State Prevalence and Ranks of Adolescent Substance Use: Implications for Cancer Prevention

Jennifer L. Moss, PhD; Benmei Liu, PhD; Li Zhu, PhD

Abstract

Introduction
This study statistically ranked states’ performance on adolescent substance use related to cancer risk (past-month cigarette smoking, binge alcohol drinking, and marijuana use).

Methods
Data came from 69,200 adolescent participants (50 states and the District of Columbia) in the National Survey on Drug Use and Health (NSDUH) and 450,050 adolescent participants (47 states) in the Youth Risk Behavior Surveillance System (YRBSS). Adolescents were aged 14 to 17 years. For 2011–2015, we estimated and ranked states’ prevalence of adolescent substance use. We calculated the ranks’ 95% confidence intervals (CIs) using a Monte Carlo method with 100,000 simulations. Spearman correlations examined consistency of ranks.

Results
Across states, the prevalence of cigarette smoking was 4.5% to 14.3% in NSDUH and 4.7% to 18.5% in YRBSS. Utah had the lowest prevalence (NSDUH: rank = 51 [95% CI, 47–51]; YRBSS: rank = 47 [95% CI, 46–47]), and states’ ranks across surveys were correlated (r = 0.66, P < .001). The prevalence of binge alcohol drinking was 5.9% to 14.3% (NSDUH) and 7.1% to 21.7% (YRBSS). Utah had the lowest prevalence (NSDUH: rank = 50 [95% CI, 40–51]; YRBSS: rank = 47 [95% CI, 47–47]), but ranks across surveys were weakly correlated (r = 0.38, P = .01). The prevalence of marijuana use was 6.3% to 18.7% (NSDUH) and 8.2% to 27.1% (YRBSS). Utah had the lowest prevalence of marijuana use (NSDUH: rank = 50 [95% CI = 33–51]; YRBSS: rank = 46 [95% CI, 46–46]), and ranks across surveys were correlated (r = 0.70, P < .001). Wide CIs for states ranked in the middle of each distribution obscured statistical differences among them.

Conclusion
Variability emerged across adolescent substance use behaviors and surveys (perhaps because of administration differences). Most states showed statistically equivalent performance on adolescent substance use. Adolescents in all states would benefit from efforts to reduce substance use, to prevent against lifelong morbidity.

Introduction
Substance use causes avoidable illness and death, including from cancer (1). Smoking tobacco causes lung, liver, and colorectal cancers, among others (2). Moderate to heavy alcohol consumption is associated with oropharyngeal, colorectal, and pancreatic cancers (3). Emerging evidence suggests a positive association between marijuana use and prostate and cervical cancer (4). Despite these risks, substance use is common: 60 million Americans smoke, 14 million are alcohol-dependent, and 14 million use illicit drugs (including marijuana) (1).

Reducing substance use among adolescents is particularly important for preventing cancer. First, lifelong substance use often begins in adolescence (5,6). For example, 88% of adult daily smokers began smoking before age 18 (7). Second, adolescence is a vulnerable period when people are particularly sensitive to substance use (2). Understanding adolescent substance use is therefore crucial to reducing the risk of related cancers.

Monitoring adolescent substance use, however, is challenging. Some adolescents may underreport use because of social desirability or fear of legal consequences (8) and others may overreport use to earn social cache from their peers (8). Studies comparing self-
report to biometric measures of substance use have indicated that self-report measures have fair validity, with some adolescents underreporting and some overreporting use (8,9). However, quantifying the degree of uncertainty in estimates of adolescent substance use in surveillance surveys is important for leveraging these estimates for research and intervention purposes. Given that some public health efforts attempt to target adolescents in high-risk geographic areas, the ability to reliably identify which states have the highest or lowest prevalence of substance use may be called into question for several reasons: different surveillance surveys may identify different states; states likely rank differently across behaviors; and statistical uncertainty may undermine strong conclusions about differences across states. Understanding the extent of this problem has implications for surveillance research, specifically for cancer prevention.

We compared and ranked state estimates of past-month cigarette smoking, binge alcohol drinking, and marijuana use among adolescents from 2 population-based surveys: the National Survey of Drug Use and Health (NSDUH) and the Youth Risk Behavior Surveillance System (YRBSS). Both surveys collect substance use data for youths using cross-sectional, multistage probability sampling design, but each survey has its own strengths (10). A major strength of NSDUH is its ability to support estimates for all 50 states and the District of Columbia, and the data are collected every year. A major strength of YRBSS is its large state-level sample size; however, the survey is conducted every other year and not every state participates in the study or achieves adequate response rates. Comparison of the 2 surveys would highlight the consistencies or differences in rankings across different surveys. Calculation of confidence intervals (CIs) around ranks, often overlooked in ranking studies (11,12), allowed us to statistically evaluate consistencies and differences in state ranks within and across surveys and behaviors, and explore implications for cancer prevention.

