



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

July 30th, 2020

2019 National Survey of Children's Health

Source and Accuracy Statement

The U.S. Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release. CBDRB-FY20-POP001-0157

Source and Accuracy Statement for the 2019 National Survey of Children's Health¹

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 provides an overview for the following phases of the 2019 NSCH survey cycle.

2.0 Sample Design

2.1 Creation of the Sample Frame

2.2 Sampling Strata

2.3 Selection of the Sample Households and Additional Assignments

2.4 Selection of the Sample Children

2.5 Sample Addresses Flagged as Production or Test Cases

3.0 Survey Weights

3.1 Overview of the Weighting Process

3.2 Final Weights Produced

3.3 Population Controls

4.0 Accuracy of Survey Estimates

4.1 Sampling Error

4.2 Nonsampling Error

2.0 Sample Design

For added details into the processes of the 2019 NSCH sample design, with the exception of the selection of the sample children, see the sampling specifications by Tersine (2019). See the subsampling specifications by Tersine (forthcoming 2020a) for further details into the selection of the sample children.

¹ The U.S. Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release. CBDRB-FY20-POP001-0157.

2.1 Creation of the Sample Frame

The population of interest for the 2019 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 2019 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*

As detailed via a Census Bureau web site (2020), its Master Address File (MAF) is an inventory of all known living quarters in the United States and Puerto Rico and is maintained by Geography Division. 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 quarter, 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 2019 NSCH was the assignment of a housing unit validity flag (VALDF19), 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 2019 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 VALDF19=1 (valid housing unit) were kept, with the unique identification variable MAFID² to match to CES's file of Administrative Flags.

2.1.2 *Use of the Center for Economic Studies' 2019 File of Administrative Flags*

All MAFIDs in the January 2019 MAF-X³ were appended with flags (e.g., poverty, internet access, and stratum) from administrative and other data sources compiled by CES. This national file was matched to the EDMAFX to produce the sample frame.

² Since MAFID cannot be released, similar household identification variables were created and placed on the Screener (HHIDS) and Topical Files (HHID).

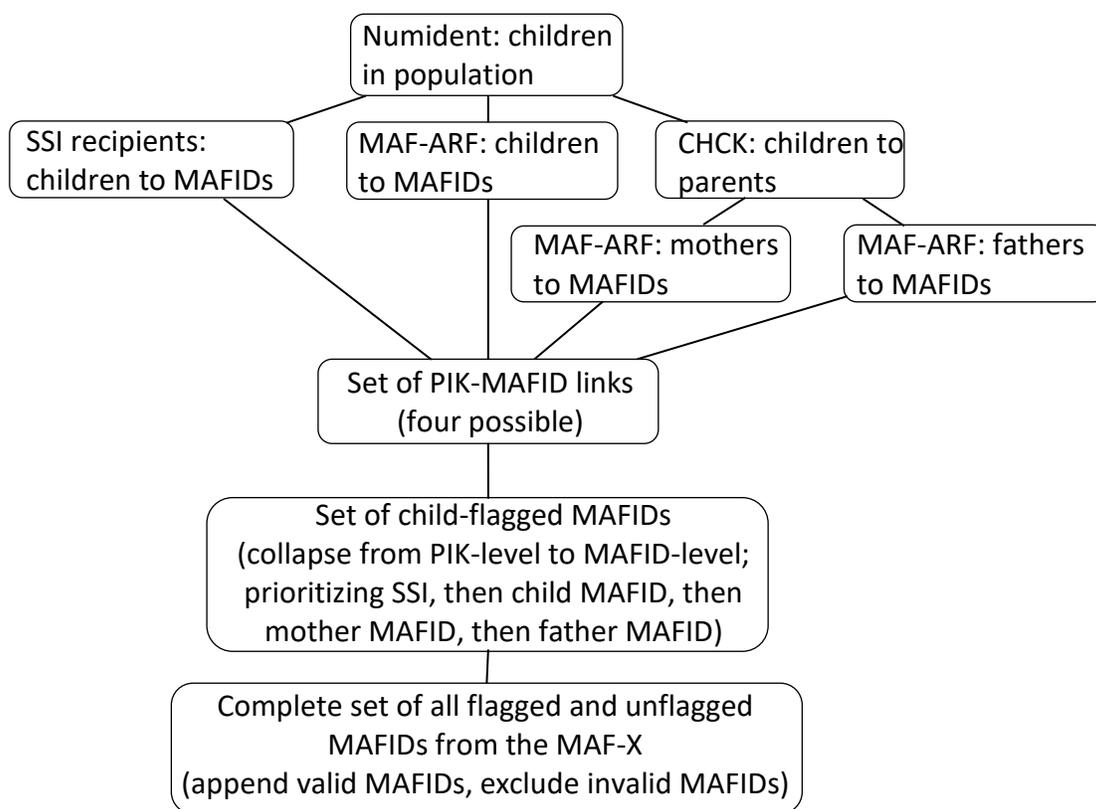
³ CES used different extracts of the 2019 MAF in their processing, specifically the MAF Extracts (MAF-X) and the MAF Auxiliary Reference File (MAF-ARF).

