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Alcohol Alert

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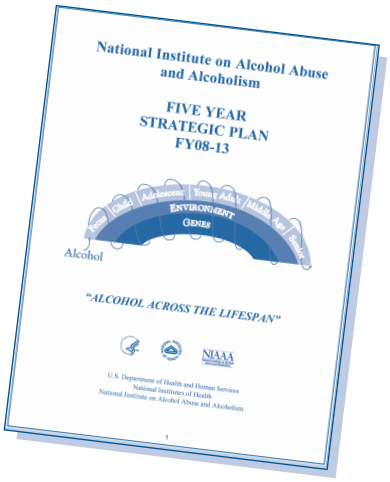
Alcohol Research: A Lifespan Perspective

Alcohol use and the risk for alcohol-related problems change over the lifespan. College students and young adults, who often drink large quantities of alcohol at one time, are more likely to experience problems such as alcohol poisoning, drunk-driving crashes, and assaults; whereas, older individuals who drink even moderately while taking certain medications run the risk of harmful drug interactions. Additionally, patterns of alcohol use may differ across the human lifespan—for example, adolescents who begin drinking prior to age 14 are more likely to develop a serious problem with alcohol later in life. Understanding how alcohol influences people across different life stages is important, especially when designing effective approaches for diagnosing, treating, and preventing alcohol abuse and dependence and their related problems.

In 2006, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) published the Five-Year Strategic Plan, *The NIAAA Strategic Plan for Research.* The Five-Year Plan introduces a new organizing principle for alcohol research studies: A Lifespan Perspective. This new perspective gives researchers a framework within which to examine how alcohol affects people at different stages of development and how different stages of development affect drinking behaviors.

The Five-Year Plan examines the current state of alcohol research—what we know about alcohol-related issues—within a Lifespan Perspective, and suggests opportunities for new research and outreach based on these findings. Since 2006, the Five-Year Plan has been revised once, and NIAAA will continue to provide updates to reflect new and emerging research opportunities. This *Alcohol Alert* presents some of the findings and opportunities outlined in the latest version of the Five-Year Plan.

"Patterns of alcohol use may differ across the human lifespan."



The Embryo and Fetus: Focus on Fetal Alcohol Spectrum Disorder (FASD) and Fetal Alcohol Syndrome (FAS)

What we know—Alcohol is a leading preventable cause of birth defects with mental deficiency. Prenatal alcohol exposure can cause a variety of problems known collectively as Fetal Alcohol Spectrum Disorder (FASD). The most severe form of FASD, Fetal Alcohol Syndrome (FAS), often is characterized by certain physical traits, such as a flattened midface, wide-set eyes and slow growth, nervous system impairments, and a range of learning and behavioral problems. Additionally, people exposed to alcohol prenatally are at higher risk of developing an alcohol and other drug use disorder later in life.

It has been reported that up to 1 in 100 children in the United States are born with FASD. Additionally, 0.5 to 3.0 children out of 1,000 are diagnosed with FAS.[1] Research suggests that other factors, such as the mother's hormone status, nutrition, age, the number of children she has had previously, and the length of time she has been drinking, as well as genetic factors including those affecting the way the body breaks down alcohol, also may contribute to the development of FASD.

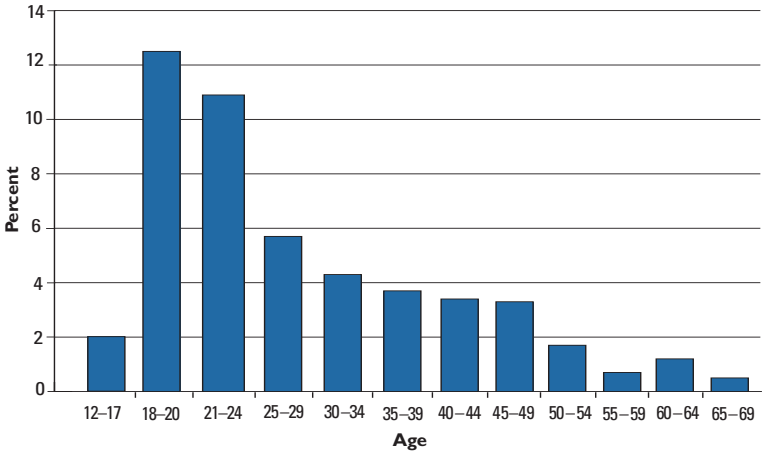
FASD can be very difficult to recognize. The symptoms are sometimes subtle and cover a wide spectrum of

