

CHAPTER 2

The Nature and Extent of Underage

Drinking in America

This document is excerpted from:

The September 2016 Report to Congress on the Prevention and Reduction of Underage Drinking

Introduction

Underage drinking and its associated problems have profound negative consequences not just for underage drinkers themselves, but also for 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, 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 4,300 deaths among underage youths in the United States every year, shortening their lives by an average of 60 years (Stahre et al., 2014).

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. In spite of increasing public recognition of the devastating consequences of underage alcohol use and its personal, economic, and social costs, underage drinking remains a serious problem. In fact, for those under 21 years old, alcohol accounts for more deaths than all other illicit drugs combined.

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 healthcare 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; the annual Monitoring the Future (MTF) survey (conducted pursuant to federal grants);¹⁹ 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, National Epidemiologic Survey on Alcohol and Related Conditions, National Health Interview Survey, 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 B.

¹⁹ Please note that for comparability with the 2014 NSDUH and 2013 YRBS data (the most recent data available), the latest MTF data included in the report are also from 2014. The 2015 MTF data, available in December 2015, will be included in the next report.

Characteristics of Underage Drinking in America

Underage alcohol use in the United States 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 the United States are described in the following paragraphs.

Underage Alcohol Use Is Widespread

Underage alcohol use in the United States is a widespread and serious problem:

- **Current Use:** The 2014 NSDUH reported that approximately 22.8 percent of Americans ages 12 through 20 (about 8.7 million people) reported having at least one drink in the 30 days prior to the survey interview. Of this age group, 13.8 percent (5.3 million) were binge drinkers (five or more drinks on the same occasion, either at the same time or within a couple of hours) on at least 1 day in the past 30 days. Approximately 3.4 percent of this age group (1.3 million) were heavy drinkers (five or more drinks on the same occasion on each of 5 or more days in the past 30 days). By definition, all heavy alcohol users are also binge alcohol users (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015a).
- **Lifetime Use:** The 2014 MTF showed that 66.0 percent of 12th graders, 49.3 percent of 10th graders, and 26.8 percent of 8th graders have had alcohol at some point in their lives²⁰ (Miech, Johnston, O'Malley, Bachman, & Schulenberg, 2015; see Exhibit 2.1).
- **Binge Use:** The 2014 NSDUH showed that 2.3 percent of 14-year-olds, 10.8 percent of 16-year-olds, 23.8 percent of 18-year-olds, and 34.6 percent of 20-year-olds engaged in binge drinking within the past 30 days (CBHSQ, 2015a).
- **Heavy Use:** The 2014 NSDUH data showed that 1.7 percent of 16-year-olds, 5.9 percent of 18-year-olds, and 10.3 percent of 20-year-olds consumed alcohol heavily in the past 30 days (CBHSQ, 2015a).
- **Lifetime Use to Intoxication:** In the 2014 MTF, 49.8 percent of 12th graders, 30.2 percent of 10th graders, and 10.8 percent of 8th graders reported having been drunk²¹ at least once (Miech et al., 2015).

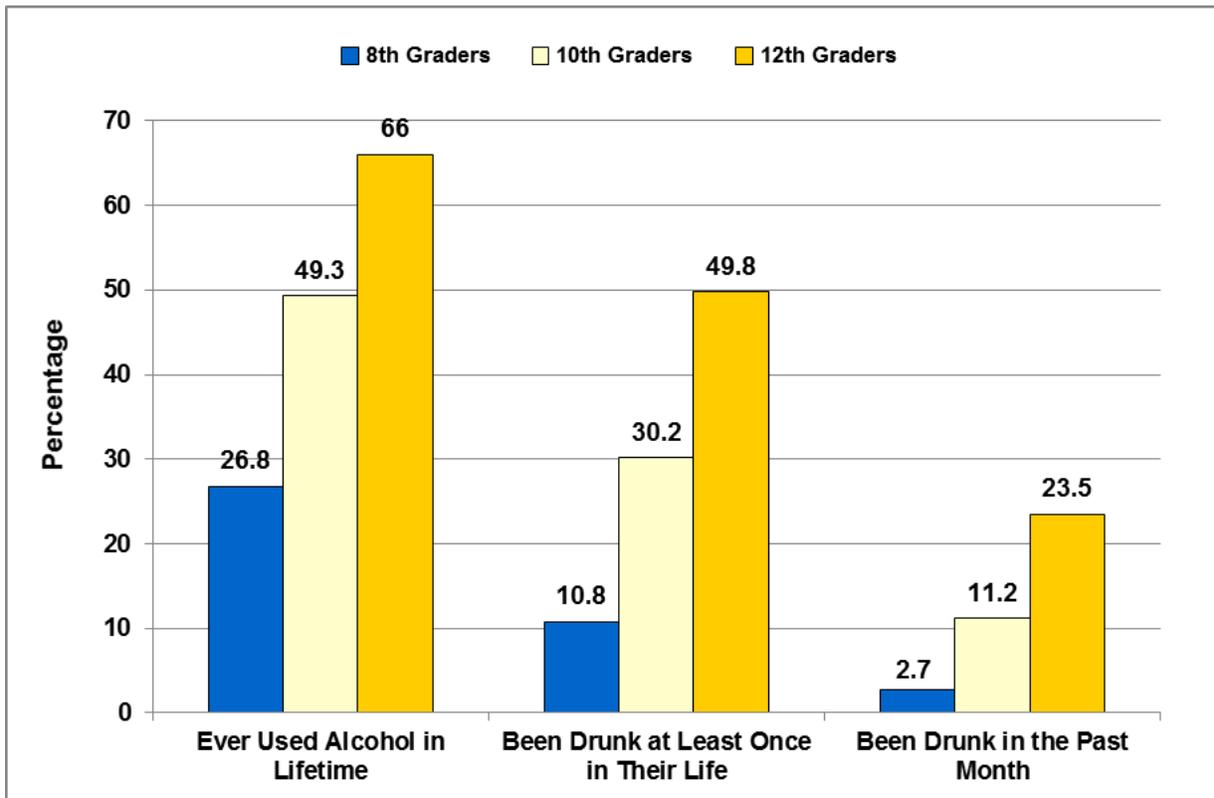
Alcohol Is the Most Widely Used Substance of Abuse among American Youth

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 (Miech et al., 2015).

²⁰ Lifetime alcohol use in this survey is defined as “having more than a few sips.”

²¹ 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, Lifetime Use to Intoxication, and Use to Intoxication Within the Past Month among 8th, 10th, and 12th Graders: 2014 (Miech et al., 2015)



Youths Start Drinking at an Early Age

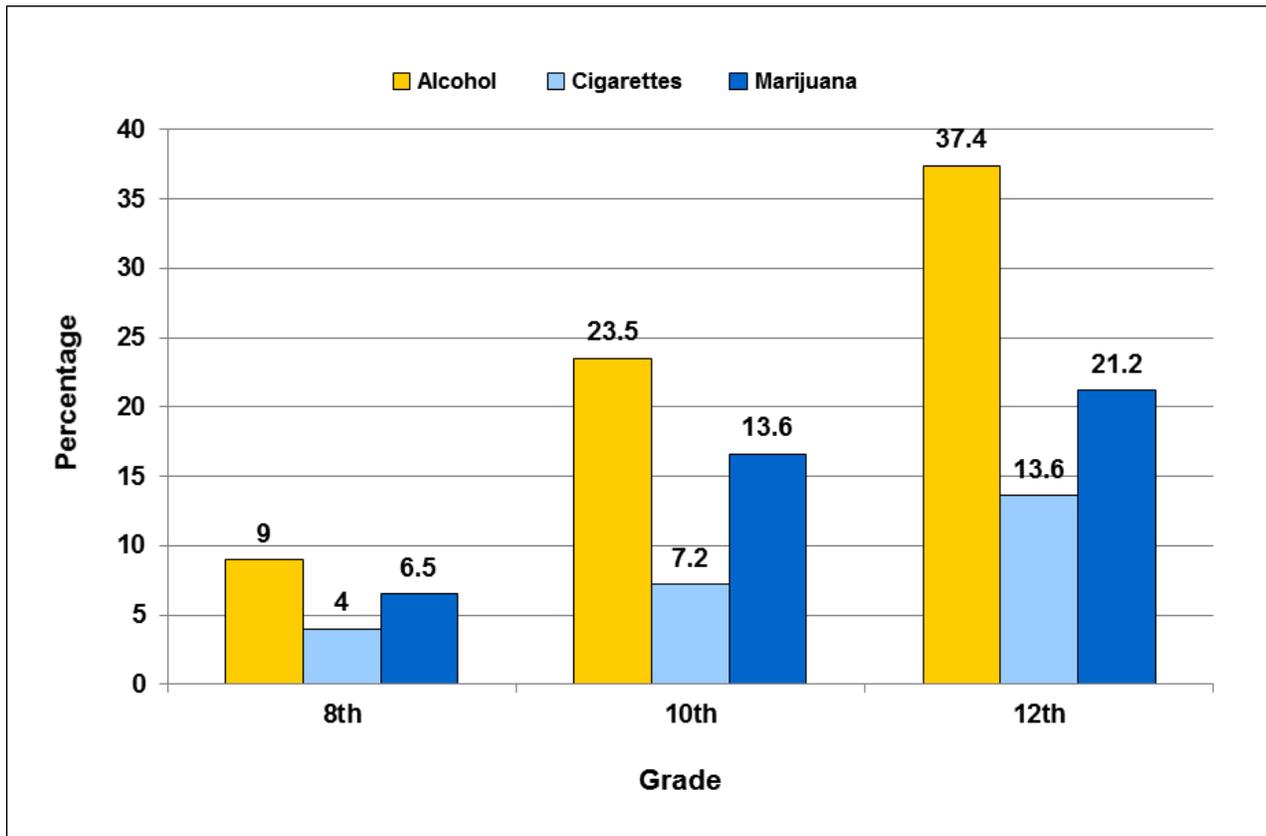
Drinking often begins at very young ages. Surveys indicate that approximately:

- Ten percent of 9- to 10-year-olds have already started drinking (Donovan et al., 2004).²²
- Almost one fifth of underage drinkers begin drinking before age 13 (Kann et al., 2014).
- Peak years of initiation are 7th through 11th grades, based on data from high school seniors (Miech et al., 2015).

Among those who initiated alcohol use in the past year, 783,000 reported being ages 12 to 14 when they initiated. This translates to approximately 2,144 youths ages 12 to 14 who initiated alcohol use per day in 2014 (CBHSQ, 2015c). Youth 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, Caetano, Goebert, & Nishimura, 2004; Ramisetty-Mikler, Goebert, Nishimura, & Caetano, 2006); criminal behavior (Eaton, Davis, Barrios, Brener, & Noonan, 2007); prescription drug misuse (Hermos, Winter, Heeren, & Hingson, 2008); unplanned and unprotected sex (Hingson, Heeren, Winter, & Wechsler, 2003); motor vehicle crashes (Hingson, Heeren, Levenson, Jamanka, &

²² Drinking is defined as having more than a few sips.

Exhibit 2.2: Past-Month Adolescent Alcohol, Cigarette, and Marijuana Use by Grade: 2014 (Miech et al., 2015)



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 drugs during adolescence (Hawkins et al., 1997; Robins & Przybeck, 1985; Buchmann et al., 2009; Liang & Chikritzhs, 2015) 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 of those who started using alcohol before 7th grade generally declined from 1998 to 2014, suggesting a possible delay in the age at first use (Miech et al., 2015).

