

Coverage Ratios of Selected Demographic and Socioeconomic Domains for the National Survey on Drug Use and Health

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Abstract

The National Survey on Drug Use and Health (NSDUH) is an annual survey that is the primary source of information on substance use and mental health measures in the U.S. civilian, noninstitutionalized population aged 12 or older. NSDUH reports provide estimates of these measures by various demographic or socioeconomic domains. This study evaluates how well NSDUH covers domains such as educational level, disability status, and low-income and uninsured adults by comparing NSDUH estimates with estimates from leading federal sources of information for these domains. This will allow analysts to make informed decisions about conducting domain-specific analyses. Coverage is defined as the ratio of a NSDUH domain estimate to the estimate from another source and was calculated at national and state levels. We discuss the selection of domains and the specific data sources, show how the coverage ratios were calculated, present ratios for a selected set of domains, and summarize how NSDUH estimates compare empirically with data from other sources.

Key Words: Household survey, coverage, coverage ratios, educational level, disability status, low-income and uninsured adults, National Survey on Drug Use and Health (NSDUH)

1. Background, Objectives, and Methods

The National Survey on Drug Use and Health (NSDUH) is an annual survey and is the primary source of statistical information on the use of illegal drugs, alcohol, and tobacco by the U.S. civilian, noninstitutionalized population aged 12 or older. The survey also includes several sections of questions that focus on mental health issues. Conducted by the federal government since 1971, the survey collects data through face-to-face interviews with a representative sample of the population at the respondent's place of residence. The survey is sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), U.S. Department of Health and Human Services (HHS), and is planned and managed by SAMHSA's Center for Behavioral Health Statistics and Quality (CBHSQ).¹

¹ Data collection and analysis are conducted under contract with RTI International, which is a registered trademark and a trade name of Research Triangle Institute.

This paper's objective is to evaluate NSDUH's coverage for a subset of three domains or subpopulations that are of interest to researchers: educational level, disability status, and low-income and uninsured adults. A forthcoming CBHSQ report (in press) provides more detailed findings for these 3 domains and 14 other demographic, socioeconomic, and geographic domains. The data sources used in this paper for comparison are primary sources of information on the domains and are from flagship federal surveys. If NSDUH's data demonstrate adequate coverage for the specific domain compared with data from the authoritative source, then analysts can feel confident in using NSDUH data to make estimates of substance use or mental health measures by those domains.

1.1 NSDUH Background

NSDUH collects information from residents of households and noninstitutional group quarters (e.g., shelters, rooming houses, dormitories) and from civilians living on military bases. The survey excludes homeless people who do not use shelters, military personnel on active duty, and residents of institutional group quarters, such as jails and hospitals. NSDUH provides national, state, and substate estimates on substance use and mental health in the civilian, noninstitutionalized population aged 12 or older.

The survey employs a stratified multistage area probability sample that is designed to be representative of both the nation as a whole and for each of the 50 states and the District of Columbia. In the 2005 to 2013 NSDUHs, the sample was allocated equally between three age groups: 12 to 17, 18 to 25, and 26 or older. Starting in 2014, the allocation of the NSDUH target sample size of 67,500 interviews has been distributed differently across these three age groups, with 25 percent allocated to youths aged 12 to 17, 25 percent allocated to young adults aged 18 to 25, and 50 percent allocated to adults aged 26 or older. For details on the sample design and state-specific sample size allocation changes, see Section A of the 2015 NSDUH methodological summary and definitions report (CBHSQ, 2016) and the 2014 NSDUH sample design report (CBHSQ, 2015).

NSDUH is a face-to-face household interview survey with selected household members aged 12 or older. For the interview, NSDUH collects data using audio computer-assisted self-interviewing (ACASI) in which respondents read the screen of a NSDUH laptop computer or listen to the questions on headphones, then enter their answers directly into the computer. ACASI is designed for accurate reporting by providing respondents with a highly private and confidential mode for responding to questions about illicit drug use, mental health, and other sensitive behaviors. NSDUH also uses computer-assisted personal interviewing (CAPI) in which interviewers read less sensitive questions to respondents and enter the respondents' answers into the laptop computer.

