



SAFER • HEALTHIER • PEOPLE™

National Health and Nutrition Examination Survey: Estimation Procedures, 2011–2014



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

Copyright information

All material appearing in this report is in the public domain and may be reproduced or copied without permission; citation as to source, however, is appreciated.

Suggested citation

Chen TC, Parker JD, Clark J, Shin HC, Rammon JR, Burt VL. National Health and Nutrition Examination Survey: Estimation procedures, 2011–2014. National Center for Health Statistics. *Vital Health Stat 2(177)*. 2018.

Library of Congress Cataloging-in-Publication Data

Names: National Center for Health Statistics (U.S.), issuing body.
Title: National health and nutrition examination survey: Estimation procedures, 2011-2014.
Other titles: Estimation procedures, 2011-2014 | Vital and health statistics. Series 2, Data evaluation and methods research ; no. 177. | DHHS publication ; no. 2018-1377. 0276-4733
Description: Hyattsville, Maryland : U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, January 2018. | Series: Vital and health statistics, series 2, data evaluation and methods research ; number 177 | Series: DHHS pub ; number 2018-1377 | Includes bibliographical references.
Identifiers: LCCN 2017057351 | ISBN 9780840606860 (pbk.) | ISBN 0840606869 (pbk.)
Subjects: | MESH: National Health and Nutrition Examination Survey (U.S.) | Health Surveys | Nutrition Surveys | Body Weight | Sampling Studies | Statistics as Topic | United States
Classification: LCC RA407.3 | NLM W2 A N148vb no.177 2018 | DDC 614.4/273--dc23
LC record available at <https://lccn.loc.gov/2017017756>

For sale by the U.S. Government Printing Office
Superintendent of Documents
Mail Stop: SSOP
Washington, DC 20402–9328
Printed on acid-free paper.

Vital and Health Statistics

Series 2, Number 177

National Health and Nutrition Examination Survey: Estimation Procedures, 2011–2014

Data Evaluation and Methods Research

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

Hyattsville, Maryland
January 2018
DHHS Publication No. 2018–1377

National Center for Health Statistics

Charles J. Rothwell, M.S., M.B.A., *Director*

Jennifer H. Madans, Ph.D., *Associate Director for Science*

Division of Health and Nutrition Examination Surveys

Kathryn S. Porter, M.D., M.S., *Director*

Ryne Paulose-Ram, Ph.D., *Associate Director for Science*

Contents

Acknowledgments	iv
Abstract	1
Introduction	1
Sample Design Summary	2
Weighting the Sample Data	3
Calculating Base Weights.	3
Nonresponse Adjustment	4
Trimming	5
Poststratification	5
Computing Final Weights.	6
NHANES National Youth Fitness Survey	6
Subsample Weights	7
Combining Survey Cycles	7
Variance Estimation	8
Variance Units for Publicly Released Data	8
Restricted Data Access in the NCHS Research Data Center	9
Summary	9
References	9
Appendix I. Glossary	11
Appendix II. Tables	13
Text Table	
Table. Sampling subdomains classified by race and Hispanic origin, income, sex, and age: National Health and Nutrition Examination Survey, 2011–2014	3
Appendix Tables	
I. Final sampling rates and base weights: National Health and Nutrition Examination Survey, 2011–2014	13
II. Variables used in forming nonresponse adjustment cells for weighting interview samples: National Health and Nutrition Examination Survey, 2011–2014	15
III. Variables used in forming nonresponse adjustment cells for weighting mobile examination center examination samples: National Health and Nutrition Examination Survey, 2011–2014	16
IV. Most common survey sample weights and their appropriate use: National Health and Nutrition Examination Survey, 2011–2014	17

Acknowledgments

The authors gratefully acknowledge the assistance of Michele Chiappa, Ryne Paulose-Ram, and Kathryn Porter in the preparation of this report.

Abstract

Background

The purpose of the National Health and Nutrition Examination Survey (NHANES) is to produce national estimates representative of the total noninstitutionalized civilian U.S. population. The sample for NHANES is selected using a complex, four-stage sample design. NHANES sample weights are used by analysts to produce estimates of the health-related statistics that would have been obtained if the entire sampling frame (i.e., the noninstitutionalized civilian U.S. population) had been surveyed.

Sampling errors should be calculated for all survey estimates to aid in determining their statistical reliability. For complex sample surveys, exact mathematical formulas for variance estimates that fully incorporate the sample design are usually not available. Variance approximation procedures are required in order to provide reasonable, approximately unbiased, and design-consistent estimates of variance.

Objective

This report describes the methods used to create NHANES 2011–2014 sample weights and variance units for the public-use data files, including sample weights for selected subsamples, such as the fasting subsample. The impacts of sample design changes on estimation for NHANES 2011–2014 and the addition of the NHANES National Youth Fitness Survey (NNYFS) 2012 are described. Approaches that data users can employ to modify sample weights when combining survey cycles or when combining subsamples are also included.

Keywords: sampling • weighting • variance estimation • mobile examination center (MEC)

National Health and Nutrition Examination Survey: Estimation Procedures, 2011–2014

by *Te-Ching Chen, Ph.D., and Jennifer D. Parker, Ph.D., National Center for Health Statistics; Jason Clark, M.S., Westat; and Hee-Choon Shin, Ph.D., Jennifer R. Rammon, M.S., and Vicki L. Burt, Sc.M., R.N., National Center for Health Statistics*

Introduction

The National Health and Nutrition Examination Survey (NHANES) is one of a series of health-related programs conducted by the National Center for Health Statistics (NCHS) to provide information on the health and nutritional status of the noninstitutionalized civilian resident population of the United States. This information is used to estimate the prevalence of various diseases and conditions and to provide information for use in planning health policy.

NHANES is unique in collecting person-level demographic, health, and nutrition information from personal interviews (interview) and a standardized physical examination in a mobile examination center (MEC). The examination includes objective measures of health status, including height, weight, blood pressure, and the collection of blood and urine specimens for laboratory testing. In 2012, NCHS also conducted the NHANES National Youth Fitness Survey (NNYFS) to collect data on physical activity and fitness levels for U.S. children aged 3–15 years. NNYFS was designed to use the same primary and secondary sampling units as NHANES during 2012.

The specific NHANES sample designs, including specifications for clustering, stratification, and oversampling population subgroups, have changed over time. Since 1999, the principal sample design has consisted of multiyear, stratified, clustered four-stage samples, with 2-year data releases. The sample design for NHANES 2011–2014

is fully described in the “National Health and Nutrition Examination Survey: Sample Design, 2011–2014” (1). Designs for earlier continuous NHANES are described in previous reports (2,3).

Two key changes in the design of NHANES 2011–2014 compared with NHANES 2007–2010 were the addition of an oversample of non-Hispanic Asian persons and the use of state-level health rankings to form sampling strata.

“The National Health and Nutrition Examination Survey: Estimation Procedures, 2007–2010” (4) describes the methods that were used to construct sample weights and variance units for NHANES 2007–2010. It also provides information for the user on combining survey cycles, sample weights for subsamples, and using the strata and primary sampling unit information (variance units) provided on public-use files for variance estimation. Additional information for conducting data analysis can be found in the NHANES analytic guidelines (5).

This report describes the construction of sample weights and variance units for NHANES 2011–2014, updating the NHANES 2007–2010 estimation procedures. The “Sample Design Summary” section summarizes the sample design specifications for NHANES 2011–2014. The “Weighting the Sample Data” section describes the creation of sample weights for the NHANES 2011–2014 sample and subsamples, with a focus on how NHANES 2011–2014 sample design features affect the sample weights. The “Variance Estimation” section describes the variance units on the

public-use data files and appropriate variance estimation methods for analysis. [Appendix I](#) provides a glossary of terms and [Appendix II](#) contains tables of supporting material. For additional information regarding the calculation of NHANES sample weights, please refer to the NHANES 2007–2010 Estimation Procedures (4).

Additional documentation of the survey content, data collection procedures, and methods for assessing nonsampling errors is provided elsewhere (see <https://www.cdc.gov/nchs/nhanes.htm>).

Sample Design Summary

The NHANES sample represents the noninstitutionalized civilian population residing in the 50 states and the District of Columbia. Since 1999, the sample design has consisted of multiyear, stratified, clustered four-stage samples, with 2-year data releases. The NHANES sample is drawn in four stages: primary sampling units (PSUs, counties or combinations of adjacent counties), segments within PSUs (census blocks or combinations of blocks), dwelling units (DUs, households) within segments, and individuals within households. PSUs are sampled from all U.S. counties.

The population subgroups chosen for oversampling directly determine the sampling domains used to select the sample at all stages. The specific NHANES sample designs, including specifications for clustering, stratification, and oversampling population subgroups, have changed over time. The set of domains for which specified reliability was desired in NHANES 2011–2014 consisted of sex-age groups for Hispanic persons, non-Hispanic black persons and non-Hispanic non-black Asian (referred to as NH Asian) persons, and income-sex-age groups for the remainder of the U.S. population. Specifically, the oversampled subgroups in the 2011–2014 survey were:

1. Hispanic persons
2. Non-Hispanic black persons

3. Non-Hispanic, non-black Asian persons
4. Non-Hispanic white persons and persons of other races and ethnicities at or below 130 percent of the federal poverty level
5. Non-Hispanic white persons and persons of other races and ethnicities aged 80 and over.

Race and Hispanic-origin domains used in the sample design and sample weight creation differ from the categories used in variables on publicly released data files (e.g., RIDRETH3 and RIDRETH1 for NHANES 2011–2014). Race and Hispanic-origin information used for sampling is based on census population estimates and obtained from the household screener to determine eligibility for inclusion in the survey. The released race and Hispanic-origin variable is based on survey response. In addition to response differences between screening (provided by the household reference person) and interview (provided by the sampled person [SP] or proxy), the released variable RIDRETH3 includes only single-race categories for the non-Hispanic white, black, and Asian groups, with all SPs reporting multi-race groups coded into the “other races, including multiracial” category. In contrast, when collecting race and ethnicity information at screening for NHANES 2011–2014, the black category included persons reporting non-Hispanic black as a single race or in combination with other races, including Asian, and the Asian screening category included non-Hispanic Asian persons as a single race and in combination with other races, except black.

