CHAPTER 2

The Nature and Extent of Underage Drinking in America

This document is excerpted from:
The 2013 Report to Congress on the Prevention and Reduction of Underage Drinking
submitted to Congress by The U.S. Department of Health and Human Services.

To obtain more information and a copy of the full Report to Congress go to:
https://www.stopalcoholabuse.gov

Introduction

Underage drinking and its associated problems have profound negative consequences for underage drinkers themselves, their families, their communities, and society as a whole. Underage drinking contributes to a wide range of costly health and social problems including motor vehicle crashes (the greatest single mortality risk for underage drinkers); suicide; interpersonal violence (e.g., homicides, assaults, and rapes); unintentional injuries such as burns, falls, and drowning; brain impairment; alcohol dependence; risky sexual activity; academic problems; and alcohol and drug poisoning. Alcohol is a factor related to approximately 4,700 deaths among underage youths in the United States every year, shortening their lives by an average of 60 years (http://www.cdc.gov/alcohol/fact-sheets/underage-drinking.htm).

Despite laws against underage drinking in all 50 states; the efforts of federal, state, and local governments spanning decades; and the dedicated work of many private groups and organizations, alcohol is the most widely consumed substance of abuse among America's youth, used more often than tobacco or marijuana. Underage alcohol use remains a challenging public health and public safety problem with severe consequences for youth and their families, communities, and society. For those under 21 years old, alcohol accounts for more deaths than all other illicit drugs combined. Nevertheless, a lack of public recognition of the devastating consequences of underage alcohol use and its personal, economic, and social costs hampers implementation of a comprehensive prevention effort.

Still, there is cause for optimism. As discussed in Chapters 3 and 4 of this report, states are increasingly adopting comprehensive policies and practices that can alter the individual and environmental factors that contribute to underage drinking and its consequences and can be expected to reduce alcohol-related deaths and disability and associated health care costs.

Federal Surveys Used in This Report

The federal government funds three major national surveys that collect data on underage drinking and its consequences: the annual National Survey on Drug Use and Health (NSDUH), formerly called the National Household Survey on Drug Abuse (NHSDA); the annual Monitoring the Future (MTF) survey;[13] and the biennial Youth Risk Behavior Survey (YRBS). Each makes a unique contribution to an understanding of the nature of alcohol use.

Four additional surveys used by the government to obtain data on underage drinkers ages 18 and older are the Behavioral Risk Factor Surveillance System (BRFSS); National Epidemiologic Survey on Alcohol and Related Conditions (NESARC); National Health Interview Survey (NHIS); and Survey of Health Related Behaviors Among Active Duty Military Personnel (formerly called the Worldwide Surveys of Substance Abuse and Health Behaviors Among Military Personnel). A more detailed description of each of these surveys and its unique contribution to research can be found in Appendix A.

[13] Please note for comparability with the 2011 NSDUH and 2011 YRBS data, the latest MTF data included in the report are also from 2011. The 2012 MTF data, which became available in December 2012, will be included in the next report.

Characteristics of Underage Drinking in America

Underage alcohol use in America is a public health problem because of the number of children and adolescents who drink, when and how much they drink, and the negative consequences that result from that drinking. Some of the principal findings of governmental surveys and other research related to underage alcohol use in America are described in the following paragraphs.

Underage Alcohol Use Is Widespread

Underage alcohol use in America is a widespread and serious problem:

- ***Current Use:*** The 2011 NSDUH reported that approximately 25.1 percent of Americans ages 12 through 20 (about 9.7 million people) reported having at least one drink in the 30 days prior to the survey interview. Of this age group, 15.8 percent (6.1 million) were binge drinkers (five or more drinks on the same occasion, e.g., at the same time or within a couple of hours) on at least 1 day in the past 30 days. Approximately 4.4 percent of this age group (1.7 million) were heavy drinkers (five or more drinks on the same occasion on each of 5 or more days in the past 30 days). Thus (by definition), all heavy alcohol users are also binge alcohol users (Substance Abuse and Mental Health Services Administration [SAMHSA], 2012a).
- ***Lifetime Use:*** MTF 2011 showed that 70.0 percent of 12th, 56.0 percent of 10th, and 33.1 percent of 8th graders have had alcohol at some point in their lives[14] (Johnston, O'Malley, Bachman, & Schulenberg, 2012a). See Exhibit 2.1.
- ***Binge Use:*** The 2011 NSDUH showed that 3.4 percent of 14-year-olds, 12.0 percent of 16-year-olds, 27.3 percent of 18-year-olds, and 36.6 percent of 20-year-olds engaged in binge drinking within the past 30 days (SAMHSA, 2012, detailed tables).
- ***Heavy Use:*** The 2011 NSDUH data showed that 2.7 percent of 16-year-olds, 7.7 percent of 18-year-olds, and 11.8 percent of 20-year-olds consumed alcohol heavily in the past 30 days (SAMHSA, 2012, detailed tables).
- ***Use to Intoxication:*** In MTF 2011, 51.0 percent of 12th, 35.9 percent of 10th, and 14.8 percent of 8th graders reported having been drunk[15] at least once (Johnston et al., 2012a).
- ***Past-Month Intoxication:*** In MTF 2011, 25.0 percent of 12th, 13.7 percent of 10th, and 4.4 percent of 8th graders reported being drunk in the past month (Johnston et al., 2012a).

Alcohol Is the Most Widely Used Substance of Abuse among American Youth

As indicated in Exhibit 2.2, a higher percentage of youth in 8th, 10th, and 12th grades used alcohol in the month prior to being surveyed than used marijuana (the illicit drug most commonly used by adolescents) or tobacco (Johnston et al., 2012a).

[14] Lifetime alcohol use in this survey is defined as "having more than a few sips."
[15] MTF asks "On how many occasions (if any) have you been drunk or very high during the past 30 days?"

Exhibit 2.1: Lifetime Alcohol Use, Use to Intoxication, and Use to Intoxication within the Past Month among 8th, 10th, and 12th Graders: 2011 (Johnston et al., 2012a)

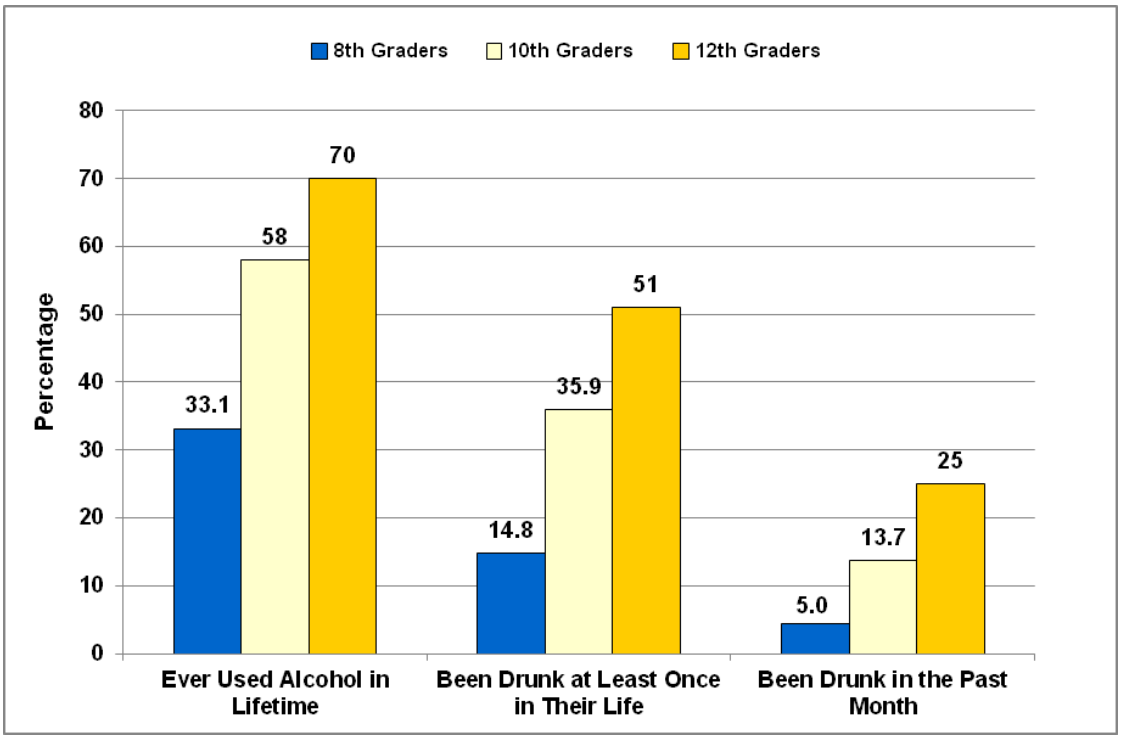
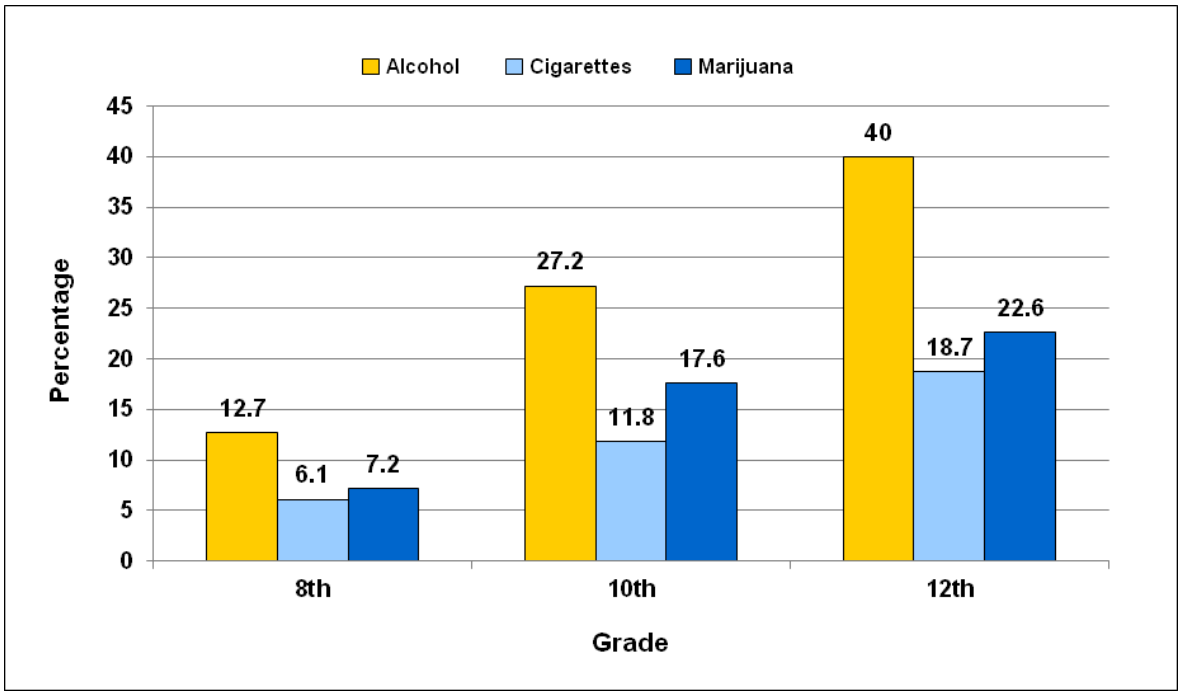


Exhibit 2.2: Past-Month Adolescent Alcohol, Cigarette, and Marijuana Use by Grade: 2011 (Johnston et al., 2012a)



Youths Start Drinking at an Early Age

Drinking often begins at very young ages. Surveys indicate that approximately:

- Ten percent of 9- to 10-year-olds have already started drinking[16] (Donovan et al., 2004).
- More than one fifth of underage drinkers begin drinking before age 13 (CDC, 2012).
- Peak years of initiation are 7th through 11th grades based on data from high school seniors (Johnston, O'Malley, Bachman, & Schulenberg, 2009a).

Slightly fewer than 1 million (972,000) persons who initiated alcohol use in the past year reported being ages 12 to 14 when they initiated. This translates to approximately 2,660 youths ages 12 to 14 who initiated alcohol use per day in 2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). Youths who report drinking before age 15 are more likely to experience problems including intentional and unintentional injury to self and others after drinking (Hingson & Zha, 2009; Hingson, Heeren, Jamanka, & Howland, 2000); violent behavior, including predatory violence and dating violence (Blitstein, Murray, Lytle, Birnbaum, & Perry, 2005; Ellickson, Tucker, & Klein, 2003; Ramisetty-Mikler, et al., 2006); criminal behavior (Eaton, Davis, Barrios, Brener, & Noonan, 2007); prescription drug misuse (Hermos et al., 2008); unplanned and unprotected sex (Hingson, Heeren, Winter, & Wechsler, 2003); motor vehicle crashes (Hingson, Heeren, Levenson, Jamanka, & Voas, 2002); and physical fights (Hingson, Heeren, & Zakocs, 2001). Early-onset drinking is thus a marker for future problems, including heavier use of alcohol and other drugs during adolescence (Robins & Przybeck, 1985; Hawkins et al., 1997) and alcohol dependence in adulthood (Grant & Dawson, 1998).

Delaying the age of first alcohol use can ameliorate some of the negative consequences of underage alcohol consumption, which means that trends in age of initiation of alcohol use are important to follow. MTF data show that the proportion of 8th, 10th, and 12th graders who had ever used alcohol and the proportion of those who started using alcohol before 7th grade generally declined from 1998 to 2011, suggesting a possible delay in the age at first use (Johnston et al., 2012a).

SAMHSA revised its methodology to provide more timely estimates that more accurately assess trends in average age at first use and other measures of initiation, such as incidence rates. Average age of first use is now calculated based on initiation within the past 12 months. Using this new method, NSDUH data indicate no difference in the average age of first use (15.6 years) among those who initiated alcohol use before age 21 between 2004 and 2005, but a significant increase to 15.8 years in 2006. The average age of first use then remained nearly the same in 2007 (15.8 years), 2008 (15.8 years), and 2009 (15.9 years) before a statistically significant increase in 2010 (16.0 years), which remained nearly the same in 2011 (15.9 years) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). Average age of first use for all drinkers, including those who started drinking at age 21 or older, was 16.6 in 2006, 17.0 in 2007, 17.7 in 2008, 17.1 in 2009, 18.0 in 2010, and 17.3 in 2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). Appendix A further discusses methodological issues in measuring age at first use and other indicators of alcohol initiation.

