain stem** controls basic functions critical to life, such as heart rate, breathing, and sleeping.

- **The limbic system** contains the brain's reward circuit—it links together a number of brain structures that control and regulate our ability to feel pleasure. Feeling pleasure motivates us to repeat behaviors such as eating—actions that are critical to our existence. The limbic system is activated when we perform these activities—and also by drugs of abuse. In addition, the limbic system is responsible for our perception of other emotions, both positive and negative, which explains the mood-altering properties of many drugs.

- **The cerebral cortex** is divided into areas that control specific functions. Different areas process information from our senses, enabling us to see, feel, hear, and taste. The front part of the cortex, the frontal cortex or forebrain, is the thinking center of the brain; it powers our ability to think, plan, solve problems, and make decisions.



## How does the brain communicate?

The brain is a communications center consisting of billions of neurons, or nerve cells. Networks of neurons pass messages back and forth to different structures within the brain, the spinal column, and the peripheral nervous system. These nerve networks coordinate and regulate everything we feel, think, and do.

### ■ *Neuron to Neuron*

Each nerve cell in the brain sends and receives messages in the form of electrical impulses. Once a cell receives and processes a message, it sends it on to other neurons.

### ■ *Neurotransmitters—The Brain's Chemical Messengers*

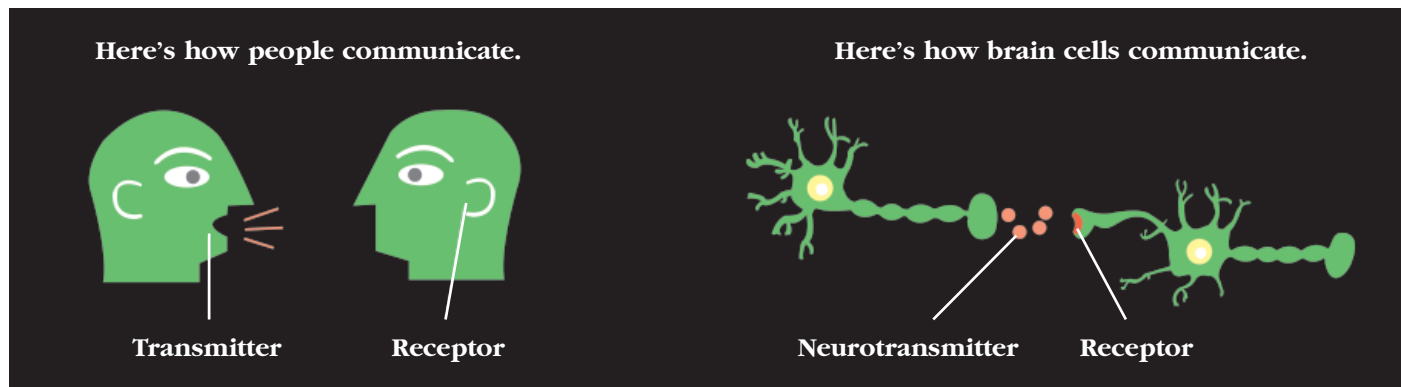
The messages are carried between neurons by chemicals called neurotransmitters. (They transmit messages between neurons.)

### ■ *Receptors—The Brain's Chemical Receivers*

The neurotransmitter attaches to a specialized site on the receiving cell called a receptor. A neurotransmitter and its receptor operate like a “key and lock,” an exquisitely specific mechanism that ensures that each receptor will forward the appropriate message only after interacting with the right kind of neurotransmitter.

### ■ *Transporters—The Brain's Chemical Recyclers*

Located on the cell that releases the neurotransmitter, transporters recycle these neurotransmitters (i.e., bring them back into the cell that released them), thereby shutting off the signal between neurons.



To send a message a brain cell releases a chemical (neurotransmitter) into the space separating two cells called the synapse. The neurotransmitter crosses the synapse and attaches to proteins (receptors) on the receiving brain cell. This causes changes in the receiving brain cell and the message is delivered.