[Table](#) lists the set of sampling domains in NHANES 2011–2014. Although data are released in 2-year cycles, at least 4 years of data must be combined to obtain an acceptable level of reliability for most of the sampling domains given in [Table](#). To create estimates for 2-year samples, domains must be collapsed to produce adequate sample sizes for analysis.

NHANES PSUs are selected with probabilities proportionate to size (PPS), where each PSU’s measure of size (MOS) is determined by criteria established in

advance for obtaining health estimates for subgroups determined by age group, sex, race and Hispanic origin, and income. The MOS is a weighted average of population counts, where the “weights” are calculated to give relatively higher probabilities of selection to PSUs with higher proportions of individuals within the subgroups chosen for oversampling. For NHANES 2011–2014, the MOS “weights” were calculated to give relatively higher probabilities of selection to PSUs with higher proportions of black, Hispanic, Asian or low-income white and other persons. In comparison, the PSU MOS used for NHANES 2007–2010 gave higher weight to PSUs with higher proportions of black, Hispanic, or low-income white and other persons. The sampling rates for each subdomain are listed in [Table I \(Appendix II\)](#).

Some counties have a MOS large enough that they are selected with certainty (certainty PSU, often referred to as self-representing or SR). The remaining counties are referred to as noncertainty PSUs (non-self-representing or NSR). The certainty PSUs are removed from the county frame prior to noncertainty PSU selection. The noncertainty PSUs are divided into strata prior to selection.

The stratification scheme for NHANES 2011–2014, as for NHANES 2007–2010, included state groups, major strata, and minor strata levels. Unlike NHANES 2007–2010 where state groups were formed using the four census regions (Northwest, South, Midwest, and West), state groups for NHANES 2011–2014 were formed using several state-level health-related variables: death rate, infant mortality rate, percentage of adults with high blood pressure, percentage of adults overweight or obese, percentage of adults with poor nutrition, and percentage of adults who smoke; state-level health statistics were available from vital statistics (6,7) and the Behavioral Risk Factor Surveillance System (8,9). There were five state groups for NHANES 2011–2014, including a separate state group for California. The NHANES 2011–2014 design defined California as a separate state group because of

Table. Sampling subdomains classified by race and Hispanic origin, income, sex, and age: National Health and Nutrition Examination Survey, 2011–2014

Sex-age	Non-Hispanic black	Hispanic	Non-Hispanic white and other		
			Non-Hispanic, non-black, Asian	Non-low-income	Low-income ¹
Males and females, age (years)	Under 1 1–2 3–5	Under 1 1–2 3–5	Under 1 1–2 3–5	Under 1 1–2 3–5	Under 1 1–2 3–5
Males, age (years)	6–11 12–19 20–39 ... 40–49 50–59 60 and over	6–11 12–19 20–39 ... 40–49 50–59 60 and over	6–11 12–19 20–39 ... 40–49 50–59 60 and over	6–11 12–19 20–29 30–39 40–49 50–59 60–69 70–79 80 and over	6–11 12–19 20–29 30–39 40–49 50–59 60–69 70–79 80 and over
Females, age (years)	6–11 12–19 20–39 ... 40–49 50–59 60 and over	6–11 12–19 20–39 ... 40–49 50–59 60 and over	6–11 12–19 20–39 ... 40–49 50–59 60 and over	6–11 12–19 20–29 30–39 40–49 50–59 60–69 70–79 80 and over	6–11 12–19 20–29 30–39 40–49 50–59 60–69 70–79 80 and over

... Category not applicable.
¹Persons living at or below 130% of the federal poverty level.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

interest in multiyear estimates for California. For detailed information about NHANES’ California samples, sample weights and analytic issues, please see “National Health and Nutrition Examination Survey: California and Los Angeles County, Estimation Methods and Analytic considerations, 1999–2006 and 2007–2014” (10).

Each of the five state groups had two or three major strata for a total of 13 major strata. There were four minor strata in each major stratum for a total of 52 minor strata. The NHANES 2011–2014 sample had one noncertainty PSU per minor stratum for the 4-year sample and two noncertainty PSUs per major stratum for each 2-year sample, one each year. NHANES 2011–2014 surveyed a total of 60 PSUs, including 8 certainty PSUs.

For survey operational purposes, the sample is designed to have approximately equal sample size per PSU. Noncertainty PSUs have 24 segments. Certainty PSUs may have any number of segments to ensure appropriate representation in the sample. In addition, some large certainty PSUs can be treated as multiple study

locations with varying numbers of segments in each location.

Weighting the Sample Data

Weighting of the NHANES data produces estimates representative of the U.S. noninstitutionalized civilian resident population. The weighting of sample data permits analysts to produce estimates of the statistics that would have been obtained if the entire eligible population had been surveyed. Sample weights can be considered measures of the number of persons in the target population represented by the particular sampled participant. Weighting takes into account several features of the survey: the differential probabilities of selection for the sampling domains, survey nonresponse, and differences between the final sample distribution and the target population distribution. Each of the three levels of data collection for NHANES (screening, interview, examination) has a

response rate. As a result, sample weights are calculated for each level of data collection.

The NHANES sample weighting is carried out in three steps. The first step involves the computation of stage base weights to compensate for unequal probabilities of selection. The second step adjusts for nonresponse to reduce the potential bias. In the third step, the sample weights are poststratified to the reference population. Poststratification is used to compensate for possible inadequacies in the eligible population and to reduce variances in the estimation procedure. The nonresponse and poststratification steps are performed at each level of data collection: the screener, interview, and examination. The new weight for each step in the adjustment is the product of the weight before the adjustment and the adjustment factor of the step.

Adjustment factors are calculated within adjustment cells defined by characteristics available for both sample participants and nonrespondents at that step. Because available information differs for each step, adjustment cells differ for each step.

Calculating Base Weights

The initial weight for each sampled participant within a sampling domain is the same for all other participants in that domain and is equal to the inverse of the sampling rate (r_k) within the sampling domain. For NHANES 2011–2014, the initial weights were adjusted to account for: 1) the proportion of DUs released in a PSU ($f_{i(release)}$), 2) the proportion of deselected DUs in a PSU ($f_{i(diesel)}$), and 3) the number of years in the sample ($f_{i(year)}$). At screening, not all DUs can be screened and not all of those screened include eligible SPs. As a result, NHANES’ samples are drawn much larger than the target sample sizes to get enough eligible persons at the screening stage. The first two adjustments account for the selection probability for the released and deselected DUs.

The three base weight adjustment factors are described below. The base weights are calculated as the product of

the initial weights and the three adjustment factors.

$$W_{i(\text{base})} = \frac{1}{r_k} (f_{i(\text{release})} f_{i(\text{desel})} f_{i(\text{year})}) \quad [1]$$

For NHANES 2007–2010, segment sizes and probability of housing unit selection were increased for years 2008–2010 to reach the target number of identified sampled participants. Base weights were also adjusted for this increase. For NHANES 2011–2014, the segment sizes were not changed after the survey began so the additional adjustment factor used for NHANES 2007–2010 (for the increased segment sizes) was not needed.

Adjustment for number of sampled DUs released to the field

In each study location, a larger sample than needed is deliberately drawn, and smaller subsamples are released for screening with the objective of obtaining a relatively fixed sample size of completed examinations. For NHANES 2011–2014, the selected sample in each study location was 80% more than was expected to be needed, but the actual sample released varied depending on the characteristics of the location. To adjust for this approach, a subsample factor is calculated for each study location as the inverse of the proportion of sampled DUs released for screening (R_i).

$$f_{i(\text{release})} = \frac{1}{R_i} \quad [2]$$

Adjustment for deselection of released DUs

When the expected number of sampled participants from released DUs exceeds the target sample size for the study location, some of the DUs from the released sets that have not been screened are randomly deselected to keep the sample size near the target. To account for the deselection, a deselection factor is applied to the remaining DUs that have been released but not screened. This factor is calculated as the inverse of the proportion of released but not screened

DUs that were not deselected ($1 - D_i$).

$$f_{i(\text{desel})} = \frac{1}{1 - D_i} \quad [3]$$

Adjustment for number of years in the sample

NHANES 2011–2014 is a 4-year sample design. Operationally, this means that the selected sample of 60 locations on which the sampling rates were based was implemented over 4 years. Fifteen of the locations were allocated to each single-year sample, with 30 locations included in each 2-year public-use data release cycle. Each single-year and 2-year sample is nationally representative; single-year data are restricted use and available from the NCHS Research Data Center (RDC).

As a result of the 4-year sample design, the initial base weights calculated from the original sampling rates correspond to 4-year samples. These original base weights are based on the sampling probabilities and, as a result, pertain to the 4-year sample prior to its implementation. This means that the original base weights sum to a national population estimate. To produce weights that sum to national population totals for single-year and 2-year samples, adjustment factors are needed. For example, to create the 2-year sample weights for NHANES 2011–2012 and NHANES 2013–2014 released on the public-use files, the 4-year base weights were multiplied by two to account for the 2-year selection (the number of years in the design divided by the number of years in the sample, $4 / 2 = 2$).

$$f_{i(\text{year})} = \frac{4}{\text{Number of years in sample}} \quad [4]$$

Nonresponse Adjustment

If every selected household was screened, and every selected person agreed to complete the interview and the examination, weighted estimates using the base weights described in the “Calculating Base Weights” section would be approximately unbiased estimates of characteristics for the noninstitutionalized civilian U.S. population. However, some of the

selected households are not screened, some of the SPs who are screened refuse to be interviewed, and some of the interviewed sampled participants refuse the examination. To reduce the potential for nonresponse bias, sample weights are adjusted for nonresponse at each stage of the survey (screener, interview, examination). The amount of information that can be used for these adjustments increases at each progressive stage; only the sampling information is available at the screener stage, while person-specific information from the interview is available to adjust examination weights.