[1] From *Fetal Alcohol Syndrome: Diagnosis, Epidemiology, Prevention, and Treatment.* Institute of Medicine, 1996. (http://www.nap.edu/openbook.php?record_id=4991&page=1).

problems. Symptoms also may change with age—for example, facial features often associated with FAS may be less prominent as a person ages. Most importantly, there is no "biomarker" for FASD—that is, there is no characteristic or distinctive biological feature that can be used to identify the disorder in every case. A major factor influencing risk for FAS and FASD is the timing of alcohol exposure during critical periods of development.

Research opportunities—Researchers are working to diagnose FASD earlier and more accurately using complex, detailed facial imaging to identify subtle facial abnormalities in infants. These abnormalities may serve as biomarkers for FASD. Another promising biomarker is a brain structure called the corpus callosum: the size of the corpus callosum is much more variable in the brains of children and adults who have experienced prenatal exposure to alcohol.

Figure 1. Prevalence of Past-year DSM-IV Alcohol Dependence by Age in the United States



Source: NIAAA 2001–2002 National Epidemiological Survey on Alcohol and Related Conditions (NESARC) data (18–60+ years of age) and Substance Abuse and Mental Health Administration (SAMHSA) 2003 National Survey on Drug Use and Health (NSDUH) (12–17 years of age).

When prenatal alcohol exposure already has occurred (i.e., if a woman drinks before she realizes that she is pregnant), or if alcohol exposure is ongoing (i.e., a woman continues to drink during pregnancy), pharmacological intervention may be helpful in countering some of the harmful effects of alcohol. Although these interventions have not yet been studied in humans, animal studies have shown intriguing results. Antioxidants, anti-inflammatory agents (such as prostaglandin inhibitors), and the nutritional co-factor choline are some of the agents that may prove useful in reducing alcohol-induced fetal injury. For example, when young rats with prenatal exposure to alcohol were given supplements of choline, they became less hyperactive and showed decreased memory loss.

Researchers also are exploring ways of treating children with FASD. Again, studies in animals suggest that behavioral interventions might improve some of the symptoms of FASD. When adult rats with prenatal exposure to alcohol were given 20 days of motor skills training, their performance improved, suggesting that brain cells damaged by alcohol may be able to partially recover. Human studies using behavioral intervention are in the early stages but also are encouraging.

Youth and Adolescence

What we know—Adolescence is the period between 12 and 17 years of age. This is a time of dramatic physical, psychological, and social change. The brain continues to develop and mature throughout adolescence and into the mid-20s, and studies suggest that consuming alcohol during this time may have lasting effects on brain development. For example, a region of the brain involved in learning and memory, the hippocampus, is smaller in adolescents who begin drinking at an early age. In addition, studies of adolescents who were receiving treatment for alcohol withdrawal showed that they were more likely to have memory problems than adolescents who did not drink.

Adolescents tend to drink differently than adults. They are more likely to engage in risky behaviors such as heavy episodic (or "binge") drinking.[2] Researchers believe these risky behaviors are the result of certain social factors, such as a greater independence and pressure from peers, as well as biological factors. Adolescents tend to be less sensitive to negative effects of alcohol, such as increased sleepiness and lack of coordination. This may explain why they are able to drink so much alcohol at one time. On the other hand, adolescents are more likely to have trouble with complex tasks, such as driving a motor vehicle, making adolescent alcohol use especially dangerous.

According to the National Household Survey on Drug Abuse, 1.47 million adolescents ages 12–17 (5.9 percent of adolescents in this age-group) met the criteria for alcohol dependence or alcohol abuse in 2003. However, the survey also showed that only 15 percent of these respondents received any treatment for alcohol problems.

[2] According to the Surgeon General's *Call to Action To Prevent and Reduce Underage Drinking* (NIAAA 2006), most college drinking studies define binge drinking as "5 or more drinks in a row for men and 4 or more drinks in a row for women" (NIAAA National Advisory Council). However, in 2004, the National Advisory Council revised the definition of binge drinking as follows: "a pattern of drinking alcohol that brings blood alcohol concentration (BAC) to 0.08 gram percent or above. For the typical adult, this pattern corresponds to consuming 5 or more drinks (male) or 4 or more drinks (female) in about two hours" (NIAAA National Advisory Council).

