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UNDERAGE DRINKING

Why Do Adolescents Drink, What Are the Risks, and How Can Underage Drinking Be Prevented?

Alcohol is the drug of choice among youth. Many young people are experiencing the consequences of drinking too much, at too early an age. As a result, underage drinking is a leading public health problem in this country.

Each year, approximately 5,000 young people under the age of 21 die as a result of underage drinking; this includes about 1,900 deaths from motor vehicle crashes, 1,600 as a result of homicides, 300 from suicide, as well as hundreds from other injuries such as falls, burns, and drownings (1–5).

Yet drinking continues to be widespread among adolescents, as shown by nationwide surveys as well as studies in smaller populations. According to data from the 2005 Monitoring the Future (MTF) study, an annual survey of U.S. youth, three-fourths of 12th graders, more than two-thirds of 10th graders, and about two in every five 8th graders have consumed alcohol. And when youth drink they tend to drink intensively, often consuming four to five drinks at one time. MTF data show that 11 percent of 8th graders, 22 percent of 10th graders, and 29 percent of 12th graders had engaged in heavy episodic (or "binge[1]") drinking within the past two weeks (6) (see figure).

Research also shows that many adolescents start to drink at very young ages. In 2003, the average age of first use of alcohol was about 14, compared to about 17 ½ in 1965 (7,8). People who reported starting to drink before the age of 15 were four times more likely to also report meeting the criteria for alcohol dependence at some point in their lives (9). In fact, new research shows that the serious drinking problems (including what is called alcoholism) typically associated with middle age actually begin to appear much earlier, during young adulthood and even adolescence.

[1] The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as a pattern of drinking alcohol that brings blood alcohol concentration (BAC) to 0.08 grams percent or above. For the typical adult, this pattern corresponds to consuming five or more drinks (men), or four or more drinks (women), in about 2 hours.

Other research shows that the younger children and adolescents are when they start to drink, the more likely they will be to engage in behaviors that harm themselves and others. For example, frequent binge drinkers (nearly 1 million high school students nationwide) are more likely to engage in risky behaviors, including using other drugs such as marijuana and cocaine, having sex with six or more partners, and earning grades that are mostly Ds and Fs in school (10).

WHY DO SOME ADOLESCENTS DRINK?

As children move from adolescence to young adulthood, they encounter dramatic physical, emotional, and lifestyle changes. Developmental transitions, such as puberty and increasing independence, have been associated with alcohol use. So in a sense, just being an adolescent may be a key risk factor not only for starting to drink but also for drinking dangerously.

Risk-Taking—Research shows the brain keeps developing well into the twenties, during which time it continues to establish important communication connections and further refines its function. Scientists believe that this lengthy developmental period may help explain some of the behavior which is characteristic of adolescence—such as their propensity to seek out new and potentially dangerous situations. For some teens, thrill-seeking might include

experimenting with alcohol. Developmental changes also offer a possible physiological explanation for why teens act so impulsively, often not recognizing that their actions—such as drinking—have consequences.

Expectancies—How people view alcohol and its effects also influences their drinking behavior, including whether they begin to drink and how much. An adolescent who expects drinking to be a pleasurable experience is more likely to drink than one who does not. An important area of alcohol research is focusing on how expectancy influences drinking patterns from childhood through adolescence and into young adulthood (11–14). Beliefs about alcohol are established very early in life, even before the child begins elementary school (15). Before age 9, children generally view alcohol negatively and see drinking as bad, with adverse effects. By about age 13, however, their expectancies shift, becoming more positive (11,16). As would be expected, adolescents who drink the most also place the greatest emphasis on the positive and arousing effects of alcohol.

Sensitivity and Tolerance to Alcohol—Differences between the adult brain and the brain of the maturing adolescent also may help to explain why many young drinkers are able to consume much larger amounts of alcohol than adults (17) before experiencing the negative consequences of drinking, such as drowsiness, lack of coordination, and withdrawal/hangover effects (18,19). This unusual tolerance may help to explain the high rates of binge drinking among young adults. At the same time, adolescents appear to be particularly sensitive to the positive effects of drinking, such as feeling more at ease in social situations, and young people may drink more than adults because of these positive social experiences (18,19).