The nonresponse adjustment procedure consists of computing adjustment factors,

$$f_{i(\text{NR})} = \frac{\text{Sum of base weights in the adjustment cell}}{\text{Sum of base weights of the respondents in the adjustment cell}} \quad [5]$$

and applying these to the survey weights as

$$w_{i(\text{NR})} = w_{i(\text{base})} f_{i(\text{NR})} \quad [6]$$

separately within nonresponse cells, where nonresponse cells are defined by categorical characteristics known for both survey participants and nonresponders.

Since little is known about households that do not complete the screener, the adjustment cells at the screening stage are just the segments, with the assumption that households in the same segment are similar. For the interview and examination nonresponse adjustments, a classification program is used to identify available variables most highly related to response propensity. Different variables are identified to form adjustment cells for the following age groups: 0–5 years, 6–19 years, 20–59 years, and 60 years and over. Variables used to form the nonresponse adjustment cells for interview and examination weights are listed in [Tables II](#) and [III](#) in [Appendix II](#).

Nonresponse adjustment reduces bias if response rates and survey characteristics vary from cell to cell and if survey participants and nonrespondents sharing the same characteristics are in the same cell.

An effect of nonresponse adjustment is that it increases the variability of the weights, which in turn increases the variance of estimates obtained from the data. When the nonresponse adjustment cells contain a sufficient number of cases and the adjustment factors are not too large, the effect on variances is modest. A large adjustment factor in a cell is usually the result of the small number of survey participants in that cell. To avoid having nonresponse adjustments based on very small sample sizes, or having large nonresponse adjustment factors, nonresponse adjustment cells can be collapsed to form larger cells. As with prior NHANES samples, cells with fewer than 30 respondents were collapsed to create larger cells in NHANES 2011–2012 and NHANES 2013–2014. Due to increasing nonresponse to the interview, larger adjustment factors than in previous NHANES samples were allowed, with most cells having factors less than 2. By comparison, for NHANES 2007–2010, all nonresponse adjustment factors were less than 1.65.

Trimming

Weight-trimming procedures are considered to reduce the impact of any extreme weights on estimation. Nonresponse adjustment can contribute to extreme weights. Extreme weights may also occur when units are sampled to yield fixed sample sizes within a PSU. Even a few unexpectedly large weights can seriously inflate the variance of survey estimates. However, trimming sample weights may introduce estimation bias, so trimming is not automatically used for all sample weights. The impacts of trimming on both variance and bias are considered when deciding whether or not to trim weights.

For NHANES 2011–2014, trimming was not performed for either the NHANES 2011–2012 or the NHANES 2013–2014 2-year sample weights, but it was employed for the NHANES-NNYFS 2011–2012 sample weights.

To determine whether or not to trim weights for samples (or subsets of samples), the distribution of weights within each sampling domain is inspected. A threshold is defined as

three times the sampling domain mean, and extreme weights that exceed this threshold are identified. The values of these extreme weights are reduced to the threshold, and the weights of all cases in the sampling domain are adjusted so that the sum of the weights in each sampling domain equals the corresponding weighted sum prior to trimming.

Trimmed sample weights are calculated as follows. Let t_i be the weight after trimming for SP i . It is defined as

$$t_i = \begin{cases} w_{i(NR)}, & \text{if } w_{i(NR)} \text{ is } \leq \text{threshold} \\ \text{threshold}, & \text{otherwise.} \end{cases} \quad [7]$$

Then the trimming factor, $f_{i(TR)}$, is calculated as

$$f_{i(TR)} = \frac{t_i}{w_{i(NR)}} \times \frac{\sum_{i=1}^{n_b} w_{i(NR)}}{\sum_{i=1}^{n_b} t_i} \quad [8]$$

where n_b is the sample size of the b th race-Hispanic origin-income-sex-age sampling domain and

$$w_{i(TR)} = w_{i(NR)} f_{i(TR)}. \quad [9]$$

Poststratification

The final step in the weighting procedure for each survey stage is poststratification to known population totals. Poststratification compensates for undercoverage or overcoverage of certain demographic groups and for any residual differential nonresponse among these groups. Poststratification, like nonresponse adjustment, is done at the screening, interview, and examination stages.

As mentioned above, a participant's sample weight represents the number of persons with similar characteristics in the target population. The sum of all participants' weights in a race-ethnicity-age-sex demographic subgroup could be considered as the total number of persons NHANES participants represented for this particular demographic subgroup. Poststratification adjusts the individual sample weights so that the sum of the sample weights within a demographic subgroup equals the population from an independent source for that demographic subgroup.

Similar to the adjustment factors for earlier steps, poststratification involves applying a ratio adjustment to the survey weights. In this step, the denominator of the adjustment factor for a particular demographic subgroup is the sum of the nonresponse-adjusted sample weights from the nonresponse adjustment step within the demographic subgroup, and the numerator N_c is the reference population control total for the demographic subgroup.

$$f_{i(PS)} = \frac{N_c}{\text{Sum of nonresponse adjusted weights of the demographic subgroup}} \quad [10]$$

The poststratified weights are then calculated as

$$w_{i(PS)} = w_{i(NR)} f_{i(PS)} \quad [11]$$

If trimming was performed, the poststratification adjustments factor $f_{i(PS)}$ and poststratification weights $w_{i(PS)}$ were calculated from trimmed weights instead of nonresponse adjusted weights.

For NHANES 2011–2012 and NHANES 2013–2014, the Census Bureau's 2011 and 2013 1-year American Community Survey (ACS) were used, respectively, as the source for the reference noninstitutionalized civilian population totals for each demographic subgroup. Though earlier NHANES cycles used the Current Population Survey (CPS) to obtain population control totals (11), beginning in 2011, ACS was used to calibrate the weights. Since Asian sampling domains were introduced in the 2011–2014 sample design, ACS was considered to provide more accurate NHANES estimates. CPS, for example, does not produce separate estimates for non-Hispanic Asians persons. The ACS population counts have been adjusted to match the Census Bureau best estimates of the total noninstitutionalized civilian population of the United States, including those not counted in surveys or in the most recent decennial census. Poststratification using ACS, therefore, brings the weighted totals up to the level of the presumed total noninstitutionalized civilian population in the United States. Detailed reports for these two population surveys

are available from the Census Bureau website (11,12).

A major effect of poststratification is that it implicitly imputes survey characteristics for persons missed by the survey due to errors in the sampling frame and adjusts for residual nonresponse not previously corrected. The underlying assumption for poststratification is that missed persons not covered by the survey have the same distribution of characteristics as surveyed persons within the poststratification cells. This assumption is obviously an oversimplification; the missed persons are likely to be different. However, in the absence of information on the characteristics of the missed persons, poststratification is a technique available for reducing bias due to undercoverage and residual nonresponse.

Computing Final Weights

The final sample weight for each sampled participant at each stage is calculated as the product of the base weight, the nonresponse adjustment, the trimming adjustment (if needed), and the poststratification adjustment. That is,

$$w_{i, \text{stage}} = w_{i, (\text{base, stage})} f_{i, (\text{NR, stage})} f_{i, (\text{TR, stage})} f_{i, (\text{PS, stage})} \quad [12]$$

The final screening weight was calculated as the product of the base weight, the adjustment factors for nonresponse, trimming (if needed), and poststratification for screen stage.

$$w_{i, \text{screen}} = w_{i, \text{base}} f_{i, (\text{NR, screen})} f_{i, (\text{TR, screen})} f_{i, (\text{PS, screen})} \quad [13]$$

The final weights from the screener stage are the base weights for the interview stage, and the final interview weight was calculated as the product of the screen weight, adjustment factors of nonresponse, trimming (if needed), and poststratification for interview stage.

$$\begin{aligned} w_{i, \text{interview}} &= w_{i, \text{screen}} f_{i, (\text{NR, interview})} \\ &\quad f_{i, (\text{TR, interview})} f_{i, (\text{PS, interview})} \\ &= w_{i, \text{base}} f_{i, (\text{NR, screen})} \\ &\quad f_{i, (\text{TR, screen})} f_{i, (\text{PS, screen})} \\ &\quad f_{i, (\text{NR, interview})} f_{i, (\text{TR, interview})} \\ &\quad f_{i, (\text{PS, interview})} \end{aligned} \quad [14]$$

The final weights from the interview stage are the base weights for the MEC examination stage, and the final MEC examination weight was calculated as the product of the interview weight, adjustment factors for nonresponse, trimming (if needed), and poststratification for examine stage.

$$w_{i, \text{MEC}} = w_{i, \text{interview}} f_{i, (\text{NR, MEC})} f_{i, (\text{TR, MEC})} f_{i, (\text{PS, MEC})} \quad [15]$$

and was calculated as

$$\begin{aligned} w_{i, \text{MEC}} &= w_{i, \text{base}} f_{i, (\text{NR, screen})} f_{i, (\text{TR, screen})} \\ &\quad f_{i, (\text{PS, screen})} f_{i, (\text{NR, interview})} \\ &\quad f_{i, (\text{TR, interview})} f_{i, (\text{PS, interview})} \\ &\quad f_{i, (\text{NR, MEC})} f_{i, (\text{TR, MEC})} \\ &\quad f_{i, (\text{PS, MEC})} \end{aligned} \quad [16]$$

The interview weight should be used for analyses of data from the household interview only, when no variables from the examination are included. The examination weights should be used for analyses of data from the examination (including the MEC interview and some laboratory data) or in conjunction with the household interview data. In addition, there are special survey components and subsamples that require further adjustment of the examination weights due to specific inclusion criteria (e.g., morning fasting sample). Component-specific special weights, if needed, are released with the data for the component and described in the component's documentation. See the "Subsample Weights" section for more details and [Table IV](#) in [Appendix II](#) for a list of the weights and usages for NHANES 2011–2014.

