UNDERAGE BINGE DRINKING VARIES WITHIN AND ACROSS STATES

AUTHORS

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INTRODUCTION

Alcohol use constitutes a serious public health issue for young people in the United States because binge drinking can have negative health, social, and economic consequences for these youths, their families, and communities. For example, youths who engage in frequent binge drinking in high school are more likely to engage in other risky behaviors, such as using marijuana and cocaine, having sex with six or more partners, and earning grades that are mostly Ds and Fs in school. In addition, the U.S. Department of Health and Human Services Healthy People 2020 initiative identified reducing rates of binge drinking among adolescents and college students as a national priority. Research suggest that between 2008 and 2014, underage binge drinking by people aged 12 to 20 declined in the United States from 19.3 percent in 2002 to 13.8 percent in 2014. This represents more than a 20 percent decline in underage drinking from a 2008 baseline to 2014. Although the national trend in underage drinking is encouraging, underage drinking remains a concern in the United States, especially because its consequences are experienced in states and local communities every year. Excessive drinking still results in more than 4,300 deaths per year among underage youths. In 2010, underage youths made almost 190,000 emergency department visits for alcohol-related injuries, and the economic cost of underage drinking was $24 billion. As a result, continued efforts are being made to identify where underage drinking is more common and where it is less prevalent. Within each state, patterns of drinking vary in different regions. For example, the availability of alcohol, drinking norms, demographic makeup of an area, and the economics of an area contribute to regional variations in drinking behaviors. Preventing underage alcohol consumption is particularly important to the individual states within the United States, which have had authority for alcohol control since 1933. All 50 states and the District of Columbia prohibit possession of alcoholic beverages by people younger than age 21, and most prohibit underage consumption of alcoholic beverages. Data on the state and local levels may provide insight into the nature and scope of underage drinking, and this insight may help state and local public health authorities to better understand and address the needs in their communities.

In Brief

- Combined 2012–2014 National Survey on Drug Use and Health state- and substate data can advance the understanding of underage binge drinking in U.S. communities.
- Nationally, 14.44 percent of people aged 12 to 20 binge drank in the past month.
- Among states, estimates of underage binge drinking ranged from 10.98 percent in Utah to 21.42 percent in North Dakota.
- Among the substate regions, estimates of underage binge drinking ranged from 8.37 percent in Shelby County (Tennessee) to 42.39 percent in Ward 2 (District of Columbia).
- Of the 16 substate regions with the lowest estimates of underage binge drinking, 12 were in the South and 4 were in the West.
- Of the 16 substate regions with the highest rates of underage binge drinking, 9 were in the Northeast, 4 were in the South, 4 were in the Midwest, and 1 was in the West.
- Compared with the estimate from 2010–2012, the estimate of past month underage binge drinking in 2012–2014 was lower in the nation as a whole (15.87 percent in 2010–2012 vs. 14.44 percent in 2012–2014).
- Between 2010–2012 and 2012–2014, 18 states plus the District of Columbia experienced a statistically significant decrease in estimates of past month underage binge drinking, while the remaining 32 states experienced no change.
This issue of The CBHSQ Report presents estimates of past month binge drinking among people aged 12 to 20 (i.e., underage) based on combined 2010–2012 and 2012–2014 National Survey on Drug Use and Health (NSDUH) data. NSDUH national, state, and substate estimates of underage alcohol use can help address policymaker and prevention specialists' needs for more localized information on underage drinking.

NSDUH is an annual survey of the U.S. civilian, noninstitutionalized population aged 12 years or older. One of NSDUH's strengths is the stability of its survey design, which allows for multiple years of data to be combined to examine the state and substate (e.g., local) estimates of underage binge drinking and changes across time.

