2022-2023 National Survey of Family Growth: Sample Design

Prepared Under Contract #75D30120C09732 with

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August 2025

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1. Executive Summary

The National Survey of Family Growth (NSFG) is a survey on fertility, family formation, family planning, reproductive health, and closely related topics. This survey has been conducted by the National Center for Health Statistics since 1973 and is a principal source of national estimates on a variety of fertility, health, and family topics. The target population for the NSFG consists of all non-institutionalized women and men aged 15-49 years as of first contact for the survey, living in households, and whose usual place of residence is the 50 United States and the District of Columbia.

In many ways, the 2022-2023 NSFG sample design is consistent with the design implemented for the prior NSFG survey period conducted between 2011 and 2019. The 2022-2023 design was based on a national area multistage probability sample with a four-stage clustered sample design. The first stage involved the selection of primary sampling units (PSUs), defined as counties or groupings of neighboring counties. The second stage involved selection of secondary sampling units (SSUs), or segments, within PSUs. These are defined as Census Block Groups (CBGs) or groupings of two or more adjacent CBGs in cases where the expected number of eligible households was insufficient to support fieldwork. To achieve a targeted oversample of 20% Black respondents, the probabilities of selection of both PSUs and SSUs with higher percentage of Black individuals were increased, based on the most recently available American Community Survey (ACS) figures.

The third stage involved selecting addresses within SSUs using an address-based sampling (ABS) frame and field-enumerated segments. Addresses in ABS segments were stratified by the likelihood of containing one or more age-eligible individuals, and those from the higher likelihood strata were sampled at a higher rate. There was no stratification of addresses in field-enumerated segments. The fourth stage involved selecting one of the eligible persons within the address. Selection rates at this stage were set to target 18.2% of all interviews being teens aged 15-19 and 55% of all interviews being females. A fifth stage of sampling involved the double sampling of nonrespondents during the third phase of data collection, or the last 4 weeks, of each quarterly data collection cycle.

During the 2022-2023 data collection period, 98,307 addresses were selected for the NSFG sample, resulting in 28,505 completed household screener surveys and 9,957 completed main surveys (5,586 females and 4,371 males). Each single year of data is designed to be nationally representative; however, users of the 2022-2023 NSFG should use both years of data to permit statistically reliable estimates to be made. No single-year weights have been provided. Rather, a set of analysis weights have been developed to make respondents in the entire 2-year data set representative of the target population.

2. Overview

This report describes the sample design developed to facilitate data collection activities for the NSFG over the 2-year period beginning in January 2022 and ending in December 2023. It is based on a broader sample design planned for the 8-year period of January 2022 through December 2029. The target population for the NSFG is women and men aged 15–49 at first survey contact whose primary residence is in one of the 50 United States or the District of Columbia. Active-duty military who do not live on military bases are in scope, but individuals living in group quarters are considered out of scope, with the exception of those living in college dormitories or fraternity/sorority houses, who are eligible to be sampled via their parents' household.

The objective of the 2022-2023 NSFG sample design was to obtain a minimum of 10,500 completed main surveys in a cost-efficient manner to generate unbiased, nationally representative estimates of fertility, family formation, and related health topics as captured by the survey instrument, for the total

eligible population and for key population domains including age, sex, and race and Hispanic origin. To achieve this objective, we implemented a four-stage clustered sample. The first stage involved sampling counties (or groupings thereof), the second stage CBGs (or groupings thereof), the third stage housing units, and the fourth stage an age-eligible individual. Details such as how the four hierarchical sampling frames were constructed, sampling rates, and other sampling details are discussed in Sections 3 through 6, respectively. Section 7 describes a fifth stage of selection where a subsample of nonrespondents was selected for the last phase of data collection with an increased promised incentive.

As discussed in this report, selection probabilities were tailored at various sampling stages to achieve oversampling so that Black individuals represent a targeted 20% of completed main surveys (referred to after this as "completes"), teens represent a targeted 18.2% of "completes," and females represent a targeted 55% of completes. These are equivalent to the targets set for these three groups in the NSFG 2011–2019 design, with the exception that Hispanic individuals are no longer explicitly oversampled because of changes in the population. The 55% target for female completes was increased slightly in calendar year 2023 to increase the number of surveys completed by females by 500, as described in Section 5.