NHANES National Youth Fitness Survey

In 2012, NCHS also conducted the NHANES National Youth Fitness Survey (NNYFS) to collect data on physical activity and fitness levels for U.S. children aged 3–15 years. NNYFS was designed to use the same primary and secondary sampling units as NHANES during 2012, and to produce approximately equal sample sizes of children aged 3–15 per PSU. The segments were enlarged to ensure there were enough DUs for both surveys.

NNYFS has six sex-age domains: boys aged 3–5 years, girls aged 3–5 years, boys aged 6–11 years, girls aged 6–11 years, boys aged 12–15 years, and girls aged 12–15 years. In addition, some survey content was collected in the same manner in both surveys. Therefore, it is possible to combine the samples to increase sample sizes for common survey content collected in 2012.

Sample weights for the combined NHANES-NNYFS 2012 sample were created using a composite of the sample weights of the two surveys. NHANES 2011 was fielded before the changes were implemented to make NHANES 2012 and NNYFS 2012 more comparable; therefore, a much smaller set of NHANES 2011 questionnaire and examination items are able to be combined with NNYFS 2012 as compared with NHANES 2012. Nevertheless, it is possible to combine NNYFS 2012 with NHANES 2011–2012 for the limited items available for both years. Sample weights for the combined NHANES-NNYFS 2011–2012 sample were created using a composite of the sample weights of the two surveys.

The weights for the combined sample started with the final interview and examination weights for NHANES 2012 and NNYFS 2012. The initial combined survey weights were calculated as the final sample weights of each survey times the proportion of the effective sample size of the combined sample for each of six sex-age group domains described. The initial combined sample weights were poststratified as described in the "Poststratification" section, with the denominators equal to the sum of the initial combined weights.

To produce sample weights for the combined NHANES-NNYFS 2011–2012 sample, the sample weights for NHANES 2011 and the final combined sample weights for the NHANES-NNYFS 2012 were divided by 2. The weights for the combined sample were then reviewed and trimmed of extreme weights. After trimming, the interview and examination weights for the combined sample were poststratified to population totals from the 2011 ACS.

Data from the NNYFS 2012 sample are released to the public. Data from either of the combined files are available only through the NCHS RDC (<https://www.cdc.gov/rdc/>). See “Restricted Data Access in the NCHS Research Data Center” section for detailed information on accessing restricted data. See the NNYFS website for specific information about NNYFS restricted data files (available from: <https://www.cdc.gov/nchs/nhanes/search/nyfsdata.aspx?Component=Non-Public>). For more detailed information on the combined NHANES-NNYFS weights, see “National Health and Nutrition Examination Survey: National Youth Fitness Survey Estimation Procedures, 2012” (https://www.cdc.gov/nchs/data/series/sr_02/sr02_168.pdf). For more information on the NNYFS survey design, implementation, and data analysis, and the combined NHANES 2011–2012 and NNYFS 2012 sample, see “National Health and Nutrition Examination Survey: National Youth Fitness Survey Plan, Operations, and Analysis, 2012” (13).

Subsample Weights

Some laboratory or examination components are done on a subsample of NHANES participants. For example, some but not all participants aged 12 years and over are selected to give blood samples for testing for lead and mercury in blood. The subsamples selected for these components are chosen at random with a specified sampling fraction (e.g., one-half of this examined age group), according to the protocol for that component. Each subsample is selected to be a nationally representative sample of the target population and has its own designated sample weight, which accounts for the additional probability of selection into the subsample component, as well as any additional nonresponse to the component.

These subsample weights are included in the respective data files. Because these weights differ from the examination weights, subsample weights must be used for statistical estimation of measures collected only in that sample

and for analyses that include those measures (see [Table IV](#) in [Appendix II](#) for a list of special component sample weights and information regarding their appropriate use). See the respective survey protocol and documentation for more detail on the laboratory tests or health measurements done on a subsample of participants (available from: <https://www.cdc.gov/nchs/nhanes.htm>).

There are caveats when trying to combine data sets with subsample weights. Some subsamples, like the three environmental subsamples, are mutually exclusive and cannot be combined together in the same data release cycle or across cycles, since weights are not available for each group. On the other hand, certain combinations of subsamples have some overlap, for example, each of the three environmental subsamples has overlap with the fasting subsample. These could be combined within the same data release cycle. These could also be combined across cycles if the overlapping sample is adequate, and there are no differences in the estimates across the cycles. However, NHANES does not provide sample weights for these combined data sets.

To combine two or more subsamples for analysis, random overlap is needed between the subsamples and appropriate weights need to be recalculated. While there are no specific recommendations regarding how to create combined sample weights for overlapping subsamples, there are calibration approaches to adjusting weights available within the SUDAAN software, with the procedures WTADJUST and WTADJX (14,15). Adjustments to create sample weights for overlapping subsamples can be made by adjusting the sample weights to match population totals within adjustment cells defined by race and Hispanic origin, sex, and age group, demographic characteristics present in both subsamples. Additional adjustments specific to the analysis may also be made to the sample weights using characteristics common to both subsamples. The selection and categorization of the variables used for adjustment will depend on the size of the combined sample and

the purpose of the analysis. Since the overlapping subsamples are typically small, coarser adjustment cells than those used for the original sample weights creation are often required.

Note that sample weight adjustments using the public-use data files would use one of the released race and Hispanic-origin variables (RIDRETH3 or RIDRETH1) available on the file for the calculations. As described earlier, sample weights created by NCHS use the sampling race and ethnicity information.

Although 24-hour dietary recall is not considered a subsample, participants who completed this component have special weights that incorporate day of the week of recall. If an analyst is interested in combining this file with a subsample and interested in how day-to-day variation in diet relates to the information in the subsample, new weights need to be created. Weights could be calculated by starting with the dietary weights and adjusting for subsample participation. If day-to-day variation in diet is not analytically important, the subsample weights could be used without adjustment.

Combining Survey Cycles

Two-year sample weights are provided on public-use files for NHANES 2011–2012 and 2013–2014. To combine these cycles to produce 4-year estimates, a new 4-year weight can be calculated by dividing the 2-year weights by 2, the number of 2-year cycles. Six-year weights can similarly be created for 2009–2014 estimates, or any three combined survey cycles for 2001–2002 or later, by dividing the 2-year weights for each cycle by 3. Other years of data can continue to be added, using these same methods. When 1999–2000 data are included, first double the 4-year weights for 1999–2002, then divide all the weights by the number of 2-year cycles.

However, as a result of sample design changes initiated in 2011, it is important to consider changes in race and Hispanic-origin sampling and the corresponding variables on the public-use files when calculating estimates based on data from combined cycles

that overlap 2011, such as the 6-year period 2009–2014. RIDRETH3 was created to account for the non-Hispanic Asian category starting in 2011 and is not available on public-use files for earlier cycles. Prior to 2011, Asian participants were grouped in the “non-Hispanic white and other” category for sampling and the “other race, including multiracial” race category for race and Hispanic-origin variables on public-use files. Therefore, for combined data sets that use cycles prior to and after 2011, non-Hispanic Asian cannot be a separate race and Hispanic-origin category and participants in this group should be added to the “Other” category. Similarly, estimates from combined cycles should only be made for the total Hispanic subgroup from 2007 onward. Additional information for race and Hispanic-origin changes over time and combining sample weights can be found in the NHANES analytic guidelines (5).

When adjusting the sample weights to combine data for multiple survey cycles, the sum of combined weights will be reasonably close to an independent estimate of the U.S. noninstitutionalized civilian population at the midpoint of the combined interval. The estimate from combined years of data will be the average over the time period. Using multiple cycles to create combined estimates is useful for increasing sample sizes, particularly for analysis of rare events and small subgroups. However, estimation using combined cycles is based on the assumption that there are no differences in the estimates across cycles, including increasing or decreasing trends, other than observed differences due to random variation.

Variance Estimation

This section introduces design-based methods of variance estimation for complex sample survey data and describes the creation of variables necessary for variance estimation on the public- and restricted-use data files for the NHANES 2011–2014 samples.

Sampling errors should be calculated for all survey estimates to aid in

determining the statistical reliability of those estimates. For complex sample surveys, exact mathematical formulas for variance estimates are not available. Variance approximation procedures are necessary to provide reasonable, approximately unbiased, and design-consistent estimates of variance. These routines require special software that account for the survey design. Standard statistical software routines that assume a simple random sample should not be used for computing variances for NHANES. Although each 2-year sample is nationally representative, it is selected from only 30 PSUs.

This small number of PSUs sometimes poses challenges for variance estimation. First, the sample sizes for some specific race-Hispanic origin-income-sex-age subdomains may be small. Second, with a small number of PSUs, direct design-based variance estimates may be unstable for some measures.

Two variance approximation procedures that account for the complex sample design and allow for the computation of design effects are replication methods and Taylor series linearization. Replication methods provide a general means for estimating variances for the types of complex sample designs and weighting procedures usually encountered in practice. The basic idea behind the replication approach is to select subsamples repeatedly from the whole sample, to calculate the statistic of interest for each of these subsamples (or “replicates”), and then to use the variability among these replicate statistics to estimate the variance of the full-sample statistic. The jackknife and Fay’s adjusted balanced repeated replication (Fay’s BRR) methods are two common procedures for deriving replicates from a full sample. The jackknife procedure drops a small part of the sample in each replicate and adjusts the weights for the sample that is retained. Fay’s BRR retains the entire sample in each replicate, but adjusts the weights so that part of the sample has increased weights and part of the sample has decreased weights (16).

For the linearization approach, nonlinear estimates are approximated

by linear estimates for the purpose of variance estimation. The linear approximation is derived by taking the first-order Taylor series approximation for the estimator. Standard variance estimation methods for linear statistics are then used to estimate the variance of the linearized estimator. Currently, NCHS recommends using Taylor series linearization for variance estimation in analyses of NHANES data for 2-year cycles or combined cycles and replication methods for single-year data. Replication methods are also recommended for use with the California NHANES data files (10). SUDAAN, Stata, R, and SAS survey procedures can be used to obtain variance estimates by these methods.