Methods

Data sources and study populations

Data on adolescent substance use came from 2 population-based surveys: NSDUH (13) and YRBSS (14). NSDUH is an annual in-home survey sponsored by the Substance Abuse and Mental Health Services Administration (13) that estimates national- and state-level use of cigarettes, alcohol, and other drugs among people aged 12 years and older. Participants complete the NSDUH questionnaire on laptop computers assisted by trained interviewers (15). NSDUH publishes estimates of survey results annually (combining the current and previous years’ results) (13). For the current analysis, we used data from the 2011–2015 NSDUH surveys, which included 69,200 adolescents aged 14 to 17 years from 50 states and the District of Columbia ("states"); estimates of binge drinking included data only from survey years 2011–2014 (N = 58,000).

YRBSS is a biennial school-based survey coordinated by the Centers for Disease Control and Prevention (14) that monitors risk behaviors among adolescents. State education or health agencies administer surveys to representative samples of students in grades 9 through 12 (16). For states with response rates at or above 60%, YRBSS releases data for public use (16). For the current analysis, we used data from the 2011, 2013, and 2015 YRBSS surveys, which included 450,050 adolescents in grades 9 through 12 aged 14 to 17 years from 47 states (excluding the District of Columbia, Minnesota, Oregon, and Washington, which either chose not to participate during all the survey years or did not achieve adequate response rates for public data release).

The current analysis was exempt from federal regulations for protections of human subjects because it involved secondary analysis of publicly available, de-identified data.

Measures

From both data sources, we measured cigarette smoking, binge alcohol drinking, and marijuana use. Cigarette smoking was defined as smoking at least 1 cigarette in the previous 30 days. Binge alcohol drinking was defined as consuming 5 or more alcoholic drinks per drinking occasion on at least 1 of the previous 30 days. In 2015, NSDUH changed the definition of binge drinking among female respondents to 4 or more alcoholic drinks; thus, estimates of binge drinking from NSDUH include only 2011–2014 data for all participants. Marijuana use was defined as using marijuana at least once in the previous 30 days. Data on marijuana use in YRBSS were not available for Hawaii, so we excluded that state from analysis of this outcome.

In addition to substance use, we gathered data on adolescent sex (ie, male or female). Data on state of residence were collected as part of survey administration.

Statistical analysis

First, we estimated the weighted percentage and standard error of each measure of substance use in each state and each survey among all adolescents and then stratified by sex. Sample weights and the complex survey design of NSDUH and YRBSS were incorporated in the estimation by using the PROC SURVEY procedures in SAS 9.3 software (SAS Institute, Inc). The standard errors were estimated by using the Taylor series linearization method.

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Next, we ranked states on their estimates for adolescent substance use from each survey. A Monte Carlo method generated simultaneous CIs around each state’s rankings using 100,000 simulations overall and by sex (separately for each survey) (12). Analyses assumed a normal distribution of estimates across states; preliminary analyses found that this assumption performed similarly to other distributional assumptions (including truncated normal, binomial, and lognormal). We determined each state’s median rank across the 100,000 simulations, rather than the raw rank generated from the estimates of substance use. Presenting median ranks maintains consistency between point estimates and 95% CIs (ie, all are estimated through the simulation analysis); in extreme cases (not observed in our data), the raw ranks could fall outside of the simulated 95% CI, but the median would not. The ranks did not necessarily span from 1 to 51 because of 1) ties and 2) the limited number of states available in YRBSS (maximum rank = 47 for cigarette smoking and binge alcohol drinking; 46 for marijuana use). We generated scatterplots of states’ ranks and CIs for each behavior and each survey.

Finally, we examined the consistency of rankings across surveys, behaviors, and subgroups (defined by adolescent sex) for states with data from both surveys by using Spearman rank correlation coefficients. All analyses used a criterion of \( P < .05 \) and were conducted in SAS 9.3 software.

Results

### Cigarette smoking

In NSDUH, the prevalence of adolescent self-reported cigarette smoking ranged from 4.5% (standard error [SE], 0.9%) in Utah to 14.3% (SE, 1.3%) in Wyoming, with a median of 9.3% (Table 1). Wyoming was ranked 1 (95% CI, 1-7) and Utah 51 (95% CI, 47-51) in adolescent cigarette smoking (Figure 1). States in the middle of the distribution had particularly wide CIs; for example, Georgia was ranked 26 (95% CI, 11-41).

In YRBSS, the prevalence of adolescent cigarette smoking ranged from 4.7% (SE, 0.4%) in Utah to 18.5% (SE, 1.0%) in Kentucky, with a median of 12.5% (Table 1). In paired samples \( t \) tests, rates of cigarette smoking were higher in YRBSS than in NSDUH across states \( P < .001 \). Kentucky was ranked 2 (95% CI, 1-6) and Utah 47 (95% CI, 46-47) in cigarette smoking (Figure 1). The ranks derived from NSDUH were not necessarily equal to those from YRBSS, but they were correlated \( r = 0.64, P < .001 \).