2.1.2.1 Processing Overview of the 2019 File of Administrative Flags

The frame for all households with children came from three data sources: the Numident, the Census Household Composition Key (CHCK), and the MAF Auxiliary Reference File (MAF-ARF). See Figure A.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 87,140,000 children in the 2018 Numident who would be 0-17 years old on June 1, 2019.

Figure A.1. Illustration of Processing for the Administrative Flags File for the 2019 National Survey of Children's Health



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 CHCK. The CHCK 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 (PIKs⁴) to parent PIKs. It identifies the

⁴ CES uses an anonymous identifier called a PIK to link individuals across datasets while protecting their personally identifiable information.

parents of children in the Numident. The source data for the CHCK 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, Public and Indian Housing and Tenant Rental Assistance Certification System data from the Department of Housing and Urban Development (HUD PIC- TRACS), and National Change of Address data from the United States Postal Service. 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 CHCK.

For each child observation from the Numident, there were multiple possible MAFIDs: the child to MAF-ARF MAFID, the child-to-CHCK-to-mother-to-MAF-ARF MAFID, the child-to-CHCK-to-father-to-MAF-ARF MAFID, and the child-to-ACS parent-to-MAF-ARF MAFID. Using that order, a single MAFID was allocated. The MAFID match rate was 89.1 percent. The 77,600,000⁵ children associated with a MAFID were then collapsed down to 40,020,000 unique MAFIDs. This implies 1.94 children per household for households assigned a flag.

For 2019, an additional step in the construction of Stratum 1 was applied. The HUD PIC-TRACS administrative data, which contain flags for the number of children present at the household level for all public housing and voucher households, were used to enhance the existing Stratum 1 process. All MAFIDs not assigned a Stratum 1 flag were merged using the CHCK-MAF-ARF process with the most recent data on all public housing and voucher households in the PIC-TRACS data. A Stratum 1 flag was then assigned to all households which had a child present flag in this data. This added 215,000 households to Stratum 1.

The MAFID list was then scaled up to the universe of MAFIDs to allow sampling of unflagged households. A merge of the 40,020,000 unique child-flagged MAFIDS with the January 2018 ACS and 2019 MAF-X file matched 40,000,000 MAFIDS with child flags, added 164,200,000 MAFIDS without child flags, and removed 19,000 MAFIDS with child flags. Thus, the sample frame file now had about 203 million valid MAFIDS⁶.

2.1.2.2 Internet-Accessible Household Flag

Since 2012, ACS respondents have been able to submit survey forms over the internet in addition to completing and mailing back a paper questionnaire. ACS paradata record whether a respondent chose the online option and this paradata was summarized at the tract level. An internet-accessible household measure for the 2019 NSCH was then constructed as a weighted

⁵ All unweighted counts and estimates in this document are rounded to no more than four significant figures in accordance with the special rounding rules of the Census Disclosure Review Board.