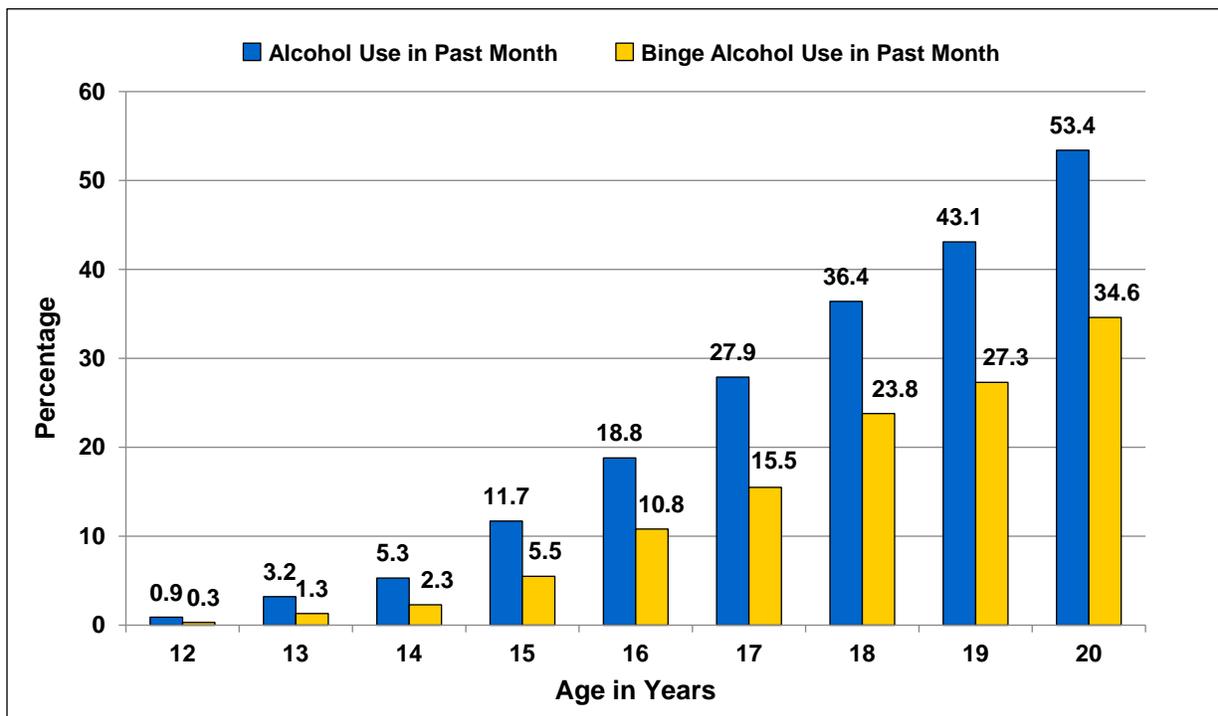
SAMHSA revised its methodology to provide more timely estimates that more accurately assess trends in average age at first use and other measures of initiation, such as incidence rates. Average age of first use is now calculated based on initiation within the past 12 months. By this new method, NSDUH 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 there was 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 was higher than all estimates from 2004 through 2009). Average age of first use then remained stable in 2011 and 2012 (15.9 years in 2011 and 16.0 years in 2012) before another statistically significant increase in 2013 (16.2 years). Age of

first use remained stable in 2014 at 16.2 years (SAMHSA, 2014b). 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, 17.6 in 2008, 17.1 in 2009, 18.0 in 2010, 17.3 in 2011, 17.6 in 2012, 17.3 in 2013, and 17.6 in 2014 (CBHSQ, 2015c). Appendix B further discusses methodological issues in measuring age at first use and other indicators of alcohol initiation.

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 2014 NSDUH reported that underage alcohol consumption in the past month increased with age from 0.9 percent for 12-year-olds to 53.4 percent for 20-year-olds; past-month alcohol consumption across all age groups peaked at 71.2 percent for 21-year-olds (CBHSQ, 2015a). Binge drinking also increased steadily between ages 12 and 20 (Exhibit 2.3), peaked at age 21 (47.1 percent), and then decreased beyond young adulthood (data not shown; CBHSQ, 2015b). Approximately 5.3 million (13.8 percent) of 12- to 20-year-olds reported past-month binge alcohol use (CBHSQ, 2015b).

Exhibit 2.3: Current and Binge Alcohol Use Among People Ages 12–20 by Age: 2014 (CBHSQ, 2015b)



Youth Binge More and Drink More Than Adults When They Drink

Young drinkers tend to drink less often than adults; when they do drink, however, they drink more heavily. Underage drinkers consume, on average, about four and a half drinks per occasion, five times a month, whereas adult drinkers 26 and older average three drinks per occasion, nine times a month (Exhibit 2.4). Youths ages 12 to 15 can theoretically reach the same blood alcohol level (BAC) after consuming three to four drinks within 2 hours as adults ages 18 and older who consume four to five drinks during this same time period (Donovan, 2009).

When asked about the number of drinks consumed on their last occasion of alcohol use in the past month, for 2013 and 2014 combined, 24.5 percent of underage drinkers reported one drink; 18.5 percent, two drinks; 25.1 percent, three or four drinks; 22.7 percent, five to eight drinks; and 9.1 percent, nine or more drinks (CBHSQ, 2015c). 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 (CBHSQ, 2015c).

Particularly worrisome among underage drinkers is the high prevalence 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 2014, 4.1 percent of 8th graders, 12.6 percent of 10th graders, and 19.4 percent of 12th graders reported heavy episodic drinking (Miech et al., 2015). In 2014, about 1.3 million youth ages 12 through 20 (3.4 percent) drank five or more drinks on a single occasion 5 or more days a month (CBHSQ, 2015a).

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): 2014 (CBHSQ, 2015c)

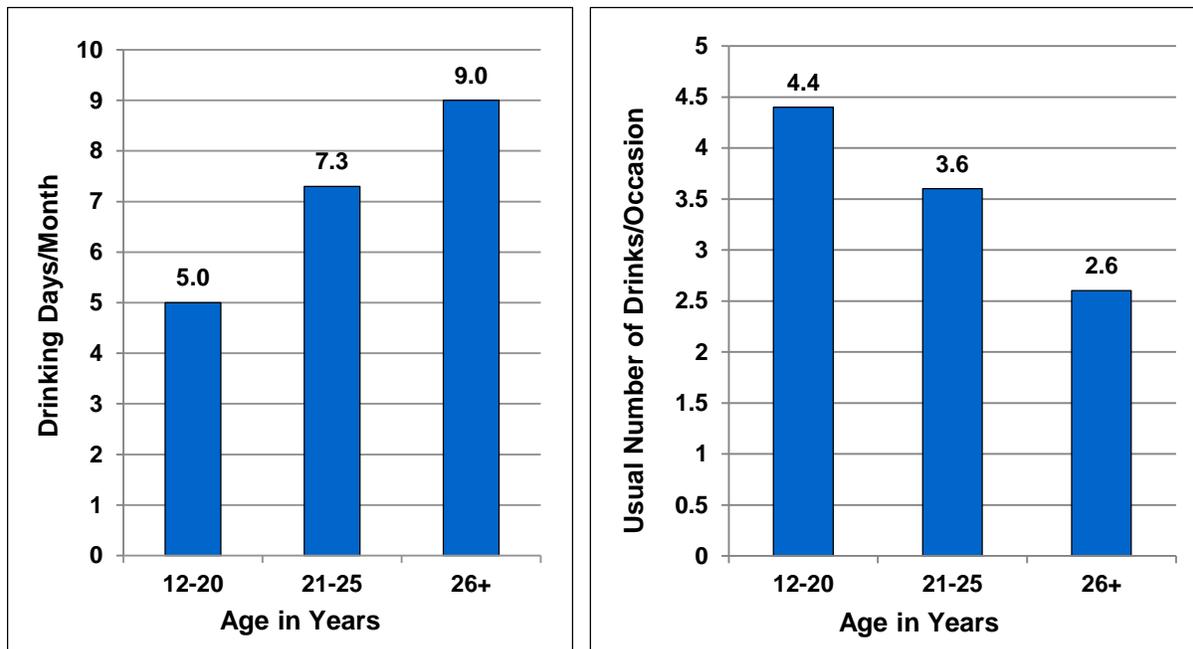
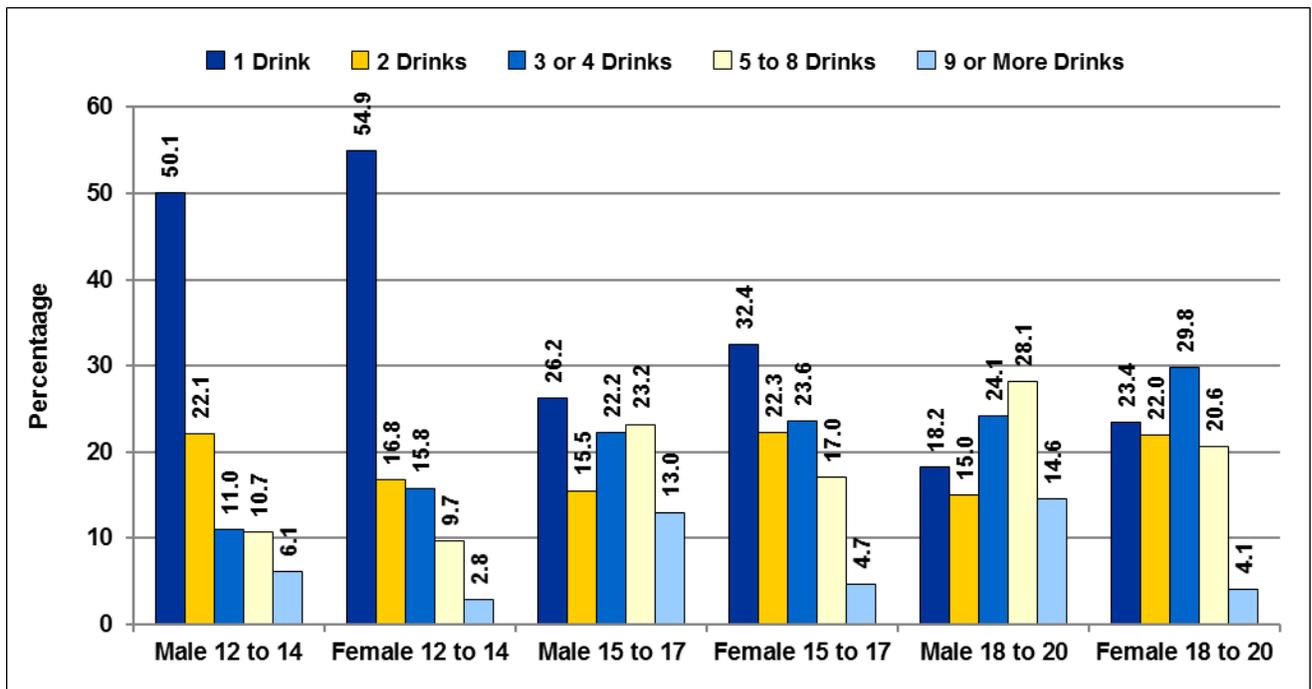


Exhibit 2.5: Number of Drinks Consumed on Last Occasion of Alcohol Use in the Past Month Among Past-Month Alcohol Users Ages 12–20, by Gender and Age Group: 2013–2014 (CBHSQ, 2015c)



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 2002. Analysis of 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. Subsequent statistical trend analyses showed that for 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, O’Malley, Bachman, & Schulenberg, 2012).

A troubling subset of binge drinking is “extreme” binge drinking or very high-intensity binge drinking, often defined as consumption of 10 or 15 or more drinks on a single occasion (Patrick et al., 2013). YRBS data from 2013 indicated that 6.1 percent of high-schoolers reported drinking 10 or more drinks within 2 hours at least once in the last month (CDC, 2014b). The percentage for males was 8 percent and for females, 4.2 percent.

MTF has tracked the prevalence of consuming 10 or more and 15 or more drinks in a row since 2005. According to MTF data for 2014, 7.1 percent of 12th graders reported consuming 10 or more drinks in a row, and 4.1 percent reported consuming 15 or more drinks in a row within the previous 2 weeks. Although these numbers have declined since 2005, the rate of decline for high-intensity binge drinking has been slower than for all binge drinking: a decline of 3.5 percent for 10 or more drinks in a row and 1.6 percent for 15 or more drinks in a row, compared with 7.7 percent for all binge drinking (Miech et al., 2015, p. 230). This disparity suggests that high-intensity binge drinking may be a more entrenched form of adolescent subculture than binge drinking overall (Patrick et al., 2013).

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 (MLDA) is lower than in the United States. These data call into question the suggestion that having a lower MLDA results in less problem drinking by adolescents.

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. As shown in Exhibit 2.7, according to the combined 2013–2014 NSDUH data, prevalence of alcohol dependence or abuse as defined by DSM-IV-TR²³ is highest among those ages 18 to 29.