### Binge alcohol drinking

In NSDUH, the prevalence of adolescent self-reported binge alcohol drinking ranged from 5.9% (SE, 1.1%) in Utah to 14.3% (SE, 1.4%) in New Jersey, with a median of 9.4% (Table 2). New Jersey was ranked 1 (95% CI, 1-7) and Utah 50 (95% CI, 40-51) in adolescent binge alcohol drinking (Figure 2). States in the middle of the distribution had wide CIs; for example, New Mexico was ranked 25 (95% CI, 5-48).
Marijuana use

In NSDUH, the prevalence of adolescent self-reported marijuana use ranged from 6.3% (SE, 0.9%) in Louisiana (SE, 0.9%) and Utah (SE, 1.4%) to 18.7% (SE, 1.6%) in Rhode Island, with a median of 9.5% (Table 3). Rhode Island was ranked 1 (95% CI, 1-4) and Louisiana and Utah tied for 50 (95% CI, 40-51, and 33-51, respectively) in adolescent marijuana use (Figure 3). States in the middle of the distribution had wide CIs; for example, Georgia was ranked 25 (95% CI, 14-42).

In YRBSS, the prevalence of adolescent binge alcohol drinking ranged from 7.1% (SE, 0.7%) in Utah to 21.7% (SE, 0.5%) in Montana, with a median of 17.1% (Table 2). In paired samples t tests, rates of binge alcohol drinking were higher in YRBSS than in NSDUH across states ($P < .001$). Montana was ranked 2 (95% CI, 1-6) and Utah 47 (95% CI, 47-47) in binge alcohol drinking (Figure 2). Again, ranks across the surveys were not necessarily equal, but they were correlated ($r = 0.36$, $P = .01$).
and Utah 46 (95% CI, 46-46) in marijuana use (Figure 3). Again, ranks across the surveys were not necessarily equal, but they were correlated ($r = 0.69, P < .001$).

Correlations of states’ ranks across behaviors

For both surveys, states’ ranks for a given substance use behavior did not correlate highly with their ranks for other behaviors. In NSDUH, the correlation of states’ ranks for cigarette smoking and binge alcohol drinking was 0.24 ($P = .09$), for cigarette smoking and marijuana use, $-0.17$ ($P = .23$), and for binge alcohol drinking and marijuana use, 0.29 ($P = .04$). In YRBSS, the correlation of states’ ranks for cigarette smoking and binge alcohol drinking was 0.55 ($P < .001$), for cigarette smoking and marijuana use, $-0.20$ ($P = .19$), and for binge alcohol drinking and marijuana use, $-0.01$ ($P = .96$).

Correlation of states’ ranks across subgroups

For both surveys, states’ overall ranks for a given behavior were similar to the ranks derived when examining subgroups of adolescent boys and adolescent girls. In NSDUH, the correlation of states’ overall ranks with ranks for boys was 0.90 for cigarette smoking, 0.66 for binge alcohol drinking, and 0.92 for marijuana use (all $P < .001$). The correlation of overall ranks with ranks for girls was 0.89 for cigarette smoking, 0.83 for binge alcohol drinking, and 0.89 for marijuana use (all $P < .001$). (Indicators and ranks stratified by sex are available from the authors on request.)

Similarly, in YRBSS, the correlation of overall ranks with ranks for boys was 0.95 for cigarette smoking, 0.96 for binge alcohol drinking, and 0.94 for marijuana use (all $P < .001$). The correlation of overall ranks with ranks for girls was 0.96 for cigarette smoking, 0.93 for binge alcohol drinking, and 0.93 for marijuana use (all $P < .001$).

Discussion

In this analysis, we demonstrated differences in states’ simulated ranks for adolescent substance use across behaviors (ie, cigarette smoking, binge alcohol drinking, marijuana use) and surveys (ie, NSDUH, YRBSS). These findings highlight the variability that emerges when ranking states on behavioral indicators, partly due to differences in behaviors, variation in surveys, and the inherent uncertainty in the statistical ranking processes.

States ranked high on one adolescent substance use behavior did not necessarily rank high on another behavior, reflecting the distinct patterns and correlates of these behaviors. Correlation coefficients between states’ ranks of different behaviors ranged from $-0.17$ to 0.29 for NSDUH and from $-0.20$ to 0.55 for YRBSS. Partly, these differences could be attributable to demographic differences across states. For example, adolescent cigarette smoking and alcohol use are inversely associated with parental socioeconomic status (SES), whereas marijuana use has an inverse U-shaped association with SES; further, these effects are moderated by race/ethnicity (18). A more contextual explanation might focus on state policies that influence these behaviors. States’ policies regulating cigarettes include indoor smoke-free air laws, tobacco taxes, and minimum age purchase of cigarettes, all of which could influence adolescent smoking prevalence (7,19,20). Similarly, emerging policies allowing marijuana use (among adults) may be associated with increased adolescent marijuana use (21). Descriptively, in the current analysis, states that have legalized marijuana tended to have higher estimates of adolescent marijuana use. State-level differences in adolescent substance use could also be related to local norms (22,23) or exposure to mass media campaigns discouraging substance use (24).