[16] Drinking is defined as having more than a few sips.

For Underage Drinkers, Alcohol Use and Binge Drinking Increase with Age

Drinking becomes increasingly common through the teenage years (O'Malley, Johnston, & Bachman, 1998). Frequent, heavy use by underage drinkers also increases each year from age 12 to age 20 (Flewelling, Paschall, & Ringwalt, 2004). The 2011 NSDUH reports that underage alcohol consumption in the past month increased with age in a steady progression from 1.6 percent for 12-year-olds to 55.3 percent for 20-year-olds and peaked at 70.1 percent for 23-year-olds (SAMHSA, 2012b). As shown in Exhibit 2.3, binge drinking also increased steadily between the ages of 12 and 20, peaking at age 23 (46.7 percent), and then decreased beyond young adulthood (data not shown) (SAMHSA, 2011, detailed tables). Approximately 6.1 million (15.8 percent) 12- to 20-year-olds reported past-month binge alcohol use (SAMHSA, 2012b).

Youth Binge More and Drink More Than Adults When They Drink

Young drinkers tend to drink less often than adults, but they drink more heavily when they do drink. For example, 92 percent of the alcohol consumed by 12- to 14-year-olds is via binge drinking (Pacific Institute for Research and Evaluation [PIRE], 2002). Underage drinkers consume, on average, about five drinks per occasion, about five times a month (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012), whereas adult drinkers 26 and older average three drinks per occasion, eight times a month (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012) (Exhibit 2.4). It is important to note that very young adolescents, because of their smaller size, reach blood alcohol concentrations (BACs) achieved by older binge-drinking

Exhibit 2.3: Current and Binge Alcohol Use among Persons Ages 12–20 by Age: 2011 (SAMHSA, 2012 detailed tables)

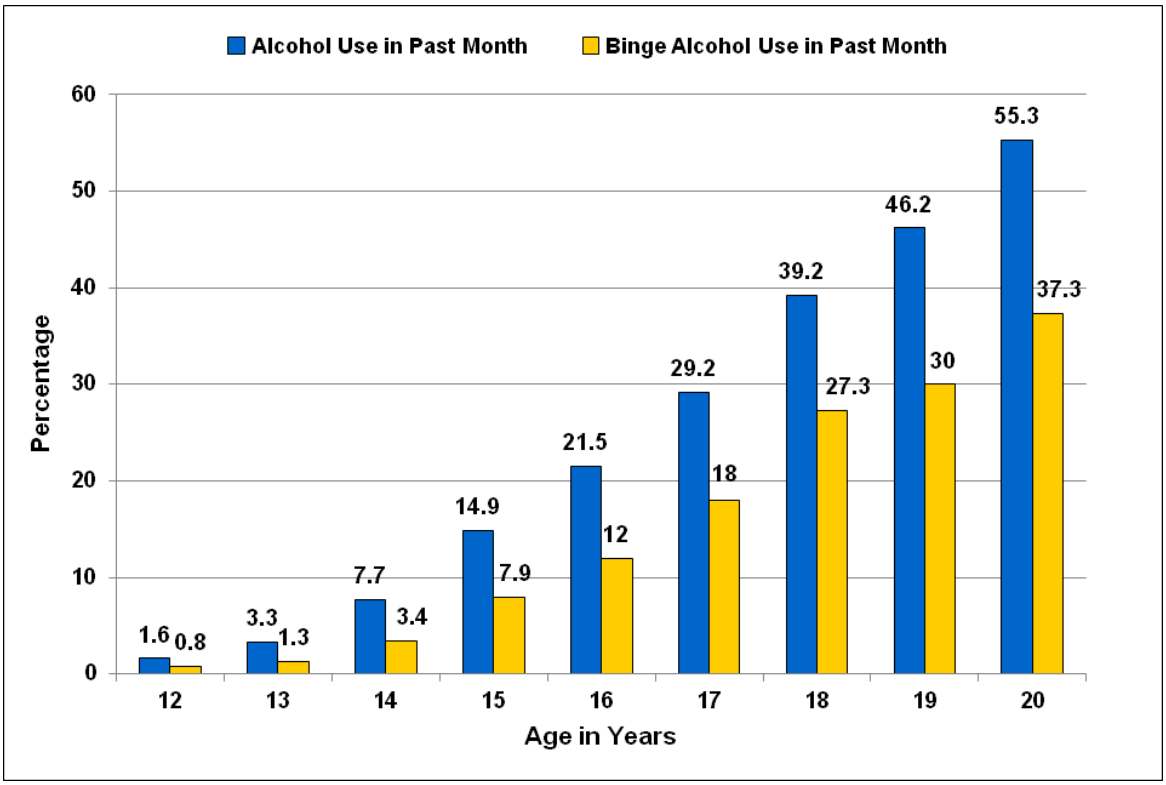
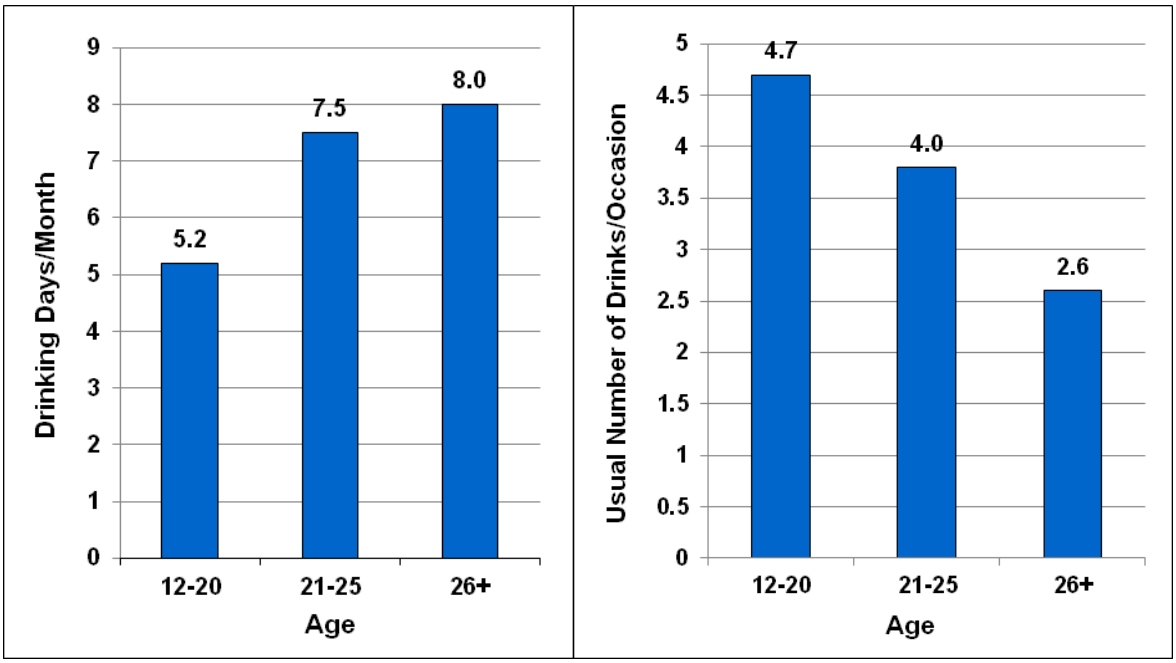


Exhibit 2.4: Number of Drinking Days per Month and Usual Number of Drinks per Occasion for Youth (12–20), Young Adults (21–25), and Adults (≥26): 2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012)



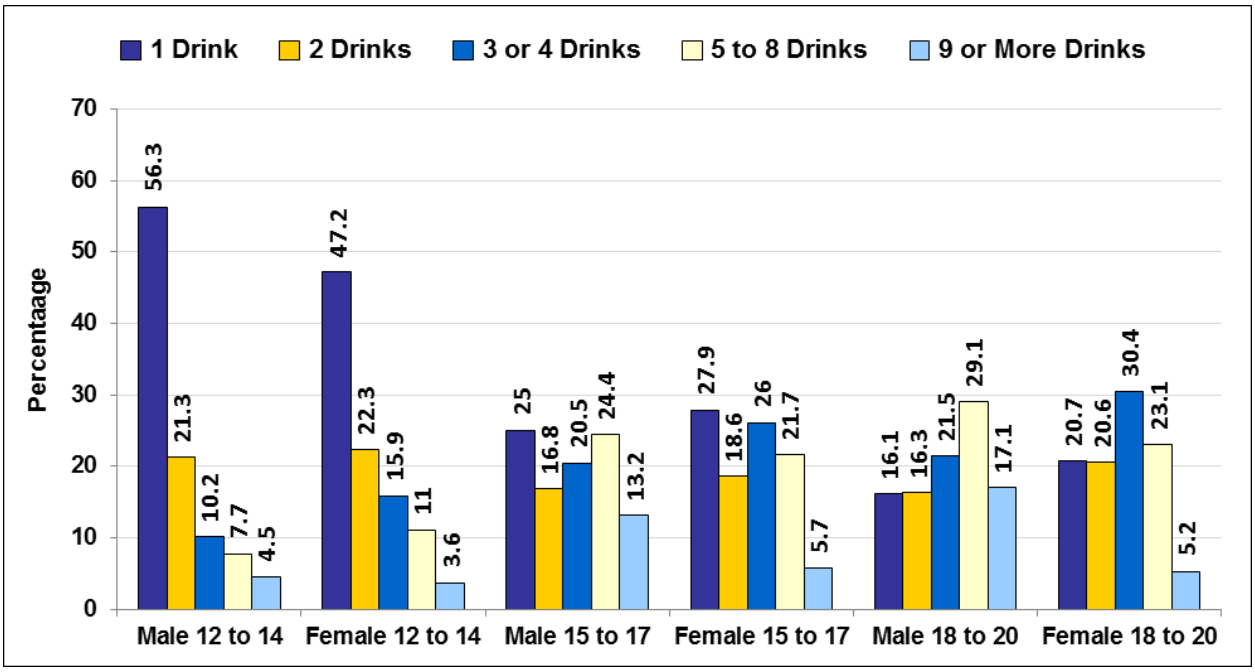
adolescents (e.g., age 18 or older) with fewer drinks (3 to 4 drinks for persons ages 12 to 15) (Donovan, 2009).

When asked about the number of drinks consumed on their last occasion of alcohol use in the past month, 22.2 percent of underage drinkers reported one drink; 18.2 percent, two drinks; 24.3 percent, three or four drinks; 24.6 percent, five to eight drinks; and 10.7 percent, nine or more drinks for 2010 and 2011 combined (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). The number of drinks consumed differs by gender (Exhibit 2.5); underage females are more likely to report consuming one to four drinks, and underage males, five to nine drinks or more. The number of drinks reported on the last occasion tends to increase with increasing age.

Particularly worrisome is the high prevalence among underage drinkers of binge drinking, which MTF defines as five or more drinks in a row in the past 2 weeks and calls "heavy episodic drinking." In 2011, 6.4 percent of 8th, 14.7 percent of 10th, and 21.6 percent of 12th graders reported heavy episodic drinking (Johnston et al., 2012a). In 2011, about 1.7 million youth ages 12 through 20 (4.4 percent) drank five or more drinks on a single occasion[17] 5 or more days a month (SAMHSA, 2012a).

[17] If a typical 160-pound male drinks five standard drinks over a 2-hour period, he would reach a blood alcohol content of 0.08, making him legally intoxicated in all 50 states.

Exhibit 2.5: Number of Drinks Consumed on Last Occasion of Alcohol Use in the Past Month among Past-Month Alcohol Users Ages 12–20, by Gender and Age Group: 2010–2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012)



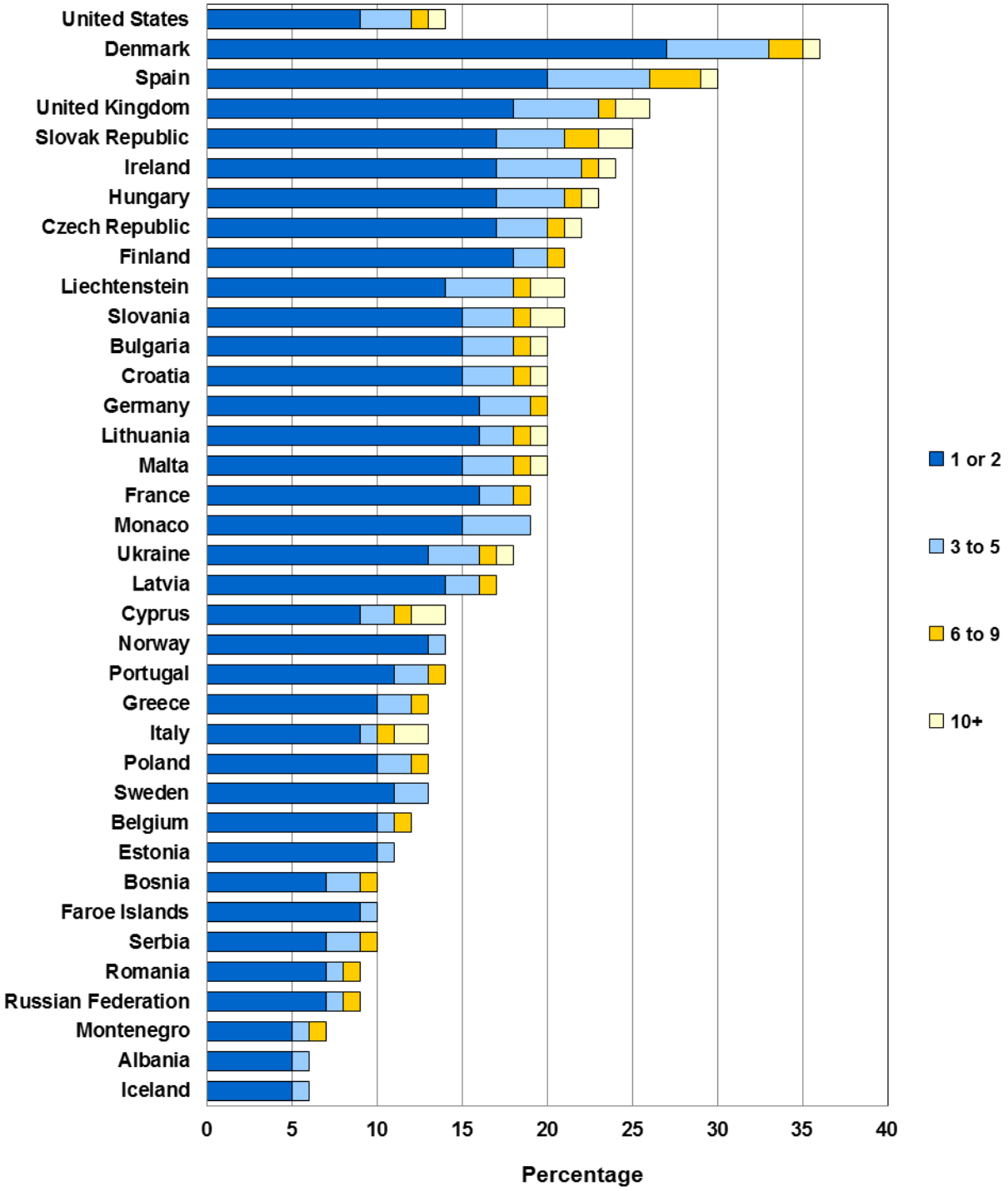
Faden and Fay (2004) used statistical trend analyses to examine underage drinking data from 1975 to 2002. Among 12th graders, drinking five or more drinks in a row in the past 2 weeks declined 7.6 percent, from 36.8 percent in 1975 to 29.2 percent in 2004. Analysis of data from the intervening years showed that the prevalence of drinking five or more drinks in a row in the past 2 weeks rose from 1975 to 1980, fell from 1980 to 1987, steeply declined from 1987 to 1993, rose from 1993 to 1997, and declined from 1997 to 2002 (Faden & Fay, 2004). Subsequent statistical trend analyses showed that among 12th graders the prevalence of drinking five or more drinks in a row in the past 2 weeks continued to fall between 2002 and 2009 (Chen, Yi, & Faden, 2011).

