Underage Drinking Literature Review

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Underage Drinking

Scope of Problem

Prevalence

Alcohol is the drug of choice for adolescents (Johnston et al. 2007) and one that many underage youth choose to use and abuse.

In 2006, more than half (53.9 percent or 20.6 million) of persons ages 12 to 20 had used alcohol in their lifetime, almost half (46.1 percent or 17.6 million) had used it in the past year, and more than one fourth (28.3 percent or 10.8 million) had used it in the past month (current use) [Pemberton et al. 2008]. According to the *National Survey on Drug Use and Health,* in 2007, 27.9 percent of persons ages 12 to 20—about 10.7 million individuals—reported drinking alcohol in the past month. Rates of current alcohol use increased with increasing age among underage persons. In 2007, 3.5 percent of persons ages 12 or 13, 14.7 percent of persons ages 14 or 15, 29.0 percent of 16- and 17-year-olds, and 50.7 percent of 18- to 20-year-olds drank alcohol during the 30 days before they were surveyed (SAMHSA 2008). Seventy-five percent of 12th graders report having tried alcohol, with 41 percent of 8th graders reporting use within their lifetime (Johnston et al. 2006a).

Not only do many underage youth drink, but many also drink to the point of inebriation. Twenty percent of 8th grade students report having been drunk at least once in their lifetime, and 6 percent within 30 days of the survey; 42 percent of 10th graders report having been drunk once, with 18 percent reporting drunkenness within the past 30 days; and 58 percent of 12th graders report having been drunk at least once, with 30 percent reporting drunkenness within the past 30 days (Johnston et al. 2006a). Roughly 7.2 million of surveyed students (18.6 percent) were binge drinkers (defined as having five or more drinks on one occasion on at least 1 day in the 30 days prior to the survey), and 2.3 million (6.0 percent) were heavy drinkers (defined as binge drinking on at least 5 days in the past 30 days) [SAMHSA 2008].

Heavy drinking is prevalent among college students and young adults in the military (Monti, Tevyaw, and Borsari 2004/2005), and binge drinking peaks in the early adult years. In 2007, among young adults ages 18 to 25, the rate of binge drinking was 41.8 percent, and the rate of heavy drinking was 14.7 percent (SAMHSA 2008). Two in five college students report binge drinking (Wechsler et al. 2002), a rate that has changed little from 1993 to 2001, despite increased prevention efforts. Binge and heavy drinking are associated with much higher rates of illicit drug use than among more moderate drinkers (Lowman 2004).

Young adults (ages 19–24) have the highest prevalence of heavy or high-risk drinking (Johnston et al. 2001) and also demonstrate an accelerated trajectory to dependence (Spear 2002). In fact, the percentage of individuals who meet the criteria for alcohol abuse and alcohol dependence are highest in this age group. Thirty-one percent of college students meet the criteria for alcohol abuse and 6 percent for alcohol dependence (Knight et al. 2002). Of all underage drinkers, 24.9 percent met the clinical criteria of the *Diagnostic and Statistical Manual of Mental Disorders,*

Fourth Edition (DSM–IV), for alcohol dependence or abuse (Foster et al. 2006; Wechsler et al. 2002). Combined data from 2002 to 2006 indicated that an annual average of 9.4 percent of persons ages 12 to 20 (3.5 million persons in that age range) met the diagnostic criteria for an alcohol use disorder (dependence or abuse) in the past year (Pemberton et al. 2008). And, though youth 12 to 20 comprise 15.4 percent of the population over 12, they constitute 30.1 percent of all U.S. drinkers who met the criteria for abusive or dependent drinking (Foster et al. 2006).

Research to date suggests there are two major trajectories of alcohol use in underage drinkers. The first pathway involves experimental or "normative" alcohol use; many users in this developmental pathway age out of heavy alcohol use (Bukstein 1994; Monti, Tevyaw, and Borsari 2004/2005; Sobell et al. 1993; Lowman 2004). The second pathway characterizes that of adolescents who often manifest early development behavioral and affective disorders and who are more likely to develop alcohol use disorders into adulthood (Lowman 2004). Thus, while 50 percent of 18-year-old heavy drinkers age out of those drinking patterns, 50 percent have the same drinking pattern 12 years later (Temple and Fillmore 1985).

From 1975 through 2003, the documented age of initiation has trended downward (Faden 2006). However, it is also possible that the problem of early-onset drinking has been underestimated (Zucker et al. 2008). Most assessments of alcohol initiation survey youth who are 12 or older and depend on retrospective recall (that is, depend on the memory of initiation rather than report it as it happens), which has been shown to yield unreliable data (Donovan 2007). Very few surveys capture normative data from children younger than 12. Having reliable data on this young cohort could help with efforts to assess prevention interventions in elementary schools and would help determine the kinds and scope of interventions that are necessary to prevent future problematic use of alcohol and illegal substances and engagement in other high-risk behaviors (Donovan 2007). What data is available suggests that significant numbers of children have experience with alcohol, ranging from having a taste to having more than a sip to alcohol use within the past year (Donovan 2007).

This trend of early alcohol use is troubling given the association of early onset drinking with other problematic outcomes such as truancy, drinking and driving, illicit substance use and abuse, risky sexual behaviors and pregnancy, delinquent behavior, and smoking (Zucker et al. 2008; Stueve and O'Donnell 2005). Assessing accurately the scope of alcohol use among this younger cohort is also important because the rate of lifetime dependence on alcohol is about four times as great for those who start drinking at 14 or younger (a 40 percent rate) than for those who start drinking at 20 or older (a 10 percent rate) [Grant and Dawson 1997]. Likewise the rate of lifetime abuse is almost three times as great for those who start drinking at 16 or younger (a 11 percent rate) to those who start at 20 or older (a 4 percent rate) [Grant and Dawson 1997]. Early initiation is also associated with alcohol-related problem behaviors, such as violence, absenteeism from work or school, and injuries (Gruber et al. 1996). Delaying the age of onset may decrease the odds of alcohol dependence or abuse: Grant and Dawson (1997) found that for each year increase in age at initiation, there was a decreased dependence rate of 14 percent and a decreased abuse rate of 8 percent. Complicating an understanding of early onset drinking and negative outcomes is the need to tease out the degree to which early use may be a marker versus a causative precursor for these later behaviors.

Adolescents who meet the criteria for alcohol dependence and abuse are also more likely than adults to meet the criteria for co-occuring psychiatric disorders, such as conduct disorder, attention deficit hyperactivity disorder, and bipolar disorder (Tapert, Caldwell, and Burke 2004/2005). Further, youth with psychiatric disorders are more likely to have alcohol use disorders (Tapert et al. 2002).

Binge Drinking

Binge drinking—having five or more drinks on one occasion—has become a topic of national concern (Wechsler et al. 2002), and clearly large numbers of underage drinkers are drinking in this dangerous fashion. Eighteen to 36 percent of high school students report binge drinking within the previous 2 weeks (Johnston, O'Malley, and Bachman 2000), and two in five college students report binge drinking (Wechsler et al. 2002). The problem may be underestimated since some research suggests that students regularly overestimate the size of a standard drink and thus underestimate the extent of their drinking (White et al. 2005).

The magnitude of the problem of binge drinking is suggested in the cases of alcohol poisoning and even death attributable to excessive consumption, often reported in the popular media, and the costs of such drinking patterns are high. Binge drinking, driving while intoxicated (DWI), and alcohol-related deaths increased between 1998 and 2001 among the 18–24 population (Hingson et al. 2005).

While the consumption of five drinks on one occasion has been used as a measure on many surveys, research is being conducted to give a more complete picture of binge drinking beyond the five-drink threshold. White, Kraus, and Swartzwelder (2006) reported that in their study of over 10,000 freshmen, frequent binge drinkers (three or more times in a 2-week period) were more likely to drink at levels two or three times the binge threshold—that is, 10 to 15 drinks—than were infrequent binge drinkers (one or two times in a 2-week period). They found a relatively large percentage of students, particularly male students, far exceed the binge threshold in drinking patterns. This pattern of drinking increases the risk of experiencing alcohol-related negative consequences (White, Kraus, and Swartzwelder 2006; D'Amico et al. 2001).