1.2 Objectives

NSDUH's primary purpose is to provide estimates of substance use and mental health. However, at both the state and national levels, analysts examine these substance use and mental health estimates by different domains, which can be demographic, socioeconomic, and geographic in nature. In a household survey such as NSDUH, it can sometimes be difficult to ensure that NSDUH's data are representative of small subpopulations (e.g., pregnant women, disabled persons). Additionally, small sample sizes for subpopulations can produce estimates with low precision, which can lead to less confidence in the estimates. This paper and CBHSQ (in press) compare estimates of multiple subpopulations across various studies so that analysts can make informed decisions about

publishing estimates for such domains. NSDUH’s annual tables show estimates across a number of domains, and other domains are commonly analyzed by researchers. Coverage ratios (CRs) for educational level, disability status, and low-income and uninsured adults are presented in this paper (see Section 1.3 for details on CRs), and CRs for other domains, such as employment status, health insurance status and type, adults on probation and parole, college enrollment, and others, were produced for CBHSQ (in press). The sources of data chosen for each domain were often considered the leading sources of information for that domain. For all of the domains discussed in this paper, NSDUH estimates were compared with estimates from the American Community Survey (ACS). For educational level, the ACS would be considered a leading source of information. Additionally, the ACS estimates were used for comparison with NSDUH estimates for several domains because it is a large survey that collects national data on many demographic and socioeconomic topics, with state estimates also often available. Sometimes, studies were chosen if they are part of the federal group of studies, even if they were not considered as the “gold standard” for information on that domain. For example, all three domains studied in this paper were compared with estimates from the National Health Interview Survey (NHIS), which is in the HHS portfolio of surveys.

It is important to note that even a leading source for a domain of interest is not without the usual survey errors. In other words, these estimates may represent a gold standard, but they are still estimates from a survey. Thus, the estimates produced from another source will have standard errors (SEs) associated with them, causing NSDUH’s estimates to differ from the other source’s data. NSDUH’s estimates might also differ from other sources of data for other reasons, such as differences in the mode of data collection, questionnaire structure, and the population that the survey covers.

1.3 Methods

In this paper, the terms “coverage” and “coverage ratio” (i.e., CR) refer to the ratio of the NSDUH domain estimate (i.e., percentage, rate, or total produced using NSDUH sampling weights and responses for a domain) to an estimate from another data source. For example, to calculate CRs for adults with less than a high school education, percentages from NSDUH were divided by percentages from the ACS. A CR of 1.0 might indicate that NSDUH has similar coverage to the other source of data for that domain. A CR of less than 1.0 might indicate undercoverage in NSDUH for that domain as compared with the other data source.

To calculate the 95 percent confidence intervals² (CIs) for these CRs at the state level or national level, the following formula was used:

$$CI = \frac{\hat{q}_1}{\hat{q}_2} \pm 1.96 \sqrt{\frac{\hat{V}(\hat{q}_1)}{\hat{q}_1^2} + \frac{\hat{V}(\hat{q}_2)}{\hat{q}_2^2}} \quad (1.0)$$

where \hat{q}_1 and \hat{q}_2 are the estimated percentages (or totals) based on NSDUH and the external data source, respectively, and $\hat{V}(\hat{q}_1)$ and $\hat{V}(\hat{q}_2)$ are the corresponding estimated

² Calculations of the CIs were done on a log scale, then converted back to the original scale because the log of the ratio of estimates \hat{q}_1 and \hat{q}_2 was assumed to have better asymptotic normal properties than the ratio itself.

variances. If the variance or SE of the estimate from the external data source was unknown, then $\hat{V}(\hat{q}_1)$ was assumed to be zero (0). In such cases, the width of the CIs may be underestimated. Note, in discussions in this paper, if the 95 percent CI does not cover 1.0, the CR is considered to be significantly different from 1.0.