Information on the prevalence of drinking five or more drinks in a row in the past 2 weeks among 8th and 10th graders first became available in 1991. In 1991, 10.9 percent of 8th graders and 21 percent of 10th graders reported engaging in this behavior compared with 9.4 percent and 19.9 percent, respectively, in 2004. Rates in the intervening years oscillated heavily for 8th graders and rose steadily for 10th graders, for whom rates peaked in 2000 and have since gradually declined (Johnston, O'Malley, Bachman, & Schulenberg, 2005). Since 2002, there have been statistically significant declines in binge drinking for all three grades (Johnston et al., 2012a).

Binge Drinking by Teens Is Not Limited to the United States

In many European countries, a significant proportion of young people ages 15 to 16 report binge drinking (Exhibit 2.6). In all countries listed in Exhibit 2.6, the minimum legal drinking age is lower than in the United States. These data call into question the suggestion that having a lower minimum legal drinking age results in less problem drinking by adolescents.

Exhibit 2.6: Percentage of European Students Ages 15–16 Who Reported Being Drunk in the Past 30 Days* Compared with American 10th Graders (Hibell et al., 2012; Data from the 2011 European School Survey Project on Alcohol and Drugs)



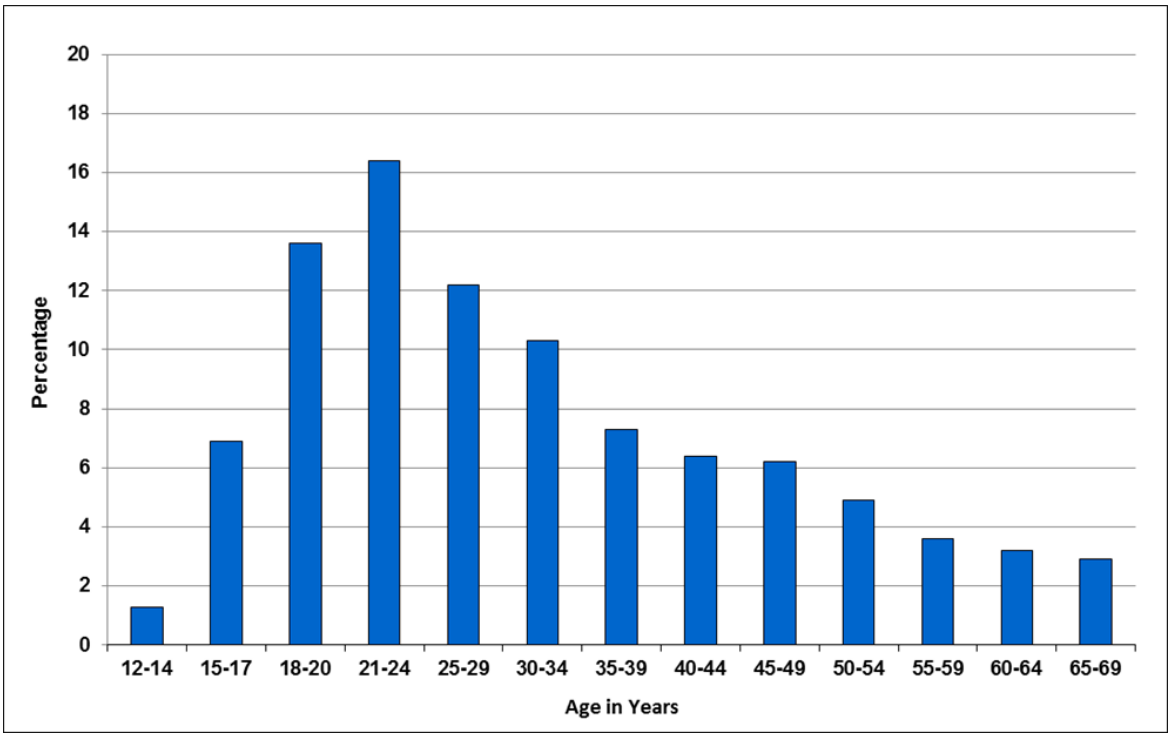
* The 2011 European School Survey Project on Alcohol and Drugs question is: "On how many occasions (if any) have you been intoxicated from drinking alcoholic beverages (staggered when walking, not able to speak properly, throwing up or not remembering what happened)?"

There Is a High Prevalence of Alcohol Use Disorders among Youth

The prevalence of alcohol abuse or dependence among underage drinkers is quite high. Because the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, text revision* (DSM-IV-TR) (APA, 2000) criteria for abuse and dependence were originally developed for use with adults, using them to assess abuse and dependence in adolescents may lead to inconsistencies.[18] As shown in Exhibit 2.7, according to the combined 2010 and 2011 NSDUH data, prevalence of alcohol dependence or abuse is highest among those ages 18 to 29.

About one in seven (13.6 percent) 18- to 20-year-olds met criteria for alcohol dependence or abuse, a prevalence rate second only to that for 21- to 24-year-olds (16.4 percent) and slightly higher than that for 25- to 29-year-olds (12.2 percent). In addition, 1.3 percent of 12- to 14-year-olds and 6.9 percent of 15- to 17-year-olds met criteria for alcohol dependence or abuse.

Exhibit 2.7: Prevalence of Past-Year DSM-IV Alcohol Dependence or Abuse by Age: 2010–2011 NSDUH (SAMHSA, CBHSQ, Special Analyses, 2012)



[18] Several researchers are actively investigating this important issue (Harford, Yi, Faden, & Chen, 2009; Mewton, Teesson, Slade, & Grove, 2010). The American Psychiatric Association (APA) is also addressing the appropriateness of the current DSM-IV-TR criteria for measuring alcohol abuse and dependence in the young as it prepares to launch DSM-V in 2013. See American Psychiatric Association DSM-V Development at http://www.dsm5.org/Pages/Default.aspx.

Underage Drinking Differs by Gender

Although underage males and females tend to start drinking at about the same age and have approximately the same prevalence of any past-month alcohol use, males are more likely to drink with greater frequency and to engage in binge and heavy drinking. According to the 2011 NSDUH data, 56.8 percent of males ages 12 and older were current drinkers compared with 47.1 percent of females in that age group. However, among underage drinkers, there were significant gender differences only in the 18- to 20-year-old age group. Among individuals ages 12 to 13, rates of current drinking were very similar: 2.2 percent for males and 2.7 percent for females. Among 14- and 15-year-olds, 12.1 percent of females and 10.5 percent of males reported current use. Among those ages 16 to 17, 26.4 percent of males and 24.1 percent of females reported being current drinkers. By ages 18 to 20, 48.6 percent of males reported past-month alcohol use compared with 44.9 percent of females (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012).

Binge-drinking prevalence is the most significant gender difference, at least among older adolescents. In 2011, 25.5 percent of male 12th graders reported binge drinking (having five or more drinks in a row) at least once in the prior 2-week period, whereas 17.6 percent of female 12th graders did (Johnston et al., 2012a). However, the gender gap is closing. In 1975, there was a 23 percentage point spread between the rates; in 2011, it was 7.9 points (Johnston et al., 2012a).

Female binge-drinking rates are comparable to those for males among younger age groups, whereas male rates increase more rapidly with age. The 2011 NSDUH showed past-month binge drinking in 0.8 percent of male and 1.3 percent of female 12- to 13-year-olds, 5.5 percent of male and 5.8 percent of female 14- to 15-year olds, 16.8 percent of male and 13.0 percent of female 16- to 17-year-olds, and 35.5 percent of male and 27.0 percent of female 18- to 20-year-olds (SAMHSA, 2011). MTF, which began collecting data from 8th and 10th graders in 1991, reports similar results. For 8th graders, female binge-drinking rates began converging with male rates in 1991, with equal rates for both genders since 2004 (Exhibit 2.8) (Johnston et al., 2009c, 2012a).

Underage Drinking by Race and Ethnicity

According to 2002–2011 NSDUH data,[19] Whites ages 12 to 20 were more likely to report current alcohol use than any other race or ethnic group. An estimated 32.1 percent of White males and 30.6 percent of White females reported past-month use, followed by Native Hawaiian or Other Pacific Islander males (28.9 percent), males of multiple races (26.5 percent), Hispanic or Latino males (26.4 percent), American Indian or Alaska Native females (25.9 percent), females of multiple races (25.9 percent), American Indian or Alaska Native males (25.5 percent), Native Hawaiian or Other Pacific Islander females (23.7 percent), Hispanic or Latino females (22.9 percent), Black or African American males (19.8 percent), Black or African American females (18.2 percent), Asian males (17.6 percent), and Asian females (16.4 percent). As shown in Exhibit 2.9, among most races/ethnic groups, males and females reported similar rates of current alcohol use; however, among Whites, Blacks, Hawaiian or Other Pacific Islanders, and Hispanics, males ages 12 to 20 were more likely to report current use than females (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). Although fewer Blacks report current

[19] To provide sample sizes sufficient to produce reliable estimates for each race/ethnic group, multiyear estimates of past-month alcohol use and binge drinking by race/ethnicity were calculated.

Exhibit 2.8: Rates of Binge Drinking in the Past 2 Weeks among Male and Female 8th, 10th, and 12th Graders, 1991–2011 (Johnston et al., 2012a)

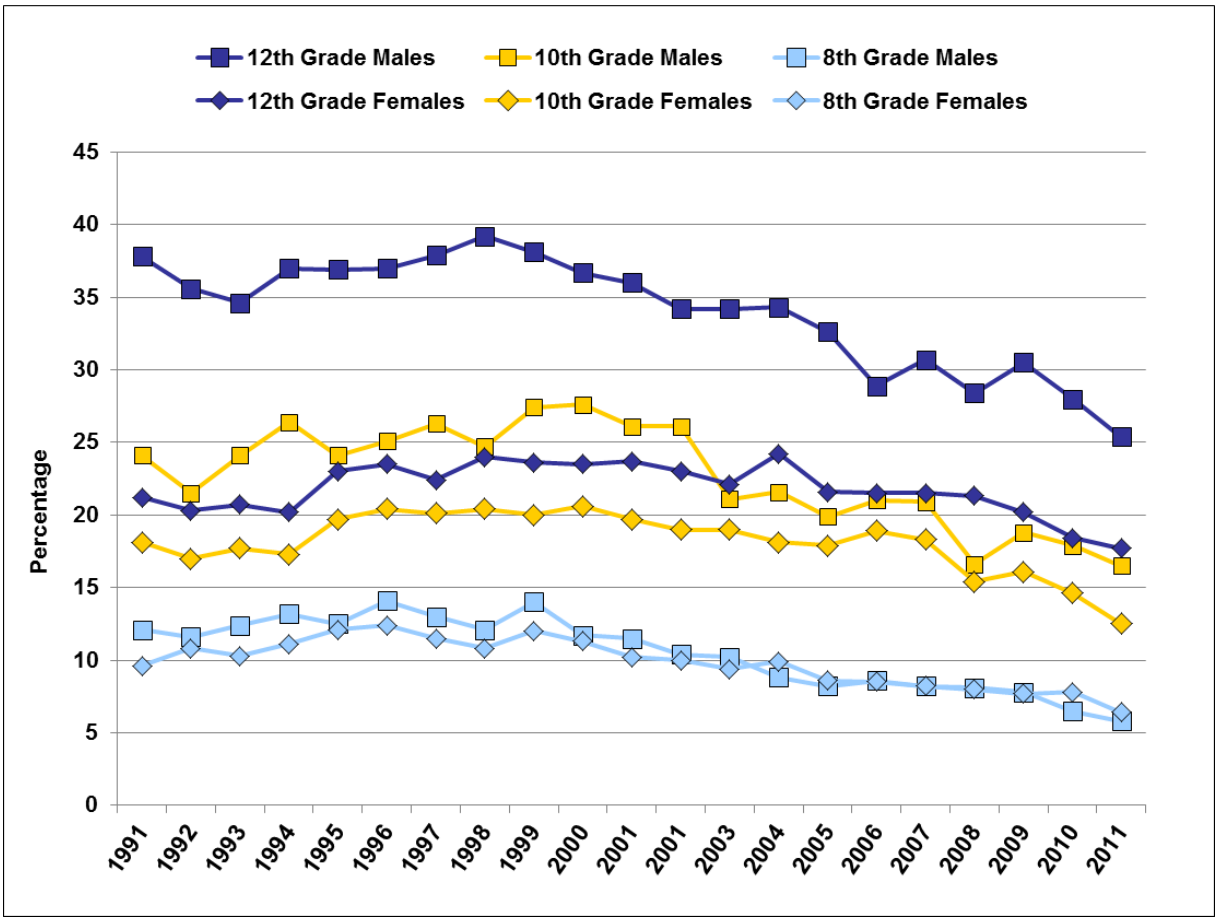
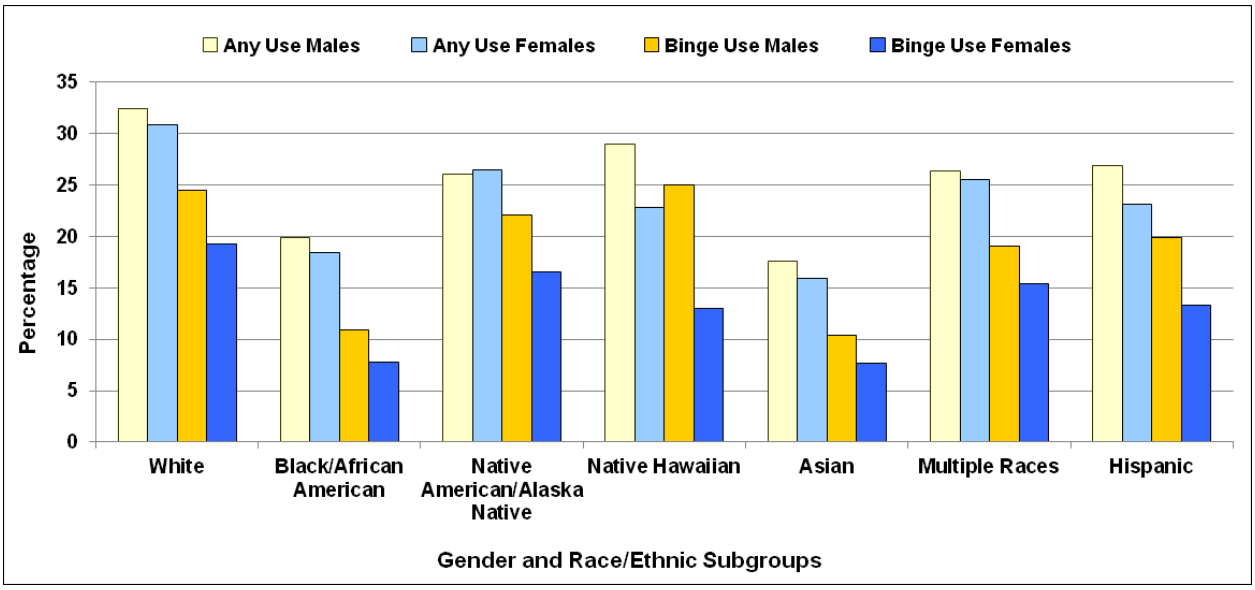