Media Exposure to Alcohol Use

Although there is little evidence that alcohol advertising directly increases consumption (Saffer 2002), there is no question that underage individuals experience significant exposure to alcohol advertising (National Center on Addiction and Substance Abuse 2002; NIAAA Task Force on College Drinking 2002a). Recent estimates suggest that 8- to 18-year-olds average 6 to 7 hours of daily exposure to mass media, along with its concomitant exposure to advertising (Roberts 2000). Many teens have TVs in their rooms, are connected to the Internet, have some kind of sound system, and have access to magazines developed for youth (Windle et al. 2008). Based on the average hours teens are exposed to such materials, adolescents may view a considerable amount of alcohol and tobacco use, often by those they consider role models (DuRant et al. 1997).

Youth are often exposed to alcohol advertising disproportionately compared with adults of legal drinking age. For example, although most age groups are exposed to beer and wine, since they are among the most heavily advertised products on television and radio (Brown and Witherspoon 2002), adolescents see 45 percent more beer advertisements and 27 percent more distilled spirits advertisements in magazines than adults are exposed to (Foster et al. 2006). In college newspapers, alcohol advertising exceeded advertising for any other product (Breed, Wallack, and Grube 1990). Likewise, advertisers choose venues in television and radio that oversample underage drinkers relative to adults (Foster et al. 2006).

The alcohol industry has been very effective in "normalizing" regular drinking through media depictions of usage—that is, by making regular drinking seem like something most people, including underage individuals, do (Donovan et al. 2007). An analysis of music videos for alcohol and tobacco use behaviors found significant amounts of usage in music videos, mostly portrayed by young adults (76 percent for smoking behaviors, 68 percent for alcohol use) and in some cases by young children or apparently underage youth (DuRant et al. 1997). Media images not only portray regular drinking as a normal, widely practiced behavior, but they also by and large portray unhealthy behaviors such as drinking, unprotected sex, smoking, and violence as "glamorous and risk free" (Brown and Witherspoon 2002; National Center on Addiction and Substance Abuse 2002). These portrayals of use as "normal" may help explain the research showing that adolescents overestimate the number of their peers who engage in high-risk behavior (such as alcohol and tobacco use) and attribute more accepting attitudes about such risky behavior to their peers than is the case (DuRant et al. 1997). The messages of these advertisements are mediated by other factors, but Brown and Witherspoon (2002, 154) point out that, whether mediated or not, minors tend to have a different perspective of such material: "Although from a researcher's point of view, it is an often distorted picture of violence, misogyny, and excess consumption, to a youth it is an often appealing portrait of action, fame, and fortune."

The alcohol industry has a powerful incentive to ignore the general calls to eliminate such advertising to underage individuals. Foster and colleagues (2006) estimated that the combined value of underage drinking and adult pathological drinking conservatively totaled $48.3 billion (some estimates place the figure as high as $62.9 billion)—which represents 37.5 percent of expenditures on alcohol. The industry can only increase its profits by recruiting new drinkers or by increasing the amount consumed by current drinkers.

A direct impact of advertising on alcohol consumption has not been established, although this lack of evidence may be due to methodological issues in studies of advertising, including construct validity and confounding (Saffer 2002; Stacy et al. 2004). Nonetheless, research suggests that drinking beliefs and intentions to drink are positively associated with an exposure to and awareness of alcohol advertisements (National Center on Addiction and Substance Abuse 2002; Stacy et al. 2004; Grube and Wallack 1994; Robinson, Chen, and Killen 1998).

Easy Access to Alcohol

Among surveyed teens 13 and older, 50 percent or more—depending on the survey, up to more than 75 percent—reported that they can easily obtain alcohol or sources to alcohol (Wagenaar

and Toomey 2002; Fell et al. 2008). In purchase-attempt studies, 47 percent to 97 percent of retail outlets sold to minors, and those who do sell to minors rarely face enforcement actions (Wagenaar and Toomey 2002; Wagenaar and Wolfson 1994). A small group of adolescents use the home-delivery services of alcohol retailers to bypass restrictions (Fletcher et al. 2000).

About one third (30.2 percent) paid for the alcohol the last time they drank, including 8.2 percent who purchased the alcohol themselves and 21.8 percent who gave money to someone else to purchase it. Among those who did not pay for the alcohol they last drank, 37.2 percent got it from an unrelated person age 21 or older, 20.7 percent from another person under 21, and 19.5 percent from a parent, guardian, or other adult family member (SAMHSA 2008).

Access to alcohol also increases when prices drop. Consumption by adolescents of alcohol and cigarettes is sensitive to prices, and research has shown that increasing the real price of alcohol reduces alcoholic consumption by youth (Chaloupka, Grossman, and Saffer 2002). Over recent decades, the real price of alcohol has decreased, making it more available to underage drinkers. From 1975 to 1990, for instance, the real price of distilled spirits dropped 32 percent, wine 28 percent, and beer 20 percent (Chaloupka, Grossman, and Saffer 2002).

At-Risk Youth

A variety of factors have been identified that predict adolescent substance use disorders. A group of highly predictive child risk variables includes parental substance use disorders (Hill et al. 1999; Hill et al. 2000), early tobacco or alcohol use (Clark et al. 2005), and neurobehavior disinhibition (Clark et al. 2005; Tapert et al. 2002; Biederman et al. 1998).

Multiple studies have linked parental substance use disorders with increased risk for adolescent substance involvement (Chassin et al. 2002; Lieb et al. 2002; Sher et al. 1991; Schuckit and Smith. 1996; Clark, Parker, and Lynch 1999.). This correlation may be due to environmental causes (e.g., modeling of alcohol use by parents), may have biological roots (e.g., prenatal exposure to alcohol), or may be connected to genetic factors (e.g., an individual may be predisposed genetically to find alcohol more pleasurable and stress dampening) [Aktan, Kumpfer, and Turner 1996].

Another risk factor for adolescent substance use is neurobehavior disinhibition or psychological dysregulation, which can be defined as “delayed or deficient development of behavioral, emotional, and cognitive regulation” (Clark et al. 2005, 14; Clark and Winters 2002; Tarter et al. 2003). In particular, children with early onset conduct disorders and antisocial behaviors are at high risk for later delinquency and substance use (Sanders 2000; Hawkins et al. 1992; Loeber 1990; Tapert et al. 2002; Giancola, Shoal, and Mezzich 2001).

Childhood use of tobacco and alcohol is also a risk factor for adolescent substance use. While experimentation with such substances is more typical of older adolescents, childhood use is atypical (Clark et al. 2005).

Attitudes Toward Underage Drinking

In *Healthy People 2010,* which sets health goals for the Nation, the Federal Government identifies underage substance use and binge drinking as targets for reductions. The document highlights how attitudes about alcohol and its use affect consumption patterns:

> The perceived acceptance of problematic drug-using behavior among family, peers, and society influences an adolescent's decision to use or avoid alcohol, tobacco, and drugs. The perception that alcohol use is socially acceptable correlates with the fact that more than 80 percent of American youth consume alcohol before their 21st birthday, whereas the lack of social acceptance of other drugs correlates with comparatively lower rates of use. Similarly, widespread societal expectations that young persons will engage in binge drinking may encourage this highly dangerous form of alcohol consumption. [USDHHS 2000, 26–31 to 26–32]

The embedded nature of cultural attitudes toward underage drinking is illustrated by the stability in rates of underage consumption in contrast to trends in decreasing use of illicit drugs and cigarettes (Schulenberg and Maggs 2002).

Parents routinely underestimate the extent of teen drinking and tend to see it as less of a problem than adolescents do (National Center on Addiction and Substance Abuse 2002). If parents express more concern about illicit substances than about alcohol use, adolescents may interpret this relative silence as an acceptance of alcohol use (National Center on Addiction and Substance Abuse 2002). In one survey, only about one fourth of parents explicitly forbid their children to drink alcohol as minors (Hazelden Foundation, as quoted in National Center on Addiction and Substance Abuse 2002). In the *Underage Drinking Survey* conducted by the National Center on Addiction and Substance Abuse (2002, 34), many adult participants expressed a belief that underage drinking is inevitable and that parents just have to "hope that their children do not drink to excess and cause harm to themselves or others."

Attitudes about the inevitability of underage drinking are reinforced when prevention and intervention efforts fail to achieve their stated objectives. Even though the programs used may be poorly conceived or have been shown to be ineffective, the failure reinforces the impression that the problem is intractable (NIAAA Task Force on College Drinking 2002a). Moreover, reliance on programs that do not work limits resources available for more effective approaches.