Concept courtesy: B.K. Madras

# *All drugs of abuse target the brain's reward system by flooding the circuit with dopamine.*

## How do drugs work in the brain?

Drugs are chemicals. They work in the brain by tapping into the brain's communication system and interfering with the way nerve cells normally send, receive, and process information. Some drugs, such as marijuana and heroin, can activate neurons because their chemical structure mimics that of a natural neurotransmitter. This similarity in structure “fools” receptors and allows the drugs to lock onto and activate the nerve cells. Although these drugs mimic brain chemicals, they don't activate nerve cells in the same way as a natural neurotransmitter, and they lead to abnormal messages being transmitted through the network.

Other drugs, such as amphetamine or cocaine, can cause the nerve cells to release abnormally large amounts of natural neurotransmitters or prevent the normal recycling of these brain chemicals. This disruption produces a greatly amplified message, ultimately disrupting communication channels. The difference in effect can be described as the difference between someone whispering into your ear and someone shouting into a microphone.

## How do drugs work in the brain to produce pleasure?

All drugs of abuse directly or indirectly target the brain's reward system by flooding the circuit with dopamine. Dopamine is a neurotransmitter present in regions of the brain that regulate movement, emotion, cognition, motivation, and feelings of pleasure. The overstimulation of this system, which rewards our natural behaviors, produces the euphoric effects sought by people who abuse drugs and teaches them to repeat the behavior.

## How does stimulation of the brain's pleasure circuit teach us to keep taking drugs?

Our brains are wired to ensure that we will repeat life-sustaining activities by associating those activities with pleasure or reward. Whenever this reward circuit is activated, the brain notes that something important is happening that needs to be remembered, and teaches us to do it again and again, without thinking about it. Because drugs of abuse stimulate the same circuit, we learn to abuse drugs in the same way.

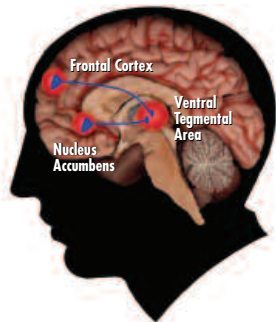
## Why are drugs more addictive than natural rewards?

When some drugs of abuse are taken, they can release 2 to 10 times the amount of dopamine that natural rewards do. In some cases, this occurs almost immediately (as when drugs are smoked or injected), and the effects can last much longer than those produced by natural rewards. The resulting effects on the brain's pleasure circuit dwarfs those produced by naturally rewarding behaviors such as eating and sex. The effect of such a powerful reward strongly motivates people to

take drugs again and again. This is why scientists sometimes say that drug abuse is something we learn to do very, very well.

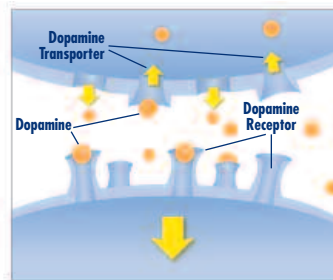
### ALL DRUGS OF ABUSE TARGET THE BRAIN'S PLEASURE CENTER

#### Brain reward (dopamine) pathways



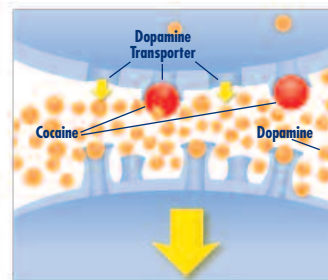
These brain circuits are important for natural rewards such as food, music, and art.

#### All drugs of abuse increase dopamine



**FOOD**

Typically, dopamine increases in response to natural rewards such as food. When cocaine is taken, dopamine increases are exaggerated, and communication is altered.