⁶ 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. Also, counts are rounded.

proportion of the respondents that chose to submit the ACS survey over the internet if given the option to do so. A tract was considered to have low internet access if the internet accessibility index was in the bottom third of the tract-level distribution.

2.1.2.3 Local-Area Household Income Relative to the Poverty Rate

The CES file also had a set of poverty variables from the 2013-2017 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 2019 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 were valid from the file in Section 2.1.1 were eligible.

2.2 Sampling Strata

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 was based on an objective of minimizing the size of Stratum 2a 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 contained 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 (Production and Test) and Additional Assignments

The 2019 NSCH sample frame is a listing of the valid housing units from the MAF, appended with several administrative flags. Appendix 1 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 3 to 7 across the states.

The expected production sample size was 180,004 unique housing unit nationwide⁷ - 107,887 (60 percent) selected from Stratum 1 and 72,117 (40 percent) from Stratum 2a - and was expected to yield approximately 515 completed interviews from households with children per state.

An additional 4,000 addresses were selected in the same process for a Screener card test, resulting in a sample of approximately 184,000 addresses. These 4,000 addresses were not part of the 2019 production sample, but were selected at the same time and designated as test cases at the end of the sampling process. Ultimately, they did not receive an incentive, were not assigned an envelope design group, and were assigned a base weight of zero.

The actual production plus test sample size was 183,996 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. The sort, prior to sampling, was by county, POVERTY (the variable described in Section 2.1.2.3), Census tract, and MAFID, within each state and stratum⁸.

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 was 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 Envelope Design Group to the Sample Records*

Incentive (\$0 (control), \$2, or \$5) and envelope design group (receive the traditional design (control) or a redesign test) for each MAFID were assigned randomly across the households that were selected for sample, by state. Forty-five percent of the sample (both production and test cases) 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 to act as a control to

⁷ The expected sample size of 180,004 was determined primarily from the available budget.

⁸ Census block was added to this sort in the 2020 sampling process.

monitor the effectiveness of the incentive treatment⁹. Within each of the three incentive groups, 50 percent of the sample randomly received an envelope redesign test while the other 50 percent did not. These assignments for each of the 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.

If:

*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)

If:

*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)

If:

*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)

If:

*Does (fill with CN_NAME) need or get special therapy, such as physical, occupational, or speech therapy? = yes (C_K2Q19=1) **AND***

⁹ Because incentives were assigned before the Screener card test, these test cases were assigned to receive an incentive; however, they ultimately did not receive any incentive.

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)

If:

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 2019 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 A.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 A.1. Strategies for Selecting the Sample Children for the 2019 National Survey of Children’s Health

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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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%	48%	Includes 80% oversampling of CSHCN.
3	1,2	22%	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

2.5 Sample Addresses Flagged as Production or Test Cases

The 4,000 addresses that were to be designated for the Screener card test were selected for sample at the same time as the production addresses. After sorting the national file of sampled housing units by FIPSST, STRATUM, INCENTIVE, ENVGROUP and MAFID, and using a random start and 184,000/4,000 as the take-every, the Screener card test addresses were randomly flagged so that they were not included in the 2019 NSCH production. Their assigned values for incentive and envelope design group that were assigned previously were now replaced with 0

for the incentive and received a traditional envelope design. Also, in the weighting process described in Section 3.0, these Screener card test cases received a base weight of zero.

2.5.1 Assignment of Three Groups of Screener Card Tests

Two thousand of the 4,000 Screener card test addresses were assigned to have a Screener card included with the first mailing, 1,000 addresses were assigned to have a Screener card mentioned with the first mailing, and 1,000 addresses were assigned to have a Screener Card mentioned in a pressure-sealed mailing. The traditional (control) came from the production sample, and were assigned by staff of the Associate Director for Demographic Programs - Survey Operations (ADDP-SO).