But current data shows that not all youth drink at the same rates, which suggests that environment and attitudes can affect the rates of alcohol use. For instance, for youth ages 12 to 20, those with family incomes of $75,000 or more drank at higher rates (28.6 percent) than those with family incomes of $20,000 to $49,999 (26.0 percent) but at lower rates than those with family incomes of less than $20,000 (33.9 percent). Binge drinking was higher among underage youth who live in nonmetropolitan areas (20.8 percent) than among those in metropolitan areas (18.8 percent). African-American youth reported lower rates (18.8 percent) for past month underage alcohol use than did non-Hispanic whites (32.6 percent). And youth in the Northeast (21.4 percent) and Midwest (21.8 percent) reported higher rates of current and binge drinking than did those in the South (17.3 percent) and West (17.8 percent) [Pemberton et al. 2008].

Changing attitudes can be challenging but necessary, since it appears that a certain level of public support is necessary if policies are to be implemented and enforced successfully (Room et al. 1995, as reported in Giesbrecht and Greenfield 1999). There is limited support for certain measures. For instance, in terms of alcohol policy, those regulations that limit access (physical, demographic, or economic) have the weakest support among the public, especially among heavy drinkers (versus abstainers), men (versus women), and young adults (versus 55 and older), as opposed to those policies that support interventions (e.g., education, prevention, treatment) [Giesbrecht and Greenfield 1999; National Center on Addiction and Substance Abuse 2002].

The power of attitudes/acceptance of drinking may be part of a recent call to lower the drinking age to 18 (Roan 2008). This movement has led to the establishment of the Amethyst Initiative, which has 130 signatories from universities and colleges, and which calls for a reconsideration of the minimum legal drinking age (MLDA) despite the evidence that the MLDA has been one of the few public policies that has been shown to be effective in reducing alcohol consumption and traffic crashes (Wagenaar and Toomey 2002). A recent lowering of the drinking age in New Zealand—similar to the results from the lowering of the drinking age in many States in the 1970s—has resulted in increased alcohol-related fatalities and injuries (Kypri et al. 2006).

Costs of Underage Drinking

The list of alcohol-related negative consequences is long and is well documented: academic problems, blackouts, personal injuries and death, negative health consequences, risky sexual behaviors (e.g., casual sex), suicide, sexual assault/rape, impaired driving, legal costs, impaired athletic performance, property damage, fights/assault, and noise disturbances (Perkins 2002b; Abbey 2002; Cooper 2002; Wechsler et al. 2002; Office of the Surgeon General 2007). The leading risk factor for injury is alcoholism (Hingson et al. 2000).

According to the 2007 *National Survey on Drug Use and Health* (NSDUH), the rate of driving under the influence of alcohol increased with age each year up to 25 years old, when the rate declined. An estimated 7.8 percent of 16- or 17-year-olds, 18.3 percent of 18- to 20-year-olds, and 25.8 percent of 21- to 25-year-olds reported driving under the influence of alcohol in the past year (SAMHSA 2008).

In the college population alone, the negative consequences of alcohol use are costly. Conservative estimates place the number of students who die each year from alcohol-related unintentional injuries (e.g., motor vehicle crashes, falls, drowning) at 1,400, those unintentionally injured under the influence of alcohol at 500,000, and those assaulted by another student who has been drinking at 600,000 (Hingson et al. 2002). Victims of alcohol-related sexual assault or date rape number 70,000, and 400,000 students have unprotected sex (Hingson et al. 2002). Twenty-five percent of students report academic problems resulting from their drinking (NIAAA Task Force on College Drinking 2002a). Alcohol use has also been connected to health problems, suicide attempts, drunk driving, vandalism, property damage, and arrests (NIAAA Task Force on College Drinking 2002a; NIAAA Task Force on College Drinking l2002b).

The number of traffic crashes related to alcohol declined in light of the passage of a uniform minimum legal drinking age across the Nation. By 1989, all 50 States and the District of Columbia had a MLDA law in place. However, the number of crashes has since remained stable (Fell et al. 2008) and poses a serious problem still.

Health problems resulting from heavy alcohol consumption can manifest themselves already in young adulthood. One study found that adolescent heavy drinkers were significantly more likely to have high blood pressure and be overweight by the time they turned 24 (Oesterle et al. 2004). Studies in neurocognitive functioning and neurodevelopment have started looking at the negative effects of adolescent alcohol use on brain development and function (see below).

There are also the long-term costs associated with alcohol use. One study found that earlier alcohol use was a significant predictor not only of substance use disorders and alcohol dependence but also of major depressive disorder (Brook et al. 2002). In a large national study of respondents 18 and older (the mean age of respondents was 44 years), individuals who started drinking before age 14 were 12 times as likely as those who started drinking after age 20 to have been injured while under the influence and during the past year (Hingson et al. 2000). Similarly, such individuals *within the last year* were 2.4 times as likely to have been in a situation after drinking that would increase their risk of injury and 3.2 times as likely to have been injured in this way (Hingson et al. 2000). Research has found that adolescents who begin drinking before they are 15 are four times as likely as those who abstain until 21 to become alcohol dependent; every year of delayed initiation correlated with a 14 percent reduction in the odds of lifetime alcohol dependence (Grant and Dawson 1997).

National Calls to Reduce Underage Drinking

Underage drinking has been acknowledged as a serious problem that needs to be addressed. In *Healthy People 2010,* which sets health goals for the Nation, the Federal Government identified underage substance use and binge drinking as targets for reductions. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) empaneled a task force in 1999 to study the problem of abusive underage drinking by college students, which resulted in 2002 in a call to action as part of a series of publications documenting the problem and the strategies that can be effective in combating the issue. In 2007 the Office of the Surgeon General released *The Surgeon General's Call to Action to Prevent and Reduce Underage Drinking*, which looks comprehensively at the problem of underage drinking and presents a vision for taking action to tackle the problem. All of these reports have been instrumental in detailing the scope of the problem of underage drinking, synthesizing important research on the issue, and presenting effective strategies for prevention and intervention.

Theoretical Contexts

Neurophysiological Research

Research on the structural and functional changes in the adolescent brain has flourished over the past decade. These neurophysiological changes affect a variety of processes, from decision-making to impulse control to memory. Research in this area in relation to alcohol use and abuse

broadly addresses two different questions: why teens drink and what happens when they do. As studies continue to address these questions, they may help explain why early onset of alcohol use is associated with later alcohol dependence/abuse (Grant and Dawson 1997).

Why Teens Drink (or Engage in Risky Behaviors)

Recent work in brain imaging studies has established that adolescence is a time of neuroplasticity or active brain development, which lasts into young adulthood. Critical to the rapid growth in this research area are advances in techniques such as structural MRI, macrostructural volumetric methods, and measures at the microstructural level (Clark et al. 2008). Such techniques have allowed researchers to begin studying the relationships between behaviors—including risk-taking behaviors such as experimentation and use of alcohol—and the development of various brain regions that control behavioral inhibition and reward anticipation. This type of research may clarify how neurobiological processes contribute to an individual's ability to regulate emotions, behaviors, and attention in response to environmental stimuli—that is, psychological regulation or dysregulation (Clark et al. 2008).

One region of the brain that has been identified as important to understanding adolescent development is the prefrontal cortex; this region of the brain is involved in the ability to assess future outcomes of behavior, attention, decision-making, behavioral regulation, and emotional regulation. The prefrontal cortex follows a linear developmental trajectory from childhood into adulthood (Kelley, Schochet, and Landry 2004; Giedd 2004), which suggests that generally for adolescents the prefrontal cortex exerts less influence over behavior than for adults. The development of the prefrontal cortex has been linked with the development of higher cognitive functions. It has also been linked to an increasing control of impulsivity or the ability to control behavior in the interests of optimizing long-term rewards. Recent studies have shown that adolescents who present with behavioral disorders that predict later substance use disorders "have difficulty with behavioral inhibition during laboratory tasks" (Clark et al. 2008, 379).

More recently, attention has also been directed toward the brain's nucleus accumbens region, which is involved in reward-seeking and risk-taking behaviors (Kelley, Schochet, and Landry 2004; Casey, Getz, and Galvan 2008). As Clark and colleagues (2008) note, the linear development of the prefrontal cortex and the control (or lack thereof) of impulsivity alone cannot explain adolescent risk-taking behaviors. Decisions to act are made in the context of anticipation of positive or negative consequences. For instance, anticipation of negative consequences on the part of adolescents reduces the chance that they will engage in risky behaviors (Galvan et al. 2007). There is a correlation, lacking in children, for adults and adolescents between activity in the nucleus accumbens and the anticipation of positive consequences for risky behavior (Galvan et al. 2007); for adolescents, that increase in accumbens activity is more intense and thus may increase the likelihood of youth engaging in risky behaviors (Casey, Getz, and Galvan 2008).