**COCAINE**

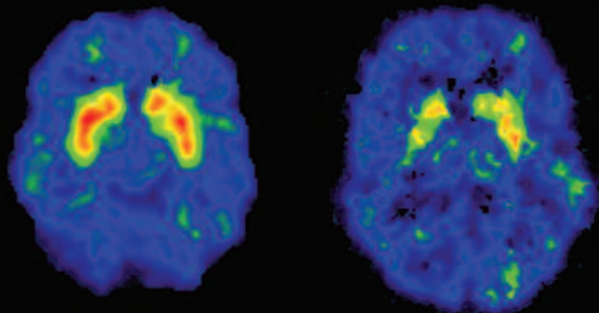
## *Long-term drug abuse impairs brain functioning.*

### What happens to your brain if you keep taking drugs?

Just as we turn down the volume on a radio that is too loud, the brain adjusts to the overwhelming surges in dopamine (and other neurotransmitters) by producing less dopamine or by reducing the number of receptors that can receive and transmit signals. As a result, dopamine's impact

on the reward circuit of a drug abuser's brain can become abnormally low, and the ability to experience any pleasure is reduced. This is why the abuser eventually feels flat, lifeless, and depressed, and is unable to enjoy things that previously brought them pleasure. Now, they need to take drugs just to bring their dopamine function back up to normal. And, they must take larger amounts of the drug than they first did to create the dopamine high—an effect known as tolerance.

#### DECREASED BRAIN FUNCTION IN METHAMPHETAMINE ABUSER



Healthy Control

Drug Abuser

Methamphetamine abusers have significant reductions in dopamine transporters.  
Source: *Am J Psychiatry* 158:377–382. 2001.

### How does long-term drug taking affect brain circuits?

We know that the same sort of mechanisms involved in the development of tolerance can eventually lead to profound changes in neurons and brain circuits, with the potential to severely compromise the long-term health of the brain. For example, glutamate is another neurotransmitter that influences the reward circuit and the ability to learn. When the optimal concentration of glutamate is altered by drug abuse, the brain attempts to compensate for this change, which can cause impairment in cognitive function. Similarly, long-term drug abuse can trigger

adaptations in habit or nonconscious memory systems. Conditioning is one example of this type of learning, whereby environmental cues become associated with the drug experience and can trigger uncontrollable cravings if the individual is later exposed to these cues, even without the drug itself being available. This learned “reflex” is extremely robust and can emerge even after many years of abstinence.

## What other brain changes occur with abuse?

Chronic exposure to drugs of abuse disrupts the way critical brain structures interact to control behavior—behavior specifically related to drug abuse. Just as continued abuse may lead to tolerance or the need for higher drug dosages to produce an effect, it may also lead to addiction, which can drive an abuser to seek out and take drugs compulsively. Drug addiction erodes a person’s self-control and ability to make sound decisions, while sending intense impulses to take drugs.

**For more information on drugs and the brain,** order NIDA’s Slide Teaching Packets CD-ROM series or the Mind Over Matter series at [www.drugabuse.gov/parent-teacher.html](http://www.drugabuse.gov/parent-teacher.html). These items and others are available to the public free of charge.

## IV. ADDICTION AND HEALTH

### What are the medical consequences of drug addiction?

Individuals who suffer from addiction often have one or more accompanying medical issues, including lung and cardiovascular disease, stroke, cancer, and mental disorders. Imaging scans, chest x-rays, and blood tests show the damaging effects of drug abuse throughout the body. For example, tests show that tobacco smoke causes cancer of the mouth, throat, larynx, blood, lungs, stomach, pancreas, kidney, bladder, and cervix. In addition, some drugs of abuse, such as inhalants, are toxic to nerve cells and may damage or destroy them either in the brain or the peripheral nervous system.

#### THE IMPACT OF ADDICTION CAN BE FAR REACHING

- Cardiovascular disease
- Stroke
- Cancer
- HIV/AIDS
- Hepatitis B and C
- Lung disease
- Obesity
- Mental disorders

### Does drug abuse cause mental disorders, or vice versa?

Drug abuse and mental disorders often co-exist. In some cases, mental diseases may precede addiction; in other cases, drug abuse may trigger or exacerbate mental disorders, particularly in individuals with specific vulnerabilities.



# *Drug abuse and HIV/AIDS are intertwined epidemics.*

## What harmful consequences to others result from drug addiction?

Beyond the harmful consequences for the addicted individual, drug abuse can cause serious health problems for others. Three of the more devastating and troubling consequences of addiction are:

### ■ *Negative effects of prenatal drug exposure on infants and children.*

It is likely that some drug-exposed children will need educational support in the classroom to help them overcome what may be subtle deficits in developmental areas such as behavior, attention, and cognition. Ongoing work is investigating whether the effects of prenatal exposure on brain and behavior extend into adolescence to cause developmental problems during that time period.