Exhibit 2.9: Alcohol Use and Binge Drinking in the Past Month among Persons Ages 12–20 by Race/Ethnicity and Gender, Annual Averages Based on 2002–2011 Data (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012)



drinking, data from the 2011 YRBS suggest that prevalence of alcohol use before age 13 is greater among Black students (21.8 percent) and Hispanic students (25.2 percent) than among White students (18.1 percent) (CDC, 2012). Sample sizes from the MTF and the YRBS do not allow estimates of alcohol consumption by youth who are American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multiple races.

Multiyear NSDUH data (2002–2011) show that White, American Indian and Alaska Native, and Hawaiian and Other Pacific Islander males ages 12 to 20 were equally likely to report binge alcohol use in the past month. An estimated 24.9 percent of Native Hawaiians or Other Pacific Islander males reported having five or more drinks on the same occasion on at least 1 day within the past 30 days, followed closely by White males (24.1 percent) and American Indian or Alaska Native males (21.6 percent). Hispanic males (19.3 percent), White females (19.1 percent), males of multiple races (18.7 percent), and American Indian or Alaska Native females (16.9 percent) reported similar rates of binge drinking, followed by females of multiple races (15.5 percent), Hispanic females (13.5 percent), Native Hawaiian or Other Pacific Islander females (13.3 percent), Black males (10.8 percent), Asian males (10.3 percent), and Asian females (7.8 percent). As Exhibit 2.9 shows, rates of binge drinking were higher for males than females for each race/ethnic group, with the differences being greatest among Native Hawaiian or Other Pacific Islanders (males 24.9 percent vs. females 13.3 percent) and Hispanics (males 19.3 percent vs. females 13.5 percent) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012).

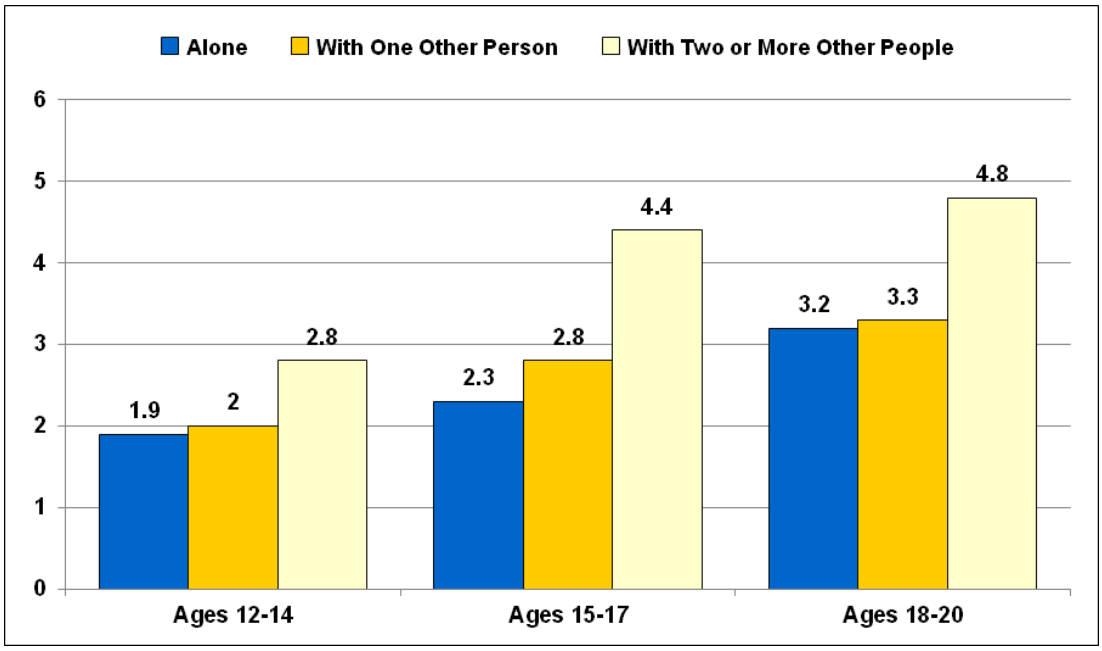
These ethnic and racial differences must be viewed with some caution. As Caetano, Clark, and Tam (1998) note, there are important differences in alcohol use and related problems among ethnic and racial subgroups of Blacks, Hispanics, Asians, and Native Americans/Alaska Natives. Moreover, the patterns of consumption for any group or subgroup represent a complex interaction of psychological, historical, cultural, and social factors inadequately captured by a limited set of labels. With these cautions in mind, however, the data discussed thus far highlight the importance of considering race and ethnicity in underage drinking prevention measures.

Social Context of Alcohol Use

NSDUH began to collect data on the social context of last alcohol use in 2006. The following discussion combines data for 2010 and 2011. Most (81.2 percent) persons ages 12 to 20 who had consumed alcohol in the past month were with two or more people the last time they drank, 13.8 percent were with one other person the last time they drank, and 5.0 percent were alone. Underage persons who drank with two or more other people on the last occasion in the past month had more drinks on the last occasion on average (4.6 drinks) than those who drank with one other person (3.0 drinks) or drank alone (2.7 drinks) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012; Pemberton, Colliver, Robbins, & Gfroerer, 2008).

The social context of drinking appears to differ across age groups. Among current drinkers, youths ages 12 to 14 were more likely to have been alone (12.3 percent) or with one other person (23.2 percent) the last time they drank compared with youths ages 15 to 17 (5.6 percent alone and 12.7 percent with one other person) or ages 18 to 20 (4.2 percent alone and 13.6 percent with one other person) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). In all age groups, underage current drinkers who drank with two or more other people averaged more drinks on the last occasion than those who drank with one other person or alone (Exhibit 2.10).

Exhibit 2.10: Average Number of Drinks Consumed on Last Occasion of Alcohol Use in the Past Month among Past-Month Alcohol Users Ages 12–20, by Social Context and Age Group: 2010–2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012)



Gender, too, interacts with social context in determining alcohol use. Most male and female underage drinkers were with two or more other people on their last drinking occasion. However, female drinkers were more likely to be with two or more people the last time they drank (83.2 percent) than were male drinkers (79.5 percent); male drinkers were more likely to have been alone the last time they drank (6.4 percent) than female drinkers (3.3 percent).

Overall, underage persons who drank with two or more other people consumed more drinks on average (4.6) than those who drank alone (2.7) or with one other person (3.0). There were no significant differences in the mean number of drinks consumed between those who drank alone and those who drank with one other person. Males consumed more drinks than did females regardless of the social context; for example, when the last drinking occasion was with two or more other people, males averaged 5.4 drinks, compared with 3.8 drinks for females (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012).

Location of Alcohol Use

NSDUH began to collect data on location of last alcohol use in 2006. The following discussion combines data for 2010 and 2011. Most underage drinkers reported last using alcohol in someone else's home (56.1 percent, averaging 4.7 drinks) or their own home (28.9 percent, averaging 3.8 drinks). The next most popular drinking locations were at a restaurant, bar, or club (8.7 percent, averaging 4.8 drinks); in a car or other vehicle (4.3 percent, averaging 5.1 drinks); or at a park, on a beach, or in a parking lot (4.3 percent, averaging 4.9 drinks). Current drinkers ages 12 to 20 who last drank at a concert or sports game (1.7 percent of all underage drinkers) consumed an average of 5.8 drinks (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012).

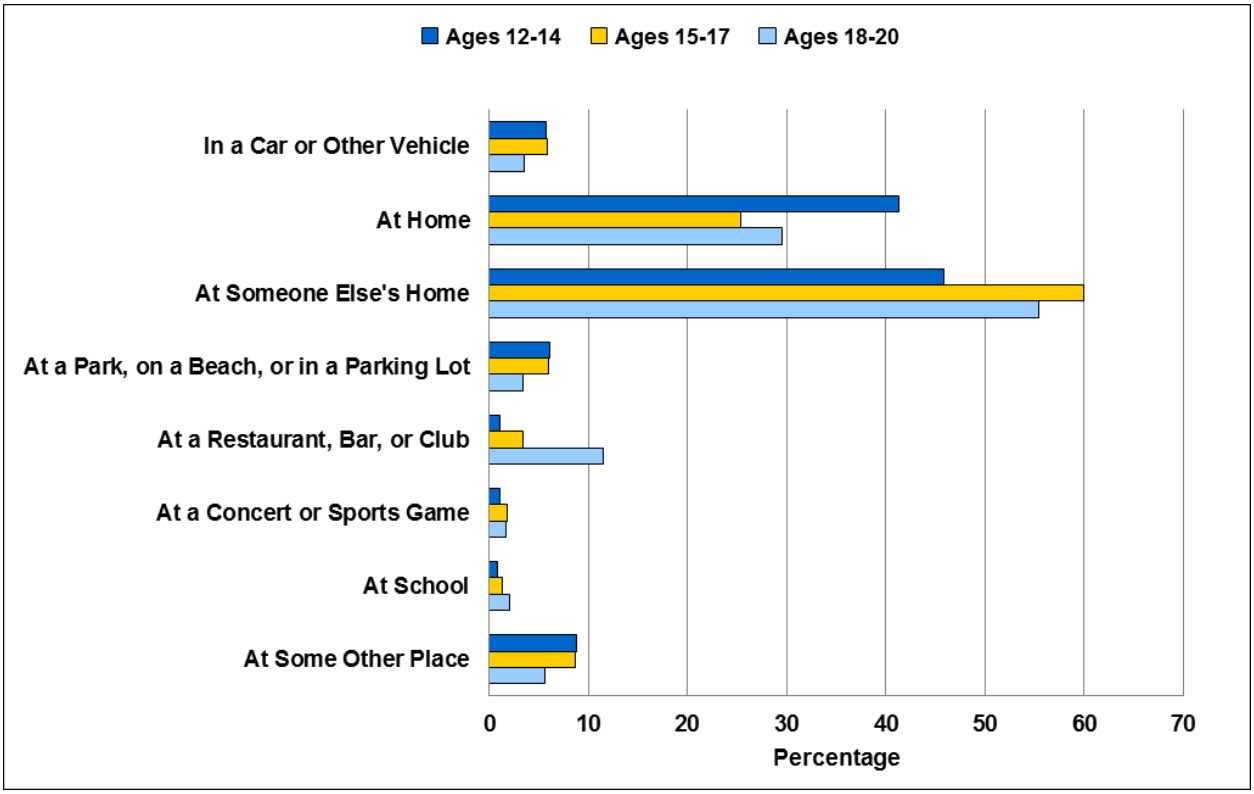
Thus, most young people drink in social contexts that appear to promote heavy consumption and where people other than the drinker may be harmed by the drinker's behavior.

According to estimates based on 2010–2011 NSDUH data, drinking location varies substantially by age. For example, drinkers ages 12 to 14 were more likely to have been in their own homes the last time they drank (41.3 percent) than were older adolescents (25.4 percent for 15- to 17-year-olds and 29.5 percent for 18- to 20-year-olds). By contrast, 12- to 14-year-olds were less likely to report being in someone else's home the last time they drank (45.8 percent) than the older age groups (59.9 percent for 15- to 17-year-olds and 55.4 percent for 18- to 20-year-olds).

Drinkers ages 18 to 20 were more likely than those in younger age groups to have been in a restaurant, bar, or club on their last drinking occasion (11.5 percent for those ages 18 to 20 versus 1.1 percent for those ages 12 to 14 and 3.4 percent for those ages 15 to 17) (Exhibit 2.11) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012). Female current alcohol users ages 12 to 20 were more likely than males to have had their last drink at a restaurant, bar, or club (10.8 percent versus 6.9 percent).

Taken together, these data suggest that underage drinking occurs primarily in a social context (three or more drinkers) at private residences. This conclusion is consistent with research that has found that underage drinking parties, where large groups of underage persons gather at

Exhibit 2.11: Location of Last Alcohol Use among Past-Month Alcohol Users Ages 12–20 by Age Group, 2010–2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012)



private residences, are high-risk settings for binge drinking and associated alcohol problems (Mayer, Forster, Murray, & Wagenaar, 1998). Similar findings exist for college student binge drinking (Clapp, Shillington, & Segars, 2000).