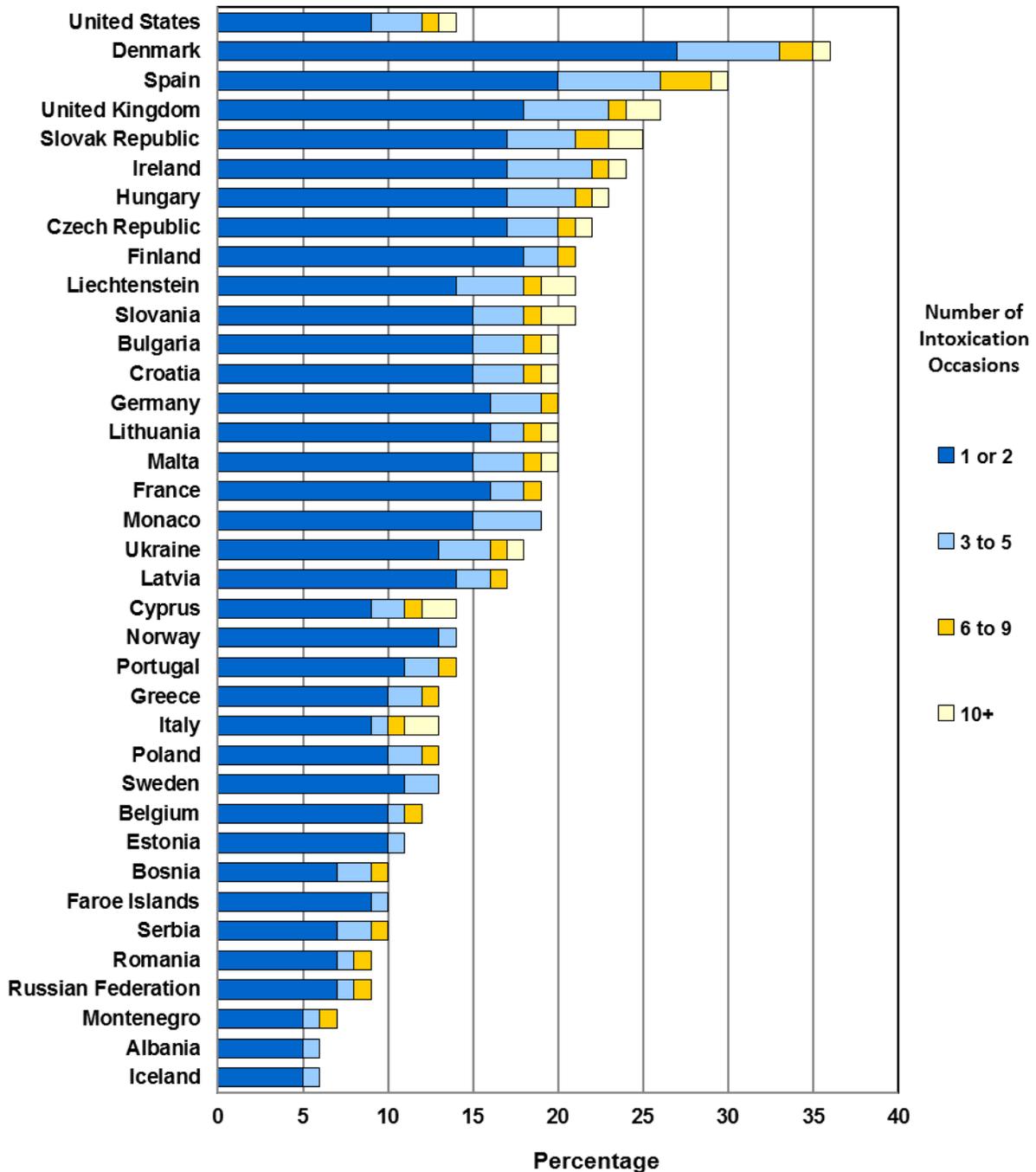
About one in ten 18- to 20-year-olds (10.4 percent) met criteria for alcohol dependence or abuse. The prevalence rate is third highest after that for 21- to 24-year-olds (14.2 percent) and 25- to 29-year-olds (12.1 percent). In addition, 0.7 percent of 12- to 14-year-olds and 4.7 percent of 15- to 17-year-olds met criteria for alcohol dependence or abuse (CBHSQ, 2015c).

Underage Drinking Differs by Gender

Any discussion of gender differences in underage drinking should include consideration of the biological factors that may underlie or contribute to differences in drinking behavior and its consequences. Although females report less alcohol consumption than males, differences in body composition (e.g., increased body fat, decreased muscle mass, and subsequently less body water, in females) result in a greater BAC in females compared with males consuming the same amount of alcohol. These physiological differences suggest that females will experience alcohol-related problems at lower doses of alcohol. On the other hand, males tend to have lower reactivity (perceived effects of alcohol as a function of amount consumed), putting them at greater risk for binge and heavy drinking (Schulte, Ramo, & Brown, 2009).

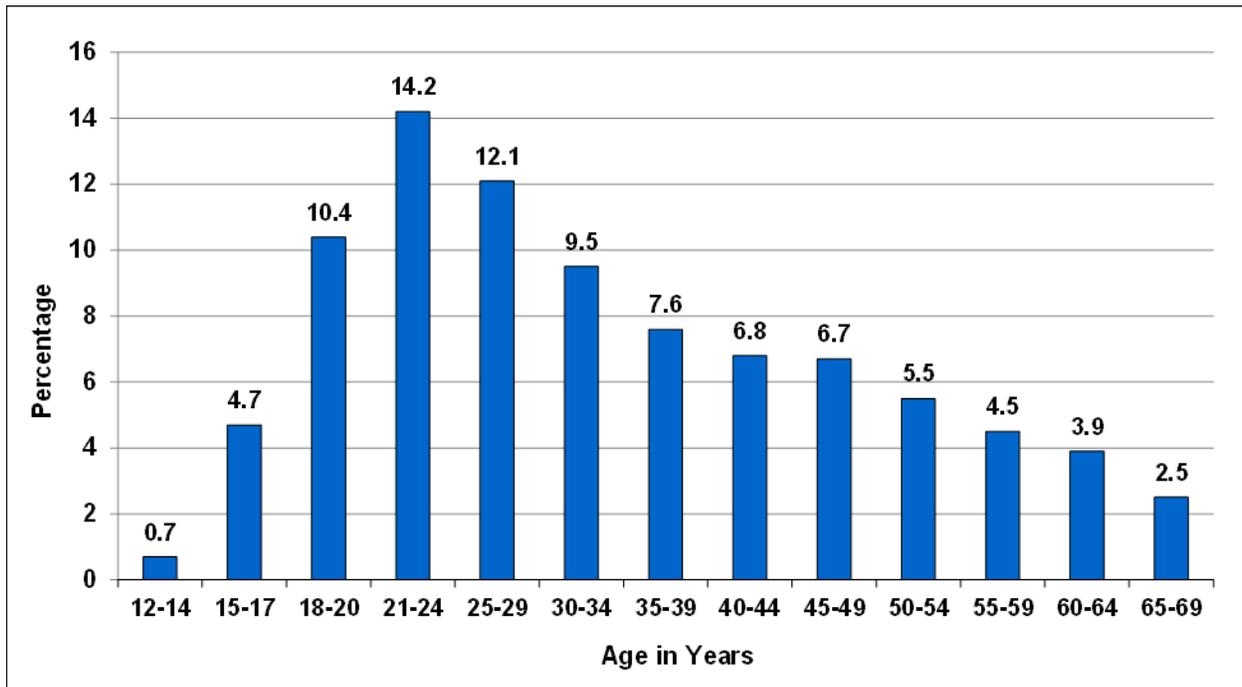
²³ The DSM-IV-TR (APA, 2000) criteria for abuse and dependence used in this study were originally developed for use with adults, and using them to assess abuse and dependence in adolescents may lead to inconsistencies. The more recent *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-V) (APA, 2013) integrates the two DSM-IV disorders, alcohol abuse and alcohol dependence, into a single disorder called alcohol use disorder (AUD). DSM-V does not specifically address adolescents. Research suggests that the criteria for DSM-V and the criteria for DSM-IV would result in similar outcomes (Winters, Martin, & Chung, 2011).

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)



Notes: The 2011 European School Survey Project on Alcohol and Drugs (ESPAD) 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)?” Information on ESPAD data collection is available at www.espad.org.

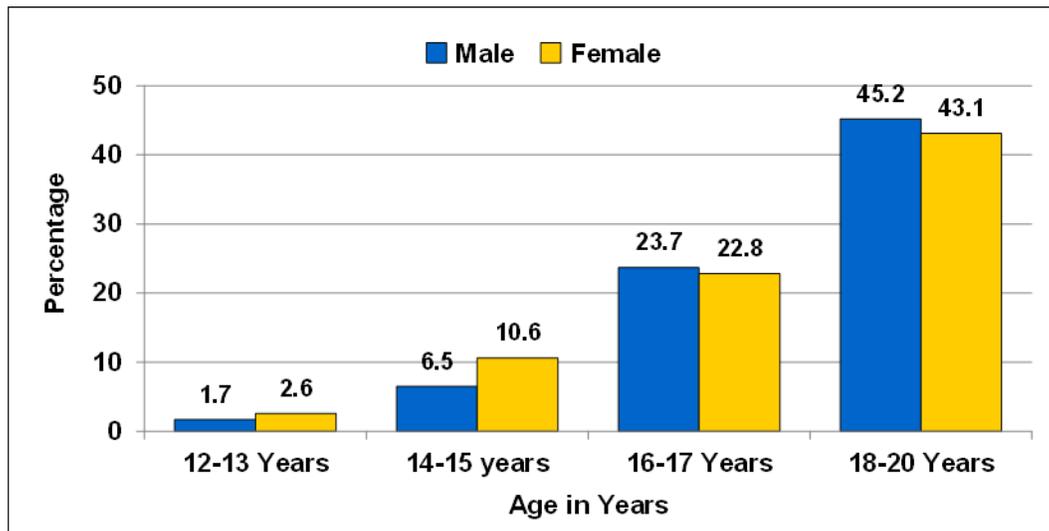
Exhibit 2.7: Prevalence of Past-Year DSM-IV Alcohol Dependence or Abuse by Age: 2013–2014 NSDUH (CBHSQ, 2015c)



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 2014 NSDUH data, 57.3 percent of males ages 12 and older were current drinkers compared with 48.4 percent of females in that age group. However, among underage drinkers, the prevalence of past-month alcohol use was higher among girls ages 14 to 15 than among boys ages 14 to 15 (Exhibit 2.8; CBHSQ, 2015c). On the other hand, binge-drinking rates for male 12th graders were higher than those for female 12th graders (see Exhibit 2.9). Binge-drinking prevalence is the most significant gender difference, at least among older adolescents. In 2014, 22.3 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 16.6 percent of female 12th graders did so (Miech et al., 2015).

Since 1991, rates of binge drinking have generally been *decreasing* for college-age (19- to 22-year-olds), 12th-, 10th-, and 8th-grade males and females (although not as steeply for college students). But the gap between male and female bingeing rates has been steadily closing since 1991 (Exhibit 2.9; Johnston, O'Malley, Bachman, & Schulenberg, 2009, 2012; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014b; 2015b).

Across all grade groups, rates for males have been decreasing faster than for females. This is most easily seen in the slopes of the linear trend data (dotted lines) in Exhibit 2.9. In 1975, among 12th graders there was a 23 percentage point spread between the rates; in 2014, it was 5.7 points (Miech et al., 2015).

Exhibit 2.8: Past-Month Alcohol Use by Age and Gender, 2014 NSDUH Data (CBHSQ, 2015c)

Underage Drinking by Race and Ethnicity

According to 2002–2014 NSDUH data,²⁴ Whites ages 12 to 20 were more likely to report current alcohol use than any other race or ethnic group. The detailed prevalence of past-month alcohol use by gender and race/ethnicity was White males (30.9 percent), White females (29.7 percent), Native Hawaiian or Other Pacific Islander males (27.2 percent), American Indian or Alaska Native females (25.6 percent), Hispanic or Latino males (25.2 percent), Native Hawaiian or Other Pacific Islander females (25.0 percent), males of multiple races (24.5 percent), females of multiple races (24.0 percent), American Indian or Alaska Native males (23.4 percent), Hispanic or Latina females (22.5 percent), Black or African American males (19.3 percent), Black or African American females (18.2 percent), Asian males (17.0 percent), and Asian females (15.4 percent). As shown in Exhibit 2.10, among most races/ethnic groups, males and females reported similar rates of current alcohol use; however, among Whites, Blacks, and Hispanics, males ages 12 to 20 were more likely to report current use than females (CBHSQ, 2015c).

Although fewer Blacks report current drinking, data from the 2013 YRBS suggest that prevalence of alcohol use before age 13 (as reported by all respondents) is greater among Black students (21.0 percent) and Hispanic students (21.8 percent) than among White students (16.7 percent; CDC, 2014b). Data from the NSDUH also indicate that at age 12, fewer Whites (8.8 percent) reported ever having a drink in their lifetime than non-Hispanic blacks (10.1 percent). Non-Hispanic Asians reported the lowest prevalence (4.0 percent). Lifetime prevalence of alcohol use as reported at age 12 among non-Hispanic Whites did not differ from the prevalence among non-Hispanic American Indians or Alaska Natives, and Hispanics, and among non-Hispanic youths with multiple races.

²⁴ 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.

The 2002–2014 NSDUH data cannot provide a valid estimate on the lifetime prevalence of alcohol use among 12-year-old non-Hispanic Native Hawaiians or Other Pacific Islanders. 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.

