SAMHSA
Substance Abuse and Mental Health
Services Administration

2020 National Survey on Drug Use and Health (NSDUH) Methodological Resource Book

Section 14: Sample Experience Report

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Section 14: Sample Experience Report

Electronic Access

This publication may be downloaded at https://www.samhsa.gov/data/.

Recommended Citation

Center for Behavioral Health Statistics and Quality. (2021). *2020 National Survey on Drug Use and Health (NSDUH) methodological resource book: Section 14: Sample experience report.* Rockville, MD: Substance Abuse and Mental Health Services Administration.

Originating Office

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U.S. Department of Health and Human Services
Substance Abuse and Mental Health Services Administration
Center for Behavioral Health Statistics and Quality
Populations Survey Branch

July 2021

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1. Introduction

1.1 Purpose

A coordinated sample design was developed for the 2014 through 2017 National Surveys on Drug Use and Health (NSDUHs) and was extended to the 2018 through 2022 NSDUHs. NSDUH is conducted under contract with RTI International.[1] The coordinated sample design is state based, with an independent, multistage area probability sample within each state and the District of Columbia. The 2020 sample design, which is part of the coordinated sample design, is thoroughly documented in the 2020 NSDUH sample design report (Center for Behavioral Health Statistics and Quality [CBHSQ], 2021). The sample design report also documents the design of a Clinical Validation Study (CVS) that was conducted during the first 3 months of the 2020 NSDUH.[2] The goal of this report is to further document the 2020 NSDUH and CVS sample experiences, including a comparison of actual sample yields to state, quarter, and CVS targets; a comparison of achieved and expected design effects (DEFFs) and relative standard errors; and documentation of any issues encountered during sample implementation.

This report is organized as follows. Chapter 2 summarizes the 2020 sample design, including the design of the CVS. 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 and mean DEFFs. Finally, Chapter 7 documents the CVS sample experience.

1.2 Impact of COVID-19 on Sample Design and Data Collection

Coronavirus disease 2019 (COVID-19) majorly affected the ability to collect data through conventional in-person data collection methods for the 2020 NSDUH. First, given the public health emergency and considering the safety of the field staff and the public, the Substance Abuse and Mental Health Services Administration (SAMHSA) decided to suspend in-person data collection on March 16, 2020. To assess the feasibility of resuming in-person data collection, a small-scale data collection was conducted from July 16 to 22, 2020, in select counties in two states where it was deemed safe based on state- and county-level health metrics. National in-person data collection did not resume until the fourth calendar quarter of the 2020 NSDUH. Because of the limited number of counties in which data could be collected in person in the fourth quarter, the respondent sample size was at risk of being reduced to an unacceptable level.

To minimize the impact of COVID-19 on the 2020 NSDUH respondent sample size, SAMHSA approved the addition of web data collection. As a result, quarter 4 became a period of multimode data collection. During this time, all sample dwelling units (SDUs) originally selected from the quarter 2, 3, and 4 area segments for in-person data collection were released for web or in-person data collection. SDUs in the quarter 2, 3, and 4 area segments deemed safe for in-person data collection were released to the field. SDUs in the remaining quarter 2, 3, and 4 area

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[1] RTI International is a trade name of Research Triangle Institute. RTI and the RTI logo are U.S. registered trademarks of Research Triangle Institute.

[2] The CVS was originally planned for the first 6 months of data collection.

segments (except in segments that were worked by field interviewers during the 1-week, small-scale data collection) were mailed an invitation to participate via web. In addition, more SDUs were selected in some quarter 2 and 3 segments and released to web data collection in quarter 4 to partially compensate for the negative impact of COVID-19 on data collection and response rates. As a result of adding web data collection and releasing a large sample of SDUs, 20,614 total interviews were completed in quarter 4, with 19,202 completed via web and 1,412 completed in person. Including 15,628 interviews completed in quarter 1 and 42 completed during the July small-scale data collection, the achieved sample for the 2020 NSDUH was 36,284 interviews.

COVID-19 also affected the CVS sample. Because data collection was suspended on March 16, 2020, and did not resume until quarter 4, the CVS was limited to the first 3 months of data collection. As a result, the achieved sample was approximately half of what was originally planned for the CVS for quarters 1 and 2 combined (see Chapter 7).

Additional detail on the impact of COVID-19 on each stage of the 2020 NSDUH sample design can be found in the 2020 NSDUH sample design report (CBHSQ, 2021). The impact of COVID-19 on 2020 NSDUH sample experiences is described in further detail in the chapters that follow.

2. Overview of the 2020 Sample Design

2.1 Target Population

The respondent universe for the 2020 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,[3] the 2020 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. People excluded from the 2020 universe included those with no fixed household address (e.g., homeless or transient people not in shelters) and residents of institutional group quarters, such as jails and hospitals.

2.2 Design Overview

The 2020 NSDUH is part of the 2014 through 2022 NSDUH coordinated sample design. Similar to NSDUHs dating back to 1999, the 2014 through 2022 surveys are conducted using computer-assisted interviewing (CAI) methods and provide sufficient sample sizes to support state and national estimates. 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 (for any state) by pooling multiple years of data.

A new pair sampling strategy was implemented in 2002 that increased the number of pairs selected in dwelling units (DUs) with older people on the roster (Chromy & Penne, 2002). With the increase in the number of pairs came a moderate decrease in the response rate for older people. In 2014, changes to the 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 through 2020 NSDUHs.

For the 2020 NSDUH, the original 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. This original target sample size would allow the Substance Abuse and Mental Health Services Administration (SAMHSA) to report precise estimates for demographic subgroups at the national level without needing to oversample specially targeted demographics. Because Clinical Validation Study (CVS) methods had the potential to affect survey estimates, the quarter 1 and 2 sample targets were supplemented with a total of 1,500 interviews proportionally allocated to states and age groups (see Section 2.2.2).[4] Then, the original 2020 sample sizes by state and age group would be maintained if the decision

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[3] Prior to 2002, the survey was called the National Household Survey on Drug Abuse (NHSDA).

[4] Although the CVS was conducted in only quarter 1 of the 2020 NSDUH, the quarter 1 and 2 interview targets were each increased by 750 interviews because the DU samples for these two quarters were selected before the decision was made to suspend data collection.

was later made to remove the CVS sample. The total expanded target sample size, which includes the original sample and the supplemental sample, was 69,007 interviews.

The CVS was originally planned for the first 6 months of the 2020 NSDUH to assess a revised NSDUH module on substance use disorders (SUDs) designed to be consistent with the criteria in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (DSM-5) (American Psychiatric Association [APA], 2013). Because of coronavirus disease 2019 (COVID-19), the CVS data collection was limited to quarter 1. A probability subsample of 750 adult and youth respondents (the CVS sample) was expected to be selected by the CAI instrument from the expanded sample (i.e., the original and supplemental samples) in quarter 1. On the basis of their responses to questions about past year use of cigarettes, alcohol, and marijuana, respondents selected for the CVS were routed to the new DSM-5 SUD modules instead of the modules using the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (APA, 1994). At the end of the NSDUH interview, the interviewers invited CVS sample respondents to participate in a follow-up clinical interview by telephone. Of the 750 respondents expected to be selected for the CVS sample, 400 were expected to complete the clinical follow-up interview in quarter 1.[5] Exhibit 2.1 shows the planned relationship between the expanded sample, the CVS sample, and the CVS follow-up sample.

Exhibit 2.1 2020 NSDUH Expected Respondent Samples

Original Sample (*n* = 67,507) +
Supplemental Sample[1] (*n* = 1,500) =
Expanded Sample (*n* = 69,007)

CVS Sample[2] (*n* = 750)

CVS Follow-Up
Sample[2] (*n* = 400)
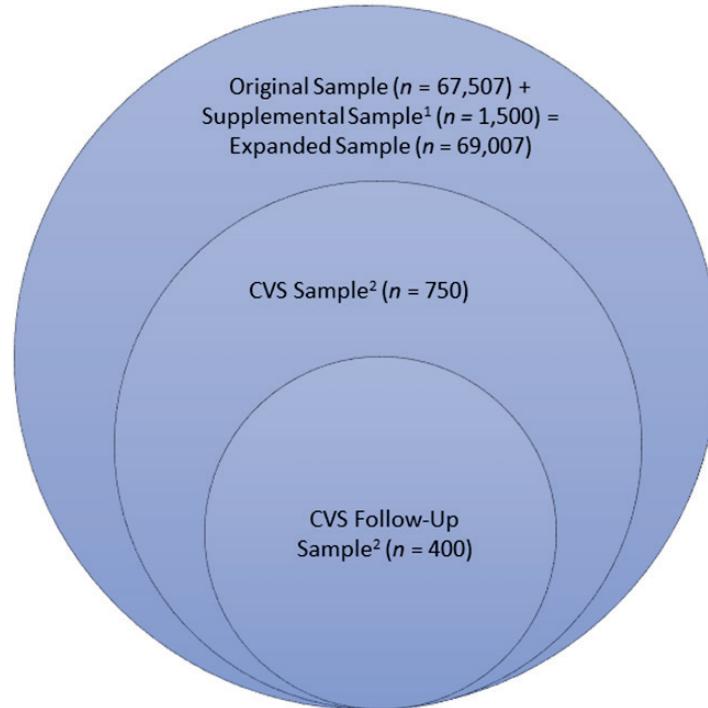
CVS = Clinical Validation Study.
[1] Included in the quarter 1 and 2 samples.
[2] Included in only quarter 1 of the 2020 NSDUH.

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[5] See the 2020 NSDUH sample design report (Center for Behavioral Health Statistics and Quality, 2021) for a discussion of the CVS sample size determination.

2.2.1 Multiyear Coordinated Design

A coordinated sample design was developed for the 2014 through 2017 NSDUHs. A large reserve sample of area clusters or segments was selected at the time the 2014 through 2017 NSDUH sample was selected. This reserve sample is being used to field the 2018 through 2022 NSDUHs. Thus, the 2018 through 2022 NSDUH designs simply continue the coordinated design.

Exhibit 2.2 summarizes the 2014 through 2022 NSDUH multistage design. The coordinated design facilitates 50 percent overlap in third-stage units (area segments) within each successive 2-year period from 2014 through 2022. This designed sample overlap may slightly increase the precision of estimates of year-to-year trends when there is a small positive correlation in successive survey years due to an overlapped segment being somewhat homogeneous. 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 2022 surveys.