Types of Alcohol Consumed by Underage Drinkers

Different alcohol beverage types are likely associated with different patterns of underage consumption. Ease of concealment, palatability, alcohol content, marketing strategies, media portrayals, parent modeling, and economic and physical availability may all contribute to the quantity of and settings for consumption. Beverage preferences may also affect the policies and enforcement strategies most effective in reducing underage drinking (CDC, 2007). Tracking young people's beverage preferences is thus an important aspect of prevention policy.

Exhibit 2.12, based on 2011 MTF data, indicates the type of alcohol consumed by underage drinkers in the 8th, 10th, and 12th grades within the past 30 days. The five alcohol categories listed are beer, wine, wine coolers, spirits, and flavored alcoholic beverages (FABs), which are sometimes called "flavored malt beverages," "alcopops," or "malternatives." Alcopops are ready-to-drink, flavored alcoholic beverages that tend to be sweet and have between 4 and 6 percent alcohol by volume (similar to beer, which typically varies between 3 and 6 percent).

In some cases, the same adolescents reported drinking more than one type of alcohol. Thus, the percentage of adolescents for a given grade who have drunk alcohol may total more than 100 percent. For example, of 12th graders who drank alcohol in the 30 days before the survey, some percentage may have consumed both beer and wine. Distilled spirits have gained significantly in popularity among 12th graders over time. In 1988, 53.3 percent reported consuming beer in the past 30 days compared with 38.5 percent who reported distilled spirits consumption (Johnston et al., 2009c). By 2011, the gap in preferences had nearly disappeared, as shown in Exhibit 2.13.

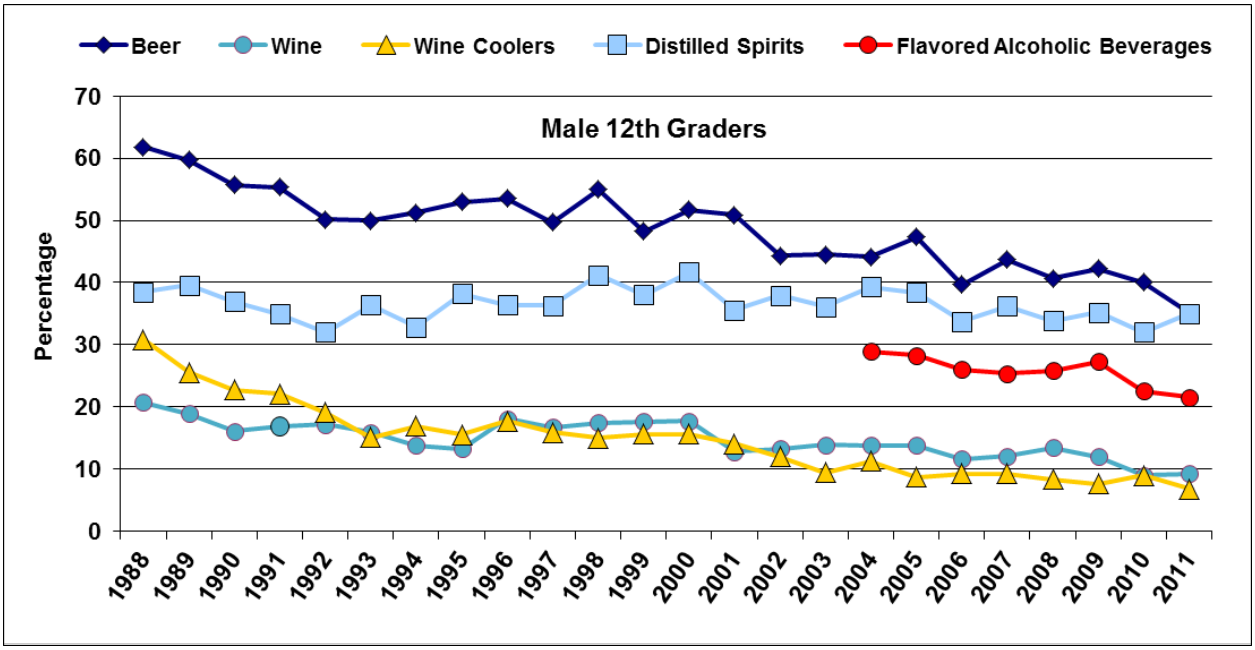
Exhibit 2.13 shows that females, particularly, have shifted their beverage preference from beer to distilled spirits and FABs. In 1988, 46.3 percent of 12th-grade females reported consuming beer and 33.6 percent reported consuming distilled spirits. By 2011, the preference had shifted, with distilled spirits consumption remaining steady at 28.0 percent and beer consumption dropping to 22.4 percent. MTF data show that females have been more likely than males to prefer FABs since 2004 (Johnston et al., 2009a, 2012a). Beverage preferences vary by state. Data from eight states indicate that, among students in 9th through 12th grades who reported binge drinking, liquor was the most prevalent beverage type (Siegel, Naimi, Cremeens, & Nelson, 2011).

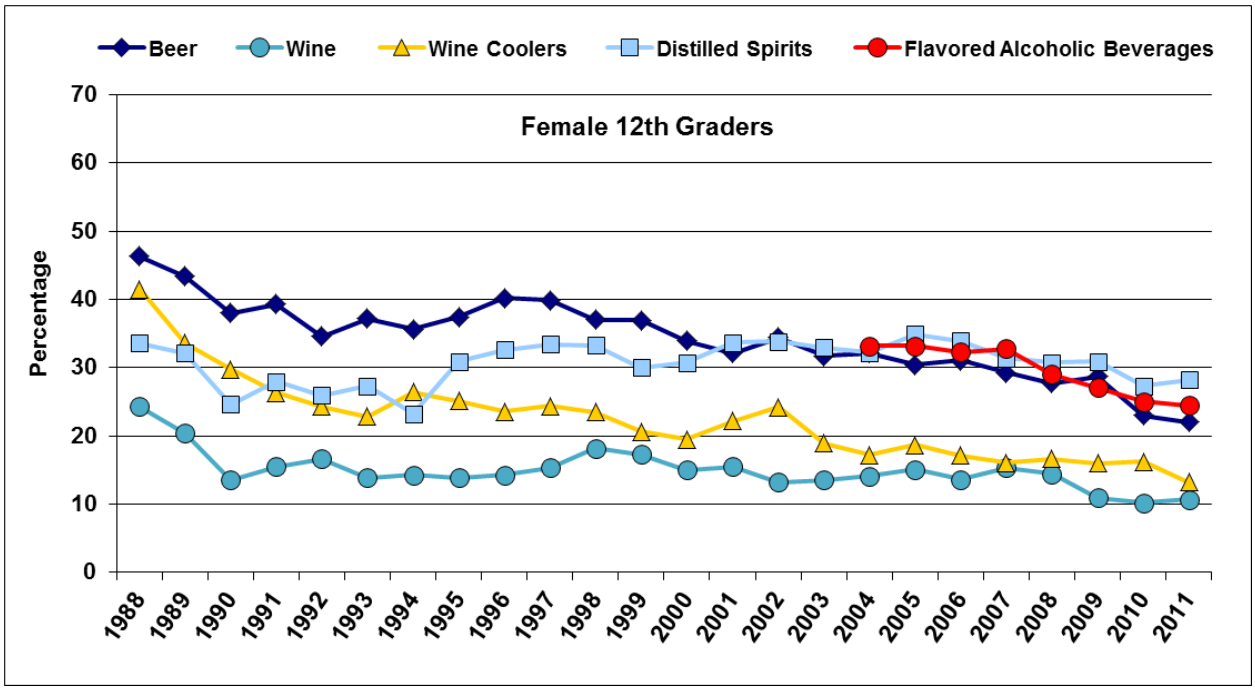
Exhibit 2.12: Past-Month Underage Alcohol Use by Category (Johnston et al., 2012a)

Grade	Beer	Wine	Wine Coolers	Spirits	Flavored Alcoholic Beverages
8	9.8%	n/c	n/c	n/c	8.6%
10	19.6%	n/c	n/c	n/c	15.8%
12	29.0%	10.2%	10.0%	29.8%	23.1%

Note: n/c indicates data not collected.

Exhibit 2.13: Trends in the Percentage of Male and Female 12th Graders Using Alcoholic Beverages by Beverage Type, 1988–2011 (Johnston et al., 2012a)





Alcohol Use in College Is Pervasive and Heavy

Although colleges and universities vary widely in their student binge-drinking rates, overall rates of college student drinking and binge drinking exceed those of age peers who do not attend college (Johnston et al., 2012b). Of college students, 80.5 percent drink and 36.1 percent report drinking five or more drinks on an occasion in the past 2 weeks. Unlike high school students and same-age peers not in college, binge-drinking rates among college students have shown little decline since 1993 (Johnston et al., 2012b). These differences are not easily attributable to differences between college attendees and nonattendees. Although college-bound 12th graders are consistently less likely than non-college-bound counterparts to report heavy drinking, college students report higher rates of binge drinking than college-age youth who are not attending college (Exhibit 2.14) (Johnston et al., 2012b). This finding suggests that college environments influence drinking practices (Hingson et al., 2002; Kuo, Wechsler, Greenberg, & Lee, 2003).

The consequences of underage drinking in college, discussed in detail in this chapter under "Adverse Consequences of College Drinking," are widespread and serious. About four out of five college students drink alcohol, about two in five engage in binge drinking (defined as five or more drinks in a row for men and four or more in a row for women within the past 2 weeks or 30 days, depending on the survey), and about one in five engages in frequent binging (three or more times in the past 2 weeks) (NIAAA, 2002a). Underage college students drink about 48 percent of the alcohol consumed by students at 4-year colleges (Wechsler et al., 2002). Some college students far exceed the binge criterion of five drinks per occasion (Wechsler et al., 1999; Wechsler & Nelson, 2008).

Alcohol Is Perceived as Readily Available by the Underage Population

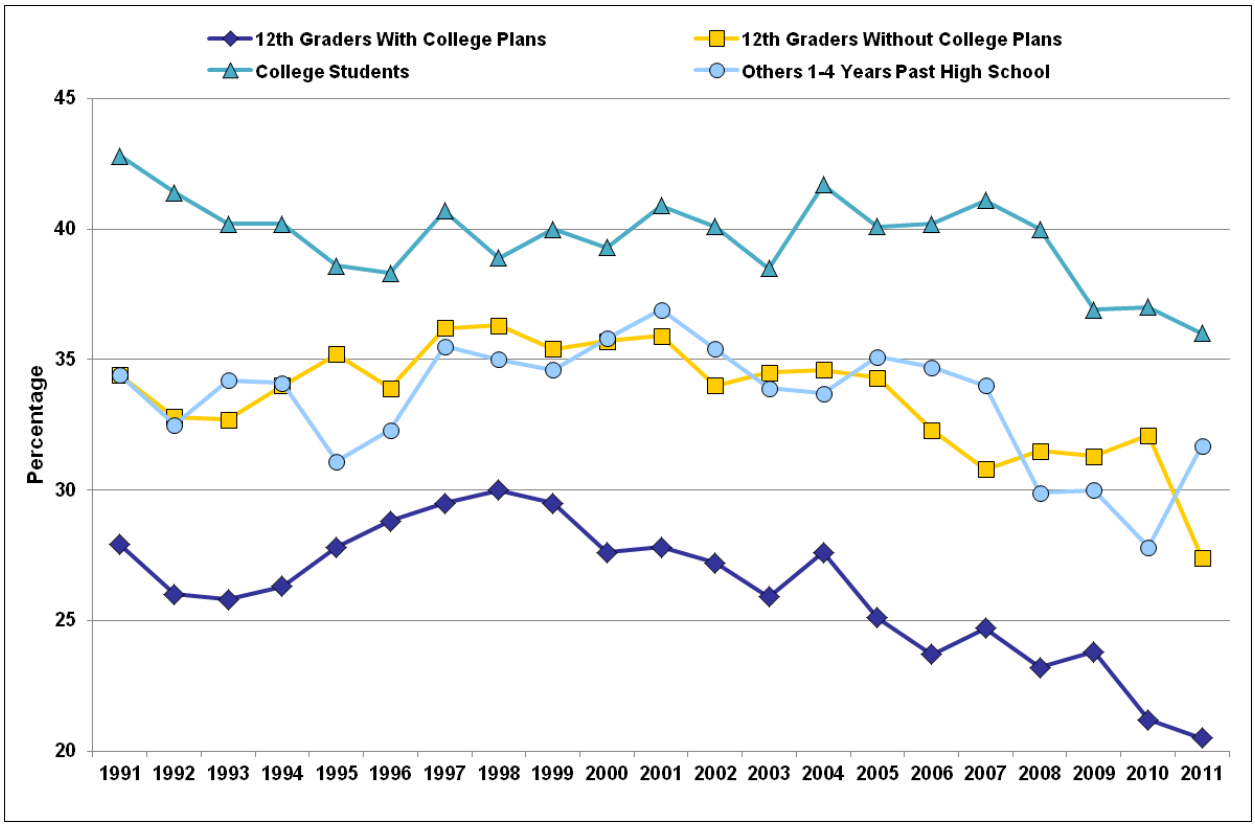
Most teens see alcohol as readily available. In 2011, 59.0 percent of 8th graders, 77.9 percent of 10th graders, and 88.9 percent of 12th graders said alcohol would be "fairly easy" or "very easy" to get (Johnston et al., 2012a). Perceived availability, however, has declined in some groups. In 1992, 76.2 percent of 8th graders perceived alcohol as easily available, but by 2011 only 59.0 percent held that perception. For 10th graders, perception of availability peaked in 1996 at 90.4 percent, but by 2011 had declined to 77.9 percent. Data for 12th graders, first collected in 1999, show that 95.0 percent perceive alcohol to be readily available—a percentage that has remained relatively stable since then.

Alcohol Is Available from a Variety of Sources

Through the STOP Act, Congress required a report on measures of the availability of alcohol from commercial and noncommercial sources to underage populations. The STOP Act also calls for surveillance data on the means of underage access to alcohol. This emphasis reflects findings that alcohol availability and consumption are strongly correlated (Dent, Grube, & Biglan, 2005).