Also, to calculate the SE of the CR, a formula by Papanicolaou (2009) was used:

$$\hat{V}\left(\frac{\hat{q}_1}{\hat{q}_2}\right) = \frac{\hat{q}_1^2}{\hat{q}_2^2} \left[\frac{\hat{V}(\hat{q}_1)}{\hat{q}_1^2} + \frac{\hat{V}(\hat{q}_2)}{\hat{q}_2^2} \right] \quad (2.0)$$

In order to display state-level CRs, tables and plots were created. The tables show the number of CRs less than 1.0 and greater than 1.0 and how many of those were significantly different from 1.0. The plots include a bar chart on the left and a scatterplot on the right. The bar chart shows the CRs for each state, with the black bars indicating that the CR was significantly different from 1.0. The scatterplots show state percentages for NSDUH for a given domain in comparison with percentages from the outside source. States with CRs greater than 1.0 appear above the 45 degree line, and all states with CRs below 1.0 appear below the 45 degree line. The states for which CRs were significantly different from 1.0 are displayed as bold black dots, and the two-letter state Postal Service abbreviations are listed next to the dots in the figures.

2. Findings

2.1 Educational Attainment

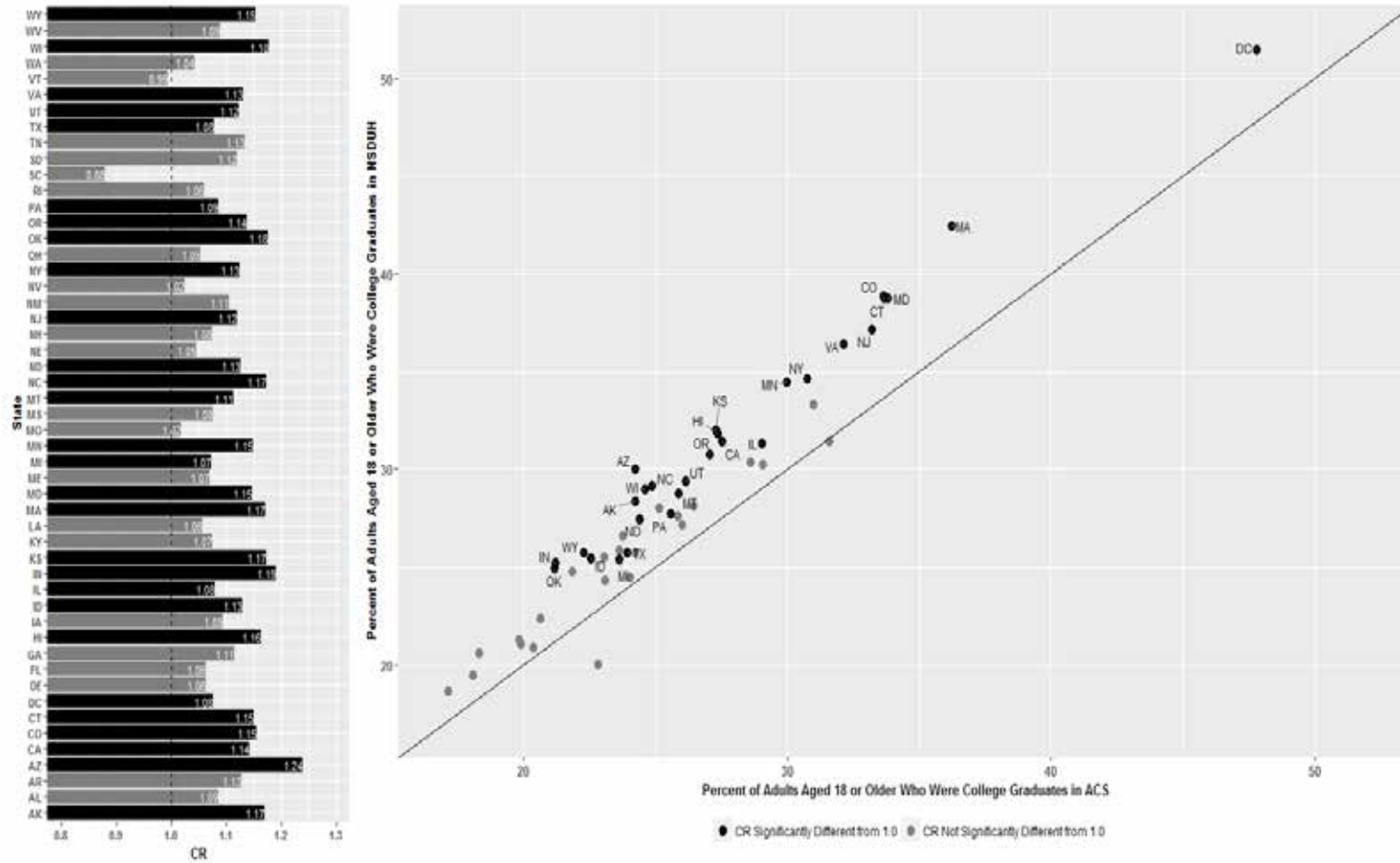
The first domain covered in this paper is the highest level of educational attainment among adults aged 18 or older. This domain has four categories: less than high school, high school graduate, some college, and college graduate. CRs were calculated at the state level by comparing 2009 to 2013 NSDUH and ACS estimates and 2014 NSDUH and Current Population Survey Annual Social and Economic Supplement (CPS ASEC) estimates. At the national level, CRs were calculated using 2014 NSDUH and NHIS estimates.

