United States® Census Bureau

U.S. Department of Commerce
U.S. CENSUS BUREAU
census.gov

October 1st, 2019

2018 National Survey of Children's Health

Source and Accuracy Statement

1.0 INTRODUCTION

The National Survey of Children's Health (NSCH) is conducted by the U.S. Census Bureau for the U.S. Department of Health and Human Services' (HHS) Health Resources and Services Administration's (HRSA) Maternal and Child Health Bureau (MCHB). It is designed to provide national and state-level information about the physical and emotional health and well-being of children under the age of 18 living in the United States, their families and their communities, as well as information about the prevalence and impact of children with special health care needs (CSHCN).

This Source and Accuracy Statement (S&A) provides an overview for the following phases of the 2018 NSCH survey cycle.

2.0 SAMPLE DESIGN

2.1 Creation of the Sample Frame

The population of interest for the 2018 NSCH is all children under the age of 18, residing in the United States on the date of the survey. Among many other key elements, the survey frame was designed to identify households with children and to provide information about household access to the internet.

The 2018 NSCH sample frame was developed from two sources: the Edited Master Address File Extract (EDMAFX) created by the Demographic Statistical Methods Division (DSMD) of the Census Bureau, and a file of administrative flags that was created by the Census Bureau's Center for Economic Studies (CES).

2.1.1 *Use of the Edited Master Address File Extract*

The Census Bureau's Master Address File (MAF) is an accurate inventory of all known living quarters in the United States, Puerto Rico, and associated island areas. It supports most of the censuses and surveys that the Census Bureau conducts, including the decennial census, the American Community Survey (ACS), and ongoing demographic surveys. The content of the MAF includes mailing and location addresses, unit type attributes, geographic codes for areas such as state, county, census tract, and census block for each living quarters, and source and history data.

The EDMAFX is created at least once every year, specifically for use by DSMD's ongoing demographic surveys. One of the important uses of the EDMAFX to the 2018 NSCH was the assignment of a housing unit validity flag (VALDF18), resulting from filtering rules and processes implemented on the file by DSMD. This flag identified records on the EDMAFX that were valid housing unit mailing addresses, and thus were eligible to be sampled for the NSCH.

The January 2018 version of the EDMAFX was used in the NSCH sample frame creation and consisted of 3,142 county and county equivalent address files rolled up to 51 state-level address files, which include the District of Columbia. Only records having VALDF18=1 (valid housing unit) were kept, with the unique identification variable MAFID[1] to match to CES's file of Administrative Flags.

2.1.2 *Use of CES's File of Administrative Flags*

All MAFIDs in the January 2018 MAF-X[2] were appended with flags (e.g., poverty, internet access, stratum) from administrative and other data sources compiled by CES. This national file was matched to the EDMAFX to produce the sample frame.

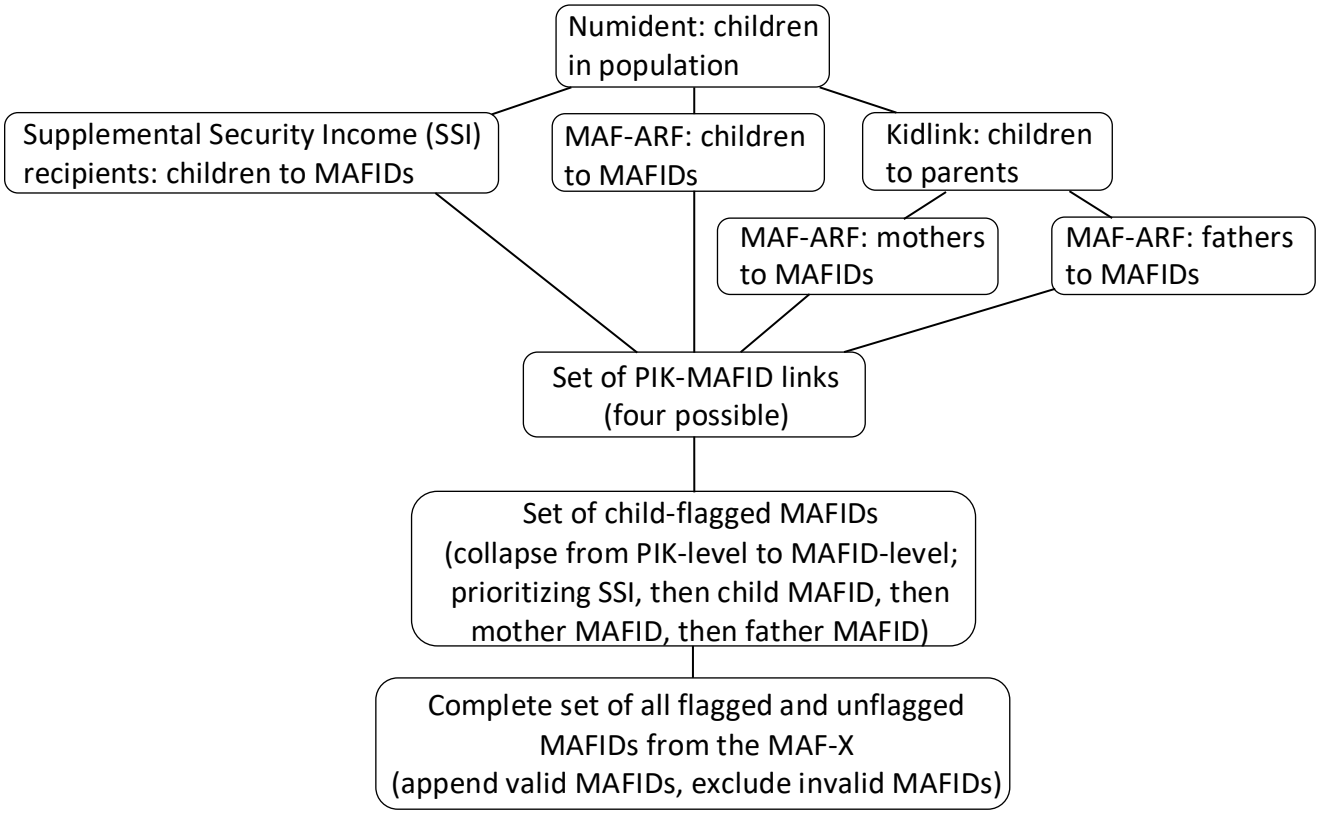
2.1.2.1 Processing Overview of CES's 2018 NSCH File of Administrative Flags