Aside from introducing a new self-administered, web-based data collection mode to complement NSFG's traditional in-person data collection mode, which is described in a separate report (see **Study Design and Data Collection Procedures** report for 2022-2023 NSFG), the sample design outlined in this document has many of the same features of the sample design implemented for NSFG 2011-2019 (see Sample Design report for 2017-2019 NSFG). Table 1 contains a summary of noteworthy differences of the 2022-2029 sample design relative to the 2011-2019 sample design.

Table 1: Summary of Differences Between the NSFG 2011-2019 Sample Design and NSFG 2022-2029 Sample Design

Feature	NSFG 2011-2019	NSFG 2022-2029	Aim(s)
1. Increased number of sampled primary sampling units (PSUs)	215 PSUs	222 PSUs	• Increase precision of point estimates • Increase complex sample design survey degrees of freedom
2. Increased year-to-year overlap of PSUs	Revisit a portion of certainty PSUs with a 1- or 2-year lag	Allocate certainty PSUs such that 40% of all PSUs in a given year also appear in an adjacent year	• More stable point estimates • Less interviewer turnover and training required
3. Redefined secondary sampling units (SSUs)	Census Blocks with 50 or more housing units	Census Block Groups with 200 or more housing units	• Lower within-SSU sampling rate means greater geographic spread and more respondent privacy • More timely American Community Survey data can be utilized
4. Redefined measure of size (MOS) for probability proportional to size selection in first and second stage	Estimated number of occupied housing units, oversampling for both Hispanic/Black individuals	Estimated number of individuals in target population, oversampling only Black individuals	• Hispanic representation has grown in recent years; oversampling to achieve 20% no longer deemed necessary • Using the estimated number of age-eligible individuals is a more accurate MOS

3. First Stage: Selection of PSUs

As noted by Brick et al. (2024), tracing back to ideas in Hansen, Hurwitz, and Madow (1953), a common definition for PSUs in nationwide in-person surveys is individual counties or groupings of adjacent, sparsely populated counties. PSUs are often sampled with probability proportional to size, or PPS (Cochran, 1977), where the *measure of size* (MOS) is the estimated number of housing units in the

target population. Assuming equal within-PSU sample sizes of housing units, which conveniently maintains roughly equivalent workloads to be undertaken by field interviewers (FIs), this approach theoretically results in a cancellation in the product of selection probabilities and renders an equal probability design. In practice, this does not precisely hold, because the MOS used is an estimate, and because certain counties are so large that they must be treated as certainty selections.

For the NSFG 2022-2029, we constructed a sampling frame consisting of 2,023 PSUs analogously to those in the NSFG 2011-2019 design. The 22 Metropolitan Statistical Areas (MSAs) with at least one million (estimated) occupied housing units based on the 2015-2019 ACS were treated as certainty selections, meaning they were guaranteed to be included in one or more years of the 8-year data collection period. The remaining set of PSUs was constructed from individual counties or groupings of sparsely populated contiguous counties using a customized algorithm that seeks to minimize the spatial size of the PSU while maintaining at least 15 SSUs in each PSU (see discussion in Section 4).

The population of 2,023 – 22 = 2,001 non-certainty PSUs was stratified into 8 mutually exclusive groups based on the cross-classification of Census region and MSA status. A sample of 208 non-certainty PSUs has been selected from these strata with stratum-specific PSU sample sizes assigned proportionally based on the stratum's sum MOS of its PSUs, where the MOS is described in more detail below. Eight PSUs, one per stratum, have been designated as reserve PSUs; thus far, none of these have been released into the field. The remaining 200 were allocated randomly to a single year. Table 2 summarizes the counts of PSUs on the frame and sampled, by stratum.

Table 2: Counts of PSUs on Frame and to be Sampled for 2022 to 2029, by Stratum

Stratum	Count of PSUs on Frame	Count of PSUs to be Sampled
Certainty Group 1	9	9
Certainty Group 2	13	13
Northeast non-MSA	34	2
Northeast MSA	128	21
Midwest non-MSA	237	4
Midwest MSA	422	41
South non-MSA	255	7
South MSA	666	87
West non-MSA	62	2
West MSA	197	36
Total	2,023	222

Within each stratum, PSUs were selected using Chromy's minimum replacement technique for PPS sequential sampling (Chromy, 1979), which is one of the sampling options built into PROC SURVEYSELECT in SAS® (SAS Institute, Inc., 2015). A weighted MOS was used such that larger PSUs and PSUs with higher concentrations of Black individuals were selected more frequently. Specifically, if we let M_{hi} represent the weighted MOS for PSU *i* in design stratum *h*, it is defined as

$$M_{hi} = 2.6 * \text{POP\_HH\_BLK\_1459}_{hi} + \text{POP\_HH\_NONBLK\_1459}_{hi}$$

where POP_HH_BLK_1549$_{hi}$ is the estimated count of individuals in the target population in the PSU who are Black and POP_HH_NONBLK_1549$_{hi}$ is the same for those who are not Black. Details on how the population estimates are calculated are included in the appendix.