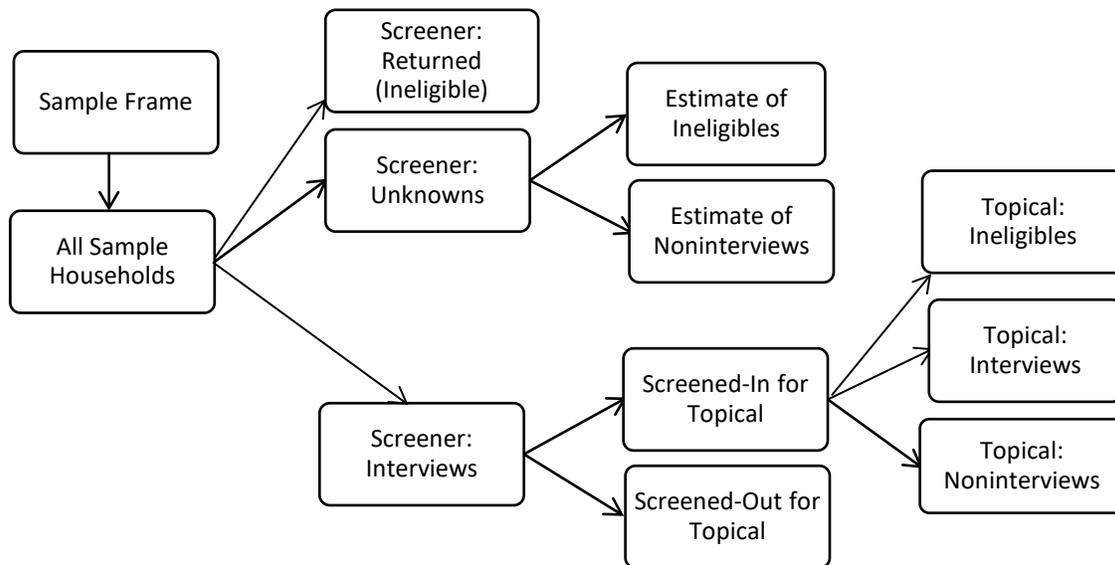
3.0 Survey Weights

For added details on the 2019 NSCH weighting, see the weighting specifications by Tersine (forthcoming 2020b).

3.1 Overview of the Weighting Process

Figure A.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 A.2. From Sample Frame to Final Outcome: A Framework for the Weighting of the 2019 National Survey Of Children’s Health



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 was 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 was an estimate of the expected number of eligible households from those cases for which nothing was 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 =

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

(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 2018 ACS data. Households were put into one of 255 cells depending on their state, race of the selected child, and ethnicity of the selected child if the selected child's race was White. 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 2018 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 ($BW \times SNA$) 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 was continued for at most 100 iterations or until the absolute difference between the sum of the weights within each raking cell of all three dimensions and the control total associated with each raking cell was less than 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 ($BW \times SNA$).

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 was 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 0 through 5, and the presence of CSHCNs. Details in the previous Table A.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 (paper=P/web=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:

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

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 2018 ACS single-year estimates and the 2019 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)¹⁰
- 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)

¹⁰ Household Poverty Ratio (POVRATIO) is a recode of Family Poverty Level (FPL_I), which is income as a percentage of the poverty threshold and ranges from 50 to 400. FPL_I (≤ 100 , (100,200], > 200) translates to POVRATIO (≤ 1 , (1,2], > 2).

- 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 (CSHCN, non-CSHCN)
- 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 (male [0,17], female [0,17])

3.1.7.1 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 ($BW \times SNA \times SC_CLSF \times WHSF \times TNA$).

Appendix 2 shows the number of extremes, by state, after the final iteration of raking and before the last and final trimming step. As shown by the low number of extremes, the proximity of the maximums to the cutoffs by state (not shown in the table), 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 = $BW \times SNA \times SC_CLSF \times WHSF \times TNA \times RAK$

Child Weight (Screener) = C_FWS = $BW \times SNA \times C_CLSF$

Household Weight (Screener) = FWH = $BW \times SNA \times HPSA$

3.3 Population Controls

The ACS is an ongoing national survey that provides vital information on a yearly basis about our nation and its people. 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 2019 NSCH weighting cells only used the resident population of the United States for people living in housing units.) It 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.