The frame for all households with children came from three data sources: the Numident, the Census kidlink file, and the MAF Auxiliary Reference File (MAF-ARF). See Figure 1 for an overview of the process.

The Numident is based on all individuals who have been assigned Social Security numbers. It is a list of Social Security number applicants with demographic data updated from federal tax data and various administrative records. There were 82,960,000 children in the 2017 Numident who would be 0–17 years old on June 1, 2018.

Figure 1: Illustration of File Processing

[1] Since MAFID cannot be released, similar household identification variables were created and placed on the Screener (HHIDS) and Topical Files (HHID).
[2] CES used different extracts of the January 2018 MAF in their processing, specifically the MAF Extracts (MAF-X) and the MAF Auxiliary Reference File (MAF-ARF).



To identify and sample households containing children in the Numident, the children in the Numident had to be connected to the households in which they live. This was done with the Census kidlink file. The Census kidlink file is a prototype linkage between children and parents based on Census and administrative records. The file uses data from Census surveys and federal administrative records to link children Protected Identification Keys (PIKs[3]) to parent PIKs. It identifies the parents of children in the Numident. The source data for the Census kidlink file are: the Census Numident, the 2010 Decennial Census Unedited File, the Internal Revenue Service (IRS) 1040 and 1099 files, the Medicare Enrollment Database, the Indian Health Service Database, the Selective Service System, and Public and Indian Housing and Tenant Rental Assistance Certification System data from the Department of Housing and Urban Development. Of these, the IRS 1040 files provided the most significant information.

The MAF-ARF was used to update household location. It links person identifiers to address identifiers using Census survey data and federal administrative data. The source data for the MAF-ARF file are the same as those listed for the Census kidlink file.

For each child observation from the Numident, there are four possible MAFIDs: the Supplemental Security Income (SSI) MAFID, the child to MAF-ARF MAFID, the child-to-kidlink-

[3] CES uses an anonymous identifier called a PIK to link individuals across datasets while protecting their personally identifiable information.

to-mother-to-MAF-ARF MAFID, and the child-to-kidlink-to-father-to-MAF-ARF MAFID. Using that order, a single MAFID was allocated. The MAFID match rate was 87.2 percent. The 73,870,000 children associated with a MAFID were then collapsed down to 38,410,000 unique MAFIDs. This implies 1.92 children per household for households assigned a flag.

The MAFID list was then scaled up to the universe of MAFIDs to allow sampling of unflagged households. A merge of the 38,410,000 unique child-flagged MAFIDS with the January 2018 ACS MAF-X file matched 38,410,000 MAFIDs with child flags, added 164,400,000 MAFIDs without child flags, and removed 300 MAFIDs with child flags. Thus, the resultant file had 202,800,000 MAFIDs[4], of which 38,410,000 MAFIDs include child flags.

2.1.2.2 Paper-only Response Probability Flag

Since 2013, ACS respondents have been able to submit survey forms over the internet in addition to completing and mailing back a paper questionnaire. Using ACS response mode choices summarized at the block-group level, as well as other block-group and tract-level characteristics, web and paper response mode probabilities were modeled by block group. Households on the NSCH frame were located within block groups and assigned a paper-only response probability.

A variable WEBGROUP was defined for the NSCH to distinguish households highly likely to complete the survey by paper (P) from those with a higher likelihood to complete by web (W). The sampled households with paper-first response probabilities in the highest 30 percent were flagged as 'High Paper' (P) and received a paper questionnaire with the initial web invitation.

2.1.2.3 Local-Area Household Income Relative to the Poverty Rate

The CES file also has a set of poverty variables from the 2016 five-year ACS file. These variables measure the proportion of households with household income in an interval defined by the poverty rate. Ultimately, a variable POVERTY was defined as Y or N from the proportion of households in the block group that have household income less than 150 percent of the poverty rate (30 percent cut-off) for use in sampling.

2.1.3 *Final 2018 NSCH Sample Frame*

The data files detailed in Sections 2.1.1 and 2.1.2 were merged together based on MAFID to create the final sample frame. Only the records that are valid from the file in Section 2.1.1 are eligible.

2.2 Sampling Strata

[4] The ACS MAF-X has both valid and invalid records, which is why the resulting file has more records than there are housing units in the United States.

Each state had three strata: 1, 2a, and 2b, which were defined by CES's child flag. Households flagged as having at least one child under the age of 18, determined by having an explicit link from a child to the household in administrative data, were assigned to Stratum 1. All other households which did not have explicit links to children were assigned to Stratum 2a or 2b based on their likelihood of having a child. Child presence in these households was modeled as a function of variables available in administrative data for all households on the MAF-X. The model was estimated with data from the most recent year of the ACS, in which child presence can be observed. Then, parameter estimates from that model were used to predict the likelihood of child presence for the households. These models were estimated separately for each state, and the threshold for bifurcation is based on an objective of maximizing the size of Stratum 2b while also maintaining 95 percent coverage of households with children in Strata 1 and 2a.