Chromy's technique selects sampling units from an ordered sampling frame—in our case, ordered geographically within strata—but unlike other PPS sampling methods, the joint probability of selecting any pair of PSUs is always greater than 0.

Combined with the 22 certainty PSUs, FIs visit a total of 222 unique PSUs over the 8-year fielding period. Table 3 is given to aid visualizing this allocation strategy.

Table 3: Illustration of the NSFG 2022-2029 PSU Allocation Scheme by PSU Type by Year

PSU Grouping	Count	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Certainty Group 1	9	X	X	X	X	X	X	X	X
Certainty Group 2a	6	X	X	X	X				
Certainty Group 2b	7					X	X	X	X
Non-Certainty Group 1	25	X							
Non-Certainty Group 2	25		X						
Non-Certainty Group 3	25			X					
Non-Certainty Group 4	25				X				
Non-Certainty Group 5	25					X			
Non-Certainty Group 6	25						X		
Non-Certainty Group 7	25							X	
Non-Certainty Group 8	25								X
Total	**222**	**40**	**40**	**40**	**40**	**41**	**41**	**41**	**41**

The 9 certainty PSUs with greater than two million occupied housing units, referred to as "Certainty Group 1," appear in the sample each year, while the remaining 13 PSUs are partitioned into "Certainty Group 2a" and "Certainty Group 2b" and appear in the sample in half of the years. This was done by systematically allocating 6 PSUs to the first 4 years of data collection, and the other 7 to the second 4 years, after first sorting the list of 13 PSUs by the estimated proportion of individuals in the PSU's target population who are Black. The remaining 222 – 22 = 200 sampled PSUs were allocated to a single year.

Under this design, for each of the first 4 years, data are collected from 40 PSUs: 15 certainty and 25 noncertainty. In each of the second 4 years, data are collected from 41 PSUs: 16 certainty and 25 noncertainty. During the 2 years of data collection this report covers, years 1 and 2 corresponding to calendar years 2022 and 2023, data were collected from a total of 65 unique PSUs: 40 x 2 less the 15 PSUs appearing in the sample in both years.

The probability of selection for PSU *i* in design stratum *h* is initially assigned as

$$\pi_{hi}^{0} = n_h \frac{M_{hi}}{M_{h\cdot}}$$

where n_h is the number of PSUs sampled from design stratum *h* (i.e., from Table 2) and $M_{h\cdot} = \sum_{i=1}^{N_h} M_{hi}$ is the sum MOS across all N_h PSUs in design stratum *h*. The exceptions are for certainty PSUs, which occur in the 22 largest PSUs and occasionally in other design strata whenever $\frac{M_{hi}}{M_{h\cdot}} > \frac{1}{n_h}$. For any certainty PSUs, $\pi_{hi}^{0} = 1$.

The last component of the first-stage selection probability is an allocation factor, a_{hi}, attributable to the fact that not all PSUs are released in a single year. For PSUs in Certainty Group 1, $a_{hi} = 1$. For PSUs designated for Certainty Group 2a (Years 1 – 4), $a_{hi} = \frac{6}{13}$. For PSUs randomly designated in Certainty Group 2b (Years 5 – 8), $a_{hi} = \frac{7}{13}$. Lastly, for non-certainty PSUs, $a_{hi} = \frac{25}{200} = \frac{1}{8}$.

The final probability of selection for a PSU in a given year is then defined as

$$\pi_{hi} = a_{hi}\pi_{hi}^{0}$$

4. Second Stage: Selection of SSUs

Nested within PSUs are SSUs, also known as *segments*, that are defined as CBGs or a collection of adjacent CBGs. CBGs are aggregations of contiguous Census Blocks generally consisting of between 600 and 3,000 individuals. A total of 202,721 SSUs were created from a starting point of 217,739 CBGs. Neighboring CBGs were combined such that each SSU contained at least an estimated 200 occupied housing units and covered at least 43,500 square meters (10.75 acres).

A targeted sample of 12 SSUs is released from each PSU each year. The term "targeted" is used because a small number of SSUs are so large that they are effectively sampled twice—that is, the number of housing units sampled therein is doubled. Another exception to note is that 24 SSUs are released each year from the largest PSU in Certainty Group 1. This compensates for the fact that, without any modification, the average SSU probability of selection in that PSU would be less than one-half of the average SSU probability in all other PSUs.