Personality Characteristics and Psychiatric Comorbidity—Children who begin to drink at a very early age (before age 12) often share similar personality characteristics that may make them more likely to start drinking. Young people who are disruptive, hyperactive, and aggressive—often referred to as having conduct problems or being antisocial—as well as those who are depressed, withdrawn, or anxious, may be at greatest risk for alcohol problems (20). Other behavior problems associated with alcohol use include rebelliousness (21), difficulty avoiding harm or harmful situations (22), and a host of other traits seen in young people who act out without regard for rules or the feelings of others (i.e., disinhibition) (23–25).

Hereditary Factors—Some of the behavioral and physiological factors that converge to increase or decrease a person's

Treatment: An Unmet Need

A major unmet need exists in the treatment of alcohol use disorders: In 2002, 1.4 million youth met the criteria for alcohol abuse or dependence, but only 227,000 actually received any treatment for these problems (1).

Moreover, much of the treatment available today does not address the specific needs of adolescents (2). For example, most young people prefer easy access to treatment, with strategies tailored to their age group (3), and treatments that do not remove them from their home or academic settings (2). Youth perceive traditional services (e.g., alcoholism treatment programs, Alcoholics Anonymous) as less helpful than brief interventions tailored to their concerns (4). Consequently, alternative formats, attention to developmental transitions, and social marketing are needed to better address alcohol problems that emerge during adolescence.

Adolescent Treatment Interventions—Complex interventions have been developed and tested in adolescents referred for treatment of alcohol and other drug disorders. Many of these patients are likely to have more than one substance use disorder (e.g., alcohol and marijuana) and to have other psychiatric disorders as well (e.g., depression, anxiety, or conduct disorder). Brief interventions are, as a rule, delivered to adolescents in general medical settings (e.g., primary care clinics, emergency rooms) or in school-based settings. These settings offer an excellent opportunity for intervening with adolescents to address their drinking before they progress to serious alcohol use disorders and to prevent the development of alcohol-related problems (5).

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risk for alcohol problems, including tolerance to alcohol's effects, may be directly linked to genetics. For example, being a child of an alcoholic or having several alcoholic family members places a person at greater risk for alcohol problems. Children of alcoholics (COAs) are between 4 and 10 times more likely to become alcoholics themselves than are children who have no close relatives with alcoholism (26). COAs also are more likely to begin drinking at a young age (27) and to progress to drinking problems more quickly (9).

Research shows that COAs may have subtle brain differences which could be markers for developing later alcohol problems (28). For example, using high-tech brain-imaging techniques, scientists have found that COAs have a distinctive feature in one brainwave pattern (called a P300 response) that could be a marker for later alcoholism risk (29,30). Researchers also are investigating other brainwave differences in COAs that may be present long before they begin to drink, including brainwave activity recorded during sleep (31) as well as changes in brain structure (32) and function (33).

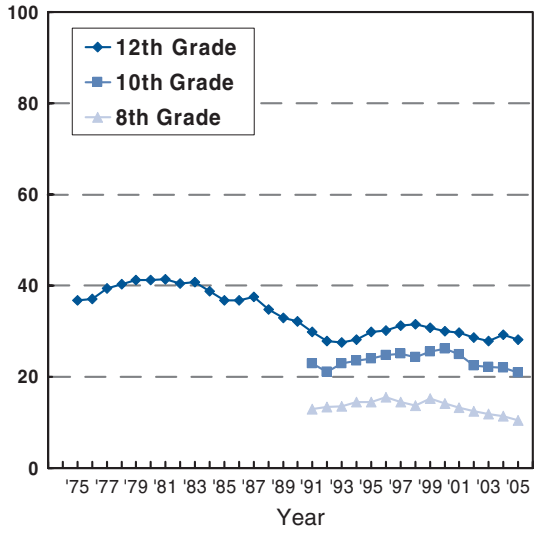
Some studies suggest that these brain differences may be particularly evident in people who also have certain behavioral traits, such as signs of conduct disorder, antisocial personality disorder, sensation-seeking, or poor impulse control (34–38). Studying how the brain's structure and function translates to behavior will help researchers to better understand how predrinking risk factors shape later alcohol use. For example, does a person who is depressed drink to alleviate his or her depression, or does drinking lead to changes in his brain that result in feelings of depression?

