Part I: Substance Use Etiology, Epidemiology and Demographics

Substance use is a multi-faceted problem that affects many Americans in all walks of life. It is difficult to get a handle on the exact number of people who are affected by this disorder and there are a wide variety of substances that are being used. Substances of use include (but are not limited to) alcohol, marijuana, inhalants, hallucinogens, cocaine, opiates, stimulants, sedatives, and tranquilizers. There are psychological and physiological indicators for each of these substances and the literature is replete with treatment issues, gender differences, age and ethnic group differences, and other psychosocial problems that complicate the landscape.

The issue of substance use is diverse and complicated. In an effort to illuminate the subject, this article will present an overview of the following: Etiology, epidemiology and demographics, substances of use, co-morbid medical problems, and diagnostic consideration and treatment issues.

Due to the amount of material this review will cover, the topic will be divided into two parts. Part I will cover etiology, epidemiology and demographics. Part II will cover substances of use, co-morbid medical issues and diagnostic/treatment considerations.

Etiology of Substance Use
Unraveling the etiology of substance use is a challenge. Theories of addiction have mainly been developed from neurobiological evidence and data from studies of learning behavior and memory mechanisms. These theories overlap and are not mutually exclusive and none of them alone can explain all aspects of addictions (Carmi & Farre, 2003).

Historically, physical dependence based theories of addiction, regarded compulsive drug taking as a behavioral manifestation of a desperate need to relieve aversive autonomic withdrawal symptoms. The physical-dependence-based theories of addiction used opiates as its model of addiction. Chronic use of opiates such as heroin or morphine causes obvious pathological changes in autonomic functioning, which are temporarily alleviated by more opiates; thus it was assumed that addicts continued to use in order to maintain homeostasis (Lyvers, 1998).

In contrast, compulsive use of drugs such as cocaine or marijuana, which is not accompanied by obvious signs of physical dependence, was thought to be driven by mental factors such as pleasure seeking, escapism, or simply habit. Over-use of these types of drugs was termed psychological dependence and was considered far less serious than drugs that one could become physically addicted to. (Koob and Le Moal, 1997; Lyvers, 1998).

In the past ten years there has been a major paradigm shift away from physical dependence as the sine qua non of addiction. Behavioral and self-report criteria such as compulsive use, drug craving and loss of control over drug use are now commonly regarded as essential features of addiction. The American Psychiatric Association's definition of substance dependence requires a patient meet three of the following seven criteria: (1) tolerance, (2) withdrawal, (3) the substance is often taken in larger amounts or over a longer period than was intended, (4) a persistent desire or unsuccessful efforts to cut down or control use, (5) a great deal of time is spent in activities necessary to obtain the substance, use the substance, or recover from the effects of the substance, (6) important social, occupational, or recreational activities are given up or reduced because of substance use, (7) the substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (Diagnostic and Statistic Manual of Mental Disorders, 4th Ed. 1994).

The most recent research findings view addictive behavior as a result of chronic drug□induced pathological changes in the dopaminergic brain circuits (Lyvers, 1998). The most recent theory provides evidence that the

following occurs when drug use is introduced into the system. Addictive drugs are initially interpreted by the brain as positive and rewarding. As long as the individual who is taking the drugs is positively reinforced by the drug the probability is that drug taking will continue. The Nucleus Accumbens (NAc) which is involved in the mediation of subjective sense of pleasure and the Ventral Tegmental Area (VTA) which modulates activity of NAc through Dopamine producing neurons are both affected by the use of addictive drugs and natural reinforcers (food, sex, water, social status, etc). Both increase the release of dopamine from the VTA. Drugs of use differ with respect to how they activate the reward pathways (Cami and Farre, 2003). As the individual continues to use the addictive substance changes take place in the homeostasis of that person's physiology. What is considered addiction represents the body's way of adapting to continued drug use. The presence of the drug in the body becomes the 'normal' physiological state and the changes brought about in the brain by addiction are then experienced as stable (Lyvers, 1998).

Koob and Le Moal (1997) propose that the organism tries to counteract the effects of a given drug through a vicious circle in which the hedonic set point (the point at which pleasure is achieved) continually changes in response to the administration of the substance. They argue that addiction is the result of deregulation of the reward mechanism and subsequent allostasis, the ability to achieve stability through change. Through this process there is a dissociation that occurs between the incentive value of the drug ("wanting") and its pleasurable effects ("liking"). The brain systems involved in the reward mechanism become hypersensitive to both the direct effects of the drug and associated stimuli that are not directly attributable to the drug. This hyper-sensitization causes pathologic wanting (craving), independent of the presence of withdrawal symptoms and leads to compulsive drug□seeking/drug taking behavior. Addictive drugs activate the same neural pathways that are activated by natural reinforcers (food, water, sex, and social status) only more efficiently. As a result there is competition for the neural pathways and as a drug goes from being rewarding to being addictive, a person will spend more time and resources to secure the drug at the expense of natural reinforcers.

The hallmarks of physiological addiction are tolerance, dependence, withdrawal, relapse and sensitization. Craving, priming, and relapse are emotional/psychosocial conditions associated with addiction. Tolerance is defined as reduced drug responsiveness with repeated exposure to a constant drug dose. Dependence is defined as an altered physiological state that develops to compensate for persistent drug exposure, which gives rise to withdrawal upon cessation of drug use. Withdrawal is defined as the aversive state with physical and emotional symptoms resulting from cessation of drug use. Relapse is defined as the reinitiating of drug use after a period of abstinence, often precipitated by stressful events or drug-related environmental cues. Sensitization is defined as an enhanced drug response that occurs with repeated exposure to a constant drug dose. Craving is an intense desire to re-experience the effects of the drug. Craving is the cause of relapse after long periods of abstinence. Priming refers to a new exposure to a formally used substance (Carmi & Farre, 1997).

