

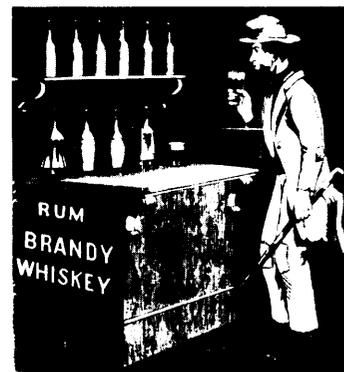
# Substance Use and Transitions to Abuse and Addiction | 5

Substance use is another precondition and contributor to addiction, since one cannot become dependent on a substance without first using it, continuing its use, and passing through stages of progressively more serious use.

Patterns of progression from use to addiction are not, however, consistent or predictable for all individuals. They can vary widely, depending on numerous individual and contextual factors and on characteristics of the use itself, such as age of onset and the type, frequency, and quantity of substance used. While other chapters in this report focus on individual and contextual factors, this chapter focuses only on the characteristics of drug use itself that can contribute to the progression to abuse and addiction.

Researchers have failed to identify specific levels of substance use or of substance-related problems that clearly distinguish use from abuse (16). This is the case, in part, because substances can differ greatly in their abuse liability and, in part, because the same levels of use of a particular substance can affect the functioning of various individuals differently. For example, for some individuals, the initial use of certain substances may constitute substance abuse, because of the severe adverse consequences of the initial use itself. (Although abuse is usually associated with large quantities of substance use per occasion, resulting in either the risk of harm to others (e.g., drunk driving) or to self (e.g., blackouts), some in the prevention field define any initial use of an illicit substance as substance abuse, because the substance being used is illicit and should not be used.)

Although the distinction between use and abuse is unclear, the causes of substance use—especially initial or casual use—are thought to differ in many cases from the causes of substance abuse



and addiction. Some researchers have asserted that substance use results primarily from social influences (e.g., peer pressure), while *abuse* results more from internal psychological and physiological processes (13). Others have reported, based on longitudinal data, that current substance use was related more to the early modeling of use by adults and to one's own prior use, whereas problem use was related more to early rebelliousness (22). A review of prevention programs also supports the conclusion that the factors associated with the initiation of use differ from the factors associated with escalation to abuse (23).

## SUBSTANCE USE

Because substance use is necessary as a precondition to abuse and addiction, prevention efforts can be directed at initial use, continuing use, or progression in use to block the later development of addiction.

Possible goals are:

- Prevent initial use. One way to prevent substance abuse and addiction is to prevent any initial use. The surest way to succeed would be to keep abusable substances out of the community, since, if they are unavailable, they cannot be used. However, once the substances are available in a community, other preventive approaches can be tried, including scare tactics (as with a policy of zero tolerance, backed up by stem parental, school, and legal penalties for use), educational efforts (through media campaigns or prevention curricula in the schools), training in refusal skills, and promotion of safe nonsubstance-using activities. The lack of clear standards and penalties, credible information, and alternative activities may certainly increase the vulnerability of youth to the appeals of abusable substances, but the presence of such efforts has not guaranteed success in preventing initial use among all youth.
- Delay initial use. Another goal is to delay initial use as long as possible, thus delaying the point at which any progression from use to abuse to addiction can begin. Such an approach can provide at least some protection for some chil-



PATRICIA M. TICE

Material from the "Just Say No" campaign.

dren—i.e., those who might otherwise initiate use at earlier ages and then more rapidly progress to abuse and possibly addiction. Early onset of substance use is often more severe than late onset and, as is discussed later in this chapter, early use of substances is one of the better predictors of subsequent problems. Thus, a delay in initial use may offer significant protection even if substances are used later on.

- Prevent, reduce, or control continued use. Another approach is to try to prevent current users from continuing or escalating their use of one substance or moving on to other substances with greater abuse liability. Many youth experiment with cigarettes, alcohol, and marijuana, but do not progress to problematic use of these or other substances. Others, however, do progress. Efforts to reduce, prevent, or control continued and progressive use, if successful, can protect individuals from the problems of abuse and addiction.