2.1.1 American Community Survey (ACS)

At the state level, CRs were computed using 2009 to 2013 NSDUH and ACS educational level estimates. For adults who had some college education but no degree, all of the 51 computed CRs were below 1.0, and 49 of those CRs were significantly less than 1.0 (see Table 1). In contrast, among the other educational levels, most of the CRs were greater than 1.0. Specifically, for college graduates, only in 2 states were the CRs less than 1.0 (albeit not significantly different from 1.0), while in 28 out of the remaining 49 states, the CRs were significantly greater than 1.0 (see Figure 1).

One possible reason for this disparity in CRs might be the difference in the definitions of the “some college” and “college graduate” educational attainments between the two surveys (i.e., adults with 4 or more years of college were considered college graduates in NSDUH, creating a potential overestimate of college graduates and an underestimate of adults with some college in NSDUH). Because the percentages in the educational levels

Figure 1: Plot of Percentages and Coverage Ratios of Adults Aged 18 or Older Who Were College Graduates, by State, NSDUH versus ACS in 2009 to 2013



ACS = American Community Survey; CR = coverage ratio; NSDUH = National Survey on Drug Use and Health.

were mutually exclusive, large differences in the percentages in the higher educational levels may affect the percentages in the lower educational levels. In 17 states, the CRs were significantly different from 1.0 for adults with less than a high school education (except in 1 state, all of these CRs were greater than 1.0); also, in 19 states, the CRs were significantly greater than 1.0 for high school graduates.

Table 1: State Coverage Ratios for Educational Level between NSDUH and ACS Estimates, by Significance Level

For States (<i>n</i> = 51)	Not Significant at 5 Percent Level of Significance	Significant at 5 Percent Level of Significance
<i>Less than High School</i>		
Coverage Ratio > 1.0	22	16
Coverage Ratio < 1.0	12	1
<i>High School Graduate</i>		
Coverage Ratio > 1.0	21	19
Coverage Ratio < 1.0	11	0
<i>Some College</i>		
Coverage Ratio > 1.0	0	0
Coverage Ratio < 1.0	2	49
<i>College Graduate</i>		
Coverage Ratio > 1.0	21	28
Coverage Ratio < 1.0	2	0

2.1.2 Current Population Survey Annual Social and Economic Supplement (CPS ASEC)

At the state level, CRs were computed using 2014 NSDUH and CPS ASEC educational level estimates. For adults who had less than a high school education, the computed CRs in 11 of the 51 states were significantly different from 1.0 (see Table 2). In all 11 of those states, the CRs were greater than 1.0. For high school graduates, the CRs in three states were significantly greater than 1.0, and the CRs in four states were significantly less than 1.0. For adults with some college education, the CRs were significantly different from 1.0 in 12 states; with the exception of 1 state, all of them had a CR that was less than 1.0. For college graduates in five states, the CRs were significantly greater than 1.0, while in two states, the CRs were significantly less than 1.0. Overall, we saw similar patterns in these CPS ASEC CRs as what we saw with ACS CRs; however, there were fewer CRs significantly different from 1.0.

2.1.3 National Health Interview Survey (NHIS)

At the national level by age group, race/ethnicity, and gender, CRs were computed using 2014 NSDUH and NHIS educational level estimates. For adults aged 18 or older with some college education, CRs statistically significantly less than 1.0 were observed for all age groups and both genders, as well as for non-Hispanic white and non-Hispanic black adults. By contrast, for all ages and both genders, the percentages of high school graduates from NSDUH were higher than the NHIS percentages.