One model of adolescent brain development suggests a differential development of the accumbens and prefrontal cortex, with the accumbens experiencing an accelerated development in early adolescence compared with the linear development of the prefrontal cortex (Casey, Getz, and Galvan 2008; Steinberg 2007). Throughout adolescence, these regions mature at different rates, shifting the balance of relative control over time. What is hypothesized, then, is that the

prefrontal cortex "may not provide sufficient top-down control of robustly activated reward processing regions" (Casey, Getz, and Galvan 2008, 6). Because top-down control is not as robust relative to the reward system activation during adolescence, the reward processing region can exercise more control. Steinberg (2007) hypothesizes that this happens most often when individuals are emotionally excited, and that when an adolescent is alone or not emotionally stimulated then top-down controls are strong enough to short circuit risky behavior.

Because adolescents may be prone to a "reward deficiency syndrome" (Spear 2002)—that is, they need higher levels of stimulation to reach equal levels of subjective pleasure than they did previously as children—it has been hypothesized that individuals are propelled to "actively seek out not only addicting drugs but also environmental novelty and sensation as a type of behavioral remediation of reward deficiency" (from Gardner 1999, in Spear 2002, 73). Of course, the risk-taking propensity of adolescents as a group is varied by individual differences among adolescents, making some individuals more at risk for negative outcomes (Casey, Getz, and Galvan 2008).

This research suggests the inadequacy of education-based models of prevention and intervention, which bracket the role of reward sensitivity (Steinberg 2004).

What Happens When Teens Drink

Researchers are investigating what neurophysiological factors influence risk-taking behaviors, such as underage alcohol use, but they are also interested in discovering the effects of alcohol on the adolescent brain and its development. In many instances, this research is conducted with animal models since the experimental manipulation of genetic and environmental factors with humans would be unethical or impossible to carry out; at the same time there are limitations to the applicability of such research to humans (Spear 2004).

Animal models have been used to demonstrate the relative insensitivity of adolescents to certain effects of ethanol, such as its sedative and locomotor impairment effects and the negative effects of withdrawal (Hiller–Sturmhöfel and Schwartzwelder 2005; Doremus et al. 2003; White et al. 2002; Spear and Varlinskaya 2005). At the same time, adolescents appear to be more sensitive to other effects, such as the "ethanol-induced disruptions of hippocampal plasticity and memory" (Spear 2002, 74), which means that, in adolescents, ethanol impairs spatial memory ability. It is unclear whether there is long-term damage from these effects, but there is evidence that chronic, intermittent, heavy exposure during adolescence—such as that experienced in binge drinking episodes—may have long-term effects (Hiller–Sturmhöfel and Schwartzwelder 2005). Teens may also develop a tolerance to the effects of alcohol that last into adulthood (Spear 2002).

Studies have established a correlation between reduced hippocampal volume and white matter integrity and alcohol use disorders, but it is unclear whether alcohol use decreases hippocampal volume, whether the reverse is true, or whether there is a synergistic interplay between the two (Tapert, Caldwell, and Burke 2004/2005, Clark, Thatcher, and Tapert 2008).

Human studies have reported neuropsychological deficits associated with histories of adolescent alcohol use (e.g., Brown et al. 2000). At the same time, there seems to be no difference in brain

function between early-onset (before age 20) and late-onset alcoholism (after age 20) [Tapert, Caldwell, and Burke 2004/2005], so caution is necessary in attributing deficits to underage alcohol use. Other mitigating factors—such as family history of alcohol use disorders, gender, age of onset, drinking patterns, use of other drugs (Tapert, Caldwell, and Burke 2004/2005)—play into cognitive functioning.

This area of research shows that adolescents are able to consume larger quantities of alcohol, since they experience fewer cues to stop drinking (e.g., they can drink more alcohol than adults without passing out) and fewer consequences of not stopping (e.g., they are less likely than adults to suffer the negative withdrawal/hangover effects), and yet may be more vulnerable to the brain damaging impacts of alcohol than are adults. It is unclear to date what the exact deleterious effects, both short-term and long-term, of alcohol use on the developing adolescent brain may be. But while research is not definitive in answering such questions at this time, as Moss (2008) points out, one need not limit attempts to reduce drinking in the absence of definitive proof of deleterious effects on the brain, given the many other negative health consequences of underage drinking.

Risk and Protective Factors

A major model for addressing factors that contribute to risky youth behaviors is the risk and protective factors model. This model is epidemiological in nature. It addresses correlations between and among various risk and protective factors in the lives of youth and negative behavioral outcomes, including substance abuse, sexual risk, school dropout, violence, and others. Hawkins, Catalano, and colleagues (Hawkins, Catalano, and Miller 1992; Catalano and Hawkins 1995; Hawkins et al. 2000) synthesized the risk factor research into the widely used and fairly comprehensive approach that has become a template for prevention program funding across multiple agencies in the United States. In brief, the model lays out a multilevel algorithm of factors (or forces) that, over the youth development process, are said to increase or decrease the likelihood that a given youth will engage in problem behaviors, such as violence, delinquency, substance abuse, school dropout, and HIV/AIDS risk behavior. Exposure to risk factors increases the likelihood of problem behavior, while exposure to protective factors reduces the likelihood of problem behavior, by buffering the risk factors. Under the Hawkins and Catalano model, risk factors are organized into the following domains: individual (e.g., biological and psychological dispositions, attitudes, values, knowledge, skills, problem behaviors); peer (e.g., norms, activities, attachment); family (e.g., function, management, bonding, abuse/violence); school (e.g., bonding, climate, policy, performance); community (e.g., bonding, norms, resources, poverty level, crime, awareness/mobilization); and, sometimes, the domain of society/environmental (e.g., norms, policy/sanctions) as well. Protective factors under this model are not as well specified, and they have been organized into a smaller set of similar domains: individual (e.g., gender, intelligence, temperament); social bonding (attachment/commitment to positive, prosocial individuals and groups); healthy beliefs and clear standards for behavior (in families, schools, communities).

Others following the same general approach have concentrated more extensively on protective factors. Thus several variants of this model focus more on protective rather than risk factors, with the programs that result concentrating more on enhancing protective factors and less on

mitigating risk factors (Pransky 1991; Benson, Galbraith, and Espeland 1994; Search Institute 1998; Benard 1996; Benard 1991). These programs use the term *resilience* for these protective qualities (Garmezy 1991). In this model, behavioral outcomes are said to be determined by the degree of resiliency that exists in the face of risk factors that may be present (Benard 1991). The protective factor approaches are clearly related to those that fall under applied developmental science or positive youth development approaches.

Harm Reduction

A harm reduction approach emphasizes limiting the negative consequences of risky behaviors and *reducing* consumption rather than eliminating the behavior itself. The elimination or reduction of substance use, then, becomes a means to achieving harm reduction rather than the main goal of an intervention (Strang 1992). This kind of approach has been adopted by the World Health Organization, which advocates this kind of framework for the prevention and treatment of alcohol dependence (Marlatt and Witkiewitz 2002). Marlatt and Witkiewitz (2002) identify three core objectives of harm reduction:

- To reduce harmful consequences associated with alcohol use
- To provide an alternative to zero-tolerance approaches by incorporating drinking goals (abstinence or moderation) that are compatible with the needs of the individual
- To promote access to services by offering low-threshold alternatives to traditional alcohol prevention and treatment

According to Marlatt and Witkiewitz (2002), studies show that such an approach can be as effective in reducing consumption and alcohol-related negative consequences as abstinence approaches. At the same time, some object to the use of harm reduction, favoring abstinence-oriented or zero-tolerance approaches. Certainly, there appears to be a dissonance between the messages conveyed by abstinence programs and harm reduction programs (Strang 1992), and harm reduction is controversial in certain contexts (e.g., needle exchange programs to reduce HIV infection rates). Opponents argue that harm reduction encourages illegal activity and is an attempt to legalize substance use (Strong 1992; Marlatt and Witkiewitz 2002). Currently, public policy and institutional views favor zero-tolerance approaches over harm reduction, though there is evidence that moderate alcohol consumption is associated with lower disease risk than either abstinence or heavy consumption (Marlatt and Witkiewitz 2002).