According to the Five-Year Plan, preventing alcohol problems in adolescents poses unique challenges. Research suggests that they may not respond well to traditional treatment methods (e.g., alcoholism treatment programs and Alcoholics Anonymous) and that brief, alternative intervention methods that are targeted specifically toward young people are more effective.

Research opportunities—Researchers continue to explore how the social and biological changes associated with adolescence contribute to alcohol use, as well as how alcohol can affect the maturing brain. Researchers also are working to refine current definitions of alcohol abuse and dependence to better diagnose and screen dangerous drinking behaviors in young people, because adolescent drinking patterns tend to differ from those of adults. Research continues to identify factors, such as certain behaviors or a family history of alcoholism, which may put young people at risk for later alcohol problems. Research also continues to explore the complex relationship between drinking and other biological factors, such as reproductive and stress hormones and sex differences.

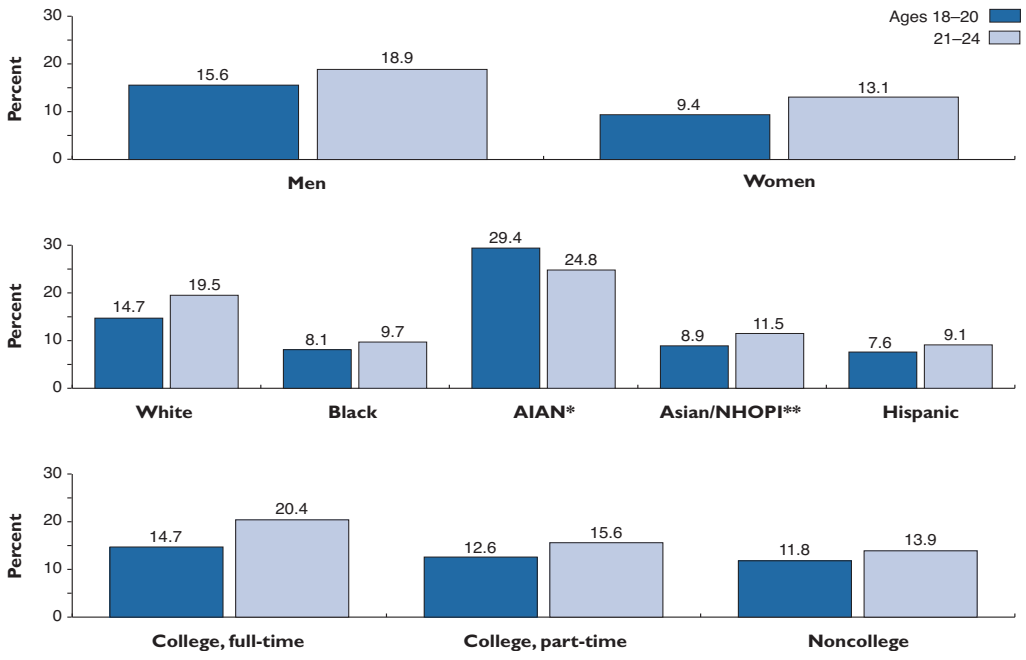
Young Adults

What we know—Young adulthood is the period between the ages of 18 and 29 years. During this period many young people pursue postsecondary education, enlist in the military, or enter the workforce. This is a time of transition and of increased risk for problems with alcohol. The youngest segment of this population—young adults ages 18–24—are most at risk for alcohol problems, compared with other age-groups (see Figure 1). This group is most likely to drink heavily, regardless of their gender, ethnicity, and school or work status—that is, whether they attend college or are employed full time (Figure 2). Despite increased attention in recent years, the problem of young adult drinking continues to escalate: alcohol-related deaths rose 5 percent for 18- to 24-year-olds between 1998 and 2001.

For college students, brief interventions that target high-risk populations (e.g., freshmen, Greek organization members, athletes, students mandated to receive treatment) and Driving Under the Influence (DUI) prevention campaigns have shown promise. For young adults in the military, few programs have been formally evaluated; however, current strategies to prevent alcohol-related problems include regulating the availability and pricing of alcohol, attempting to deglamorize alcohol use, and promoting personal responsibility and good health.