Variance Units for Publicly Released Data

Noncertainty PSUs are grouped into major strata defined by state-level health-related variables as discussed in the “Sample Design Summary” section. In any 2-year sample there are two PSUs sampled from each stratum. These strata are used as variance strata to estimate sampling error in the Taylor series linearization approach. Within each variance stratum, the two sampled PSUs are generally defined as variance units. Certainty PSUs are not selected within strata. Variance strata for these PSUs are formed based on the relative size of the PSU compared with the other PSUs. As a result, some of these variance strata may have one PSU split into multiple variance units, while other variance strata may comprise three PSUs for variance estimation, depending on the number and size of the certainty locations that year.

The small number of PSUs in a 2-year NHANES sample, geographic data and other characteristics of the geographic area on the data files, as well as local publicity campaigns while the survey is in the field, all pose a risk for data disclosure. As a result, masked variance units (MVUs) are provided for use with the public-use data files to reduce the chance of an intruder being able to match PSUs in the sample to PSUs in the geographic areas, while minimizing the bias in the

variance caused by altering the PSU structure. Collectively, MVUs (pseudo-PSUs) formed by the noncertainty and certainty locations can be used for variance estimations and to estimate sampling error. Though they are not the “true” design PSUs, the pseudo-PSUs produce variance estimates that closely approximate the variances that would have been estimated using the true design PSUs. MVUs have been created for all 2-year survey cycles from NHANES 1999–2000 through 2013–2014 and can be used for analyzing any 2-year data set or any combined 4- to 16-year data set. Analysts can compute replicate weights for variance estimation based on MVUs.

Restricted Data Access in the NCHS Research Data Center

For the current sample design, NHANES data are released to the public in 2-year data cycles. In addition to public-use data files, there are special data sets that are available only through the NCHS RDC. These include data sets with (a) data items that were collected from a single-year sample or collected for any time period other than a public-release 2-year cycle (identified as such in the component description, e.g., the single-year 24-hour urine data [17]), (b) data merged geographically to some other contextual data files (often supplied by the data user), and (c) data items that are determined to be too sensitive or too detailed to be released to the public due to confidentiality restrictions. NHANES data linked with administrative data (e.g., Medicare, Medicaid or Children’s Health Insurance Program, and Social Security Administration data) are only available in the RDC.

Some of these data files have special sample weights that should be used when these nonpublic data sets are analyzed within the confines of the RDC environment. For example, single calendar-year data files have single-year interview and examination weights. These single-year sample weights can be combined with sample weights provided on the 2-year public-use file to create 3-year sample weights. All single-year

sample weights were calculated in the same manner as the public-use 2-year sample weights described in the “Weighting the Sample Data” section.

If a special data file involves subsampling, then special subsample weights were created for that file that reflect the number of calendar years in the data file and the rate of subsampling. For all special data files, appropriate documentation is provided in the RDC to describe the necessary sample weights.

Unmasked PSU and variance stratum codes (which differ from the MVU codes provided for the public-use files) can be provided for variance estimation for restricted data files in the RDC. These unmasked variance codes are necessary for studies that use geographically defined variables or for studies that geographically merge NHANES with external data sets. In addition, Fay’s BRR weights for 2-year data and jackknife weights for single-year data with unmasked variance units are available in the RDC. If replication methods are to be used for combined survey years or cycles with unmasked variance units, replicate weights must be computed by the analyst in the RDC. Providing the unmasked PSU and stratum codes poses no disclosure risk because of the restrictions of the RDC. Further, any subnational estimate that is generated from an RDC analysis must be reviewed and approved by NCHS staff to protect the confidentiality of sampled participants.

More information on the RDC and lists of commonly used restricted NHANES data files and variables are available from the NCHS website at: <https://www.cdc.gov/rdc/>. Other restricted variables not listed here may be available upon request. Information on proposals for use of stored specimens is available from: <https://www.cdc.gov/nchs/nhanes/biospecimens/biospecimens.htm>.

Summary

This report describes the methods used to create NHANES 2011–2014 sample weights and variance units for the public use data files, including sample

weights for selected subsamples, such as the fasting subsample. The impacts of sample design changes on estimation for NHANES 2011–2014 and the addition of the NNYFS 2012 are described.

Approaches that data users can employ to modify sample weights when combining survey cycles or when combining subsamples are also included.

References

1. Johnson CL, Dohrmann SM, Burt VL, Mohadjer LK. National Health and Nutrition Examination Survey: Sample design, 2011–2014. National Center for Health Statistics. *Vital Health Stat* 2(162). 2014. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_162.pdf.
2. Curtin LR, Mohadjer LK, Dohrmann SM, Montaquila JM, Kruszon-Moran D, Mirel LB, et al. The National Health and Nutrition Examination Survey: Sample design, 1999–2006. National Center for Health Statistics. *Vital Health Stat* 2(155). 2012. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_155.pdf.
3. Curtin LR, Mohadjer LK, Dohrmann SM, Kruszon-Moran D, Mirel LB, Carroll MD, et al. National Health and Nutrition Examination Survey: Sample design, 2007–2010. National Center for Health Statistics. *Vital Health Stat* 2(160). 2013. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_160.pdf.
4. Mirel LB, Mohadjer LK, Dohrmann SM, Clark J, Burt VL, Johnson CL, Curtin LR. National Health and Nutrition Examination Survey: Estimation procedures, 2007–2010. National Center for Health Statistics. *Vital Health Stat* 2(159). 2013. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_159.pdf.
5. Johnson CL, Paulose-Ram R, Ogden CL, Carroll MD, Kruszon-Moran D, Dohrmann SM, Curtin LR. National Health and Nutrition Examination Survey: Analytic guidelines,

- 1999–2010. National Center for Health Statistics. Vital Health Stat 2(161). 2013. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_161.pdf.
6. National Center for Health Statistics. Vital statistics. Annual mortality files, 2003–2005.
 7. National Center for Health Statistics. Vital statistics. Linked birth/infant death data set, 2002–2004.
 8. CDC. Behavioral risk factor surveillance system. 2001.
 9. CDC. Behavioral risk factor surveillance system. 2002.
 10. Parker JD, Kruszon-Moran D, Mohadjer LK, Dohrmann SM, Van de Kerchhove W, Clark J, Burt VL. National Health and Nutrition Examination Survey: California and Los Angeles County, estimation methods and analytic considerations, 1999–2006 and 2007–2014. National Center for Health Statistics. Vital Health Stat 2(173). 2017. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_173.pdf.
 11. U.S. Census Bureau. Current population survey design and methodology technical paper (66). 2006. Available from: <https://www.census.gov/prod/2006pubs/tp-66.pdf>.
 12. U.S. Census Bureau. Design and methodology American Community Survey. 2009. Available from: https://www.census.gov/content/dam/Census/library/publications/2010/acs/acs_design_methodology.pdf.
 13. Borrud L, Chiappa M, Burt V, Gahche J, Zipf G, Dohrmann SM, Johnson CL. National Health and Nutrition Examination Survey: National Youth Fitness Survey plan, operations, and analysis, 2012. National Center for Health Statistics. Vital Health Stat 2(163). 2014. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_163.pdf.
 14. Brown GG. Survey weight adjustment using PROC WTADJUST from SUDAAN V10. In: American Association for Public Opinion Research 2010 conference. Available from: https://www.rti.org/sites/default/files/resources/aapor10_brown_poster.pdf.
 15. RTI International. SUDAAN (Release 11.1) [computer software]. 2017. Available from: <http://sudaansupport.rti.org/sudaan/page.cfm?obj=A4FF532B-5056-B100-31D5BDEAEF4181A2>.
 16. Judkins DR. Fay's method for variance estimation. *J Off Stat* 6(3):223–39. 1990.
 17. National Center for Health Statistics. National Health and Nutrition Examination Survey 2014–2014 data documentation, codebook, and frequencies. 24-Hour urine collection data processing—First collection. Available from: https://www.cdc.gov/Nchs/Nhanes/limited_access/URI_H_R.htm.

Appendix I. Glossary

Demographic subgroup—A demographic group defined by race and Hispanic origin, age, and sex, which might be a single or a combination of multiple sample domains.

Domain—A demographic group of analytic interest (analytic domain). Analytic domains may also be sampling domains if a sample design is created to meet goals for those specific demographic groups. For the National Health and Nutrition Examination Survey (NHANES), sampling domains are defined by race and Hispanic origin, income, age, and sex. See *Sampling domain*.

Dwelling unit (DU)—Also "housing unit." A house, apartment, mobile home or trailer, group of rooms, or single room occupied as separate living quarters or, if vacant, intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants live separately from other individuals in the building and which have direct access from outside the building or through a common hall. In this report, the term generally means those DUs that are eligible for the survey (i.e., excluding institutional group quarters), or that could become eligible (e.g., vacant at the time of sampling, but could be occupied once screening begins).

Household—All the persons who occupy a housing unit as their usual place of residence.

Masked variance units (MVUs)—A collection of secondary sampling units aggregated into groups for the purpose of variance estimation and designed to prevent disclosure of the identity of the selected primary sampling units (PSUs). For NHANES, rather than using the units as sampled, some pseudo units are created. The resulting units produce variance estimates that closely approximate the "true" design variance estimates. MVUs have been created for all 2-year survey cycles from NHANES 1999–2000 through 2013–2014. They can also be used for analyzing any combined 4-, 6-, or 8-year data set.

Measure of size (MOS)—A value assigned to every sampling unit in a sample selection, usually a count of units associated with the elements to be selected. For NHANES, the MOS is actually a weighted average of estimates of population counts for the race-Hispanic-origin-income groups of interest.

National Center for Health Statistics (NCHS)—As the nation's principal health statistics agency, NCHS designs, develops, and maintains a number of systems that produce data related to demographic and health concerns. These include data on registered births and deaths collected through the National Vital Statistics System, and data collected by the National Health Interview Survey, NHANES, the National Health Care Surveys, and the National Survey of Family Growth, among others. NCHS is part of the Centers for Disease Control and Prevention, an operating division of the U.S. Department of Health and Human Services.