Variable state-level sampling occurred in only Strata 1 and 2a, with no households selected from Stratum 2b. Since Stratum 2b contains those households deemed very unlikely to have children, based on the lack of explicit links to children as well as the modeling results, the efficiency of the survey was increased by not sampling in the stratum.

2.3 Selection of the Sample Households and Additional Assignments

The 2018 NSCH sample frame is a listing of the valid housing units from the MAF, appended with several administrative flags. Attachment A provides the calculated expected sample sizes, by state and stratum. Sample sizes were calculated by factoring in the expected valid address rate, expected response rates, and the prevalence of households with children. Addresses in Stratum 1 were sampled at a higher rate than Stratum 2a to increase the number of households with children in the sample while limiting the increase in the variance from the differential sampling rates. The oversampling factor (sampling rate for Stratum 1 divided by the sampling rate for Stratum 2a) ranged from 2 to 5 across the states. The total sample size was determined to be 176,054 housing units[5], 105,792 selected from Stratum 1 and 70,262 from Stratum 2a, and was expected to yield approximately 450 Topical interviews per state. (Note: The expected totals differ from the actual totals as a result of rounding in the sampling process. The resulting sample size was 176,052 households, with no state's actual sample size differing from its expected sample size by more than one.)

2.3.1 *Process of Selecting Households*

The sample was a systematic random sample from an ordered list. We sorted within each state and stratum by county, POVERTY (the variable described in Section 2.1.2.3), Census tract, and MAFID prior to sampling.

[5] The total expected sample size of 176,054 was determined primarily from the available budget.

Sampling intervals determined the households selected to be in sample and were calculated for each of the two sampling strata in each state. The formula is the state-level stratum size on the frame divided by the calculated state-level expected sample size in the stratum.

When determining the random start for each stratum of each state, first a uniform random number between (0,1) was generated. The returned value was then multiplied by the sampling interval to get the random start, or the first record to be in sample for that state and stratum.

2.3.2 *Assignment of Incentive and Certified Mail Group to the 176,052 Sample Records*

Incentive ($0 (control), $2, or $5) and certified mail group (receive a certified mail package or not) for each MAFID were assigned randomly across the households that were selected for sample, by state. Forty-five percent of the sample was assigned to receive a $2 incentive, 45 percent of the sample was assigned to receive a $5 incentive, and the remaining 10 percent received no incentive and act as a control to monitor the effectiveness of the incentive treatment. Within each of the three incentive groups, 50 percent of the sample randomly received a certified mail package while the other 50 percent did not. These assignments for each of the sample records were made before any data was collected.

2.4 Selection of the Sample Children

2.4.1 *Determining Each Child's Eligibility*

A child is an eligible child if their age is less than 18 years.

2.4.2 *Determining the Status of each Eligible Child's Special Health Care Needs*

An eligible child in a household is deemed a child with special health care needs (C_CSHCN=1) if one or more of the following five groups have Screener responses of 'yes' to all of the questions in that group.

Group 1:
Does (fill with CN_NAME) CURRENTLY need or use medicine prescribed by a doctor, other than vitamins? = yes (C_K2Q10=1) **AND**
Is (fill with CN_NAME)'s need for prescription medicine because of ANY medical, behavioral, or other health condition? = yes (C_K2Q11=1) **AND**
Is this a condition that has lasted or is expected to last 12 months or longer? = yes (C_K2Q12=1)

Group 2:
Does (fill with CN_NAME) need or use more medical care, mental health, or educational services than is usual for most children of the same age? = yes (C_K2Q13=1) **AND**
Is (fill with CN_NAME)'s need for medical care, mental health, or educational services because of ANY medical, behavioral, or other health condition? = yes (C_K2Q14=1) **AND**
Is this a condition that has lasted or is expected to last 12 months or longer? = yes (C_K2Q15=1)

Group 3:
Is (fill with CN_NAME) limited or prevented in any way in his or her ability to do the things most children of the same age can do? = yes (C_K2Q16=1) **AND**
Is (fill with CN_NAME)'s limitation in abilities because of ANY medical, behavioral, or other health condition? = yes (C_K2Q17=1) **AND**
Is this a condition that has lasted or is expected to last 12 months or longer? = yes (C_K2Q18=1)

Group 4:
Does (fill with CN_NAME) need or get special therapy, such as physical, occupational, or speech therapy? = yes (C_K2Q19=1) **AND**
Is (fill with CN_NAME)'s need for special therapy because of ANY medical, behavioral, or other health condition? = yes (C_K2Q20=1) **AND**
Is this a condition that has lasted or is expected to last 12 months or longer? = yes (C_K2Q21=1)

Group 5:
Does (fill with CN_NAME) have any kind of emotional, developmental, or behavioral problem for which he or she needs treatment or counseling? = yes (C_K2Q22=1) **AND**
Has his or her emotional, developmental, or behavioral problem lasted or is it expected to last 12 months or longer? = yes (C_K2Q23=1)

2.4.3 *Strategies for Selecting the 2018 NSCH Sample Children (SC_) from the Screener Responses*

For both the paper and the web data collection instruments, the sample child was selected randomly from the first four eligible children based on the probabilities of selection listed in Table 1 after sorting by:

- special health care needs status
  - age (youngest to oldest)
- non-special health care needs status
  - age (youngest to oldest)

In the case of two or three children having the same age and the same special health care needs status, an additional sort by name (A to Z) was implemented. If they also had the same name, e.g., all 'blank', then sorting had no effect.