2.2 Disability

The second domain covered in this paper is disability status among adults aged 18 to 64. NSDUH defined disability as those who had not worked in the past week and who

Table 2: State Coverage Ratios for Educational Level between NSDUH and CPS ASEC Estimates, by Significance Level

For States (<i>n</i> = 51)	Not Significant at 5 Percent Level of Significance	Significant at 5 Percent Level of Significance
<i>Less than High School</i>		
Coverage Ratio > 1.0	26	11
Coverage Ratio < 1.0	14	0
<i>High School Graduate</i>		
Coverage Ratio > 1.0	14	3
Coverage Ratio < 1.0	30	4
<i>Some College</i>		
Coverage Ratio > 1.0	12	1
Coverage Ratio < 1.0	27	11
<i>College Graduate</i>		
Coverage Ratio > 1.0	32	5
Coverage Ratio < 1.0	12	2

provided the reason as “disabled for work.” The ACS definition for disability was slightly different: disability was defined as those who were not in the labor force and who were also disabled. The disability definition used in the NHIS was similar to the NSDUH definition. CRs were calculated at the state level by comparing data from the 2011 to 2013 NSDUHs and ACS. At the national level, CRs were calculated using 2014 NSDUH and NHIS estimates.

2.2.1 American Community Survey (ACS)

At the state level, CRs were computed using 2011 to 2013 NSDUH and ACS estimates of disability status. Overall, most of the CRs were not significantly different from 1.0 (see Table 3). The CRs in New York, Rhode Island, and South Carolina were greater than 1.0, which indicates a higher percentage of adults with a disability in NSDUH as compared with the ACS for those states (see Figure 2). In Idaho and Indiana, the CRs were less than 1.0. In most of the states, the CRs were very close to the 45 degree line, indicating that there was a high degree of correlation between the estimates of disability status from NSDUH and the ACS (see Figure 2). Despite the wording differences of the disability questions, the ACS and NSDUH seemed to have similar estimates of disability status, with 46 states having CRs not significantly different from 1.0.

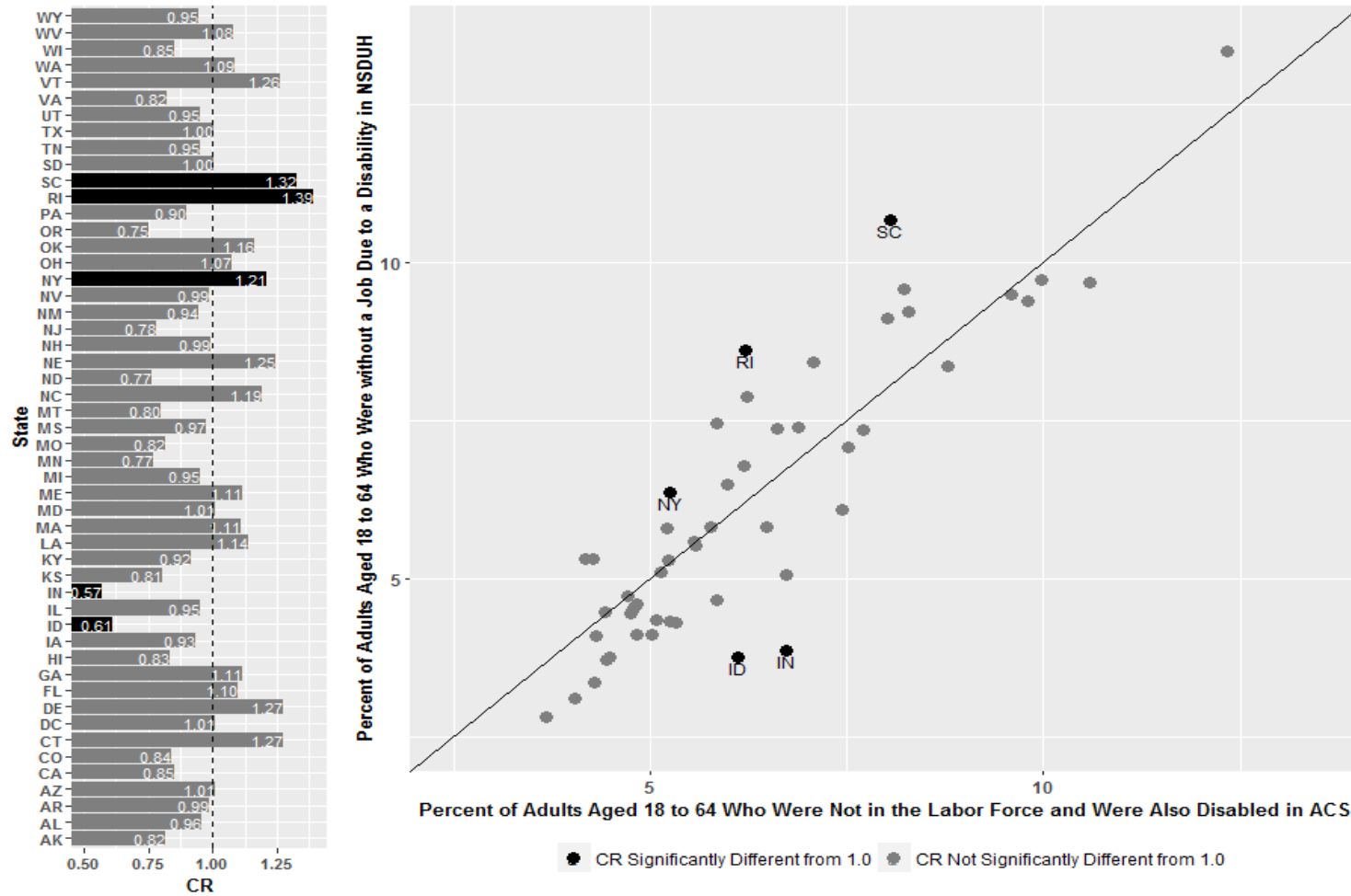
Table 3: State Coverage Ratios for Disability Status between NSDUH and ACS Estimates, by Significance Level