Other hereditary factors likely will become evident as scientists work to identify the actual genes involved in addiction. By analyzing the genetic makeup of people and families with alcohol dependence, researchers have found specific regions on chromosomes that correlate with a risk for alcoholism (39–41). Candidate genes for alcoholism risk also have been associated with those regions (42). The goal now is to further refine regions for which a specific gene has not yet been identified and then determine how those genes interact with other genes and gene products as well as with the environment to result in alcohol dependence. Further research also should shed light on the extent to which the same or different genes contribute to alcohol problems, both in adults and in adolescents.

Environmental Aspects—Pinpointing a genetic contribution will not tell the whole story, however, as drinking behavior reflects a complex interplay between inherited and environmental factors, the implications of which are only beginning to be explored in adolescents (43). And what influences drinking at one age may not have the same impact at another. As Rose and colleagues (43) show, genetic factors appear to have more influence on adolescent drinking behavior in late adolescence than in mid-adolescence.

Environmental factors, such as the influence of parents and peers, also play a role in alcohol use (44). For example, parents who drink more and who view drinking favorably may have children who drink more, and an adolescent girl with an older or adult boyfriend is more likely to use alcohol and other drugs and to engage in delinquent behaviors (45).

Binge Drinking



Percent of young people drinking 5+ drinks at one time in the last 2 weeks.

Source: www.monitoringthefuture.org/data/05data.html#2005data-drugs.

Researchers are examining other environmental influences as well, such as the impact of the media. Today alcohol is widely available and aggressively promoted through television, radio, billboards, and the Internet. Researchers are studying how young people react to these advertisements. In a study of 3rd, 6th, and 9th graders, those who found alcohol ads desirable were more likely to view drinking positively and to want to purchase products with alcohol logos (46). Research is mixed, however, on whether these positive views of alcohol actually lead to underage drinking.

What Are the Health Risks?

Whatever it is that leads adolescents to begin drinking, once they start they face a number of potential health risks. Although the severe health problems associated with harmful alcohol use are not as common in adolescents as they are in adults, studies show that young people who drink heavily may put themselves at risk for a range of potential health problems.

Brain Effects—Scientists currently are examining just how alcohol affects the developing brain, but it's a difficult task. Subtle changes in the brain may be difficult to detect but still have a significant impact on long-term thinking and memory skills. Add to this the fact that adolescent brains are still maturing, and the study of alcohol's effects becomes even more complex. Research has shown that animals fed alcohol during this critical developmental stage continue to show long-lasting impairment from alcohol

as they age (47). It's simply not known how alcohol will affect the long-term memory and learning skills of people who began drinking heavily as adolescents.

Liver Effects—Elevated liver enzymes, indicating some degree of liver damage, have been found in some adolescents who drink alcohol (48). Young drinkers who are overweight or obese showed elevated liver enzymes even with only moderate levels of drinking (49).

Growth and Endocrine Effects—In both males and females, puberty is a period associated with marked hormonal changes, including increases in the sex hormones, estrogen and testosterone. These hormones, in turn, increase production of other hormones and growth factors (50), which are vital for normal organ development. Drinking alcohol during this period of rapid growth and development (i.e., prior to or during puberty) may upset the critical hormonal balance necessary for normal development of organs, muscles, and bones. Studies in animals also show that consuming alcohol during puberty adversely affects the maturation of the reproductive system (51).

Preventing Underage Drinking Within a Developmental Framework

Complex behaviors, such as the decision to begin drinking or to continue using alcohol, are the result of a dynamic interplay between genes and environment. For example, biological and physiological changes that occur during adolescence may promote risk-taking behavior, leading to early experimentation with alcohol. This behavior then shapes the child's environment, as he or she chooses friends and situations that support further drinking. Continued drinking may lead to physiological reactions, such as depression or anxiety disorders, triggering even greater alcohol use or dependence. In this way, youthful patterns of alcohol use can mark the start of a developmental pathway that may lead to abuse and dependence. Then again, not all young people who travel this pathway experience the same outcomes.

Perhaps the best way to understand and prevent underage alcohol use is to view drinking as it relates to development. This "whole system" approach to underage drinking takes into account a particular adolescent's unique risk and protective factors—from genetics and personality characteristics to social and environmental factors. Viewed in this way, development includes not only the adolescent's inherent risk and resilience but also the current conditions that help to shape his or her behavior (52).