Across surveys, states’ estimates for adolescent substance use were not consistent. First, states’ substance use estimates were up to 2.6 times as high in YRBSS as in NSDUH. In addition, the median substance use estimates in NSDUH were 9.3% to 9.5%, whereas the median estimates in YRBSS were 12.5% to 18.9%, indicating greater variability in substance use in YRBSS than NSDUH. Differences in survey administration mode, sampling frame, and item wording could explain this variability in prevalence estimates (25). In terms of administration, NSDUH is delivered in homes (15) and YRBSS in schools (16); for both surveys, figures of authority may be nearby while the survey is administered (parents or teachers, respectively), which could lead to underreporting (8), but adolescents may overreport substance use in YRBSS to impress their peers. However, one recent study of adolescent self-report of substance use found that survey setting did not introduce bias to responses (26). In terms of sampling frame, NSDUH includes (and YRBSS excludes) adolescents who drop out of school, who in turn have higher levels of substance use (25). In terms of item wording, slight differences could account for some differences in estimates; for example, the cigarette smoking item in NSDUH was “During the past 30 days, have you smoked part or all of a cigarette?” (13) whereas the item in YRBSS was “During the past 30 days, on how many days did you smoke cigarettes?” (14). However, efforts to obtain substance use estimates without using self-report on surveys (eg, through biometric tests) would be burdensome to collect in a population-based survey, and a previous study demonstrated construct validity of self-reported adolescent substance use estimates (27). Further, wide differences in states’ estimates of adolescent substance use translated into wide differences in states’ ranks across surveys. When comparing ranks in NSDUH versus YRBSS, the correlations were 0.64 for cigarette smoking, 0.36 for binge alcohol drinking, and 0.69 for marijuana use. The overall inconsistency is
selecting high-need states for behavior-specific research depends on the survey used, and selecting high-need states for research on multiple substance use behaviors requires care. However, calculating 95% CIs around ranks affords some flexibility because it allows researchers not only to recognize the uncertainty in rankings but also to identify states that have moderate ranks whose CIs include the poorest ranks. For example, Wyoming is ranked 1 and 4 for cigarette smoking and 12 and 5 for binge alcohol drinking in NSDUH and YRBSS, respectively, but its 95% CIs all include at least rank 2, indicating that it is in the top 5% of states in terms of adolescent use of these 2 substances (a pattern that would not have been immediately discernible without 95% CIs). From the perspective of states that performed well on all indicators, Utah was ranked last (indicating low adolescent substance use prevalence) on all behaviors, which could offer some clues for cancer prevention activities. Overall, however, these findings underscore the need for additional research in at least 2 areas: 1) improving surveillance of cancer prevention behaviors, especially as prevalence estimates appear to be sensitive to survey mode, and uncertainty in the state rankings was evident; and 2) hypothesis generation and testing for state characteristics, programs, and policies that can discourage adolescent substance use for the purpose of lifelong cancer prevention.

This study has several limitations. NSDUH and YRBSS both used self-reported measures of substance use, which are subject to biases (8). Not all states participated in YRBSS (16), restricting the range of ranks and the scope of our inferences. However, NSDUH collected data for all states, allowing us to examine the entire United States. In 2015, NSDUH changed their definition of binge drinking for adolescent girls (15), so the estimates of binge drinking included data only from 2011–2014. Finally, we did not examine the emerging use of other substances that might be related to cancer risk among adolescents, such as e-cigarettes (34). In terms of study strengths, our analysis leveraged data from more than half a million participants in 2 nationally representative surveys using different administration modes. This generous sample size allowed us to produce stable state-level estimates of adolescent substance use. Finally, our research points to the need for improved methodology to rank and compare states’ performance on public health indicators.

Adolescent substance use that contributes to cancer risk is relatively common (4.5% to 27.1% across surveys and behaviors). In 2 population-based surveys, we found some consistency in performance for selected states and across subgroups. However, great variability emerged in states’ rankings, potentially due to differences in behaviors, survey methods, and statistical procedures. Generally, we could not distinguish among states’ performance on adolescent substance use with certainty. Yet public health officials may be able to adopt policies and programs in states that had low
estimates of substance use (eg, Utah) to reduce adolescent cigarette smoking, binge alcohol drinking, and marijuana use elsewhere. Such a goal is important for reducing morbidity and mortality among adolescents now (eg, from vehicular crashes when the driver is under the influence of alcohol) and as they grow older (eg, from cancers associated with cigarette, alcohol, and marijuana use).

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Author Information

Corresponding Author: Jennifer L. Moss, PhD, Cancer Prevention Fellow, Surveillance Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, 9609 Medical Center Dr, Room 4E514, MSC 9765, Bethesda, MD 20892–9765. Telephone: 240-276-5048. Email: Jennifer.moss@nih.gov.

Author Affiliations: 1National Cancer Institute, Bethesda, Maryland.