Preventing, delaying, reducing, or controlling the use of substances can help prevent abuse and addiction. Because of their directness and apparent simplicity, these goals can be very appealing. Detracting from their appeal, however, is that they can be difficult to achieve, especially for multi-

problem individuals in communities where abusable substances are widely available and aggressively marketed, and for individuals who may be physiologically predisposed to the continued and escalating use of substances.

In addition to being a precondition (without which abuse and addiction become impossible), substance use can also be an important contributor to later abuse and addiction, by affecting individuals physiologically, psychologically, and socio-culturally.

### ■ Physiological Effects

Addictive substances affect processes in the brain, some of them operating through reward systems, and can produce drug tolerance and dependence. Tolerance manifests itself when, to produce a given response (e.g., a high), an individual must ingest more of a substance. Physiological drug dependence has at least two defining characteristics: the development of tolerance to the effects of the drug and the manifestation of symptoms of withdrawal on abrupt discontinuation or reduction in dosage. The development of physiological tolerance and dependence can contribute to the progression from use to abuse and addiction: as tolerance to a substance increases, an individual must ingest more of the substance to continue to obtain a given desired response; as dependency develops, an individual must continue to ingest the substance to avoid the unpleasant experience of withdrawal.

### ■ Psychological Effects

Substance use may contribute to further use and abuse through psychological means as well. For example, an initial successful experience of use may reduce an individual's fear about the substance, thus opening the way to continued use that can lead to growing tolerance and dependence.

Changes in expectations about the consequences of alcohol use have also been associated with increases in behavioral tolerance. Specifically, less impairment from drinking alcohol occurred when, after the ingestion, successfully performing certain tasks was rewarded, while all



OFFICE OF TECHNOLOGY ASSESSMENT

Buttons urging the use of a designated driver, developed by Mothers Against Drunk Driving (MADD) in conjunction with AAMCO Transmissions. The joint campaign targets specific times identified by MADD as especially susceptible to drinking and driving—summer, Labor Day, New Year's Eve, and St. Patrick's Day.

other variables that increase tolerance were controlled. Several recent studies and a literature review have found that the ingestion of alcohol increased when the rewards for alternative behaviors were constrained (24). Also, social drinkers who expect the effects of alcohol to be better than the outcomes of other activities may well be more likely to make the transition to abusive drinking. Such a hypothesis is supported by several studies that found that alcohol abusers identify a greater number of favorable consequences of alcohol consumption than do nonabusers (24).

Continued use of substances can also impair the learning of skills, especially among the young, and the ability to remember lessons once learned. Developmental processes may be slowed, which may hamper decisionmaking, in general, and about the use of substances, in particular. However, the progression from use to abuse may also, in many cases, not be simply linear, as when individuals move in and out of substance abusing patterns, depending on the developmental stages and social and cultural situations and contexts that may be affecting them.

## ■ Sociocultural Effects

Sociocultural factors, triggered by substance use, can also contribute to progression in use. An individual who initiates use, for example, may begin to participate in a subgroup that encourages use, such as the patrons of crack houses, groups of heroin users, members of substance-using motorcycle gangs, adolescent peer groups, cocktail party groups, after-work beer groups, and groupies who follow certain rock bands. (In some cases, too, such groups and subcultures may provide the impetus for the initiation of use as well.) Such social and cultural environments encourage, reinforce, maintain, and increase substance use and abuse—all of which can develop after the initiation of use outside the group. Conversely, the lack of rewarding, substance-free alternative groups and activities may render individuals more vulnerable to the appeals of substance-using groups and subcultures.

## STAGES IN THE INITIATION OF USE

Do individuals first use one substance (e.g., alcohol or tobacco) and only later use another (e.g., cocaine or heroin)? Are stages in the first use of different substances similar across cultures? Does the use of one substance (e.g., marijuana) directly increase the likelihood of later use of another substance (e.g., heroin)? Or is progression in use caused more by other mediating factors, such as multiple behavior problems? If so, might these other problems contribute to later use of certain substances even in the absence of the use of other substances earlier on?

The basic question about whether there are stages in the initiation of the use of different substances has been studied in the United States (9,11,12,21,27) and in Israel and France (1). While study results vary somewhat, the sequence most often reported is that alcohol and cigarette use come first, followed by marijuana use and then by the use of other illicit substances. Some variations in this sequence have been found for in-

dividuals of different sexes, racial and ethnic groups, and cultures. The idea that the use of some substances increases the likelihood of the use of other substances has led to several hypotheses.