Children mature at different rates. Developmental research takes this into account, recognizing that during adolescence there are periods of rapid growth and reorganization, alternating with periods of slower growth and integration of body systems. Periods of rapid transitions, when social or cultural factors most strongly influence the biology and behavior of the adolescent, may be the best time to target delivery of interventions (53). Interventions that focus on these critical development periods could alter the life course of the child (54), perhaps placing him or her on a path to avoid problems with alcohol.

To date, researchers have been unable to identify a single track that predicts the course of alcohol use for all or even most young people. Instead, findings provide strong evidence for wide developmental variation in drinking patterns within this special population (55,56).

Interventions for Preventing Underage Drinking

Intervention approaches typically fall into two distinct categories: (1) environmental-level interventions, which seek to reduce opportunities for underage drinking, increase penalties for violating minimum legal drinking age (MLDA) and other alcohol use laws, and reduce community tolerance for alcohol use by youth; and (2) individual-level interventions, which seek to change knowledge, expectancies, attitudes, intentions, motivation, and skills so that youth are better able to resist the pro-drinking influences and opportunities that surround them.

Environmental approaches include:

Raising the Price of Alcohol—A substantial body of research has shown that higher prices or taxes on alcoholic beverages are associated with lower levels of alcohol consumption and alcohol-related problems, especially in young people (57–60).

Increasing the Minimum Legal Drinking Age—Today all States have set the minimum legal drinking at age 21. Increasing the age at which people can legally purchase and drink alcohol has been the most successful intervention to date in reducing drinking and alcohol-related crashes among people under age 21 (61). NHTSA (1) estimates that a legal drinking age of 21 saves 700 to 1,000 lives annually. Since 1976, these laws have prevented more

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than 21,000 traffic deaths. Just how much the legal drinking age relates to drinking-related crashes is shown by a recent study in New Zealand. Six years ago that country lowered its minimum legal drinking age to 18. Since then, alcohol-related crashes have risen 12 percent among 18- to 19-year-olds and 14 percent among 15- to 17-year-olds (62). Clearly a higher minimum drinking age can help to reduce crashes and save lives, especially in very young drivers.

Enacting Zero-Tolerance Laws—All States have zero-tolerance laws that make it illegal for people under age 21 to drive after *any* drinking. When the first eight States to adopt zero-tolerance laws were compared with nearby States without such laws, the zero-tolerance States showed a 21-percent greater decline in the proportion of single-vehicle night-time fatal crashes involving drivers under 21, the type of crash most likely to involve alcohol (63).

Stepping up Enforcement of Laws—Despite their demonstrated benefits, legal drinking age and zero-tolerance laws generally have not been vigorously enforced (64). Alcohol purchase laws aimed at sellers and buyers also can be effective (65), but resources must be made available for enforcing these laws.

Individual-focused interventions include:

School-Based Prevention Programs—The first school-based prevention programs were primarily informational and often used scare tactics; it was assumed that if youth understood the dangers of alcohol use, they would choose not to drink. These programs were ineffective. Today, better programs are available and often have a number of elements in common: They follow social influence models and include setting norms, addressing social pressures to drink, and teaching resistance skills. These programs also offer interactive and developmentally appropriate information, include peer-led components, and provide teacher training (66).

Family-Based Prevention Programs—Parents' ability to influence whether their children drink is well documented and is consistent across racial/ethnic groups (67,68). Setting clear rules against drinking, consistently enforcing those rules, and monitoring the child's behavior all help to reduce the likelihood of underage drinking. The Iowa Strengthening Families Program (ISFP), delivered when students were in grade 6, is a program that has shown long-lasting preventive effects on alcohol use (69,70).

Selected Programs Showing Promise

Environmental interventions are among the recommendations included in the recent National Research Council (NRC) and Institute of Medicine (IOM) report on underage drinking (71). These interventions are intended to reduce commercial and social availability of alcohol and/or reduce driving while intoxicated. They use a variety of strategies, including server training and compliance checks in places that sell alcohol; deterring adults from purchasing alcohol for minors or providing alcohol to minors; restricting drinking in public places and preventing underage drinking parties; enforcing penalties for the use of false IDs, driving while intoxicated, and violating zero-tolerance laws; and raising public awareness of policies and sanctions.

Who Drinks?

Rates of drinking and alcohol-related problems are highest among White and American Indian or Alaska Native youth, followed by Hispanic youth, African Americans, and Asians.

Prevalence rates of drinking for boys and girls are similar in the younger age groups; among older adolescents, however, more boys than girls engage in frequent and heavy drinking, and boys show higher rates of drinking problems.