A special case was children in households that had four or more eligible children. These children were sorted first by their special health care needs status, then by name (A to Z), and then sorted by age (youngest to oldest).

The strategies employed for selecting a single child allowed for an oversample of both CSHCNs and children 0 through 5 years old.

Table 1: Strategies for Selecting the Sample Children

Number of Eligible Children in Household (TOTKIDS_R)	Number of Eligible Non-SHCN* (TOTNONSHCN), CSHCN (TOTCSHCN)	Probability of Selection for non-SHCN	Probability of Selection for CSHCN†	Notes
1	1,0 or 0,1	100%		Single child is selected.
2	2,0 or 0,2	• If only 1 child is aged 0-5, that child's probability of selection is 62% and the other child's probability of selection is 38%. • Otherwise, each child has an equal chance of selection of 50%.		Includes 60% oversampling of children aged 0-5.
2	1,1	36%	64%	Includes 80% oversampling of CSHCN.
3	3,0 or 0,3	• If only 1 child is aged 0-5, that child's probability of selection is 44% and each of the other two children have an equal chance of selection of 28%. • If 2 children are aged 0-5, each has a probability of selection of 38% and the other child has a probability of selection of 24%. • If all 3 children are aged 0-5 or 6-17, then each child has an equal chance of selection of 33.3%.		Includes 60% oversampling of children aged 0-5.
3	2,1	52% • 26% probability of selection for *each* non-SHCN child.	48%	Includes 80% oversampling of CSHCN.
3	1,2	22% • 39% probability of selection for *each* CSHCN.	78%	Includes 80% oversampling of CSHCN.
4 or more	Any combination	Before the sort, each of the first 4 children has an equal 25% probability of selection.		Simple random selection of 1 of the first 4 (sorted) children, regardless of non-SHCN or CSHCN.

* SHCN – Special Health Care Needs

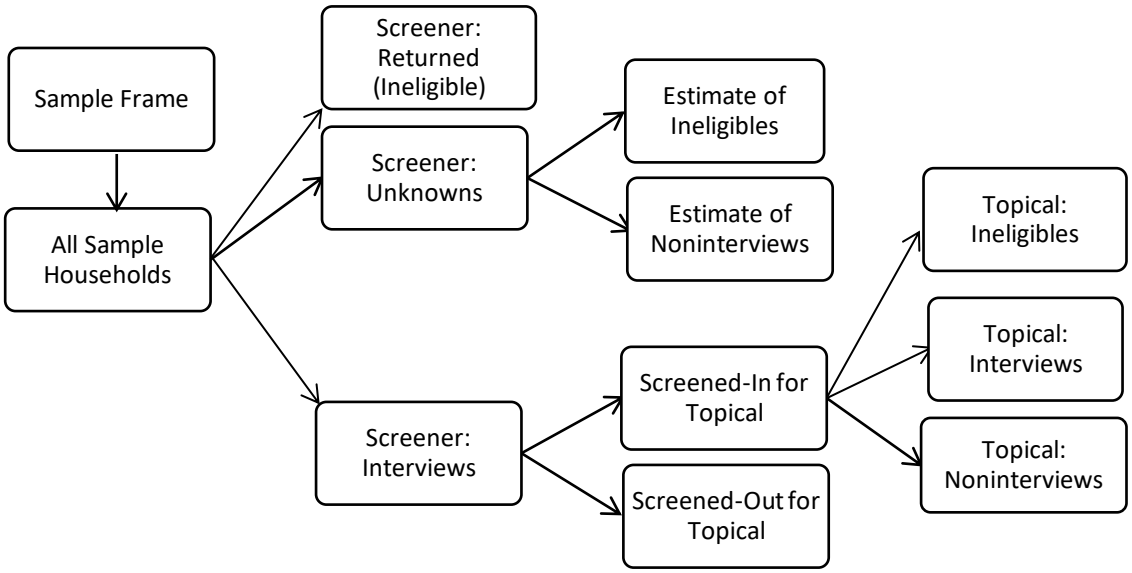
† CSHCN – Children with Special Health Care Needs

3.0 SURVEY WEIGHTS

3.1 Overview of the Weighting Process

Figure 2 provides a framework for the weighting steps. The weighting process used the data from each phase of the data collection, from both the paper and web instruments, to produce final weights for the Screened-in Households, Screener Children, and Topical Selected Children.

Figure 2: From Sample Frame to Final Outcome



The weighting process was done by state, with the District of Columbia treated as a state. Weighting for the interviewed children began with the base weight (BW) for each sample household, followed by a Screener nonresponse adjustment (SNA). Then, the eligible children from the Screener interview cases were raked to population controls (Child-Level Screener Factor=CLSF). A within-household subsampling factor (WHSF) was applied to the Screener interview cases to adjust for the subsampling of a single child, and a Topical nonresponse adjustment (TNA) was applied to the Topical interview cases. As a factor for the final weight for interviewed children, a final raking adjustment (RAK) to various demographic controls was performed. The weighting process for all Screener children was a subset of these six factors. Similarly, the screened-in households received a household-level weight, calculated using BW, SNA, and a Household Post-Stratification Adjustment (HPSA).

3.1.1 *Base weight*

The BW for each sample housing unit is the inverse of its probability of selection for the Screener. Each state had two sampling strata with different probabilities of selection for each. If there had been no nonresponse and the survey frame was complete, using this weight would give unbiased estimates for the survey population.

3.1.2 *Screener Nonresponse Adjustment Factor*

The SNA increased the weights of the households responding to the Screener to account for all the households not responding to the Screener.

The count of Screener noninterviews is an estimate of the expected number of eligible households from those cases for which nothing is received. The term eligible here refers to the address belonging to an occupied, residential household. The expected number of eligible cases was estimated by taking the eligibility rate among the known cases and applying it to the unknown cases.