### ■ *Negative effects of second-hand smoke.*

Second-hand tobacco smoke, also referred to as environmental tobacco smoke (ETS), is a significant source of exposure to a large number of substances known to be hazardous to human health, particularly to children. According to the Surgeon General's 2006 Report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke*, involuntary smoking increases the risk of heart disease and lung cancer in never-smokers by 25–30 percent and 20–30 percent, respectively.

### ■ *Increased spread of infectious diseases.*

Injection of drugs such as heroin, cocaine, and methamphetamine accounts for more than a third of new AIDS cases. Injection drug use is also a major factor in the spread of hepatitis C, a serious, potentially fatal liver disease and a rapidly growing public health problem. Injection drug use is not the only way that drug abuse contributes to the spread of infectious diseases. All drugs of abuse cause some form of intoxication, which interferes with judgment and increases the likelihood of risky sexual behaviors. This, in turn, contributes to the spread of HIV/AIDS, hepatitis B and C, and other sexually transmitted diseases.

**4 OUT OF 10 U.S. AIDS DEATHS ARE  
RELATED TO DRUG ABUSE**



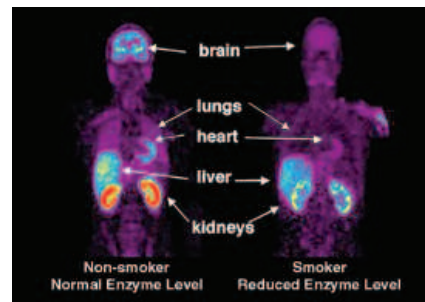
## *Tobacco use is responsible for an estimated 5 million deaths worldwide each year.*

### What are some effects of specific abused substances?

- **Nicotine** is an addictive stimulant found in cigarettes and other forms of tobacco. Tobacco smoke increases a user's risk of cancer, emphysema, bronchial disorders, and cardiovascular disease. The mortality rate associated with tobacco addiction is staggering. Tobacco use killed approximately 100 million people during the 20th century and, if current smoking trends continue, the cumulative death toll for this century has been projected to reach 1 billion.
- **Alcohol** consumption can damage the brain and most body organs. Areas of the brain that are especially vulnerable to alcohol-related damage are the cerebral cortex (largely responsible for our higher brain functions, including problemsolving and decisionmaking), the hippocampus (important for memory and learning), and the cerebellum (important for movement coordination).
- **Marijuana** is the most commonly abused illicit substance. This drug impairs short-term memory and learning, the ability to focus attention, and coordination. It also increases heart rate, can harm the lungs, and can cause psychosis in those at risk.

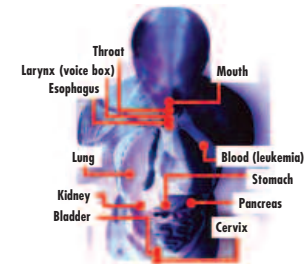
### TOBACCO SMOKE AFFECTS THE WHOLE BODY

#### Monoamine Oxidase B



Source: PNAS;100:11600-11605. 2003.

#### Smoking causes cancer throughout the body.



Source: *The Health Consequences of Smoking: A Report of the Surgeon General*. 2004.

- **Inhalants** are volatile substances found in many household products, such as oven cleaners, gasoline, spray paints, and other aerosols, that induce mind-altering effects. Inhalants are extremely toxic and can damage the heart, kidneys, lungs, and brain. Even a healthy person can suffer heart failure and death within minutes of a single session of prolonged sniffing of an inhalant.
- **Cocaine** is a short-acting stimulant, which can lead abusers to “binge” (to take the drug many times in a single session). Cocaine abuse can lead to severe medical consequences related to the heart, and the respiratory, nervous, and digestive systems.