The following community trials show how environmental strategies can be useful in reducing underage drinking and related problems.

The Massachusetts Saving Lives Program—This intervention was designed to reduce alcohol-impaired driving and related traffic deaths. Strategies included the use of drunk driving checkpoints, speeding and drunk driving awareness days, speed-watch telephone hotlines, high school peer-led education, and college prevention programs. The 5-year program decreased fatal crashes, particularly alcohol-related fatal crashes involving drivers ages 15–25, and reduced the proportion of 16- to 19-year-olds who reported driving after drinking, in comparison with the rest of Massachusetts. It also made teens more aware of penalties for drunk driving and for speeding (72).

The Community Prevention Trial Program—This program was designed to reduce alcohol-involved injuries and death. One component sought to reduce alcohol sales to minors by enforcing underage sales laws; training sales clerks, owners, and managers to prevent sales of alcohol to minors; and using the media to raise community awareness of underage drinking. Sales to apparent minors (people of legal drinking age who appear younger than age 21) were significantly reduced in the intervention communities compared with control sites (73).

Communities Mobilizing for Change on Alcohol—This intervention, designed to reduce the accessibility of alcoholic beverages to people under age 21, centered on policy changes among local institutions to make underage

drinking less acceptable within the community. Alcohol sales to minors were reduced: 18- to 20-year-olds were less likely to try to purchase alcohol or provide it to younger teens, and the number of DUI arrests declined among 18- to 20-year-olds (74,75).

***Multicomponent Comprehensive Interventions*—**Perhaps the strongest approach for preventing underage drinking involves the coordinated effort of all the elements that influence a child's life—including family, schools, and community. Ideally, intervention programs also should integrate treatment for youth who are alcohol dependent. Project Northland is an example of a comprehensive program that has been extensively evaluated.

Project Northland was tested in 22 school districts in northeastern Minnesota. The intervention included (1) school curricula, (2) peer leadership, (3) parental involvement programs, and (4) communitywide task force activities to address larger community norms and alcohol availability. It targeted adolescents in grades 6 through 12.

Intervention and comparison communities differed significantly in "tendency to use alcohol," a composite measure that combined items about intentions to use alcohol and actual use as well as in the likelihood of drinking "five or more in a row." Underage drinking was less prevalent in the intervention communities during phase 1; higher during the interim period (suggesting a "catch-up" effect while intervention activities were minimal); and again lower during phase 2, when intervention activities resumed (76).

Project Northland has been designated a model program by the Substance Abuse and Mental Health Services Administration (SAMHSA), and its materials have been adapted for a general audience. It now is being replicated in ethnically diverse urban neighborhoods.

Conclusion

Today, alcohol is widely available and aggressively promoted throughout society. And alcohol use continues to be regarded, by many people, as a normal part of growing up. Yet underage drinking is dangerous, not only for the drinker but also for society, as evident by the number of alcohol-involved motor vehicle crashes, homicides, suicides, and other injuries.

People who begin drinking early in life run the risk of developing serious alcohol problems, including alcoholism, later in life. They also are at greater risk for a variety of adverse consequences, including risky sexual activity and poor performance in school.

Identifying adolescents at greatest risk can help stop problems before they develop. And innovative, comprehensive approaches to prevention, such as Project Northland, are showing success in reducing experimentation with alcohol as well as the problems that accompany alcohol use by young people.

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Resources

Source material for this *Alcohol Alert* originally appeared in *Alcohol Research & Health*, Volume 28, Number 3, 2004/2005.

For more information on underage drinking, see also:

- ***Make a Difference: Talk to Your Child About Alcohol*—a research based booklet geared to parents and caregivers of young people ages 10 to 14. Covers a wide range of topics, from strategies for preventing underage drinking to recognizing the warning signs of a drinking problem.**
- **NIAAA's Web site for middle schoolers, *www.theCoolSpot.gov*—offers an interactive tool designed especially for young teens. Provides information about alcohol in a fun, engaging way, including how to say "no" to drinking and compelling reasons not to drink.**
- ***A Family History of Alcoholism: Are You at Risk?*—contains basic information for anyone who is concerned about a family history of alcoholism. Lists organizations that can help relatives or friends of alcoholics.**
- **For these and other resources, visit NIAAA's Web site, www.niaaa.nih.gov**

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