For certainty PSUs, either 4 or 8 years' worth of SSUs are selected in advance of the first year the given PSU is in the field, and subsets randomly allocated into four or eight yearly replicates. For non-certainty PSUs, SSUs are sampled on a yearly basis. This adds flexibility for two reasons. The first is that more timely ACS data released in the future can be merged onto the frame and utilized. The second reason is that the oversampling factor(s) in the weighted PPS sampling approach (described below) can be modified, if necessary.

Within a year, SSUs were grouped into triads based on nearest geographical proximity to one another, and then randomly allocated to quarters. Additionally, a reserve of three SSUs per PSU is maintained in each annual sample. Reserve SSUs are used as substitutes on rare occasions when data collection would be challenging or altogether impossible because of an insufficient number of housing units—for example, a large military base covering a majority of the SSU's land area, or an SSU located in an area impacted by a natural disaster. During the 2022-2023 data collection period, a total of 979 SSUs from the population of 202,721 were selected. Only two of these SSUs were substituted with a reserve SSU.

Let M_{hij} represent the weighted MOS for SSU *j* in PSU *i* in design stratum *h*. Specifically,

$$M_{hij} = 2.6 * \text{POP\_HH\_BLK\_1459}_{hij} + \text{POP\_HH\_NONBLK\_1459}_{hij}$$

where POP_HH_BLK_1549$_{hij}$ is the estimated count of individuals in the target population in the SSU who are Black and POP_HH_NONBLK_1549$_{hij}$ is the same for those who are not Black.

The probability of selection for SSU *j* in PSU *i* in design stratum *h* is initially assigned as

$$\pi_{hij}^{0} = n_{hi}\frac{M_{hij}}{M_{hi\cdot}}$$

where n_{hi} is the number of SSUs sampled in the given PSU (in most cases, $n_{hi} = 12$), and $M_{hi\cdot} = \sum_{j=1}^{N_{hi}} M_{hij}$ is the sum MOS for all N_{hi} SSUs in the given PSU.

The last component of the second-stage selection probability is an allocation factor, a_{hij}, attributable to the fact that not all SSUs are released in a single year. For SSUs in PSUs in Certainty Group 1, $a_{hij} = \frac{1}{8}$. For SSUs in PSUs in Certainty Groups 2a and 2b, $a_{hij} = \frac{4}{8} = \frac{1}{2}$. For all other SSUs, $a_{hij} = 1$.

The final probability of selection for an SSU released in a given year is defined as

$$\pi_{hij} = a_{hij}\pi^{0}_{hij}$$

5. Third Stage: Selection of Housing Units

The third stage of the NSFG sample design is selecting housing units. The starting point in building the frame of housing units within each sampled SSU is RTI's enhanced ABS frame described at http://abs.rti.org/background. Specifically, an address serves as a proxy for a housing unit (or household), and the reader should note that these terms are used interchangeably in this report. RTI's ABS frame is derived from the United States Postal Service's (USPS) Computerized Delivery Sequence (CDS) file and is updated on a monthly basis. Addresses are geocoded with latitude and longitude coordinates, effectively placing each address into a hierarchy of useful geographical designations, including CBGs.

Within each sampled SSU, the net coverage rate (Harter et al., 2021) of the ABS frame was estimated by way of the ratio of the count of locatable (i.e., city-style) addresses to the estimated count of occupied housing units using the most up-to-date ACS figures. This is an estimate, and not a ratio calculated with certainty, since there can be errors on frame (e.g., new construction missing, geocoding errors) and in the ACS control totals (e.g., sampling error). For SSUs with an estimated net coverage rate of 85% or greater, addresses from the ABS frame were used as-is. We assumed that 90% of SSUs would have sufficient ABS frame coverage. Of the 979 SSUs sampled across the 2022-2023 data collection period, 910, or 93%, met the 85% coverage threshold. The sampling frame of housing units in the remaining 69 SSUs were populated by a *dependent listing* operation, whereby trained listers used electronic tablets loaded with an interactive, proprietary software containing street maps marked with the ABS-derived locatable housing units to confirm, remove, or add additional housing units to the SSU's frame.