A few small studies show that the most frequent means of obtaining alcohol are parties, friends, and adult purchasers (Harrison, Fulkerson, & Park, 2000; Preusser, Ferguson, Williams, & Farmer, 1995; Wagenaar et al., 1996), and, for younger adolescents, family members (National Research Council [NRC], Institute of Medicine [IOM], 2004). The NRC and IOM report notes: "Use of friends under 21 and adult strangers as sources for alcohol appears to increase with age

Exhibit 2.14: Prevalence of Binge Drinking in the Past 2 Weeks by 12th Graders with and without College Plans, College Students, and Others 1 to 4 Years Past High School: 1991–2011 (Johnston et al., special runs, January 2010; 2011a,b; 2012a,b)



while reports of parents or other family members as sources decrease with age…use of commercial sources appears to be much higher among college students, in urban settings, and where possession and purchase laws are relatively weak or unenforced."

Before 2006, NSDUH collected data only on the *perception* of alcohol availability by those under 21. In 2006, new items were added to ascertain the *actual* source from which underage drinkers obtained their alcohol. NSDUH divides sources of last alcohol use into two categories: the underage drinker paid (he or she purchased it or gave someone else money to do so) or did not pay (he or she received it for free from someone or took it from his or her own home or someone else's home). Combined data from 2010 and 2011 show that among all underage current drinkers, 30.5 percent paid for alcohol the last time they drank (8.3 percent purchased the alcohol themselves; 22.0 percent gave money to someone else to do so). Those who paid for alcohol themselves consumed more drinks on their last drinking occasion (average of 5.6 drinks) than those who did not (average of 3.8 drinks). This difference is at least partially explained by the fact that older underage drinkers are more likely to pay for alcohol and to drink more.

Among all underage drinkers, 69.5 percent did not pay for the alcohol the last time they drank. A total of 27.5 percent were given alcohol for free by an unrelated individual age 21 or older,

6.5 percent got the alcohol from a parent or guardian, 9.1 percent got it from another family member age 21 or older, and 4.3 percent took it from their own home.

The most common sources of alcohol varied substantially by age. For youths ages 12 to 14, the most common sources were receiving it free from someone under age 21 (16.3 percent), receiving it from a parent or guardian (16.0 percent), or receiving it free from another family member age 21 or older (15.1 percent). For youths ages 15 to 17, the most common sources were receiving it free from an unrelated person age 21 or older (21.7 percent), receiving it free from someone under age 21 (19.7 percent), and giving somebody else money to purchase the alcohol (17.0 percent). As shown in Exhibit 2.15, among 18- to 20-year-olds, most current drinkers either received alcohol for free from an unrelated person age 21 or older (30.8 percent) or gave somebody else money to purchase the alcohol (25.4 percent) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012).

Older underage persons were more likely to have paid for alcohol themselves (either by purchasing it themselves or by paying someone else to purchase it) on their last drinking occasion: 36.3 percent of 18- to 20-year-olds did so compared with 21.1 percent of 15- to 17-year-olds and 6.7 percent of 12- to 14-year-olds. Male underage drinkers were more likely to have paid for alcohol themselves on their last drinking occasion (36.5 percent) than their female counterparts (23.6 percent) (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012).[20]

Exposure of Underage Populations to Messages Regarding Alcohol in Advertising and Entertainment Media

The STOP Act requires the HHS Secretary to report to Congress on the extent of "the exposure of underage populations to messages regarding alcohol in advertising and the entertainment media as reported by the Federal Trade Commission (FTC)." To date, FTC has conducted three formal studies of the exposure of those under 21 to alcohol advertising, described below. FTC has not conducted any studies that measure alcohol depictions in entertainment media.

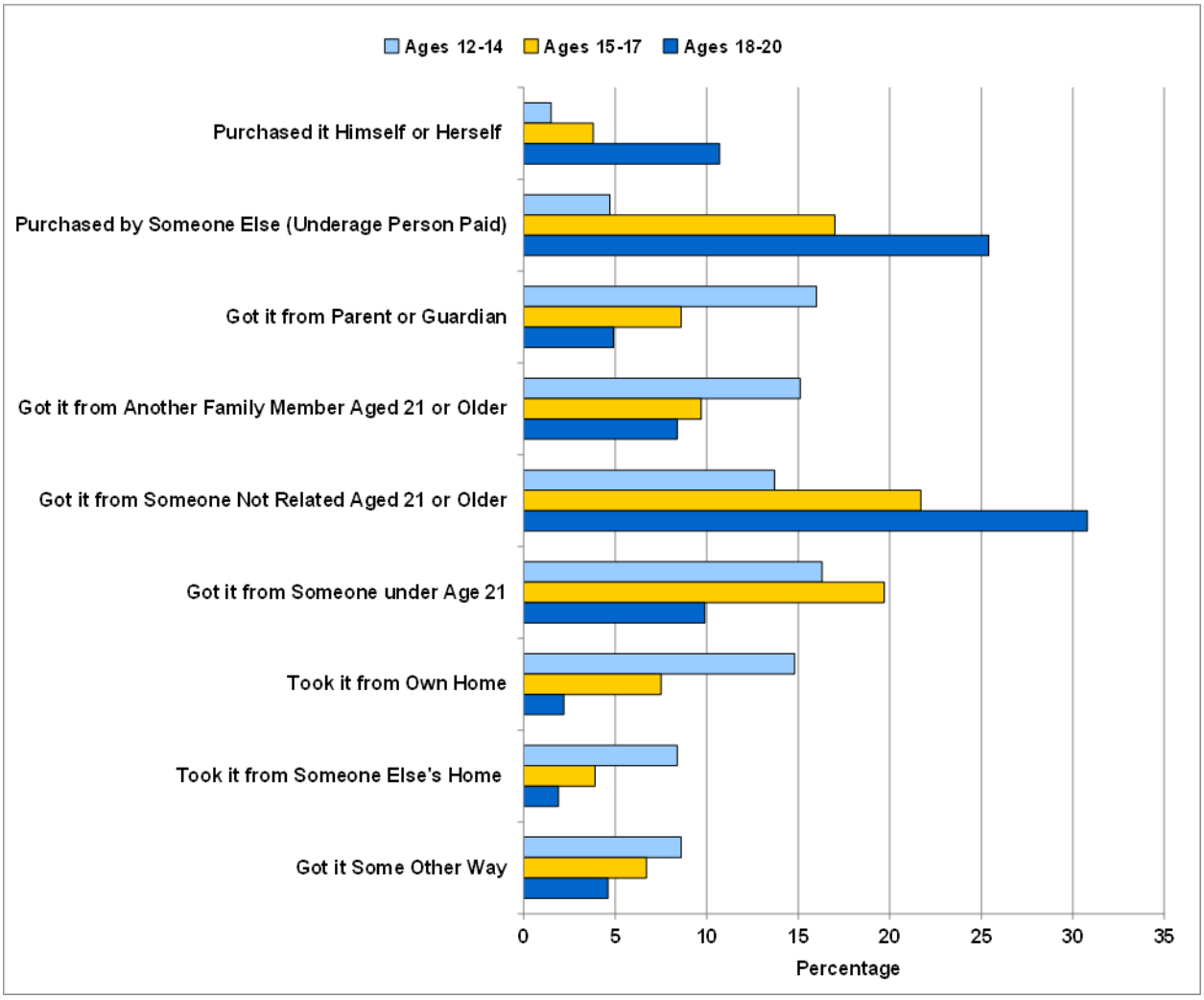
1999 Alcohol Report

In 1999, FTC reported that the voluntary codes of the alcohol industry permitted alcohol advertising in media where as little as 50 percent of the audience was of legal age. Only half the companies studied were able to show that nearly all of their ads reached a majority legal-age audience; the other half either provided data showing that a substantial portion of their ads did not comply with the 50 percent guideline or failed to obtain the data needed to evaluate their code compliance. Noting that the 50 percent standard permitted alcohol advertising to reach large numbers of underage consumers, FTC recommended that the industry raise the placement standard and measure compliance against reliable up-to-date audience composition data.[21]

[20] More detailed information can be found in the special report by Pemberton and colleagues entitled Underage Alcohol Use: Findings from the 2002-2006 National Surveys on Drug Use and Health. See http://www.oas.samhsa.gov/underage2k8/underage.pdf.

[21] For more information, see *Self-Regulation in the Alcohol Industry* (FTC, 1999), available at http://www.ftc.gov/reports/alcohol/alcoholreport.htm.

Exhibit 2.15: Source of Last Alcohol Used among Past-Month Alcohol Users Ages 12–20, by Age Group: 2010–2011 (SAMHSA, CBHSQ, NSDUH, Special Data Analysis, 2012)



2003 Alcohol Report

FTC's 2003 review reported that over 99 percent of the radio, television, and magazine advertising budgets for alcohol brands whose target audience included 21-year-olds were expended in compliance with the 50 percent placement standard. FTC also announced that the alcohol industry had agreed to amend its voluntary codes to require that adults over 21 constitute at least 70 percent (thus reducing the permissible underage percentage to 30 percent) of the audience for TV, magazine, and radio ads, based on reliable data. To facilitate compliance, the revised codes of the beer and spirits industries required members to conduct periodic post-placement audits and promptly remedy any identified problems.[24]

[24] For more information, see *Alcohol Marketing and Advertising* (FTC, 2003), available at http://www.ftc.gov/os/2003/09/alcohol08report.pdf.

2008 Alcohol Report

In 2008, FTC published its third study of alcohol advertising, evaluating compliance with the 70 percent placement standard and other matters relating to underage exposure. Data showed that 92.5 percent of advertising placements complied with the 70 percent standard; furthermore, because placements that missed the target were concentrated in smaller media, more than 97 percent of total alcohol advertising "impressions" (individual exposures to advertising) met the standard. When advertising exposure data were aggregated across companies and measured media, about 86 percent of the alcohol advertising audience consisted of legal-age adults.[25]

Youth Drinking Is Correlated with Adult Drinking Practices

Generational transmission has been widely hypothesized as one factor shaping the alcohol consumption patterns of young people. Whether through genetics, social learning, or cultural values and community norms, researchers have repeatedly found a correlation between youth drinking practices and those of their adult relatives and other community adults (SAMHSA, 2008). Nelson and colleagues (2009) demonstrated this relationship at the population (state) level. State estimates of youth and adult current drinking and binge drinking from 1993 through 2005 were significantly correlated when pooled across years. These results suggest that some policies that primarily affect adult drinkers (e.g., pricing and taxation, hours of sale, on-premises drink promotions) may affect underage drinking.

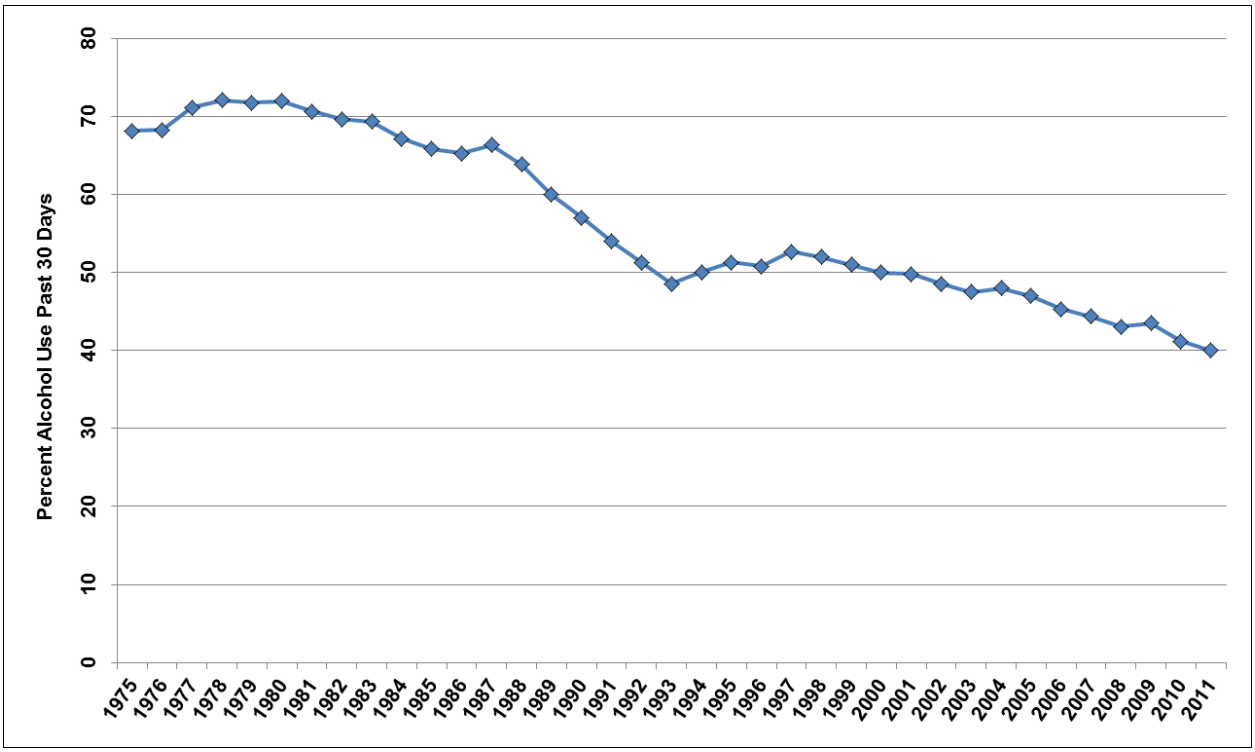
Despite Meaningful Progress, Underage Drinking Remains Unacceptably High

Available data from 1975 to 2011 document that the prevalence of drinking among 12th graders peaked in 1978 for lifetime use and past-year use (Johnston et al., 2012a). Lifetime alcohol use among 12th graders in 2006 showed a statistically significant decline from 2005, dropping from 75.1 percent to 72.7 percent (Johnston, O'Malley, Bachman, & Schulenberg, 2007). Levels of lifetime alcohol use remained steady from 2007 to 2011 (Johnston et al., 2009a, 2012a). Past-month use among 12th graders increased from 1975 to 1978, decreased slightly from 1978 to 1988, decreased from 1988 to 1993, increased from 1993 to 1997, decreased from 1997 to 2002, remained steady from 2002 to 2005, and has decreased slightly since then (Johnston et al., 2009a,c; 2012a) (Exhibit 2.16).