Exhibit 2.9: Rates of Binge Drinking in the Past 2 Weeks Among Male and Female 8th, 10th, and 12th Graders and College Students, 1991–2014
 (Johnston, O’Malley, Bachmann, et al., 2015b; Johnston, O’Malley, Miech, et al., 2015a)

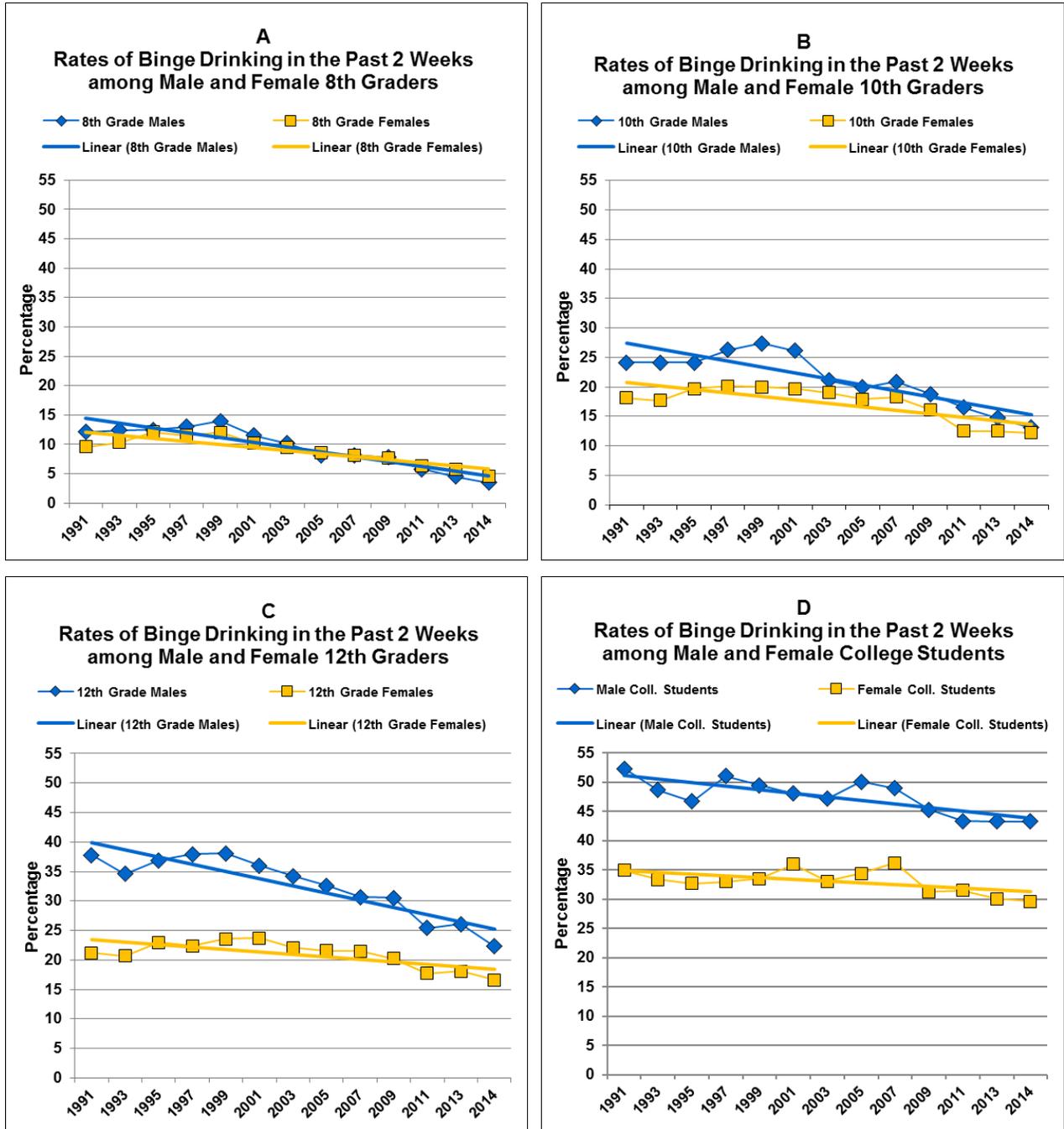
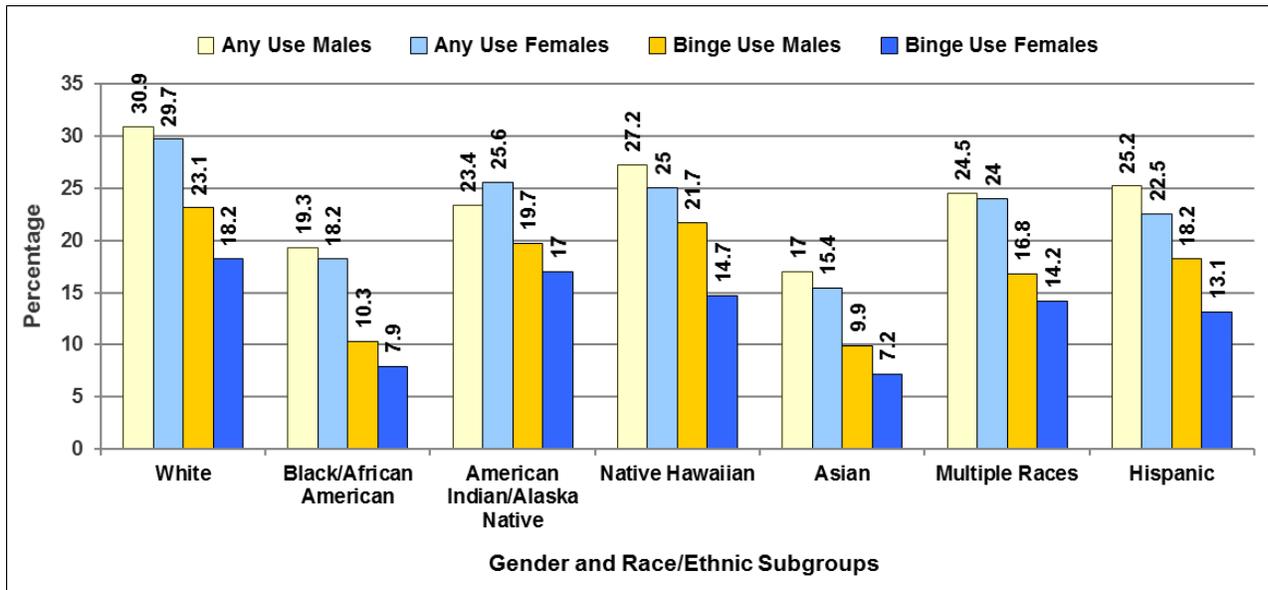


Exhibit 2.10: Alcohol Use and Binge Drinking in the Past Month Among People Ages 12–20 by Race/Ethnicity and Gender, Annual Averages Based on 2002–2014 Data (CBHSQ, 2015c)



Multi-year NSDUH data (2002–2014) for males and females ages 12 to 20 on binge alcohol use indicate that an estimated 23.1 percent of White males reported having five or more drinks on the same occasion on at least 1 day within the past 30 days, followed closely by Native Hawaiian or Other Pacific Islander males (21.7 percent). The remaining race/ethnicity and gender groups are American Indian or Alaska Native males (19.7 percent), Hispanic males (18.2 percent), White females (18.2 percent), American Indian or Alaska Native females (17.0 percent), males of multiple races (16.8 percent), Native Hawaiian or Other Pacific Islander females (14.7 percent), females of multiple races (14.2 percent), Hispanic females (13.1 percent), Black males (10.3 percent), Asian males (9.9 percent), Black females (7.9 percent), and Asian females (7.2 percent).

As Exhibit 2.10 shows, rates of binge drinking tend to be higher for males than females for each race/ethnic group except American Indian or Alaska Native, with the differences being greatest among Native Hawaiian or Other Pacific Islanders (males 21.7 percent versus females 14.7 percent) and Hispanics (males 18.2 percent versus females 13.1 percent; CBHSQ, 2015c).

These ethnic and racial differences must be viewed with some caution. As Caetano, Clark, and Tam (1998) noted, 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

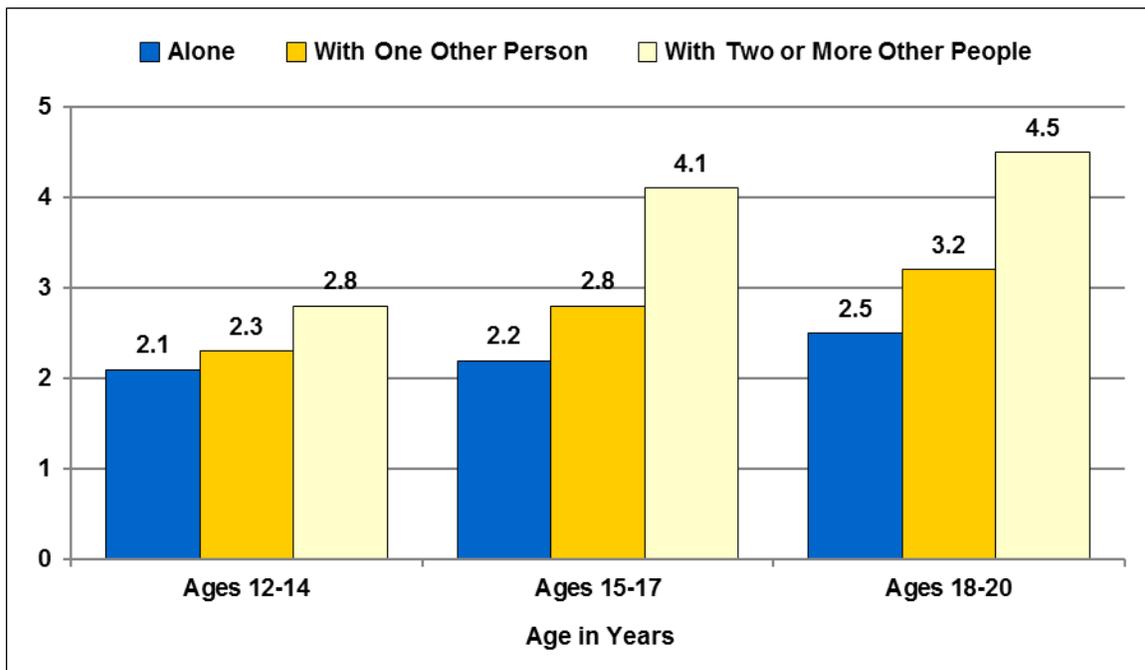
Underage alcohol use is strongly affected by the context in which drinking occurs, including the number of people present and the location where drinking takes place. Of particular concern is underage drinking at large parties.

Number of People Present at Drinking Event

Most (77.2 percent) people ages 12 to 20 who had consumed alcohol in the past month were with two or more people the last time they drank, 16.6 percent were with one other person the last time they drank, and 6.2 percent were alone.²⁵ Underage people 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 (4.4 drinks) than did those who drank with one other person (3.0 drinks) or drank alone (2.4 drinks; Pemberton, Colliver, Robbins, & Gfroerer, 2008; CBHSQ, 2015c).

The number of people present at the last drinking event appears to differ across age groups. Among current drinkers, youths ages 12 to 14 were more likely to have been alone (12.9 percent) or with one other person (20.9 percent) the last time they drank, compared with youths ages 15 to 17 (7.5 percent alone and 15.0 percent with one other person) or ages 18 to 20 (5.2 percent alone and 17.0 percent with one other person; CBHSQ, 2015c). In the 15–17 and 18–20 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 2.11).

Exhibit 2.11: 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: Annual Averages Based on 2012–2014 Data (CBHSQ, 2015c)



²⁵ The discussion in this section combines data for 2013 and 2014.

Most male and female underage drinkers were with two or more other people on their last drinking occasion (75.7 percent and 78.8 percent, respectively). However, male drinkers were more likely to drink alone (7.3 percent) than were female drinkers (5.1 percent).

Overall, underage people who drank with others were more likely to consume a greater number of drinks on average than those who drank alone; those who drank with two or more other people consumed more drinks on average (4.4 drinks) than did those who drank with one other person (3.0 drinks) or drank alone (2.4 drinks). Males consumed more drinks than did females for all three situations (drinking alone, drinking with one other person, or drinking with two or more people). For example, when the last drinking occasion was with two or more other people, males averaged 5.2 drinks, whereas females averaged 3.5 drinks (CBHSQ, 2015c).

Location of Alcohol Use

Most underage drinkers reported last using alcohol in someone else's home (52.8 percent, averaging 4.4 drinks) or in their own home (33.8 percent, averaging 3.4 drinks).²⁶ The next most popular drinking locations were at a restaurant, bar, or club (6.9 percent, averaging 4.2 drinks); at a park, on a beach, or in a parking lot (4.0 percent, averaging 4.9 drinks); or in a car or other vehicle (3.5 percent, averaging 5.6 drinks). Current drinkers ages 12 to 20 who last drank at a concert or sports game (2.2 percent of all underage drinkers) consumed an average of 5.8 drinks (CBHSQ, 2015c). 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.

Drinking location varies by age. For example, drinkers ages 12 to 14 were more likely to have been in their own homes the last time they drank (44.2 percent) than were 15- to 17-year-olds (28.0 percent) or 18- to 20-year-olds (35.5 percent). By contrast, 12- to 14-year-olds were less likely to report being in someone else's home the last time they drank (44.8 percent) than the 15- to 17-year olds (59.3 percent), or 18- to 20-year-olds (50.7 percent).

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 (9.0 percent for those ages 18 to 20 versus 1.5 percent for those ages 12 to 14 and 2.8 percent for those ages 15 to 17; Exhibit 2.12; SAMHSA, 2014b). 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 (8.7 percent versus 5.2 percent).