Noninstitutionalized civilian population—Includes all people living in households and noninstitutional group quarters who are not active members of the military. This is the target population for NHANES.

Primary sampling unit (PSU)—The first-stage selection unit in a multistage area probability sample. In NHANES, PSUs are counties or groups of counties in the United States. Some PSUs are so large that they are selected into the survey with a probability of one. These are referred to as PSUs selected with certainty ("certainty PSUs" or often referred to as self-representing PSU [SR PSU]); all other PSUs are selected without certainty (noncertainty PSUs [NSR PSU]).

Probability proportionate to size (PPS) sampling—In this method, the probability of selecting any unit varies with the size of the unit, giving larger units a greater probability of selection and smaller units a lower probability. NHANES uses PPS sampling in the selection of PSUs and Secondary sampling unit (SSUs).

Public-use data file—An electronic data set containing respondent records from a survey with a subset of variables collected in the survey that have been reviewed by analysts within NCHS to ensure that respondent identities are protected. NCHS disseminates these files to encourage public use of the survey data.

Race and Hispanic origin—Unless otherwise specified, the phrase (race and Hispanic origin) in this report is used as it was used in NHANES sample selection and sample weight construction. It refers to Hispanic, non-Hispanic black, non-Hispanic, and non-black Asian persons, and a fourth group that includes non-Hispanic white and all other persons.

Replicates—Subsamples selected repeatedly from a sample used in some variance estimation approaches. With these approaches, the statistic of interest is calculated for each subsample, and the variability among the replicate statistics is used to estimate the variance of the full-sample statistic. The jackknife and balanced repeated replication (BRR) methods are two common procedures for the derivation of replicates from a full sample. The BRR method was used in the creation of replicate weights for most of the NHANES 2011–2014 multiyear samples.

Respondent—A person selected into a sample who agrees to participate in all aspects of the survey. In NHANES, persons agreeing to complete the in-home interview are considered "interview respondents." Persons agreeing to complete both the in-home interview and an examination in a mobile examination center (MEC) are considered "MEC respondents."

Response rate—The number of survey respondents divided by the number of persons selected into the sample. The response rates in this report are MEC response rates—calculated as the number of people receiving examinations in the MEC divided by the total number of people sampled.

Restricted-use data file—An electronic data set of survey respondent records containing some information that may, if released to the public, risk disclosing individual survey respondents. These data are available only through the NCHS Research Data Center. These include data sets with (a) data items collected from single year); (b) data geographically linked to other contextual data files (often supplied by the data user); or (c) data items determined to be too sensitive or too detailed to be released to the public due to confidentiality restrictions.

Sample weight—The estimated number of persons in the target population that an NHANES respondent represents. For example, if a man in the sample represents 12,000 men in his race-Hispanic-origin-income-age subdomain, then his sample weight is 12,000. The NHANES sample weights were adjusted for different sampling rates (of the race-Hispanic-origin-income-sex-age groups), different response rates, and different coverage rates among persons in the sample, so that accurate national estimates could be made from the sample. The product of all of these adjustments is sometimes called the “final” sample weight.

Sampling domain—NHANES 2011–2014 included 87 sampling domains, which were defined by race and Hispanic origin, income, age, and sex. Every person in the NHANES target population can be classified into exactly one of the 87 sampling domains. See *Domain*.

Sampling rate—The rate at which a unit is selected from a sampling frame. For NHANES, the rates required for sampling persons in the race-Hispanic-origin-income-sex-age domains were designed to achieve the designated number of MEC examinations in each of those domains. The sampling rates are the driving force in all stages of sampling.

Screener—An interview (usually short) containing a set of questions asked of a household member to determine whether the household contains anyone eligible for the survey. In NHANES, the screener consisted of compiling a household roster and collecting the income level of the household and the race and Hispanic origin, age, and sex

of all household members. In NHANES, only persons aged 18 and over can answer the screener.

Screening—The process of conducting, or attempting to conduct, the screener interview in selected DUs. Occupied DUs (households) are screened using the screener. Other units can also be screened; the process for these units is simply verification that they are either vacant or not DUs. See *Screener*.

Secondary sampling unit—The second-stage selection unit in a multistage area probability sample. For NHANES, these are typically referred to as “segments;” see *Segment*.

Segment—A group of housing units located near each other, all of which were considered for selection into the sample. For NHANES, segments consist of a census block, or group of blocks, and their selection makes up the second stage of sampling. Within each segment, a sample of DUs was selected.

Stratification (or strata)—The partitioning of a population of sampling units into mutually exclusive categories (strata). Typically, stratification is used to increase the precision of survey estimates for subpopulations important to the survey's objectives. To select the PSUs fielded in 2011–2014, PSUs were stratified based on health status, metropolitan statistical area status, and various population demographics.

Study location—The set of segments within a PSU that were fielded together, with all MEC examinations conducted at the same physical location. The distinction between a PSU and a study location is necessary because some large certainty PSUs were divided into multiple study locations and fielded at different times.

Target population—The population to be described by estimates from the survey. In NHANES, the target population is the resident noninstitutionalized civilian population of the United States, which excludes all persons in supervised care or custody in institutional settings, all active-duty military personnel, active-duty family members living overseas, and any other persons residing outside the 50 states and the District of Columbia.

Undercoverage—The result of failing to include all of the target population within the sampling frame.

Variance—A measure of the dispersion of a set of numbers. In this report, the variance is specifically the sample variance, which is a measure of the variation of a statistic, such as a proportion or a mean, calculated as a function of the sampling design and the population parameter being estimated. Many common statistical software packages compute “population variances” by default; these may underestimate the sampling variance because they do not incorporate any effects of having taken a sample instead of collecting data from every person in the full population. Estimating the variance in NHANES requires special statistical software, as discussed in this report.

Variance stratum—The cluster of variance units used when forming a replicate for variance estimation. For NHANES, the PSU sampling strata usually correspond to the variance strata.

Variance unit—A collection of secondary sampling units aggregated into groups and excluded when forming a replicate for variance estimation. For NHANES, an entire PSU usually corresponds to a variance unit.

Weight—See *Sample weight*.

Appendix II. Tables

Table I. Final sampling rates and base weights: National Health and Nutrition Examination Survey, 2011–2014

Race and Hispanic-origin-income-sex-age sampling domain ²	2011–2012		2013–2014 ¹	
	Numerator of sampling rate ³	Base weight	Numerator of sampling rate ⁴	Base weight
Non-Hispanic black				
Male and female:				
Under 1	1.00	1,430.08	1.00	1,890.34
1–2	0.82	1,748.32	1.00	1,890.34
3–5	0.58	2,471.85	0.76	2,471.85
Male:				
6–11	0.58	2,458.66	0.77	2,458.66
12–19	0.45	3,159.91	0.60	3,159.91
20–39	0.26	5,491.79	0.34	5,491.79
40–49	0.31	4,588.14	0.41	4,588.14
50–59	0.34	4,201.29	0.45	4,201.29
60 and over	0.70	2,037.30	0.93	2,037.30
Female:				
6–11	0.62	2,319.15	0.82	2,319.15
12–19	0.45	3,212.60	0.59	3,212.60
20–39	0.21	6,887.17	0.27	6,887.17
40–49	0.25	5,647.05	0.33	5,647.05
50–59	0.30	4,740.20	0.40	4,740.20
60 and over	0.50	2,861.99	0.66	2,861.99
Hispanic				
Male and female:				
Under 1	0.98	1,458.48	1.00	1,890.34
1–2	0.51	2,829.21	0.68	2,769.02
3–5	0.38	3,798.67	0.51	3,678.71
Male:				
6–11	0.37	3,858.13	0.51	3,736.30
12–19	0.29	4,870.33	0.41	4,667.40
20–39	0.16	8,821.38	0.23	8,197.64
40–49	0.19	7,696.97	0.28	6,680.39
50–59	0.26	5,460.40	0.38	4,925.07
60 and over	0.69	2,064.02	0.94	2,020.57
Female:				
6–11	0.38	3,775.37	0.52	3,656.15
12–19	0.31	4,619.96	0.43	4,427.46
20–39	0.15	9,676.17	0.21	8,902.08
40–49	0.18	7,785.45	0.28	6,757.18
50–59	0.26	5,539.49	0.38	4,996.40
60 and over	0.56	2,544.90	0.76	2,491.33
Non-Hispanic, non-black Asian				
Male and female:				
Under 1	1.00	1,430.08	1.00	1,890.34
1–2	1.00	1,430.08	1.00	1,890.34
3–5	1.00	1,430.08	1.00	1,890.34
Male:				
6–11	1.00	1,430.08	1.00	1,890.34
12–19	1.00	1,430.08	1.00	1,890.34
20–39	0.44	3,270.54	0.58	3,270.54
40–49	0.62	2,295.99	0.82	2,295.99
50–59	0.68	2,093.59	0.90	2,093.59
60 and over	1.00	1,430.08	1.00	1,890.34
Female:				
6–11	1.00	1,430.08	1.00	1,890.34
12–19	0.93	1,540.84	1.00	1,890.34
20–39	0.47	3,068.76	0.62	3,068.76
40–49	0.58	2,449.97	0.77	2,449.97
50–59	0.63	2,283.92	0.83	2,283.92
60 and over	1.00	1,430.08	1.00	1,890.34

See footnotes at end of table.

Table I. Final sampling rates and base weights: National Health and Nutrition Examination Survey, 2011–2014—Con.