In the 2010–2014 NSDUHs, binge drinking is defined as having five or more drinks on the same occasion (i.e., at the same time or within a couple of hours of each other) on at least 1 day in the past 30 days (i.e., past month). This report presents NSDUH estimates of past month underage binge drinking across four levels: (1) the nation, (2) census regions (i.e., South, Midwest, West, and Northeast), (3) states (i.e., 50 states and the District of Columbia), and (4) substate regions (i.e., 362 substate regions). This report also compares estimates of underage binge drinking in 2010–2012 and 2012–2014. All changes across time that are discussed in this report are statistically significant at the .05 level. Findings in this report are annual averages based on combined 2012–2014 NSDUH data from approximately 84,700 respondents aged 12 to 20. Estimates were derived from a complex statistical model (i.e., small area estimation) in which substate data from NSDUH were combined with other local area data to enhance statistical power and analytic capability.9

NATIONAL, REGIONAL, AND STATE ESTIMATES

In this section, estimates of past month binge drinking among people aged 12 to 20 are presented in Figure 1 and Table 1 for the nation, census regions, and the 50 states and the District of Columbia. In Table 1, state estimates of underage past month binge drinking are shown to two decimal places and are ordered from highest to lowest percentage of the population with past month binge drinking. To produce the map in Figure 1, the states that were presented in Table 1 from highest to lowest were divided into quintiles (fifths).10 A state having a higher or lower estimate does not imply that the estimate is significantly higher or lower than the next highest or lowest estimate. When comparing two estimates, overlapping 95 percent confidence intervals do not imply that the estimates are statistically equivalent at the 5 percent level of significance.11

National Estimate of Underage Binge Drinking

National estimates of underage binge drinking provide the overall context for understanding this issue. Based on combined 2012–2014 NSDUH data, an annual average of 5.5 million people aged 12 to 20 in the U.S. engaged in binge drinking in the past month. Nationally, 14.44 percent of all people aged 12 to 20 engaged in binge drinking in the past month. Among states, estimates of past month underage binge drinking ranged from 10.98 percent in Utah to 21.42 percent in North Dakota (Figure 1; Table 1).

Regional Estimates of Underage Binge Drinking

The combined 2012–2014 NSDUH data confirms that underage drinking occurs in every U.S. census region. Across the census regions, estimates of past month binge drinking among people aged 12 to 20 were 16.49 percent in the Northeast, 15.47 percent in the Midwest, 14.25 percent in the West, and 13.02 percent in the South (Table 1).12

The census regions represent large groupings of states, and the combined 2012–2014 NSDUH data indicate that underage binge drinking varies within census regions (Table 1). In the Northeast, estimates of past month underage binge drinking ranged from 21.00 percent in New Hampshire to 15.34 percent in New York. In the Midwest, estimates of past month underage binge drinking ranged from 21.42 percent in North Dakota to 14.48 percent in Indiana. In the West, estimates of past month underage binge drinking ranged from 17.33 percent in Montana to 10.98 percent in Utah. In the South, estimates of past month underage binge drinking ranged from 18.03 percent in the District of Columbia to 11.45 percent in Tennessee.
State Estimates of Underage Binge Drinking

As described previously, the 50 states and the District of Columbia were divided into quintiles based on the percentage of the population aged 12 to 20 who engaged in binge drinking in the past month (Figure 1). Based on combined 2012–2014 NSDUH data, there were 10 states in the lowest quintile of estimates of past month underage binge drinking. The 10 states in the lowest quintile were Mississippi (13.00 percent), Texas (12.93 percent), Alabama (12.86 percent), Hawaii (12.78 percent), Florida (12.51 percent), Idaho (12.42 percent), Georgia (12.32 percent), North Carolina (11.65 percent), Tennessee (11.45 percent), and Utah (10.98 percent).

Based on combined 2012–2014 NSDUH data, there were 10 states in the highest quintile of estimates of past month underage binge alcohol use. The 10 states in the highest quintile were North Dakota (21.42 percent), New Hampshire (21.00 percent), Vermont (20.85 percent), Rhode Island (19.90 percent), South Dakota (18.58 percent), Massachusetts (18.19 percent), the District of Columbia (18.03 percent), Iowa (17.62 percent), Wisconsin (17.50 percent), and Montana (17.33 percent).