Binge drinking in the past 2 weeks among 12th graders peaked in 1981, held steady in 1982, and then declined from 40.8 percent in 1983 to a low of 27.5 percent in 1993—a decrease of almost one third, and thus a significant improvement (Johnston et al., 2009a). From 1993 to 1998, binge drinking rose by about 4 percentage points among 12th graders. After increasing to 32 percent in 1998, the rate among 12th graders dropped to 25 percent by 2006, where it remained through 2009; it then declined significantly to 22 percent by 2011—a new low (Johnston et al., 2012a). An upward drift in binge drinking among 8th graders occurred from 1991 (10.9 percent) to 1996 (13.3 percent) and among 10th graders from 1991 (21.0 percent) to 2000 (24.1 percent). After those peaks, a slight decline in binge use occurred in all three grades until 2002, when rates fell

[25] For more information, see *Self-Regulation in the Alcohol Industry* (FTC, 2008), available at http://www.ftc.gov/os/2008/06/080626alcoholreport.pdf.

Exhibit 2.16: Trends in 30-Day Prevalence of Alcohol Use for 12th Graders, 1975–2011 (Johnston et al., 2012a)



appreciably. Since 2002, there have been statistically significant declines in binging for all three grades (Johnston et al., 2012a). Faden and Fay (2004) examined similar underage drinking data from NSDUH, MTF, and YRBS from 1990 to 2002. Trend analyses "show a pattern of relative stability or decreases in the late 1990s and early 2000s for all groups on all measures with the exception of daily drinking by 10th graders in MTF and drinking five or more drinks in a row by 10th graders in YRBS" (Faden & Fay, 2004, p. 1393). These authors continue: "these results considered together offer stronger support for the finding of stability or decrease in youth drinking prevalence in the past 10 years or so than results from any one survey do by themselves." More recent analyses of the same data sources (Chen, Yi, & Faden, 2011) show continued declines in past-month and binge alcohol use through 2009.

These results are encouraging. Meaningful progress is being made. However, as the following sections demonstrate, the consequences of underage drinking remain a substantial threat to public health. From this perspective, the prevalence of alcohol use by persons under age 21 remains unacceptably high.

Consequences and Risks of Underage Drinking

Underage drinking is a problem for individuals and society. Underage drinking is a threat to public health and safety, with profound consequences for youth, their families, and their communities. According to the *Call to Action*, about 5,000 people under age 21 die annually from alcohol-related injuries involving underage drinking. Underage drinking also results in enormous economic costs. In 2006, almost $24.6 billion (about 11 percent) of the total $223.5

billion economic costs of excessive alcohol consumption were related to underage drinking. The costs largely resulted from losses in workplace productivity (58 percent of the total cost), law enforcement and other criminal justice expenses related to excessive alcohol consumption (19 percent of the total cost), health care expenses for problems caused by excessive drinking (15 percent of the total cost), and motor vehicle crash costs from impaired driving (6 percent of the total cost). Most productivity losses (28 percent) were due to deaths from alcohol-attributable conditions involving underage youth (Bouchery et al., 2011).

Underage drinking is a complex problem that results in a range of adverse short- and long-term consequences. The following sections describe some of these negative consequences, which include the negative effects of alcohol consumption on underage drinkers and consequences for those around them (referred to as secondary effects of underage alcohol use).

Alcohol-Related Motor Vehicle Traffic Crashes

The greatest mortality risk for underage drinkers is motor vehicle crashes. In 2010, of the 1,936 drivers ages 15 to 20 who were killed in motor vehicle traffic crashes:

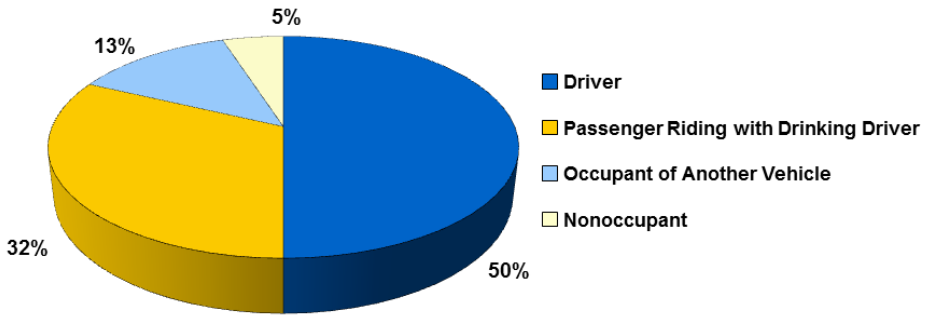
- 587 (30 percent) had a BAC of 0.01 or higher.
- 97 (5 percent of all fatally injured drivers this age) had a BAC of 0.01 to 0.07 g/dL.
- 490 (25 percent of fatally injured drivers this age) had a BAC of 0.08 g/dL or higher (NHTSA FARS, 2010).

In 2010, of the 373 nonoccupants (pedestrians and pedal cyclists) in the 15- to 20-year-old age group killed in motor vehicle traffic crashes, 85 (23 percent) had a BAC of 0.01 g/dL or higher, 13 (3 percent of all nonoccupant fatalities this age) had a BAC of 0.01–0.07 g/dL, and 72 (19 percent of nonoccupant fatalities this age) had a BAC of 0.08 g/dL or higher (NHTSA FARS, 2010). Relative to adults, young people who drink and drive have an increased risk of alcohol-related crashes because of their increased impairment from a given amount of alcohol and, perhaps because of their relative inexperience behind the wheel. One study found that a BAC of 0.08 g/dL rendered adult drivers in all age and gender groups 11 times more likely than sober drivers to die in a single-vehicle crash. In a classic paper, Zador (1991) reported that in 16- to 20-year-olds, a BAC of 0.08 g/dL rendered male drivers 52 times more likely and female drivers 94 times more likely than sober gender-matched drivers the same age to die in a single-vehicle fatal crash.

The distribution of fatalities in motor vehicle traffic crashes involving a 15- to 20-year-old driver with a BAC of 0.08 g/dL or higher by person type in 2010 is shown in Exhibit 2.17.

According to 2011 NSDUH survey data, about 3.6 percent of 16-year-olds, 6.7 percent of 17-year-olds, 10.0 percent of 18-year-olds, 14.2 percent of 19-year-olds, and 16.5 percent of 20-year-olds reported driving under the influence of alcohol at least once in the past year (SAMHSA, detailed tables, 2012b). In general, the reported prevalence of driving under the influence of alcohol increases with age until about age 25, although there is some variation among survey years. For example, according to the 2010 NSDUH data, prevalence of driving under the influence of alcohol peaked at age 22, and then declined for older persons. Overall, 24.1 percent of high school students in the 2011 YRBS had, in the past 30 days, ridden with a driver who had been drinking; 27.7 percent of seniors had done so (CDC, 2012).

Exhibit 2.17: Distribution of Fatalities in Motor Vehicle Traffic Crashes Involving a 15- to 20-Year-Old Driver with a BAC of 0.08 or Higher by Person Type in 2010 (NHTSA FARS, 2010)



Other Unintentional Injuries such as Burns, Falls, and Drowning

Motor vehicle traffic crashes, homicide, and suicide are the three leading causes of death among youths ages 12 to 20 (Exhibit 2.18). In addition to motor vehicle crashes, underage drinking contributes to all major causes of fatal and nonfatal trauma experienced by young people. In 2009, 2,410 youths ages 12 to 20 died from unintentional injuries other than motor vehicle crashes, such as poisoning, drowning, falls, burns (CDC, 2011). Research suggests that about 40 percent of these deaths were attributable to alcohol (Smith, Branas, & Miller, 1999).

Suicide, Homicide, and Violence

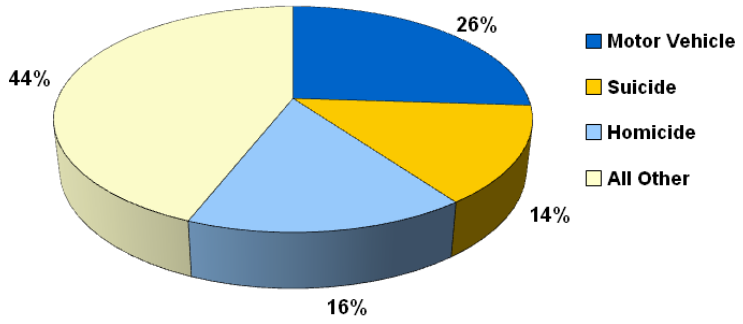
Data from 17 states shows that among suicide decedents tested who were ages 10 to 19 (all of whom were under the legal drinking age in the United States), 12 percent had BACs >0.08 g/dL (Crosby et al., 2009). One study (Smith et al., 1999) estimated that, for the population as a whole, nearly a third (31.5 percent) of homicides and almost a quarter (22.7 percent) of suicides were attributable to alcohol (i.e., involved a decedent with a BAC of 0.10 g/dL or greater). Another study focused on youth suicide estimated that 9.1 percent of hospital-admitted suicide acts by those under 21 years old involved alcohol and that 72 percent of these cases were attributable to alcohol (Miller et al. 2006).

Police and child protective services records suggest that those under age 21 commit 30 percent of murders, 31 percent of rapes, 46 percent of robberies, and 27 percent of other assaults (Miller et al., 2006). As the authors note, relying on victim reports rather than agency records would yield higher estimates. For the population as a whole, an estimated 50 percent of violent crime is related to alcohol use by the perpetrator (Harwood, Fountain, & Livermore, 1998). The degree to which violent crimes committed by those under 21 are alcohol related is yet unknown.

Years of Potential Life Lost Due to Alcohol

Approximately 30 years of potential life are lost for persons with an alcohol-attributable death across all age groups (CDC, 2004). By comparison, each person who dies from cancer loses an average of 15 years of life, and each person who dies from heart disease loses an average of 11 years of life (Ries et al., 2003). Persons under age 21 who die as a result of alcohol use lose an average of 60 years of potential life (CDC, 2011).

Exhibit 2.18: Leading Causes of Death for Youth Ages 12–20: 2009 (CDC WISQARS, 2012)[26]



Risky Sexual Activity

According to the Surgeon General's *Call to Action*, underage drinking plays a significant role in risky sexual behavior, including unwanted, unintended, and unprotected sexual activity, as well as sex with multiple partners. Such behavior increases the risk for unplanned pregnancy and for contracting sexually transmitted diseases (STDs), including infection with HIV, the virus that causes AIDS (Cooper & Orcutt, 1997). When pregnancies occur, underage drinking may result in fetal alcohol spectrum disorders (FASDs), including fetal alcohol syndrome, which remains a leading cause of mental retardation (Warren & Bast, 1988; Stratton, Howe, & Battaglia, 1996; Jones, Smith, Ulleland, & Streissguth, 1973). A review article by Nolen-Hoeksema cites a number of studies suggesting that underage drinking by both victim and assailant increases the risk of physical and sexual assault (Nolen-Hoeksema, 2004; Abbey, 2011).

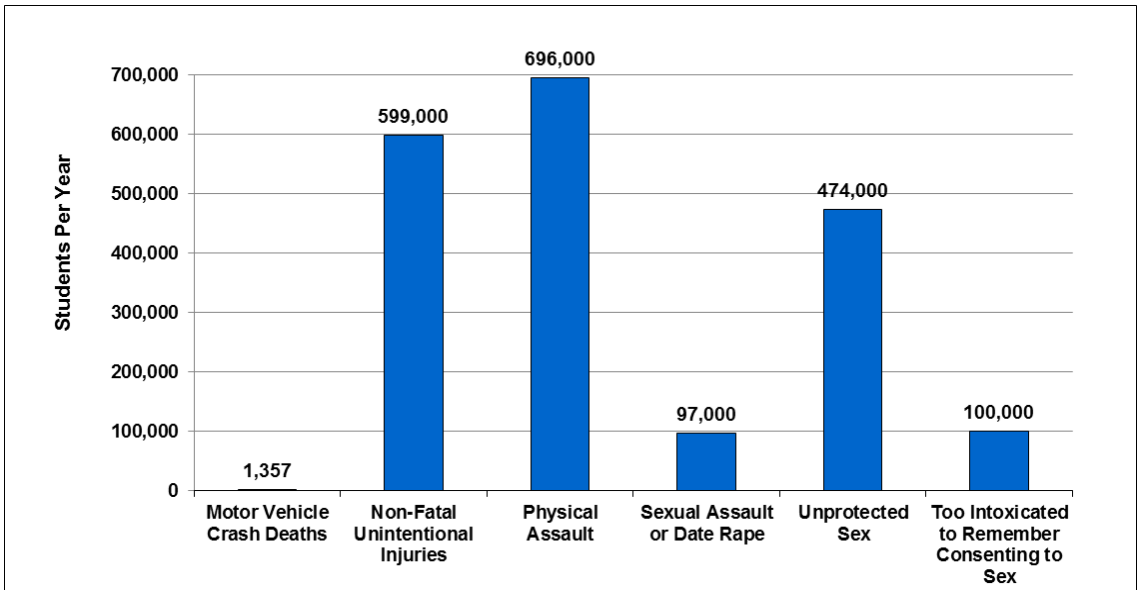
Adverse Consequences of College Drinking

One NIAAA-funded study (Abbey et al., 1996) reported that over half of college women respondents had experienced some form of sexual assault. Slightly less than one third of these assaults were characterized by respondents as attempted or completed rapes. However, the incidence of college sexual assaults is difficult to measure, and different studies report different rates. A review by Abbey (2011) of three relevant studies (Abbey et al, 2004; Seto and Barbaree, 1995; Testa, 2002) concludes that approximately half of all reported and unreported sexual assaults involve alcohol consumption by the perpetrator, victim, or both, Abbey further reports that, typically, if the victim consumes alcohol, the perpetrator does as well. Estimates of perpetrators' intoxication during the incident ranged from 30 percent to 75 percent.

Many other adverse social consequences are linked with college alcohol consumption. Hingson and colleagues (2009) estimated that annually more than 696,000 college students were assaulted or hit by another student who had been drinking; another 599,000 were unintentionally injured while under the influence of alcohol. Research suggests that roughly 474,000 students ages 18 to 24 have unprotected sex due to drinking, and each year more than 100,000 students ages 18 to 24 report having been too intoxicated to know if they consented to having sex (Exhibit 2.19). Approximately 25 percent of college students report academic consequences as a result of their

[26] CDC's web-based Injury Statistics Query and Reporting System (WISQARS) is an interactive database system that provides customized reports of injury-related data.

Exhibit 2.19: Prevalence of Alcohol-Related Morbidity and Mortality among College Students Ages 18–24 (calculated using methods presented in Hingson et al., 2005, 2009)



drinking, including missing class, falling behind, doing poorly on exams or papers, and receiving lower grades overall. About 11 percent of college student drinkers report having damaged property while under the influence of alcohol (Hingson et al., 2005).