## ■ The Stepping Stone Hypothesis

In its strongest form, the so-called “stepping stone” hypothesis asserted that the **use** of marijuana often or almost always led to violent crime and to the use of other illicit substances (28). This hypothesis has never been proved. An even earlier version of the steppingstone hypothesis goes back to the beginning of the 20th century, when the presumed progression from tobacco to alcohol to morphine use was presented as an argument for prohibiting both alcohol and tobacco. One observer commented that there was no strong evidence that the use of these substances causes progression from one to another; rather, some individuals are more prone to the use of multiple substances. Also, the criminalization of marijuana may have caused some marijuana users to move on to other illicit substances through contact with the subculture of illicit users (14).

## ■ The Gateway Hypothesis

More recently, a more moderate hypothesis, the gateway hypothesis, has been put forward. It asserts that use of certain substances increases somewhat the chances of progression to the use of other substances. For example, in one longitudinal study, men who had used both alcohol and cigarettes by age 15 had a 52 percent greater chance of using marijuana, compared to men who had never used alcohol or cigarettes by age 25 (26). For women, the increased chance of marijuana use among alcohol and cigarette users was 46 percent. Similarly, for the next stage, men who had used marijuana by age 15 had a 68 percent greater chance of initiating the use of other illicit substances, compared with those who had never used marijuana. For women, the increased probability was 53 percent.

### ■ Early and Frequent Use

A still more constrained version, but one that may be more predictive, suggests that early and frequent use increases the probability of movement to later levels in the sequence (12). For example, researchers have reported that early use of substances is associated with later problematic use (7,20).

### ■ Nonuse of a Substance at an Earlier Stage

Another hypothesis proposes that the nonuse of a substance at an earlier age reduces the chances of later use of other substances. A longitudinal study has found that the chance that an individual who had never used marijuana would move up a level to use other illicit substances was very low (26). This finding corroborated conclusions reached earlier based on a cross-sectional study (18).

Because of variations among communities and cultures, the search for a universally applicable sequence in the initiation of the use of different substances may be less fruitful than the study of why there may be somewhat different sequences, depending on factors such as availability and social norms. The relative ease of availability of some substances (e.g., cigarettes, beer, wine) may well account for their frequent appearance at an early stage in the sequence of use. However, this may vary among cultures. In France, for example, wine is widely available and used both at an early age and at an early stage in the sequence. In other cultures, where wine is less available but inhalants are widely available and inexpensive, inhalants are used at an early age and early in the sequence. Use at a young age may be a marker, at least in some cultures, for other risk factors, such as parental substance abuse and other family problems, which can contribute to later substance abuse problems, independently of early and frequent use. For example, one study found that, irrespective of the age of onset of use, individuals who exhibited numerous behavioral problems in their youth moved on to problem substance use, no matter how early or late in their youth they began to use substances (20).

### ■ Limitations in the Research

Research into stages in the initiation of the use of different substances has itself evolved through stages. A number of issues, which have not been thoroughly addressed, remain:

- The identification of stages in the progression from use to abuse and addiction is more a description of the stages some individuals move through than a prediction of necessary stages for most individuals, since the majority of substance users do not move on to abuse. Reasonable questions are: What prevents some individuals from progressing from initial use to abuse and addiction? Are the obstacles primarily due to the absence of preconditions, such as biological and pharmacological preconditions or availability and marketing. Studying those individuals who do not progress from use to addiction may provide insights and lessons about how to prevent progression among those who do progress. Of particular importance are studies of the changing vulnerabilities and resiliencies of individuals in different developmental stages from childhood through adolescence, young adulthood, and adulthood.
- What is the role of substance use in progression to abuse and addiction? The initiation of use of a particular substance may often not be the most important contributor to the use of a substance higher in the sequence. Other factors directly related to use may play a larger role. For example, age of onset, quantity, frequency, techniques, and purposes of the substance use may be more salient. Longitudinal risk factor and expectancy studies have begun to look at the role of these other elements.
- Are some individuals more predisposed to use and abuse substances than others? Individual biological and psychological factors may also strongly influence which individuals progress from use to abuse.
- What environmental factors contribute to substance use and abuse? Availability, marketing, social norms, peer groups, subcultures, and settings that encourage substance use may also be key in determining which individuals progress.