Sixteen Screener weighting cells were defined by the sampling stratum (STRATUM), an indicator of the likelihood of households to respond by paper (WEBGROUP), a block-group poverty measure (yes/no) variable indicating the proportion of households with income less than 150 percent of the poverty rate, and a Metropolitan Area Flag (located within vs. outside of a metropolitan area).

Within each resultant Screener weighting cell, the SNA was defined as:

$$\left(\frac{\text{weighted sum of Screener interviews + S\_NONINT}}{\text{weighted sum of Screener interviews}}\right)$$

where S_NONINT =

$$\left(\frac{\text{weighted sum of Screener interviews}}{\text{weighted sum of Screener interviews + weighted sum of Screener ineligible households}}\right) \times$$

$$(\text{weighted sum of households with unknown Screener eligibility})$$

This was the last of the weight processing for Screener households for which there was no Screener interview or for interviewed households that indicated having no eligible children.

3.1.3 *Household Post-Stratification Adjustment Factor*

All households that indicated on the Screener that there were eligible children present (also called screened-in households) were given a household-level weight. In addition to the BW and SNA, there was an HPSA applied in order to achieve the final screened-in household weight. This factor consisted of ratio adjustments to population controls attained from 2017 ACS data.

Households were put into one of 255 cells depending on their state and race/ethnicity of the selected child. The five cells within each of the 51 states were Hispanic White alone, non-Hispanic White alone, Black alone, Asian alone, and Other. Cells were collapsed as necessary. Within each cell, the HPSA was calculated as the control for the cell divided by the cell's weighted total.

3.1.4 *Child-Level Screener Factor*

All eligible children (at most four) from the Screener interviewed households were given a Child-Level Screener Weight in order to eventually produce state-level CSHCN prevalence estimates. This was accomplished through iterative raking to population controls attained from the 2017 ACS single-year estimates.

Raking to the population controls was accomplished using the following three analytical domains of interest, in this order: (Cells were collapsed as necessary.)

- Dimension #1 – State by Child's Race (White, Black, Asian, Other)
- Dimension #2 – State by Child's Ethnicity (Hispanic, non-Hispanic)
- Dimension #3 – State by Child's Sex by Child's Age Group (0-5, 6-11, 12-17)

Each iteration consisted of three ratio adjustments. Ratio adjustments control the weights to the respective dimension control totals and each ratio adjustment is called a rake. The first rake used the most recent intermediate weight (BW × SNA) as the child's input weight in the raking process. All subsequent rakes used the resulting weight from the previous rake as the input weight. The iterative raking process continued until convergence was met for all cells. Convergence required the cell's weighted total to be within one percent of the control.

At the end of the process, the CLSF was calculated as the weight after the final iteration divided by the weighted total prior to raking (BW× SNA).

Households where a child was selected from a completed Screener to receive a Topical interview, but became ineligible to complete a Topical were not assigned any further nonzero weighting factors. Examples may include households for which the Screener was received after the final Topical mailing, the child is no longer a resident of the household, etc.

3.1.5 *Within-Household Subsampling Factor*

Weights of the remaining eligible cases were adjusted for the subsampling of children within the households. The value of the adjustment is the inverse of the probability of selection for the selected children. Probabilities varied by the number of children in the household, the presence of children aged zero through five, and the presence of CSHCNs. Details in the previous Table 1 show these probabilities of selection for each possible scenario. The weights for the selected children now represented all children (at most four) in the household, and took into account oversampling for CSHCNs and young children.

3.1.6 *Topical Nonresponse Adjustment Factor*

Similar to the SNA, the TNA increased the weights of the households responding to the Topical to account for all of the households not responding to the Topical. These households returned a Screener and went through the subsampling process to select a single child to be the subject of

the Topical. If the respondent reached Section H and answered at least 50 percent of key items, then it was considered a Topical interview. A returned Topical that did not meet these conditions was considered a Topical noninterview.

Households were put into one of 16 cells depending on WEBGROUP (P/W), tenure (owner occupied or not), imputed poverty/non-poverty (yes/no), and presence of SHCN of the selected child. Within each of the 16 Topical weighting cells, collapsed as necessary:

$$\text{TNA} = \left(\frac{\text{weighted sum of Topical interviews} + \text{weighted sum of Topical Noninterviews}}{\text{weighted sum of Topical interviews}}\right)$$

Households for which there was no Topical interview were not assigned any further nonzero weighting factors.

3.1.7 *Raking Adjustment Factor*

This final step of the weighting process was accomplished through iterative raking to population controls attained from the 2017 ACS single-year estimates and the 2018 NSCH Screener data. Since the process was very similar to that of the CLSF, details are omitted in this section. The only significant differences were the addition of trimming and the dimensions:

- Dimension #1 – State by Household Poverty Ratio (≤1, (1,2], >2)
- Dimension #2 – State by Household Size (≤3, 4, >4)
- Dimension #3 – State Groupings by Respondent's Education (Less than a High School Degree, High School Degree, Greater than a High School Degree)
- Dimension #4 – State by Selected Child's Race (White, Black, Asian, Other)
- Dimension #5 – State by Selected Child's Ethnicity (Hispanic, non-Hispanic)
- Dimension #6 – State by Selected Child's SHCN Status (Yes, No)
- Dimension #7 – Selected Child's Race by Ethnicity, at the national level (White Hispanic, White non-Hispanic, Black Hispanic, Black non-Hispanic, Asian, Other Hispanic, Other non-Hispanic)
- Dimension #8 – Selected Child's Sex by Single Age, at the national level

3.1.8 *Trimming Extreme Weights*

At the end of each iteration, the weights were checked for extreme values. An extreme value was defined to be one that exceeded the median weight plus six times the interquartile range (IQR) of the weights in each state. These extreme weights were trimmed to this cutoff (six times the IQR of weights in that state). Then, the weights were checked for convergence, which required each cell's weighted total to be within one percent of the control for the cell. If convergence had not been achieved, the RAK raking steps were applied again and the new resulting weights were rechecked for extreme values and trimmed as before, continuing as necessary until convergence was reached. At the end of the process, the RAK was calculated as

the weight after the final iteration and trimming divided by the weighted total prior to raking (BW × SNA × SC_CLSF × WHSF × TNA).

