2015 NATIONAL SURVEY ON DRUG USE AND HEALTH

METHODOLOGICAL RESOURCE BOOK SECTION 14: SAMPLE EXPERIENCE REPORT

Substance Abuse and Mental Health Services Administration
Center for Behavioral Health Statistics and Quality
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1. Introduction

A coordinated sample design was developed for the 2014 through 2017 National Surveys on Drug Use and Health (NSDUHs).[1] The multiyear design consists of a deeply stratified, multistage area probability design. The 2015 sample design is thoroughly documented in the 2015 NSDUH sample design report (Center for Behavioral Health Statistics and Quality, 2016a). The goal of this report is to further document the 2015 NSDUH sample experiences, including a comparison of actual sample yields to state and quarter targets, a comparison of achieved and expected design effects (DEFFs) and relative standard errors (RSEs), and documentation of any issues encountered during sample implementation.

This report is organized as follows. Chapter 2 summarizes the 2015 sample design. Chapters 3, 4, and 5 document the sample experiences at the third, fourth, and fifth stages of sample selection, respectively. Chapter 6 includes a comparison of the observed precisions with the expected precisions and a comparison of median design effects (DEFFs) and mean DEFFs. Finally, three issues encountered during sample implementation are described in Chapter 7.

[1] This report presents information from the 2015 NSDUH. Prior to 2002, the survey was called the National Household Survey on Drug Abuse (NHSDA).

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2. Overview of the 2015 Sample Design

2.1 Target Population

The respondent universe for the 2015 National Survey on Drug Use and Health (NSDUH) was the civilian, noninstitutionalized population aged 12 years or older residing in the United States. Consistent with the NSDUH designs since 1991, the 2015 NSDUH universe included residents of noninstitutional group quarters (e.g., shelters, rooming houses, dormitories, and group homes), residents of Alaska and Hawaii, and civilians residing on military bases in the United States. Persons excluded from the 2015 universe included those with no fixed household address (e.g., homeless or transient persons not in shelters) and residents of institutional group quarters, such as jails and hospitals.

2.2 Design Overview

The Substance Abuse and Mental Health Services Administration (SAMHSA) implemented major changes in the way that NSDUH would be conducted beginning in 1999 and continuing through subsequent years. The survey is conducted using computer-assisted interviewing (CAI) methods and provides state estimates based on minimum sample sizes per state. Furthermore, the NSDUH sample was redesigned in 2014 to allow for a more cost-efficient sample allocation to the largest states while maintaining adequate sample sizes in smaller states to support reliable state and substate estimates based on the small area estimation (SAE) methodology. Reliable direct state estimates are also possible (in any state) by pooling multiple years of data. The target national sample size of 67,507 is distributed across five age groups as follows: 25 percent for youths aged 12 to 17, 25 percent for young adults aged 18 to 25, 15 percent for adults aged 26 to 34, 20 percent for adults aged 35 to 49, and 15 percent for adults aged 50 or older. This large sample size allows SAMHSA to continue reporting precise estimates for demographic subgroups at the national level without needing to oversample specially targeted demographics, as was required prior to 1999. This large sample is referred to as the "main sample." The achieved sample for the 2015 NSDUH was 68,073 persons.

Beginning with the 2002 NSDUH and continuing through the 2015 NSDUH, survey respondents were given a $30 incentive for participation. As expected, the incentive had the effect of increasing response rates, thereby requiring fewer selected households than previous surveys. In recent years, however, response rates have been slowly declining, which has required the number of selected households to increase. In 2014 and 2015, this increase was partially offset by selecting fewer youths aged 12 to 17, requiring fewer selected households per completed interview. That is, with more proportional sampling by age group, fewer households are needed to support the oversample of youths aged 12 to 17.

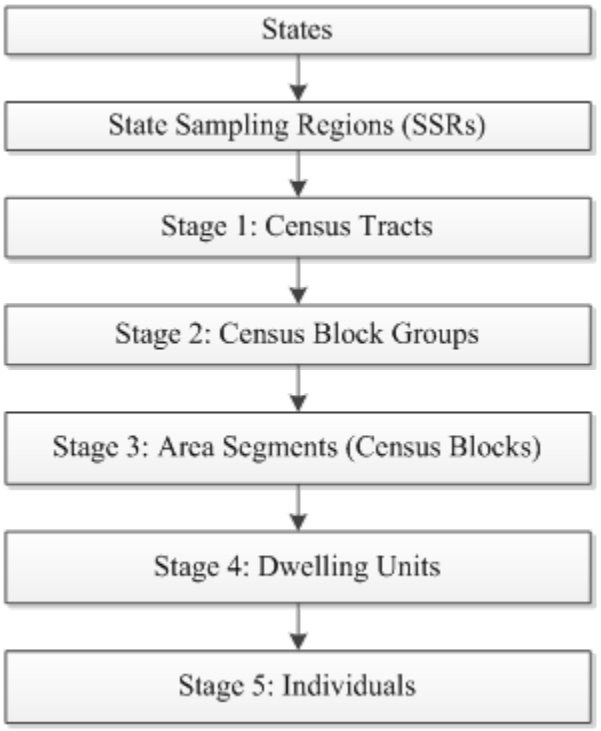
An additional design change was made in 2002 and continued through 2013. A new pair sampling strategy was implemented that increased the number of pairs selected in dwelling units (DUs) with older persons on the roster (Chromy & Penne, 2002). With the increase in the number of pairs came a moderate decrease in the response rate for older persons. Changes to the 2014 through 2017 sample design with respect to age group and state necessitated a review of the

pair sampling strategy. As a result, slightly fewer pairs were selected for the 2014 and 2015 NSDUHs.

2.2.1 4-Year Coordinated Design

A coordinated sample design was developed for the 2014 through 2017 NSDUHs. Exhibit 1 summarizes the multistage design. The coordinated design facilitates 50 percent overlap in third-stage units (area segments) within each successive 2-year period from 2014 through 2017. This designed sample overlap slightly increases the precision of estimates of year-to-year trends because of the expected small but positive correlation resulting from the overlapping sample between successive survey years. The 50 percent overlap of segments significantly reduces segment listing costs because only one half of the segments need to be listed for the 2015 through 2017 surveys.

Exhibit 1. Summary of the 2014 through 2017 NSDUH Design



The 2015 design provides for estimates by state in all 50 states plus the District of Columbia. States may therefore be viewed as the first level of stratification and as a reporting variable. In the 2005 through 2013 NSDUH design, the sample was divided into 8 "large" states and 43 "small" states (including the District of Columbia), with the large and small sample states designed to yield 3,600 and 900 respondents per state, respectively. Beginning in 2014 and continuing in 2015, the survey's sample was designed to yield the following:

- 4,560 completed interviews in California;
- 3,300 completed interviews each in Florida, New York, and Texas;
- 2,400 completed interviews each in Illinois, Michigan, Ohio, and Pennsylvania;

- 1,500 completed interviews each in Georgia, New Jersey, North Carolina, and Virginia;
- 967 completed interviews in Hawaii; and
- 960 completed interviews in each of the remaining 37 states and the District of Columbia.

To accommodate state and local policymakers' need for substate estimates in Kauai County, Hawaii, the sample was designed to yield a minimum of 200 completed interviews in this county over a 3-year period. This allows for Kauai County to be included as a separate entity in the production of substate estimates that are produced biennially and typically based on 3 years of data. To achieve this goal while maintaining precision at the state level, Kauai County was treated separately from the remainder of Hawaii for sample allocation and sample size management purposes. The target annual sample in Hawaii consisted of 67 completed interviews in Kauai County and 900 completed interviews in the remainder of the state, for an expected total of approximately 967 completed interviews each year.

In all states, the sample sizes were sufficient to support reliable direct estimates or estimates based on the SAE methodology for selected outcomes while maintaining efficiency for national estimates. All state estimates are typically produced by pooling multiple years of data to increase precision, especially for estimates of change over time. For example, to measure short-term change in past month illicit drug use by state, 2012-2013 data and 2013-2014 data are pooled and the two resulting small area estimates are compared. To measure long-term change in the same estimate, 2002-2003 data and 2013-2014 data are pooled and compared (Center for Behavioral Health Statistics and Quality [CBHSQ], 2015-2016).

Within each state, state sampling regions (SSRs) were formed. Based on a composite size measure, each state was geographically partitioned into roughly equal-sized regions according to population. In other words, regions were formed such that each area yielded, in expectation, roughly the same number of interviews within each state during each quarterly data collection period. This partitioning divided the United States into 750 SSRs.

Similar to the 2005 through 2013 NSDUHs, the first stage of selection for the 2014 through 2017 NSDUHs was census tracts.[2] This stage was included to contain sample segments within a single census tract to the extent possible.[3] Segments that cross census tract boundaries make merging to external data sources difficult.

The first stage of selection began with the construction of an area sample frame that contained one record for each census tract in the United States. If necessary, census tracts were aggregated within SSRs until each first-stage sampling unit met the minimum size requirement. In California, Florida, Georgia, Illinois, Michigan, New Jersey, New York, North Carolina,

[2] A census tract is a small, relatively permanent statistical subdivision of a county or equivalent entity that contains between 1,200 and 8,000 people, with an optimum size of 4,000 people (U.S. Census Bureau, Redistricting Data Office, 2009).

[3] Some census tracts had to be aggregated in order to meet the minimum DU requirement.

Ohio, Pennsylvania, Texas, and Virginia, this minimum size requirement was 250 DUs[4] in urban areas and 200 DUs in rural areas.[5] In the remaining states and the District of Columbia, the minimum requirement was 150 DUs in urban areas and 100 DUs in rural areas.

Before selecting census tracts,[6] additional implicit stratification was achieved by sorting the first-stage sampling units by a CBSA/SES[7] (core-based statistical area/socioeconomic status) indicator[8] and by the percentage of the population that is non-Hispanic and white.[9] From this well-ordered sample frame, 48 census tracts per SSR were sequentially selected with probabilities proportionate to a composite size measure and with minimum replacement (Chromy, 1979).

For the second stage of selection, adjacent census block groups were aggregated within selected census tracts as necessary to meet the minimum DU requirements (150 or 250 DUs in urban areas and 100 or 200 DUs in rural areas according to state). After the resulting second-stage sampling units were formed, they were sorted in the order they were formed (i.e., geographically), and one census block group[10] was selected per sampled census tract with probability proportionate to a composite size measure and with minimum replacement (Chromy, 1979). Compared with 2013 and prior years, the selection of census block groups is an additional stage of selection that was included in the 2014 through 2017 NSDUH samples to facilitate possible transitioning to an address-based sampling (ABS) design in the future.