Nonstudent, nonmilitary personnel may be more likely to continue dangerous drinking patterns into adulthood. This population does not have access to institutionally based programs that typically serve college students and military personnel. Additionally, this population may not have access to mental health services, making them vulnerable to psychiatric conditions, such as depression and anxiety, often associated with dangerous drinking patterns.

Figure 2. Percentage of Individuals Exceeding the Daily Drinking Limit for Ages 18–20 and 21–24, by Gender, Race-Ethnicity, and College Enrollment Status



Source: NIAAA 2001–2002 NESARC data. *AIAN = American Indian/Alaska Native, ** NHOPI = Native Hawaiian/Other Pacific Islander

Research opportunities—As noted above, researchers now believe that the brain continues to develop into the mid-20s. Scientists are continuing to explore alcohol's potentially damaging effects on the young adult brain. Using noninvasive brain scans, such as the electroencephalogram (EEG), which measures and records the electrical activity of the brain, researchers can study changes that occur with drinking and determine whether the brain can return to a normal level of function as young adults begin to "age out" of heavy drinking. Studies also can help to determine how the maturing brain affects a young adult's decision to drink and how best to intervene with college students, military personnel, and young adults who are not enlisted in college or in the military.

Although most young adults drink less as they transition into midlife, some continue to drink heavily. Research continues to explore the risk factors associated with continued drinking into midlife.

Midlife: Focus on Detrimental Effects of Drinking and on Treatment Options

What we know—The Five-Year Plan considers midlife as spanning the ages of 30–59. During this period the consequences of heavy drinking often become evident. Alcoholic liver disease, alcohol pancreatitis, several types of cancer, disorders of the heart and circulatory system, alcohol-related brain disorders, and other adverse effects upon the endocrine and immune system are most likely to emerge during this time. For people in midlife, research often has focused on how alcohol damages body tissues, as well as methods for better tailoring treatments and interventions to this segment of the population.

Individuals in midlife are more likely to seek treatment for alcohol dependence. Three drugs—disulfiram, naltrexone, and acamprosate—have been approved for use in the United States to treat alcoholism. Although some patients have responded well to these medications, others have not. Research shows that a variety of factors—both biological and social—influence an individual's response to therapy.

Research opportunities—Some of the most exciting alcohol research focuses on developing new medications for alcoholism, targeting multiple sites. New medications could help people with alcohol dependence who do not respond well to existing medications. Several promising agents, including baclofen, rimonabant, and memantine, now are being evaluated for safety and efficacy in treating alcohol use disorders. Current research also is exploring the possibility of preventing or treating organ injury through the use of pharmaceuticals, as well as through the use of antioxidant- and cannabinoids-related agents.

Alcohol metabolism has been shown to have an important role in organ damage. This is another area of research that is receiving attention. Other studies are examining treatment approaches that help people to change their drinking behavior and identifying biological and social factors that encourage drinking behaviors as well as those that increase the chances of recovery.

Moderate drinking among adults is another chief area of research. Although heavy alcohol use is associated with the development of

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Alcohol and HIV/AIDS

HIV (Human Immunodeficiency Virus), the virus that causes AIDS (Acquired Immunodeficiency Syndrome), is epidemic in the United States. As many as 950,000 people in the United States may be infected with the HIV virus, and more than 500,000 people have died from the infection. Eighty percent of people infected with HIV drink alcohol, and between 30 and 60 percent have been diagnosed with an alcohol use disorder.

The relationship between HIV and alcohol is complex and needs further study. Drinking might make it easier for the HIV virus to establish an infection; additionally, alcohol use might actually accelerate the course of the disease. Alcohol also may change the way the body breaks down HIV medications, interfering with their effectiveness.

In addition, it has been shown that people who drink are less likely to get tested for HIV. When they do test positive they are less likely to seek treatment and are less compliant with treatment. Drinking also is associated with risk-taking behaviors that might put people at increased risk for contracting HIV.

Clearly, alcohol use and HIV/AIDS are closely intertwined. Additional research is needed to learn more about this complex relationship. Longitudinal studies also may prove helpful, providing a better understanding of how alcohol and HIV can interact and affect individuals over time.

many diseases, some research suggests that moderate alcohol consumption may protect individuals from some of the health problems that tend to strike during midlife, including coronary artery disease, type 2 diabetes, dementia, and ischemic stroke. More research is needed to determine whether these potential benefits outweigh the risks of drinking.