Attachment B shows the distribution of the weights, by state, after the final iteration of raking and before the last and final trimming step. As shown by the low number of extremes in the final column, the proximity of the maximums to the cutoffs by state, and convergence to controls being met for all raking cells, it was decided to perform the final trimming at this point and the raking process was complete.

3.2 Final Weights Produced

Selected Child Weight (Topical) = FWC = BW × SNA × SC_CLSF × WHSF × TNA × RAK
Child Weight (Screener) = C_FWS = BW × SNA × C_CLSF
Household Weight (Screener) = FWH = BW × SNA × HPSA

3.3 Population Controls

The ACS is an ongoing national survey that samples approximately 3.5 million addresses annually, averaging about 290,000 addresses per month. These data are collected continuously throughout the year to produce annual population and housing estimates. The survey covers the resident population of the United States and Puerto Rico for people living in housing units and group quarters. (Note that the 2018 NSCH weighting cells only used the resident population of the United States for people living in housing units.)

The ACS produces critical information for small areas and small population groups – it is the only source of information for many of its topics in these small areas.

Two different sets of estimates, with weights, are released each fall in the form of single-year (12 months of data) and five-year (60 months of data) datasets. The 2018 NSCH weighting cells used the 2017 single-year ACS estimates as population controls.

4.0 ACCURACY OF SURVEY ESTIMATES

A sample survey estimate has two types of error: sampling and nonsampling. The accuracy of an estimate depends on both types of error. The nature of the sampling error is known given the survey design; the full extent of the nonsampling error is unknown.

4.1 Sampling Error

The NSCH estimates are based on a sample; they may differ somewhat from the figures that would have been obtained if a complete census had been taken using the same questionnaire and instructions. This difference is known as sampling error and can be estimated from the survey data. While the simplest calculations of sampling error assume simple random

sampling, these will underestimate the sampling error for the 2018 NSCH. This is because different sampling rates were used across the two sampling strata, as well as across states, resulting in a complex sample design.

Standard errors indicate the magnitude of the sampling error and can be used to construct confidence intervals around the survey estimates. By calculating the confidence intervals for a particular sample, one can say with a specified confidence that the average estimate derived from all possible samples is included in the confidence interval.

4.1.1 *Estimating Sampling Errors for the 2018 NSCH*

Standard errors for the NSCH estimates can be obtained using the Taylor Series approximation method, which is available in software packages such as SAS, Stata, and SUDAAN. The sampling strata are identified by state and the child stratum flag, and the Primary Sampling Unit (PSU) is the household.

For SAS, the following statements are used:

- proc surveyfreq (or proc surveymeans or proc surveyreg)
- strata FIPSST and STRATUM
- cluster HHIDS (for the Screener) HHID (for the Topical)
- weight FWH (household weight, Screener), C_FWS (child weight, Screener), FWC (selected child weight, Topical)

For Stata the following statements are used:

- svyset strata FIPSST and STRATUM
- svyset psu HHIDS (for the Screener) or HHID (for the Topical)
- svyset pweight FWH (household weight, Screener), C_FWS (child weight, Screener), FWC (selected child weight, Topical)

For Stata, the two stratum variables need to be combined into a single variable.

For SUDAAN the following statements are used:

- proc ….[6] design = WR
- nest FIPSST STRATUM (HHIDS for the Screener or HHID for the Topical) / psulevel=3
- weight FWH (household weight, Screener), C_FWS (child weight, Screener), FWC (selected child weight, Topical)

For SUDAAN, the data file needs to be sorted by FIPSST and STRATUM, and then HHIDS (for the Screener) or HHID (for the Topical). HHID, HHIDS, FIPSST and STRATUM must be converted from character to numeric variable type.

[6] The procedures for descriptive and analytical statistics in SUDAAN are DESCRIPT, CROSSTAB, and RATIO.

The Taylor series method for estimating variances is simple to implement and takes into account the complex sample design, but it is less accurate than some other methods. An assumption must be made that households are sampled with replacement when they aren't. The method also does not take into account the impact of the weighting on the variances.

4.2 Nonsampling Error

For a given estimator, the difference between the estimate that would result if the sample were to include the entire population and the true population value being estimated is known as nonsampling error. There are several sources of nonsampling error which may occur during the development or execution of the survey. For the NSCH, it can occur because of circumstances created by the respondent, the survey instrument, or the way the data are collected and processed. For example, errors could occur because of:

- Measurement error: The respondent provides incorrect information, estimates the requested information, or an unclear survey question is misunderstood by the respondent.
- Coverage error: Individuals which should have been included in the survey frame were missed.
- Nonresponse error: Responses are not collected from all those in the sample or the respondent is unwilling to provide information.
- Imputation error: Values are estimated imprecisely for missing data.
- Processing error: Forms may be lost, data may be incorrectly keyed, coded, or recoded.