The census block groups were generally larger than practical for building frames of housing units through field enumeration. Therefore, one smaller geographic region was selected within each sampled census block group. For this third stage of sampling, each selected census

[4] DU counts were obtained from the 2010 census data supplemented with revised population counts from Nielsen Claritas, which is a market research firm headquartered in San Diego, California (see http://www.nielsen.com/us/en.html).

[5] The basis for the differing minimum DU requirement in urban and rural areas is that it is more difficult to meet the requirement in rural areas, 100 DUs are sufficient to support one field test and two main study samples in the smaller states, and 200 DUs are sufficient to support three samples in the larger sample states.

[6] For the remainder of the discussion, first-stage sampling units are referred to as "census tracts" even though each first-stage sampling unit contains one or more census tracts.

[7] CBSAs include metropolitan and micropolitan statistical areas as defined by the Office of Management and Budget (2009).

[8] Four categories are defined as (1) CBSA/low SES, (2) CBSA/high SES, (3) non-CBSA/low SES, and (4) non-CBSA/high SES. To define SES, census tract-level median rents and property values obtained from the 2006 to 2010 American Community Survey (ACS) data were given a rank (1,…,5) based on state and CBSA quintiles. The rent and value ranks then were averaged, weighted by the percentages of renter- and owner-occupied DUs, respectively. If the resulting score fell in the lower 25th percentile by state and CBSA, the area was considered "low SES"; otherwise, it was considered "high SES."

[9] Although the large sample size eliminates the need for the oversampling of specially targeted demographic subgroups as was required prior to the 1999 National Household Survey on Drug Abuse (NHSDA), sorting by a CBSA/SES indicator and by the percentage of the population that is non-Hispanic and white ensures dispersion of the sample with respect to SES and race/ethnicity. Implicit stratification also has the potential to lower sampling error by reducing the selection of neighboring and possibly similar segments than if the selection was done completely at random.

[10] For the remainder of the discussion, second-stage sampling units are referred to as "census block groups" even though each second-stage sampling unit contains one or more census block groups.

block group was partitioned into compact clusters[11] of DUs by aggregating adjacent census blocks.[12] Consistent with the terminology used in previous NSDUHs, these geographic clusters of blocks are referred to as "segments." A sample DU in NSDUH refers to either a housing unit or a group quarters listing unit, such as a dormitory room or a shelter bed. Similar to census tracts and census block groups, segments were formed to contain a minimum of 150 or 250 DUs in urban areas and 100 or 200 DUs in rural areas according to state. This minimum DU requirement will support the overlapping sample design and any special supplemental samples or field tests that SAMHSA may wish to conduct.

Prior to selection, the segments were sorted in the order they were formed (i.e., geographically), and one segment was selected within each sampled census block group using Chromy's method of sequential random sampling (with probability proportionate to size and minimum replacement) (Chromy, 1979). The 48 selected segments within each SSR were randomly assigned to a survey year and quarter of data collection. Although 48 segments were selected, only 20 were needed to field the main survey across the 4-year period. The remaining segments are available to accommodate supplemental studies and other uses.

An equal probability subsample of eight segments per SSR is used for each NSDUH year. These eight segments are randomly assigned to quarters and to two panels within each quarter. For 2015, the first panel segments (panel B) were used for the 2014 and 2015 surveys. The second panel segments (panel C) were used for the 2015 survey and will be used again for the 2016 survey, constituting the overlap sample.

2.2.2 Sample Frame

Beginning in 2014, three changes related to the sample frame were implemented. First, whereas the sampling frame for the 2005 through 2013 NSDUHs was constructed using 2000 census data, the 2014 through 2017 sample frame was built using 2010 census data supplemented with 2013 population projections from Nielsen Claritas.[13] Furthermore, because the Census Bureau's long-form data were no longer available, census tract-level median rents and property values were obtained from the 2006 to 2010 ACS. These data were used to form the CBSA/SES indicator that was used in the implicit stratification of the first-stage sampling units (census tracts). This change was confirmed to improve coverage and therefore require smaller poststratification adjustments in weighting (CBHSQ, 2015).

Next, the number and distribution of SSRs was revised in 2014. In the 2005 through 2013 design, the 8 large states were partitioned into 48 SSRs and the small states were partitioned into 12 SSRs, for a total of 900 SSRs. Beginning in 2014, the sampling frame was stratified into

[11] Although the entire cluster is compact, the final sample of DUs represents a noncompact cluster. Noncompact clusters (selection from a list) differ from compact clusters in that not all units within the cluster are included in the sample. Although compact cluster designs are less costly, a noncompact cluster design was used because it provides for greater heterogeneity of dwellings within the sample. Also, social interaction (contagion) among neighboring dwellings is sometimes introduced with compact clusters (Kish, 1965).

[12] A census block is a small statistical area bounded by visible features (streets, roads, streams, railroad tracks, etc.) and nonvisible boundaries (e.g., city, town, and county limits). A block group is a cluster of census blocks within the same census tract and generally contains between 300 and 6,000 people (U.S. Census Bureau, Redistricting Data Office, 2009).

[13] See footnote 4 for information about Nielsen Claritas.

750 SSRs with the number of SSRs varying by state. In each of the eight large states (California, Florida, Illinois, Michigan, New York, Ohio, Pennsylvania, and Texas), the total number of SSRs was reduced. In four of the small states (Georgia, New Jersey, North Carolina, and Virginia), the total number of SSRs was increased, while there was no change in the number of SSRs in the remaining small states. Thus, the change in the number and distribution of SSRs affected only 12 states.

In general, the new SSR distribution in the affected states resulted in increased efficiency in the highly populated areas and efficiency losses in the less populated areas. In the highly populated areas, some efficiency was gained because the SSRs and segment locations were more compact and the work could be completed by fewer field interviewers (FIs). The concentrated locations reduced travel for the FIs, provided sufficient options for case assignments, and provided the option for FIs to work more hours, if desired. In some less populated areas, the decrease in SSRs created some inefficiencies because the SSRs were larger and the segment locations were not as central. In these areas, it was often challenging for an FI to cover all of the work in an SSR due to the varying location of segments and the location of an FI's home. Depending on the quarter, some SSRs experienced inefficiencies due to increased FI travel for the initial assignments and reduced FI options for conducting cleanup. Not all of the FIs were willing or available to travel longer distances, creating some inefficiencies in case assignments. In these areas, the use of borrowed FIs (BFIs) and sometimes traveling FIs (TFIs) was required.

In the states of Illinois, Michigan, Ohio, and Pennsylvania, the total number of SSRs was cut in half, and the average segment size was increased. As a result, these states experienced both gains and losses in efficiency. In the highly populated areas, these states not only gained due to increased yield and clustering, but also in staffing selection. Field management for 2014 was able to reduce the number of field staff members in the highly populated areas of these states. With location being equal, the best, most proficient, more efficient, and dedicated field staff members were retained. In the less populated areas of these states, increased SSR sizes and varying segment locations caused inefficiencies. Some segments had no nearby FI and had to be worked by a BFI or TFI, thus increasing travel costs. Overall, the greater yields in these states resulted in gains in efficiency, but also kept the field staff members working in their local segments longer while waiting for that assignment to be finished and before sending them to another area to work or clean up.

Overall, the new SSR distribution resulted in a reduction of hours and miles per interview; however, miscellaneous travel expenses increased. The SSR distribution also affected scheduling because it was initially not known what the yield would be in an area or when an FI would be available to move on to another assignment. With the higher yield, FIs took longer to work their initial assignments and were delayed while working a travel assignment. Compared with previous designs when field staff members completed their assignments several weeks before the end of the quarter, FIs were working late into each quarter. Without a short break at the end of the quarter, getting off to a strong start at the beginning of the following quarter was more challenging.

The issues related to the new SSR distribution and, in particular, its impact on hours and miles per interview and miscellaneous expenses continued into 2015. In response to these issues,

management of the FI case assignments and staffing levels was modified based on the 2014 field experience. Staffing levels were increased in many states, and new local staff were hired with the expectation of fewer hours per week and required travel in rural areas to accommodate quarterly fluctuations in location assignments. Because management of the new SSR distribution required more travel to cover remote areas, the team of dedicated TFIs increased from 11 to 16 team members, and field supervisors increased the utilization of FIs who could travel from adjacent states. Field supervisors proactively made quarterly assignments to account for working cases later into the quarter, and weekly production benchmarks were adjusted to reflect realistic expectations based on the 2014 fieldwork.

The third change, which was mentioned previously, was the addition of a sample selection stage by selecting census block groups from selected census tracts. The purpose of this change was to facilitate the possible transition to ABS. The introduction of census blocks as a sampling stage was transparent in the area sampling results and was expected to have little impact on the person-level analysis weight.

2.2.3 Sample Selection at Fourth and Fifth Stages

After sample segments for the 2015 NSDUH were selected, specially trained field household listers visited the areas and compiled complete lists of all eligible DUs within the sample segment boundaries. These lists served as the frames for the fourth stage of sample selection.

The primary objective of the fourth stage of sample selection (listing units) was to select the minimum number of DUs needed in each segment to meet the targeted sample sizes for all age groups. Thus, listing unit sample sizes for the segment were determined using the age group with the largest sampling rate, which is referred to as the "driving" age group. Using 2010 census data adjusted to more recent data from Nielsen Claritas, state- and age-specific sampling rates were computed. These rates then were adjusted by (a) the segment's probability of selection; (b) the subsegmentation inflation factor,[14] if any; (c) the probability of selecting a person in the age group (equal to the maximum, or 0.99, for the driving age group); and (d) an adjustment for the "maximum of two" rule.[15] In addition to these factors, historical data from the 2013, 2014, and 2015 NSDUHs were used to compute predicted screening and interviewing response rate adjustments. The final adjusted sampling rate then was multiplied by the actual number of DUs found in the field during counting and listing activities. The product represents the segment's listing unit sample size.

Some constraints were put on the listing unit sample sizes. First, to ensure adequate samples for supplemental studies, the listing unit sample size could not exceed 100 per segment

[14] Segments found to be very large in the field were partitioned into *subsegments*. Then one subsegment was chosen at random with probability proportional to the size to be fielded. In some cases, a second-level subsegmenting was required if the census totals used in the initial subsegmenting were off and the selected subsegment was still too large for listing. The subsegmentation inflation factor accounts for reducing the size of the segment.

[15] Brewer's Selection Algorithm never allows for greater than two persons per household to be chosen. Thus, sampling rates are adjusted to satisfy this constraint.

or half of the actual listing unit count. Next, for cost-efficiency, if five unused listing units remained in the segment, a minimum of five listing units per segment was required.