Figure 1. Underage binge alcohol use in the past month among people aged 12 to 20, by State: percentages, annual averages based on combined 2012 to 2014 NSDUHs

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
Table 1. Underage binge alcohol use in the past month among people aged 12 to 20: by quintile group: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Census region</th>
<th>Percentage of adolescents</th>
<th>Quintile group</th>
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</thead>
<tbody>
<tr>
<td>North Dakota</td>
<td>Midwest</td>
<td>21.42%</td>
<td>5</td>
</tr>
<tr>
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<td>Northeast</td>
<td>21.00%</td>
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<td>Northeast</td>
<td>20.85%</td>
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<td>Northeast</td>
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</tr>
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<td>18.19%</td>
<td>5</td>
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<td>District of Columbia</td>
<td>South</td>
<td>18.03%</td>
<td>5</td>
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<tr>
<td>Iowa</td>
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<td>17.62%</td>
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<td>Wisconsin</td>
<td>Midwest</td>
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<td>5</td>
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<td>Montana</td>
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<td>17.33%</td>
<td>5</td>
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<td>South</td>
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<tr>
<td>Texas</td>
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<td>Florida</td>
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<tr>
<td>Idaho</td>
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<tr>
<td>Utah</td>
<td>West</td>
<td>10.96%</td>
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</table>

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014
This report also compares the combined 2012–2014 NSDUH state estimates of past month underage binge drinking with 2010–2012 estimates of underage binge drinking to examine changes over time. The 2010–2012 NSDUH data are based on information obtained from approximately 94,200 people aged 12 to 20. The inclusion of a common year (i.e., 2012) in these comparisons increases the precision of the estimates and the ability to detect statistically significant differences between the two periods. Statistically significant differences between 2010–2012 and 2012–2014 NSDUH estimates indicate average annual change between 2010–2011 and 2013–2014. It is not possible to examine changes over time at the substate level because of changes to substate boundaries by the states between 2010–2012 and 2012–2014.

Comparisons of 2010–2012 NSDUH national estimates with 2012–2014 NSDUH national estimates indicate that the nation as a whole experienced a statistically significant decrease in past month underage binge drinking (15.87 to 14.44 percent) (Table 2). Similarly, when 2010–2012 NSDUH region-level estimates of past month underage binge drinking were compared with 2012–2014 NSDUH estimates, all four census regions experienced statistically significant decreases (18.25 to 16.49 percent in the Northeast, 17.19 to 15.47 percent in the Midwest, 14.38 to 13.02 percent in the South, and 15.24 to 14.25 percent in the West) (Table 2).

When the 2010–2012 state estimates were compared with the 2012–2014 NSDUH state estimates, 18 states and the District of Columbia (California, Connecticut, Delaware, Florida, Idaho, Illinois, Iowa, Kentucky, Michigan, Minnesota, Montana, New Jersey, New York, Ohio, Tennessee, Texas, Virginia, and West Virginia) experienced a statistically significant decrease in their estimates of past month underage binge drinking. The remaining 32 states experienced no change in the percentage of past month underage binge drinking (Table 2). No states had significantly higher estimates of underage binge drinking in 2012–2014 compared with 2010–2012.
Table 2. Underage binge alcohol use in the past month among people aged 12 to 20 by state: percentages, annual averages based on combined 2010 to 2012 and combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>95% Confidence interval</td>
</tr>
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<td><strong>National</strong>*</td>
<td>15.87 (15.41–16.35)</td>
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<tr>
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<td>14.99 (13.32–16.64)</td>
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<td>12.49 (11.03–14.10)</td>
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<td>15.95 (14.36–17.58)</td>
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<td>Wisconsin</td>
<td>17.65 (15.89–19.55)</td>
<td>17.50 (15.73–19.42)</td>
</tr>
</tbody>
</table>

* Difference between the 2010-2012 and 2012-2014 estimate is statistically significant at the 0.05 level.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2010 to 2014.
The combined 2012-2014 NSDUH state and national estimates of binge drinking among people aged 12 to 20 highlight the prevalence of underage drinking. Although state and national estimates of underage binge drinking may be useful for state policymakers, more localized information may further enhance their understanding of the issue of underage drinking in their communities. The Substance Abuse and Mental Health Services Administration (SAMHSA) works with state substance abuse/mental health agency representatives to define substate areas that meet state needs and reporting requirements while ensuring that the NSDUH sample sizes are large enough to provide estimates with adequate precision.\textsuperscript{13}