The survey samples approximately 3.5 million housing unit addresses annually, averaging about 295,000 addresses per month, with a response rate¹¹ of 92% in 2018. These data are collected continuously throughout the year to produce annual population and housing estimates. 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 2019 NSCH weighting cells used the 2018 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 2019 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 2019 National Survey of Children’s Health*

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

¹¹ Survey Response Rate (state x, year y) =

$$\left(\frac{\text{Initially weighted estimate of interviews in state x in year y}}{\text{Initially weighted estimate of cases eligible to be interviewed in state x for year y}} \right) * 100$$

- cluster HHIDS (for the Screener) or HHID (for the Topical)
- weight FWH (household weight, Screener), C_FWS (child weight, Screener), or 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), or 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:

- proc¹² 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), or 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.

The Taylor series method for estimating variances via the above software packages 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 are not. 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.

¹² The procedures for descriptive and analytical statistics in SUDAAN are DESCRIPT, CROSSTAB, and RATIO.

- 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 (U.S. Census Bureau, 2013). 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 2019 NSCH, the weighted proportion of households that completed a Screener is 47.8 percent and the weighted proportion of households with children that completed a Topical is 35.3 percent. The weighted overall survey response rate is 42.4 percent.

A separate nonresponse bias analysis will be conducted to assess nonresponse bias in the 2019 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 A.2 shows the 2019 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 A.2. 2019 National Survey of Children’s Health Coverage Ratios, before Post-Stratification

Demographic Category	Age 0-5	Age 6-11	Age 12-17
Overall	0.64	0.71	0.78
Hispanic	0.47	0.52	0.60
Non-Hispanic White Only	0.77	0.87	0.92
Non-Hispanic Black Only	0.37	0.44	0.49
Non-Hispanic Other Race	0.73	0.80	0.87

Source: U.S. Census Bureau, 2019 National Survey of Children’s Health internal data

As seen in Table A.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, and will be addressed in a forthcoming 2019 NSCH Nonresponse Bias Analysis.

- 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 from the paper instrument is collected on at most four children in a household and only those children receive weights; the web instrument collects up to 99 children on the Screener, but only the first four are reported on and weighted. 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. The coverage ratios when using final Topical weights are in Table A.3.

Table A.3. 2019 National Survey of Children’s Health Coverage Ratios using Final Topical Weights

Demographic Category	Age 0-5	Age 6-11	Age 12-17
Overall	1.00	1.00	1.00
Hispanic	1.00	0.97	1.06
Non-Hispanic White Only	1.03	1.01	0.97
Non-Hispanic Black Only	0.92	1.03	1.04
Non-Hispanic Other Race	0.98	0.99	0.96

Source: U.S. Census Bureau, 2019 National Survey of Children’s Health internal data

5.0 References

- Tersine, Jr., A.G. (2019). "Sampling Specifications for the 2019 National Survey of Children's Health, Including Creation of the Sample Frame." U.S. Census Bureau Memorandum from Anthony G. Tersine, Jr. to Jeffrey D. Sisson dated August 26, 2019.
- Tersine, Jr., A.G. (forthcoming 2020a). "Subsampling Specifications for the 2019 National Survey of Children's Health." U.S. Census Bureau Memorandum from Anthony G. Tersine, Jr. to Jeffrey D. Sisson forthcoming.
- Tersine, Jr., A.G. (forthcoming 2020b). "Weighting Specifications for the 2019 National Survey of Children's Health." U.S. Census Bureau Memorandum from Anthony G. Tersine, Jr. to Jeffrey D. Sisson forthcoming.
- 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. (2020). "Master Address File." Retrieved from https://collab.ecm.census.gov/div/geo/mafresources/MAF_Wiki/MAF/Master_Address_File.aspx.