Using a random start point and interval-based (systematic) selection, the actual listing units were selected from the segment frame. In 2015 and beyond, DUs that are selected from the overlap segments in the prior year are flagged as "used" and are not eligible for selection in the "current" year (i.e., two separate samples are selected with the complement of the prior year's sample serving as the DU frame in the "current" year). Individuals may be selected in consecutive years if they move and their new residence is selected the year after their original DU was sampled. No mechanism is currently in place for identifying duplicate persons in a given year, but this number should be small given the restriction on DUs that were sampled in the previous year.

After DU selections were made, an interviewer visited each selected DU to obtain a roster of all persons residing in the DU. Using the roster information obtained from an eligible member of the selected DU, 0, 1, or 2 persons were selected for the survey. Sampling rates were preset by age group and state. Roster information was entered directly into the electronic screening instrument, which automatically implemented this fifth stage of selection based on the state and age group sampling parameters.

One advantage of using an electronic screening instrument in NSDUH is the ability to impose a more complicated person-level selection algorithm on the fifth stage of the NSDUH design. Similar to the 1999 through 2013 designs, one feature that was included in the 2014 through 2017 design is that any two survey-eligible persons within a DU have some chance of being selected (i.e., all survey-eligible pairs of persons had some nonzero chance of being selected). This design feature is of interest to NSDUH researchers because, for example, it allows analysts to examine how the drug use propensity of one individual in a family relates to the drug use propensity of another family member residing in the same DU (e.g., the relationship of drug use between a parent and his or her child). The pair sampling algorithm in NSDUH is based on the Chromy and Penne (2002) adaptation of the Brewer (1963, 1975) method for selecting samples of size two. Chromy and Penne (2002) also introduced a pair sampling parameter λ that governs the number of pairs selected. A simulation analysis was conducted to select the pair sampling parameter for the 2014 and 2015 NSDUHs (see the 2015 NSDUH sample design report; CBHSQ, 2016a).

As in previous years, during the data collection period, if an interviewer encountered any new or missed DU on the premises of a sampled DU (e.g., a garage apartment), the new or missed dwelling was selected into the 2015 NSDUH. However, unlike the 2005 through 2013 NSDUHs, the half-open interval (HOI) procedure[16] was not implemented. An evaluation of 2010 NSDUH data found that the HOI procedure accounted for only 0.2 percent of the total DUs on the supplemented NSDUH frame (Iannacchione, McMichael, Shook-Sa, & Morton, 2012). Further, an analysis of cases added to the sample through the HOI procedure found that these

[16] In summary, the HOI technique states that, if a DU is selected and an interviewer observes any new or missed DUs between the selected DU and the DU appearing immediately after the selection on the counting and listing form, all new or missed dwellings falling in this interval will be selected. If a large number of new or missed DUs are encountered (greater than 10), a sample of the new or missing DUs is selected, and the sample weight is adjusted accordingly.

respondents did not have an appreciable impact on the estimates (Cunningham et al., 2009). Excluding the HOI procedure decreases the burden on FIs and simplifies the screening process. This decrease in burden outweighs the small increase in coverage resulting from implementation of the HOI procedure. To minimize bias associated with large numbers of missed DUs, interviewers were instructed to call their supervisors if they noticed large differences in the segment listing and what they encountered in the field. Then special "bust" procedures were implemented (see the 2015 NSDUH sample design report; CBHSQ, 2016a).

2.2.4 Creation of Variance Estimation Strata and Replicates

The nature of the stratified, clustered sampling design requires that the design structure be taken into consideration when computing variances of survey estimates. Key nesting variables representing the variance estimation strata and replicates were created to capture explicit stratification and to identify clustering. For the 2014 through 2017 NSDUHs, variance estimation strata are defined at the SSR level, and each SSR is assigned to a different stratum every quarter in a pseudorandom fashion. Similar to the 2005 through 2013 definition of variance estimation strata, the 2014 through 2017 definition also has the effect of increasing the number of degrees of freedom (*df*) for state-level estimates while preserving the number of degrees of freedom for national estimates (750). Each of the smallest sample states is in 48 different strata (12 SSRs × 4 quarters); therefore, 48 degrees of freedom are available for state estimates in these states. At the other extreme, the largest sample state, California, is in 144 strata (36 SSRs × 4 quarters) and therefore has 144 degrees of freedom for estimation. Two replicates per year were defined within each variance stratum. Each variance replicate consists of four segments, one for each quarter of data collection. The first replicate consists of those segments that are "phasing out" or will not be used in the next survey year. The second replicate consists of those segments that are "phasing in" or will be fielded again the following year, thus constituting the 50 percent overlap between survey years.

Census tracts, block groups, and segments are nested within variance replicates, so the nesting variables cover the variance contributions of all three sampling units. Also, because one segment is selected per sampled census tract and block group, the selection of census tracts and block groups at the first stages of selection may reduce variance by controlling the sample distribution and minimizing the chance of selecting neighboring and possibly similar segments within the same census tract or block group. All weighted statistical analyses for which variance estimates are needed should use the stratum and replicate variables to identify nesting. Stratification reduces variances, while clustering increases them. Ignoring these design elements may produce standard errors that lead to false-positive or false-negative test outcomes. Variance estimates can be computed using a clustered data analysis software package such as SUDAAN® (CBHSQ, 2016a; RTI International, 2013).

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3. Segment (Third-Stage) Sample Experience

As mentioned in Chapter 2, the third stage of selection for the 2014 through 2017 National Surveys on Drug Use and Health (NSDUHs) was area segments. To form segments within sampled census block groups, adjacent census blocks were collapsed until the total number of dwelling units (DUs) within the area met the minimum requirement. In California, Florida, Georgia, Illinois, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, and Virginia, this minimum size requirement was 250 DUs in urban areas and 200 DUs in rural areas. In the remaining states and the District of Columbia, the minimum requirement was 150 DUs in urban areas and 100 DUs in rural areas.

To control the geographic distribution of the sample, segments were sorted in the order they were formed (geographically within census block groups), and one segment was selected per sampled census block group using the probability proportional to size with minimal replacement sequential sampling method. As a result, 48 census tracts/segments per state sampling region (SSR) were chosen for a total of 36,000 segments. Although only 20 segments per SSR or 15,000 segments total were needed to support the 4-year study from 2014 through 2017, an additional 28 segments were selected to serve as replacements when segment DUs are depleted and/or to support any supplemental studies embedded within NSDUH.

The 48 sampled segments per SSR were randomly assigned to survey years by drawing equal probability subsamples of four segments. The first subsample of segments was assigned to the 2014 NSDUH and constituted the panel of segments to be used for 2014 only. The second subsample of segments was assigned to the 2014 NSDUH and was used again in the 2015 survey. The third subsample of segments was assigned to the 2015 NSDUH and will be used again in the 2016 survey. The fourth subsample of segments was assigned to the 2016 NSDUH and will be used again in the 2017 survey. Finally, the fifth subsample of segments will be used for the 2017 NSDUH only. Within each subsample, segments were assigned to survey quarters 1 through 4 in the order that they were selected.

Using the survey year and quarter assignments, a segment identification number (SEGID) then was assigned. The first two digits of the SEGID are the state abbreviation, the second two digits are the SSR within state, and the last two digits are called the "segment suffix," with the next-to-last digit being the panel identifier and the last digit being the original quarter assignment.

Because segments were selected with minimal replacement, some segments may have been selected more than once. Among the 15,000 segments selected for the 4-year study, 14,605 (97.4 percent) were unique. Table 3.1 lists the duplicated segments in the 2015 NSDUH sample. Panel A segments in Table 3.1 are not in the 2015 sample, but are duplicates of segments in the 2015 sample. Because segments are randomly assigned to panels, duplicates may exist within or across panels. For example, AK06A3 and AK06B2 are in different panels, while DC07B1 and DC07B2 are in the same panel. The original segment (e.g., AK06A3) is field enumerated, and the resulting DU frame is used each time the segment is fielded (e.g., for AK06A3 and

AK06B2). DUs that were selected in previous fieldings are ineligible for selection in subsequent fieldings. Within survey years, duplicate segments may be assigned to the same or different quarters. If a segment is used twice in the same quarter (e.g., CO07B1 and CO07C1), a double sample is selected from the first segment, then randomly split for analysis purposes.

Table 3.1 Duplicated Segments in the 2015 NSDUH Sample

Original Segment	2015 NSDUH Duplicate Segment
AK06A3*	AK06B2
CO07B1	CO07C1
DC06A4*	DC06C4
DC07B1	DC07B2
DC12B3	DC12C2
DE02A3*	DE02C2
DE05A2*,[a]	DE05C1
HI08A3*	HI08B4
ME09A2*	ME09C2
MT07B2	MT07B3
ND11A3*	ND11C4
SD02A1*	SD02C2
WY03A2*	WY03C2

*Segment is not in the 2015 NSDUH sample but is a duplicate of a segment in the 2015 NSDUH sample.

[a]Original segment is also a duplicate of an earlier segment.

During field enumeration, a small number of segments are switched with another segment in the same SSR and panel due to difficult conditions during the winter months. In general, quarter 1 segments are switched with quarter 2 segments, and quarter 3 segments are switched with quarter 4 segments. Table 3.2 lists the quarter switches in the 2015 NSDUH sample.

Table 3.2 2015 NSDUH Segment Quarter Switches in the Field

Quarters 1 and 2		Quarters 3 and 4	
Original Segment in Quarter 1	**Switched Segment from Quarter 2**	**Original Segment in Quarter 3**	**Switched Segment from Quarter 4**
AK01C1	AK01C2	AK01B3	AK01B4
AK02B1	AK02B2	AK01C3	AK01C4
AK02C1	AK02C2	AK03C3	AK03C4
AK04B1	AK04B2	AK10B3	AK10B4
AK05C1	AK05C2	AK11C3	AK11C4
AK10C1	AK10C2	AK12B3	AK12B4
AK11C1	AK11C2	CA34C3	CA34C4
CO06B1	CO06B2	CO11B3	CO11B4
IA02B1	IA02B2	CO11C3	CO11C4
IA05B1	IA05B2	CO12B3	CO12B4
IA09B1	IA09B2	CO12C3	CO12C4
IA12B1	IA12B2	GA15C3	GA15C4
ID11C1	ID11C2	ID07C3	ID07C4
ID12B1	ID12B2	ID11B3	ID11B4
ID12C1	ID12C2	ID11C3	ID11C4
ME09C1	ME09C2	MO01B3	MO01B4
MO08B1	MO08B2	MO01C3	MO01C4
MT01B1	MT01B2	MO07B3	MO07B4
MT01C1	MT01C2	MO09C3	MO09C4
MT02B1	MT02B2	MO12B3	MO12B4
MT04C1	MT04C2	MT09B3	MT09B4
MT06B1	MT06B2	MT09C3	MT09C4
MT07C1	MT07C2	MT10C3	MT10C4
MT10C1	MT10C2	MT11B3	MT11B4
MT11B1	MT11B2	OR02B3	OR02B4
NM02C1	NM02C2	OR04B3	OR04B4
WV04C1	WV04C2	TN11C3	TN11C4
WV05C1	WV05C2	WY06C3	WY06C4
WV07C1	WV07C2	WY07C3	WY07C4
WY04C1	WY04C2		
WY05C1	WY05C2		
WY08C1	WY08C2		
WY09C1	WY09C2		

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4. Dwelling Unit (Fourth-Stage) Sample Experience

The process by which the dwelling unit (DU) frame is constructed is called "counting and listing." In summary, a certified lister visits the selected area and lists a detailed and accurate address (or description, if no address is available) for each DU within the segment boundaries. The list of DUs constructed during counting and listing is entered into a database and serves as the frame from which the fourth-stage sample is drawn.