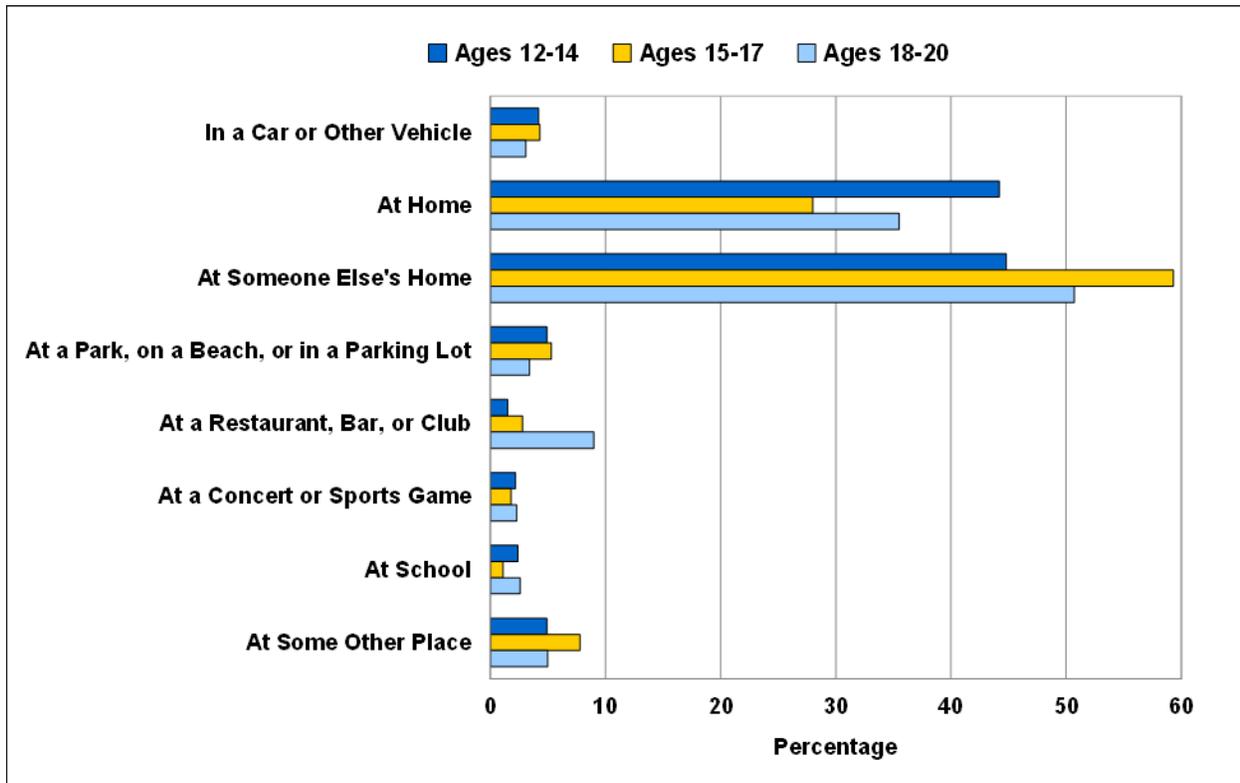
Underage Drinking Parties

The data cited above suggest that underage drinking occurs primarily in a social context (three or more drinkers) at private residences. Such drinking occasions include parties at which large numbers of youth are present.

Drinking parties attract those 21 and over as well as significant numbers of underage drinkers (Wells, Graham, Speechley, & Koval, 2005). For this reason, parties are a common environment in which young drinkers are introduced to heavy drinking by older and more experienced drinkers (Wagoner et al., 2012).

²⁶ For the analyses in this section, 2013 and 2014 NSDUH data are combined to provide sufficient sample sizes.

Exhibit 2.12: Drinking Location of Last Alcohol Use Among Past-Month Alcohol Users Ages 12–20 by Age Group: Annual Averages Based on 2012–2014 Data (CBHSQ, 2015c)



Parties are settings for binge drinking and other patterns of consumption leading to high BACs (Clapp, Reed, Holmes, Lange, & Voas, 2006; Clapp, Min, Shillington, Reed, & Croff, 2008; Demers et al., 2002; Paschall & Saltz, 2007; Usdan, Moore, Schumacher, & Talbott, 2005; Wagoner et al., 2012). Factors that increase the risk of high BACs include the size of party and the number of people drinking (Wagoner et al., 2012), drinking games (Clapp et al., 2006, 2008), “bring your own booze” policies (Clapp et al., 2006), parties sponsored by fraternities (Paschall & Saltz, 2007), and parties where illicit drugs are available (Clapp et al., 2006). Demers and colleagues (2002) suggested that large parties have a greater facilitative effect on men’s drinking than on women’s. Drinking parties are settings for aggression, including serious arguments, pushing, fights, and sexual assault (Wagoner et al., 2012). Because large numbers of youth are drinking outside their own homes, drinking parties may significantly increase the risk of driving after drinking (PIRE, 2000).

Drinking parties pose serious problems for law enforcement officers. These include breaking up parties without allowing drinkers to flee to their cars (PIRE, 2000), processing large numbers of underage offenders (PIRE, 2000), and identifying the individuals who have furnished alcohol to minors (Wagoner et al., 2012). Paschall, Lipperman-Kreda, Grube, and Thomas (2014) rated social host policies for comprehensiveness and stringency. They found a small but significant negative relationship between the strength of the policies and underage drinking at parties among past-year drinkers. For information on party-related enforcement practices that states are

implementing, see Chapter 4. For information on relevant state legal policies see “Hosting Underage Drinking Parties” and “Keg Registration” in Chapter 4.

Types of Alcohol Consumed by Underage Drinkers

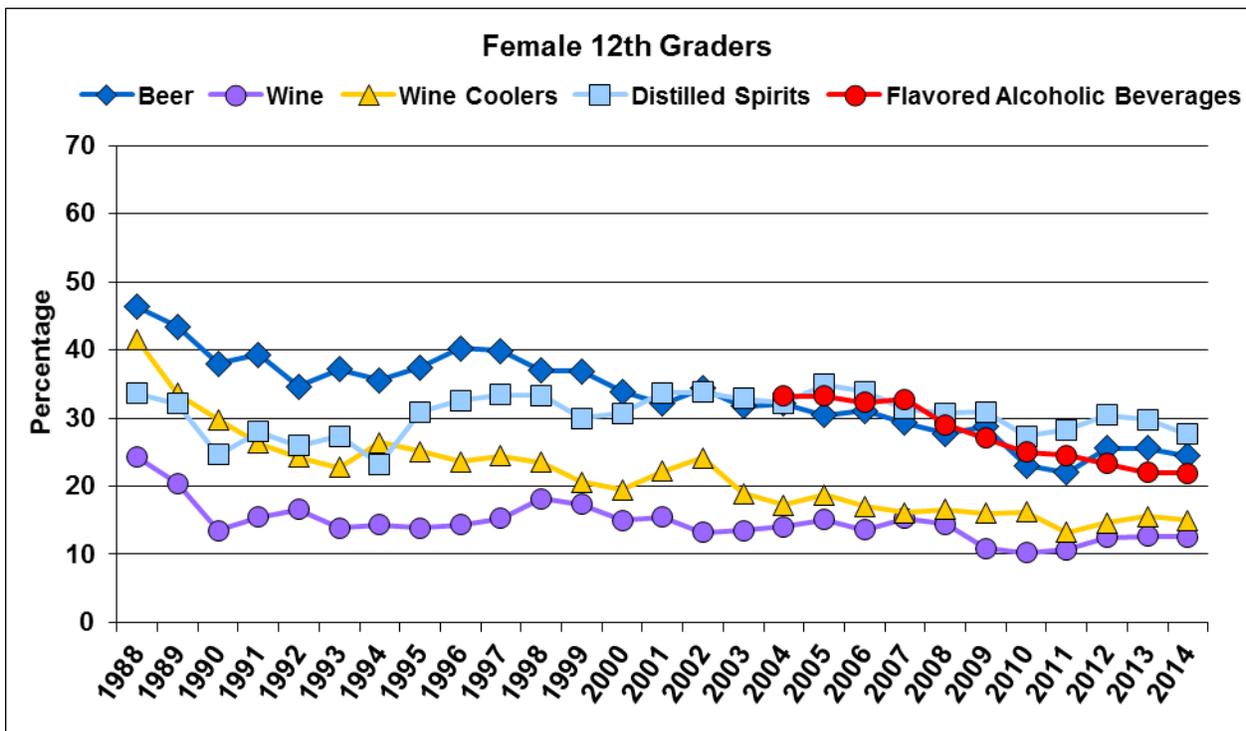
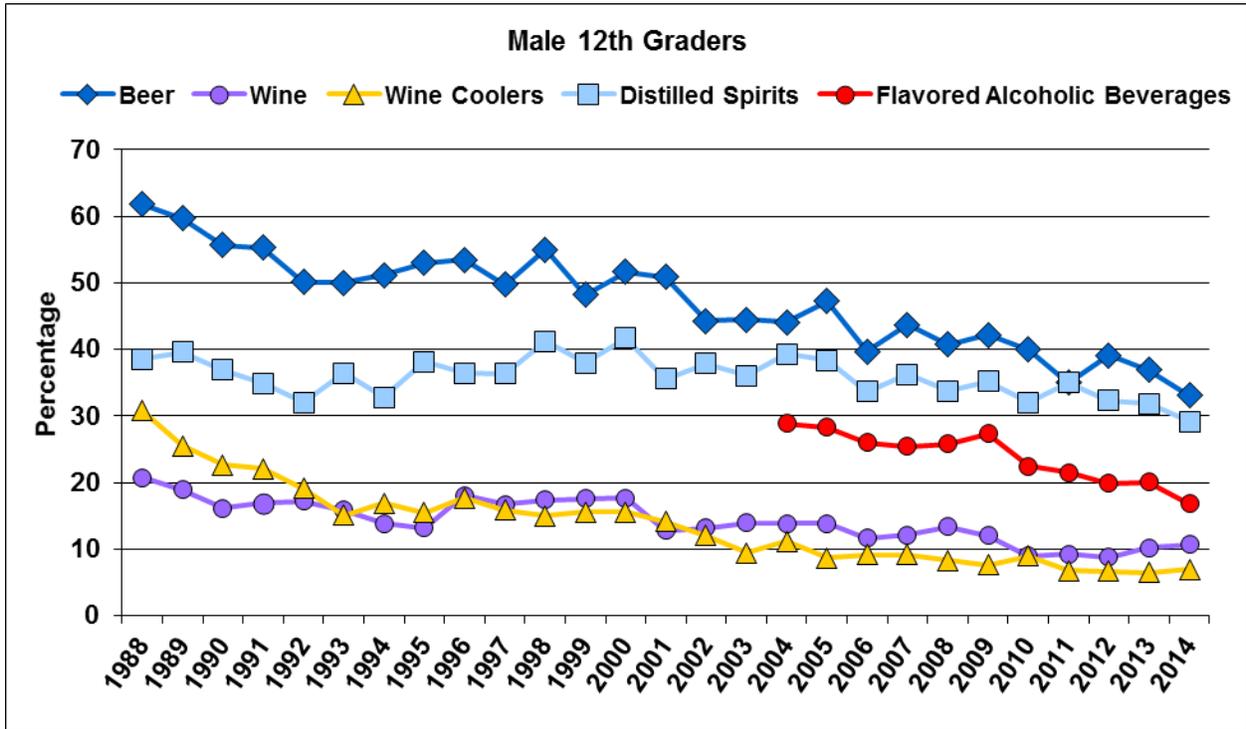
Different alcohol beverage types are likely associated with different patterns of underage consumption. Ease of concealment, palatability, alcohol content, marketing strategies, media portrayals, parent modeling, and economic and physical availability may all contribute to the quantity of and settings 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. Since 1988, preferences have shifted markedly for both male and female 12th graders (Exhibit 2.13). Wine is now preferred by 13 percent or fewer of underage drinkers and is therefore not discussed here.

In 1988, beer was the preferred beverage for both sexes by a large margin. By 2011, however, preference for beer had declined and preference for distilled spirits had increased, such that the two were equally preferred by males that year; in subsequent years, preference for beer slightly exceeded preference for spirits. A similar change in preference occurred earlier (in 2005) for females, who continue to prefer distilled spirits over beer by a slight margin. In 2004 (the first year flavored alcoholic beverages were included in the survey), female preference for beer, distilled spirits, and flavored alcoholic beverages was about the same. Female preference for flavored alcoholic beverages has declined steadily since then. Male preference for flavored alcoholic beverages, which has not been as high as female preference, also declined during this period. Data from eight states indicate that, among students in 9th through 12th grades who reported binge drinking, distilled spirits were the most prevalent beverage type (Siegel, Naimi, Cremeens, & Nelson, 2011). In a study of a nationally representative sample of youth ages 13 to 20 who had consumed at least one alcoholic drink in the past 30 days, distilled spirits accounted for 43.8 percent of binge-drinking prevalence, the highest percentage for any beverage type (Naimi, Siegel, DeJong, O’Doherty, & Jernigan, 2015).

Several studies (Fortunato, Albers, Siegel, & Jernigan, 2014; Naimi et al., 2015; Siegel et al., 2013) focused on underage drinkers’ brand preferences, consistently finding that underage drinkers prefer a limited number of brands. Naimi and colleagues found that the top 25 “binge brands” account for 46.2 percent of all binge drinking reports, and Siegel and colleagues found that the top 25 brands account for about half of all alcohol consumption by volume.

Although high-potency grain alcohol products have a reported market share among youth of 0.7 percent, their retail availability is of considerable recent concern (Siegel et al., 2013). These products are cheap, and given that they are twice as strong (151 to 190 proof) as standard spirits products (80 to 101 proof), underage consumers may find it very difficult to gauge their alcohol consumption, increasing the likelihood of injury. Epidemiologic data on the use of high-potency grain alcohol is currently limited. Siegel and colleagues (2013) found that according to an Internet panel of youth ages 13 to 20, 5.8 percent reported consuming high-alcohol-content grain alcoholic beverages in the past 30 days. Naimi and colleagues (2015) reported that when underage drinkers consume grain alcohol, they are significantly more likely to binge.