Combined 2012–2014 NSDUH data can be used to estimate past month underage binge drinking in 362 substate regions. The 2012–2014 NSDUH estimates in this report are based on substate boundaries that reflect current state needs and reporting requirements and may not be comparable with estimates from substate regions from prior years. For more information on the substate region definitions used in the NSDUH, see the "2012–2014 National Survey on Drug Use and Health Substate Region Definitions" at http://samhsa.gov/data/. In most states, the substate regions are defined in terms of single counties or groups of counties; however, in some states, the regions are defined entirely in terms of census tracts (in Connecticut, the District of Columbia, and Massachusetts), parishes (in Louisiana), boroughs/census areas (in Alaska), a combination of counties and census tracts (in California and Delaware), and a combination of counties and independent cities (in Maryland, Missouri, Nevada, and Virginia).

Combined 2012–2014 NSDUH substate region estimates of past month binge drinking among people aged 12 to 20 are displayed on a U.S. map (Figure 2). In Table S1, substate region estimates are shown to two decimal places and are listed alphabetically. To produce the substate map in Figure 2, the substate estimates of past year nonmedical use of prescription pain relievers were ordered from highest to lowest percentage and were then divided into three approximately equal groups based on their percentage. There are 121 substate regions in the lowest third (i.e., with the lowest percentages) and there are 121 substate regions in the highest third (i.e., with the highest percentages). There are 120 substate regions in the middle third. The highest and lowest thirds were subdivided into thirds to further distinguish among the substate regions. Overall, the seven groups in each map were constructed to represent a somewhat symmetrical distribution.\textsuperscript{14} In some cases, a category could have more or fewer substate regions because two (or more) substate regions have the same estimate (to two decimal places). When such ties occurred at the "boundary" between two groups, all substate regions with the same estimate were assigned to the lower group. Individual state maps at http://samhsa.gov/data/ provide more granularity in areas too small to display clearly on the U.S. maps. Table S1 provides estimates associated with each map. Ninety-five percent confidence intervals are included as a measure of precision for each estimate.\textsuperscript{15}
Among the substate regions, the 2012-2014 NSDUH estimates of past month underage binge drinking ranged from 8.37 percent in Shelby County (Tennessee) to 42.39 percent in Ward 2 in the west-central section of the District of Columbia (Figure 2). Of the 16 substate regions with the highest rates of past month underage binge drinking, 7 were in the Northeast (2 in New Hampshire, 2 in Rhode Island, 1 in Vermont, 1 in Connecticut, and 1 in Massachusetts), 4 were in the South (3 in the District of Columbia and 1 in West Virginia), 4 were in the Midwest (2 in North Dakota, 1 in Ohio, and 1 in South Dakota), and 1 was in the West (Wyoming).

Of the 16 substate regions with the lowest rates of past month binge drinking among people aged 12 to 20, there were 12 in the South (4 in North Carolina, 2 in Florida, 2 in Tennessee, 1 in Georgia, 1 in Texas, 1 in Delaware, and 1 in the District of Columbia), and 4 were in the West (3 in Utah and 1 in Idaho).

**Figure 2. Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs**

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
WITHIN-STATE VARIATION IN UNDERAGE BINGE DRINKING

The previous sections examined 2012–2014 NSDUH state and substate past month estimates of underage binge drinking individually. Some substate areas are too small to display clearly on the U.S. national maps (Figure 2); therefore, individual state maps are particularly useful for seeing these small substate areas. SAMHSA produces individual NSDUH state maps that display the substate estimates of past month underage binge drinking. In this section, two of the individual state maps are presented to illustrate the variability within states. For more state-specific NSDUH maps, see http://www.samhsa.gov/data/sites/default/files/NSDUHsubstateStateTabs2014/NSDUHsubstateSpecificStatesTOC2014.htm.