For States (<i>n</i> = 51)	Not Significant at 5 Percent Level of Significance	Significant at 5 Percent Level of Significance
Coverage Ratio > 1.0	19	3
Coverage Ratio < 1.0	27	2

2.2.2 National Health Interview Survey (NHIS)

At the national level by gender and race/ethnicity, CRs were computed using 2014 NSDUH and NHIS estimates of disability status. None of the CRs was significantly different from 1.0, indicating that the estimates from NSDUH and the NHIS for disability status at the national level were very comparable. This could be a result of the target population and questionnaires being similar for the two surveys.

Figure 2: Plot of Percentages and Coverage Ratios of Adults Aged 18 to 64 with a Disability, by State, NSDUH versus ACS in 2011 to 2013



ACS = American Community Survey; CR = coverage ratio; NSDUH = National Survey on Drug Use and Health.

2.3 Low-Income and Uninsured Adults

The third domain covered in this paper is low-income and uninsured adults aged 18 or older. CRs were calculated at the state level by comparing 2009 to 2013 NSDUH and ACS estimates. At the national level, CRs were calculated using 2013 NSDUH and NHIS estimates and 2013 NSDUH and 2014 CPS ASEC estimates. When calculating CRs for comparisons of NSDUH's estimates with estimates from the ACS and NHIS, adults with low income were defined as those with a family income of less than or equal to 138 percent of the federal poverty level.³ For CRs derived from comparisons of NSDUH and CPS ASEC estimates, adults with low income were defined as those with a family income of less than or equal to 139 percent of the federal poverty level. Uninsured adults are adults with no health insurance.

2.3.1 American Community Survey (ACS)

At the state level, CRs were computed using 2009 to 2013 NSDUH and ACS estimates for low-income and uninsured adults. There were 10 states with CRs significantly different from 1.0 (see Table 4), with 5 CRs significantly greater than 1.0 (in California, Louisiana, Nevada, Tennessee, and Texas) and 5 CRs significantly less than 1.0 (in Alaska, Minnesota, North Dakota, South Dakota, and Wisconsin) (see Figure 3). CRs significantly greater than 1.0 (i.e., above the 45 degree line in the scatterplot) were most likely in states with higher percentages of low-income and uninsured adults. CRs significantly lower than 1.0 were most likely in states with lower percentages of low-income and uninsured adults. Some differences could be attributed to the different reference period used by the surveys for family income. The ACS asked about income in the past year, whereas NSDUH asked about income in the previous calendar year.