Exhibit 2.2   Summary of the 2014 through 2022 NSDUH Design

States
↓
State Sampling Regions (SSRs)
↓
Stage 1: Census Tracts
↓
Stage 2: Census Block Groups
↓
Stage 3: Area Segments (Census Blocks)
↓
Stage 4: Dwelling Units
↓
Stage 5: Individuals
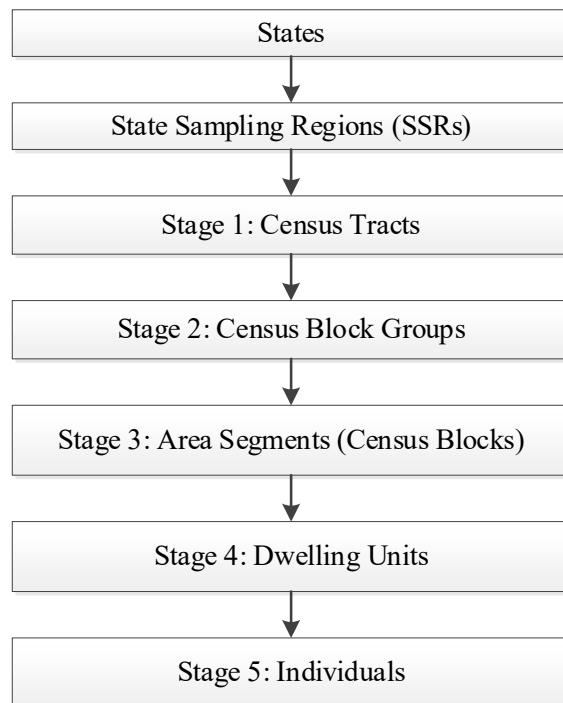
The 2020 design provides for estimates by state in all 50 states plus the District of Columbia. States may therefore be viewed as the first level of stratification and as a reporting variable. In the 2005 through 2013 NSDUH design, the sample was divided into 8 "large" states and 43 "small" states (including 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 through 2020, the survey's sample was designed to yield a total of 67,507 interviews distributed to states as follows:

- 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 estimates based on the SAE methodology while maintaining efficiency for national estimates (RTI International, 2012). Direct estimates and estimates of change are typically produced by pooling multiple years of data to increase precision. For example, 2008-2009 data are pooled, 2018-2019 data are pooled, then the two pooled estimates are compared for an estimate of long-term change (Center for Behavioral Health Statistics and Quality [CBHSQ], 2020).

Prior to selecting the sample for the 2014 through 2022 NSDUHs, state sampling regions (SSRs) were formed within each state. These SSRs will serve as sampling strata for the duration of the 2014 through 2022 NSDUHs. Based on a composite size measure,[6] 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 2022 NSDUHs was census tracts.[7] This stage was included to contain sample segments within a single census tract to the extent possible.[8] Segments that cross census tract boundaries make merging to external data sources difficult.

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[6] The composite size measure is defined as the population weighted by the state sampling rate in each age group.

[7] 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).

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

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 primary sampling unit (PSU; one or more census tracts) met the minimum size 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[9] in urban areas and 200 DUs in rural areas.[10] 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 PSUs, additional implicit stratification was achieved by sorting the first-stage sampling units by a CBSA/SES[11] (core-based statistical area/socioeconomic status) indicator[12] and by the percentage of the population that is non-Hispanic and White.[13] From this well-ordered sample frame, 48 PSUs per SSR were sequentially selected with probabilities proportionate to a composite size measure and with minimum replacement[14] (Chromy, 1979).

For the second stage of selection, adjacent census block groups were aggregated within selected PSUs 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 (SSUs) were formed, they were sorted in the order they were formed (i.e., geographically), and one SSU was selected per sampled PSU 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 in the 2014 through 2022 NSDUH samples

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[9] DU counts were obtained from the 2010 census data supplemented with revised population counts from Claritas, a market research firm (see https://www.claritas.com/ ⧉).

[10] 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.

[11] CBSAs include metropolitan and micropolitan statistical areas as defined by the Office of Management and Budget (2009). Metropolitan statistical areas contain at least one urbanized area with 50,000 or more people and may include adjacent territory with a high degree of social and economic integration with the core as measured by commuting. Micropolitan statistical areas have an urban core with at least 10,000 but fewer than 50,000 people, plus adjacent territory that is socioeconomically tied to the core by commuting. Both metropolitan and micropolitan statistical areas are defined in terms of whole counties (or equivalent entities).

[12] 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 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."

[13] Although the large sample size eliminates the need for the oversampling of specially targeted demographic subgroups as was required prior to the 1999 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 make sampling error lower by reducing the selection of neighboring and possibly similar segments than if the selection was done completely at random.

[14] Probability minimum replacement sampling is a type of probability proportional to size sampling that allows for a sampling unit with a relatively large measure of size to be selected more than once. More importantly, neighboring units on the sorted sampling frame are unlikely to be jointly selected for the sample. This reduces the potential for variance when neighboring units are similar with respect to the outcomes being measured.

is an additional stage of selection to facilitate possible transitioning to an address-based sampling design in the future.

The SSUs were generally larger than practical for building frames of housing units through field enumeration. Therefore, one smaller geographic region was selected within each sampled SSU. For this third stage of sampling, each selected SSU was partitioned into compact clusters[15] of DUs by aggregating adjacent census blocks.[16] 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 PSUs and SSUs, 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 SSU using Chromy's method of sequential random sampling (with probability proportionate to a composite size measure and with minimum replacement) (Chromy, 1979). The 48 selected segments within each SSR were randomly assigned to a survey year and quarter of data collection. Although only 20 segments per SSR were needed to support the 2014 through 2017 NSDUHs, an additional 28 segments were selected to serve as replacements when segment DUs are depleted, to support any supplemental studies embedded within NSDUH, and to extend the sample to the next decennial census, if desired. These 28 segments constitute the "reserve" sample and are being used to support the 2018 through 2022 NSDUHs.

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 2020, the first panel segments (panel G) were used for the 2019 and 2020 surveys, constituting the overlap sample. The second panel segments (panel H) were used for the 2020 survey and are being used again for the 2021 survey.

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[15] 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).

[16] 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).

2.2.2 2020 NSDUH Sample Design Changes

The 2020 NSDUH sample design differed from the multiyear coordinated design for two reasons:

- In the first two quarters of the 2020 NSDUH, the original sample of 67,507 interviews was supplemented with approximately 1,500 interviews to support the CVS (see Exhibit 2.1).[17]
- Because of the impact of COVID-19 on data collection and response rates, adjustments to the sample design were required.

Although removal of the CVS sample from the expanded 2020 NSDUH sample was not planned, a supplemental sample of 1,500 interviews was included to maintain the original sample sizes by state and age group if the CVS sample were removed (e.g., if CVS methods were found to significantly affect survey responses). This supplemental sample was allocated proportionally to states and age groups. Table 2.1 displays the expected sample sizes by state for the expanded sample of 69,007 interviews.

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[17] The supplemental sample was selected from the same segments as the original sample.

Table 2.1   2020 NSDUH Expected Sample Sizes, by State

State	Original Sample (n_m)	Supplemental Sample (n_s)	Expanded Sample (m_h)
Total United States	67,507	1,500	69,007
Alabama	960	22	982
Alaska	960	3	963
Arizona	960	32	992
Arkansas	960	14	974
California	4,560	182	4,742
Colorado	960	26	986
Connecticut	960	17	977
Delaware	960	4	964
District of Columbia	960	3	963
Florida	3,300	99	3,399
Georgia	1,500	47	1,547
Hawaii	967	6	973
Idaho	960	8	968
Illinois	2,400	59	2,459
Indiana	960	31	991
Iowa	960	14	974
Kansas	960	13	973
Kentucky	960	20	980
Louisiana	960	21	981
Maine	960	6	966
Maryland	960	28	988
Massachusetts	960	33	993
Michigan	2,400	47	2,447
Minnesota	960	26	986
Mississippi	960	14	974
Missouri	960	28	988
Montana	960	5	965
Nebraska	960	9	969
Nevada	960	14	974
New Hampshire	960	6	966
New Jersey	1,500	42	1,542
New Mexico	960	10	970
New York	3,300	93	3,393
North Carolina	1,500	47	1,547
North Dakota	960	3	963
Ohio	2,400	54	2,454
Oklahoma	960	18	978
Oregon	960	19	979
Pennsylvania	2,400	60	2,460
Rhode Island	960	5	965
South Carolina	960	23	983
South Dakota	960	4	964
Tennessee	960	31	991
Texas	3,300	126	3,426
Utah	960	13	973

(continued)

Table 2.1   2020 NSDUH Expected Sample Sizes, by State (continued)

State	Original Sample (n_m)	Supplemental Sample (n_s)	Expanded Sample (m_h)
Vermont	960	3	963
Virginia	1,500	39	1,539
Washington	960	34	994
West Virginia	960	9	969
Wisconsin	960	27	987
Wyoming	960	3	963

Although an expanded sample was planned for the 2020 NSDUH, COVID-19 made it difficult to collect data in person after the first calendar quarter. As a result, the respondent sample size was at risk of being reduced to an unacceptable level. SAMHSA approved the addition of web data collection in quarter 4 to partially compensate for the negative impact of COVID-19 on NSDUH data collection. During this multimode data collection period, all selected dwelling units (SDUs) originally selected for the quarter 2, 3, and 4 samples in areas deemed safe for in-person data collection were released to the field. Quarter 2, 3, and 4 SDUs in the remaining areas (except in segments that were worked by field interviewers [FIs] during the 1-week, small-scale data collection in July) were mailed an invitation to participate via web. In addition, all remaining DUs (i.e., those not previously selected) in some quarter 2 and 3 segments (those retiring from use after 2020) were selected and released to web data collection to increase the final respondent sample size. As a result of these adjustments, the achieved sample for the 2020 NSDUH was 36,284 interviews. This sample size is sufficient for producing national estimates for people aged 12 or older and adults aged 18 or older (Morton et al., 2020).

2.2.3 Sample Selection at the Fourth and Fifth Stages

After sample segments for the 2020 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 projections from 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,[18] 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

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[18] 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.

the "maximum of two" rule.[19] In addition to these factors, historical data from the 2018, 2019, and 2020 NSDUHs were used to compute predicted screening and interviewing response rate adjustments.[20] 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 120 per segment[21] or half of the actual listing unit count. Next, for cost efficiency (i.e., to make traveling to and from the segment worth the expense), a minimum of five listing units were selected if five unused listing units remained in the segment.