As described in Section 2.2.3, after the DU frame was constructed, the next step was to determine the minimal number of DUs to select for each segment to meet the targeted sample sizes for all age groups. This sample size determination was performed on a quarterly basis to take advantage of both segment differences and, if necessary, make adjustments to design parameters (e.g., to use the most recent response rate experience). Table 4.1 provides the number of DUs that were enumerated during the counting and listing process and the number of DUs that were sampled. After accounting for anticipated screening and interview response rates using historical National Survey on Drug Use and Health (NSDUH) data, an average of 32.82 sample dwelling units (SDUs) were selected per segment. The number of SDUs per segment varied by state according to the state's sample size, number of segments, and anticipated response rates.

Table 4.1 Segment and Dwelling Unit Summary

State	Total Segments	Listed DUs	SDUs	SDUs per Segment	Added DUs	Percent Increase in DUs	Total Selected DUs
Total Population	6,000	1,589,668	196,892	32.82	1,070	0.54	197,962
Alabama	96	23,171	2,772	28.88	25	0.90	2,797
Alaska	96	23,497	3,243	33.78	46	1.42	3,289
Arizona	96	22,277	3,021	31.47	1	0.03	3,022
Arkansas	96	19,716	2,866	29.85	9	0.31	2,875
California	288	89,013	11,244	39.04	38	0.34	11,282
Colorado	96	24,057	2,624	27.33	13	0.50	2,637
Connecticut	96	23,418	2,855	29.74	17	0.60	2,872
Delaware	96	23,798	2,693	28.05	8	0.30	2,701
District of Columbia	96	27,907	5,153	53.68	24	0.47	5,177
Florida	240	77,557	10,499	43.75	31	0.30	10,530
Georgia	120	36,945	4,006	33.38	9	0.22	4,015
Hawaii	96	28,899	3,093	32.22	46	1.49	3,139
Idaho	96	21,630	2,011	20.95	9	0.45	2,020
Illinois	192	61,064	7,076	36.85	27	0.38	7,103
Indiana	96	22,560	2,721	28.34	8	0.29	2,729
Iowa	96	20,524	3,051	31.78	17	0.56	3,068
Kansas	96	21,001	2,630	27.40	10	0.38	2,640
Kentucky	96	23,116	2,459	25.61	10	0.41	2,469
Louisiana	96	22,807	2,614	27.23	4	0.15	2,618
Maine	96	21,412	4,250	44.27	27	0.64	4,277

See notes at end of table.
(continued)

Table 4.1 Segment and Dwelling Unit Summary (continued)

State	Total Segments	Listed DUs	SDUs	SDUs per Segment	Added DUs	Percent Increase in DUs	Total Selected DUs
Maryland	96	26,196	2,293	23.89	15	0.65	2,308
Massachusetts	96	21,237	3,315	34.53	51	1.54	3,366
Michigan	192	60,664	7,135	37.16	31	0.43	7,166
Minnesota	96	20,303	2,477	25.80	13	0.52	2,490
Mississippi	96	20,587	2,551	26.57	3	0.12	2,554
Missouri	96	23,400	2,582	26.90	0	0.00	2,582
Montana	96	19,563	3,152	32.83	43	1.36	3,195
Nebraska	96	19,918	2,505	26.09	5	0.20	2,510
Nevada	96	27,280	2,665	27.76	11	0.41	2,676
New Hampshire	96	22,753	3,272	34.08	52	1.59	3,324
New Jersey	120	39,978	4,052	33.77	24	0.59	4,076
New Mexico	96	23,297	2,560	26.67	8	0.31	2,568
New York	240	78,131	12,032	50.13	85	0.71	12,117
North Carolina	120	38,145	4,233	35.28	18	0.43	4,251
North Dakota	96	20,504	3,413	35.55	12	0.35	3,425
Ohio	192	61,164	7,004	36.48	28	0.40	7,032
Oklahoma	96	21,132	2,850	29.69	7	0.25	2,857
Oregon	96	20,760	2,509	26.14	17	0.68	2,526
Pennsylvania	192	59,636	7,381	38.44	48	0.65	7,429
Rhode Island	96	22,297	2,866	29.85	35	1.22	2,901
South Carolina	96	23,404	2,935	30.57	9	0.31	2,944
South Dakota	96	21,211	2,345	24.43	9	0.38	2,354
Tennessee	96	22,158	2,662	27.73	8	0.30	2,670
Texas	240	75,921	6,196	25.82	31	0.50	6,227
Utah	96	21,339	1,496	15.58	10	0.67	1,506
Vermont	96	20,344	3,764	39.21	31	0.82	3,795
Virginia	120	37,483	3,912	32.60	22	0.56	3,934
Washington	96	21,913	2,674	27.85	18	0.67	2,692
West Virginia	96	23,674	3,234	33.69	16	0.49	3,250
Wisconsin	96	22,241	3,149	32.80	21	0.67	3,170
Wyoming	96	18,666	2,797	29.14	10	0.36	2,807

DU = dwelling unit; SDU = sample dwelling unit.

To compensate for quarterly variations in response rates and yields, a sample partitioning procedure was implemented in all quarters. The entire sample of DUs still would be selected, but only certain percentages of the total would be released into the field. An initial percentage would be released in all segments at the beginning of the quarter. Based on interquarter work projections, additional percentages would be released 1 month into the quarter as needed and if field staff could handle the added workload. Each partitioning of the sample is a valid sample and helps manage the sample sizes by state without jeopardizing the validity of the study. Incidentally, a reserve DU sample of 20 percent also was selected within each selected segment, over and above the required quarterly sample, to allow for supplemental releases within each quarter. These releases usually occur as a result of lower than expected response rates, but are also released for other reasons, including a large percentage of sample in controlled access areas and in college dormitories that are vacant during the summer months. In previous years, additional sample has also been released to compensate for sample lost to natural disasters and other emergency situations (e.g., following Hurricanes Katrina and Rita). Sample releases are made at the state level and do not target any particular age group. In each quarter, the DU sample was allocated out to states in the following release percentages:

Release 1: 67 percent of entire sample (80/120, main sample + 20 percent reserve);
Release 2: 4 percent of entire sample (5/120, main sample + 20 percent reserve);
Release 3: 4 percent of entire sample (5/120, main sample + 20 percent reserve);
Release 4: 8 percent of entire sample (10/120, main sample + 20 percent reserve);
Release 5: 8 percent of entire sample (10/120, main sample + 20 percent reserve); and
Release 6: 8 percent of entire sample (10/120, main sample + 20 percent reserve).

As described in the 2015 NSDUH sample design report (Center for Behavioral Health Statistics and Quality [CBHSQ], 2016a), a weight adjustment is applied to all DUs within a segment to account for the partial release of sample. The DU release adjustment is equal to the inverse of the percentage of the sample that is released into the field. A summary of the quarterly sample sizes and percentages released is provided in Table 4.2. If the release plan was implemented with no changes, a percentage equal to 100/120 or 83.3 percent would be expected.

To ensure that most DUs had a chance of selection and to minimize bias associated with incomplete frames, a check for missed DUs was implemented at most sampled DUs.[17] During the screening interview, the field interviewer (FI) asked the screening respondent about other units on the property of the sampled DU (e.g., a garage apartment). When found on the property of a sampled DU, the unlisted units became part of the sample (added DUs) and were considered "linked" to that DU. If the number of added DUs linked to any particular sample DU did not exceed 5, and if the number for the entire segment was less than or equal to 10, the FI was instructed to consider these DUs as part of his or her assignment. If either of these limits was exceeded, special subsampling procedures were implemented (see the 2015 NSDUH sample design report; CBHSQ, 2016a).

In addition to checking for missed DUs at each sampled DU, interviewers were instructed to call their supervisors if they noticed large differences in the segment listing and what they encountered in the field. If the FI identified 150 or more missed DUs in a segment or 50 or more missed DUs following any DU, special "bust" procedures were implemented to minimize bias associated with large numbers of missed DUs. The bust procedures involve selecting a subsample of the missed DUs and adding them to the interview's assignment; these procedures are described in more detail in the 2015 NSDUH sample design report (CBHSQ, 2016a). The total number of added DUs identified during the screening interview or added through the bust procedures is summarized in Table 4.1. Overall, a 0.54 percent increase in sample was realized through the check for missed DUs. Larger increases in sample were realized in the states of Alaska, Hawaii, Massachusetts, Montana, New Hampshire, and Rhode Island. In Alaska, Hawaii, and Montana, properties that were listed by mailbox may have had only one mailbox for several units. Also, in general, Hawaii had a large number of DUs on the property of other DUs that were difficult to see. The Northeast states typically had a large number of garage apartments and single family homes converted into multiple units. The added DU information in Table 4.1 will be used in the sample size calculations for future NSDUHs.

[17]The screening respondent was not asked about other units on the property or within the sampled DU in apartment buildings and other multiunit structures.