Potential Brain Impairment

Adverse effects on normal brain development are a potential long-term risk of underage alcohol consumption. Neurobiological research suggests that adolescence may be a period of unique vulnerability to the effects of alcohol. For example, early heavy alcohol use may have negative effects on the actual physical development of the brain structure of adolescents (Brown & Tapert, 2004), as well as on brain functioning. Negative effects indicated by neuropsychological studies include decreased ability in planning, executive functioning, memory, spatial operations, and attention, all of which play important roles in academic performance and future levels of functioning (Giancola & Mezzich, 2000; Brown, Tapert, Granholm, & Dellis, 2000; Tapert & Brown, 1999; Tapert et al., 2001). As Brown and colleagues (2000) note, these deficits may put alcohol-dependent adolescents at risk for falling farther behind in school, putting them at an even greater disadvantage relative to nonusers. Some of these cross-sectional findings are supported by longitudinal analyses (Squeglia, Jacobus, & Tapert, 2009).

Impaired Academic Performance

Underage drinking including binge drinking affects academic performance. Students who reported binge drinking were three times more likely to report earning mostly Ds and Fs on their report cards compared with non–binge drinkers (Miller, Naimi, Brewer, & Jones, 2007).

Increased Risk of Developing an Alcohol Use Disorder Later in Life

Early-onset alcohol use (14 or younger), alone and in combination with escalated drinking in adolescence, has been noted in several studies as a risk factor for the development of alcohol-

related problems in adulthood (Agrawal et al., 2009; Dawson et al., 2008; Grant & Dawson, 1997; Gruber, DiClemente, Anderson, & Lodico, 1996; Hawkins et al., 1997; Schulenburg, O'Malley, Bachman, Wadsworth, & Johnston, 1996; York, Welte, Hirsch, Hoffman, & Barnes, 2004). Grant and Dawson (1997) found that more than 40 percent of persons who initiated drinking before age 13 met diagnostic criteria for alcohol dependence at some time in their lives. By contrast, alcohol dependence rates among those who started drinking at ages 17 and 18 were 24.5 percent and 16.6 percent, respectively (Exhibit 2.20). Data from the 2009–2011 NSDUH survey suggest a similar relationship between age of initiation and development of alcohol-related problems. Only 10 to 11 percent of persons who started at age 21 or older met the criteria.

The onset of alcohol consumption in childhood or early adolescence is a marker for later alcohol-related problems, including heavier adolescent use of alcohol and other drugs (Robins & Przybeck, 1985; Hawkins et al., 1997). Adults who started drinking at age 14 were three times more likely to report driving after drinking too much ever in their lives than were those who began drinking after age 21. Crashes were four times as likely for those who began drinking at age 14 as for those who began drinking after age 21 (Hingson, Heeren, Levenson, Jamanka, & Voas, 2001). Children of parents who binge are twice as likely to binge themselves and to meet alcohol dependence criteria.

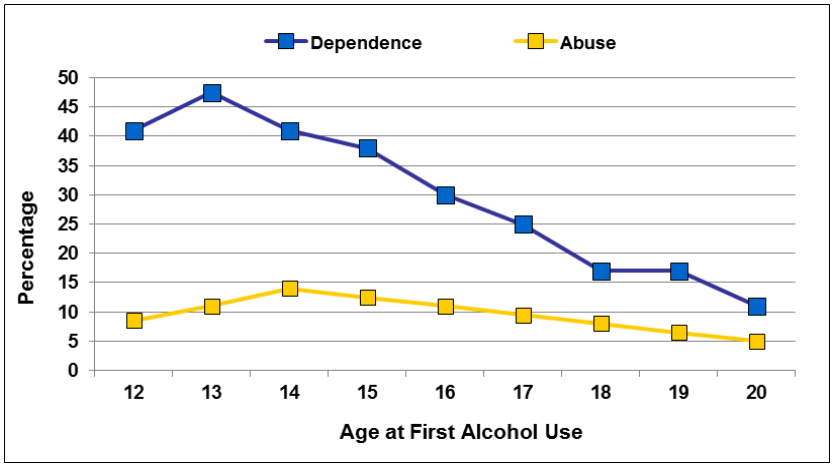
Underage Drinking: A Developmental Phenomenon

As the Acting Surgeon General wrote in the introduction to the *Call to Action*:

> …the latest research also offers hopeful new possibilities for prevention and intervention by furthering our understanding of underage alcohol use as a developmental phenomenon—as a behavior directly related to maturational processes in adolescence. New research explains why adolescents use alcohol differently from adults, why they react uniquely to it, and why alcohol can pose such a powerful attraction to adolescents, with unpredictable and potentially devastating outcomes.

This understanding of underage alcohol use as a developmental phenomenon is one of the major themes of the *Call to Action* and is an important concept in this report.

Exhibit 2.20: Ages of Initiation and Levels of DSM Diagnoses for Abuse and Dependence (Grant & Dawson, 1997)

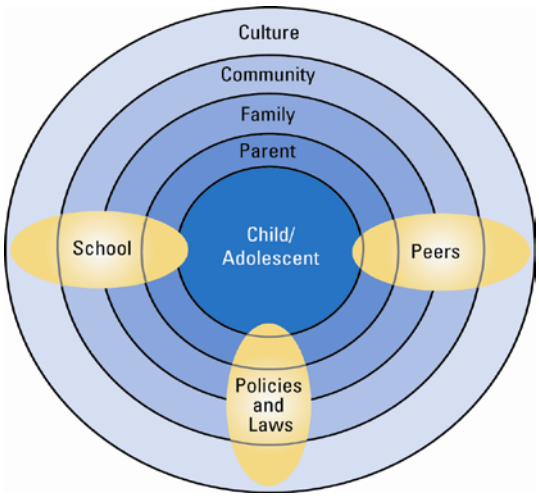


Adolescence is the period between the onset of puberty[27] and the assumption of adult roles. It is a time of particular vulnerability to alcohol use and its consequences for a variety of developmental reasons, some specific to the individual and others related to the biological and behavioral changes produced by adolescence itself. In addition, alcohol can present a special allure to some adolescents for social, genetic, psychological, and cultural reasons. Recent advances in the fields of epidemiology, developmental psychopathology, human brain development, and behavioral genetics have provided new insights into adolescent development and its relationship to underage alcohol use.

Adolescent alcohol consumption is a complex behavior influenced by multiple factors, including the normal maturational changes that all adolescents experience; the various social and cultural contexts in which adolescents live (e.g., family, peers, and school); genetic, psychological, and social factors specific to each adolescent; and environmental factors that influence the availability and appeal of alcohol (e.g., enforcement of underage alcohol policies, marketing practices, and media exposure). Biological factors internal to the adolescent, such as genes and hormones, interact with factors external to the adolescent, such as peers, school, and the overall culture, in determining whether and to what extent an adolescent will use alcohol. Internal and external factors influence each other in reciprocal ways as the adolescent's development unfolds over time. Youths are not uniformly at risk for alcohol consumption nor are they uniformly at risk over the span of their own adolescence.

An important aspect of understanding the adolescent attraction to alcohol, as well as the means by which its use can be prevented or reduced, is appreciating the significant influence of the many social systems in which adolescents operate. These different social systems both influence adolescents and are, in turn, influenced by adolescents (Bronfenbrenner, 1979). As shown in Exhibit 2.21, these systems include the adolescent's family, peers, school, extracurricular and

Exhibit 2.21: Systems That Influence Adolescent Behavior (HHS, 2007)



[27] For the purpose of this report, puberty is defined as a sequence of events by which a child becomes a young adult characterized by secretions of hormones, development of secondary sexual characteristics, reproductive functions, and growth spurts.

community activities, sports teams and clubs, religious institutions, other diverse organizations with which the adolescent interacts, part-time work, the community itself, the culture, and even influences from around the world accessed through the internet and other electronic resources. Each social system exposes the adolescent to both positive and negative influences, potentially increasing or decreasing the adolescent's risk of alcohol use. These multiple systems interact and may reinforce or counteract each other. Exhibit 2.21 represents the multiple systems in which adolescents are embedded. Their relative influences vary across development.

Each system may affect an adolescent's decision to use alcohol. To protect adolescents properly from alcohol use, parents and other adults must be involved in multiple social systems as individuals, citizens, and voters. By understanding the roles these systems play in the teen's life and by acting strategically on the basis of established and emerging research, parents, other adults, and the nation can reduce the risk and consequences of underage alcohol use.

An understanding of underage alcohol use as a developmental phenomenon sheds significant light on the particular vulnerabilities of adolescents to alcohol use, as well as protective measures likely to prevent and reduce underage drinking. Some of the most important developmental findings included in the *Call to Action* are discussed below.

The Developing Adolescent Brain

During adolescence, dramatic changes to the brain's structure, neuron connectivity ("wiring"), and physiology occur (Restak, 2001). These changes affect everything from emerging sexuality to emotionality and judgment. However, not all parts of the brain mature at the same time. Differences in maturational timing across the brain can result in impulsive decisions or actions, disregard for consequences, and emotional reactions that can lead to alcohol use or otherwise put teenagers at serious risk.

Stress and Adolescent Transitions

The physical effects of puberty create dramatic changes in the sexual and social experiences of maturing adolescents that require significant psychological and social adaptation, creating stress that may contribute to increased consumption of alcohol during the adolescent period (Tschann et al., 1994). In graduating from elementary to middle school, from middle to high school, and from high school to college or the workplace, adolescents face new stressors. Research shows a link between stress and alcohol consumption. For example, research on nonhuman primates shows that adolescent monkeys double their alcohol intake under stress and that excessive alcohol consumption is related to changes in stress hormones and serotonin (Barr et al., 2004).

Personality Traits

Studies of adolescent drinking have repeatedly failed to find specific sets of personality traits that uniquely predict alcohol use in adolescents. Nonetheless, research does show that adolescents who use alcohol heavily or have alcohol use disorders (AUDs) do exhibit certain shared personality traits (also shared by some adolescents who do not abuse alcohol). High levels of impulsiveness, aggression, conduct problems, novelty seeking (Gabel et al., 1999); low harm avoidance (Jones & Heaven, 1998); and other risky behaviors in childhood and early adolescence may be associated with future heavy alcohol use and AUDs (Soloff et al., 2000).

Mental Disorders

Depression and anxiety are risk factors for alcohol problems because some people drink to cope with internal distress. Adolescents with defined mental disorders have significantly elevated rates of alcohol and other drug use problems. Because many young people are involved not only with alcohol but also with other substances, and may also have a co-occurring mental disorder, interventions should be designed to address this complexity.

Adolescents from Families with a Family History of Alcohol Dependence

Children whose families include individuals who abuse alcohol are at increased risk for alcohol dependence throughout their lives. Genes account for over half of the risk for alcohol dependence; environmental factors account for the rest. However, no single gene accounts for the majority of risk. The development of a complex behavioral disorder such as alcohol dependence likely depends on specific genetic factors interacting with one another, multiple environmental factors, and the interaction between genetic and environmental factors. Research suggests that genes have a stronger influence on the development of problematic use, whereas environment seems to play a greater role in initiation of use (Rhee et al., 2003). The current college environment may increase the likelihood that persons with genetic predispositions to alcohol use disorders will have those predispositions expressed (Timberlake et al., 2007).

Sensitivity to Effects of Alcohol Use

Animal research indicates that adolescents in general are more sensitive than adults to the stimulating effects of alcohol and less sensitive to some of the aversive effects of acute alcohol intoxication, such as sedation, hangover, and ataxia (loss of muscular coordination) (Doremus et al., 2003; Little et al., 1996; Silveri & Spear, 1998; Varlinskaya & Spear, 2004; White et al., 2002; for review, see Spear, 2000, and Spear & Varlinskaya, 2005). This differing sensitivity may make adolescents more vulnerable to certain harmful effects of alcohol use. For example, adolescents are able to drink more than adults (who might pass out or be inclined to go to sleep) and therefore are more likely than adults to initiate activities when they are too impaired to perform them competently, such as driving. They are also more likely to drink to the point of coma. Furthermore, in the case of driving, each drink increases impairment more for adolescents than for adults (Hingson & Winter, 2003). Children whose parents abuse alcohol may be at even greater risk for excessive drinking resulting from a combination of genetic and developmental factors that lower their sensitivity to alcohol.

These issues are reviewed in detail in *Underage Drinking: Understanding and Reducing Risk in the Context of Human Development*, a special supplement of the journal *Pediatrics* (2008).

Intervening Amidst Complexity

Underage alcohol use is a highly complex phenomenon driven by a variety of interacting factors. A developmental approach to preventing and reducing underage alcohol use takes into account these complex forces and factors that determine an adolescent's decision to use or not use alcohol. Complex interactions among biological, social, cultural, and environmental factors evolve as maturation proceeds; thus, the same adolescent at age 13 and later at age 17 will have different developmental needs and require different protective structures and skills to avoid using alcohol. To further complicate matters, periods of rapid transition, reorganization, and growth

spurts alternate with periods of quiet and consolidation—all within a changing social context. A developmental approach to the prevention and reduction of underage drinking recognizes the importance of all environmental and social systems that affect adolescents, as well as adolescents' maturational processes and individual characteristics.

An advantage of understanding underage alcohol use as a developmental phenomenon is the unique insight it provides into risk and protective factors. Although the problem of underage drinking is complex, it is not insurmountable. A developmental approach makes clear the need for a coordinated national effort to prevent and reduce underage drinking and for the active involvement of both public and private sectors as well as parents, other caregivers, and other adults. Success in solving a public health and safety problem as complex as underage drinking will require the engagement of every American, as the *Call to Action* puts it, "in a national effort to address underage drinking early, continuously, and in the context of human development. Underage alcohol use is everybody's problem—and its solution is everybody's responsibility."

Conclusion

As the data in this chapter demonstrate, characteristics of underage drinking such as age of initiation, current usage, and amounts consumed have fluctuated over the years. There is cause for some optimism, as the average age of first use has slowly risen, while binge-drinking rates show a gradual decline. Nevertheless, the overall rates of underage drinking remain unacceptably high, with the ability of youth to gain access to alcohol remaining relatively easy, particularly during the college years. The risks associated with this access are profound, resulting in traffic fatalities, injuries, suicides and homicides, and risky sexual behavior, as well as adverse effects on brain development and academic performance.