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 people in a given year, but this number should be small given the restriction on DUs that were sampled in the previous year.

After the initial quarter 2 and 3 samples were selected, the decision was made to select and release additional quarter 2 and 3 samples to partially compensate for the negative impact of COVID-19 on data collection and response rates. All remaining DUs (i.e., those not previously selected) in the quarter 2 and 3 segments retiring from use after 2020 were selected and released to web data collection during the multimode data collection period. The quarter 2 and 3 sample weights were adjusted to reflect the selection of the additional sample.

After DU selections were made, an FI visited the selected DU to obtain a roster of all people residing in the DU (in quarter 1, the small-scale data collection in July 2020, and areas eligible for in-person data collection during the multimode data collection period) or an eligible member of the selected DU provided roster information during the web screening interview (during the multimode data collection period only). Using this roster information, the electronic or web instrument automatically selected 0, 1, or 2 people for the survey using preset state and age group sampling rates.

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

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[19] Brewer's selection algorithm never allows for greater than two people per household to be chosen (Brewer, 1963, 1975; Cochran, 1977, pp. 261-263). Thus, sampling rates are adjusted to satisfy this constraint.

[20] Data from quarters 2 through 4 of the 2019 NSDUH and quarter 1 of the 2020 NSDUH were used to compute expected screening and interview response rates for the quarter 3 and 4 samples. For the quarter 4 sample, the state-level response rates were then adjusted so that the overall expected response rate would be 20 percent, the expected web response rate.

[21] To support the larger DU samples required, the maximum listing unit sample size limit was increased to 150 per segment for the quarter 3 sample and removed altogether for the quarter 4 sample. Half of the listed DUs still were reserved for the following year's sample (CBHSQ, 2021).

design. Similar to the 1999 through 2013 designs, one feature that was included in the 2014 through 2020 design is that any two survey-eligible people within a DU have some chance of being selected (i.e., all survey-eligible pairs of people 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 through 2022 NSDUHs (see the 2020 NSDUH sample design report; CBHSQ, 2021).

As in previous years, during the 2020 data collection period, if an FI 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 2020 NSDUH.[22] However, unlike the 2005 through 2013 NSDUHs, the half-open interval (HOI) procedure[23] 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 et al., 2012). Further, an analysis of cases added to the sample through the HOI procedure found that these 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, FIs were instructed to call their supervisors if they noticed large differences between the segment listing and what they encountered in the field. If large differences were noticed, then special "bust" procedures were implemented (see the 2020 NSDUH sample design report; CBHSQ, 2021).

2.2.4 CVS Sample Design

The CVS sample was originally planned for the first 6 months of the 2020 NSDUH. However, because quarter 2 data collection was suspended because of COVID-19, the CVS was limited to quarter 1 of the 2020 NSDUH. A probability subsample of 750 respondents was expected to be drawn from the quarter 1 expanded sample. People eligible for the CVS sample were aged 12 or older, chose to answer the NSDUH main study interview questions in English, and did not break off before beginning the SUD module, including those with no past year use of alcohol or any drug.[24] Within the NSDUH interview, eligible respondents were selected for the CVS sample based on their responses to questions on past year use of cigarettes, alcohol, and marijuana. Eight strata were constructed from all combinations of past year use of cigarettes, alcohol, and marijuana. Using the initials of these three variables, the stratification design is

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[22] Web screening respondents were not asked the missed DU question.
[23] In summary, the rules for the HOI technique state that, if a DU is selected and an FI 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 more than 10 new or missed DUs are encountered, a sample of the new or missing DUs is selected, and the sample weight is adjusted accordingly.
[24] The new SUD module and the clinical follow-up interview were conducted in English only. Therefore, respondents who chose to answer the NSDUH main study questions in Spanish were excluded from the CVS.

referred to as the cigarette, alcohol, and marijuana (CAM) design. A random sample was selected from each CAM stratum based on predetermined sampling rates. In addition, a state and age group adjustment increased efficiency by selecting a nationally representative sample of respondents aged 12 or older, with no oversampling of any specific populations (such as age group or state) other than the CAM designations.[25] For further details, see the 2020 NSDUH sample design report (CBHSQ, 2021).

The CVS sample was administered a new SUD module that used criteria in the DSM-5 (APA, 2013). NSDUH respondents selected for the CVS were routed to the new SUD module instead of to the previous SUD module that used criteria in the DSM-IV (APA, 1994). Otherwise, except for the SUD items, the NSDUH interview was virtually identical for respondents selected for the CVS and those not selected for the CVS.[26] NSDUH respondents selected for the CVS and diverted to the new SUD items were then invited by the interviewer at the end of the NSDUH interview to participate in a follow-up clinical interview by telephone, ideally to be scheduled within 2 weeks of the NSDUH interview.

After passing through the CVS sample selection algorithm, it was expected that approximately 400 of the 750 CVS sample respondents would complete the CVS clinical follow-up interview (i.e., the CVS follow-up sample).

2.3   Creation of Variance Strata and Variance PSUs

The nature of the stratified, clustered sample design requires that the design structure be taken into consideration when computing variances of survey estimates. Variance strata and variance PSUs[27] were created to capture the impact on variance of stratification and clustering in the sample design and to confound intruders from identifying respondents. For the 2014 through 2022 NSDUHs, each design stratum in an SSR is assigned to a different variance stratum every quarter in a pseudorandom fashion. The 2014 through 2022 definition provides a large number of degrees of freedom (*df*) for state-level variance estimates and maintains the number of degrees of freedom for national estimates (750). Each of the smallest sample states is in 48 design strata (12 SSRs × 4 quarters) in 48 different variance strata so that 48 degrees of freedom are available for variance estimates in these states. At the other extreme, the largest sample state, California, has 144 design strata (36 SSRs × 4 quarters) in 144 variance strata and therefore has 144 degrees of freedom for variance estimation. Two variance PSUs per year were defined within each variance stratum. Each variance PSU consists of four segments, one for each quarter of data collection. The first variance PSU consists of those segments that are "phasing out" or will not be used in the next survey year. The second variance PSU 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.

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[25] SAMHSA determined that the CVS did not need to provide state-level estimates and that it would be sufficient to provide estimates of those aged 12 or older rather than by various age groups.

[26] For CVS respondents, questions assessing DSM-IV symptoms that were not also included in the DSM-5 criteria (e.g., legal troubles) were included at the end of the DSM-5 SUD module. For non-CVS respondents, questions assessing DSM-5 symptoms that were not also included in the DSM-IV criteria (e.g., craving and cannabis withdrawal) were included at the end of the CAI interview.

[27] Variance PSUs were previously called "variance replicates."

Because census tracts, block groups, and segments are nested within variance PSUs, the impact on variance from clustering within all three sampling stages is covered in variance estimation. All weighted statistical analyses for which variance estimates are needed should use the variance strata and variance PSU variables to capture the impact of stratification and clustering on variance. Stratification tends to reduce variances, whereas clustering tends to increase 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, 2021; RTI International, 2013). For the 2020 NSDUH, separate person-level analysis weights were developed for quarters 1 and 4 to account for differences in data collection modes (i.e., exclusively in-person data collection in quarter 1 and predominantly web multimode data collection in quarter 4) and to accommodate analytic needs. In addition, quarter 1 and 4 break-off weights were developed to take into account missing data because of break-offs (CBHSQ, in press a). When using the quarterly analytic weights (ANALWT_Q1 and ANALWT_Q4) and quarterly break-off weights (ANALWTMH_Q1 and ANALWTMH_Q4), some variance strata contain data from only one variance PSU. Because variance estimation requires data from two variance PSUs per variance stratum, quarterly variance strata were created to accompany the quarterly weights. Quarter 1 and 4 variance strata were created by collapsing variance strata with data in only one variance PSU with a neighboring variance stratum. The original variance PSU variable was retained. Table 2.2 summarizes the quarterly variance strata and variance PSU variables and the corresponding quarterly weight variables.

Table 2.2   2020 NSDUH Variance Strata and Variance PSU Variables, by Analysis Type

Analysis Type	Variance Strata Variable	Variance PSU Variable	Analysis Weights
Quarter 1 Analyses	VESTRQ1	VEREP	ANALWT_Q1, ANALWTMH_Q1
Quarter 4 Analyses	VESTRQ4	VEREP	ANALWT_Q4, ANALWTMH_Q4
Combined Quarter 1 and 4 Analyses	VESTRQ1Q4	VEREP	ANALWT_Q1Q4, ANALWTMH

PSU = primary sampling unit.

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3. Segment (Third-Stage) Sample Experience

As mentioned in Chapter 2, the third stage of sampling for the 2014 through 2022 National Surveys on Drug Use and Health (NSDUHs) was area segments. To form segments within sampled second-stage sampling units (SSUs; one or more 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 SSUs), and one segment was selected per sampled SSU using the probability proportional to composite size with minimal replacement sequential sampling method. As a result, 48 segments per state sampling region (SSR) were chosen for a total of 36,000 selected segments nationally. Although only 20 segments per SSR or 15,000 segments total were needed to support the 2014 through 2017 NSDUHs, an additional 28 "reserve" segments were selected to serve as replacements when segment DUs are depleted, to support any supplemental studies embedded within NSDUH, or to extend the sample to the next decennial census. Out of the reserve sample, 20 segments per SSR are being used to support the 2018 through 2022 NSDUHs.

The 48 sampled segments per SSR were randomly assigned to the 2014 through 2022 survey years (40 segments) and 2 "reserve" panels (8 segments) by drawing equal probability subsamples of 4 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 was used again in the 2016 survey. This process continued for the remaining 36 sampled segments. 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 for the SSR within the 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 30,000 segments selected for the 2014 through 2022 surveys, 28,608 (95.4 percent) were unique. Table 3.1 lists the duplicated segments in the 2020 NSDUH sample. Panel F segments in Table 3.1 are not in the 2020 sample but are duplicates of segments in the 2020 sample. Because segments are randomly assigned to panels, duplicates may exist within or across panels. For example, DC02F3 and DC02G4 are in different panels, while VT07G1 and VT07G2 are in the same panel. The original segment (e.g., DC02F3) is field enumerated, and the resulting DU frame is used each time the segment is fielded (e.g., for DC02F3 and DC02G4). 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, a double sample is selected from the first segment, then randomly split for analysis purposes.