The Census Bureau employs quality control procedures throughout the production process, including the overall design of surveys, the wording of questions, and the statistical review to minimize these errors. However, since the full extent of the nonsampling error is unknown, one should be particularly careful when interpreting results based on small differences between estimates. The Census Bureau recommends that data users incorporate information about nonsampling error into their analyses, as nonsampling error could impact the conclusions drawn from the results.

Although nonsampling error cannot be measured directly, nonresponse and coverage are two types whose potential effects can be examined to a limited extent.

4.2.1 *Nonresponse*

The effect of nonresponse cannot be measured directly, but one indication of its potential effect is the nonresponse rate. For the 2018 NSCH, the weighted proportion of households that completed a Screener is 49.8 percent and the weighted proportion of households with children

that completed a Topical is 36.9 percent. The weighted overall survey response rate is 43.1 percent.

In accordance with Census Bureau and Office of Management and Budget Quality Standards, the Census Bureau will conduct a separate nonresponse bias analysis to assess nonresponse bias in the 2018 NSCH.

4.2.2 *Coverage*

Coverage errors occur when the total population that could be selected for a sample differs from the survey's target population. Missed housing units and missed people within sample households create undercoverage, which adds bias to survey estimates if the missed population differs from those interviewed on key survey items.

A common measure of survey coverage is the coverage ratio, calculated as the estimated population before post-stratification divided by the independent population control. Table 2 shows the 2018 NSCH coverage ratios by age groups for certain race/ethnicity groups. The coverage ratios are calculated using NSCH sampling weights of all Screener children that are adjusted for nonresponse, but not adjusted to match independent controls. A coverage ratio of one indicates that the survey estimate perfectly matches the independent control. A coverage ratio less than one indicates undercoverage, and a coverage ratio greater than one indicates overcoverage.

Table 2: 2018 National Survey of Children's Health Coverage Ratios

Demographic Category	Age 0-5	Age 6-11	Age 12-17
Overall	0.65	0.74	0.80
Hispanic	0.46	0.56	0.63
Non-Hispanic White Only	0.78	0.87	0.91
Non-Hispanic Black Only	0.40	0.44	0.51
Non-Hispanic Other Race	0.83	0.95	1.00

Source: U.S. Census Bureau, 2018 National Survey of Children's Health internal data

As seen in Table 2, the coverage ratios for Hispanic, non-Hispanic Black only, and overall for children aged 0 to 5 are below the Census Bureau standard of 0.7 (U.S. Census Bureau, 2013). These low coverage ratios can be attributed to the following:

- Response was lower for areas with larger non-White populations.
- Excluding Stratum 2b from sampling lowered coverage ratios of households with children in general.
- Screener data is collected on at most four children in a household, and only those children receive weights. Although only a small proportion of responding households report more than four children, they do not receive weights.

These effects were largely mitigated once the weights were controlled to independent population totals. When using final weights, all coverage ratios in Table 2 are above 0.91.

5. Supporting Material

U.S. Census Bureau. “Sampling Specifications for the 2018 National Survey of Children’s Health, including Creation of the Sample Frame.” Finalized memorandum from Anthony G. Tersine, Jr. to Craig A. Johnson.

U.S. Census Bureau. “Subsampling Specifications for the 2018 National Survey of Children’s Health.” Finalized memorandum from Anthony G. Tersine, Jr. to Craig A. Johnson.

U.S. Census Bureau. (2013). “U.S. Census Bureau Statistical Quality Standards.” Retrieved from https://www.census.gov/content/dam/Census/about/about-the-bureau/policies_and_notices/quality/statistical-quality-standards/Quality_Standards.pdf

U.S. Census Bureau. “Weighting Specifications for the 2018 National Survey of Children’s Health.” Finalized memorandum from Anthony G. Tersine, Jr. to Jeffrey D. Sisson.

Attachment A: 2018 Expected Sample Sizes, by Stratum and State

State	Total Sample Size	Stratum 1 Sample	Stratum 2a Sample
Alabama	4104	2566	1538
Alaska	4090	2190	1900
Arizona	4007	2312	1695
Arkansas	5393	2946	2448
California	3014	2066	947
Colorado	2773	1719	1054
Connecticut	2674	1755	919
Delaware	3233	2175	1058
District of Columbia	3426	2206	1220
Florida	4359	2650	1710
Georgia	4059	2577	1483
Hawaii	3899	1338	2561
Idaho	3030	1782	1248
Illinois	2863	1790	1073
Indiana	3093	1951	1142
Iowa	2812	1720	1092
Kansas	2960	2001	959
Kentucky	3965	2372	1593
Louisiana	5148	3149	1999
Maine	3205	1866	1339
Maryland	2646	1750	896
Massachusetts	2553	1768	785
Michigan	2618	1792	826
Minnesota	2066	1458	608
Mississippi	5666	3133	2533
Missouri	3116	2063	1053
Montana	3408	1790	1618
Nebraska	2805	1723	1082
Nevada	4333	2511	1822
New Hampshire	3124	1980	1145
New Jersey	2828	1846	982
New Mexico	5164	2625	2539
New York	3386	1998	1388
North Carolina	3895	2329	1567
North Dakota	3286	1845	1440
Ohio	3091	1978	1113
Oklahoma	4771	2658	2112
Oregon	2652	1727	925
Pennsylvania	2655	1807	849
Rhode Island	3497	2152	1345
South Carolina	3651	2447	1204
South Dakota	2796	1661	1135
Tennessee	3625	2233	1392
Texas	4201	2689	1512
Utah	2130	1516	615

State	Total Sample Size	Stratum 1 Sample	Stratum 2a Sample
Vermont	2940	1673	1268
Virginia	2743	1784	959
Washington	2673	1659	1014
West Virginia	5131	2427	2704
Wisconsin	2302	1540	762
Wyoming	4193	2098	2095
National	**176,054**	**105,792 (60%)**	**70,262 (40%)**