Senior Adults and Alcohol: A National Health Issue

What we know—Senior adults tend to drink less than other age-groups (see Figure 1). However, research suggests that alcohol problems in older adults soon may become a national health issue. Senior adult drinking is on the rise; as people live longer, the number of people who drink will increase. Research also shows that people born in recent years tend to drink more than older generations, suggesting that as the current population ages, these individuals will continue to drink more.

Older adults are at particular risk for alcohol-related problems. As individuals age they metabolize alcohol more slowly; as a result, alcohol remains in the body longer. Older adults are more likely to have health conditions that can be exacerbated by alcohol, including stroke, hypertension, neurodegeneration, memory loss, mood disorders, and cognitive or emotional problems. Additionally, older adults are more likely than younger people to take medications, putting them at risk for interactions that can be dangerous or even life-threatening. Alcohol also may decrease effectiveness of some medications.

Research shows that treatment can be effective in older individuals. They tend to respond better to treatment that takes place in groups of people in their same age range. Cognitive behavioral therapy has been shown to be effective in older patients. Group family therapy also has been shown to be successful, perhaps because family therapy engages support systems that might have been lacking or even exacerbating the patient's alcohol use. Although it has not been well studied, some research shows that medications for alcoholism may not work as well in older adults.

According to the current literature, the most beneficial treatment for alcohol use disorders in older adults may be education; many seniors lack information on the dangers of alcohol use. The age at which they begin drinking also is important. Older adults who began problem drinking earlier in life tend to have worse treatment outcomes than those who began drinking later in life.

Research opportunities—Although older adults are the most rapidly growing segment of the population today, very little alcohol-related research has been conducted among this age-group. Researchers continue to explore how the physiological and social changes that come with aging interact with alcohol use. New research is examining the effectiveness of current medications in seniors with alcohol use disorders, as well as developing medications that might work better in older individuals. Researchers are examining how alcohol use may impact the development of diseases such as Alzheimer's, type 2 diabetes, and other age-related health problems. Ongoing research will reveal how changing demographics may affect the use, impact, and consequences of older adult drinking.

Conclusion

NIAAA's Five-Year Plan gives researchers a framework within which to explore how alcohol affects individuals at different stages of development and how different stages of development affect drinking behaviors. This Lifespan Perspective offers a new approach to the age-old question: Why do some people drink too much? It enables researchers to conceptualize the complex and evolving relationship between human development and alcohol and to explore how alcohol intersects with biology and the environment. New insights gained through the Lifespan Perspective will result in more effective and better-targeted interventions that take into account the changing needs of individuals at every stage of life.

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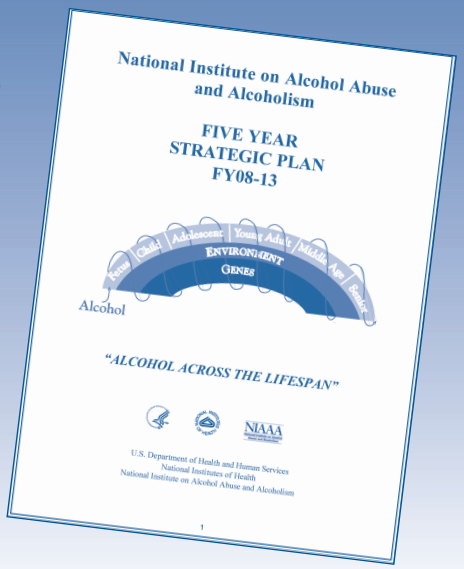
Resources

Source material for this *Alcohol Alert* originally appeared in the *National Institute on Alcohol Abuse and Alcoholism (NIAAA) Five-Year Strategic Plan*.

The Five-Year Plan highlights new research avenues that will address alcohol use across the human lifespan, emphasizing how drinking behavior evolves over an individual's lifetime in response to biological, psychological, and social and environmental changes. Over time the Plan will be updated to reflect new and emerging research opportunities.

The Plan is available online at http://pubs.niaaa.nih.gov/publications/StrategicPlan/NIAAASTRATEGICPLAN.htm



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