To operationalize a harm reduction approach, harms must be defined and prioritized—that is, those harms deemed most destructive will be targeted. For evaluation purposes, measures need to be developed to assess progress in reductions. Measuring harms, though, is not necessarily simple or straightforward, since some harms may be cumulative (such as cirrhosis) and not simply discrete events (Strang 1992). They may be categorized as legal, financial, personal, or social (Strang 1992).

The following three approaches (brief interventions, motivational interviewing, social norms models) can be considered harm reduction since they do not necessarily espouse the cessation of all underage drinking either for an individual or for a population.

Brief Interventions

A body of research has established the efficacy of brief interventions (Moyer et al. 2002). Studies suggest that brief interventions can lead to reductions in health care utilization, reductions in alcohol-related harm, and reductions in health care and societal costs (Fleming 2002).

It may be that brief interventions are more effective for adolescents than longer, more intensive interventions (Monti, Tevyaw, and Borsari 2004/2005). There are many instances of positive effects of brief interventions for both male and female nondependent drinkers, though there is no research yet that documents whether the effects extend beyond 12 months (Fleming 2002; Monti, Tevyaw, and Borsari 2004/2005). Brief interventions have been successfully used to reduce alcohol consumption with nontreatment seeking individuals—that is, these individuals have been screened and provided interventions in such venues as emergency departments or campus health centers when they sought treatment for some other condition or alcohol-related problem (e.g., injuries) [Monti, Tevyaw, and Borsari 2004/2005; Moyer et al. 2002].

There are various ways to implement brief interventions. Counseling sessions may range from 5 to 60 minutes in duration. Visits may range from one to six in a 6- to 8-week period. Providers may be nurses, physicians, or counselors (NIAAA Task Force on College Drinking 2002b). Brief interventions consist of four main steps: ask (e.g., about the frequency/quantity of drinking); assess and provide direct, clear feedback (e.g., express concern about the effects of drinking patterns, such as engagement in risky behaviors); advise appropriate action (e.g., use behavioral modification techniques); and provide follow-up supportive care (Fleming 2002, 42–43). There is some evidence that interventions delivered by a patient's personal physician may be more effective, and that there is a minimum dosage of three to four contacts to achieve reductions in alcohol use (Fleming 2002).

While many studies have linked the success of brief interventions to the empathy of the counselor (Fleming 2002), some studies suggest that computer-based interventions can be effective as well. Dimeff (1997) conducted a study that included computerized, personalized graphic feedback that covered alcohol risks and suggestions for reducing alcohol-related consequences. While the sample size was small, and the feedback was then reviewed with a primary care provider, the results suggest the potential effectiveness of using computer-generated feedback (discussed in Larimer and Cronce 2002). Other studies suggest that mailed feedback may be equally effective and that interpersonal interaction may not be necessary (Agostinelli, Brown, and Miller 1995; Walters et al. 2000). Indeed, one study found that mailed feedback alone led to greater reductions in drinking than treatment plus mailed feedback (Walters et al. 2000).

Motivational Interviewing

Miller (1995) defines motivational interviewing as "a directive, client-centered counseling style of eliciting behavior change by helping clients to explore and resolve ambivalence. Compared with nondirective counseling, it is more focused and goal directed. The examination and resolution of ambivalence is its central purpose, and the counselor is intentionally directive in

pursuing this goal." (quoted in Fleming 2002, 59). This counseling technique is designed to help individuals change a specific behavior (e.g., alcohol use).

Based on the theory that an individual is responsible for changing his or her behavior (NIAAA Task Force on College Drinking 2002b), motivational interviewing uses personalized feedback given in an empathetic, nonconfrontational manner. This technique rests on several other assumptions, including

- Confrontational/negative messages are counterproductive to bringing about change.
- Most people move through a series of steps before they are ready to change.
- Change is internally motivated rather than externally imposed.
- Education/knowledge alone will not effect change.
- A key to motivating change is to reduce ambivalence.
- The individual can, in fact, make a change. [Fleming 2002]

This method of intervention may be particularly effective with adolescents because it is nonconfrontational and does not set specific outcomes. Instead, it addresses risky behaviors within the context of an individual's goals and values (McCambridge and Strang 2004).

Although, in general, motivational interviewing models are not structured to support those with clinically diagnosable alcohol abuse or dependence (Monti, Tevyaw, and Borsari 2004/2005), at least one study (McCambridge and Strang 2004) found that this type of intervention had the deepest impact on those most in need owing to their heavy drinking, who are also those individuals least likely to benefit from other types of interventions.

Motivational interviewing may also be particularly successful with adolescents since they may experience a lower level of motivation to change than adults do. Many underage drinkers may not have experienced the severe negative consequences of drinking and often perceive regular drinking to be the norm (Brown et al. 2005); they therefore lack the motivation to change, which can be a key to successful intervention.

Studies show that brief motivational interventions (BMIs) can make a significant impact on use rates of alcohol and marijuana. For instance, Burke and colleagues (2003) found that BMIs led to reduced substance use by 51 percent of participants, compared with 37 percent of participants who received either no treatment or usual treatment. These effects were maintained over time (Monti, Tevyaw, and Borsari 2004/2005). To date, most BMIs have been studied in college populations, but other venues (e.g., emergency departments, worksite employee assistance programs, DWI programs) could offer interventions for nonstudent young adults (Monti, Tevyaw, and Borsari 2004/2005). Motivational interventions can also be effective at reducing alcohol-related negative consequences, in addition to reductions in consumption (Monti et al. 1999).

Social Norms Theory

While the scope of underage drinking is troublesome, research suggests that it is important not to emphasize the scope of a problem at the expense of ignoring what is the most common or typical

behavior—that is, the "norm." In fact, individuals more often conform to normative behaviors and expectations than not, as is well documented in a variety of studies (Perkins 2002a). Social norms not only describe typical behaviors and expectations but also shape them (Perkins 2002a). Behavioral norms—the most common actions in a group—can be distinguished from attitudinal norms—widely shared beliefs and expectations (Perkins 2002a).

As briefly mentioned earlier, research shows that many underage individuals have a skewed understanding of how much their peers are drinking and what their peers' attitudes toward alcohol use are. In general, adolescents tend to overestimate how much their peers are drinking and believe that their peers generally have more permissive attitudes toward alcohol use than they actually hold (Perkins and Berkowitz 1986). Perkins and Berkowitz (1986) reported that about three fourths of college students either did not support drinking to the point of intoxication or condoned occasional intoxication only if it did not interfere with responsibilities. In contrast, about two thirds thought their peers condoned frequent drunkenness, even if it had negative consequences. Other studies have confirmed this discrepancy between perceptions of attitudinal and behavioral norms and the actual norms of the peers; it has been documented at numerous collegiate institutions across the Nation (Perkins 1994; Baer and Carney 1993; Baer, Stacy, and Larimer 1991; Prentice and Miller 1993; Page, Scanlan, and Gilbert 1999), in high schools (Beck and Treiman 1996), and among young adults (Linkenbach 1999).

Because perceived social norms have been demonstrated to correlate with personal drinking behavior (Perkins 2002a), it is hypothesized that changing perceptions of norms will affect alcohol use. It is postulated that, just as an increase in alcohol use is supported by misperceptions of alcohol use norms, such interventions may in fact alter actual norms in the direction of reduced alcohol use (Perkins 2002a).

Expectancies

Research has started looking at the role of expectancies—that is, the expectations of the effects of using alcohol—in drinking pattern trajectories. Both parents and the media help shape adolescents' expectancies, and positive expectations about alcohol use are associated with intent to drink and with increased consumption of alcohol (National Center on Addiction and Substance Abuse 2002; Zucker et al. 2008). The degree to which expectancies about alcohol use are positive or negative has been shown to shape alcohol-use behavior (National Center on Addiction and Substance Abuse 2002). Generally, children hold negative expectancies about alcohol, but these become more positive as children age into adolescence (Zucker et al. 2008).

Several studies indicate that expectancy challenge interventions can result in significant decreases in alcohol use, although the sample sizes of the studies were small and there was no long-term follow-up (Larimer and Cronce 2002).