As previously noted, the assignments of the substate areas within states were created by dividing 362 substate regions, nationally, into 7 groups based on their percentages of past month underage binge drinking. Figure 2 shows that states that are in the highest and lowest quintiles tend to have more uniform substate estimates. That is, states with the highest percentages of past month underage binge drinking tend to have substate areas with high percentages of past month underage binge drinking. For example, 5 of the 10 states in the highest quintile of estimates of past month underage binge drinking had substate estimates that were all in the highest third. When all of the substate areas are in the same third, this is a probable indicator of low variability within those states. Estimates were not tested to determine whether they represent significantly higher or lower estimates.

Across the states and the District of Columbia, the most variability in substate estimates occurred within states in the middle quintile. Stated another way, the states in the middle third in Figure 1 had the most variation at the substate level in Figure 2. Of the 11 states in the middle quintile, 9 states had substate-level estimates of past month underage binge drinking that were in the highest, middle, and lowest third, which may indicate more variability. An example of this variability can be seen in small areas such as the District of Columbia (Figure 3) and large areas such as Texas (Figure 4).

In the District of Columbia, the 2012–2014 NSDUH estimates of past month underage binge drinking ranged from 42.39 percent in Ward 2 to 10.85 percent in Ward 7 (Figure 4). Higher percentages of underage binge drinking occurred in Ward 2 (42.39 percent), Ward 3 (24.80 percent) and Ward 1 (23.61 percent). Lower percentages of underage binge drinking occurred in Ward 7 (10.85 percent), Ward 4 (11.78 percent), Ward 8 (11.99 percent), and Ward 6 (12.38 percent). Ward 5 (15.85 percent) fell in the middle third.

Figure 3. Binge alcohol use in the past month among people aged 12 to 20 in the District of Columbia, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
In Texas, the 2012–2014 NSDUH estimates of past month binge alcohol use among people aged 12 to 20 ranged from 17.67 percent in Region 2 to 10.57 percent in Region 6. In Texas, higher percentages of underage binge drinking occurred in Region 2 (17.67 percent), Region 1 (16.84 percent), and Region 7 (16.67 percent). Lower percentages of underage binge drinking occurred in Region 6 (10.57 percent), Region 11 (12.32 percent), Region 3 (12.37 percent), Region 8 (12.62 percent), and Region 4 (12.89 percent). The remaining 3 regions (Regions 9, 5, and 10) fell in the middle third.

As previously mentioned, the maps of the 2012–2014 NSDUH substate estimates of past month binge alcohol use among people aged 12 to 20 in the District of Columbia (Figure 3) and Texas (Figure 4) are examples of the individual state maps produced using the combined 2012-2014 NSDUH data. The state-specific NSDUH maps for the remaining states are available on the following website: http://www.samhsa.gov/data/sites/default/files/NSDUHsubstateStateTabs2014/NSDUHsubstateSpecificStatesTOC2014.htm.
Each year, thousands of adolescents and young adults engage in underage drinking, which negatively affects their health and can lead to emergency department visits for alcohol-related illnesses, injuries, and other problems. For many youths, excessive drinking results in premature mortality, with traffic crashes accounting for 36 percent of the alcohol-attributable deaths for those younger than 21. This issue of The CBHSQ Report showed that NSDUH estimates of underage binge drinking among people aged 12 to 20 in the United States have declined in the nation as a whole, in the 4 census regions, and in 18 states plus the District of Columbia between 2010–2012 and 2012–2014. Monitoring trends in underage drinking remains a concern across the states and in the nation as a whole because of the health risks associated with this behavior.

In addition, this report also illustrates that the extent of underage drinking also varied within states. Although it is not possible to monitor trends in underage drinking at the substate level because of changing definitions of substate regions, the estimates of underage drinking at the substate level enable policymakers to contrast their state- and substate-level information to help inform needs assessments in their communities. The maps in this report identify substate underage binge drinking levels for people aged 12 to 20 to help state policymakers and prevention specialists quickly see if there are locations in their state where this behavior is more common.