Exhibit 2.13: Trends in the Percentage of Male and Female 12th Graders Using Alcoholic Beverages by Beverage Type, 1988–2014
 (Johnston, O’Malley, Bachman, et al., 2015b)



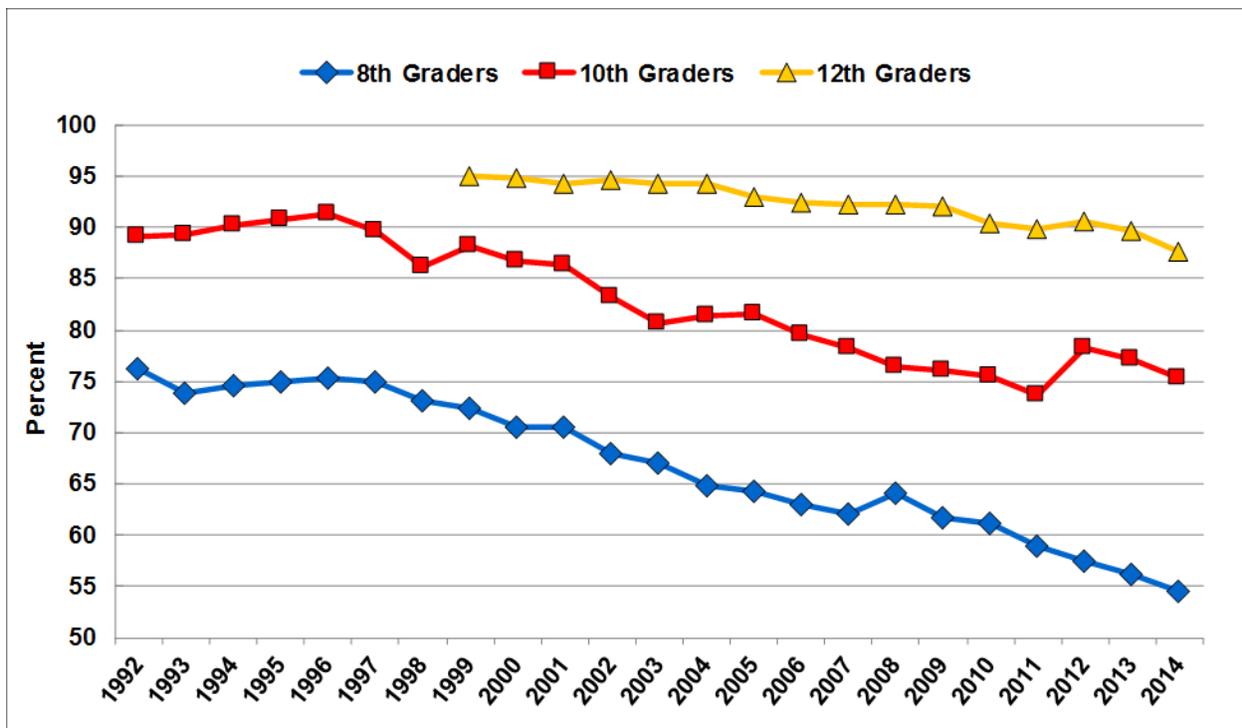
Given the dangers of high-potency grain alcohol, some states have banned its sale. Improved data on these products, including underage use and related injury, would help policymakers evaluate appropriate responses.²⁷

Alcohol Is Perceived as Readily Available by the Underage Population

The relationship among alcohol availability, levels of consumption, and occurrence of alcohol-related problems is well documented in the *Surgeon General’s (SG’s) Call to Action* (U.S. Department of Health and Human Services [HHS], 2007). As shown in Exhibit 2.14, most teens see alcohol as readily available. In 2014, 54.4 percent of 8th graders, 75.3 percent of 10th graders, and 87.6 percent of 12th graders said alcohol would be “fairly easy” or “very easy” to get (Miech et al., 2015). Perceived availability, however, has declined in some groups.

In 1992, 76.2 percent of 8th graders perceived alcohol as easily available, but by 2014, only 54.4 percent held that perception. For 10th graders, perception of availability peaked in 1996 at 90.4 percent, but by 2014, it had declined to 75.3 percent. Data for 12th graders, first collected in 1999, showed that 95.0 percent perceived alcohol to be readily available—a percentage that has declined only slightly since then. These reductions in perceived availability may be attributable in part to policies and enforcement practices described in Chapter 4.3 (see “Laws Addressing Minors in Possession of Alcohol,” “Laws Targeting Alcohol Suppliers,” and “Alcohol Pricing Policies”). Continued attention to these policies and practices may lead to further reductions.

Exhibit 2.14: Trends in Availability of Alcohol as Perceived by 8th, 10th, and 12th Graders (Miech et al., 2015)



²⁷ Maryland (MD Code, Art. 2B, § 16-505.2), California (West’s Ann.Cal.Bus. & Prof.Code § 23403), and Florida (West’s F.S.A. § 565.07) have all enacted such laws.

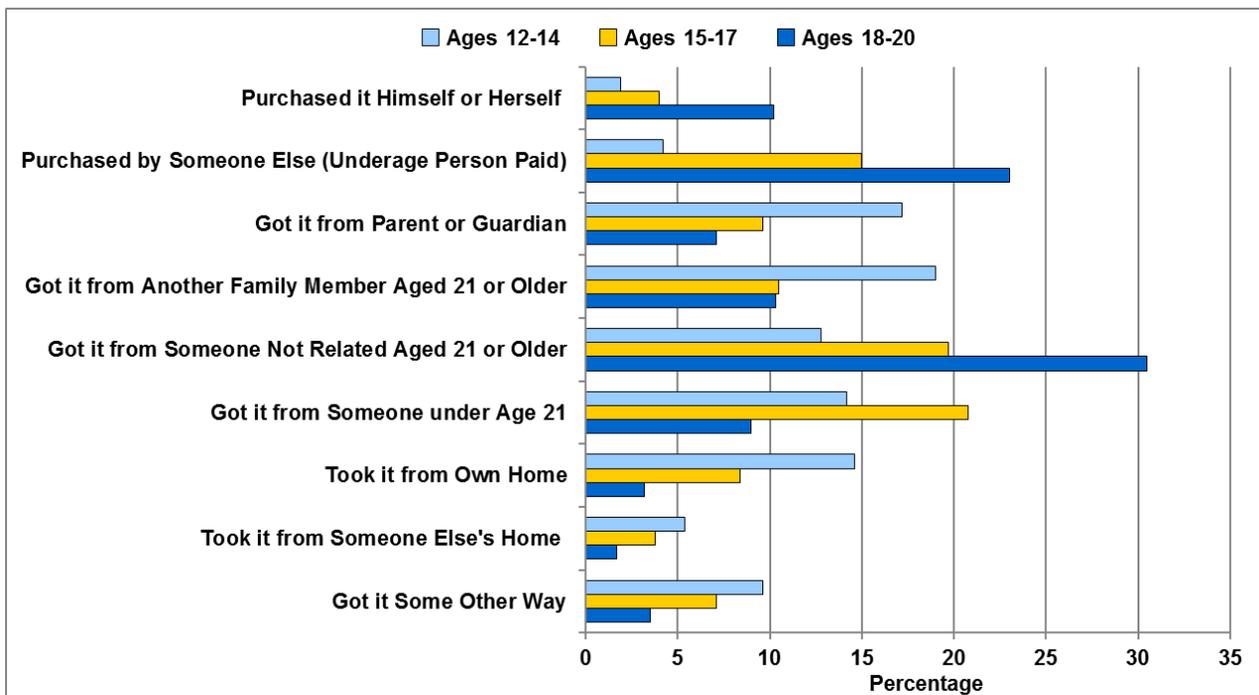
Alcohol is Available From a Variety of Sources

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 2013 and 2014 show that among all underage current drinkers, 28.2 percent paid for alcohol the last time they drank (8.1 percent purchased the alcohol themselves; 19.9 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 5.2 drinks) than those who did not (average of 3.5 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, 71.8 percent did not pay for the alcohol the last time they drank. A total of 26.7 percent were given alcohol for free by an unrelated person age 21 or older, 8.2 percent got the alcohol from a parent or guardian, 10.7 percent got it from another family member age 21 or older, and 5.1 percent took it from their own homes.

The most common sources of alcohol varied substantially by age as shown in Exhibit 2.15. For youths ages 12 to 14, the most common sources were receiving it free from another family member age 21 or older (19.0 percent) or from a parent or guardian (17.2 percent). For youths ages 15 to 17, the most common sources were receiving it free from someone under age 21 (20.8 percent) or from an unrelated person age 21 or older (19.7 percent) and giving somebody else money to purchase the alcohol (15.0 percent).

Exhibit 2.15: Source of Last Alcohol Used Among Past-Month Alcohol Users Ages 12–20, by Age Group: 2013–2014 (CBHSQ, 2015c)



Among 18- to 20-year-olds, most current drinkers either received alcohol for free from an unrelated person age 21 or older (30.5 percent) or gave someone else money to purchase the alcohol (23.0 percent; CBHSQ, 2015c). Older underage people were more likely to have paid for alcohol themselves (either purchasing it themselves or paying someone else to purchase it) on their last drinking occasion: 33.4 percent of 18- to 20-year-olds did so, compared with 19.3 percent of 15- to 17-year-olds and 6.4 percent of 12- to 14-year-olds. Male underage drinkers were more likely to have paid for alcohol themselves on their last drinking occasion (33.9 percent) than their female counterparts (22.3 percent; CBHSQ, 2015c).²⁸

Enforcement of furnishing laws (see Chapter 4) is one key to reducing youth access to alcohol. Flewelling and colleagues (2013), in a multi-community study, found significant associations between the level of underage drinking law enforcement in the intervention communities and reductions in both 30-day use of alcohol and binge drinking.

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

To date, the Federal Trade Commission (FTC) has conducted four formal studies of the exposure of those under 21 to alcohol advertising.

- *1999 FTC 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.²⁹
- *2003 FTC Alcohol Report:* FTC's 2003 review reported that more than 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 television, 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.³⁰
- *2008 FTC 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

²⁸ More detailed information can be found in the special report by Pemberton et al. (2008).

²⁹ For more information, see *Self-Regulation in the Alcohol Industry* (FTC, 1999), available at <https://www.ftc.gov/reports/self-regulation-alcohol-industry-federal-trade-commission-report-congress>.

³⁰ For more information, see *Alcohol Marketing and Advertising* (FTC, 2003), available at <http://www.ftc.gov/os/2003/09/alcohol08report.pdf>.

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) were due to placements that complied with the standard. When advertising exposure data were aggregated across companies and measured media, 86.2 percent of the alcohol advertising audience consisted of legal-age adults.³¹

- *2014 FTC Alcohol Report*: This fourth FTC study of alcohol advertising evaluated industry compliance in the first half of 2011, with the self-regulatory code requirement that ads be placed only in media in which at least 70 percent of the audience is adult (age 21 plus).³² Data showed that 93.1 percent of the companies’ placements in measured media met the 70 percent standard. (Measured media refers to TV, radio, magazine, newspaper, and Internet websites whose audience characteristics, including age, are measured by demographic services.) When data were aggregated across companies and media, 85.4 percent of alcohol advertising impressions (individual ad exposures) were seen by adults age 21 plus, while 14.6 percent were seen by underage persons. With regard to TV, when data were aggregated across companies, 85.3 percent of impressions were seen by adults 21 plus, while 14.7 percent were seen by underage persons. The overall audiences for major social media (Facebook, Twitter, and YouTube) exceed 70 percent age 21 plus; Facebook further limits alcohol ad viewing to people who previously registered as 21 plus, and Twitter and YouTube offer age-gating technologies. The report also evaluated product placement in entertainment media. In mid-2011, the industry adopted a 71.6 percent adult audience composition standard for future ad placements (reflecting 2010 U.S. Census data on the percentage of the population age 21 plus).

Although evidence of a causal relationship is lacking, other research indicates that youth exposure to alcohol advertising is associated with initiation of alcohol consumption by youth and with increased alcohol consumption by youth who drink. A systematic review showed that of 13 longitudinal research studies examined, 12 studies demonstrated an association between youth exposure to alcohol advertising and the initiation of alcohol consumption by youth as well as increased alcohol consumption by youth who had already initiated alcohol use (Anderson, Bruijn, Angus, Gordon, & Hastings, 2009).

During 2001–2009, youth exposure to alcohol advertising on television in the United States increased 71 percent. This is largely attributable to increased alcohol advertising on cable television programs, particularly by distilled spirits companies (Jernigan, Ross, Ostroff, McKnight-Eily, & Brewer, 2013). In 2009, 13 percent of youth exposure came from advertising that was noncompliant with the industry’s voluntary placement standards (CAMY, 2010; Jernigan et al., 2013).

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

³¹ For more information, see *Self-Regulation in the Alcohol Industry* (FTC, 2008), available at <http://www.ftc.gov/os/2008/06/080626alcoholreport.pdf>.