## Nearly 1 in 10 high school seniors report nonmedical use of the prescription pain reliever Vicodin.

- **Amphetamines**, including methamphetamine, are powerful stimulants that can produce feelings of euphoria and alertness. Methamphetamine's effects are particularly long lasting and harmful to the brain. Amphetamines can cause high body temperature and can lead to serious heart problems and seizures.
- **Ecstasy (MDMA)** produces both stimulant and mind-altering effects. It can increase body temperature, heart rate, blood pressure, and heart wall stress. Ecstasy may also be toxic to nerve cells.
- **LSD** is one of the most potent hallucinogenic, or perception-altering, drugs. Its effects are unpredictable, and abusers may see vivid colors and images, hear sounds, and feel sensations that seem real but do not exist. Abusers also may have traumatic experiences and emotions that can last for many hours. Some short-term effects can include increased body temperature, heart rate, and blood pressure; sweating; loss of appetite; sleeplessness; dry mouth; and tremors.
- **Heroin** is a powerful opiate drug that produces euphoria and feelings of relaxation. It slows respiration and can increase risk of serious infectious diseases, especially when taken intravenously. Other opioid drugs include morphine, OxyContin, Vicodin, and Percodan, which have legitimate medical uses; however, their non-medical use or abuse can result in the same harmful consequences as abusing heroin.

- **Prescription medications** are increasingly being abused or used for nonmedical purposes. This practice cannot only be addictive, but in some cases also lethal. Commonly abused classes of prescription drugs include painkillers, sedatives, and stimulants. Among the most disturbing aspects of this emerging trend is its prevalence among teenagers and young adults, and the common misperception that because these medications are prescribed by physicians, they are safe even when used illicitly.



- **Steroids**, which can also be prescribed for certain medical conditions, are abused to increase muscle mass and to improve athletic performance or physical appearance. Serious consequences of abuse can include severe acne, heart disease, liver problems, stroke, infectious diseases, depression, and suicide.
- **Drug combinations.** A particularly dangerous and not uncommon practice is the combining of two or more drugs. The practice ranges from the co-administration of legal drugs, like alcohol and nicotine, to the dangerous random mixing of prescription drugs, to the deadly combination of heroin or cocaine with fentanyl (an opioid pain medication). Whatever the context, it is critical to realize that because of drug-drug interactions, such practices often pose significantly higher risks than the already harmful individual drugs.

**For more information on the nature and extent of common drugs of abuse and their health consequences**, go to NIDA's Web site ([www.drugabuse.gov](http://www.drugabuse.gov)) to order free copies of the popular *Research Reports* ([www.drugabuse.gov/ResearchReports/ResearchIndex.html](http://www.drugabuse.gov/ResearchReports/ResearchIndex.html)), *InfoFacts*, and other publications.

## V. TREATMENT AND RECOVERY

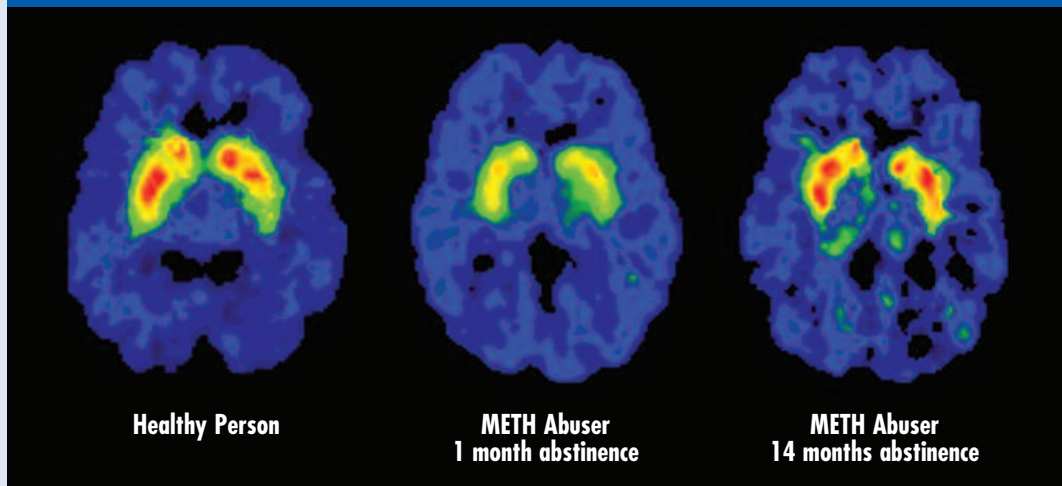
### Can addiction be treated successfully?