A small portion of SSUs originally designated for listing were considered too large to list in their entirety. Those initially flagged for closer inspection were any SSU where the land area exceeded 10 square miles or the estimated number of occupied housing units exceeded 1,200. Among these, SSUs deemed too large to comprehensively list were partitioned into manageable sub-segments composed of Census Blocks with as close to equivalent numbers of housing units in each as possible. These estimated housing units were available at the Census Block level using the 2020 Census Address Count Listing file. Once the sub-segments were defined, one of them was selected using a simple random sampling procedure. Housing units listed in the sub-segment selected were weighted up to represent those sub-segments not selected (see Section 2.3 of Report XXX). To minimize the added variability this weighting procedure introduces, as few sub-segments were created as feasibly possible within the SSU.

For ABS (i.e., non-listed) SSUs, historical screening data from a prior nationally representative survey were used to fit a logistic regression model to predict the probability that the given address contains one or more age-eligible individuals. Available covariates included those at an area level derived from the Census Planning Database (CPB) and those at an address-level that come from vendor data regularly appended to RTI's ABS frame. A stepwise model selection procedure was used, starting with several dozen candidate covariates and all possible two-way interactions. Virtually all covariates maintained were age-range indicator or percentage (e.g., percentage of individuals 65+ in the CBG per ACS data in the CPB).

Address-level probabilities were then ranked into three approximately equal-sized strata (low, mid, or high likelihood of age-eligibility) based on the magnitude of these probabilities. Using a targeted eligibility rate boost of 4-5 percentage points, relative to what would be obtained via proportional allocation, PROC OPTMODEL in SAS (SAS Institute, Inc., 2014) was used to allocate the sample across

these strata while simultaneously (1) minimizing the unequal weighting effect, or loss in precision because of weighting (Kish, 1992); and (2) maintaining approximately equal sample sizes across SSUs within a quarter. Table 4 tabulates the count of all addresses in the various strata, for both the sampling frame and the sample. In all, 98,307 addresses were sampled for the 2022-2023 data collection period. Addresses were selected systematically after first sorting by ZIP code and the CDS variables USPS Carrier Route ID and Visit Sequence for non-listed SSUs, and comparably in listed SSUs by geographic information extracted from the listing software.

The probability of selecting address *l* in SSU *j* in PSU *i* in design stratum *h* is a function of its SSU-level address stratum, *k* (i.e., one of three age-eligibility strata or the stratum of listed addresses), and a sub-segmentation factor c_{hijk} where, aside from a few special cases of SSUs deemed too large to list in their entirety, $c_{hijk} = 1$. If we let N_{hijk} denote the number of addresses in stratum *k* within the given SSU, and n_{hijk} the number of addresses sampled released, the address selection probability is

$$\pi_{hijkl} = \frac{1}{c_{hijk}} \frac{n_{hijk}}{N_{hijk}}$$

Table 4: Count of Addresses in the Sampling Frame and Selected by Age-Eligibility Likelihood Stratum in the 2022-2023 NSFG Data Collection Period

Stratum	Count of Addresses in Sampling Frame	Percent of Addresses in Sampling Frame	Count of Addresses Selected	Marginal Address Sampling Rate
Listed SSUs	33,636	3.4	7,152	21.3
Low -Likelihood of Age Eligibility	319,992	32.4	18,691	5.8
Mid Likelihood of Age Eligibility	317,669	32.1	32,859	10.3
High Likelihood of Age Eligibility	316,817	32.1	39,605	12.5

The sample size of addresses per quarter was increased over the course of the 2022-2023 data collection period to account for a lower than anticipated yield rate ultimately observed, shown in Table 5. One driver of lower yield, requiring sample size increases, was COVID-19 restrictions early in 2022 and subsequent labor supply challenges that made recruiting and retaining FIs exceptionally difficult. Another reason for the sample size increase was to collect an additional 1,000 female main survey completes: 500 in 2023 and 500 in 2024. The 2022-2023 NSFG data collection period ended with 9,957 main survey completes. Given 98,307 addresses were ultimately sampled, this corresponds to a yield rate of 10.1%.