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### Table 1. Prevalence of Cigarette Smoking Among Adolescents Aged 14–17 Years and Simulated Ranking of States by Prevalence, National Survey on Drug Use and Health (NSDUH) and Youth Risk Behavior Surveillance System (YRBSS), 2011–2015

| State            | NSDUH | YRBSS |
|------------------|-------|-------|
|                  | Ranka | % (SE)| Ranka | % (SE) |
| Alabama          | 35    | 8.0 (0.9) | 5     | 16.7 (0.9) |
| Alaska           | 29    | 8.8 (1.0) | 36    | 10.7 (0.8) |
| Arizona          | 43    | 6.9 (0.8) | 27    | 12.1 (0.8) |
| Arkansas         | 13    | 10.6 (1.2) | 7     | 16.2 (1.0) |
| California       | 49    | 5.7 (0.4) | 46    | 6.5 (1.3) |
| Colorado         | 20    | 9.7 (1.2) | 14    | 14.4 (1.5) |
| Connecticut      | 42    | 7.0 (1.0) | 26    | 12.2 (0.8) |
| Delaware         | 21    | 9.6 (1.2) | 27    | 12.2 (0.6) |
| District of Columbia | 44   | 6.7 (1.0) | —     | —     |
| Florida          | 48    | 6.0 (0.5) | 37    | 10.4 (0.4) |
| Georgia          | 26    | 9.1 (1.0) | 18    | 13.7 (1.0) |
| Hawaii           | 31    | 8.5 (1.0) | 42    | 9.4 (0.5) |
| Idaho            | 22    | 9.5 (1.0) | 36    | 10.7 (0.6) |
| Illinois         | 38    | 7.6 (0.5) | 26    | 12.2 (0.7) |
| Indiana          | 24    | 9.3 (1.1) | 20    | 13.3 (1.0) |
| Iowa             | 19    | 9.9 (0.9) | 6     | 16.3 (1.5) |
| Kansas           | 31    | 8.5 (1.2) | 31    | 11.6 (0.7) |
| Kentucky         | 6     | 12.2 (1.2) | 2     | 18.5 (1.0) |
| Louisiana        | 8     | 11.7 (1.3) | 12    | 14.8 (1.2) |
| Maine            | 25    | 9.2 (1.1) | 30    | 11.6 (0.4) |
| Maryland         | 43    | 6.9 (0.9) | 40    | 10.0 (0.6) |
| Massachusetts    | 34    | 8.1 (1.0) | 40    | 9.9 (0.5) |
| Michigan         | 25    | 9.2 (0.6) | 35    | 10.8 (0.7) |
| Minnesota        | 30    | 8.6 (1.0) | —     | —     |
| Mississippi      | 10    | 11.1 (1.1) | 8     | 15.8 (0.9) |
| Missouri         | 6     | 12.2 (1.2) | 32    | 11.4 (0.9) |
| Montana          | 3     | 13.0 (1.3) | 18    | 13.7 (0.6) |
| Nebraska         | 32    | 8.4 (1.0) | 25    | 12.5 (0.7) |
| Nevada           | 37    | 7.7 (1.0) | 44    | 7.9 (0.6) |
| New Hampshire    | 12    | 10.8 (1.1) | 20    | 13.4 (0.8) |
| New Jersey       | 37    | 7.8 (0.8) | 24    | 12.7 (1.0) |

Abbreviation: SE, standard error.

a Ranks are the median rank generated in 100,000 Monte Carlo simulations. Past-month cigarette smoking was defined as smoking at least 1 cigarette in the previous 30 days. YRBSS data were collected in 2011, 2013, and 2015; District of Columbia, Minnesota, Oregon, and Washington were excluded from YRBSS because they either chose not to participate or did not achieve adequate response rates.

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Table 1. Prevalence of Cigarette Smoking Among Adolescents Aged 14–17 Years and Simulated Ranking of States by Prevalence, National Survey on Drug Use and Health (NSDUH) and Youth Risk Behavior Surveillance System (YRBSS), 2011–2015