Race and Hispanic-origin-income-sex-age sampling domain ²	2011–2012		2013–2014 ¹	
	Numerator of sampling rate ³	Base weight	Numerator of sampling rate ⁴	Base weight
Non-Hispanic white or other, low-income				
Male and female:				
Under 1	0.90	1,589.94	1.00	1,890.34
1–2	0.40	3,575.80	0.55	3,464.05
3–5	0.32	4,442.21	0.44	4,303.39
Male:				
6–11	0.35	4,058.72	0.48	3,931.88
12–19	0.29	4,979.74	0.39	4,824.12
20–29	0.23	6,088.01	0.33	5,729.90
30–39	0.44	3,276.56	0.59	3,177.27
40–49	0.34	4,190.58	0.47	4,063.59
50–59	0.33	4,276.60	0.46	4,147.01
60–69	0.38	3,734.97	0.52	3,621.79
70–79	0.70	2,055.29	0.95	1,993.01
80 and over	1.00	1,430.08	1.00	1,890.34
Female:				
6–11	0.37	3,848.80	0.51	3,728.53
12–19	0.27	5,309.69	0.38	4,987.89
20–29	0.16	8,770.22	0.24	8,018.48
30–39	0.26	5,563.59	0.36	5,236.32
40–49	0.27	5,261.14	0.38	4,951.67
50–59	0.29	4,941.72	0.39	4,791.97
60–69	0.26	5,554.53	0.36	5,227.79
70–79	0.35	4,074.04	0.48	3,950.58
80 and over	0.49	2,925.40	0.67	2,836.75
Non-Hispanic white or other, non-low-income				
Male and female:				
Under 1	0.38	3,749.62	0.53	3,562.14
1–2	0.20	7,201.28	0.29	6,620.53
3–5	0.13	11,066.36	0.19	9,704.34
Male:				
6–11	0.13	10,981.69	0.20	9,630.10
12–19	0.09	16,419.59	0.14	13,564.01
20–29	0.07	19,355.25	0.12	15,538.73
30–39	0.08	16,858.95	0.14	13,926.96
40–49	0.07	19,422.44	0.12	15,592.66
50–59	0.06	22,809.90	0.11	17,810.47
60–69	0.08	17,190.55	0.13	14,200.89
70–79	0.16	9,218.96	0.23	8,210.64
80 and over	0.33	4,282.86	0.46	4,068.72
Female:				
6–11	0.13	10,768.92	0.20	9,443.51
12–19	0.09	15,367.79	0.15	12,881.82
20–29	0.08	18,803.49	0.12	15,311.41
30–39	0.08	17,365.14	0.13	14,345.11
40–49	0.07	21,833.52	0.11	17,048.09
50–59	0.06	24,990.82	0.10	18,993.03
60–69	0.09	16,761.14	0.14	13,846.16
70–79	0.16	9,182.40	0.23	8,178.08
80 and over	0.29	4,959.41	0.41	4,634.20

¹Sampling rates for 2013–2014 sample were increased to account for reduced screening amounts.
²Age in years.
³Corresponds to a 180% sample; sampling rates may be calculated by dividing the numerator by 1,430.
⁴Corresponds to a 180% sample; sampling rates may be calculated by dividing the numerator by 1,890.
 SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table II. Variables used in forming nonresponse adjustment cells for weighting interview samples: National Health and Nutrition Examination Survey, 2011–2014

Variables considered for nonresponse, by age group	Order and categories of variables cross-classified to form nonresponse adjustment cells	
	2011–2012	2013–2014
0–5 years		
Race and ethnicity of sampled person	1. Hispanic, non-Hispanic black, other	6. Hispanic, non-Hispanic black, Asian, other
Urbanicity	2. Urban, suburban, rural	...
Census region	3. Northeast, Midwest, South, West	3. Northeast, Midwest, South, West
Health-based state groups used for sampling strata	4. Most healthy states, California, second-most healthy states, third-most, fourth-most	5. Most healthy states, California, second-most healthy states, third-most, fourth-most
Household size	5. 1–4, 5–6, 7 or more	4. 1–2, 3–4, 5–6, 7 or more
Tract-level median income (by quartile)	...	1. First quartile, second, third, fourth
Sex of household reference person	...	2. Male, female
6–19 years		
Race and ethnicity of sampled person	1. Hispanic, non-Hispanic black, other	1. Hispanic, non-Hispanic black, Asian, other
Urbanicity	2. Nonrural, rural	...
Census region	3. Northeast, all others	7. Northeast, Midwest, South, West
Number of sampled persons in household	4. 1–2, 3, 4, 5 or more	3. 1–4, 5 or more
Sex of household reference person	5. Male, female	8. Male, female
Health-based state groups used for sampling strata	6. Most healthy states including California, second-and third-most healthy states, fourth-most	4. Most healthy states, California, second-most healthy states, third-most, fourth-most
Household size	...	2. 1–2, 3–4, 5–6, 7 or more
Tract-level percentage of the population aged 25 and over with a college education or higher	...	5. First quartile, second, third, fourth
Tract-level median age	...	6. First quartile, second, third, fourth
20–59 years		
Race and ethnicity of sampled person	1. Hispanic, non-Hispanic black, other	5. Hispanic, non-Hispanic black, Asian, other
Urbanicity	2. Urban, nonUrban	...
Census region	3. Midwest, South, other	3. Northeast, Midwest, South, West
Health-based state groups used for sampling strata	4. Most healthy states including California, second-and third-most healthy states, fourth-most	4. Most healthy states, California, second-most healthy states, third-most, fourth-most
Household size	5. 1–2, 3–4, 5–6, 7 or more	...
Number of sampled persons in household	6. 1–2, 3, 4, 5 or more	2. 1–4, 5 or more
Sex of sampled person	7. Male, female	8. Male, female
Presence of a sampled person under age 16 in household	8. Yes, no	...
Tract-level median income	...	1. First quartile, second, third, fourth
Sex of household reference person	...	6. Male, female
Tract-level percentage of the population born in the United States	...	7. First quartile, second, third, fourth
Number of sampled persons combined with presence of a sampled person under age 16 in household	...	9. One person under age 16, one person aged 16 and over, more than one person under age 16, more than one person aged 16 and over, mixed ages
Tract-level percentage of the population aged 25 and over with a college education or higher	...	10. First quartile, second, third, fourth
60 years and over		
Urbanicity	1. Urban, suburban, rural	...
Race and ethnicity of sampled person	2. Non-Hispanic non-black non-Asian (white), other	6. Hispanic, non-Hispanic black, Asian, other
Number of sampled persons in household	3. 1, 2, 3–5, 6 or more	3. 1–2, 3 or more
Household size	4. 1–2, 3 or more	...
Sex of household reference person	5. Male, female	...
Census region	6. Northeast, Midwest, South, West	2. Northeast, Midwest, South, West
Health-based state groups used for sampling strata	7. Most healthy states including California, second-and third-most healthy states, fourth-most	7. Most healthy states, California, second-most healthy states, third-most, fourth-most
Tract-level percentage of the population that is Asian alone or in combination	...	1. First quartile, second, third, fourth
Tract-level percentage of the population aged 25 and over with a college education or higher	...	4. First quartile, second, third, fourth
Tract-level median income	...	5. First quartile, second, third, fourth

... Category not applicable.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table III. Variables used in forming nonresponse adjustment cells for weighting mobile examination center samples: National Health and Nutrition Examination Survey, 2011–2014

Variables considered for nonresponse, by age group	Order and categories of variables cross-classified to form nonresponse adjustment cells	
	2011–2012	2013–2014
0–5 years		
Number of sampled persons in household	1. 1, more than 1	...
Presence of a sampled person over age 16 in household	2. Yes, no	...
Household size	3. 1–4, 5–6, 7 or more	...
Census region	...	1. Northeast, Midwest, South, West
Race and ethnicity of sampled person	...	2. Hispanic, non-Hispanic black, Asian, other
Sex of household reference person	...	3. Male, female
6–19 years		
Highest level of education in household	1. Less than high school, high school, more than high school	...
Sex of household reference person	2. Male, female	...
Health-based state groups used for sampling strata	3. Most healthy states, California, second-most healthy states, third-most, fourth-most	...
Number of sampled persons in household	...	1. 1–3, 4 or more
Home ownership	...	2. Own, rent, some other arrangement
Tract-level median income	...	3. First quartile, second, third, fourth
Tract-level percentage of the population born in the United States	...	4. First quartile, second, third, fourth
20–59 years		
Census region	1. Northeast, Midwest, South, West	...
Home ownership	2. Own, other	2. Own, rent, some other arrangement
Number of sampled persons in household	3. 1, more than 1	...
Presence of a sampled person under age 16 in household	4. Yes, no	...
Highest level of education for sampled person	5. Less than high school, high school, more than high school	...
Household size	6. 1–2, 3–4, 5–6, 7 or more	...
Self-reported health	7. Excellent/very good/good, fair/poor	...
Number of sampled persons combined with presence of a sampled person under age 16 in household	...	1. One person under age 16, one person aged 16 and over, more than one person under age 16, more than one person aged 16 and over, mixed ages
Highest level of education in household	...	3. Less than high school, high school, more than high school
Sex of household reference person	...	4. Male, female
Race and ethnicity of sampled person	...	5. Hispanic, non-Hispanic black, Asian, other
60 years and over		
Census region	1. Northeast, Midwest, South, West	...
Highest level of education in household	2. Less than high school, high school, more than high school	...
Home ownership	...	1. Own, rent, some other arrangement
Tract-level percentage of the population aged 25 and over with a college education or higher	...	2. First quartile, second, third, fourth
Tract-level median age	...	3. First quartile, second, third, fourth

... Category not applicable.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Table IV. Most common survey samples weights and their appropriate use: National Health and Nutrition Examination Survey, 2011–2014