Despite the need for greater understanding about the issues above, already completed research into stages in substance use has been influential in providing the basis for policy and program recommendations. The gateway hypothesis has encouraged some prevention advocates and program planners to focus on preventing or delaying the use of gateway substances (e.g., alcohol, cigarettes, marijuana) as a possibly effective way to prevent later use of illicit substances. Longitudinal studies have found that the use of cigarettes by youth can be a strong predictor of later problems with substances (17).

### STAGES IN THE CYCLE OF USE, ABUSE, AND ADDICTION

One approach to the study of stages in substance use focuses not just on the initiation of use; but also on the continuation of use, maintenance and progression of use within a class of substances; progression across classes; and regression, cessation, and relapse cycles in use and abuse (2).

#### ■ Initiation of Use

Initiation is clearly a key first step in the progression to more serious levels of use. Because substance use is often initiated during adolescence, most substance use research has focused on initiation of use among adolescents. However, most individuals who initiate substance use do not progress to harmful use. Also, the factors associated with such progression may often differ from the factors associated with initiation. Thus, the focus on the initiation of use during adolescence is not sufficient for an understanding of the progression from use to abuse and addiction.

#### ■ Continuation of Use

After trying a substance for the first time, one person may say, “I won’t be trying that again,” while another may say, “That’s for me.” Although only limited research has been conducted on risk and protective factors associated with the transition from experimentation to continued use, the continuation of use can apparently be influenced by the pharmacology of the substance (e.g., whether

it produces desired or pleasant experiences), the biology of the individual (e.g., whether specific individuals have genetic or acquired biological predispositions or intolerances to the use of specific substances), the availability and marketing of the substance (e.g., whether a substance is widely available, used, and accepted for use), other characteristics of the individual (e.g., at what developmental stage one is, and whether one has mental or emotional problems, which may be ameliorated at least temporarily by substances), and community contexts (e.g., substance-using subcultures or settings that strongly encourage and reinforce a continued use of substances).

#### ■ Maintenance and Progression of Use Within a Class of Drugs

Maintenance and progression may include conformity with norms of consumption—for example, initial and continued heavy use of alcohol in a college fraternity. Progression with cocaine could entail movement from snorting to smoking or injection. College students in some fraternities and sororities with drinking traditions may be at higher risk for heavy substance use, especially of alcohol. But very little research has been conducted on the risk factors for maintenance of high levels of use or for progression within classes of substances to excessive use among this age group.

#### ■ Progression in Use Across Classes of Substances

At this stage, an individual may try different substances for different, and often compensating, effects. For example, the antiemetic properties of tetrahydrocannabinol in cannabis can be used to facilitate greater use of alcohol, alcohol or marijuana can be used to smooth out the aftermath of snorting cocaine, and heroin can be used for similar purposes after a binge with crack.

#### ■ Regression, Cessation, and Relapse Cycles

The transition away from abuse may occur a number of times before an individual succeeds in getting off a substance or, failing that, remains



In the eighteenth and nineteenth centuries, artists depicted alcoholism as the "drunkard's progress." This example, probably made around 1850, consists of six printed cotton banners.

dependent. It may also be influenced by the same factors, or kinds of factors, that contributed to the substance abuse problem in the first place, including the full range of biological and pharmacological factors, availability and marketing, individual emotional needs, or contextual factors.

## STAGES IN PROBLEM BEHAVIORS

Does substance use itself contribute to conduct disorders, delinquency, and other problem behaviors? Do these behaviors then, in turn, contribute to the progression to more use and to abuse and addiction?

Adolescents who use substances, especially those that are illegal, are more likely than nonusers to exhibit various problem behaviors, including: early sexual experimentation, delinquent activities, eating problems, and psychological or psychiatric problems, including suicide and suicidal thoughts (10). Less is known, however,

about the sequencing of these behaviors. The interrelations among the factors is likely to vary widely among individuals, but some sequences may predominate. Several such sequences have been proposed. One suggested developmental sequence, for example, includes six stages: oppositional (characterized by disobedience at home); offensive (including disobedience in school, fighting, lying); aggressive (physical attacks on others, theft at home); minor delinquency (shoplifting and status offenses, such as alcohol use, truancy, running away); major delinquency (break-in and entry, car theft, substance abuse, robbery, drug dealing); and violence (assault, rape, homicide) (15).