Table 3.1   Duplicated Segments in the 2020 NSDUH Sample

Original Segment	2020 NSDUH Duplicate Segment
DC02F3[a]	DC02G4
DE08G2	DE08H3
SC05F4[a,b]	SC05G3
VT04F3[a,b]	VT04G2
VT07G1[b]	VT07G2, VT07H2
VT08G2	VT08H2

[a] This segment is not in the 2020 NSDUH sample but is a duplicate of a segment in the 2020 NSDUH sample.
[b] The 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. In 2020, one quarter 1 segment (SD12G1) was switched with a quarter 3 segment (SD12G3) because the quarter 2 segment also had winter access problems. Table 3.2 lists the quarter switches in the 2020 NSDUH sample. As mentioned in Sections 1.2 and 2.2.2, because data collection was suspended during quarter 2 and most of quarter 3, all quarter 2, 3, and 4 segments were fielded during the quarter 4 multimode data collection period except those that were worked by field interviewers during the 1-week, small-scale data collection in July 2020. Therefore, the quarter switches were less useful in 2020 than they were in previous years.

Table 3.2   2020 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
AK02G1	AK02G2	AK03H3	AK03H4
AK04G1	AK04G2	AR09G3	AR09G4
AK11G1	AK11G2	CA10H3	CA10H4
AK11H1	AK11H2	CO06H3	CO06H4
AL04G1	AL04G2	CO09G3	CO09G4
AZ11G1	AZ11G2	CO11H3	CO11H4
CO08H1	CO08H2	MO01G3	MO01G4
CO09H1	CO09H2	MO02H3	MO02H4
CO12G1	CO12G2	MO06H3	MO06H4
CO12H1	CO12H2	MO12H3	MO12H4
LA01H1	LA01H2	MT01H3	MT01H4
MO06H1	MO06H2	MT02H3	MT02H4
MO12G1	MO12G2	MT10G3	MT10G4
MS02H1	MS02H2	MT12G3	MT12G4

(continued)

Table 3.2   2020 NSDUH Segment Quarter Switches in the Field (continued)

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**
MS08G1	MS08G2	ND01H3	ND01H4
MS09G1	MS09G2	NM02H3	NM02H4
MT01G1	MT01G2	NM06H3	NM06H4
MT07H1	MT07H2	NM11G3	NM11G4
ND01G1	ND01G2	SD08H3	SD08H4
ND07G1	ND07G2	TN05H3	TN05H4
ND12H1	ND12H2	TN08H3	TN08H4
NV01G1	NV01G2	TN09G3	TN09G4
SD06H1	SD06H2	TN09H3	TN09H4
SD08H1	SD08H2	TX02H3	TX02H4
SD09H1	SD09H2	TX13H3	TX13H4
SD10G1	SD10G2	WY01H3	WY01H4
SD11G1	SD11G2	WY03H3	WY03H4
SD12G1	SD12G3	WY04G3	WY04G4
TN03H1	TN03H2	WY07G3	WY07G4
TN07H1	TN07H2	WY07H3	WY07H4
TN11H1	TN11H2	WY12H3	WY12H4
TX04H1	TX04H2		
TX19H1	TX19H2		
UT05G1	UT05G2		
UT08H1	UT08H2		
VA06H1	VA06H2		
WY01H1	WY01H2		
WY05G1	WY05G2		
WY05H1	WY05H2		
WY10G1	WY10G2		
WY10H1	WY10H2		

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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. Using a paper-based format, lists of DUs constructed during counting and listing are entered into a database and serve 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 minimum number of DUs to select for each segment to meet the targeted sample sizes for all age groups. This sample size determination was performed quarterly 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).[28]

When determining the number of DUs to select for the initial quarter 3 sample, the target person sample sizes were adjusted to compensate for the suspension of data collection due to coronavirus disease 2019 (COVID-19). Approximately half of the interviews not collected in quarter 2 were added to the quarter 3 sample target with the other half of the deficit expected to be made up in quarter 4. To support the larger sample size, the Substance Abuse and Mental Health Services Administration approved increasing the maximum number of DUs that could be selected from a segment from 120 to 150, subject to half of the listed units in each segment being reserved for the following year's sample.

As in the quarter 3 sample, the target person sample sizes for the initial quarter 4 sample were adjusted to compensate for the suspension of data collection due to COVID-19. However, unlike previous quarters, the initial quarter 4 sample was designed for web data collection. Historical state-level response rates were adjusted so that the overall expected response rate would be 20 percent (the expected web response rate), and these adjusted rates were used in the DU sample calculations. In addition, a 95 percent adjustment was applied for the estimated percentage of mailable addresses on the DU sample frame. As a result of these changes, a much larger sample of DUs would be required. Because the National Survey on Drug Use and Health (NSDUH) segments were not designed to support as large of a DU sample as would be required to make up the annual deficit through web data collection, the "maximum" number of DUs was selected in most segments.

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. For the 2020 NSDUH, an average of 107.1 sample dwelling units (SDUs) were selected per segment. As mentioned previously, all SDUs originally selected from the quarter 2, 3, and 4 segments and all remaining DUs in some quarter 2 and 3 segments were released for web or in-person data collection in quarter 4. As a result of the larger DU sample size, the average number of SDUs per segment was much larger in 2020 than it was in previous years. The number of SDUs per segment varied by state according to the state's sample size, number of segments, and anticipated response rates.

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[28] Although data collection was suspended at the end of quarter 1 and did not resume until quarter 4, the hope was that field data collection could resume after a relatively short period. Consequently, the DU samples still were selected quarterly.

Table 4.1   2020 NSDUH 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	1,509,356	642,324	107.05	215	0.03	642,539
Alabama	96	22,976	9,977	103.93	1	0.01	9,978
Alaska	96	23,331	9,259	96.45	3	0.03	9,262
Arizona	96	23,511	10,094	105.15	1	0.01	10,095
Arkansas	96	21,235	8,391	87.41	2	0.02	8,393
California	288	78,554	33,906	117.73	12	0.04	33,918
Colorado	96	21,799	9,475	98.70	0	0.00	9,475
Connecticut	96	23,042	10,576	110.17	0	0.00	10,576
Delaware	96	22,884	10,111	105.32	0	0.00	10,111
District of Columbia	96	29,246	12,834	133.69	3	0.02	12,837
Florida	240	71,534	30,859	128.58	8	0.03	30,867
Georgia	120	33,031	12,927	107.73	0	0.00	12,927
Hawaii	96	24,510	9,578	99.77	13	0.14	9,591
Idaho	96	20,278	8,607	89.66	2	0.02	8,609
Illinois	192	52,132	23,599	122.91	4	0.02	23,603
Indiana	96	23,523	9,826	102.35	1	0.01	9,827
Iowa	96	21,605	8,703	90.66	4	0.05	8,707
Kansas	96	20,603	7,828	81.54	0	0.00	7,828
Kentucky	96	24,219	10,430	108.65	2	0.02	10,432
Louisiana	96	22,450	8,621	89.80	1	0.01	8,622
Maine	96	21,994	9,519	99.16	2	0.02	9,521
Maryland	96	25,268	10,440	108.75	4	0.04	10,444
Massachusetts	96	23,401	9,981	103.97	3	0.03	9,984
Michigan	192	55,863	24,112	125.58	7	0.03	24,119
Minnesota	96	20,642	9,239	96.24	6	0.06	9,245
Mississippi	96	21,401	9,003	93.78	7	0.08	9,010
Missouri	96	22,224	9,312	97.00	1	0.01	9,313
Montana	96	20,176	8,417	87.68	18	0.21	8,435
Nebraska	96	22,376	9,856	102.67	3	0.03	9,859
Nevada	96	24,653	10,408	108.42	14	0.13	10,422
New Hampshire	96	21,303	9,846	102.56	22	0.22	9,868
New Jersey	120	33,803	13,889	115.74	3	0.02	13,892
New Mexico	96	21,663	9,498	98.94	0	0.00	9,498
New York	240	67,759	29,770	124.04	16	0.05	29,786
North Carolina	120	33,066	15,092	125.77	1	0.01	15,093
North Dakota	96	20,421	8,936	93.08	0	0.00	8,936
Ohio	192	54,485	22,672	118.08	7	0.03	22,679
Oklahoma	96	22,992	9,690	100.94	2	0.02	9,692
Oregon	96	22,179	9,470	98.65	2	0.02	9,472
Pennsylvania	192	54,183	22,866	119.09	4	0.02	22,870
Rhode Island	96	22,022	9,960	103.75	9	0.09	9,969
South Carolina	96	22,585	10,128	105.50	0	0.00	10,128
South Dakota	96	19,554	8,038	83.73	0	0.00	8,038
Tennessee	96	22,515	9,380	97.71	0	0.00	9,380
Texas	240	67,822	29,127	121.36	1	0.00	29,128
Utah	96	20,801	8,149	84.89	1	0.01	8,150
Vermont	96	23,949	9,807	102.16	10	0.10	9,817
Virginia	120	34,489	14,268	118.90	3	0.02	14,271
Washington	96	22,017	9,225	96.09	2	0.02	9,227
West Virginia	96	22,228	9,584	99.83	1	0.01	9,585
Wisconsin	96	21,831	9,180	95.63	9	0.10	9,189
Wyoming	96	19,228	7,861	81.89	0	0.00	7,861

DU = dwelling unit; SDU = sample dwelling unit.

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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 after 1 month of data collection 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 response rates being lower than expected 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. In 2020, the additional sample was released to partially compensate for the impact of COVID-19 on data collection and response rates. Sample releases are made at the state level and do not target any particular age group. In quarters 1 and 2, the initial DU sample was allocated 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).

To allow for greater flexibility, the additional quarter 2 sample was partitioned into the following release percentages:

Release 1: 33 percent of additional sample;
Release 2: 33 percent of additional sample;
Release 3: 17 percent of additional sample;
Release 4: 8 percent of additional sample;
Release 5: 4 percent of additional sample; and
Release 6: 4 percent of additional sample.

Similarly, the initial quarter 3 sample and the additional quarter 3 sample were partitioned into the following release percentages:

Release 1: 33 percent of entire sample (40/120, main sample + 20 percent reserve) or additional sample;
Release 2: 33 percent of entire sample (40/120, main sample + 20 percent reserve) or additional sample;
Release 3: 17 percent of entire sample (20/120, main sample + 20 percent reserve) or additional sample;
Release 4: 8 percent of entire sample (10/120, main sample + 20 percent reserve) or additional sample;
Release 5: 4 percent of entire sample (5/120, main sample + 20 percent reserve) or additional sample; and

Release 6: 4 percent of entire sample (5/120, main sample + 20 percent reserve) or additional sample.