**YES.** Addiction is a treatable disease. Discoveries in the science of addiction have led to advances in drug abuse treatment that help people stop abusing drugs and resume their productive lives.

### Can addiction be cured?

Addiction need not be a life sentence. Like other chronic diseases, addiction can be managed successfully. Treatment enables people to counteract addiction's powerful disruptive effects on brain and behavior and regain control of their lives.

#### RECOVERY OF BRAIN FUNCTION WITH PROLONGED ABSTINENCE



These images of the dopamine transporter show the brain's remarkable potential to recover, at least partially, after a long abstinence from drugs—in this case, methamphetamine.

Source: *J Neurosci* 21:9414–9418. 2001.

# *Addiction need not be a life sentence.*

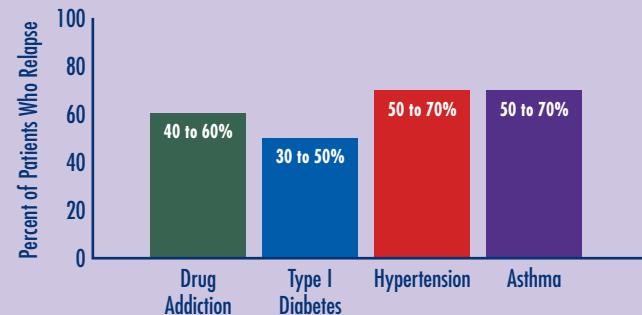
## Does relapse to drug abuse mean treatment has failed?

No. The chronic nature of the disease means that relapsing to drug abuse is not only possible, but likely, with relapse rates similar to those for other well-characterized chronic medical illnesses such as diabetes, hypertension, and asthma, which also have both physiological and behavioral components. Treatment of chronic diseases involves changing deeply imbedded behaviors, and relapse does not mean treatment failure. For the addicted patient, lapses back to drug abuse indicate that treatment needs to be reinstated or adjusted, or that alternate treatment is needed.

## What are the basics of effective addiction treatment?

Research shows that combining treatment medications, where available, with behavioral therapy is the best way to ensure success for most patients. Treatment approaches must be tailored to address each patient's drug abuse patterns and drug-related medical, psychiatric, and social problems.

COMPARISON OF RELAPSE RATES BETWEEN  
DRUG ADDICTION AND OTHER CHRONIC ILLNESSES



Relapse rates for drug-addicted patients are compared with those suffering from diabetes, hypertension, and asthma. Relapse is common and similar across these illnesses (as is adherence to medication). Thus, drug addiction should be treated like any other chronic illness, with relapse serving as a trigger for renewed intervention.

Source: McLellan et al., JAMA 284:1689–1695. 2000.

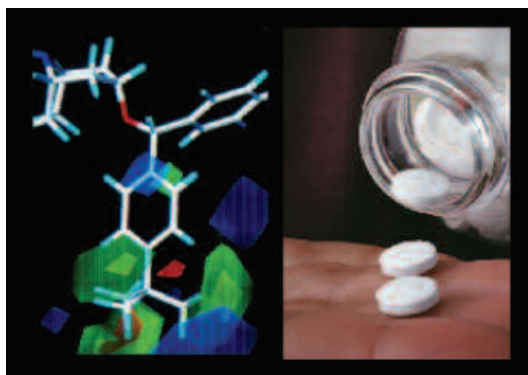
## How can medications help treat drug addiction?

Different types of medications may be useful at different stages of treatment to help a patient stop abusing drugs, stay in treatment, and avoid relapse.

- **Treating Withdrawal.** When patients first stop abusing drugs, they can experience a variety of physical and emotional symptoms, including depression, anxiety, and other mood disorders; restlessness;

and sleeplessness. Certain treatment medications are designed to reduce these symptoms, which makes it easier to stop the abuse.