Table 5: Address Sample Sizes and Completes in the 2022 and 2023 NSFG Data Collection Period

	2022					
Metric	**Q1**	**Q2**	**Q3**	**Q4**	**2022 Total**	
Sample Size	4,826	6,036	9,997	9,993	30,852	
Completes	363	568	1,100	1,002	3,033	
Yield Rate	7.5%	9.4%	11.0%	10.0%	9.8%	
	2023					
Metric	**Q1**	**Q2**	**Q3**	**Q4**	**2023 Total**	**2022–2023 Total**
Sample Size	16,794	16,874	16,911	16,876	67,455	98,307
Completes	1,786	1,852	1,757	1,529	6,924	9,957
Yield Rate	10.6%	11.0%	10.4%	9.1%	10.3%	10.1%

Note that, although most addresses in RTI's enhanced ABS frame have a one-to-one relationship with a housing unit, some are associated with multiple housing units. These addresses are referred to as *drop points* (DPs) and the units therein are referred to as *drop point units* (DPUs). Nationwide, approximately 1.5% of HUs are DPUs, but they are concentrated most heavily in cities. DPUs pose a challenge for survey contact attempts by mail because no apartment number or unit designation is available, making it difficult to send targeted participation requests. Strategies used in practice range from excluding all or a portion from the sampling frame (Amaya, 2017), sampling all DPUs within a sampled DP (Lewis, McMichael, and Looby, 2023a), or substituting a nearby address from a building of the same size where unit numbers are available (Lewis, McMichael, & Looby, 2023b). For surveys like NSFG with an in-person data collection mode, DPUs are less of a concern, since the units can be identified by FIs on the ground.

Our strategy was to treat DPs (i.e., clusters of DPUs) as individual sampling units on the frame, after first excluding DPs with four or more DPUs. As reported in Amaya (2017), approximately 95% of all DPUs are located in DPs with two (80%) or three (15%) DPUs. If a DP address was selected, an attempt was made to collect data on all two or three DPUs therein. FIs were instructed to key in differentiable information about the case in the notes field of the sample record. No mail correspondence was sent to these addresses prior to FI data collection commencing in the fifth week of the quarter. Of the 98,307 addresses sampled during the 2022-2023 data collection period, 1,210, or 1.2%, were DPUs.

6. Fourth Stage: Selection of Individuals

The fourth stage of the NSFG sample design is selecting an individual within a sampled address. The first step in this process is requesting an adult informant to complete a short screening survey. The screener determines whether there are one or more individuals between the age of 15 and 49 living at the address, including any household members temporarily living away in university group quarters. If no age-eligible individuals were present, the housing unit was coded out as ineligible and data collection discontinued. For addresses with one or more age-eligible individuals present, the screening survey populated a roster of individual names (or initials) and a small number of critical demographics, such as age, sex, and race/Hispanic origin. From this roster, one individual was selected at random using a pre-programmed feature built into the screening survey software, and a main survey was attempted on the selected individual.

The selection of an individual within a housing unit was not made using simple random sampling approach. Rather, a MOS was assigned to each age-eligible individual, and a single selection was made with PPS with respect to these MOS figures. Table 6 shows the MOS definitions used in 2022 and 2023. In both years, the MOS was contingent on an individual's age and sex. Females and teens were assigned a larger MOS to facilitate oversampling relative to males and non-teens because NSFG targets 55% of all main survey completes to be female and 18.2% of all main survey completes to be teens. (Strategies to oversample Black individuals to be 20% of all respondents occur at the PSU and SSU stages discussed in Sections 2 and 3 of this report.) The MOS values used in 2022 were carried forward from those used in the 2017-2019 NSFG design—see Table 8 of Sample Design report for 2017-2019 NSFG. However, these MOS figures were decreased for males in 2023, thereby increasing the selection probabilities of females, because of two factors: (1) fewer than the targeted 55% female completes were obtained in 2022, which may partially be attributable to the revised mixed-mode design; and (2) to account for the aforementioned sample increase to obtain 1,000 additional female completes over a 2-year period that began in 2023.

Table 6: Within-Household Measures of Size in 2022 and 2023

Category	2022	2023
Females 15-19	1.00	1.00
Females 20-49	0.25	0.25
Males 15-19	0.91	0.64
Males 20-49	0.23	0.16

For housing unit *l* of address stratum *k* within SSU *j* in PSU *i* in the primary design stratum *h*, a MOS was assigned according to Table 6. If we denote this MOS as F_{hijklm}, the probability of selecting individual *m* is

$$\pi_{hijklm} = \frac{F_{hijklm}}{F_{hijkl\cdot}}$$

where $F_{hijkl\cdot}$ is the sum of the MOS values for all individuals in the household.