Table 4: State Coverage Ratios for Low-Income and Uninsured Adults between NSDUH and ACS Estimates, by Significance Level

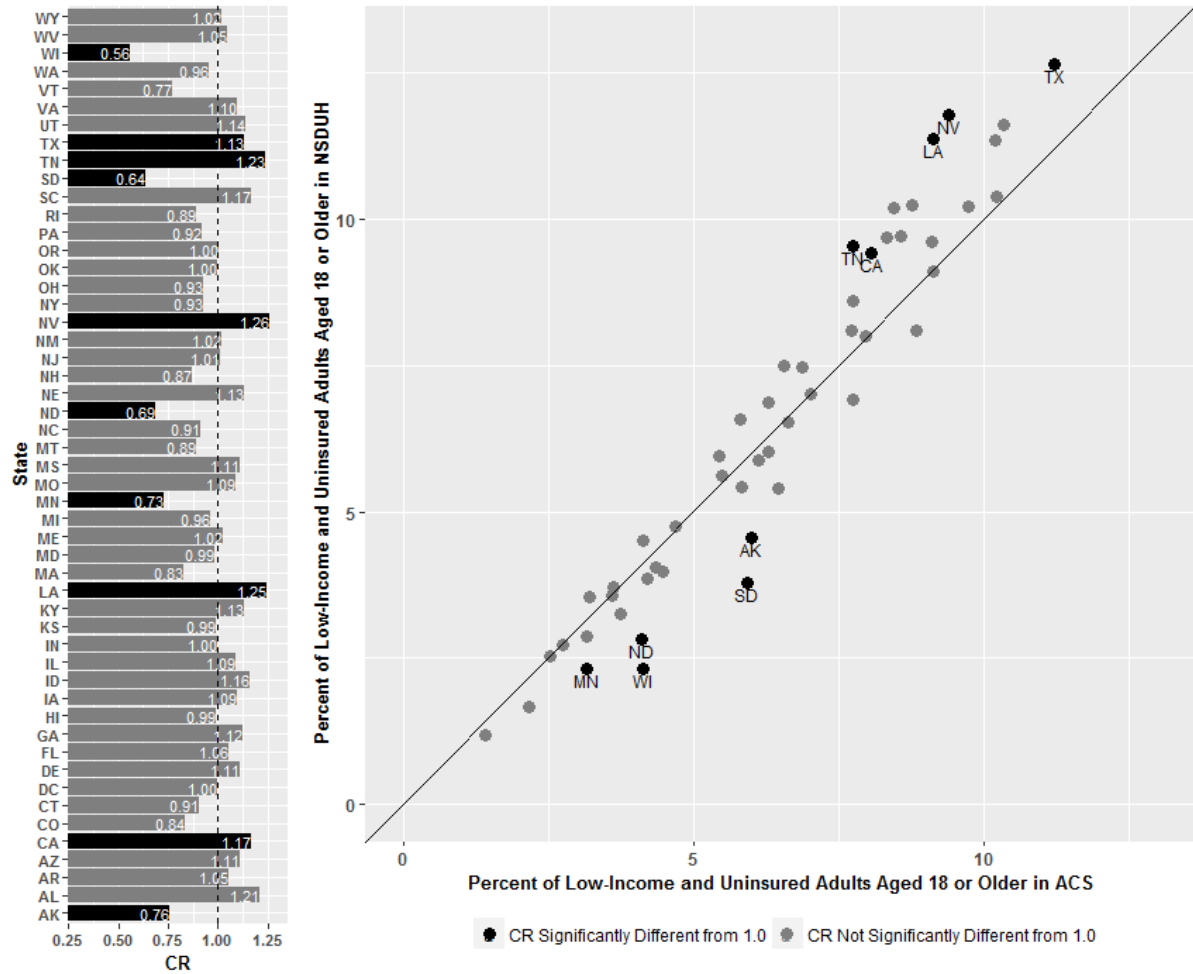
For States (<i>n</i> = 51)	Not Significant at 5 Percent Level of Significance	Significant at 5 Percent Level of Significance
<i>Aged 18 or Older</i>		
Coverage Ratio > 1.0	22	5
Coverage Ratio < 1.0	19	5