Long-term use of addictive drugs produces alterations in the brain and increase vulnerability to relapse, and facilitates craving even months or years after successful detoxification. The factors involved in relapse and cravings include acute re-exposure to the drug or drug priming, exposure to environmental stimuli previously paired with drug use (triggers) and exposure to environmental stressors. The extent of sensitization varies with different drugs and is responsible for responses, craving and relapse (Carmi & Farre, 1997).

Research designed to elucidate how personality and developmental traits and status are associated with substance dependence have just begun in earnest in the recent past. Helmus et al, 2001 found that personality traits and mental disorders are major conditioning factors in drug addiction and that risk taking or novelty-seeking traits favor the use of addictive drugs. Kaplow, Curran, & Dodge, 2002 reported on a multi-site longitudinal study designed to identify predictors of early-onset substance use using demographic, environmental, parenting, child's psychology profile, behavior profile, and social functioning beginning at kindergarten-age. The initial data was gathered in kindergarten and 1st grade. Annual assessments were done for each of the 295 subjects at ages 10, 11, and 12. Results indicated that 21% of the children reported having initiated substance use by age 12. Results from longitudinal logistic regression models showed that risk factors at kindergarten included being male, having a parent who used substances, lower levels of parental verbal reasoning, higher levels of over activity, more thought problems, and more social problem

solving skills deficits. Children with no risk factors had less than a 10% chance of initiating substance use by age 12, children with 2 or more risk factors had greater than a 50% chance of initiating substance use. In a study designed to examine the etiology of alcohol and other substance use disorders, Tarter (2002) found that low affect and low behavior self-regulation during child development measured by interaction with family and peers predisposes individuals to begin using substances in adolescence.

Epidemiology and Demographics

Epidemiologic data come from diverse sources, however, the sample survey has become the most important method of determining the number of substance users. Among survey data, the most often cited in the literature is the National Institute on Drug Abuse (NIDA) National Household Survey on Drug Abuse (NHSDA) survey. Other sources of epidemiologic data include collateral rates of other diseases (i.e., cirrhosis of the liver, overdose related deaths, hepatitis 'B' and 'C' and HIV), Drug Enforcement Administration (DEA) data, studies done locally, and treatment program data. In essence, it is difficult to know how many American's are abusing drugs and/or alcohol at any given time.

The most recent data reported by the Substance Abuse and Mental Health Services Administration (SAMHSA) in the United States Department of Health & Human Services (HHS) (Sept 5, 2003) state that in 2002, 22 million Americans suffered from substance dependence or use due to drug and/or alcohol use.

The 2002 survey reports there were 19.5 million Americans, (8.3%) of the population ages 12 or older who currently report using illicit drugs, 54 million report binge drinking in the 30 days prior to this survey and 15.9 million report being heavy drinkers. The report further states that 7.7 million people (3.3%) of the entire population ages 12 and older need treatment for a diagnosable drug problem and 18.6 million (7.9%) need treatment for a serious alcohol problem. Of these people only 1.4 million received specialized substance use treatment for an illicit drug problem and 1.5 million received treatment for alcohol problems. Of those surveyed over 94 percent of people with substance use disorders who did not receive treatment did not believe they needed treatment. However, of the 362,000 people who realized they needed treatment for drug use, 88,000 who tried were unable to obtain treatment in 2002. There were an additional 266,000 who tried to obtain treatment for alcohol related disorders and were not able to so.

The 2002 survey found the following regarding rate of use of various illicit substances: The most commonly used illicit drug is marijuana, which is used by 14.6 million Americans. The survey further reports that 2 million persons currently report using cocaine, 567,000 who use crack. 1.2 million people, including 676,000 who used Ecstasy, reported hallucinogen use. 166,000 people reported heroin use. The second most common category of drug use is people abusing prescription drugs for non-medical use. Of this group and estimated 6.2 million (2.6% of people ages 12 or older) 4.4 million used narcotic pain relievers, 1.8 million used anti-anxiety medications (tranquilizers), 1.2 million used stimulants and 0.4 million used sedatives.

This survey further found that 10.7 million people ages 12 – 28 (28.8% of this age group) had being drinking alcohol in the month prior to the survey interview. Of these, 7.2 million were binge drinkers (19.3%), and 2.3 million report being heavy drinkers (6.2%). There were 33.5 million Americans who reported driving under the influence of alcohol at least once in the 12 months prior to the interview. An additional 11 million people (4.7% of the population 12 years of age or older) reported driving under the influence of an illicit drug during the 12 months prior to interview.

Of those people ages 12 or older who received some type of treatment related to the use of alcohol or illicit drugs in the 12 months prior to the survey interview, 974,000 received treatment for marijuana, 796,000 for cocaine, 360,000 for non-medical use of narcotic pain relievers, 277,000 for heroin and 2.2 million for alcohol.

The trends in lifetime use show an increase in use of pain relievers for non-medical use among those ages 12-17 from 9.6% in 2001 to 11.2% in 2002. During those same time frames young adults, ages 18-25 increased their use of pain relievers for non-medical use from 19.4% in 2001 to 22.1 percent in 2002. The rate was 6.8% in 1992.

According to this survey, there were 4 million adults who reported having both a substance use disorder and a serious mental illness. Among adults with substance use dependence or use, 20.4% had a co-morbid serious mental illness. Of those reporting serious mental illness in 2002, over 23% reported dependence on or used alcohol or illicit drugs.

It is very interesting and instructive to note that this survey is based on interviews with 68,126 respondents who were interviewed in their homes. This included persons residing in dormitories or homeless shelters, however, it excludes person in the military, in prisons or other types of institutional settings or persons who are homeless.

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