Source: U.S. Census Bureau, 2018 National Survey of Children's Health internal data

Attachment B: Summary of Last Raking Result before Final Trimming

STATE	MIN	Q1	MEDIAN	Q3	MAX	IQR	CUTOFF	Extremes
Alabama	311.1	742.5	1129.7	1908.9	8194.7	1166.3	8127.7	9
Alaska	49.4	143.9	226.5	438.4	1969.4	294.5	1993.6	0
Arizona	428.7	1170.9	1846.9	3116.8	13632.5	1945.9	13522.3	1
Arkansas	91.3	407.3	638.3	1092.8	4753.8	685.6	4751.7	2
California	2277.0	6484.2	10512.3	19266.0	88322.2	12781.8	87203.0	1
Colorado	571.7	1107.7	1537.3	2603.2	10522.2	1495.5	10510.2	4
Connecticut	282.2	644.4	948.2	1627.1	6852.7	982.7	6844.3	6
Delaware	56.2	160.9	244.3	395.4	1656.5	234.5	1651.1	11
District of Columbia	18.7	73.2	120.2	262.6	1261.0	189.4	1256.5	2
Florida	1295.8	3193.7	5016.5	8561.3	37185.6	5367.6	37222.3	0
Georgia	666.9	1732.3	2867.9	5286.2	24147.3	3553.9	24191.1	0
Hawaii	64.3	234.2	392.0	668.0	2993.8	433.8	2994.8	0
Idaho	153.4	369.1	521.5	825.5	3253.1	456.4	3259.7	0
Illinois	798.7	2181.7	3412.2	6273.3	27675.5	4091.6	27961.7	0
Indiana	651.9	1366.5	2154.2	3126.6	12722.6	1760.2	12715.2	1
Iowa	286.7	579.1	962.4	1500.4	6564.4	921.3	6490.3	3
Kansas	264.6	470.4	761.6	1295.2	5787.3	824.7	5710.0	5
Kentucky	320.1	741.5	1069.5	1736.0	7032.8	994.5	7036.6	0
Louisiana	299.6	801.2	1201.0	2088.0	8903.1	1286.7	8921.5	0
Maine	97.2	249.3	340.3	517.9	1973.4	268.6	1952.0	4
Maryland	516.9	1202.4	1813.4	2895.3	11996.7	1692.9	11970.9	7
Massachusetts	603.4	1036.3	1487.2	2715.9	11637.1	1679.6	11564.7	4
Michigan	670.3	1738.5	2610.8	4512.8	19277.6	2774.4	19256.8	4
Minnesota	363.1	1073.6	1449.4	2517.8	10219.4	1444.3	10114.9	9
Mississippi	112.1	411.1	720.6	1262.3	5810.6	851.2	5827.7	0
Missouri	330.0	969.1	1595.2	2815.4	12496.5	1846.3	12672.9	0
Montana	97.4	209.9	320.4	516.2	2140.9	306.3	2158.2	0
Nebraska	144.3	372.1	596.5	963.0	4163.9	590.9	4142.1	1
Nevada	175.8	508.9	763.8	1456.7	6455.4	947.8	6450.7	1
New Hampshire	86.2	200.2	293.2	492.6	2071.8	292.3	2047.1	2
New Jersey	409.2	1700.9	2475.7	4048.4	16571.2	2347.4	16560.3	2
New Mexico	97.0	329.9	543.3	995.6	4531.9	665.7	4537.5	0
New York	959.4	2743.3	4833.8	8874.3	41611.3	6131.0	41619.9	0
North Carolina	732.8	1668.3	2478.8	4282.8	18199.5	2614.5	18166.0	1
North Dakota	25.1	119.8	210.3	344.3	1568.6	224.5	1557.1	1
Ohio	1128.1	2023.2	3220.8	4826.9	20143.9	2803.7	20043.0	7
Oklahoma	252.8	593.3	1012.1	1764.4	8038.7	1171.1	8038.6	1
Oregon	363.1	750.1	1028.0	1957.6	8286.3	1207.5	8273.0	4
Pennsylvania	908.0	2157.8	3313.1	5198.9	21582.0	3041.1	21559.6	3
Rhode Island	53.8	147.1	228.2	395.2	1738.7	248.2	1717.2	1
South Carolina	366.2	806.0	1151.4	2025.2	8488.7	1219.3	8467.1	4
South Dakota	91.7	179.6	285.7	452.3	1929.6	272.6	1921.5	1
Tennessee	462.0	1195.4	1810.3	3054.1	12944.8	1858.6	12962.1	0
Texas	1857.1	5398.9	7903.4	14306.0	61584.6	8907.1	61345.8	5

STATE	MIN	Q1	MEDIAN	Q3	MAX	IQR	CUTOFF	Extremes
Utah	370.6	798.7	1294.8	2123.0	9257.9	1324.4	9240.9	2
Vermont	49.7	94.4	140.6	229.4	960.1	135.0	950.7	1
Virginia	678.9	1546.3	2389.5	3761.9	15702.8	2215.6	15683.3	4
Washington	345.9	1160.2	2037.4	3489.9	15971.6	2329.6	16015.1	0
West Virginia	102.9	248.2	398.3	678.3	3020.3	430.2	2979.3	7
Wisconsin	450.1	931.0	1429.0	2450.9	10662.0	1520.0	10548.8	10
Wyoming	61.4	127.5	199.2	299.8	1233.6	172.2	1232.4	2

Source: U.S. Census Bureau, 2018 National Survey of Children's Health data