³² For more information, see *Self-Regulation in the Alcohol Industry* (FTC, 2014), available at <http://www.ftc.gov/reports/self-regulation-alcohol-industry-report-federal-trade-commission-0>.

values and community norms, researchers have repeatedly found a correlation between youth drinking practices and those of their adult relatives and other community adults. Nelson, Naimi, Brewer, and Nelson (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. Xuan and colleagues (2013) analyzed YRBS data from 1999 to 2009 and found a positive correlation between state-level adult binge drinking and youth binge drinking. A 5 percentage point increase in binge-drinking prevalence among adults was associated with a 12 percent relative increase in the odds of alcohol use among youth. Paschall, Lipperman-Kreda, and Grube (2014) examined relationships between characteristics of the local alcohol environment and adolescent alcohol use and beliefs in 50 California cities. A greater increase in past-year alcohol use and heavy drinking over a 3-year period was observed among adolescents living in cities with higher levels of adult drinking. Stronger state alcohol policies directed to the general population (e.g., alcohol taxes and regulations on alcohol outlet density) are independently associated with less youth drinking, and the effect of these policies on youth drinking is mediated, in part, through their effects on adults (Xuan et al., 2015).

Despite Meaningful Progress, Underage Drinking Remains Unacceptably High

In 2014, MTF lifetime, annual, and 30-day measures of alcohol use were at historic lows over the life of the study in all three grades, as was the measure of binge drinking. Binge drinking among 8th, 10th, and 12th graders increased modestly in the 1990s, leveled off in the early 2000s, and then began a gradual decline in 2002. Declines have continued through the most recent data recorded in 2014, which marks the lowest levels for both drunkenness and alcohol use in all three grades measured by the MTF survey (Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2015b, 2016).

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” (p. 1393). The authors continued: “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 people 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. Underage drinking is responsible for more than 4,000 deaths annually among underage youth, as well as other health and social costs. Some of the health risks of underage drinking may manifest later in life. For example, underage drinking increases the risk of

developing alcohol use disorder and can produce lingering deficits in cognitive functions. Other risks include suicide and homicide; physical and sexual assault; legal problems, such as being arrested for drunk driving or physically hurting someone while drunk; and impaired academic achievement.

Underage drinking also results in enormous economic costs. In 2010, almost \$24.3 billion (about 10 percent) of the total \$249.0 billion economic costs of excessive alcohol consumption were related to underage drinking (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015). It is estimated that 64.1 percent of underage drinking costs can be attributed to lost productivity; most of that is due to premature mortality from alcohol-attributable conditions involving underage youth (Bouchery, Harwood, Sacks, Simon, & Brewer, 2011).

Underage drinking not only imposes societal costs in its own right, but also, given the increased risk that those who drink at young ages will develop alcohol use disorders later in life (see below), contributes indirectly to the costs of excessive adult alcohol use.

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).

Driving After Drinking

The greatest mortality risk for underage drinkers is motor vehicle crashes. In 2014, of the 1,717 drivers ages 15 to 20 who were killed in motor vehicle traffic crashes:

- 451 (26 percent) had a BAC of 0.01 or higher.
- 85 (5 percent) of all fatally injured drivers this age had a BAC of 0.01 to 0.07 g/dL.
- 366 (21 percent) of fatally injured drivers this age had a BAC of 0.08 g/dL or higher (National Center for Statistics and Analysis, 2015).

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 2014 is shown in Exhibit 2.16.

Relative to adults, young people who drive after drinking 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 2014 NSDUH survey provided data on the number of youth by age who reported driving after drinking at least once in the past year (Exhibit 2.17; CBHSQ, 2015b). As shown in the exhibit, this behavior increases steadily with age. O'Malley and Johnston (2013) reported longitudinal data for high school seniors (previous 2 weeks) on driving after drinking any alcohol and after five or more drinks and on being a passenger when the driver has had any alcohol and has had five or more drinks (Exhibit 2.18).

Exhibit 2.16: 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 2014 (National Center for Statistics and Analysis, 2015)

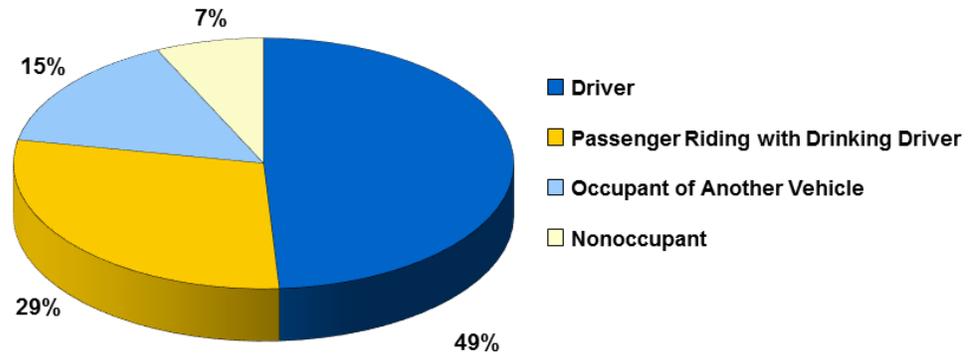


Exhibit 2.17: Percentage of Drivers Ages 16–20 Reporting Driving After Drinking At Least Once in the Past Year by Age: 2014 (CBHSQ, 2015b)

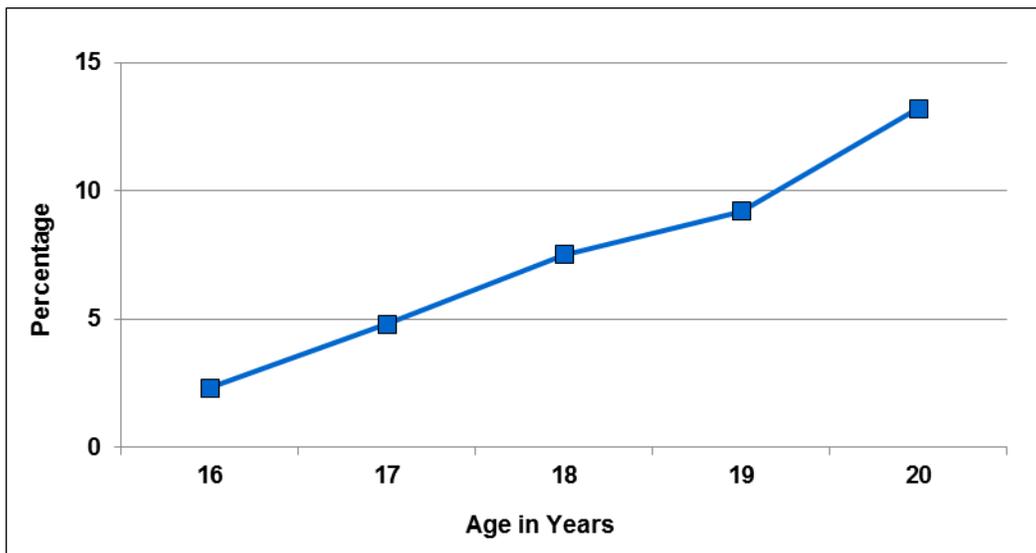
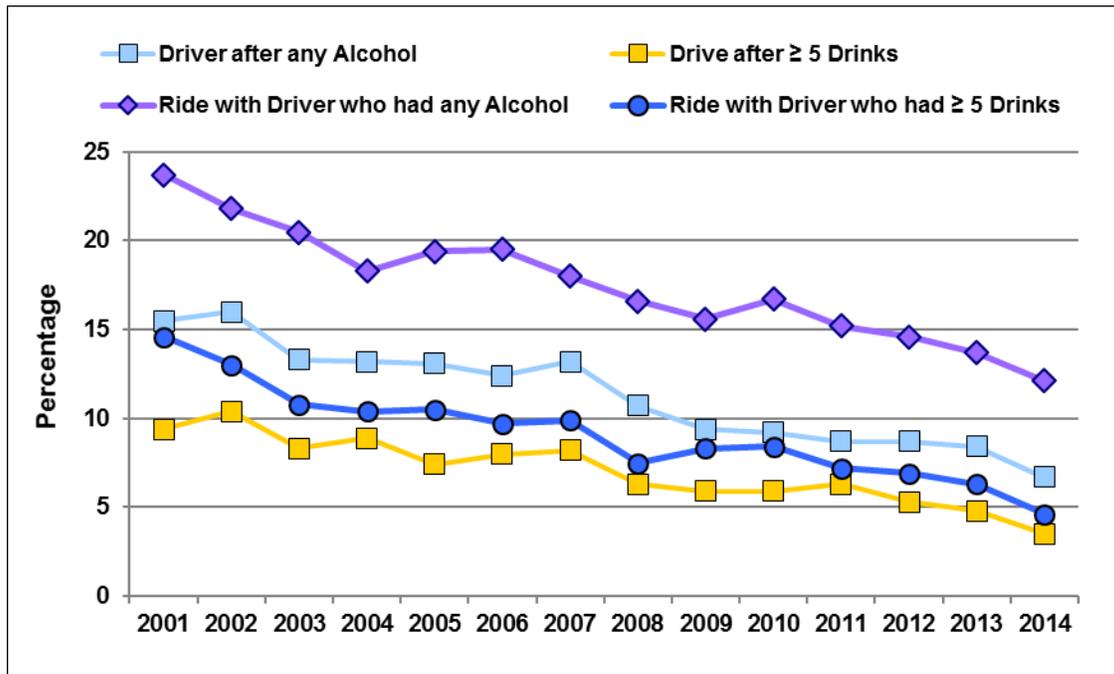


Exhibit 2.18 shows that all four of these behaviors have declined in the last decade, but they remain unacceptably high, especially given the risks associated with driving after even small amounts of alcohol (see above). Males were more than twice as likely as females to report driving after five or more drinks, a finding replicated in other studies (CDC, 2014b; Quinn & Fromme, 2012a). Very high percentages of high school seniors who drove after drinking five or more drinks experienced consequences. O’Malley and Johnston (2013) reported that 43.2 percent received a ticket or warning and 30.2 percent were involved in a crash.

An obvious but underappreciated fact is that access to cars is a prerequisite for this behavior (see Klitzner, Vegega, & Gruenewald, 1988). O’Malley and Johnston (2013) addressed this directly: high school seniors who drive more frequently are more likely to drive after drinking. The behavior is also associated with factors that may relate to access to cars and driving frequency.

Exhibit 2.18: Trends in Percentage of 12th Graders Reporting Driving after Alcohol Use or Riding after Alcohol Use by the Driver (O'Malley & Johnston, 2013)



These include living off-campus (Quinn & Fromme, 2012b), spending more evenings out (O'Malley & Johnston, 2013), higher socioeconomic status, and driving someone's car without permission (Delcher, Johnson, & Maldonado-Molina, 2013). Graduated driver's license (GDL) policies (see Chapter 4) limit the extent to which young people drive and the conditions under which they drive. "Use/lose" policies revoke driving privileges among young people convicted of an alcohol offense. Cavazos-Regh and colleagues (2012) found that students in states with strong GDL laws and the most restrictive "use/lose" laws were significantly less likely to report driving after drinking.

A number of policy approaches (see Chapter 4) have been shown to reduce driving after drinking and associated mortality and morbidity among youth. Chief among these is the age 21 MLDA. Two reviews of the research on the age 21 MLDA concluded that this policy reduces injuries and saves lives, even though the law is imperfectly enforced and widely disobeyed (DeJong & Blanchette, 2014; McCartt, Hellinga, & Kirley, 2010). Fell, Fisher, Voas, Blackman, and Tippetts (2009) found that the age 21 MLDA was associated with a 16 percent decline in the ratio of drinking to nondrinking drivers under age 21 involved in fatal crashes, after controlling for a number of other state-level traffic safety and alcohol-related policies.

Another study that examined the effects of a wide variety of laws designed to reduce driving after drinking found significant effects of underage purchase and consumption laws and laws related to the production and use of false identification (Fell, Fisher, Voas, Blackman, & Tippetts, 2008). Cavazos-Regh and colleagues (2012) used 1999–2009 YRBS data to examine the impact of GDL and "use/lose" laws on drinking and driving behaviors of youth ages 16 to 17. Restrictive GDL laws and "use/lose" laws were associated with decreased driving after drinking any alcohol and decreased riding in a car with a driver who had been drinking alcohol.

Other Leading Causes of Death in Youth

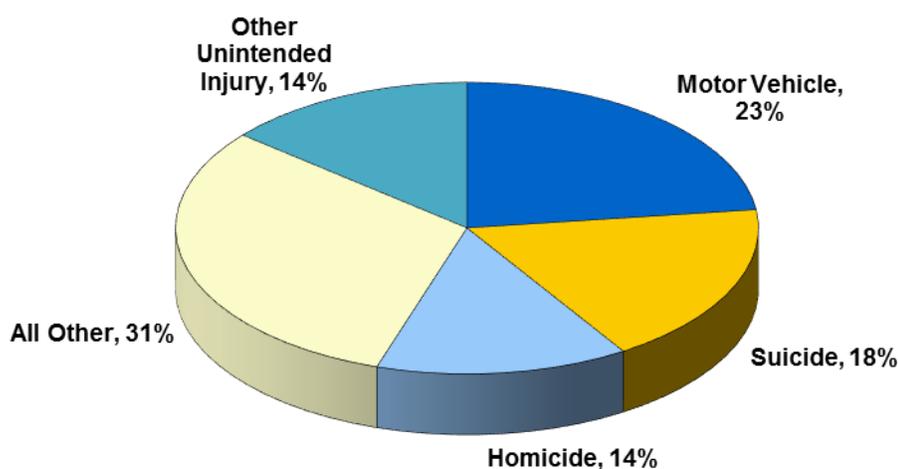
In addition to contributing to motor vehicle crashes, underage drinking contributes to all major causes of fatal and nonfatal trauma experienced by young people. Suicide, other unintentional injuries, and homicide, along with motor vehicle traffic crashes, are the four leading causes of death among youths ages 12 to 20 (Exhibit 2.19).