Finally, the quarter 4 sample was partitioned into the following release percentages:

> *Release 1*: 33 percent of entire sample;
> *Release 2*: 33 percent of entire sample;
> *Release 3*: 17 percent of entire sample;
> *Release 4*: 8 percent of entire sample;
> *Release 5*: 4 percent of entire sample; and
> *Release 6*: 4 percent of entire sample.

As described in the 2020 NSDUH sample design report (Center for Behavioral Health Statistics and Quality [CBHSQ], 2021), 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 sample sizes and percentages released by data collection period is provided in Table 4.2. If the release plan was implemented without changes, a percentage equal to 100/120 or 83.3 percent would be expected. Because all SDUs were released during the multimode data collection period, the release percentage is 120/120 or 100.0 percent for all states.

To ensure that nearly all 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.[29] During the in-person 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, FIs were instructed to consider these DUs as part of their assignments. If either of these limits was exceeded, special subsampling procedures were implemented (CBHSQ, 2021).

In addition to checking for missed DUs at each sampled DU, FIs were instructed to call their supervisors if they noticed large differences in the segment listing and what they encountered in the field. If an 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 FI's assignment; these procedures are described in more detail in CBHSQ (2021). 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 0.03 percent increase in sample was realized through the check for missed DUs. Compared with the percent increase in previous years, the percent increase in sample was very small because the majority of SDUs were invited to participate via web and were not asked the missed DU question.

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[29] The screening respondent was not asked about other units on the property or within the sampled DU in apartment buildings and other multiunit structures. In addition, web screening respondents were not asked the missed DU question.

Table 4.2   2020 NSDUH Dwelling Unit Sample Sizes and Percentages Released, by Data Collection Period

Region/State	Quarter 1			Quarter 4		
	# Selected	# Released	Percent	# Selected	# Released[1]	Percent
Total Population	72,734	60,587	83.30	581,739	581,737	100.00
Northeast	15,388	12,826	83.35	113,390	113,388	100.00
Connecticut	999	826	82.68	9,750	9,750	100.00
Maine	1,264	1,055	83.47	8,464	8,464	100.00
Massachusetts	1,163	970	83.40	9,011	9,011	100.00
New Hampshire	1,217	1,013	83.24	8,833	8,833	100.00
New Jersey	1,617	1,357	83.92	12,533	12,532	99.99
New York	4,122	3,434	83.31	26,337	26,336	100.00
Pennsylvania	2,653	2,214	83.45	20,652	20,652	100.00
Rhode Island	1,172	974	83.11	8,986	8,986	100.00
Vermont	1,181	983	83.23	8,824	8,824	100.00
Midwest	16,688	13,880	83.17	137,421	137,421	100.00
Illinois	3,296	2,745	83.28	20,854	20,854	100.00
Indiana	930	777	83.55	9,049	9,049	100.00
Iowa	921	768	83.39	7,935	7,935	100.00
Kansas	881	733	83.20	7,095	7,095	100.00
Michigan	2,259	1,878	83.13	22,234	22,234	100.00
Minnesota	1,060	881	83.11	8,358	8,358	100.00
Missouri	1,024	855	83.50	8,457	8,457	100.00
Nebraska	892	745	83.52	9,111	9,111	100.00
North Dakota	1,018	847	83.20	8,089	8,089	100.00
Ohio	2,417	1,992	82.42	20,680	20,680	100.00
South Dakota	983	819	83.32	7,219	7,219	100.00
Wisconsin	1,007	840	83.42	8,340	8,340	100.00
South	24,429	20,369	83.38	200,493	200,493	100.00
Alabama	1,047	872	83.29	9,105	9,105	100.00
Arkansas	775	645	83.23	7,746	7,746	100.00
Delaware	1,710	1,426	83.39	8,685	8,685	100.00
District of Columbia	2,492	2,077	83.35	10,757	10,757	100.00
Florida	3,762	3,134	83.31	27,725	27,725	100.00
Georgia	1,279	1,063	83.11	11,864	11,864	100.00
Kentucky	882	738	83.67	9,692	9,692	100.00
Louisiana	758	630	83.11	7,991	7,991	100.00
Maryland	933	780	83.60	9,660	9,660	100.00
Mississippi	826	692	83.78	8,311	8,311	100.00
North Carolina	1,743	1,446	82.96	13,646	13,646	100.00
Oklahoma	897	750	83.61	8,940	8,940	100.00
South Carolina	969	808	83.38	9,320	9,320	100.00
Tennessee	884	741	83.82	8,639	8,639	100.00
Texas	2,665	2,229	83.64	26,898	26,898	100.00
Virginia	1,526	1,272	83.36	12,996	12,996	100.00
West Virginia	1,281	1,066	83.22	8,518	8,518	100.00
West	16,229	13,512	83.26	130,435	130,435	100.00
Alaska	1,083	900	83.10	8,359	8,359	100.00
Arizona	1,179	983	83.38	9,111	9,111	100.00
California	4,502	3,746	83.21	30,160	30,160	100.00
Colorado	1,105	918	83.08	8,557	8,557	100.00
Hawaii	1,043	874	83.80	8,704	8,704	100.00
Idaho	793	666	83.98	7,941	7,941	100.00
Montana	1,236	1,028	83.17	7,389	7,389	100.00
Nevada	932	775	83.15	9,633	9,633	100.00
New Mexico	921	768	83.39	8,730	8,730	100.00
Oregon	859	714	83.12	8,756	8,756	100.00
Utah	543	449	82.69	7,700	7,700	100.00
Washington	1,114	926	83.12	8,299	8,299	100.00
Wyoming	919	765	83.24	7,096	7,096	100.00

Note: Quarter 4 includes all DUs originally selected for the quarter 2, 3, and 4 samples, plus additional DUs selected from some quarter 2 and 3 segments.

[1]Group quarter units (GQUs) listed as housing units (code 19) are dropped from the frame. If the number of GQUs in the missing group quarters structure is 50 or more, a subsample of GQUs is added back to the sample. In quarter 4, two DUs were dropped and not replaced for this reason.

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5. Person (Fifth-Stage) Sample Experience

Compared with previous designs, the 2014 through 2022 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 original 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 desired sample sizes in each state as described in Section 2.2.1. Finally, the original sample was supplemented with 1,500 interviews proportionally allocated to states and age groups to support the Clinical Validation Study (CVS). Table 5.1 displays the desired and achieved sample yields by age group and state. Because of coronavirus disease 2019 (COVID-19), the achieved sample sizes are much smaller than their projected counterparts. However, the addition of web data collection and adjustments to the sample design late in 2020 allowed for a total of 36,284 interviews to be completed in 2020. This sample size is sufficient for producing national estimates for people aged 12 or older and adults aged 18 or older (Morton et al., 2020).

Table 5.1   2020 NSDUH Yields, by Age Group and State

Age Group and State	Targeted	Achieved	Percent Difference
Total	69,007	36,284	-47.42
12-17	17,015	6,322	-62.84
18-25	17,066	8,880	-47.97
26-34	10,344	6,140	-40.64
35-49	13,836	8,029	-41.97
50+	10,746	6,913	-35.67
Alabama	982	442	-54.99
Alaska	963	467	-51.51
Arizona	992	532	-46.37
Arkansas	974	406	-58.32
California	4,742	2,193	-53.75
Colorado	986	635	-35.60
Connecticut	977	546	-44.11
Delaware	964	584	-39.42
District of Columbia	963	448	-53.48
Florida	3,399	1,521	-55.25
Georgia	1,547	692	-55.27
Hawaii	973	642	-34.02
Kauai County	67	136	102.99
Remainder of Hawaii	906	506	-44.15
Idaho	968	625	-35.43
Illinois	2,459	1,372	-44.20
Indiana	991	517	-47.83
Iowa	974	542	-44.35
Kansas	973	533	-45.22
Kentucky	980	538	-45.10
Louisiana	981	358	-63.51
Maine	966	498	-48.45

Table 5.1   2020 NSDUH Yields, by Age Group and State (continued)

Age Group and State	Targeted	Achieved	Percent Difference
Maryland	988	636	-35.63
Massachusetts	993	517	-47.94
Michigan	2,447	1,264	-48.34
Minnesota	986	698	-29.21
Mississippi	974	352	-63.86
Missouri	988	491	-50.30
Montana	965	511	-47.05
Nebraska	969	659	-31.99
Nevada	974	497	-48.97
New Hampshire	966	592	-38.72
New Jersey	1,542	752	-51.23
New Mexico	970	545	-43.81
New York	3,393	1,859	-45.21
North Carolina	1,547	783	-49.39
North Dakota	963	591	-38.63
Ohio	2,454	1,261	-48.61
Oklahoma	978	506	-48.26
Oregon	979	651	-33.50
Pennsylvania	2,460	1,262	-48.70
Rhode Island	965	442	-54.20
South Carolina	983	500	-49.14
South Dakota	964	600	-37.76
Tennessee	991	469	-52.67
Texas	3,426	1,579	-53.91
Utah	973	680	-30.11
Vermont	963	723	-24.92
Virginia	1,539	758	-50.75
Washington	994	560	-43.66
West Virginia	969	420	-56.66
Wisconsin	987	575	-41.74
Wyoming	963	460	-52.23

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

In addition to changes in the state and age group sample allocation, a new pair sampling parameter was selected for the 2014 through 2022 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 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 2022 NSDUHs, simulation analyses based on the 2012 screening data, modified to reflect the 2014 through 2022 age group sample proportions, were conducted, and $\lambda = 0.25$ was selected (Center for Behavioral Health Statistics and Quality, 2019b). As a result, fewer pairs were projected to be selected in the 2014 through 2022 NSDUHs than were

selected in the 2002 through 2013 NSDUHs. However, as a result of increasing the older adult sample, a λ value of 0.25 yielded a large projected number of youth-adult pairs in 2014 through 2022 when compared with earlier years.

Prior to the 2020 NSDUH, pair projection models were updated using 2018 screening data. 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 and response rates were much smaller than their projected counterparts overall and in all age group pairs because of the impact of COVID-19 on the 2020 NSDUH sample.

Table 5.2 **2020 NSDUH 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	Projected Count ($\lambda = 0.25$)	Observed Count ($\lambda = 0.25$)
12+, 12+	30,053	18,461
12-17, 12-17	3,355	2,165
12-17, 18-25	2,797	1,743
12-17, 26+	8,550	5,044
18-25, 18-25	4,578	2,885
18-25, 26+	5,188	3,013
26+, 26+	5,585	3,611

Note: Projected pair selection counts are based on 2018 NSDUH screening data.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2018 and 2020.