7. Fifth Stage: Double-Sampling for Nonresponse

The fifth and final stage of the NSFG sample design is a cost-efficient technique to reduce nonresponse with a more intensive data collection approach referred to in the literature as *double sampling* or *two-phase sampling* for nonresponse (Deming, 1953; Hansen & Hurwitz, 1946). During the 2022-2023 NSFG, at the conclusion of Phases 1 and 2 of the quarterly data collection cycle—that is, after the first twelve weeks—a stratified random subsample of nonrespondents was selected to be offered an additional $40 promised incentive to participate. This final 4 weeks marks Phase 3 of the 16-week data collection cycle, and the motivation is twofold: (1) increase the response rate and (2) mitigate the risk of nonresponse bias. These benefits come at a cost with respect to precision, however, as the subsampling must be reflected in an additional weighting factor (see Section 2.5 of **Weighting Methodology** report), which can increase the variance weighted survey estimates.

Prior to the onset of Phase 3, nonresponding cases were stratified into to one of six mutually exclusive strata based on status. Counts and percentages of the cases falling in each stratum/status are given in Table 7. These figures are for all 8 quarters of the 2022-2023 NSFG data collection period. For the 98,307 sample cases sampled over the 8 quarters, a total of 78,212 cases had either broken off or not responded by the end of Phase 2 in the given quarter. These 78,212 were stratified based on the cross-classification of its breakoff status and data collection stage. Screener breakoffs are those for which a

screener survey for the address was started but the individual did not reach the end and hit "submit." A main survey breakoff is one where the sampled individual started the male/female instrument but discontinued prior to the computer-assisted self-interview (CASI) section of the survey. Individuals reaching the CASI section of the survey are considered completes, with sufficient data obtained to retain in the final analysis data set (i.e., so not considered a breakoff).

Any breakoff scenario, whether at the screener or at the female/male main survey, was selected into the Phase 3 sample with certainty. There were 2,634 of these cases. Nonrespondents at any stage who had not started the screener or main survey were sampled at a marginal rate of 43.3%. As can be observed in Table 7, the vast majority of these cases were sampled addresses that had not yet completed the screening survey. During the first 6 quarters of the 2022-2023 NSFG period, the three strata of nonrespondents were sampled at approximately 40%, but their respective sampling rates were increased to 50% in the final 2 quarters of 2023 to increase the number of main survey completes obtained for the first public-use file. These cases sampled for Phase 3 were selected within strata using simple random sampling. Of the 35,358 cases selected for Phase 3, a total of 1,490 ended up completing the survey, for a marginal yield rate of 4.2%. Per the last column of Table 7, this yield rate was higher (12.4%) for screener breakoffs and for individual nonrespondents who had been selected for the male survey (12.8%) or female survey (15.3%).

Table 7: Cases Qualifying and Sampled for Phase 3, by Status, and Number of Completes in the 2022 and 2023 NSFG Data Collection Period

Status	Number of Cases Qualifying for Phase 3	Number of Cases Selected for Phase 3	Phase 3 Marginal Sampling Rate	Number of Main Survey Completes in Phase 3	Phase 3 Marginal Yield Rate
Breakoff During Screener	1,201	1,201	100.0	40	3.3
Breakoff During Female Main Survey	1,045	1,045	100.0	99	9.5
Breakoff During Male Main Survey	388	388	100.0	48	12.4
Nonrespondent at Screener	71,079	30,750	43.3	1,025	3.3
Nonrespondent at Female Main Survey	2,309	1,029	44.6	157	15.3
Nonrespondent at Male Main Survey	2,190	945	43.2	121	12.8
Totals	78,212	35,358	45.2	1,490	4.2

The probability of selecting a case is a function of its status at the onset of Phase 3. There was no change the probability of selection for cases responded prior to Phase 3. On the other hand, nonrespondents were assigned a modified probability of selection based on their status, which could be either at the address-level (e.g., nonrespondent/breakoff at screener) or at the individual-level (e.g., nonrespondent/breakoff at main survey). If we let $N_{hijkl'}$ denote the number of address-level cases eligible for Phase 3 and $n_{hijkl'}$ denote the number selected for a given quarter, address-level nonrespondents selected into Phase 3 had their probability of selection modified to

$$\pi_{hijkl'} = \pi_{hijkl} * \frac{n_{hijkl'}}{N_{hijkl'}}$$

Note that if a screener was completed during Phase 3, this probability was further multiplied by π_{hijklm} , calculated as described in Section 6.

If we let $N_{hijklm'}$ denote the number of individual-level cases eligible for Phase 3 and $n_{hijklm'}$ denote the number selected for a given quarter, individual-level nonrespondents selected into Phase 3 had their probability of selection modified to

$$\pi_{hijklm'} = \pi_{hijklm} * \frac{n_{hijklm'}}{N_{hijklm'}}$$

8. Timeline of Sampling Events

Finally, Table 8 summarizes six key sampling events, their respective frequency of occurrence, and the point(s) in time when conducted. The table also makes note of certain additional specifics, as pertinent.