Reducing binge drinking among youths and adults is an ongoing challenge for the nation as a whole and for the states individually. As states continue to examine their laws and social norms regarding underage drinking, including social hosting laws, monitoring state-level trends in underage binge drinking may also help state and local policymakers plan for and allocate resources to address underage drinking. This report may be used as a tool to gather more information in shaping the story of binge drinking in youth populations. This example can be applied to many other problems that the United States is facing while trying to reach its goal of minimizing alcohol-related injuries and deaths among youths. For more information on underage drinking prevention, see the following websites:


Other NSDUH Substate Measures

The combined 2012–2014 NSDUH estimates for past month underage binge drinking for people aged 12 to 20 are available, along with 25 additional behavioral health measures for 384 substate areas, 50 states and the District of Columbia, 4 census regions, and the United States. Information on the methodology that generated these estimates is available online at [http://samhsa.gov/data/](http://samhsa.gov/data/). This report discusses one of the measures for the 362 substate areas displayed on the maps. The 25 additional measures include substance use and mental health issues, including use of illicit drugs (e.g., marijuana use, cocaine use, nonmedical use of prescription pain relievers), alcohol, and tobacco; substance use disorders; needing but not receiving treatment for a substance use problem; any mental illness, serious mental illness; depression; and suicidal thoughts. Also provided are national maps for all measures and detailed tables including percentages for each substate region, state, census region, and the nation for people aged 12 or older; tables by age group; and state-specific tables and maps. The state maps are particularly useful in areas too small to display clearly on the U.S. maps.
The need for services, and other uses. Treatment programs and to promote public health. States use NSDUH substate estimates for a variety of purposes, including strategic planning and areas reported in their applications for the Substance Abuse Prevention and Treatment Block Grant (SABG) administered by SAMHSA. The SABG program Substance use and mental health officials from each of the 50 states and the District of Columbia typically define these substate areas to correspond to IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI. The Northeast has 9 states: CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest has 12 states: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI. The West has 13 states: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, and WY. The South has 16 states plus the District of Columbia: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV. The Northeast has 9 states: CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest has 12 states: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI. The South has 16 states plus the District of Columbia: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV. The Northeast has 9 states: CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest has 12 states: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI. The South has 16 states plus the District of Columbia: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV. The Northeast has 9 states: CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest has 12 states: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI.

Estimates presented in this report are derived from a hierarchical Bayes model-based small area estimation (SAE) procedure in which NSDUH data at the substate level are combined with local area county and census block group tract-level data from the area to provide more precise estimates of substance use and mental health outcomes. The precision of the SAE estimates can be improved significantly by combining data across 3 years (i.e., 2012 to 2014). With 3 years of combined NSDUH data, the sample sizes in the 362 substate regions ranged from 100 people to approximately 3,500 people. In some cases, a "quintile" could have more or fewer states than desired because two (or more) states have the same estimate (to two decimal places). When such ties occurred at the "boundary" between two quintiles, all states with the same estimate were assigned to the lower quintile. In this report, state estimates are discussed in terms of their observed rankings because they provide useful context. However, a state having a highest or lowest rate does not imply that the state's rate is significantly higher or lower than the rate of the next highest or lowest state. Similarly, the quintiles were not selected to represent statistical differences across quintiles or to correspond to proximity to a target public health threshold for a particular measure. For example, the division of states into quintiles does not indicate that states in the same quintile are statistically similar to each other. While a nearly equal number of states are contained in each quintile, the size of the intervals (i.e., the difference between the upper and lower limits of each quintile) that define the map boundaries is not necessarily uniform across each quintile. When comparing two state prevalence rates, the method of overlapping confidence intervals is more conservative (i.e., it rejects the null hypothesis of no difference less often) than the standard method based on Z statistics when the null hypothesis is true. Even if confidence intervals for two states overlap, the two estimates may be declared significantly different by the test based on Z statistics. Hence, the method of overlapping confidence intervals is not recommended to test the difference of two state estimates. A detailed description of the method of overlapping confidence intervals and its comparison with the standard methods for testing of a hypothesis is given in the following articles: (a) Schenker, N., & Gentleman, J. F. (2001). On judging the significance of differences by examining the overlap between confidence intervals. American Statistician, 55(3), 182-186. (b) Payton, M. E., Greenstone, M. H., & Schenker, N. (2003). Overlapping confidence intervals or standard error intervals: What do they mean in terms of statistical significance? Journal of Insect Science, 3, 34. For details on a more accurate test to compare state prevalence estimates, please see Section B.12 in Appendix B of 2011-2012 National Survey on Drug Use and Health: Guide to state tables and summary of small area estimation methodology, located at http://www.samhsa.gov/data/NSDUH/2k12State/NSDUHsae2012/Index.aspx.