In 2013, 2,105 youths ages 12 to 20 died from unintentional injuries from causes other than motor vehicle crashes, such as poisoning, drowning, falls, and burns (CDC, 2015b). Research suggests that about 40 percent of these deaths were attributable to alcohol (Smith, Branas, & Miller, 1999).

Data from 17 states show that among people who died by suicide who were ages 10 to 19 (all of whom were under the legal drinking age in the United States) and were tested, 12 percent had BACs >0.08 g/dL (Crosby, Espitia-Hardman, Hill, & Ortega, 2009). One study (Smith et al., 1999) estimated that, for the population as a whole, nearly one third (31.5 percent) of homicides and almost a quarter (22.7 percent) of suicides were attributable to alcohol (i.e., involved a deceased person with a BAC of 0.10 g/dL or greater). Another study focusing on youth suicide estimated that 9.1 percent of hospital-admitted suicide acts by those under age 21 involved alcohol, and of those cases, 72 percent were attributable to alcohol (Miller, Levy, Spicer, & Taylor, 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.

Exhibit 2.19: Leading Causes of Death for Youth Ages 12–20: 2013 (CDC, 2014a)



Years of Potential Life Lost Due to Alcohol

People under age 21 who die as a result of alcohol use lose an average of 60 years of potential life (CDC, 2015a). 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), because these are primarily diseases of older adults.

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 (Brown, Tapert, Granholm, & Dellis, 2000; Giancola & Mezzich, 2000; Tapert & Brown, 1999; Tapert et al., 2001; Winward, Hanson, Bekman, Tapert, & Brown, 2014).

As Brown and colleagues (2000) noted, 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). A 10-year prospective study (Hanson, Medina, Padula, Tapert, & Brown, 2011) found that having a history of heavy alcohol or other substance use during adolescence appears to be more important in determining cognitive deficits than whether or not individuals continued to have substance-related problems into their mid-twenties.

The Adolescent Brain Cognitive Development (ABCD) study, launched in 2015, is expected to provide information on the factors that contribute to adolescent alcohol abuse and its long-term effects on brain development and associated life outcomes. The ABCD study is the “largest long-term study of brain development and child health in the United States,” according to the study website (<http://abcdstudy.org/>). The study will enroll about 10,000 children ages 9 and 10 at 19 research institutions across the country and follow them into early adulthood for 10 years. Researchers will use noninvasive neuroimaging and cognitive, academic, social, emotional, and biological assessments to determine how childhood experiences interact with each other and with children’s changing biology to affect brain development and other outcomes.”

An initiative at the National Institutes of Health (NIH), Collaborative Research on Addiction at NIH (CRAN), is leading the ABCD study in partnership with other NIH Institutes. CRAN comprises the National Institute on Drug Abuse (NIDA), the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and the National Cancer Institute (NCI).

Risky Sexual Activity

According to the *SG’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, including infection with HIV, the virus that causes AIDS (Cooper & Orcutt, 1997). When pregnancies occur, underage drinking may result in fetal alcohol

spectrum disorders, including fetal alcohol syndrome, which remains a leading cause of intellectual disabilities (Jones, Smith, Ulleland, & Streissguth, 1973; Stratton, Howe, & Battaglia, 1996; Warren & Bast, 1988). A review article by Nolen-Hoeksema cited a number of studies suggesting that underage drinking by both victim and assailant increases the risk of physical and sexual assault (Abbey, 2011; Nolen-Hoeksema, 2004).

Impaired Academic Performance

In general, cross-sectional studies have found that students who do poorly in school drink more than students whose school performance is better (Bryant, Schulenberg, O'Malley, Bachman, & Johnston, 2003). For example, students who report binge drinking are three times more likely to report earning mostly Ds and Fs on their report cards than non-binge drinkers (Miller, Naimi, Brewer, & Jones, 2007).

However, the evidence from longitudinal studies is less clear cut, and in some cases the data suggest that academic failure leads to increased drinking rather than the reverse. Using data from the Youth Development Study (Mortimer, 2003), Owens, Shippee, and Hensl (2008) tracked a panel of youth from their freshman to senior years in high school. The authors failed to find a significant link across the high school years between increased drinking and diminishing academic performance.

A 1-year longitudinal analysis of middle school and high school students using the National Longitudinal Study of Adolescent Health found that, independent of consumption levels, students who drank experienced modest declines (one-tenth of a letter grade) in academic achievement (Crosnoe, Muller, & Frank, 2004). Using a similar design, Crosnoe (2006) found a stronger association between number of classes failed and later alcohol use than between alcohol use and academic performance. Academic failure appeared to lead to increased drinking through weakened bonds that traditionally control problem behavior, especially bonding to teachers. Interestingly, both Mortimer (2003) and Owens and colleagues (2008) found that increasing GPAs were associated with increasingly frequent drinking occasions. The authors speculated that good grades may bring a measure of parental freedom.

Renna (2008) tracked educational attainment and alcohol use at ages 19 and 25 among two cohorts of people 18 years old in 1982 and 1983, using data from the National Longitudinal Survey of Youth. Binge drinking in the senior year of high school reduced the probability of receiving a high school diploma and increased the probability of graduating later in life with a general education development diploma (and hence realizing lowered earning potential). Also of interest, the study found that increases in the MLDA increased the probability of people graduating by age 19 by 5.3 percentage points.

Increased Risk of Developing an Alcohol Use Disorder Later in Life

Early-onset alcohol use, alone and in combination with escalated drinking in adolescence, has been noted as a risk factor for developing alcohol-related problems in later life (Agrawal et al., 2009; Dawson et al., 2008; Hingson, Heeren & Winter, 2006; Hingson & Zha, 2009; Pitkänen, Lyyra, & Pulkkinen, 2005; York, Welte, Hirsch, Hoffman, & Barnes, 2004). Grant and Dawson (1997) found that more than 40 percent of people who initiated drinking before age 13 met

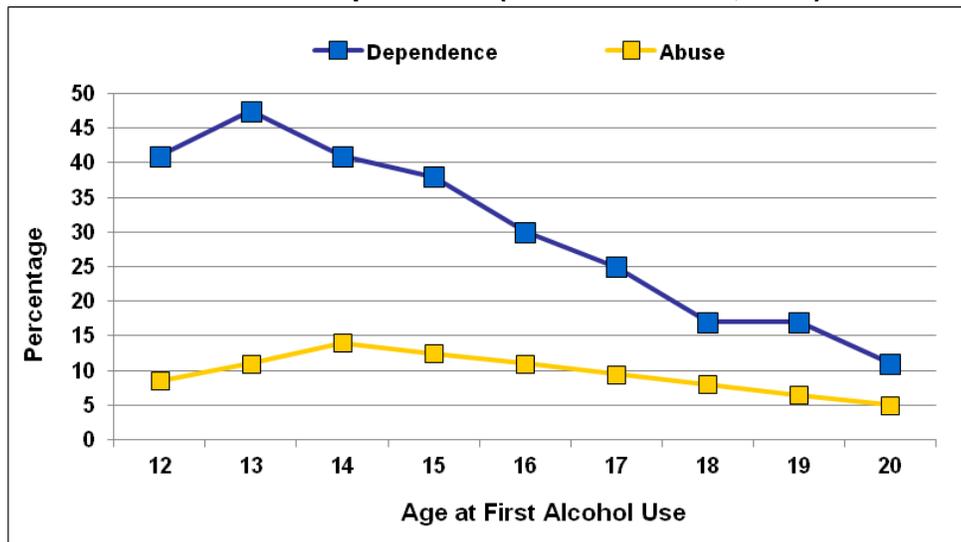
diagnostic criteria for alcohol dependence at some time in their lives.³³ By contrast, alcohol dependence rates among those who started drinking at ages 17 and 18 were 24.5 percent and 16.6 percent, respectively (Exhibit 2.20). Data from the 2009–2011 NSDUH suggested a similar relationship between age of initiation and development of alcohol-related problems. Only 10 to 11 percent of people who started drinking at age 21 or older met the criteria.

The onset of alcohol consumption in childhood or early adolescence is a marker for later use of drugs, drug dependence, and drug-related crash involvement (Hermos et al., 2008; Hingson, Heeren, & Edwards, 2008). Use of both alcohol and marijuana or alcohol, marijuana, and cigarettes before age 16 is associated with a spectrum of young adult substance use problems, as well as substance use disorder diagnoses (Moss, Chena, & Yi, 2014).

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).

Many young people are neither asked by medical providers about their drinking nor advised to reduce or stop drinking. A study of 10th graders found that in the past month, 36 percent reported drinking, 28 percent reported binge drinking, and 23 percent reported drunkenness. Of those who saw a physician in the past year (82 percent), 54 percent were asked about drinking, 40 percent were advised about related harms, and 17 percent were advised to reduce or stop. Frequent drinkers, binge drinkers, and those drunk were more often advised to reduce or stop. Nonetheless, only 25 percent of them received that advice from physicians. In comparison,

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



³³ As noted above, the criteria for alcohol-related disorders in the DSM-V (APA, 2013) do not specifically address adolescents.

36 percent of frequent smokers, 27 percent of frequent marijuana users, and 42 percent of frequent other drug users were advised to reduce or quit those behaviors (Hingson, Zha, Ianotti, & Simons-Morton, 2013).

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 *SG's Call to Action* and is an important concept in this report.

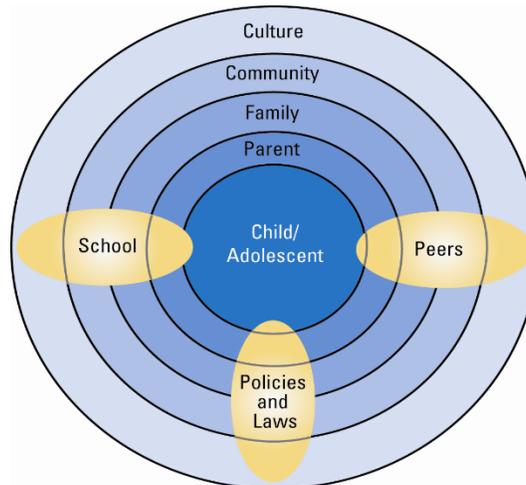
Adolescence is the period between the onset of puberty³⁴ and the assumption of adult roles. It is a time of particular vulnerability to alcohol use and its consequences for a variety of developmental reasons, some specific to the individual and others related to the biological and behavioral changes 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, school); genetic, psychological, and social factors specific to each adolescent; and environmental factors that influence availability and appeal of alcohol (e.g., enforcement of underage alcohol policies, marketing practices, 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 the 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; neither 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 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.

³⁴ 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.

**Exhibit 2.21: Systems That Influence Adolescent Behavior
(Office of the Surgeon General, 2007)**



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 teenagers’ lives 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 *SG’s 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, Schwandt, Newman, & Higley, 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 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, Stallings, Schmitz, Young, & Fulker, 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 alcohol use disorders (Soloff, Lynch, & Moss, 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.

Family and Parental Influence

Children whose families include individuals who abuse alcohol are at increased risk for alcohol dependence throughout their lives. Genes account for more than half the risk for alcohol dependence; environmental factors account for the rest. However, no single gene accounts for the majority of risk. 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 people with genetic predispositions to alcohol use disorders will have those predispositions expressed (Timberlake et al., 2007).

Parental monitoring and parental attitudes and perceptions about drinking (such as seeing underage drinking as a rite of passage) have been shown to be very important influences on underage drinking. Studies have found that some parenting practices have proven beneficial in reducing adolescent alcohol use (Beck, Boyle, & Boekeloo, 2003; Ennet et al., 2001; Resnick et al., 1997; Watkins, Howard-Barr, Moore, & Werch, 2006). Parental monitoring, communication, and emotional support have a positive effect on adolescent alcohol use and are predictive of reduced adolescent alcohol problems (Ennet et al., 2001; Wood, Read, Mitchell, & Brand, 2004). At least one study suggests that parental disapproval of any alcohol use during high school is correlated with reduced alcohol use in college (Abar, Abar, & Turrisi, 2009). Some parents believe that providing alcohol to their children at home under supervision will lead to more moderate drinking practices. However, a meta-analysis of 22 studies found that parental

provision of alcohol was associated with increased adolescent alcohol use, heavy episodic drinking, and higher rates of alcohol problems (Kaynak, Winters, Cacciola, Kirby, & Arria, 2014). The data were equivocal that parental provision is protective in the face of other risks.

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, Brunell, Varlinskaya, & Spear, 2003; Little, Kuhn, Wilson, & Swartzwelder, 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. Also, 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 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 *SG’s Call to Action* states—“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.