Cognitive-Behavioral Therapy/Treatment

Cognitive-Behavioral Therapy/Treatment (CBT) is a problem-focused approach designed to help people identify and change the dysfunctional beliefs, thoughts, and patterns of behavior that contribute to their problems. Its underlying principle is that thoughts affect emotions, which then

influence behaviors. CBT combines two effective kinds of psychotherapy—*cognitive therapy* and *behavioral therapy*.

Cognitive therapy concentrates on thoughts, assumptions, and beliefs. With cognitive therapy, people are encouraged to recognize and to change faulty or maladaptive thinking patterns. Cognitive therapy is a way to gain control over inappropriate repetitive thoughts that often feed or trigger various presenting problems (Beck 1995). For instance, in a young person who is having trouble completing a math problem, a repetitive thought may be "I'm stupid, I am not a good student, I can't do math." Replacing negative thoughts such as these with more realistic thoughts such as "This problem is difficult, I'll ask for help," is a well-tested strategy that has been found to help many young people facing academic problems.

Behavioral therapy concentrates on specific actions and environments that either change or maintain behaviors (Skinner 1974; Bandura 1977). For instance when someone is trying to reduce their alcohol consumption he or she often is encouraged to change daily habits. That individual may be encouraged to engage, for instance, in aerobic exercise or meditation (Murphy, Pagano, and Marlatt 1986). Replacing negative behaviors with positive behaviors is a well-known strategy to help change behaviors, particularly when the new behavior is reinforced.

The combination of cognitive therapy and behavioral therapy has proven highly beneficial. For example, in the midst of a panic attack, it may feel impossible to gain control over thoughts and apply cognitive therapy techniques. In this case, a behavioral technique such as deep breathing may be easier to implement, which may help to calm and focus thinking.

The distinctive features of Cognitive-Behavioral Therapy are as follows:

- It is the most evidence-based form of psychotherapy.
- It is active, problem focused, and goal directed. In contrast to many "talk therapies," CBT emphasizes the present, concentrating on what the problem is and what steps are needed to alleviate it.
- It is easy to measure. Since the effects of the therapy are concrete (i.e., changing behaviors) the outcomes tend to be quite measurable.
- It provides quick results. If the person is motivated to change, relief can occur rapidly.

The studies reviewed provide consistent empirical evidence that CBT is associated with significant and clinically meaningful positive changes, particularly when therapy is provided by experienced practitioners (Waldron and Kaminer 2004). CBT has been successfully applied across settings (e.g., schools, support groups, prisons, treatment agencies, community-based organizations, churches) and across ages and roles (e.g., students, parents, teachers). It has been shown to be relevant to people with differing abilities and from a diverse range of backgrounds. The strategies of CBT have been successfully used to forestall the onset, ameliorate the severity, and divert the long-term consequences of problem behaviors among young people, including substance use and abuse.

Underage Drinking Prevention and Intervention Programs

Science has made great progress in recent years with regard to the prevention and treatment of substance abuse. There is still much to learn about adapting interventions and treatments to effectively address specific risks by gender, ethnic identification, and geographic settings. However, from universal prevention aimed at children to offender treatment for substance use disorders in institutions and communities, much has been learned in the past 2 decades about what works and what does not (BJA 2003; Dusenbury and Falco 1995; Ferrer–Wreder et al. 2003; Robertson, David, and Rao 2003).

Prevention

Much of the research on preventing substance use among children and adolescents has concentrated on reducing risks that lead to—and promoting factors that protect against—use and abuse (Hawkins, Catalano, and Arthur 2002). These interventions are designed and tested to help optimize the development of children. Scientists have found effective ways to work with families, schools, and communities to help young people develop skills and approaches to stopping problems related to substance use before they occur (Robertson, David, and Rao 2003).

Mothers and Early Caregivers

Without question, the best way to start out life is by having a substance free environment from conception (Olds, Henderson, and Kitzman 1994). Prenatal alcohol exposure is significantly correlated with alcohol use problems in adolescents, as is being a child of an alcoholic (Baer et al. 1998; Baer et al. 2003; Zucker et al. 2008). Being cared for in a family with many protective factors and few risk factors can help foster a propensity toward being substance free (Olds et al. 1998).

Some interventions are designed to work with pregnant women and new mothers to increase the chances that young children will have a solid beginning in life. One effective program is the Nurse–Family Partnership. This program serves to promote emotional, physical, and behavioral health in at-risk, first-time mothers and their children who live in communities of disorganization and marginalization. The program seeks to give new mothers the tools, knowledge, and, most important, support needed to initiate and maintain healthy lifestyles that are free of substance use, full of positive parenting, and armed with the understanding of developmentally appropriate child behaviors. To date, Olds's program has shown both short- and long-term positive effects on the children and the families that it serves (Olds et al. 1997).

School Age

Problem behaviors such as alcohol or drug use often begin during the school-age years. The full extent of alcohol use in children and adolescents remains unknown at this point, although available data suggests that this is an issue that needs further documentation and attention (Zucker et al. 2008). Implementing prevention programs in the school setting increases the chance of averting the problems associated with alcohol, tobacco, and other drug use and abuse.

Most programs do not deal with alcohol prevention in isolation from other substance use prevention, and according to the National Institute on Drug Abuse, prevention programs should address preventing the underage use of legal drugs such as tobacco or alcohol as well as the use of illegal drugs such as marijuana or heroin. Further, programs should address the inappropriate use of legally obtained substances such as inhalants, prescription medications, or over-the-counter drugs (Robertson, David, and Rao 2003).

Drug prevention efforts over the past 2 decades have largely relied on classroom curricula usually designed for primary and middle school children (Dusenbury and Falco 1995). The Nation's schools spend $125 million on drug abuse prevention curricula each year; however, many of these programs may not be effective in preventing substance abuse (Dusenbury and Falco 1995). One reason such programs fail is that drug and alcohol abuse prevention curricula have traditionally been based on pure information dissemination. Previous evaluations show that this didactic approach may be effective at transmitting information regarding drug and alcohol abuse; used alone, though, it is not effective at changing the underlying attitudes and behaviors (Sherman 2000; Gottfredson 1997; Botvin, Botvin, and Ruchlin 1998; Sherman et al. 1998; Rosenbaum and Hanson 1998).

A review of the literature in the drug abuse prevention field suggests certain types of school-based curricula can effectively reduce substance abuse in adolescence (Botvin and Botvin 1992; Dusenbury and Falco 1995; Perry et al. 1996; Tobler and Stratton 1997). Schools have adopted two major psychosocial approaches, the social influences approach and a more comprehensive personal and social competence enhancement approach (Skara and Sussman 2003). Efficacious prevention curricula consist of several key elements. Curricula delivered in an interactive format with smaller groups of young people have been shown to produce strong and lasting positive results (Tobler and Stratton 1997). Effective curricula give students the tools to recognize internal pressures such as stress or anxiety and external pressures such as peer attitudes and advertising that may influence them to use alcohol, tobacco, and other drugs. Another useful component is helping students develop and practice personal, social, and refusal skills to resist these influences effectively (Dusenbury and Falco 1995). Also, evaluation is conducted on an ongoing basis (Wagner, Tubman, and Gil 2004).

Since certain antisocial behaviors and personality traits have been linked to later alcohol use problems, early screening for these behaviors and traits in high-risk contexts (e.g., violent neighborhoods) may be a particularly useful strategy. While such early childhood factors do not inevitably lead to or predict later adolescent chronic conduct problems, interventions at this early point in time will have a greater success rate than intervention in adolescence when patterns and antisocial outcomes "have become inevitably overdetermined" (Dodge and Petit 2003, 363).

Recent reviews of preventive interventions have looked at hundreds of interventions (Foxcroft et al. 2003; Spoth, Greenberg, and Turrisi 2008). The research has identified some programs as ineffective; many programs have not been evaluated adequately to determine their effectiveness; and some have been identified as promising or as having emerging evidence of effectiveness. Some of the effective/promising programs are exclusively school-based curricula; some include school-based components but are a part of broader community- and family-based intervention efforts. Some specifically address substance use; others address more distal factors, such as

conduct problems, that can predict or lead to substance use and abuse. It is important to note that the same program may be considered effective, promising, or ineffective depending on the outcomes sought. For instance, the Olweus Bullying Prevention Program has been identified as an effective program for violence prevention while it has been identified as only promising regarding its effectiveness as a program in addressing alcohol risk; conversely, the Skills, Opportunities, and Recognition (SOAR) program (formerly known as the Seattle Social Development Project) has been identified as effective for alcohol risk but is promising with regard to violence prevention (Spoth, Greenberg, and Turrisi 2008; Center for the Study and Prevention of Violence 2008). Among those programs that include school-based components and have been identified as effective or promising for addressing alcohol risk or alcohol outcomes are Life Skills Training, Midwestern Prevention Project, The Incredible Years, Second Step, and Linking the Interests of Families and Teachers.