Table 5.3 **2020 NSDUH 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	Projected Response Rate ($\lambda = 0.25$)	Observed Response Rate ($\lambda = 0.25$)
12+, 12+	59.9	38.4
12-17, 12-17	71.3	42.4
12-17, 18-25	65.8	34.4
12-17, 26+	64.3	37.6
18-25, 18-25	58.2	39.9
18-25, 26+	53.3	38.0
26+, 26+	50.8	38.1

Note: Projected pair response rates are based on 2018 NSDUH screener data.

Note: Observed response rates are based on interview age.

Note: A pair response requires both members of the age group pair to respond.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2018 and 2020.

Departures from planned sample sizes typically occur for several reasons, including sampling variability, access problems (e.g., in gated communities or college dormitories), and departures from expected response rates. In 2020, departures from planned sample sizes occurred primarily because of the impact of COVID-19 on data collection and response rates. Although the addition of web data collection provided a means for collecting data when in-person data collection was not feasible in most areas, web response rates are typically lower than in-person response rates. Therefore, a larger sample of dwelling units was required. Table 5.4 provides weighted screening and interview response rates by state for the 2020 NSDUH.[30] Tables 5.5 and 5.6 provide weighted screening and interview response rates by state for quarter 1 and 4, respectively. Because 93 percent of the interviews were conducted via web in quarter 4, comparisons of response rates between quarters 1 and 4 can be thought of as differences between in-person (quarter 1) and web (quarter 4) response rates.

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[30] For the 2020 NSDUH, household eligibility was imputed for dwelling units that did not initiate the web screening interview and that were not visited by a field interviewer (i.e., households with unknown eligibility). Thus, the screening response rate is calculated using the American Association for Public Opinion Research (AAPOR) Response Rate 4 (RR4), which estimates the proportion of dwelling units with unknown eligibility that are actually eligible. The interview response rate is calculated using AAPOR's Response Rate 2 (RR2) (AAPOR, 2016, p. 61).

Table 5.4　2020 NSDUH 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	642,549	536,203	84.34	90,937	25.71	62,515	36,284	60.41	15.53
Alabama	9,978	7,781	78.56	1,091	24.80	744	442	56.70	14.06
Alaska	9,262	7,208	78.12	1,127	22.97	767	467	61.92	14.23
Arizona	10,095	8,059	81.93	1,356	24.80	907	532	62.82	15.58
Arkansas	8,393	6,320	75.16	901	26.64	663	406	62.81	16.73
California	33,918	30,403	90.19	4,721	23.13	3,897	2,193	56.70	13.11
Colorado	9,475	7,734	83.28	1,579	25.75	1,065	635	59.67	15.37
Connecticut	10,576	9,425	90.12	1,413	23.32	933	546	60.61	14.14
Delaware	10,111	8,202	82.53	1,534	24.14	968	584	66.99	16.17
District of Columbia	12,837	10,975	85.36	2,094	21.49	672	448	66.48	14.29
Florida	30,867	23,871	76.72	3,818	26.28	2,467	1,521	62.90	16.53
Georgia	12,927	10,650	82.66	1,483	26.68	1,144	692	59.98	16.00
Hawaii	9,594	8,221	87.41	1,628	30.59	1,173	642	57.78	17.68
Idaho	8,609	7,085	82.47	1,391	29.21	1,063	625	62.35	18.21
Illinois	23,603	20,469	87.27	3,328	21.95	2,464	1,372	60.38	13.25
Indiana	9,827	8,143	84.18	1,200	25.27	873	517	60.75	15.35
Iowa	8,707	7,326	83.55	1,449	30.68	932	542	60.50	18.56
Kansas	7,828	6,340	81.74	1,210	29.52	854	533	60.86	17.97
Kentucky	10,432	8,547	82.73	1,342	28.08	889	538	66.97	18.81
Louisiana	8,622	6,825	81.09	895	24.80	641	358	59.03	14.64
Maine	9,521	7,633	80.80	1,652	29.40	946	498	59.40	17.47
Maryland	10,444	9,155	87.91	1,543	24.01	1,046	636	64.60	15.51
Massachusetts	9,984	8,778	88.33	1,342	25.65	953	517	58.32	14.95
Michigan	24,119	20,233	84.33	3,280	27.93	2,148	1,264	63.54	17.75
Minnesota	9,245	8,028	87.28	1,753	30.14	1,212	698	63.09	19.02
Mississippi	9,010	7,138	78.91	869	23.11	631	352	59.61	13.78
Missouri	9,313	7,571	82.01	1,317	28.59	868	491	59.97	17.15
Montana	8,435	6,841	81.28	1,480	26.65	868	511	64.76	17.26
Nebraska	9,859	8,289	85.48	1,428	29.69	1,046	659	66.02	19.60

(continued)

Table 5.4   2020 NSDUH 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	10,422	9,262	90.48	1,138	23.46	873	497	61.48	14.42
New Hampshire	9,869	8,379	83.75	1,745	31.05	1,154	592	52.68	16.35
New Jersey	13,892	12,355	89.45	1,898	22.98	1,434	752	53.97	12.40
New Mexico	9,498	7,544	79.78	1,258	26.58	897	545	63.27	16.82
New York	29,787	26,227	88.64	4,527	22.81	3,372	1,859	55.81	12.73
North Carolina	15,093	12,292	81.29	1,938	23.19	1,259	783	65.26	15.13
North Dakota	8,936	7,091	78.65	1,523	28.18	1,006	591	61.52	17.34
Ohio	22,679	19,301	86.29	3,167	26.96	2,132	1,261	65.41	17.64
Oklahoma	9,692	7,962	82.61	1,219	28.54	871	506	62.90	17.95
Oregon	9,473	8,287	88.11	1,842	36.87	1,130	651	61.97	22.85
Pennsylvania	22,870	19,958	87.79	3,237	23.52	2,192	1,262	62.19	14.63
Rhode Island	9,969	7,859	75.49	1,216	24.41	819	442	56.92	13.89
South Carolina	10,128	7,914	79.60	1,214	24.14	852	500	63.03	15.22
South Dakota	8,038	6,384	80.45	1,424	30.93	998	600	61.71	19.09
Tennessee	9,380	7,775	83.46	1,168	27.07	840	469	58.04	15.71
Texas	29,128	23,999	82.95	3,228	24.24	2,702	1,579	59.55	14.44
Utah	8,150	6,946	86.64	1,210	29.30	1,190	680	58.88	17.26
Vermont	9,821	8,397	86.03	2,117	30.79	1,273	723	56.26	17.32
Virginia	14,271	11,752	81.33	2,145	29.36	1,277	758	62.16	18.25
Washington	9,227	7,955	86.67	1,584	31.45	1,002	560	56.95	17.91
West Virginia	9,585	7,533	78.35	1,193	24.81	719	420	65.36	16.22
Wisconsin	9,189	7,397	80.13	1,626	32.30	936	575	65.08	21.02
Wyoming	7,861	6,384	82.51	1,096	27.22	753	460	60.35	16.43

DU = dwelling unit.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

Table 5.5   2020 Quarter 1 NSDUH 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	60,785	52,827	86.71	35,304	67.76	24,304	15,628	63.24	42.85
Alabama	873	710	81.35	535	75.32	374	253	61.53	46.34
Alaska	903	750	82.59	511	68.34	352	238	69.73	47.65
Arizona	984	875	90.27	578	63.82	383	249	70.12	44.75
Arkansas	647	504	75.76	390	77.62	268	197	73.24	56.85
California	3,758	3,508	93.23	2,183	62.64	1,833	1,150	60.21	37.71
Colorado	918	841	91.60	561	66.72	427	270	59.87	39.94
Connecticut	826	756	91.54	395	52.22	234	139	61.93	32.34
Delaware	1,426	1,281	89.86	667	52.07	426	275	66.28	34.51
District of Columbia	2,080	1,820	85.12	783	42.52	239	185	72.73	30.92
Florida	3,142	2,566	77.94	1,814	70.08	1,196	820	65.56	45.94
Georgia	1,063	904	85.08	703	77.74	511	356	65.26	50.73
Hawaii	880	788	89.63	526	65.26	356	235	64.16	41.87
Idaho	668	580	86.82	447	77.21	337	213	62.30	48.10
Illinois	2,749	2,472	90.02	1,330	53.04	1,003	556	56.16	29.79
Indiana	778	681	87.56	479	70.31	368	237	62.36	43.85
Iowa	772	656	84.96	516	78.72	330	217	66.43	52.29
Kansas	733	623	84.99	482	77.39	357	241	66.50	51.47
Kentucky	740	633	85.62	490	77.35	330	234	71.98	55.67
Louisiana	631	554	87.79	458	82.64	310	193	63.44	52.43
Maine	1,057	832	78.01	636	76.74	340	207	62.10	47.66
Maryland	784	707	90.21	439	62.08	338	243	72.06	44.74
Massachusetts	973	879	90.35	566	64.40	361	214	57.44	36.99
Michigan	1,885	1,618	85.84	1,240	76.65	814	523	60.56	46.42
Minnesota	887	802	90.40	581	72.45	429	272	63.69	46.14
Mississippi	699	543	77.69	399	73.52	309	200	68.41	50.29
Missouri	856	719	83.98	559	77.77	372	254	69.34	53.92
Montana	1,046	900	85.57	654	72.48	369	239	62.46	45.27
Nebraska	748	673	89.97	492	73.08	334	253	74.91	54.74

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Table 5.5   2020 Quarter 1 NSDUH 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	789	742	94.31	377	51.29	281	177	60.78	31.18
New Hampshire	1,029	896	81.85	625	69.75	405	226	52.20	36.41
New Jersey	1,360	1,248	91.76	797	63.82	609	361	56.62	36.13
New Mexico	768	628	81.78	441	70.24	320	225	66.38	46.63
New York	3,448	3,084	89.39	1,687	54.84	1,344	765	54.85	30.08
North Carolina	1,447	1,190	81.65	729	61.35	479	342	71.55	43.90
North Dakota	847	656	76.64	501	76.57	329	207	61.78	47.30
Ohio	1,999	1,809	90.20	1,257	69.47	823	514	63.39	44.04
Oklahoma	752	633	84.11	506	79.97	360	254	70.25	56.18
Oregon	716	659	92.11	467	70.79	267	182	70.83	50.15
Pennsylvania	2,218	2,010	90.63	1,189	59.23	766	461	62.24	36.86
Rhode Island	983	793	67.27	475	59.96	312	179	55.47	33.26
South Carolina	808	680	84.16	459	67.52	322	217	67.41	45.52
South Dakota	819	704	85.96	599	85.06	405	276	69.18	58.84
Tennessee	741	652	87.98	495	75.94	346	222	64.11	48.69
Texas	2,230	1,908	85.60	1,344	70.30	1,085	706	63.11	44.37
Utah	450	417	92.68	302	72.45	317	205	62.24	45.09
Vermont	991	854	86.14	583	68.28	331	199	59.77	40.81
Virginia	1,275	1,086	79.51	795	73.14	489	317	66.07	48.32
Washington	928	808	87.05	590	72.99	340	224	64.00	46.72
West Virginia	1,067	841	78.72	602	71.72	345	211	58.45	41.92
Wisconsin	849	684	80.54	557	81.41	328	225	68.93	56.12
Wyoming	765	670	87.60	513	76.58	401	270	69.82	53.47