- **Staying in Treatment.** Some treatment medications are used to help the brain adapt gradually to the absence of the abused drug. These medications act slowly to stave off drug cravings, and have a calming effect on body systems. They can help patients focus on counseling and other psychotherapies related to their drug treatment.



Discoveries in science lead to advances in drug abuse treatment.

- **Preventing Relapse.** Science has taught us that stress, cues linked to the drug experience (e.g., people, places, things, moods), and exposure to drugs are the most common triggers for relapse. Medications are being developed to interfere with these triggers to help patients sustain recovery.

## How do behavioral therapies treat drug addiction?

Behavioral treatments help engage people in drug abuse treatment, modifying their attitudes and behaviors related to drug abuse and increasing their life skills to handle stressful circumstances and environmental cues that may trigger intense craving for drugs and prompt another cycle of compulsive abuse. Moreover, behavioral therapies can enhance the effectiveness of medications and help people remain in treatment longer.

## MEDICATIONS USED TO TREAT DRUG ADDICTION

- **Tobacco Addiction**
  - **Nicotine replacement therapies** (e.g., patch, inhaler, gum)
  - **Bupropion**
  - **Varenicline**
- **Opioid Addiction**
  - **Methadone**
  - **Buprenorphine**
- **Alcohol and Drug Addiction**
  - **Naltrexone**—helps prevent relapse to alcohol and heroin abuse
  - **Disulfiram**—helps prevent relapse to alcohol abuse; currently being tested for treating cocaine abuse
  - **Acamprosate**—helps prevent relapse to alcohol abuse

## *Treatment must address the whole person.*



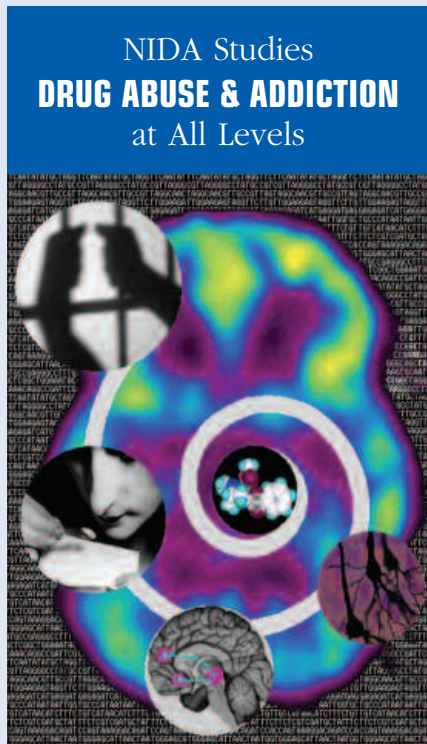
- **Cognitive Behavioral Therapy.** Seeks to help patients recognize, avoid, and cope with the situations in which they are most likely to abuse drugs.
- **Motivational Incentives.** Uses positive reinforcement such as providing rewards or privileges for remaining drug free, for attending and participating in counseling sessions, or for taking treatment medications as prescribed.
- **Motivational Interviewing.** Employs strategies to evoke rapid and internally motivated behavior change to stop drug use and facilitate treatment entry.
- **Group Therapy.** Helps patients face their drug abuse realistically, come to terms with its harmful consequences, and boost their motivation to stay drug free. Patients learn effective ways to solve their emotional and interpersonal problems without resorting to drugs.

### How do the best treatment programs help patients recover from the pervasive effects of addiction?

Getting an addicted person to stop abusing drugs is just one part of a long and complex recovery process. When people enter treatment, addiction has often taken over their lives. The compulsion to get drugs, take drugs, and experience the effects of drugs has dominated their every waking moment, and drug abuse has taken the place of all the things they used to enjoy doing. It has disrupted how they function in their family lives, at work, and in the community, and has made them more likely to suffer from other serious illnesses. Because addiction can affect so many aspects of a person's life, treatment must address the needs of the whole person to be successful. This is why the best programs incorporate a variety of rehabilitative services into their comprehensive treatment regimens. Treatment counselors select from a menu of services for meeting the individual medical, psychological, social, vocational, and legal needs of their patients to foster their recovery from addiction.