College Programs

Young adults ages 18 to 22 enrolled full time in college were more likely than their peers who are part-time college students or who are not currently enrolled in college to use alcohol in the past month, binge drink (five or more drinks on the same occasion—that is, at the same time or within a couple of hours of each other), and drink heavily (five or more drinks on the same occasion on each of 5 or more days in the past 30 days). According to the 2007 *National Survey on Drug Use and Health*, 63.7 percent of full-time college students reported past month alcohol use, 43.6 percent reported binge drinking, and 17.2 percent reported heavy use. In comparison, 53.5 percent of persons ages 18 to 22 who were not enrolled full time in college reported past month alcohol use, 38.4 percent reported binge drinking, and 12.9 percent reported heavy use (SAMHSA 2008). Given that college students drink more than their noncollegiate peers, campuses can be a key place for instituting prevention and intervention programs (O'Malley and Johnston 2002).

Unfortunately, many of the programs that have been implemented on college campuses have been ineffective. In general, ineffective programs include those that encourage just saying "no," those that are only didactic or educational, and those that are required courses (Fleming 2002). They are also ineffective since those who most need these programs tend not to participate (Larimer and Cronce 2002). Black and Coster (1996) found that 39.6 percent of female and 46.2 percent of male drinkers were not interested in even minimal intervention. Many of these ineffective approaches continue to be used, in part because of low evaluation efforts (Larimer and Cronce 2002; NIAAA Task Force on College Drinking 2002b).

Research has shown that there are programs that can be effective. A social norms approach (see above) can be targeted at the most vulnerable groups on campus (e.g., freshmen, athletes, Greek system members) [NIAAA Task Force on College Drinking 2002b; Perkins 2002]. Social marketing offers promise for recruiting those who most need programs (NIAAA Task Force on College Drinking 2002b; Larimer and Cronce 2002). Some programs that have shown promise have educational/awareness programs, which include knowledge-based programs, values clarification programs, and normative education programs (Larimer and Cronce 2002). More recently, programs based on cognitive-behavioral skill building have been introduced on college campuses. These programs sometimes incorporate elements from educational/awareness

programs, but "they do so within the context of building skills to change beliefs or behaviors that support high-risk drinking" (Larimer and Cronce 2002, 152). These programs show promise, but few studies of cognitive-behavioral programs have been conducted with college-age drinkers.

Family

Family relationships and family dysfunction are powerful predictors of substance use in adolescence (Sanders 2000). Additionally, young adolescents are often introduced to adult drinking practices in the home or a family context (Donovan 2007). Parents, guardians, or other adult family members provided the alcohol 19.5 percent of the time to underage drinkers (SAMHSA 2008). While this alcohol may provided by family in the context of religious or family traditions, the little research that exists suggests this early onset may be just as problematic as that which occurs among peers (Zucker et al. 2008). These factors make the family an important avenue for intervention efforts; consequently, some prevention programs have targeted families to reduce these risk factors (Sanders 2000; Catalano et al. 1999; Spoth, Redmond, and Lepper 1999).

Substance prevention efforts concentrating on the family have shown considerable progress over recent years (Ashery, Robertson, and Kumpfer 1998; Dishion and Kavanagh 2000; Dusenbury 2000; Kumpfer and Alvarado 1998; Sanders 2000). Family training at the time of transition from childhood to adolescence may be particularly important for parents (Loveland–Cherry, Ross, and Kaufman 1999). Such programs prepare parents for the changes their child will experience and offer parents tools that can help them steer their children away from early and heightened drug involvement (Bry et al. 1998; Ferrer–Wreder 2003; Kumpfer and Alvarado 1998).

Evaluations of promising family training programs that work to prevent youth drug use have shown both short- and long-term promise, particularly in terms of lowering alcohol initiation and use rates. Positive programmatic-related changes in alcohol and family variables have been found to persist between 2 and 3½ years postintervention (Kumpfer, Molgaard, and Spoth 1996; Loveland–Cherry, Ross, and Kaufman 1999; Park et al. 2000).

While research is continuing about the usefulness of particular intervention actions, (Dusenbury 2000; Etz, Robertson, and Ashery 1998), exemplary interventions of this type regularly include some key components. These effective features include giving parents accurate information about alcohol and drugs and encouraging parents to clarify their own views about youth substance use. Other useful tools are to support the family in defining and enforcing a family policy on youth substance use, developing specific parenting skills (e.g., limit setting) and involving young people and parents in social resistance training (Bry et al. 1998; Dusenbury 2000; Kumpfer and Alvarado 1998; Sanders 2000). For a few examples of well-tested, effective programs, see Preparing for the Drug Free Years, the Strengthening Families Program, and the Child and Parent Relations Project.

Higher Risk Youth and Families

In the case of higher risk youth with behavioral problems in general and those related to substance issues in particular, family therapies may be particularly effective (Ferrer–Wreder et al. 2003; Hogue et al. 2002; Szapocznik and Williams 2000). These interventions work with

single families on a one-to-one basis. This approach helps target specific strengths within the family and provide a setting for youth and parents to practice new, positive ways of interacting directly with each other (Etz, Robertson, and Ashery 1998; Kumpfer and Alvarado 1998). Exemplary family initiatives that have shown efficacy in reducing overall reoffending rates, violence and drug–related crimes, and other institutional assignments include Functional Family Therapy and Multisystemic Therapy.

For youth whose problem behaviors and risk are largely associated with their parents' drug abuse, interventions seem to be most successful when explicit drug treatment for parents is combined with the previously mentioned effective family intervention components. These family-focused interventions expressly treat parental addiction and relapse, codependence issues, and youth knowledge, attitudes, and expectations regarding alcohol and other drugs (Dusenbury 2000; Ferrer–Wreder et al. 2003; Kumpfer et al. 1998). While only a few rigorously tested therapies for substance-addicted parents exist (Bry et al. 1998; Ferrer–Wreder et al. 2003), one program stands out. In the Focus on Families efficacy trial, results indicated declines in parental drug use and improvements in related family variables with endurance up to 1 year after the intervention.

The same level of success in reducing youth substance use among the offspring of these parents has been more difficult to achieve. While treatment interventions can be successful, relapse rates are high among the adolescent population, with most reinitiating use within 3 to 6 months posttreatment (Wagner 2008). There is evidence pointing to a possible trickledown intervention effect for children whose parents have successfully undergone addiction treatment (O'Farrell and Feehan 1999). Longer term follow up of participating children will offer a more precise test of the potential benefits of these family therapies (Bry et al. 1998; Dusenbury 2000). Future work may also profit from a greater incorporation of youth-focused components that are tailored to the social and developmental changes taking place in childhood and adolescence (Ferrer–Wreder et al. 2003; Spoth, Greenberg, and Turrisi 2008; Wagner 2008).

Community Awareness Policy and Norms

Limiting a young person's access to alcohol and tobacco through community initiatives and policy change and enforcement has taken on renewed efforts (Ferrer–Wreder et al. 2003). Using policy as an instrument for prevention is largely based on the premise that this approach has the potential to yield population-level changes in youth problem behavior and adult conduct (Ferrer–Wreder et al. 2003). Analyses of public policy related to alcohol- and tobacco-purchase and consumption offer evidence that policy change and enforcement can be an effective deterrent (Holder and Wagenaar 1994; NIAAA Task Force on College Drinking 2002b).

Well-tested, efficacious community-focused interventions include Project Northland, Midwestern Prevention Project, and Communities Motivated for Change on Alcohol (CMCA). CMCA was designed to reduce drinking by young people and concentrated on the environment factors that allow underage drinkers access to alcohol. Effectively limiting the access to alcohol to people under the legal drinking age not only directly reduces teen drinking but also communicates a clear message to the community that underage drinking is inappropriate and unacceptable. CMCA employs a range of social organizing techniques to address legal,

institutional, social, and health issues to reduce youth alcohol use by eliminating illegal alcohol sales to youths by retailers and obstructing the provision of alcohol to youths by adults.