| State            | NSDUH Rank | % (SE) | YRBSS Rank | % (SE) |
|------------------|------------|--------|------------|--------|
| New Mexico       | 13         | 10.6 (1.4) | 14         | 14.4 (0.7) |
| New York         | 46         | 6.3 (0.5)    | 41         | 9.6 (0.5)     |
| North Carolina   | 33         | 8.3 (1.0)    | 17         | 13.8 (0.7)    |
| North Dakota     | 13         | 10.7 (1.2)   | 11         | 15.0 (0.7)    |
| Ohio             | 21         | 9.6 (0.6)    | 6          | 16.5 (1.6)    |
| Oklahoma         | 13         | 10.7 (1.1)   | 7          | 16.1 (1.0)    |
| Oregon           | 31         | 8.5 (1.1)    | —          | —             |
| Pennsylvania     | 20         | 9.7 (0.6)    | 32         | 11.3 (1.3)    |
| Rhode Island     | 42         | 7.1 (1.1)    | 45         | 7.6 (0.7)     |
| South Carolina   | 14         | 10.5 (1.1)   | 17         | 13.9 (0.9)    |
| South Dakota     | 6          | 12.2 (1.3)   | 15         | 14.2 (1.4)    |
| Tennessee        | 24         | 9.3 (1.0)    | 11         | 15.0 (0.8)    |
| Texas            | 44         | 6.8 (0.5)    | 17         | 13.9 (0.7)    |
| Utah             | 51         | 4.5 (0.9)    | 47         | 4.7 (0.4)     |
| Vermont          | 11         | 10.9 (1.1)   | 32         | 11.3 (0.5)    |
| Virginia         | 43         | 6.9 (0.8)    | 38         | 10.3 (0.8)    |
| Washington       | 23         | 9.4 (1.3)    | —          | —             |
| West Virginia    | 4          | 12.6 (1.3)   | 2          | 18.4 (0.8)    |
| Wisconsin        | 16         | 10.2 (1.2)   | 29         | 11.8 (0.7)    |
| Wyoming          | 1          | 14.3 (1.3)   | 4          | 17.1 (0.8)    |

Abbreviation: SE, standard error.

*Ranks are the median rank generated in 100,000 Monte Carlo simulations. Past-month cigarette smoking was defined as smoking at least 1 cigarette in the previous 30 days. YRBSS data were collected in 2011, 2013, and 2015; District of Columbia, Minnesota, Oregon, and Washington were excluded from YRBSS because they either chose not to participate or did not achieve adequate response rates.*
## Table 2. Prevalence of Binge Drinking Among Adolescents Aged 14–17 Years and Simulated Ranking of States by Prevalence, National Survey on Drug Use and Health (NSDUH) and Youth Risk Behavior Surveillance System (YRBSS), 2011–2015

| State            | NSDUH |       |       | YRBSS |       |       |
|------------------|-------|-------|-------|-------|-------|-------|
|                  | Rank<sup>a</sup> | % (SE) | Rank<sup>a</sup> | % (SE) |
| Alabama          | 22    | 9.7 (1.1) | 27    | 16.5 (0.9) |
| Alaska           | 47    | 7.0 (1.1) | 43    | 13.2 (0.8) |
| Arizona          | 40    | 8.1 (1.0) | 10    | 19.2 (1.1) |
| Arkansas         | 19    | 10.1 (1.4) | 15    | 18.2 (0.9) |
| California       | 25    | 9.5 (0.5) | 40    | 14.0 (1.7) |
| Colorado         | 20    | 10.0 (1.2) | 5    | 20.7 (1.8) |
| Connecticut      | 21    | 9.8 (1.4) | 24    | 17.0 (0.8) |
| Delaware         | 41    | 8.0 (1.2) | 23    | 17.2 (0.6) |
| District of Columbia | 37  | 8.4 (1.4) | 37    | 14.5 (1.0) |
| Florida          | 35    | 8.6 (0.5) | 33    | 15.4 (0.4) |
| Georgia          | 33    | 8.8 (1.0) | 37    | 14.5 (1.0) |
| Hawaii           | 15    | 10.6 (1.2) | 43    | 13.1 (0.6) |
| Idaho            | 23    | 9.6 (1.2) | 23    | 17.1 (1.0) |
| Illinois         | 35    | 8.6 (0.6) | 20    | 17.5 (0.8) |
| Indiana          | 37    | 8.4 (1.1) | 27    | 16.6 (1.1) |
| Iowa             | 22    | 9.7 (1.1) | 3    | 21.3 (2.4) |
| Kansas           | 16    | 10.4 (1.4) | 24    | 17.0 (0.9) |
| Kentucky         | 46    | 7.3 (1.0) | 13    | 18.6 (0.8) |
| Louisiana        | 12    | 11.0 (1.4) | 6    | 20.5 (1.5) |
| Maine            | 34    | 8.7 (1.1) | 44    | 12.8 (0.4) |
| Maryland         | 17    | 10.3 (1.2) | 35    | 15.1 (0.6) |
| Massachusetts     | 5    | 12.3 (1.2) | 18    | 17.8 (0.7) |
| Michigan         | 21    | 9.8 (0.7) | 38    | 14.4 (0.7) |
| Minnesota        | 45    | 7.5 (0.9) | 30    | 15.9 (0.9) |
| Mississippi      | 36    | 8.5 (1.2) | 17    | 17.8 (0.8) |
| Missouri         | 18    | 10.2 (1.4) | 7    | 20.0 (1.1) |
| Montana          | 9     | 11.5 (1.4) | 2    | 21.7 (0.5) |
| Nebraska         | 34    | 8.7 (1.2) | 38    | 14.3 (0.8) |
| Nevada           | 30    | 9.0 (1.5) | 31    | 15.7 (1.0) |
| New Hampshire    | 7     | 11.8 (1.2) | 18    | 17.8 (0.8) |
| New Jersey       | 1     | 14.3 (1.4) | 5    | 20.8 (1.4) |
| New Mexico       | 25    | 9.5 (1.4) | 22    | 17.2 (0.7) |

Abbreviation: SE, standard error.