Table 4.2 Quarterly Dwelling Unit Sample Sizes and Percentages Released

Region/State	Quarter 1			Quarter 2		
	# Selected	# Released	Percent	# Selected	# Released	Percent
Total Population	52,623	43,840	83.31	57,731	53,290	92.31
Northeast	11,386	9,498	83.42	12,811	12,202	95.25
Connecticut	741	621	83.81	811	811	100.00
Maine	981	815	83.08	1,280	1,280	100.00
Massachusetts	820	682	83.17	880	880	100.00
New Hampshire	799	669	83.73	908	908	100.00
New Jersey	1,163	967	83.15	1,381	1,148	83.13
New York	3,094	2,581	83.42	3,471	3,469	99.94
Pennsylvania	1,981	1,661	83.85	2,242	1,869	83.36
Rhode Island	769	639	83.09	792	791	99.87
Vermont	1,038	863	83.14	1,046	1,046	100.00
Midwest	12,208	10,176	83.36	13,485	12,064	89.46
Illinois	2,054	1,708	83.15	2,283	1,903	83.36
Indiana	701	590	84.17	741	741	100.00
Iowa	776	646	83.25	946	793	83.83
Kansas	681	567	83.26	804	665	82.71
Michigan	1,875	1,560	83.20	2,043	2,041	99.90
Minnesota	623	521	83.63	710	650	91.55
Missouri	668	559	83.68	782	624	79.80
Nebraska	676	564	83.43	740	494	66.76
North Dakota	931	778	83.57	1,039	863	83.06
Ohio	1,807	1,501	83.07	1,902	1,901	99.95
South Dakota	639	532	83.26	632	526	83.23
Wisconsin	777	650	83.66	863	863	100.00
South	17,539	14,594	83.21	18,970	17,198	90.66
Alabama	754	622	82.49	820	719	87.68
Arkansas	788	659	83.63	825	723	87.64
Delaware	762	632	82.94	797	729	91.47
District of Columbia	1,138	944	82.95	1,428	1,428	100.00
Florida	3,029	2,519	83.16	3,309	2,901	87.67
Georgia	1,142	951	83.27	1,145	1,145	100.00
Kentucky	659	546	82.85	735	674	91.70
Louisiana	695	582	83.74	775	775	100.00
Maryland	722	598	82.83	732	547	74.73
Mississippi	621	517	83.25	745	683	91.68
North Carolina	1,239	1,039	83.86	1,293	1,187	91.80
Oklahoma	662	552	83.38	802	801	99.88
South Carolina	853	713	83.59	862	756	87.70
Tennessee	644	532	82.61	734	641	87.33
Texas	1,871	1,559	83.32	1,952	1,627	83.35
Virginia	1,079	896	83.04	1,095	1,095	100.00
West Virginia	881	733	83.20	921	767	83.28
West	11,490	9,572	83.31	12,465	11,826	94.87
Alaska	847	704	83.12	844	772	91.47
Arizona	797	660	82.81	793	793	100.00
California	2,960	2,466	83.31	3,240	3,238	99.94
Colorado	752	626	83.24	738	678	91.87
Hawaii	797	664	83.31	917	789	86.04
Idaho	563	471	83.66	571	505	88.44
Montana	834	694	83.21	947	947	100.00
Nevada	660	548	83.03	795	795	100.00
New Mexico	675	564	83.56	702	645	91.88
Oregon	737	615	83.45	690	661	95.80
Utah	411	343	83.45	472	390	82.63
Washington	730	612	83.84	847	704	83.12
Wyoming	727	605	83.22	909	909	100.00

(continued)

Table 4.2 Quarterly Dwelling Unit Sample Sizes and Percentages Released (continued)

Region/State	Quarter 3			Quarter 4		
	# Selected	# Released	Percent	# Selected	# Released	Percent
Total Population	59,233	50,651	85.51	55,575	49,111	88.37
Northeast	13,257	11,351	85.62	12,552	10,736	85.53
Connecticut	813	745	91.64	741	678	91.50
Maine	1,414	1,292	91.37	1,216	863	70.97
Massachusetts	948	807	85.13	946	946	100.00
New Hampshire	989	945	95.55	949	750	79.03
New Jersey	1,316	1,037	78.80	1,199	900	75.06
New York	3,846	3,043	79.12	3,523	2,939	83.42
Pennsylvania	2,183	1,914	87.68	2,214	1,937	87.49
Rhode Island	767	671	87.48	765	765	100.00
Vermont	981	897	91.44	999	958	95.90
Midwest	13,624	12,137	89.09	13,067	11,711	89.62
Illinois	2,200	1,654	75.18	2,066	1,811	87.66
Indiana	790	724	91.65	756	666	88.10
Iowa	955	835	87.43	887	777	87.60
Kansas	820	681	83.05	813	717	88.19
Michigan	2,098	1,834	87.42	2,036	1,700	83.50
Minnesota	704	673	95.60	633	633	100.00
Missouri	796	697	87.56	768	702	91.41
Nebraska	776	711	91.62	736	736	100.00
North Dakota	975	975	100.00	955	797	83.46
Ohio	2,004	1,917	95.66	1,929	1,685	87.35
South Dakota	695	695	100.00	592	592	100.00
Wisconsin	811	741	91.37	896	895	99.89
South	19,237	16,230	84.37	17,910	15,906	88.81
Alabama	819	683	83.39	822	748	91.00
Arkansas	815	716	87.85	768	768	100.00
Delaware	807	710	87.98	743	622	83.71
District of Columbia	1,558	1,362	87.42	1,481	1,419	95.81
Florida	3,295	2,609	79.18	3,123	2,470	79.09
Georgia	1,133	949	83.76	961	961	100.00
Kentucky	703	552	78.52	687	687	100.00
Louisiana	713	712	99.86	685	545	79.56
Maryland	642	539	83.96	609	609	100.00
Mississippi	831	724	87.12	686	627	91.40
North Carolina	1,229	926	75.35	1,181	1,081	91.53
Oklahoma	924	768	83.12	793	729	91.93
South Carolina	826	758	91.77	847	708	83.59
Tennessee	817	781	95.59	853	708	83.00
Texas	2,027	1,608	79.33	1,772	1,402	79.12
Virginia	1,098	915	83.33	1,048	1,006	95.99
West Virginia	1,000	918	91.80	851	816	95.89
West	13,115	10,933	83.36	12,046	10,758	89.31
Alaska	1,013	967	95.46	875	800	91.43
Arizona	870	795	91.38	883	773	87.54
California	3,460	2,733	78.99	3,200	2,807	87.72
Colorado	692	692	100.00	720	628	87.22
Hawaii	1,035	812	78.45	919	828	90.10
Idaho	559	510	91.23	525	525	100.00
Montana	886	705	79.57	921	806	87.51
Nevada	814	648	79.61	674	674	100.00
New Mexico	744	619	83.20	732	732	100.00
Oregon	726	608	83.75	650	625	96.15
Utah	487	362	74.33	401	401	100.00
Washington	859	710	82.65	776	648	83.51
Wyoming	970	772	79.59	770	511	66.36

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5. Person (Fifth-Stage) Sample Experience

Compared with previous designs, the 2014 through 2017 National Survey on Drug Use and Health (NSDUH) design places more sample in the 26 or older age groups to estimate substance use and related mental health measures more accurately among the aging drug-using population. As noted previously, the target national sample size of 67,507 was distributed across five age groups as follows: 25 percent for youths aged 12 to 17, 25 percent for young adults aged 18 to 25, 15 percent for adults aged 26 to 34, 20 percent for adults aged 35 to 49, and 15 percent for adults aged 50 or older. Further, the sample was designed to yield minimum sample sizes in each state as described in Section 2.2.1. Table 5.1 displays the desired and achieved sample yields by age group and state. In general, the sample allocation and sample size management procedures were effective at achieving the numerous sample size targets.

Table 5.1 Yields, by Age Group and State

Age Group and State	Targeted	Achieved	Percent Difference
Total	67,507	68,073	0.84
12-17	16,877	16,955	0.46
18-25	16,877	17,215	2.00
26-34	10,126	10,317	1.89
35-49	13,501	13,378	-0.91
50+	10,126	10,208	0.81
Alabama	960	953	-0.73
Alaska	960	981	2.19
Arizona	960	996	3.75
Arkansas	960	981	2.19
California	4,560	4,671	2.43
Colorado	960	994	3.54
Connecticut	960	964	0.42
Delaware	960	945	-1.56
District of Columbia	960	924	-3.75
Florida	3,300	3,386	2.61
Georgia	1,500	1,498	-0.13
Hawaii	967	1,020	5.48
Idaho	960	949	-1.15
Illinois	2,400	2,365	-1.46
Indiana	960	973	1.35
Iowa	960	962	0.21
Kansas	960	986	2.71
Kentucky	960	938	-2.29
Louisiana	960	957	-0.31
Maine	960	994	3.54
Maryland	960	946	-1.46
Massachusetts	960	948	-1.25
Michigan	2,400	2,441	1.71
Minnesota	960	951	-0.94

(continued)

Table 5.1 Yields, by Age Group and State (continued)

Age Group and State	Targeted	Achieved	Percent Difference
Mississippi	960	921	-4.06
Missouri	960	986	2.71
Montana	960	977	1.77
Nebraska	960	945	-1.56
Nevada	960	997	3.85
New Hampshire	960	995	3.65
New Jersey	1,500	1,517	1.13
New Mexico	960	959	-0.10
New York	3,300	3,310	0.30
North Carolina	1,500	1,576	5.07
North Dakota	960	988	2.92
Ohio	2,400	2,428	1.17
Oklahoma	960	971	1.15
Oregon	960	962	0.21
Pennsylvania	2,400	2,374	-1.08
Rhode Island	960	964	0.42
South Carolina	960	987	2.81
South Dakota	960	904	-5.83
Tennessee	960	1,004	4.58
Texas	3,300	3,308	0.24
Utah	960	968	0.83
Vermont	960	960	0.00
Virginia	1,500	1,526	1.73
Washington	960	944	-1.67
West Virginia	960	947	-1.35
Wisconsin	960	961	0.10
Wyoming	960	971	1.15

Some unique challenges arose with the increase in sample allocated to the 26 or older age groups. Respondents in these age groups are more challenging to find at home and persuade to take the time to participate in the study. In 2015, the unweighted interview response rate was 77.57 percent for individuals aged 12 to 17, 74.17 percent for individuals aged 18 to 25, and 68.59 percent for individuals aged 26 or older (Center for Behavioral Health Statistics and Quality [CBHSQ], 2016b). Within the 26 or older age group, individuals aged 50 or older had the lowest unweighted interview response rate (66.42 percent). The higher percentage of respondents in the older age groups required more visits to attempt completion of pending cases and for refusal conversion efforts. Anecdotally, individuals aged 50 or older are more likely to live in controlled access situations, making it more challenging to complete screening and interviewing for these cases.