The West has 13 states: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, and WY. The South has 16 states plus the District of Columbia: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, and WV. The Northeast has 9 states: CT, MA, ME, NH, NJ, NY, PA, RI, and VT. The Midwest has 12 states: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, and WI. Substance use and mental health officials from each of the 50 states and the District of Columbia typically define these substate areas to correspond to areas reported in their applications for the Substance Abuse Prevention and Treatment Block Grant (SABG) administered by SAMHSA. The SABG program provides financial and technical assistance to the 50 states, the District of Columbia, and other jurisdictions to support substance abuse prevention and treatment programs and to promote public health. States use NSDUH substate estimates for a variety of purposes, including strategic planning and program development, production of epidemiological profiles for briefing state legislatures and informing the public, allocation of funds to areas based on the need for services, and other uses.
14. The seven categories were not selected to represent statistical differences across categories or to correspond to proximity to a target public health threshold for a particular measure. For example, the division of substate regions into seven categories does not indicate that substate regions in the same category are statistically similar to each other. Furthermore, the size of the intervals (i.e., the difference between the upper and lower limits of each category) that define the map boundaries is not necessarily uniform across each category. The substate areas are uniquely defined based on the needs of each state and may not be demographically or geographically comparable to substate areas in other states.

15. When comparing two substate region percentages, the method of overlapping confidence intervals is more conservative (i.e., it rejects the null hypothesis of no difference less often) than the standard method based on Z statistics when the null hypothesis is true. Even if confidence intervals for two substate regions overlap, the two estimates may be declared significantly different by the test based on Z statistics. Hence, the method of overlapping confidence intervals is not recommended to test the difference of two substate region estimates. As percentages are standardized, they do not inform a reader when two states or substates have the same percentage but different population sizes.

16. Ward 2 includes census tracts primarily in the west-central part of the District of Columbia.


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**SUGGESTED CITATION**

Supplemental Table S1: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Substate region</th>
<th>Small area estimate</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
<th>Substate area group</th>
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Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

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<thead>
<tr>
<th>State</th>
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<th>95% CI (lower)</th>
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<td>10.02%</td>
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Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Substate region</th>
<th>Small area estimate</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
<th>Substate area group</th>
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</table>

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Substate region</th>
<th>Small area estimate</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
<th>Substate area group</th>
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<td>15.25%</td>
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Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Substate region</th>
<th>Small area estimate</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
<th>Substate area group</th>
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Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
### Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Substate region</th>
<th>Small area estimate</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
<th>Substate area group</th>
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<td>14.61%</td>
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Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
### Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

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</tbody>
</table>

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
Supplemental Table S1 - continued: Underage binge alcohol use in the past month among people aged 12 to 20, by substate region: percentages, annual averages based on combined 2012 to 2014 NSDUHs