DU = dwelling unit.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

Table 5.6   2020 Quarter 4 NSDUH 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	581,764	483,376	83.54	55,633	11.13	38,211	20,656	59.48	6.62
Alabama	9,105	7,071	77.68	556	8.08	370	189	54.81	4.43
Alaska	8,359	6,458	76.85	616	9.15	415	229	59.64	5.46
Arizona	9,111	7,184	79.21	778	10.29	524	283	60.66	6.25
Arkansas	7,746	5,816	74.94	511	8.25	395	209	58.78	4.85
California	30,160	26,895	89.22	2,538	9.96	2,064	1,043	55.55	5.54
Colorado	8,557	6,893	81.06	1,018	13.40	638	365	59.60	7.99
Connecticut	9,750	8,669	89.57	1,018	11.70	699	407	60.20	7.04
Delaware	8,685	6,921	80.09	867	13.70	542	309	67.24	9.21
District of Columbia	10,757	9,155	85.43	1,311	15.65	433	263	64.75	10.13
Florida	27,725	21,305	76.26	2,004	9.36	1,271	701	62.06	5.81
Georgia	11,864	9,746	81.82	780	8.24	633	336	58.19	4.79
Hawaii	8,714	7,433	86.45	1,102	15.04	817	407	55.94	8.42
Idaho	7,941	6,505	81.07	944	12.66	726	412	62.36	7.90
Illinois	20,854	17,997	86.38	1,998	11.39	1,461	816	61.81	7.04
Indiana	9,049	7,462	83.14	721	10.73	505	280	60.21	6.46
Iowa	7,935	6,670	83.07	933	13.68	602	325	58.47	8.00
Kansas	7,095	5,717	80.64	728	12.35	497	292	58.84	7.27
Kentucky	9,692	7,914	81.77	852	10.91	559	304	65.32	7.13
Louisiana	7,991	6,271	79.21	437	6.81	331	165	57.62	3.93
Maine	8,464	6,801	81.69	1,016	14.88	606	291	58.47	8.70
Maryland	9,660	8,448	87.23	1,104	12.36	708	393	62.26	7.70
Massachusetts	9,011	7,899	87.58	776	10.74	592	303	58.59	6.29
Michigan	22,234	18,615	83.82	2,040	11.26	1,334	741	64.52	7.27
Minnesota	8,358	7,226	86.29	1,172	16.04	783	426	62.90	10.09
Mississippi	8,311	6,595	79.32	470	6.80	322	152	56.26	3.83
Missouri	8,457	6,852	81.32	758	10.69	496	237	56.94	6.09
Montana	7,389	5,941	80.01	826	12.12	499	272	65.64	7.96
Nebraska	9,111	7,616	83.99	936	14.22	712	406	62.68	8.91

Table 5.6   2020 Quarter 4 NSDUH 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	9,633	8,520	88.70	761	9.72	592	320	61.70	6.00
New Hampshire	8,840	7,483	84.41	1,120	17.88	749	366	52.83	9.45
New Jersey	12,532	11,107	88.73	1,101	9.86	825	391	53.11	5.24
New Mexico	8,730	6,916	79.13	817	11.82	577	320	62.25	7.36
New York	26,339	23,143	88.40	2,840	12.56	2,028	1,094	56.13	7.05
North Carolina	13,646	11,102	81.17	1,209	10.95	780	441	63.29	6.93
North Dakota	8,089	6,435	79.25	1,022	14.34	677	384	61.43	8.81
Ohio	20,680	17,492	84.93	1,910	11.33	1,309	747	66.09	7.49
Oklahoma	8,940	7,329	82.07	713	9.83	511	252	60.25	5.92
Oregon	8,757	7,628	86.26	1,375	20.10	863	469	58.92	11.84
Pennsylvania	20,652	17,948	86.86	2,048	11.35	1,426	801	62.18	7.06
Rhode Island	8,986	7,066	78.97	741	11.64	507	263	57.36	6.67
South Carolina	9,320	7,234	78.26	755	10.54	530	283	61.68	6.50
South Dakota	7,219	5,680	78.85	825	13.80	593	324	59.45	8.21
Tennessee	8,639	7,123	81.91	673	9.06	494	247	55.96	5.07
Texas	26,898	22,091	82.11	1,884	9.01	1,617	873	58.35	5.26
Utah	7,700	6,529	84.68	908	14.01	873	475	57.72	8.09
Vermont	8,830	7,543	85.99	1,534	19.26	942	524	55.07	10.60
Virginia	12,996	10,666	82.03	1,350	13.15	788	441	60.75	7.99
Washington	8,299	7,147	86.52	994	15.55	662	336	54.69	8.50
West Virginia	8,518	6,692	78.21	591	8.42	374	209	67.93	5.72
Wisconsin	8,340	6,713	80.00	1,069	16.08	608	350	63.85	10.27
Wyoming	7,096	5,714	80.76	583	8.76	352	190	56.82	4.98

DU = dwelling unit.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

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 2020 National Survey on Drug Use and Health (NSDUH). One objective was to provide a mechanism for comparing the expected precision of the 2020 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,

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

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:

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

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 n_d and *DEFF(d)* are the sample size and median (or mean, as the case may be) DEFF across a set of prevalence estimates for 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, median (or mean) 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, assuming the first-stage sampling units were selected with replacement. They were not in fact selected with replacement, but the assumption simplifies variance estimation immensely while only slightly and conservatively biasing the results upward (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 SE, based on wr sampling of primary sampling units, 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 et al., 2001).

The final NSDUH weights (including all adjustments) are treated as probability weights (i.e., inverses of the inclusion probabilities) in the SUDAAN linearization variance-estimation routine when estimating prevalences. This practice captures the potential increase in variance resulting from the variability of the final weights compared with pure probability weights. It fails, however, to capture potential reductions in variance afforded by, for example, the final poststratification adjustment. The bias of this method of variance estimation is felt most acutely in the estimation of totals, so much so that the estimated total for a prevalence in a demographic domain—age group, gender, race, Hispanic origin, region, or a two-way cross-classification of these domains—is treated as the product of a census estimate for the domain's population and the NSDUH estimate of a person-level prevalence in the domain. Note that a NSDUH estimated total is equal to this product because the weights are adjusted to the census-provided totals. The estimated variance of the NSDUH total is the square of the census-provided total for the domain population multiplied by the variance of the person-level prevalence in the domain. This approach removes the variability of the NSDUH-estimated domain population size from variance estimation.

For simplicity, SUDAAN is used directly for estimating the variance of totals for three-way cross-classifications of the demographic domains. For a fuller description of how the variances of NSDUH totals are estimated, see the 2018 NSDUH methodological summary and definitions (Center for Behavioral Health Statistics and Quality [CBHSQ], 2019a).

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

$$RSE[-\ln(\hat{p})] > 0.175 \text{ when } \hat{p} \le 0.5 \text{ }^{[31]}$$

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:

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[31] The approximation of the mean squared error (MSE) or $MSE[-\ln(\hat{p})] \cong \dfrac{MSE(\hat{p})}{(-\hat{p})^2} = [RSE(\hat{p})]^2$ implies

$RSE[-\ln(\hat{p})] \cong \dfrac{RSE(\hat{p})}{[-\ln(\hat{p})]}$ and analogously for $RSE[-\ln(1-\hat{p})]$.

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

This equation is part of the standard suppression rule that is used in the reporting of NSDUH estimates. See the 2020 NSDUH statistical inference report for more information (CBHSQ, in press b).

It may be noted that, for a given sample size, the RSE of $-\ln(1-\hat{p})$ increases as $\hat{p}$ decreases, and for a given $\hat{p}$, it increases as the sample size decreases. Although the RSE of $-\ln(1-\hat{p})$ 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 $1-\hat{p}$.

6.2   Comparison of Observed Precision with Expected Precision

In this section, benchmarks from the 2020 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. Using 2018 NSDUH data, predicted precision requirements for the 2020 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 2020 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 2020 (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 the past year (TXYRSPILAL),
- serious mental illness (SMI) in the past year (SMIYR_U), 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 2020 sample design report's specified domain breakdowns (CBHSQ, 2021).

6.2.1 Sample and Precision Requirements

Initial sample requirements for the 2020 NSDUH were defined in terms of the following:

- target 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 to develop more reliable national estimates and representative state-level estimates using small area estimation (SAE) and direct estimation procedures. To achieve this objective in 2020, 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.