**For more information on drug treatment,** NIDA offers a selection of free treatment manuals and guides for practitioners, including *Principles of Drug Addiction Treatment: A Research-Based Guide* ([www.drugabuse.gov/PODAT/PODATIndex.html](http://www.drugabuse.gov/PODAT/PODATIndex.html)) and *Brief Strategic Family Therapy for Adolescent Drug Abuse* ([www.drugabuse.gov/TXManuals/bsft/bsftindex.html](http://www.drugabuse.gov/TXManuals/bsft/bsftindex.html)).

# VI. ADVANCING ADDICTION SCIENCE AND PRACTICAL SOLUTIONS



## Leading the Search for Scientific Solutions

To address all aspects of drug abuse and its harmful consequences, NIDA's research program ranges from basic studies of the addicted brain and behavior to health services research. NIDA's research program develops prevention and treatment approaches and ensures they work in real-world settings. In this context, NIDA is strongly committed to developing a research portfolio that addresses the special vulnerabilities and health disparities that exist among ethnic minorities or that derive from gender differences.

## Bringing Science to Real-World Settings

- **National Drug Abuse Treatment Clinical Trials Network (CTN).** The CTN "road tests" research-based drug abuse treatments in community treatment programs around the country.
- **Criminal Justice Drug Abuse Treatment Studies (CJ-DATS).** Led by NIDA, CJ-DATS is a network of research centers, in partnership with criminal justice professionals, drug abuse treatment providers, and Federal agencies responsible for developing integrated treatment approaches for criminal justice offenders and testing them at multiple sites throughout the Nation.

## Sharing Free Information With the Public

NIDA further increases the impact of its research on the problems of addiction by sharing free information about its findings with professional audiences and the general public. Special initiatives target students and teachers, designated populations, and ethnic groups.

## NIDA's Special Initiatives for Students, Teachers, and Parents



***NIDA Goes Back to School***—Targets grade school, middle school, and high school students and teachers.  
[www.backtoschool.drugabuse.gov](http://www.backtoschool.drugabuse.gov)



***Heads Up: Real News About Drugs and Your Body***—

A drug education series created by NIDA and SCHOLASTIC INC. for students in grades 6 to 12.

[www.teacher.scholastic.com/scholasticnews/indepth/headsup](http://www.teacher.scholastic.com/scholasticnews/indepth/headsup)



***NIDA for Teens: The Science Behind Drug Abuse***—An interactive

Web site geared specifically for adolescents that contains age-appropriate facts on drugs, real stories about teens and drug abuse, games, take-home activities, and a Q&A forum with Dr. NIDA.

[www.teens.drugabuse.gov](http://www.teens.drugabuse.gov)

## Publications on Prevention and Treatment Principles

***Preventing Drug Use among Children and Adolescents: A Research-Based Guide***—

NIDA's research-based guide for preventing drug abuse among children and adolescents provides 16 principles derived from effective drug abuse prevention research, and includes answers to questions on risk and protective factors, as well as community planning and implementation, to help prevention practitioners use research results to address drug abuse among children and adolescents in communities across the country.

***Principles of Drug Addiction Treatment: A Research-Based Guide***—

This guide summarizes the 13 principles of effective treatment, answers common questions, and describes types of treatment, providing examples of scientifically based and tested treatment components.

***Principles of Drug Abuse Treatment for Criminal Justice Populations: A Research-Based Guide***—NIDA's research-based guide for treating drug abusers involved with the criminal justice system provides 13 essential treatment principles, and includes answers to frequently asked questions and resource information.



### For more information:

NIDA's publications are available free of charge and are downloadable from the NIDA Web site ([www.drugabuse.gov](http://www.drugabuse.gov)). The NIDA site also contains additional research-based information about drugs, drug abuse, and addiction. You can also order NIDA's materials by calling the National Clearinghouse for Alcohol and Drug Information at 800-729-6686.

**[www.drugabuse.gov](http://www.drugabuse.gov)**

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