In addition to the shift in sample to the older age groups, a new pair sampling parameter was selected for the 2014 through 2017 NSDUHs. The pair sampling algorithm in NSDUH is based on the Chromy and Penne (2002) adaptation of the Brewer (1963, 1975) method for selecting samples of size 2 as a means of selecting samples of 0, 1, or 2 people within a selected dwelling unit (DU) containing at least 1 eligible person. Chromy and Penne's adaptation includes

a pair sampling parameter, λ, that governs the number of pairs selected. Simulation analyses resulted in the selection of $\lambda = 0.50$ for the 2002 to 2013 NSDUH sample designs because this selection increased the number of pairs by about 20 percent (relative to the selection of $\lambda = 0.00$) with only a moderate impact on the response rates by age group.

For the 2014 through 2017 NSDUHs, simulation analyses based on the 2012 screening data, modified to reflect the 2014 through 2017 age group sample proportions, were conducted, and $\lambda = 0.25$ was selected (CBHSQ, 2014). As a result, fewer pairs were projected to be selected in the 2014 through 2017 NSDUHs than were selected in the 2002 through 2013 NSDUHs. However, as a result of increasing the older adult sample, a lambda value of 0.25 yielded a large projected number of adolescent-adult pairs in 2014 through 2017 when compared with earlier years.

Tables 5.2 and 5.3 provide projected and observed pair selection counts and response rates, respectively, by age group pairs for the three age groups: 12 to 17, 18 to 25, and 26 or older. Observed selection counts in 2015 were considerably larger than their projected counterparts overall and in most age group pairs. This is partially because the observed counts are based on an overall sample of 68,073 interviews and the projected counts are based on 67,507 interviews. Further, response rates were lower than anticipated, requiring more selections to achieve the desired sample. Finally, the projection models may require updating.

Table 5.2 Projected and Observed Pair Selection Counts, by Age Group Pairs (Three Age Groups: 12 to 17, 18 to 25, and 26 or Older)

Age Group Pair	2014-2017 Projected Count ($\lambda = 0.25$)	2015 Observed Count ($\lambda = 0.25$)
12+, 12+	22,752	27,778
12-17, 12-17	3,041	2,962
12-17, 18-25	2,326	2,571
12-17, 26+	6,208	8,120
18-25, 18-25	3,185	4,043
18-25, 26+	3,833	4,971
26+, 26+	4,160	5,111

[1] Observed counts in 2015 sum to 68,073, whereas simulated counts sum to 67,507.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2012 and 2015.

Table 5.3 Projected and Observed Pair Response Rates, by Age Group Pairs (Three Age Groups: 12 to 17, 18 to 25, and 26 or Older)

Age Group Pair	2014-2017 Projected Response Rate ($\lambda = 0.25$)	2015 Observed Response Rate ($\lambda = 0.25$)
12+, 12+	71.4	64.6
12-17, 12-17	81.4	76.1
12-17, 18-25	76.1	69.8
12-17, 26+	74.8	68.9
18-25, 18-25	71.2	65.6
18-25, 26+	67.1	58.2
26+, 26+	60.7	54.1

[1] Observed response rates based on questionnaire age.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2012 and 2015.

Departures from the planned sample sizes occur for several reasons, including sampling variability, access problems (e.g., in gated communities or college dormitories), and departures from expected response rates. Table 5.4 provides weighted screening and interview response rates by state for the 2015 NSDUH. These rates will be used to fine-tune the sample size calculations for the 2016 NSDUH.

Table 5.4 Weighted Screening and Interview Response Rates, by State

State	Total Selected DUs	Total Eligible DUs	Weighted DU Eligibility Rate	Total Completed Screeners	Weighted DU Screening Response Rate	Total Selected	Total Respondents	Weighted Interview Response Rate	Weighted Overall Response Rate
Overall	197,962	165,328	83.52	132,210	79.69	94,499	68,073	69.25	55.19
Alabama	2,797	2,185	76.27	1,831	83.26	1,328	953	67.99	56.61
Alaska	3,289	2,381	70.54	1,892	79.18	1,373	981	71.59	56.68
Arizona	3,022	2,314	75.63	1,949	84.15	1,363	996	70.73	59.52
Arkansas	2,875	2,344	81.49	2,005	85.49	1,343	981	68.96	58.95
California	11,282	10,153	89.74	7,564	73.80	6,445	4,671	68.69	50.69
Colorado	2,637	2,240	84.50	1,795	80.03	1,328	994	72.42	57.96
Connecticut	2,872	2,518	87.67	1,936	76.95	1,411	964	66.21	50.94
Delaware	2,701	2,339	86.46	1,756	75.03	1,323	945	71.21	53.43
District of Columbia	5,177	4,341	84.31	3,118	71.43	1,231	924	74.47	53.19
Florida	10,530	8,387	76.81	6,793	80.63	4,665	3,386	70.07	56.50
Georgia	4,015	3,307	82.30	2,603	78.78	1,992	1,498	71.79	56.56
Hawaii	3,139	2,630	83.04	1,959	74.23	1,389	1,020	70.76	52.53
Idaho	2,020	1,813	89.63	1,530	84.44	1,277	949	72.78	61.46
Illinois	7,103	6,286	87.98	4,639	73.92	3,592	2,365	63.14	46.67
Indiana	2,729	2,292	83.95	1,819	79.34	1,376	973	68.00	53.95
Iowa	3,068	2,668	87.02	2,265	84.66	1,357	962	68.53	58.02
Kansas	2,640	2,283	86.54	1,962	85.92	1,351	986	71.42	61.37
Kentucky	2,469	2,000	80.99	1,695	84.66	1,271	938	72.06	61.01
Louisiana	2,618	2,170	82.65	1,804	83.66	1,282	957	73.03	61.10
Maine	4,277	3,140	69.05	2,643	84.00	1,400	994	68.79	57.78
Maryland	2,308	2,018	87.02	1,513	75.20	1,290	946	69.83	52.52
Massachusetts	3,366	2,960	86.00	2,131	72.27	1,591	948	57.99	41.91
Michigan	7,166	5,787	80.33	4,853	83.66	3,383	2,441	69.43	58.08
Minnesota	2,490	2,149	86.12	1,766	82.05	1,286	951	73.16	60.02
Mississippi	2,554	2,060	80.51	1,741	84.80	1,257	921	70.17	59.51
Missouri	2,582	2,094	81.27	1,846	88.22	1,342	986	70.25	61.98
Montana	3,195	2,528	78.91	2,159	85.62	1,329	977	69.44	59.45
Nebraska	2,510	2,156	85.51	1,794	82.82	1,301	945	71.21	58.97

(continued)

Table 5.4 Weighted Screening and Interview Response Rates by State (continued)

State	Total Selected DUs	Total Eligible DUs	Weighted DU Eligibility Rate	Total Completed Screeners	Weighted DU Screening Response Rate	Total Selected	Total Respondents	Weighted Interview Response Rate	Weighted Overall Response Rate
Nevada	2,676	2,287	84.89	1,746	76.61	1,317	997	69.97	53.60
New Hampshire	3,324	2,763	82.92	2,191	79.00	1,435	995	68.23	53.90
New Jersey	4,076	3,647	89.72	2,807	75.90	2,247	1,517	65.39	49.63
New Mexico	2,568	1,853	70.05	1,644	88.94	1,260	959	73.85	65.68
New York	12,117	10,496	86.58	6,863	64.83	4,963	3,310	63.60	41.23
North Carolina	4,251	3,606	83.35	2,990	82.87	2,125	1,576	69.99	58.00
North Dakota	3,425	2,758	80.63	2,484	89.86	1,342	988	72.44	65.09
Ohio	7,032	5,899	83.71	4,773	80.86	3,458	2,428	68.48	55.38
Oklahoma	2,857	2,285	79.91	1,918	84.37	1,359	971	67.59	57.02
Oregon	2,526	2,195	86.87	1,803	82.11	1,333	962	71.04	58.33
Pennsylvania	7,429	6,257	83.87	5,054	80.80	3,232	2,374	71.72	57.95
Rhode Island	2,901	2,461	84.76	1,915	77.81	1,354	964	69.45	54.04
South Carolina	2,944	2,436	82.77	2,040	83.70	1,304	987	72.52	60.70
South Dakota	2,354	1,968	83.80	1,799	91.69	1,199	904	74.77	68.56
Tennessee	2,670	2,172	81.16	1,846	84.96	1,352	1,004	69.71	59.22
Texas	6,227	5,184	82.00	4,538	87.56	4,358	3,308	73.28	64.16
Utah	1,506	1,316	87.49	1,176	89.31	1,204	968	77.43	69.16
Vermont	3,795	3,050	80.26	2,525	82.82	1,355	960	68.96	57.11
Virginia	3,934	3,410	86.61	2,754	80.78	2,113	1,526	69.71	56.32
Washington	2,692	2,423	90.14	1,867	76.82	1,306	944	69.98	53.76
West Virginia	3,250	2,617	80.65	2,119	80.92	1,327	947	66.77	54.03
Wisconsin	3,170	2,513	73.54	2,108	84.08	1,365	961	68.35	57.47
Wyoming	2,807	2,189	76.87	1,889	86.02	1,315	971	72.26	62.16

DU = dwelling unit.

6. Sampling Error

6.1 Computation of Relative Standard Errors and Design Effects

Several objectives were set for calculating relative standard errors (RSEs) and design effects (DEFFs) for the 2015 National Survey on Drug Use and Health (NSDUH). One objective was to provide a mechanism for comparing the expected precision of the 2015 design with the precision actually obtained. A second objective was to have a record of the magnitudes of the DEFFs for a future redesign of the survey.

The RSE of a domain *d* prevalence estimate $\hat{p}_d$ is the standard error (SE) of the estimate divided by the estimate, that is,

$$RSE(\hat{p}_d) = SE(\hat{p}_d) / \hat{p}_d \cdot \tag{1}$$

The DEFF for a prevalence estimate is its variance divided by the variance that would be observed if simple random sampling (SRS) had been used:

$$DEFF(d) = \frac{\mathrm{VAR}(\hat{p}_d)}{\mathrm{VAR}_{\mathrm{SRS}}(\hat{p}_d)}. \tag{2}$$

Hence, the SE of the estimated prevalence can be approximated as follows:

$$SE(\hat{p}_d) \cong [DEFF(d)\hat{p}_d(1-\hat{p}_d)/n_d]^{1/2}, \tag{3}$$

where $DEFF(d)$ and n_d are the median (or mean, as the case may be) DEFF and sample size of domain d, respectively.

As noted previously, the DEFF is the ratio of the design-based variance estimate divided by the variance estimate that would have been obtained from an SRS of the same size. Therefore, the DEFF summarizes the effects of stratification, clustering, and unequal weighting on the variance of a complex sample design. Because clustering and unequal weighting are expected to increase the variance and generally dominate the stratification effect, the DEFF is expected to be greater than 1 in most instances. However, DEFFs were sometimes less than 1 for prevalence rates near 0.