One of the few studies of problem behavior sequences looked at the order of initiation of four different substances, delinquency, and sexual activity, among a sample of black adolescents (3). For males, it found involvement proceeded gener-

ally from beer use to cigarette use, then to delinquency, sexual activity, marijuana use, and the use of hard liquor. For females, the progression was generally from cigarette use, to delinquency, beer use, sexual activity, marijuana, and hard liquor. For both sexes, delinquency and youthful sexual activity tended to precede the use of marijuana and hard liquor.

While a high correlation among problem behaviors has been frequently found, the sequencing of those behaviors is less clear. The early use of so-called gateway drugs, such as beer and cigarettes, may contribute to later problem behaviors, while the later use of marijuana, hard liquor, and other illicit substances may be more the result of extended participation in problem behaviors. More research is needed in this area if these hypotheses are to be better understood and tested.

### KEY ASPECTS OF USE

Some research has focused on characteristics of substance use that can strongly influence the progression from use to abuse and addiction. In addition to the age of first use, these characteristics include the frequency, quantity, and type of substance used, and the technologies and purposes and expectations of use.

#### ■ Age of First Use

Initiation into substance use at a young age is one of the most striking and often-found predictors of later problems, including abuse. For example, in one large community epidemiology study, men who first used substances before age 15 developed mental and behavioral problems in 51 percent of the cases, compared with 16 percent among those who began at age 18 or later. For women, the comparable figures are 39 and 12 percent, respectively. Other studies have also found problems later on associated with the earlier introduction to alcohol or other drug use (19).

This pattern seems to hold specifically for later substance use and abuse as well. Early use of substances was found to be associated with later problematic use (7,20). Another study estimated that, of the men who had initiated the use of marijuana

by the age of 14, 71 percent would be expected to initiate the use of other illicit substances by age 25, compared with 9 percent of those who first started at age 21 (12).

One report asserted that frequency of use was the mechanism through which early onset probably operates (12). However, another study concludes that preexisting conduct problems are a better predictor of later substance abuse problems than is early use (19). It found that, in individuals with many conduct problems, any use of a substance, no matter how late in youth, was followed by abuse.

#### ■ Frequency and Quantity of Substance Used

When addiction occurs, it usually results from a period of increasing intensity and frequency of use (5,6). Although frequency has often been employed as a measure of problematic use, one study found that quantity of substance used, rather than frequency of use, was a more powerful predictor of disruptive and problematic use (21). Quantity and frequency are often related, but they are not identical. An infrequent user could go on a binge, where large quantities are consumed, that could be extremely harmful. By contrast, a frequent user, such as someone who drinks alcohol every day but in strict moderation, may not encounter substance-related problems (although a maintenance alcoholic may drink daily with no apparent intoxication, but with the later development of associated health problems). The quantity and frequency of substance use can be strongly affected by the availability and marketing of the substance and by the techniques or technologies for administering the drug.

#### ■ Type of Substance Used

The type of substance used can also influence the chances of later substance problems. More addictive substances—those with greater abuse liability—will make restraint from continued and possibly escalating use more difficult. Cigarettes provide an example experienced by many individuals: nicotine is extremely addictive, and only a

minority of those who try cigarettes and continue to smoke them will be able to control or easily cut back on their use.

### ■ Techniques of Use

Techniques of administration can also influence the progression of substance use. The introduction of prewrapped, prepackaged cigarettes, together with widely distributed matches, was followed by the rapid escalation of cigarette use, and presumably addiction to nicotine, in the United States in the late 1800s and early 1900s. Similarly, the introduction of smokable free-base and crack cocaine, the administration of which is much more efficient than the snorting of powdered cocaine, led to an explosion of cocaine abuse and addiction. The Bahamas, for example, experienced a hundredfold increase in cocaine-related hospital emergency room admissions following the introduction of crack and free-base cocaine in the 1980s (8).