2.3.2 Current Population Survey Annual Social and Economic Supplement (CPS ASEC)

CRs for the United States were calculated using the 2014 CPS ASEC data for comparison with data from the 2013 NSDUH for two adult age groups (i.e., adults aged 18 or older and adults aged 18 to 64). CRs greater than 1.0 (and statistically significantly different from 1.0) were observed for both genders and in the two adult age groups, as well as for

³ Poverty level was defined by comparing a respondent's total family income with the U.S. Census Bureau's poverty thresholds (both measured in dollar amounts) in order to determine the poverty status of the respondent and his or her family. Information on family income, size, and composition (i.e., number of children) was used to determine the respondent's poverty level. The poverty level was calculated as a percentage of the poverty threshold by dividing a respondent's reported total family income by the appropriate poverty threshold amount. For information on how poverty is measured, see the U.S. Census Bureau (2016).

Figure 3: Plot of Percentages and Coverage Ratios of Low-Income and Uninsured Adults Aged 18 or Older, by State, NSDUH versus ACS in 2009 to 2013



ACS = American Community Survey; CR = coverage ratio; NSDUH = National Survey on Drug Use and Health.

the overall age groups. Note that there were differences in the health insurance status measures between the two surveys. The CPS ASEC's uninsured rate represents the percentage of the population that had no health insurance coverage during the entire previous calendar year. NSDUH, on the other hand, measured health insurance coverage status at the time of the survey interview.

2.3.3 National Health Interview Survey (NHIS)

Nationally, the 2013 NSDUH's estimate of uninsured individuals among low-income adults aged 18 to 64 was similar to the estimate from the 2013 NHIS (i.e., the CR was not significantly different from 1.0). This was also the case for the 35 to 44 age group and the 45 to 64 age group. However, for adults aged 18 to 34, the CR was significantly less than 1.0 (i.e., 0.90). The NHIS family income questions were similar to the ACS questions in that they asked about the past year, whereas NSDUH asked about the past calendar year.

2.4 Limitations and Conclusions

This work has several limitations. First, SEs were not easily available for some of the outside sources (e.g., the CPS ASEC). For these cases, SEs associated with those estimates were assumed to be zero (0); thus, the SEs of the CRs were underestimated along with underestimating the CI widths. Underestimating the CI widths led to more CRs being significantly different from 1.0. Second, NSDUH's target population was sometimes not the same as the population from the source being used to create the CRs. When possible, percentages were used instead of totals, which may have nullified some target population differences where both NSDUH and the source population actually had the same prevalence, but not always. Similarly, the questions differed in most cases between the sources, potentially causing the measurement of the domains being compared to differ and causing the CRs to be different from 1.0. Third, for some sources and domains, the CRs were calculated using only 1 year of data. If more years of data had been used, the results may have been more stable at the state level. In most cases, analysts tend to use multiple years of data when looking at NSDUH estimates for smaller subpopulations at the state level. It is possible that the coverage biases would be lower had multiple years of data been used.

Across the 17 domains and various sources considered for the larger report (CBHSQ, in press), the results were mixed. For the three domains considered in this paper, NSDUH tended to have overcoverage or undercoverage for certain educational levels, but this might largely be due to methodological differences. This study used data prior to 2015. In 2015, the NSDUH questionnaire was revised to better determine a respondent's exact educational attainment, and this might have improved coverage bias for this domain. NSDUH's coverage for disability status was good compared with the ACS and NHIS. There were very few CRs significantly different from 1.0. The domain on low-income and uninsured adults had mixed coverage depending on the data source. However, for most cases, NSDUH's estimates and the estimates from the outside sources appeared to be correlated.

This paper provides data users with an overview of NSDUH coverage for certain domains. Data users can use these CRs to make informed decisions regarding which domains to report on with some confidence from NSDUH's data. Results indicating undercoverage or overcoverage for a NSDUH domain do not mean that data should not

be used. There might be several reasons why coverage differences might occur. Instead, users should be aware of any coverage issues that might result due to differences between the sources compared, the mode of survey administration, the target population, and other factors so they can note these in their analyses or reports.

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