Note that the DEFF is based on the with-replacement (wr) variance estimate as obtained from SUDAAN, which properly accounts for clustering, stratification, and unequal weighting (RTI International, 2013). Prior to the 2000 survey, a more complex method of variance estimation was used; however, it was decided that only the standard SUDAAN wr SE, based on the primary sampling unit (PSU), would be used for the sake of simpler interpretation and for easier computation of the SE of functions of estimates, such as differences and ratios. A description of the previous method of variance estimation can be found in the 1999 National

Household Survey on Drug Abuse (NHSDA) sampling error report (Wheeless, Gordek, & Singh, 2001).

Also note that, prior to 2004, the SEs were applied directly from SUDAAN to only a subset of tables. Since then, the process changed so that the decision about which method of calculation would be used for the SEs of estimated totals was made at the estimate level (e.g., the cell level) rather than at the marginal table level. In this way, the estimated totals would have consistent values for their variances throughout all reported tables. A specific set of domains used as covariates in the poststratification step of the NSDUH weighting process were designated as the "controlled" domains. The SE reported for estimates from these domains would be based on the original method. Estimates from all other domains would include the SE directly from the SUDAAN calculation. A more detailed discussion of the 2004 change in SE reporting can be found in Section B.2.1 of Section B in the 2015 NSDUH's methodological summary and definitions report (Center for Behavioral Health Statistics and Quality [CBHSQ], 2016c).

DEFFs associated with prevalence estimates below 0.00005 or greater than or equal to 0.99995 (an ad hoc rule representing 0 or 1 in practice) or prevalence estimates exhibiting low precision were not used for determining the medians. To identify estimates with low precision, the suppression rule used in earlier years was applied. Specifically, DEFFs or the corresponding prevalence estimates were not included if the corresponding RSE of $-\ln(\hat{p})$ satisfies

$$RSE[-\ln(\hat{p})] > 0.175 \text{ when } \hat{p} \le 0.5$$

or

$$RSE[-\ln(1-\hat{p})] > 0.175 \text{ when } \hat{p} > 0.5 .$$

Another way to identify estimates with potentially low precision is to find estimates where the nominal sample size is under 100 or the effective sample size is under 68. The effective sample size is defined as follows:

$$Effective\ n = \frac{n}{deff} = \frac{\hat{p}(1-\hat{p})}{[SE(\hat{p})]^2}.$$

This equation is part of the standard suppression rule that is used in the reporting of NSDUH estimates. See the 2015 NSDUH statistical inference report for more information (CBHSQ, in press).

It may be noted that, for a given sample size, the RSE increases as $\hat{p}$ decreases, and for a given $\hat{p}$, it increases as the sample size decreases. The above discussion pertains to $\hat{p} < 0.5$ Although the RSE of $\hat{p}$ is not symmetric about $\hat{p} = 0.5$, it makes logical sense for precision requirements to be identical for $\hat{p}$ and $1-\hat{p}$. Therefore, it is convenient to use the convention that the suppression rule for $\hat{p} < 0.5$ also applies for $\hat{p} > 0.5$ by replacing $\hat{p}$ with $1-\hat{p}$.

6.1.1 Derivation of the $RSE[-\ln(\hat{p})]$ Approximation

Define the first-order Taylor series of a function, $f\left(\hat{\theta}\right)$, about a point, θ, as

$$f\left(\hat{\theta}\right) \cong f\left(\theta\right) + \left[df\left(\hat{\theta}\right)/d\hat{\theta}\right]_{\hat{\theta}=\theta}\left(\hat{\theta}-\theta\right),$$

then $\left[f\left(\hat{\theta}\right)-f\left(\theta\right)\right] \cong \left[df\left(\hat{\theta}\right)\Big/d\hat{\theta}\right]_{\hat{\theta}=\theta}\left(\hat{\theta}-\theta\right)$. If $E\left(\hat{\theta}\right)=\theta$, then

$$Var\left[f\left(\hat{\theta}\right)\right] = E\left|f\left(\hat{\theta}\right)-f\left(\theta\right)\right|^2 \cong \left|df\left(\hat{\theta}\right)\Big/d\hat{\theta}\right|^2_{\hat{\theta}=\theta} Var\left(\hat{\theta}\right), \text{ where } Var\left(\hat{\theta}\right) = E\left(\hat{\theta}-\theta\right)^2.$$

Let

$$\hat{\theta}=\hat{p} \quad f(\hat{\theta}) = -\ln(\hat{p}) \quad d\ln(\hat{p})/d\hat{p} = -1\Big/\hat{p},$$

then the approximation of the variance would be

$$Var[-\ln(\hat{p})] \cong Var(\hat{p}) \div (-\hat{p})^2 = [RSE(\hat{p})]^2,$$

and the approximation of the relative variance could be shown as

$$Relvar[-\ln(\hat{p})] \cong [RSE(\hat{p})]^2 \div [-\ln(\hat{p})]^2.$$

Taking the square root of both sides of the equation leads to the approximation of $RSE[-\ln(\hat{p})]$ as

$$RSE[-\ln(\hat{p})] \cong RSE(\hat{p}) \div [-\ln(\hat{p})]$$

The derivation of $RSE[-\ln(1-\hat{p})]$ follows a similar set of steps.

6.2 Comparison of Observed Precision with Expected Precision

In this chapter, benchmarks from the 2015 NSDUH design process are compared with the estimated achieved precision of important outcome measures. These benchmarks are the predicted precision that the statisticians anticipated during the design of the survey.

Predicted precision requirements for the 2015 designs were specified in terms of targeted RSEs and minimum sample sizes. To obtain the targeted RSEs, RSEs were computed for 25 measures of interest for specific domains of interest. These 25 key NSDUH outcomes that the sample design optimization for the 2015 NSDUH was based on included recency-of-use estimates for both illicit and licit drugs, dependence on alcohol and illicit drug use, treatment for substance abuse, and mental health issues. Specifically, the following outcomes were used for 2015 (variable names on the NSDUH data files are in parentheses):

- alcohol use in the past month (ALCMON),

- binge alcohol use in the past month (BNGDRKMON),
- marijuana use in the past month (MRJMON),
- cigarette use in the past month (CIGMON),
- misuse of a pain reliever in the past month (PNRNMMON),
- alcohol use disorder in the past year (ABODALC),
- illicit drug use disorder in the past year (UDPYILL),
- alcohol use disorder or illicit drug use disorder in the past year (UDPYILAL),
- specialty substance use treatment in past year (TXYRSPILAL),
- serious mental illness (SMI) in past year (SMIYR), and
- major depressive episode (MDE) in the past year (AMDEYR).

Table 6.1 shows a comparison of the projected and observed RSEs for the 25 outcomes from the 2015 sample design report's specified domain breakdowns (CBHSQ, 2016a).

6.2.1 Sample and Precision Requirements

Initial sample requirements for the 2015 NSDUH were defined in terms of the following:

- minimum sample sizes of 4,560 completed interviews in California; 3,300 completed interviews each in Florida, New York, and Texas; 2,400 completed interviews each in Illinois, Michigan, Ohio, and Pennsylvania; 1,500 completed interviews each in Georgia, New Jersey, North Carolina, and Virginia; 967 completed interviews in Hawaii; and 960 completed interviews in each of the remaining 37 States and the District of Columbia; and
- allocation to age groups as follows: 25 percent for youths aged 12 to 17, 25 percent for young adults aged 18 to 25, 15 percent for adults aged 26 to 34, 20 percent for adults aged 35 to 49, and 15 percent for adults aged 50 or older.

The 1999 sample was the first to reflect the objective of the Substance Abuse and Mental Health Services Administration (SAMHSA) to develop more reliable national estimates and representative state-level estimates using small area estimation (SAE) as well as direct estimation procedures. To achieve this objective in 2015, the targeted sample size by state was set to be at least 960 completed interviews. In 13 states, the target was set at greater than 960 completed interviews. The larger overall sample made it possible to get adequate precision for Hispanic and non-Hispanic black or African-American populations without any targeted oversampling of high concentration areas of these populations or any oversampling through screening for these populations. Unlike previous NSDUHs, no specific precision requirements were set for the 2015 NSDUH. Instead, it was designed to achieve acceptable precision for various subpopulations of interest, which accounted for the allocation of persons per state and the requirement to support direct estimation in some large sample states and SAE in the remaining states. Using the state and age group distribution, estimates and RSEs were modeled for 25 key outcomes measures and domains of interest.

Table 6.1 Comparisons of Projected and Observed Relative Standard Errors and Sample Sizes for Key Outcome Measures, by Demographic Domain

Data File Variable Name	Measure	Domain	2015 Prevalence	Projected RSE (2014-2017)	2015 RSE	Relative Change in RSE[1]	Expected Sample Size (2014-2017)	2015 Sample Size	Relative Change in Sample Size[2]
ALCMON	Past Month Alcohol Use	12+	0.5170	0.0068	0.0062	-0.0943	67,507	68,073	0.0084
ALCMON	Past Month Alcohol Use	12-20	0.2030	0.0225	0.0208	-0.0752	23,429	23,180	-0.0106
ALCMON	Past Month Alcohol Use	50+	0.5000	0.0126	0.0120	-0.0491	10,126	10,315	0.0187
ALCMON	Past Month Alcohol Use	API, 12+	0.3940	0.0435	0.0367	-0.1560	3,425	3,237	-0.0549
ALCMON	Past Month Alcohol Use	AIAN, 12+	0.3790	0.0676	0.0813	0.2021	769	967	0.2575
ALCMON	Past Month Alcohol Use	Pregnant, 12-44	0.0930	0.1552	0.1342	-0.1354	786	908	0.1552
BNGDRKMON[3]	Past Month Binge Alcohol Use	18-25	0.3900	0.0132	0.0132	-0.0030	16,877	17,097	0.0130
BNGDRKMON[3]	Past Month Binge Alcohol Use	12+	0.2490	0.0115	0.0108	-0.0649	67,507	68,073	0.0084
MRJMON	Past Month Marijuana Use	12+	0.0830	0.0207	0.0186	-0.1014	67,507	68,073	0.0084
MRJMON	Past Month Marijuana Use	12-17	0.0700	0.0374	0.0345	-0.0768	16,877	16,911	0.0020
MRJMON	Past Month Marijuana Use	18-25	0.1980	0.0225	0.0202	-0.1036	16,877	17,097	0.0130
MRJMON	Past Month Marijuana Use	50+	0.0400	0.0724	0.0611	-0.1558	10,126	10,315	0.0187
MRJMON	Past Month Marijuana Use	API, 12+	0.0330	0.1121	0.1347	0.2018	3,425	3,237	-0.0549
MRJMON	Past Month Marijuana Use	AIAN, 12+	0.1120	0.1588	0.1432	-0.0983	769	967	0.2575
MRJMON	Past Month Marijuana Use	Pregnant, 12-44	0.0340	0.1328	0.1902	0.4326	786	908	0.1552
CIGMON	Past Month Cigarette Use	12-17	0.0420	0.0404	0.0471	0.1651	16,877	16,911	0.0020
CIGMON	Past Month Cigarette Use	12+	0.1940	0.0131	0.0130	-0.0053	67,507	68,073	0.0084
PNRNMMON[3]	Past Month Pain Reliever Misuse	18-25	0.0240	0.0520	0.0552	0.0606	16,877	17,097	0.0130
PNRNMMON[3]	Past Month Pain Reliever Misuse	12+	0.0140	0.0394	0.0417	0.0589	67,507	68,073	0.0084
ABODALC	Past Year Alcohol Use Disorder	12+	0.0590	0.0210	0.0224	0.0678	67,507	68,073	0.0084
UDPYILL[3]	Past Year Illicit Drug Use Disorder	12+	0.0290	0.0287	0.0285	-0.0073	67,507	68,073	0.0084
UDPYILAL[3]	Past Year Substance Use Disorder	50+	0.0420	0.0656	0.0545	-0.1688	10,126	10,315	0.0187
TXYRSPILAL[3]	Past Year Specialty Substance Use Treatment	12+	0.0090	0.0592	0.0577	-0.0249	67,507	68,073	0.0084
SMIYR	Past Year SMI	18+	0.0400	0.0306	0.0295	-0.0358	50,630	51,162	0.0105
AMDEYR	Past Year MDE	18+	0.0670	0.0239	0.0229	-0.0418	50,630	50,606	-0.0005