<table>
<thead>
<tr>
<th>State</th>
<th>Substate region</th>
<th>Small area estimate</th>
<th>95% CI (lower)</th>
<th>95% CI (upper)</th>
<th>Substate area group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wisconsin</td>
<td>Wisconsin</td>
<td>17.56%</td>
<td>15.73%</td>
<td>19.42%</td>
<td>5</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Milwaukee</td>
<td>15.98%</td>
<td>12.98%</td>
<td>19.52%</td>
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<tr>
<td>Wisconsin</td>
<td>Northeastern</td>
<td>17.52%</td>
<td>14.01%</td>
<td>21.02%</td>
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<tr>
<td>Wisconsin</td>
<td>Northern</td>
<td>17.71%</td>
<td>14.37%</td>
<td>21.63%</td>
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</tr>
<tr>
<td>Wisconsin</td>
<td>Southeastern</td>
<td>16.51%</td>
<td>13.52%</td>
<td>20.01%</td>
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</tr>
<tr>
<td>Wisconsin</td>
<td>Southern</td>
<td>17.61%</td>
<td>14.47%</td>
<td>21.26%</td>
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</tr>
<tr>
<td>Wisconsin</td>
<td>Western</td>
<td>20.43%</td>
<td>16.83%</td>
<td>24.56%</td>
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</tr>
<tr>
<td>Wyoming</td>
<td>Wyoming</td>
<td>16.89%</td>
<td>15.04%</td>
<td>18.83%</td>
<td>5</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Judicial District 1 (Laramie)</td>
<td>15.97%</td>
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<td>19.68%</td>
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</tr>
<tr>
<td>Wyoming</td>
<td>Judicial District 2</td>
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<td>Wyoming</td>
<td>Judicial District 3</td>
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<td>11.61%</td>
<td>17.29%</td>
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</tr>
<tr>
<td>Wyoming</td>
<td>Judicial District 4</td>
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<td>Judicial District 5</td>
<td>16.27%</td>
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<td>Wyoming</td>
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<td>11.59%</td>
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<tr>
<td>Wyoming</td>
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<td>Wyoming</td>
<td>Judicial District 9</td>
<td>13.84%</td>
<td>10.88%</td>
<td>17.46%</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health (NSDUH), 2012 to 2014.
SUMMARY

Background: Alcohol use constitutes a serious public health issue for young people in the United States. Although the national trend in underage drinking is encouraging, this issue remains a concern. Method: Combined 2012–2014 National Survey on Drug Use and Health national, regional, state-level, and substate-level estimates of past month binge drinking among people aged 12 to 20 were analyzed. Results: Underage binge drinking estimates vary extensively among census regions, within each state, and throughout the nation. Among the substate regions, past month underage binge drinking estimates ranged from 8.37 percent in Shelby County (Tennessee) to 42.39 percent in Ward 2 (District of Columbia). Compared with the estimate from 2010–2012, the estimate of past month underage binge drinking in 2012–2014 was lower in the nation as a whole (15.87 percent in 2010–2012 vs. 14.44 percent in 2012–2014). Eighteen states plus the District of Columbia experienced a statistically significant decrease from 2010–2012 to 2012–2014 in the rate of past month underage binge drinking, while the remaining 32 states experienced no change in past month underage binge drinking. Conclusion: Highlighting the percentage of youths engaging in underage binge drinking at state and substate levels can help policymakers inform their assessments of substance abuse needs in their communities.

Keywords: underage binge drinking, National Survey on Drug Use and Health, NSDUH, state, substate

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KEYWORDS


The Substance Abuse and Mental Health Services Administration (SAMHSA) is the agency within the U.S. Department of Health and Human Services that leads public health efforts to advance the behavioral health of the nation. SAMHSA’s mission is to reduce the impact of substance abuse and mental illness on America’s communities. The National Survey on Drug Use and Health (NSDUH) is an annual survey sponsored by The Substance Abuse and Mental Health Services Administration (SAMHSA). Findings in this report are annual averages based on combined 2012–2014 NSDUH data from approximately 84,700 respondents aged 12 to 20. The 2010–2012 NSDUH estimates are based on information obtained from approximately 94,200 people aged 12 to 20. The NSDUH collects data by administering questionnaires to a representative sample of the population through face-to-face interviews at their place of residence. The CBHSQ Report is prepared by The Center for Behavioral Health Statistics and Quality (CBHSQ), SAMHSA, and by RTI International in Research Triangle Park, North Carolina. (RTI International is a trade name of Research Triangle Institute.) Information on the most recent NSDUH is available in the following publication: Center for Behavioral Health Statistics and Quality. (2016). Key substance use and mental health indicators in the United States: Results from the 2015 National Survey on Drug Use and Health (HHS Publication No. SMA 16-4984, NSDUH Series H-51). Retrieved from http://www.samhsa.gov/data/ Also available online: http://www.samhsa.gov/data/population-data-nsduh.

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Substance Abuse & Mental Health Services Administration
Center for Behavioral Health Statistics and Quality
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