The most studied public policy intervention is the minimum legal drinking age. The preponderance of evidence suggests that these laws help reduce underage drinking and driving, despite the fact that enforcement of the laws has been poor and that few minors are prosecuted for infractions (Pacific Institute on Research and Evaluation 1999). By 1998, all States enacted zero-tolerance laws, which set allowable blood–alcohol levels at or close to zero for minors (Ferguson and Williams 2002).

Another effective strategy for reducing consumption is to raise the price of alcohol through excise taxes, which have been shown to reduce alcoholic consumption by youth (Chaloupka, Grossman, and Saffer 2002). In fact, the real price of alcohol has declined significantly over time. From 1975 to 1990, for instance, the real price of distilled spirits dropped 32 percent, wine 28 percent, and beer 20 percent (Chaloupka, Grossman, and Saffer 2002). Some reject this approach, arguing that it impinges on all consumers and not exclusively problematic users of alcohol.

Intervention

Young adults (ages 19–24) have the highest prevalence of heavy or high-risk drinking (Johnston et al. 2001) and also demonstrate an accelerated trajectory to dependence (Spear 2002). In fact, the percentage of individuals who meet the criteria for alcohol abuse and alcohol dependence are highest in this age group. Clearly, there is a tremendous need for effective interventions, but getting youth to treatment is often a challenge for a number of reasons. For instance, young adults rarely perceive themselves as having alcohol problems or as being problem drinkers, which suggests the need for effective screening tools in venues where such individuals might be found (Monti, Tevyaw, and Borsari 2004/2005). Even when youth receive needed treatment, relapse rates remain high, ranging from 35 percent to 75 percent 1-year posttreatment (Brown et al. 1994; Tomlinson, Brown, and Abrantes 2004, Wagner 2008).

A pressing issue, then, is to determine why these high relapse rates persist and how they can be effectively addressed.

Generally, treatment programs for adolescents with alcohol and other drug use disorders have been based on adult models of treatment, and only over the last 2 decades have programs increasingly been geared toward treating youth (Deas 2008; Wagner 2008). Of equal importance, few studies looking at treatment for adolescents were funded until the late 1990s, so data on treatment programs for alcohol use disorders in adolescents is still relatively scant compared with that on programs for adults (Cornelius 2005). An additional complication is that findings from adult studies are not necessarily useful when looking at adolescents since predictors of treatment outcome do not hold between the two populations (Brown et al. 1994). Some adolescent-specific assessment tools, screening instruments, and measures are available, but improvements are still needed (Clark and Winters 2002).

In developing adolescent-specific treatment interventions, the fact that adolescents with substance use disorders also tend to have much higher rates of psychopathology than do adults must be taken into account (Brown et al. 1994). For instance, rates of comorbidity of substance use disorders and conduct disorder have been found to be as high as 95 percent in clinical samples (Clark et al. 1997). One study found that as many as 82 percent of teens met the criteria for an additional DSM–III–R diagnosis (Stowell and Estroff 1992). Alcohol-dependent teens present with a variety of comorbid disorders such as conduct disorder, attention-deficit hyperactivity disorder, and major depression at higher rates than in the general population (Clark et al. 1997; Tomlinson, Brown, and Abrantes 2004; Abrantes, Brown, and Tomlinson 2004). Moreover, psychiatric comorbidity with substance use, especially for adolescents with externalizing disorders, is associated with poorer treatment outcomes, even when treatment is more intensive (Tomlinson, Brown, and Abrantes 2004).

The most promising interventions to date are family-based interventions, motivational enhancement therapy (motivational interviewing), behavioral therapy, and cognitive-behavioral therapy, although the evidence of the effectiveness of these types of programs for handling alcohol and other drug use disorders remains scant, in part because outcomes measured may not include alcohol use. A small number of studies have been conducted looking at the use of pharmacotherapy—that is, the use of drugs to treat alcohol-use disorders. Extant studies (e.g., Brown et al. 2001; Cornelius et al. 2005; Geller et al. 1998) offer promising avenues to follow but only limited guidance, since the studies' validity is limited by small sample sizes (e.g., Cornelius et al. 2005 [n=10]), weak study design, or the lack of replicated findings.

Wraparound

Wraparound initiatives have produced promising results in providing support, guidance, and services to at-risk youth and juvenile offenders with substance-use related issues. Wraparound, when well run and staffed by committed individuals, offers a highly structured, integrated services environment that has the potential to offer positive benefits for all.

Baltimore, Md.'s Choice Program and San Francisco, Calif.'s Detention Diversion Advocacy Program are two examples of programs that have produced promising results by providing at-risk youth and juvenile offenders with intensive supervision and individualized treatment plans. These complex, multifaceted intervention strategies are designed to keep delinquent youth at home and out of institutions whenever possible. Rather than forcing these young people to enroll in predetermined, inflexible treatment programs, these initiatives involve "wrapping" a comprehensive array of individualized services and support networks "around" young people (Bruns et al. 2004). A care coordinator assembles and leads child and family teams consisting of family members, paid service providers, and community members (such as teachers and mentors), who know the youth under treatment and are familiar with his or her changing needs. These teams work together to ensure that the individual child's needs are being met across all domains—in the home, the educational sphere, and the broader community at large.

Treatment Centers: Therapeutic Communities and Residential Treatment Centers

Recent studies have demonstrated that properly implemented treatment programs for juvenile offenders can make significant impacts on both the substance abuse and recidivism rates of incarcerated youth. A recent analysis of Maryland's CREST program indicates that the program significantly increases participants' likelihood of remaining drug free (Mello 1997). Two analyses of Arizona's Amity therapeutic community program (which features an intensive aftercare component) have also found a marked decrease in both substance abuse and rearrest rates for up to 24 months after leaving prison (Mullen, Arbiter, and Glider 1991; Wexler 1999). Subjects in the Wexler study had a rearrest rate of 26.9 percent, versus a rate of 40.9 percent for nontreatment offenders. Results such as these suggest that therapeutic community programs, while challenging to implement in many correctional settings, are nevertheless worth further investigation and refinement.

Evaluation Results

Numerous programs have been found either to be effective for prevention of, or intervention with, underage alcohol use or have shown promising or emerging evidence for programmatic effectiveness. Specific program descriptions can be found on this site that delineate the evidence that is available for each program.

There also sometimes exists disagreement among researchers and evaluators about whether a program is effective. For instance, Spoth, Greenberg, and Turrisi (2008) identified Project Northland as an intervention for adolescents "with most promising evidence on alcohol outcomes." In contrast, Foxcroft and colleagues (2003, 403) include Project Northland among those programs for which "the evidence base does not support… continued use in the primary prevention of alcohol misuse for young people." How is it possible for different groups to evaluate the same program so differently?

This type of disagreement is largely due to methodological issues that keep the field from reaching consensus and moving forward. Evaluation efforts and designs have improved over the last 2 decades considerably, yet problems remain. For instance, some programs may have shown beneficial outcome effects in the short term but may lack studies that follow them longitudinally to either prove or disprove the decay of program effect. Or there may be studies that suggest no long-term benefit, but the study design may be flawed. Depending on the emphasis of the evaluator, a program could be deemed either effective (because there are proven short-term outcome effects) or ineffective (because there is no evidence of long-term effects).

There are other methodological problems that need to be resolved. Different measures are used across different studies so that, for instance, two studies on binge drinking might use two different units of time. Definitions vary across studies, so that "early onset" can have different meanings. Many studies depend on retrospective reporting instead of using surveillance data, which, as shown above, can lead to inaccurate data, especially in determining when children begin drinking. Age of onset is frequently used as a proxy for other alcohol use behaviors, such as regular use or first drunkenness, that may have significance for later onset abuse (Zucker et al.

2008). In response to such issues, Bukstein and Winter (2004) have issued a call to develop a core set of assessment instruments for adolescent treatment clinical trials that will allow for cross study comparisons.

Ineffective Programs

There is a growing body of research that confirms that certain approaches are ineffective. Among those that fail to effect change are interventions based on a "just say 'no'" approach, educational programs divorced from other methods, required courses, and inconsistent policies and procedures (NIAAA Task Force on College Drinking 2002b). Some of these programs, though—such as DARE [Drug Abuse Resistance Education] (Clayton, Cattarelo, and Johnstone, 1996; Dukes, Ullman, and Stein, 1996; Ennett et al., 1994)—continue to be widely used across the United States.

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