AIAN = American Indian or Alaska Native (NEWRACE2 = 3); API = Asian or Other Pacific Islander (NEWRACE2 = 4 or 5); MDE = major depressive episode; Pregnant 12-44 = (PREG2=1); RSE = relative standard error; SMI = serious mental illness.

NOTE: Projected RSEs were determined using 2014 through 2017 state and age sample allocations in a variance component model.

[1] *Relative Change in RSE* = {[*RSE*(*observed*) – *RSE*(*projected*)]/*RSE*(*projected*)}.

[2] *Relative Change in Sample Size* = {[*2015 Sample Size – Expected Sample Size*]/(*Expected Sample Size*)}.

[3] *These variables were redefined for 2015 and break trend from the variables as defined previously. Subsequently, they have been renamed starting with the 2015 NSDUH.*.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015.

6.2.2 Observed versus Expected Precision

In Table 6.1, the expected RSEs and sample sizes are presented for the 25 key outcomes and measures and the RSEs and sample sizes that were observed for the 2015 NSDUH. All but one of the observed RSEs differed by no more than roughly 20 percent. Although this might be considered quite a large difference in terms of percentages, the point changes from the expected RSEs were generally quite small. Also, the percentage changes followed no particular direction. Out of 25 observed precisions, 18 were less than the expected precisions that were described in the 2015 sample design plan (CBHSQ, 2014).

6.3 Comparison of Median and Mean Design Effects

The mean DEFF is more sensitive to outliers and is generally larger than the median DEFF. Table 6.2 compares the median and mean of 53 DEFFs for three age groups and over all ages in the 2015 NSDUH design. Comparisons are also provided for the four race/ethnicity categories, although they were not used as stratification variables when selecting individuals within households. Table 6.3 provides the same median and mean DEFFs for the 2013 through 2015 NSDUHs. In a continuation of what was seen for the 2014 NSDUH, the current design used in 2015 is more efficient overall and within all race/ethnicity groups when compared with the design used prior to 2014.

Table 6.2 Comparison of Median and Mean Design Effects of 53 Outcomes: 2015

Outcome	Median Design Effect	Mean Design Effect	Difference (Mean – Median)	Percentage Difference[1]
Total	2.24	2.29	0.05	2.11
Age (Years)				
12 to 17	1.62	1.62	0.00	0.30
18 to 25	1.75	1.77	0.02	1.02
26+	1.74	1.79	0.06	3.18
Race/Ethnicity				
White, Not Hispanic or Latino	2.01	2.04	0.03	1.53
Black or African American, Not Hispanic or Latino	2.34	2.37	0.03	1.35
Hispanic or Latino	2.40	2.36	-0.04	-1.84
Other or Multiple, Not Hispanic or Latino	2.66	2.50	-0.16	-5.91

[1] Computed as 100 * (*Mean* – *Median*) / *Median*.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015.

Table 6.3 Median and Mean Design Effects of 53 Outcomes: 2013 through 2015

Outcome	Median Design Effect			Mean Design Effect		
	2013	2014	2015	2013	2014	2015
Total	3.11	2.26	2.24	3.16	2.28	2.29
Age (Years)						
12 to 17	1.70	1.70	1.62	1.68	1.70	1.62
18 to 25	2.07	1.82	1.75	2.05	1.82	1.77
26+	1.85	1.76	1.74	1.83	1.76	1.79
Race/Ethnicity						
White, Not Hispanic or Latino	2.93	1.94	2.01	2.95	2.07	2.04
Black or African American, Not Hispanic or Latino	3.11	2.32	2.34	3.25	2.25	2.37
Hispanic or Latino	3.63	2.37	2.40	3.56	2.39	2.36
Other or Multiple, Not Hispanic or Latino	4.19	2.46	2.66	3.81	2.67	2.50

Note: A total of 26 of the 53 outcomes for 2015 were similar but not directly comparable with the variables from the 2013 and 2014 NSDUHs. Results based on the 27 comparable outcomes were very similar to results based on the full 53 outcomes.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2013, 2014, and 2015.

The median and mean DEFF estimates were based on estimates from the following four types of substance use and mental health categories: (a) *eight illicit drug use categories:* any illicit drug use, marijuana/hashish, cocaine, crack, inhalants, hallucinogens, misuse of any psychotherapeutics, and misuse of pain relievers; (b) *seven licit drug use categories:* tobacco, cigarettes, smokeless tobacco, cigars, alcohol, heavy drinking, and binge drinking; (c) *six treatment or abuse categories:* abuse of drugs or alcohol, dependence on drugs or alcohol, treatment received for illicit drug use, treatment received for alcohol use, treatment received for either alcohol use or illicit drug use, treatment received for both alcohol use and illicit drug use; and (d) *six mental health categories:* any mental illness (AMI), SMI, treatment or counseling for mental illness, MDE, suicidal thoughts, serious psychological distress (SPD). Estimates used from the illicit and licit categories included one from each of three recency-of-use classes: ever used, used in past year, and used in past month. An exception was made for estimates of heavy drinking and binge drinking, which are past month variables. The treatment or abuse and mental health variables are for past year.

The median and the mean DEFFs were calculated from the above estimates for the total population, by age and by race/ethnicity. As seen from Table 6.2, the mean DEFF turned out to be larger than the median DEFF in six of the eight domains. The differences between the mean and median DEFFs fell below 3.2 percent for seven of the eight comparison groups. However, within the race/ethnicity comparison categories, the percentage differences varied by up to 5.91 percent for the non-Hispanic or Latino other races.

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7. Issues Encountered

In addition to the 2015 National Survey on Drug Use and Health (NSDUH) sample experiences documented in this report, three issues with the sample implementation were encountered. These problems are documented in this chapter.

7.1 Dwelling Unit Release Adjustment Error

As described in Chapter 4, a reserve sample of dwelling units (DUs) was selected within each selected segment, over and above the required quarterly DU sample. Then the full sample was partitioned into probability subsamples for release to the field. Finally, a weight adjustment was applied to all DUs within a segment to account for the partial release of sample. When DUs were listed as the wrong type (i.e., group quarter units were listed as housing units or vice versa), the original sample units were coded as listing errors (ineligible) and replaced with an equal number of sample units of the correct type. Although all of the replacement units were released to the field, only a portion of their original DU counterparts may have been released. As a result, the DU release adjustment may have been incorrect for these "equal exchange" units.

In 2015, there were a total of 51 equal exchange DUs out of 165,328 eligible DUs. To correct the DU release adjustment for these DUs, the weight adjustment was set to 1 for all equal exchange DUs. This correction will be applied to all equal exchange DUs going forward.

7.2 Nebraska Segment Group Quarter Sampling Error

As a result of the NSDUH field verification procedures, it was discovered that a field interviewer (FI) incorrectly screened apartments in three group quarters in a quarter 1 2015 Nebraska segment. During the field enumeration (listing) stage, the lister obtained a list of all of the apartments and all of the beds/rooms within each apartment. Each apartment was numbered (e.g., 101, 102), and each apartment had four rooms, labeled A, B, C, and D, with one bed per room. The resulting listing was at the bed level, so each apartment had four listing units, one for each bed. Although it caused confusion for the FI, listing by beds was not an error. The listing could have been done by bed or by apartment.

Because the frame was at the bed level, selected units were at the bed level, such as apartment 101, bed B. The FI, on the other hand, assumed that the entire apartment was selected. If anybody in the apartment cooperated, the FI screened the entire apartment, and all four persons residing in the apartment had a chance of selection.

For 2015, the error was corrected using weight adjustments. To reduce the likelihood of this error reoccurring, field listers will be encouraged to list by beds only if it is the only available option (e.g., in homeless shelters). Their supervisors will also be reminded to carefully review any group quarters in advance of the data collection quarter, determine if they are listed by units or beds, then review that information with the FI before data collection begins.

7.3 California Segment Reverse Listing Error

A quarter 1 2016 respondent in one California segment reported that her address was selected and one of her sons was interviewed 2 years ago (i.e., in 2014). The segment was fielded for the first time in quarter 1 2015, so the address could not have been selected in 2014. However, in quarter 1 2015 the FI reported that the DUs on the street section containing this DU were listed in reverse order. The FI was instructed to correct the addresses for sample dwelling units (SDUs) to reflect the correct path of travel. Addresses for DUs that were not selected in 2015 were then corrected in-house prior to selecting the quarter 1 2016 sample. Although the FI made the address edits as instructed, it is possible that he or she visited the same address in 2015 at a different sampling unit. In general, when an FI screens a DU in error the first year and that address is selected the second year, an attempt is made to complete the interview the second year. If the respondent is willing to participate, the data are kept; otherwise, the data are coded as a refusal. These guidelines were followed when handling this DU in quarter 1 2016. A new procedure to locate an SDU based on its address and not by its exact location on the map should minimize the chance of this type of problem occurring again.

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