Appendix 1

Table 1.1. 2019 National Survey of Children’s Health Estimated Sample Sizes, by Stratum

STATE	FIPSST	TOTAL SAMPLE ¹³	STRATUM 1 SAMPLE	STRATUM 2a SAMPLE
Alabama	01	4148	2531	1617
Alaska	02	5238	2267	2971
Arizona	04	4167	2331	1837
Arkansas	05	5146	2791	2355
California	06	3265	2205	1060
Colorado	08	2941	1785	1156
Connecticut	09	2956	1879	1078
Delaware	10	3645	2309	1336
District of Columbia	11	3513	2363	1150
Florida	12	4406	2625	1781
Georgia	13	4288	2659	1629
Hawaii	15	3817	1595	2222
Idaho	16	2938	1732	1206
Illinois	17	3222	1956	1266
Indiana	18	3205	2019	1186
Iowa	19	2666	1722	944
Kansas	20	2910	1938	971
Kentucky	21	3869	2248	1621
Louisiana	22	5336	3097	2239
Maine	23	3150	1964	1186
Maryland	24	2821	1855	966
Massachusetts	25	2677	1785	892
Michigan	26	2629	1791	838
Minnesota	27	2042	1406	636
Mississippi	28	5222	3139	2083
Missouri	29	3237	2104	1133
Montana	30	3840	1980	1860
Nebraska	31	2920	1836	1084
Nevada	32	4146	2505	1641
New Hampshire	33	3101	2014	1087
New Jersey	34	2942	1886	1056
New Mexico	35	5380	2632	2748
New York	36	3782	2168	1615
North Carolina	37	3451	2255	1195
North Dakota	38	3134	1899	1235

¹³ Total sample may differ from the sum of Stratum 1 and Stratum 2a samples due to rounding.

STATE	FIPSST	TOTAL SAMPLE ¹³	STRATUM 1 SAMPLE	STRATUM 2a SAMPLE
Ohio	39	2944	2002	941
Oklahoma	40	4651	2563	2088
Oregon	41	2826	1831	996
Pennsylvania	42	2793	1853	940
Rhode Island	44	3431	2191	1239
South Carolina	45	3951	2504	1447
South Dakota	46	3191	1815	1375
Tennessee	47	3358	2214	1144
Texas	48	4122	2622	1500
Utah	49	2229	1566	664
Vermont	50	3158	1800	1358
Virginia	51	2770	1794	976
Washington	53	2893	1748	1145
West Virginia	54	4949	2320	2629
Wisconsin	55	2332	1561	771
	56	4256	2233	2023
National		180,004	107,887	72,117
Stratum Proportion			60%	40%

Source: U.S. Census Bureau, 2019 National Survey of Children's Health internal data

Appendix 2

Table 2.1. Summary of Last Raking Result before Final Trimming for the 2019 National Survey of Children's Health

STATE	FIPSST	# EXTREMES
Alabama	01	2
Alaska	02	4
Arizona	04	2
Arkansas	05	9
California	06	0
Colorado	08	11
Connecticut	09	8
Delaware	10	0
District of Columbia	11	3
Florida	12	0
Georgia	13	0
Hawaii	15	0
Idaho	16	16
Illinois	17	1
Indiana	18	3
Iowa	19	2
Kansas	20	15
Kentucky	21	5
Louisiana	22	0
Maine	23	2
Maryland	24	4
Massachusetts	25	5
Michigan	26	2
Minnesota	27	11
Mississippi	28	1
Missouri	29	2
Montana	30	12
Nebraska	31	14
Nevada	32	0
New Hampshire	33	1
New Jersey	34	5
New Mexico	35	0
New York	36	0
North Carolina	37	7
North Dakota	38	2
Ohio	39	2
Oklahoma	40	3
Oregon	41	2
Pennsylvania	42	1
Rhode Island	44	15
South Carolina	45	4

STATE	FIPSST	# EXTREMES
South Dakota	46	11
Tennessee	47	2
Texas	48	0
Utah	49	5
Vermont	50	4
Virginia	51	6
Washington	53	11
West Virginia	54	3
Wisconsin	55	6
Wyoming	56	3

Source: U.S. Census Bureau, 2019 National Survey of Children's Health data