<sup>a</sup> Ranks are the median rank generated in 100,000 Monte Carlo simulations. Past-month binge drinking was defined as consuming 5 or more alcoholic drinks per drinking occasion on at least 1 of the previous 30 days. NSDUH data on binge alcohol drinking came from survey years 2011–2014 only. YRBSS data were collected in 2011, 2013, and 2015; District of Columbia, Minnesota, Oregon, and Washington were excluded from YRBSS because they either chose not to participate or did not achieve adequate response rates.
Table 2. Prevalence of Binge Drinking Among Adolescents Aged 14–17 Years and Simulated Ranking of States by Prevalence, National Survey on Drug Use and Health (NSDUH) and Youth Risk Behavior Surveillance System (YRBSS), 2011–2015

| State        | NSDUH |       | YRBSS |       |
|--------------|-------|-------|-------|-------|
|              | Ranka | % (SE)| Ranka | % (SE)|
| New York     | 8     | 11.7 (0.8) | 21     | 17.3 (0.9) |
| North Carolina | 35   | 8.6 (1.1)  | 39     | 14.1 (0.7) |
| North Dakota | 35    | 8.6 (1.2)  | 11     | 18.9 (0.8) |
| Ohio         | 27    | 9.3 (0.6)  | 16     | 18.0 (1.3) |
| Oklahoma     | 38    | 8.3 (1.1)  | 15     | 18.2 (0.9) |
| Oregon       | 6     | 12.1 (1.3) | –      | – |
| Pennsylvania | 17    | 10.3 (0.7) | 43     | 13.2 (1.1) |
| Rhode Island | 29    | 9.1 (1.3)  | 38     | 14.4 (0.9) |
| South Carolina | 38  | 8.3 (1.2)  | 34     | 15.2 (1.0) |
| South Dakota | 9     | 11.4 (1.5) | 26     | 16.7 (1.0) |
| Tennessee    | 47    | 7.0 (0.9)  | 30     | 16.1 (0.8) |
| Texas        | 35    | 8.6 (0.6)  | 5      | 20.5 (0.9) |
| Utah         | 50    | 5.9 (1.1)  | 47     | 7.1 (0.7)  |
| Vermont      | 2     | 13.6 (1.4) | 22     | 17.3 (0.4) |
| Virginia     | 40    | 8.1 (0.9)  | 44     | 13.0 (0.7) |
| Washington   | 25    | 9.5 (1.2)  | –      | – |
| West Virginia | 9   | 11.4 (1.2) | 9      | 19.5 (0.8) |
| Wisconsin    | 28    | 9.2 (1.2)  | 12     | 18.7 (1.0) |
| Wyoming      | 12    | 11.0 (1.3) | 5      | 20.8 (0.7) |

Abbreviation: SE, standard error.

*Ranks are the median rank generated in 100,000 Monte Carlo simulations. Past-month binge drinking was defined as consuming 5 or more alcoholic drinks per drinking occasion on at least 1 of the previous 30 days. NSDUH data on binge alcohol drinking came from survey years 2011–2014 only. YRBSS data were collected in 2011, 2013, and 2015; District of Columbia, Minnesota, Oregon, and Washington were excluded from YRBSS because they either chose not to participate or did not achieve adequate response rates.*
Table 3. Prevalence of Marijuana Use Among Adolescents Aged 14–17 Years and Simulated Ranking of States by Prevalence, National Survey on Drug Use and Health (NSDUH) and Youth Risk Behavior Surveillance System (YRBSS), 2011–2015