### ■ Expectations and Effects of Use

The expectations and effects of use can also reinforce use and influence progression from use to abuse and addiction. Research reviews have discussed some examples of the expectations and effects of using illicit substances that can reinforce their use and may increase the likelihood of progression to abuse and addiction (13,25). These purposes include:

- The reduction of negative feelings, including the use of stimulants to alleviate depression and weakness; psychedelics to combat boredom and disillusionment; alcohol to assuage feelings of guilt, loneliness, and anxiety; and tranquilizers, amphetamines, and sedatives to reduce painful feelings.
- The reduction of self-rejection. Some researchers have found an association between substance use and indices of insecurity, dissatisfaction with self, desire to change oneself, defensiveness, low self-esteem, and low self-confidence.
- The increase in potency. Increases in physical and sexual potency, daring, and toughness can be achieved by using specific substances in certain situations. This can be especially appealing to youth, who may be wrestling with feelings of powerlessness, dissatisfaction, and frustration.
- The expression of anger. Substances can heighten expressions of anger (e.g., in opposition to mainstream norms) or can medicate away anger and rage. Narcotics and hypnotics may help reduce rage, shame, jealousy, and impulses toward extreme aggressiveness.
- The achievement of peer acceptance. Peers often play the largest role in endorsing and encouraging substance use, and in supplying substances. The initiation, continuation, and progression of use can be important ways for individuals to gain acceptance into peer groups. This can be true in school (e.g., in a fraternity), at work (e.g., in a sales force that demands that one be able to “hold one’s liquor”), in substance-using gangs, and among certain groups of artists (e.g., some contemporary painters and musicians).
- The seeking of euphoria. Many substance users, especially addicts, report favorably on drug-induced euphoria. Indeed, the prospect of euphoria may be the initial attraction of the substance. It can also encourage continued use, even to the point of addiction and negative consequences.
- The coping with problems. For some users, substances temporarily alleviate problems they have been unable to resolve in other ways. While the problems may be causing emotional pain, the use of substances, especially for the young, can inhibit the development of other problem-solving skills and may alleviate symptoms only in the short-run, since the underlying causes of the problems are likely to remain unresolved.
- The reduction of overwhelming trauma. Post-traumatic stress (e.g., after a war, or after physical or sexual abuse) can result in the use of addictive substances, since use may temporarily

ly reduce fears, flashbacks, and other negative feelings.

- The suppression of appetite or hunger. Another function of using some psychoactive substances is appetite suppression. An extensive literature exists on the use of nicotine, from cigarette smoking, to control appetite and weight. This phenomenon often manifests itself in the negative: for example, current smokers (especially women) are reluctant to stop smoking for fear they will gain weight (4).
- The seeking of stimulus. Individuals who seek higher levels of external stimulation can also turn to substances, for a high, for hallucinations, for unpredictable effects.
- The regulation of affective and behavioral impairments. Those with mood disorders, such as depression, and behavioral impairments may find that some substances alter moods and allow them to modify behaviors.

The above expectations and effects might well be expected to contribute to more continued and progressively heavier substance use than would more casual purposes such as curiosity, experimentation, or recreational use. The more “serious” the expectations, effects, and functions of substance use, the greater the likelihood of continued use and abuse may be. As noted earlier, the use of substances, especially by the young, to address problems or to achieve feelings may impede the development of skills for managing feelings and behaviors and for solving problems, and thus may

result in deficiencies in handling problems in life later on. Indeed, the use of substances at very young ages may even contribute to permanent changes in the brain that may contribute to further use and abuse. More research is needed to clarify the connections between the expectations and effects of use and the progression to heavier and more problematic use and abuse.

## SUMMARY

Substance use, including the progression to heavier and more harmful use, is a precondition and contributor to abuse and addiction. Researchers have focused on stages in the progression of substance use in several ways. They have studied stages in the initiation of the use of different substances, finding a sequence that moves from the use of cigarettes and wine or beer, to the use of marijuana, then hard liquor, and finally other illicit substances. Because many individuals who use substances do not go on to substance abuse, and because use at one level does not guarantee use at a higher level, these stages are descriptive but not predictive.

In addition to the biologically and pharmacologically reinforcing properties of addictive substances that can lead to tolerance and dependence, key aspects of substance use that contribute to abuse and addiction include age of first use, the frequency, quantity, and type of substance used, and the techniques and expectations and effects of use.