Table 6.1   Comparisons of Projected and Observed Relative Standard Errors and Sample Sizes for Key Outcome Measures, by Demographic Domain, 2020 NSDUH

Data File Variable Name	Measure	Domain	Prevalence	Projected RSE	Observed RSE	Percent Relative Change in RSE[1]	Expected Sample Size	Observed Sample Size	Percent Relative Change in Sample Size[2]
ALCMON	Past Month Alcohol Use	12+	0.5002	0.0072	0.0105	45.25	69,007	36,284	-47.42
ALCMON	Past Month Alcohol Use	12-20	0.1612	0.0223	0.0446	100.16	23,383	9,340	-60.06
ALCMON	Past Month Alcohol Use	50+	0.5017	0.0135	0.0183	35.87	10,746	6,749	-37.20
ALCMON	Past Month Alcohol Use	API, 12+	0.3292	0.0394	0.0616	56.44	4,103	2,161	-47.33
ALCMON	Past Month Alcohol Use	AIAN, 12+	*	0.1007	*	*	777	*	*
ALCMON	Past Month Alcohol Use	Pregnant, 12-44	0.1055	0.1470	0.2036	38.53	770	447	-41.95
BNGDRKMON	Past Month Binge Alcohol Use	18-25	0.3136	0.0147	0.0303	105.95	17,066	8,915	-47.76
BNGDRKMON	Past Month Binge Alcohol Use	12+	0.2223	0.0105	0.0186	77.17	69,007	36,284	-47.42
MRJMON	Past Month Marijuana Use	12+	0.1184	0.0195	0.0252	29.03	69,007	36,284	-47.42
MRJMON	Past Month Marijuana Use	12-17	0.0589	0.0379	0.0756	99.46	17,015	6,330	-62.80
MRJMON	Past Month Marijuana Use	18-25	0.2307	0.0212	0.0360	69.73	17,066	8,915	-47.76
MRJMON	Past Month Marijuana Use	50+	0.0653	0.0630	0.0699	10.97	10,746	6,749	-37.20
MRJMON	Past Month Marijuana Use	API, 12+	0.0396	0.1294	0.1912	47.74	4,103	2,161	-47.33
MRJMON	Past Month Marijuana Use	AIAN, 12+	*	0.1656	*	*	777	*	*
MRJMON	Past Month Marijuana Use	Pregnant, 12-44	0.0801	0.1754	0.2537	44.67	770	447	-41.95
CIGMON	Past Month Cigarette Use	12-17	0.0140	0.0584	0.1600	174.01	17,015	6,330	-62.80
CIGMON	Past Month Cigarette Use	12+	0.1495	0.0144	0.0251	74.19	69,007	36,284	-47.42
PNRNMMON	Past Month Pain Reliever Misuse	18-25	0.0086	0.0770	0.1636	112.51	17,066	8,915	-47.76
PNRNMMON	Past Month Pain Reliever Misuse	12+	0.0092	0.0555	0.0966	74.10	69,007	36,284	-47.42
ABODALC	Past Year Alcohol Use Disorder	12+	0.0546	0.0238	0.0387	62.67	69,007	36,284	-47.42
UDPYILL	Past Year Illicit Drug Use Disorder	12+	0.0323	0.0329	0.0474	44.18	69,007	36,284	-47.42
UDPYILAL	Past Year Substance Use Disorder	50+	0.0458	0.0612	0.0911	48.92	10,746	6,749	-37.20
TXYRSPILAL	Past Year Specialty Substance Use Treatment	12+	0.0097	0.0627	0.0964	53.70	69,007	36,284	-47.42
SMIYR_U	Past Year SMI	18+	0.0542	0.0264	0.0410	55.21	51,992	29,954	-42.39
AMDEYR	Past Year MDE	18+	0.0842	0.0214	0.0321	49.92	51,992	28,713	-44.77

* Low precision (see suppression criteria in Chapter 10 of the statistical inference report [CBHSQ, in press b]).

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 2022 state and age sample allocations in a variance component model. All model components were updated using 2018 NSDUH data.

[1] *Percent Relative Change in RSE = 100*{[RSE(observed) – RSE(projected)] / RSE(projected)}.*

[2] *Percent Relative Change in Sample Size = 100*{[2020 Sample Size – Expected Sample Size] / (Expected Sample Size)}.*

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2018 and 2020.

Unlike previous NSDUHs, no specific precision requirements were set for the 2014 through 2022 NSDUHs. Instead, they were designed to achieve acceptable precision for various subpopulations of interest, which accounted for the allocation of people per state and the requirement to support direct estimation in some large sample states and SAE in the remaining states (RTI International, 2012). Using the state and age group distribution, estimates and RSEs were modeled for 25 key outcome measures and domains of interest.

6.2.2 Observed versus Expected Precision

In Table 6.1, the expected and observed RSEs and sample sizes for the 2020 NSDUH are presented for the 25 key outcome measures. As noted previously, the achieved sample sizes for the 2020 NSDUH were smaller than planned because of the impact of COVID-19 on data collection. As a result, the variances of estimates were larger; therefore, the RSEs were larger than expected. All of the 25 observed precisions were greater than the expected precisions described in the 2020 sample design plan (CBHSQ, 2019b).

6.3 Comparison of Median and Mean Design Effects

The mean DEFF is more sensitive to outliers and is typically 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 2020 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 2018 through 2020 NSDUHs. Like the RSEs, the median and mean DEFFs for the 2020 NSDUH are larger than they have been in recent years because of smaller sample sizes and larger variances.

Table 6.2   Comparison of Median and Mean Design Effects of 53 Outcomes: 2020

Outcome	Median Design Effect	Mean Design Effect	Difference (Mean – Median)	Percentage Difference[1]
Total	3.13	3.15	0.02	0.70
Age (Years)				
12 to 17	2.23	2.06	-0.17	-7.58
18 to 25	3.15	3.06	-0.09	-2.91
26+	2.58	2.63	0.05	1.87
Race/Ethnicity				
White, Not Hispanic or Latino	3.02	2.96	-0.06	-1.88
Black or African American, Not Hispanic or Latino	2.75	2.84	0.09	3.38
Hispanic or Latino	3.13	2.87	-0.25	-8.09
Other or Multiple, Not Hispanic or Latino	4.23	4.18	-0.05	-1.13

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

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

Table 6.3   Median and Mean Design Effects of 53 Outcomes: 2018 through 2020

Outcome	Median Design Effect			Mean Design Effect		
	2018	2019	2020	2018	2019	2020
Total	2.42	2.35	3.13	2.47	2.40	3.15
Age (Years)						
12 to 17	1.72	1.71	2.23	1.70	1.83	2.06
18 to 25	1.74	1.84	3.15	1.76	1.81	3.06
26+	1.78	1.78	2.58	1.88	1.82	2.63
Race/Ethnicity						
White, Not Hispanic or Latino	2.23	2.21	3.02	2.20	2.20	2.96
Black or African American, Not Hispanic or Latino	2.24	2.13	2.75	2.29	2.30	2.84
Hispanic or Latino	2.53	2.34	3.13	2.56	2.38	2.87
Other or Multiple, Not Hispanic or Latino	2.51	2.59	4.23	2.74	2.57	4.18

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2018 to 2020.

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, 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, and treatment received for both alcohol use and illicit drug use; and (d) *six mental health categories:* any mental illness, SMI, mental health services, MDE, suicidal thoughts, and serious psychological distress. 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 the 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 only three of the eight domains. The differences between the mean and median DEFFs were 3.38 percent or less for six of the eight comparison groups with the largest differences being 7.58 percent for the 12 to 17 age group and 8.09 percent for the non-Hispanic or Latino Black or African American race/ethnicity group.

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7. CVS Sample Experience

The Clinical Validation Study (CVS) sample was planned to be a probability subsample of 1,500 respondents drawn from the National Survey on Drug Use and Health (NSDUH) expanded sample during the first 6 months of 2020. Because of coronavirus disease 2019 (COVID-19), the CVS was limited to quarter 1 of the 2020 NSDUH with an expected sample size of 750 respondents.

The CVS sample was drawn from the expanded NSDUH sample by means of a stratified random sample design. The stratified design consisted of eight strata constructed from all combinations of three binary variables measuring the presence or absence of past year cigarette use (CIGPY_R), past year alcohol use (ALCPY_R), and past year marijuana use (MRJPY_R) because these variables are highly correlated with the corresponding substance use disorders (SUDs) of interest. These three variables are recodes representing raw versions of past year use of cigarettes, alcohol, and marijuana obtained early in the NSDUH interview. The three recoded variables can be created from information obtained early in the NSDUH interview, which enabled selection of the CVS sample before the SUD module was administered. This feature is important because the SUD module administered to the CVS sample differs from the SUD module administered to the remaining NSDUH respondents (i.e., the non-CVS sample). Using the initials of the three variables, this stratification design is referred to as the cigarette, alcohol, and marijuana (CAM) design. Table 7.1 shows the expected and observed sample sizes for the CVS by CAM stratum. In general, the CVS sample performed as expected.

Table 7.1   Expected and Observed CVS Sample Sizes, by CAM Stratum

CAM Stratum	CIGPY_R	ALCPY_R	MRJPY_R	Expected CVS Sample Size	Observed CVS Sample Size	Percent Relative Difference[1]
1	0	0	0	111	92	-17.12
2	0	0	1	13	17	30.77
3	0	1	0	168	201	19.64
4	0	1	1	103	104	0.97
5	1	0	0	45	45	0.00
6	1	0	1	18	14	-22.22
7	1	1	0	115	88	-23.48
8	1	1	1	177	138	-22.03
Total	N/A	N/A	N/A	750	699	-6.80

CAM = cigarette, alcohol, and marijuana; CVS = Clinical Validation Study; N/A = not applicable.

[1] Computed as 100 * (*Observed – Expected*) / *Expected*.

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

At the end of the NSDUH interview, CVS sample respondents were invited to participate in a follow-up clinical interview by telephone. Based on experience from past follow-up studies, it was expected that approximately 400 of the 750 CVS sample respondents would complete the CVS clinical follow-up, and these 400 cases would be referred to as the CVS follow-up sample.

Throughout quarter 1 data collection, the CVS sample, the CVS follow-up sample, and associated outcome rates were monitored. Although some outcome rates differed from their expected values, the overall quarter 1 sample performed as expected, and no adjustments to the CVS sampling rates were required. As shown in Table 7.2, a total of 699 quarter 1 respondents

were selected for the CVS. Of those selected, 539 agreed to participate in the CVS (77.1 percent), and 424 completed the follow-up interview (78.7 percent).

Table 7.2   Achieved Sample Sizes and Outcome Rates for the CVS

Item	Quarter 1 Expanded Sample	Eligible for the CVS[1]	Selected for the CVS[2]	Agreed to Follow Up[3]	Completed Follow-Up Interview[4]
Sample Size	15,628	15,001	699	539	424
Outcome Rate	N/A	0.9599	0.0466	0.7711	0.7866

CVS = Clinical Validation Study; N/A = not applicable.

[1] Outcome rate is computed as *Eligible for the CVS / Quarter 1 Expanded Sample.*

[2] Outcome rate is computed as *Selected for the CVS / Eligible for the CVS.*

[3] Outcome rate is computed as *Agreed to Follow Up / Selected for the CVS.*

[4] Outcome rate is computed as *Completed Follow-Up Interview / Agreed to Follow Up.*

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2020.

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This methodological report was prepared by the Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Behavioral Health Statistics and Quality, and RTI International. Work by RTI was performed under Contract No. HHSS283201700002C. Rong Cai served as the government contracting officer representative, and David Hunter served as the RTI project director.

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