| State           | NSDUH | YRBSS |
|-----------------|-------|-------|
|                 | Rank  | % (SE)| Rank  | % (SE) |
| Alabama         | 43    | 7.6 (0.9) | 33    | 17.1 (0.9) |
| Alaska          | 13    | 12.4 (1.3) | 23    | 18.9 (0.8) |
| Arizona         | 18    | 11.5 (1.1) | 8     | 22.3 (1.2) |
| Arkansas        | 35    | 8.7 (1.2)  | 36    | 16.5 (0.7) |
| California      | 19    | 11.3 (0.6) | 10    | 21.5 (2.0) |
| Colorado        | 2     | 16.8 (1.6) | 11    | 21.4 (1.2) |
| Connecticut     | 15    | 12.0 (1.3) | 8     | 22.3 (0.8) |
| Delaware        | 20    | 11.0 (1.2) | 4     | 23.7 (0.8) |
| District of Columbia | 5 | 14.7 (1.1) | –     | –     |
| Florida         | 30    | 9.4 (0.5)  | 13    | 20.5 (0.5) |
| Georgia         | 25    | 10.0 (1.1) | 19    | 19.6 (1.0) |
| Hawaii          | 14    | 12.2 (1.2) | –     | –     |
| Idaho           | 30    | 9.4 (1.2)  | 37    | 16.3 (0.8) |
| Illinois        | 30    | 9.3 (0.6)  | 14    | 20.3 (0.8) |
| Indiana         | 24    | 10.2 (1.0) | 32    | 17.2 (0.9) |
| Iowa            | 44    | 7.5 (1.0)  | 43    | 13.8 (1.9) |
| Kansas          | 37    | 8.4 (1.1)  | 41    | 15.3 (0.8) |
| Kentucky        | 43    | 7.7 (1.1)  | 35    | 16.7 (0.8) |
| Louisiana       | 50    | 6.3 (0.9)  | 37    | 16.4 (1.1) |
| Maine           | 11    | 12.8 (1.2) | 18    | 19.6 (0.5) |
| Maryland        | 17    | 11.6 (1.2) | 18    | 19.6 (0.5) |
| Massachusetts   | 7     | 13.9 (1.2) | 2     | 24.6 (0.8) |
| Michigan        | 13    | 12.4 (0.7) | 31    | 17.4 (0.6) |
| Minnesota       | 38    | 8.3 (1.0)  | –     | –     |
| Mississippi     | 46    | 7.2 (0.9)  | 31    | 17.3 (0.7) |
| Missouri        | 29    | 9.5 (1.0)  | 32    | 17.2 (1.1) |
| Montana         | 13    | 12.4 (1.3) | 17    | 19.8 (0.7) |
| Nebraska        | 44    | 7.5 (0.8)  | 45    | 12.5 (0.8) |
| Nevada          | 13    | 12.5 (1.3) | 24    | 18.6 (1.1) |
| New Hampshire   | 7     | 13.9 (1.1) | 5     | 23.2 (0.9) |
| New Jersey      | 32    | 9.1 (1.0)  | 23    | 18.9 (1.0) |
| New Mexico      | 13    | 12.5 (1.3) | 1     | 27.1 (1.2) |
| New York        | 18    | 11.4 (0.6) | 22    | 19.0 (0.7) |

Abbreviation: SE, standard error.

* Ranks are the median rank generated in 100,000 Monte Carlo simulations. Past-month marijuana use was defined as using marijuana at least once in the previous 30 days. YRBSS data were collected in 2011, 2013, and 2015; District of Columbia, Minnesota, Oregon, and Washington were excluded from YRBSS because they either chose not to participate or did not achieve adequate response rates. Data on marijuana use in YRBSS were not available for Hawaii.
Table 3. Prevalence of Marijuana Use Among Adolescents Aged 14–17 Years and Simulated Ranking of States by Prevalence, National Survey on Drug Use and Health (NSDUH) and Youth Risk Behavior Surveillance System (YRBSS), 2011–2015

| State           | NSDUH          | YRBSS          |
|-----------------|----------------|----------------|
|                 | Rank<sup>a</sup> | % (SE)        | Rank<sup>a</sup> | % (SE) |
| North Carolina  | 34             | 8.9 (1.1)     | 8              | 22.3 (0.9) |
| North Dakota    | 41             | 7.9 (1.1)     | 42             | 14.5 (0.8) |
| Ohio            | 33             | 9.0 (0.5)     | 15             | 20.3 (1.4) |
| Oklahoma        | 41             | 7.9 (1.2)     | 35             | 16.6 (1.0) |
| Oregon          | 8              | 13.6 (1.3)    | --             | --      |
| Pennsylvania    | 24             | 10.3 (0.7)    | 34             | 17.0 (1.1) |
| Rhode Island    | 1              | 18.7 (1.6)    | 5              | 23.3 (0.8) |
| South Carolina  | 36             | 8.6 (0.9)     | 18             | 19.7 (0.9) |
| South Dakota    | 39             | 8.2 (1.1)     | 43             | 14.2 (1.5) |
| Tennessee       | 43             | 7.7 (0.9)     | 16             | 20.0 (0.8) |
| Texas           | 30             | 9.3 (0.6)     | 19             | 19.5 (0.8) |
| Utah            | 50             | 6.3 (1.4)     | 46             | 8.2 (0.7)  |
| Vermont         | 3              | 16.7 (1.4)    | 8              | 22.4 (0.7) |
| Virginia        | 43             | 7.7 (1.0)     | 36             | 16.6 (0.7) |
| Washington      | 5              | 14.6 (1.5)    | --             | --      |
| West Virginia   | 43             | 7.7 (0.8)     | 30             | 17.5 (0.8) |
| Wisconsin       | 17             | 11.7 (1.2)    | 29             | 17.8 (1.1) |
| Wyoming         | 37             | 8.5 (1.1)     | 26             | 18.2 (0.7) |

Abbreviation: SE, standard error.

<sup>a</sup> Ranks are the median rank generated in 100,000 Monte Carlo simulations. Past-month marijuana use was defined as using marijuana at least once in the previous 30 days. YRBSS data were collected in 2011, 2013, and 2015; District of Columbia, Minnesota, Oregon, and Washington were excluded from YRBSS because they either chose not to participate or did not achieve adequate response rates. Data on marijuana use in YRBSS were not available for Hawaii.