Table 8: Summary and Timeline of Key Sampling Events

Event	Frequency	Point in Time	Notes
1. PSU Sample Selection and Allocation	Once	Summer 2021	• One reserve PSU per stratum (8 total) selected
2. SSU Sample Selection and Allocation	Once for certainty PSUs; annually for non-certainty PSUs	Summer 2021 for Certainty Group 1 and 2a PSUs; Summer 2025 for Certainty Group 2b PSUs; annually in Summer for non-certainty PSUs	• Weighted measures of size based on most recent ACS/ABS frame figures • Randomly allocated to years for certainty PSUs • Within years and for non-certainty PSUs, clustered geographically into triads and randomly assigned to quarters • Three reserve SSUs per PSU maintained
3. Listing in Segments with Estimated Net Coverage Rate of ABS Frame < 85%	Annually	Late Fall of Year Prior, Finishing Early in Given Data Collection Year	• Conducted up front for all sampled SSUs requiring it within the PSU
4. HU Sample Selection and Release	Quarterly	Last month of prior quarter	• Drawn from recent ABS frame available • Drawn from listing frame where applicable
5. Individual Selection within HH	Ongoing	Upon completion of screener	• Handled automatically with pre-programmed MOS parameters to oversample females and teens
6. Sample Nonrespondents for Phase 3	Quarterly	Immediately before the start of 13th week, start of Phase 3	• Goal is to minimize lag between sample selection and when Phase 3 begins

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Appendix: Procedure for Estimating the Age-Eligible Population at the Census Block Group Level Not Living in Group Quarters

The American Community Survey (ACS) publishes many estimates of population counts by age and housing type (i.e., households or group quarters). The NSFG targets individuals aged 15-49 living in households, which is not directly available in published data at the Census Block Groups (CBG) level. This brief appendix describes a procedure to disentangle these totals from other published totals under certain mild assumptions.

The following estimates of individuals are available in published ACS data at the CBG level either directly or by summing together other available estimates:

- POP_1517 – population aged 15-17 living in either households or group quarters
- POP_3549 – populated aged 35-49 living in either households or group quarters
- POP_5064 – population aged 50-64 living in either households or group quarters
- POP_GQ_0017 – population aged 0-17 living in group quarters
- POP_HH_0017 – population aged 0-17 living in households
- POP_HH_1517 – population aged 15-17 living in households
- POP_HH_1834 – population aged 18-34 living in households
- POP_HH_3564 – population aged 35-64 living in households

The ACS concurrently publishes the following estimates of individuals at the state level:

- POP_GQ_0014_STATE – population aged 0-14 living in group quarters
- POP_GQ_1517_STATE – population aged 15-17 living in group quarters

The first step is to estimate the number of people aged 35-49 in households using

POP_HH_3549 = POP_HH_3564*(POP_3549/(POP_3549 + POP_5064))

which adjusts the household population aged 35-64 by the proportion of people aged 35-49 of those aged 35-64 in the CBG. The second step is to estimate the number of people aged 15-17 living in group quarters as follows:

POP_GQ_1517 = (POP_GQ_1517_STATE /

(POP_GQ_0014_STATE + POP_GQ_1517_STATE))*POP_GQ_0017

In words, the population of all minors living in group quarters is multiplied by the rate of minors living in group quarters in the state who are aged 15-17. For most CBGs, POP_GQ_0017 is 0 so POP_GQ_1517 is also 0. In a few instances, this calculation leads to POP_GQ_1517 > POP_1517. When that occurs, set POP_GQ_1517 to POP_1517.

The third step is to estimate those aged 15-17 living in households using

POP_HH_1517 = POP_1517 - POP_GQ_1517

This allows us to estimate the number of people aged 15-49 living in households as

POP_HH_1549 = POP_HH_1517 + POP_HH_1834 + POP_HH_3549

To estimate the number of Black individuals aged 15-49 living in households, the proportion of people living in households who are Black is estimated and then applied to POP_HH_1549. Using published ACS data, estimates are available for:

- POP_BLK_HH – population living in households, Black or African American alone
- POP_TOT_HH – population living in households

Thus, the Black and non-Black population in households aged 15-49 is estimated as follows:

POP_HH_BLK_1549 = POP_HH_1549*(POP_BLK_HH/ POP_TOT_HH)

POP_HH_NONBLK_1549 = POP_HH_1549 - POP_HH_BLK_1549