Sample weights	Application	Notes
Full samples		
Interview weights (WTINT2YR)	Use when analyzing data from the home interview only. Do not use if the analysis includes variables that were also collected on examined persons in the mobile examination center (MEC).	
Examination weights (WTMEC2YR)	Use when analyzing data from the MEC examination. Do not use if the analysis includes variables collected as part of one of the dietary interviews or part of one of the subsamples (e.g., fasting or environmental).	
Dietary Day 1 sample weights (WTDRD1)	Use when analyzing data from sample with completed Day 1 24-hour dietary recall or the Flexible Consumer Behavior Survey telephone follow-up module.	Instead of adjusting for 7 days of the week in addition to race and ethnicity and age groups like in NHANES 2011–2012, NHANES 2013–2014 Day 1 dietary weights were adjusted based on race and ethnicity, age groups, and four categories of the day of the week (weekdays, Fridays, Saturdays, and Sundays).
Dietary Day 1 and Day 2 completed sample (WTDR2D)	Use when analyzing data from the smaller sample with 2 days of completed 24-hour dietary recall.	Dietary 2-day sample weights were adjusted based on race and ethnicity, age groups, and Day 1 and Day 2 weekday-weekend categories.
One-half subsamples		
Blood metals one-half subsample weights (WTSH2YR)	Use when analyzing blood lead, cadmium, total mercury, selenium, and manganese, etc. (blood metals).	Blood metals one-half subsample weights are only for aged 12 and over for 2013–2014. MEC weights should be used for children aged 1–11 in 2013–2014 and all ages in 2011–2012.
Fasting subsample weights (WTSF2YR)	Use when analyzing the plasma fasting glucose, insulin levels, triglycerides, and low-density lipoprotein cholesterol (lipids) only for examined persons assigned to and meeting the criteria for the fasting subsample.	Fasting subsample weights are for participants aged 12 and over who were examined in a morning session and fasted 8–23 hours. Diagnosed diabetes is a separate poststratification category (to the interview weights).
Oral glucose tolerance test (OGTT) subsample weights (WTSOG2YR)	Use when analyzing only OGTT glucose levels or OGTT glucose levels with other data such as insulin or fasting levels for examined persons assigned to and meeting the criteria for the OGTT.	OGTT subsample weights are for participants aged 12 and over who were examined in a morning session, fasted 9–23 hours, and had valid glucose test results, except for women stating they were pregnant. Women stating that they were not pregnant, but were later determined to be pregnant from laboratory results, were eligible and are included. Diagnosed diabetics were not given the OGTT, but nonpregnant diagnosed diabetics are included in the OGTT file with a weight equal to their fasting weight.
Volatile organic compound (VOC) subsample weights (WTSVOC2Y)	Use when analyzing data from volatile organic compound one-half laboratory subsample for examined persons assigned to and meeting the criteria for this subsample.	VOC subsample weights are for participants aged 12 and over. For 2013–2014, WTSVOC2Y equals to WTSH2YR for participants aged 12 and over.
VOC smoking weights (WTSVS2YR)	Use when analyzing the VOC smoking special sample.	VOC smoking weights are for participants in the VOC subsample plus current smokers. Current smokers were identified based on the smoking questions asked to all participants aged 20 and over for 2011–2012 and participants aged 18 and over for 2013–2014.

Table IV. Most common survey samples weights and their appropriate use: National Health and Nutrition Examination Survey, 2011–2014—Con.

Sample weights	Application	Notes
One-third subsamples		
Environmental chemicals A weights (WTSA2YR)	Use when analyzing data from the one-third laboratory environmental subsample A for examined persons assigned to and meeting the criteria for this subsample.	Environmental subsample A, B, C weights are each for a one-third subsample of examined participants aged 6 and over. Participants are assigned to one of the three mutually exclusive one-third environmental subsamples based on the sampling scheme. The analytes in each of the three subsamples are varied depending on what is included in the cycle. The names Subsample A, Subsample B, and Subsample C are for convenience and not representative of any ordering. The proper subsample weights attached in the data set should be used to analyze. As the same analytes might be in different subsamples, it is important to check the weight.
Environmental chemicals B weights (WTSC2YR)	Use when analyzing data from the one-third laboratory environmental subsample B for examined persons assigned to and meeting the criteria for this subsample.	See Environmental chemicals A weights.
Environmental chemicals C weights (WTSC2YR)	Use when analyzing data from the one-third laboratory environmental subsample C for examined persons assigned to and meeting the criteria for this subsample.	See Environmental chemicals A weights.
Smoking weights (WTFSM)	Use when analyzing the smoking special sample.	These weights apply to the participants in environmental chemicals subsample A plus all examined adults who were current smokers. Current smokers were identified based on the smoking questions asked to all participants aged 20 and over for 2011–2012, and participants aged 18 and over for 2013–2014.
Special single-year sample (Research Data Center only)		
NHANES-NNYFS 2012 interview weights (WTINT)	Use when analyzing data from the home interview for the combined NHANES-NNYFS 2012 sample only.	These weights apply to children aged 3–15 years who participated in either NHANES or NNYFS in 2012.
NHANES-NNYFS 2012 MEC weights (WTMEC)	Use when analyzing data from the MEC examination for the combined NHANES-NNYFS 2012 sample only.	These weights apply to children aged 3–15 years who participated in either NHANES or NNYFS in 2012.
24-hour urine (2014) (WT1YUR)	Use when analyzing the 24-hour urine collection sample.	These weights apply to a one-half sample from NHANES 2014 examined adults aged 20–69. Jackknife and Fay's balanced repeated replication weights are also available for variance estimations.

NOTES: NHANES is National Health and Nutrition Examination Survey. NNYFS is NHANES National Youth Fitness Survey.

SOURCE: NCHS, National Health and Nutrition Examination Survey, 2011–2014.

Vital and Health Statistics Series Descriptions

Active Series

- Series 1. Programs and Collection Procedures**
Reports describe the programs and data systems of the National Center for Health Statistics, and the data collection and survey methods used. Series 1 reports also include definitions, survey design, estimation, and other material necessary for understanding and analyzing the data.
- Series 2. Data Evaluation and Methods Research**
Reports present new statistical methodology including experimental tests of new survey methods, studies of vital and health statistics collection methods, new analytical techniques, objective evaluations of reliability of collected data, and contributions to statistical theory. Reports also include comparison of U.S. methodology with those of other countries.
- Series 3. Analytical and Epidemiological Studies**
Reports present data analyses, epidemiological studies, and descriptive statistics based on national surveys and data systems. As of 2015, Series 3 includes reports that would have previously been published in Series 5, 10–15, and 20–23.

Discontinued Series

- Series 4. Documents and Committee Reports**
Reports contain findings of major committees concerned with vital and health statistics and documents. The last Series 4 report was published in 2002; these are now included in Series 2 or another appropriate series.
- Series 5. International Vital and Health Statistics Reports**
Reports present analytical and descriptive comparisons of U.S. vital and health statistics with those of other countries. The last Series 5 report was published in 2003; these are now included in Series 3 or another appropriate series.
- Series 6. Cognition and Survey Measurement**
Reports use methods of cognitive science to design, evaluate, and test survey instruments. The last Series 6 report was published in 1999; these are now included in Series 2.
- Series 10. Data From the National Health Interview Survey**
Reports present statistics on illness; accidental injuries; disability; use of hospital, medical, dental, and other services; and other health-related topics. As of 2015, these are included in Series 3.
- Series 11. Data From the National Health Examination Survey, the National Health and Nutrition Examination Surveys, and the Hispanic Health and Nutrition Examination Survey**
Reports present 1) estimates of the medically defined prevalence of specific diseases in the United States and the distribution of the population with respect to physical, physiological, and psychological characteristics and 2) analysis of relationships among the various measurements. As of 2015, these are included in Series 3.
- Series 12. Data From the Institutionalized Population Surveys**
The last Series 12 report was published in 1974; these reports were included in Series 13, and as of 2015 are in Series 3.
- Series 13. Data From the National Health Care Survey**
Reports present statistics on health resources and use of health care resources based on data collected from health care providers and provider records. As of 2015, these reports are included in Series 3.

- Series 14. Data on Health Resources: Manpower and Facilities**
The last Series 14 report was published in 1989; these reports were included in Series 13, and are now included in Series 3.
- Series 15. Data From Special Surveys**
Reports contain statistics on health and health-related topics from surveys that are not a part of the continuing data systems of the National Center for Health Statistics. The last Series 15 report was published in 2002; these reports are now included in Series 3.
- Series 16. Compilations of Advance Data From Vital and Health Statistics**
The last Series 16 report was published in 1996. All reports are available online; compilations are no longer needed.
- Series 20. Data on Mortality**
Reports include analyses by cause of death and demographic variables, and geographic and trend analyses. The last Series 20 report was published in 2007; these reports are now included in Series 3.
- Series 21. Data on Natality, Marriage, and Divorce**
Reports include analyses by health and demographic variables, and geographic and trend analyses. The last Series 21 report was published in 2006; these reports are now included in Series 3.
- Series 22. Data From the National Mortality and Natality Surveys**
The last Series 22 report was published in 1973. Reports from sample surveys of vital records were included in Series 20 or 21, and are now included in Series 3.
- Series 23. Data From the National Survey of Family Growth**
Reports contain statistics on factors that affect birth rates, factors affecting the formation and dissolution of families, and behavior related to the risk of HIV and other sexually transmitted diseases. The last Series 23 report was published in 2011; these reports are now included in Series 3.
- Series 24. Compilations of Data on Natality, Mortality, Marriage, and Divorce**
The last Series 24 report was published in 1996. All reports are available online; compilations are no longer needed.

For answers to questions about this report or for a list of reports published in these series, contact:

Information Dissemination Staff
National Center for Health Statistics
Centers for Disease Control and Prevention
3311 Toledo Road, Room 4551, MS P08
Hyattsville, MD 20782

Tel: 1-800-CDC-INFO (1-800-232-4636)
TTY: 1-888-232-6348

Internet: <https://www.cdc.gov/nchs>

Online request form: <https://www.cdc.gov/info>

For e-mail updates on NCHS publication releases, subscribe online at: <https://www.cdc.gov/nchs/govdelivery.htm>.

**U.S. DEPARTMENT OF
HEALTH & HUMAN SERVICES**

Centers for Disease Control and Prevention
National Center for Health Statistics
3311 Toledo Road, Room 4551, MS P08
Hyattsville, MD 20782-2064

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

FIRST CLASS MAIL
POSTAGE & FEES PAID
CDC/NCHS
PERMIT NO. G-284