SAFER • HEALTHIER • PEOPLE™

# Nonresponse in the National Survey of Children's Health, 2007

# Vital and Health Statistics

## Series 2, Number 156

## Nonresponse in the National Survey of Children's Health, 2007

## Data Evaluation and Methods Research

**National Center for Health Statistics**

Edward J. Sondik, Ph.D., *Director*

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

**Division of Health Interview Statistics**

Jane F. Gentleman, Ph.D., *Director*

# Contents

## Abstract

**Objectives**

For random-digit-dial telephone surveys, the increasing difficulty in contacting eligible households and obtaining their cooperation raises concerns about the potential for nonresponse bias. This report presents an analysis of nonresponse bias in the 2007 National Survey of Children's Health, a module of the State and Local Area Integrated Telephone Survey conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics.

**Methods**

An attempt was made to measure bias in six key survey estimates using four different approaches: comparison of response rates for subgroups, use of sampling frame data, study of variation within the existing survey, and comparison of survey estimates with similar estimates from another source.

**Results**

Even when nonresponse-adjusted survey weights were used, the interviewed population was more likely to live in areas associated with higher levels of home ownership, lower home values, and greater proportions of non-Hispanic white persons when compared with the nonresponding population. Bias was found (although none greater than 3%) in national estimates of the proportion of children in excellent or very good health, those with consistent health insurance coverage, and those with a medical home. However, the level and direction of the bias depended on the approach used to measure it. There was no evidence of significant bias in the proportion of children with preventive medical care visits, those with families who ate daily meals together, or those living in safe neighborhoods.

**Keywords:** survey error • bias • evaluation • SLAITS

# Nonresponse in the National Survey of Children's Health, 2007

*by Benjamin J. Skalland, M.S., NORC at the University of Chicago; and Stephen J. Blumberg, Ph.D., Division of Health Interview Statistics, National Center for Health Statistics*

## Introduction

Nonresponse in telephone surveys occurs when eligible sample members (e.g., selected households) are not measured, either in their entirety ("unit nonresponse") or for particular items ("item nonresponse"). Unit nonresponse occurs if contact cannot be established with eligible sample members, if eligible sample members refuse to participate, or if there is a language or other barrier that prevents the interviewer from conducting the survey with an eligible sample member (1). Of these causes, the first two (noncontact and noncooperation) are particularly troubling for random-digit-dial (RDD) telephone surveys.

Technological impediments to making contact with a household are one of the primary causes of unit nonresponse in telephone surveys (2). These impediments include answering machines and call-waiting, caller ID, and call-blocking features. Each of these services allows potential respondents to avoid contact with unknown callers and to be selective about which calls are answered. If contact is made with a household, respondent refusals also result in nonresponse. An individual's propensity to refuse cooperation (either directly or by avoiding contact) can be related to his or her personal characteristics and how those characteristics interact with the perceived cost or benefit of answering the telephone and participating in the survey (3).

If these personal characteristics are also related to the substantive topics of the survey, bias can occur. This nonresponse bias can vary by survey topic because different topics may be more or less strongly related to the personal characteristics that influence telephone survey response propensity. This report presents an analysis of unit-nonresponse bias for selected national estimates from the 2007 National Survey of Children's Health (NSCH).

## The National Survey of Children's Health, 2007

According to its vision statement, the Maternal and Child Health Bureau (MCHB) of the U.S. Department of Health and Human Services' Health Resources and Services Administration strives "for a society where children are wanted and born with optimal health, receive quality care, and are nurtured lovingly and sensitively as they mature into healthy, productive adults" (4,5). This effort is fostered by block grants to states, which are matched by state funds. NSCH was conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS) to assess how well individual states, and the nation as a whole, are meeting MCHB's strategic plan goals and national performance measures. The results from NSCH

support these goals by providing a basis for federal and state program planning and evaluation efforts.

The content of NSCH is broad, addressing a variety of physical, emotional, and behavioral health indicators and measures of children's health experiences with the health care system. The survey includes an extensive battery of questions about the family, including parental health, stress and coping behaviors, and family activities. NSCH also asks respondents for their perceptions of the child's neighborhood. No other survey provides this breadth of information about children, families, and neighborhoods with sample sizes sufficient for state-level analyses in every state, collected in a manner that allows comparison among states and nationally (6). Maternal and child health programs in each state, and MCHB at the federal level, use data from NSCH to characterize children's health status, understand their families and communities, and identify the challenges they face in navigating the health care system. Federal and state Title V programs find the data invaluable for planning and evaluating programs. Researchers and public policy analysts at the state and federal levels also use these data to assess issues such as the prevalence of uninsured children, the relationship of family health to children's health, and the impact of state programs on children's health and well-being. Finally, the data provide baseline estimates for several MCHB companion objectives for the Healthy People 2020 initiative (7).

The 2007 NSCH was conducted as part of the State and Local Area Integrated Telephone Survey (SLAITS) program (8), which is sponsored by NCHS. SLAITS is a broad-based, ongoing surveillance system available at the national, state, and local levels for tracking and monitoring the health and well-being of children and adults. SLAITS modules use the same sampling frame as CDC's National Immunization Study (NIS) and immediately follow NIS in selected households, using the NIS sample for efficiency and economy. In the course of identifying households with children aged 19–35 months, NIS

uses a landline RDD sample and computer-assisted telephone interview (CATI) technology to screen approximately 1 million households each year. The process of identifying this large number of households—most of which are ultimately age-ineligible for NIS—offers an opportunity to administer other surveys on a range of health- and welfare-related topics in an operationally seamless, cost-effective, and statistically sound manner.

# Unit Nonresponse in the 2007 NSCH

The stages of the 2007 NSCH and the types of nonrespondents are shown in the Figure. A list-assisted (9) RDD sample of landline telephone numbers is drawn in each state, and an attempt is made to identify and interview households containing children under age 18 years. To contribute to the survey estimates, a telephone number that is part of the initial sample must first be "resolved"; that is, it must be determined whether the telephone number belongs to a household. If a

household is identified, it must then be screened for the presence of children under age 18. If the household contains such children, a child is selected randomly, a detailed interview about that child is administered, and survey estimates are produced from the resulting data (8).

Nonresponse can occur at any of the three stages. For some telephone numbers, it is never determined whether the number belongs to a household. That is, some numbers remain unresolved. Some households that have been identified do not complete the age-eligibility screener, and some households that are identified as containing children under age 18 do not complete the detailed interview. This report explores the effects of the three types of nonrespondents—nonresolved, non-age-screened, and noninterviewed—on key national survey estimates.

# Nonresponse Bias

Nonresponse bias in a survey estimate ($\bar{y}_r$) can be expressed in two forms (10). The first formulation



NOTE: RDD is random-digit dial.
SOURCE: CDC/NCHS, National Survey of Children's Health, 2007.
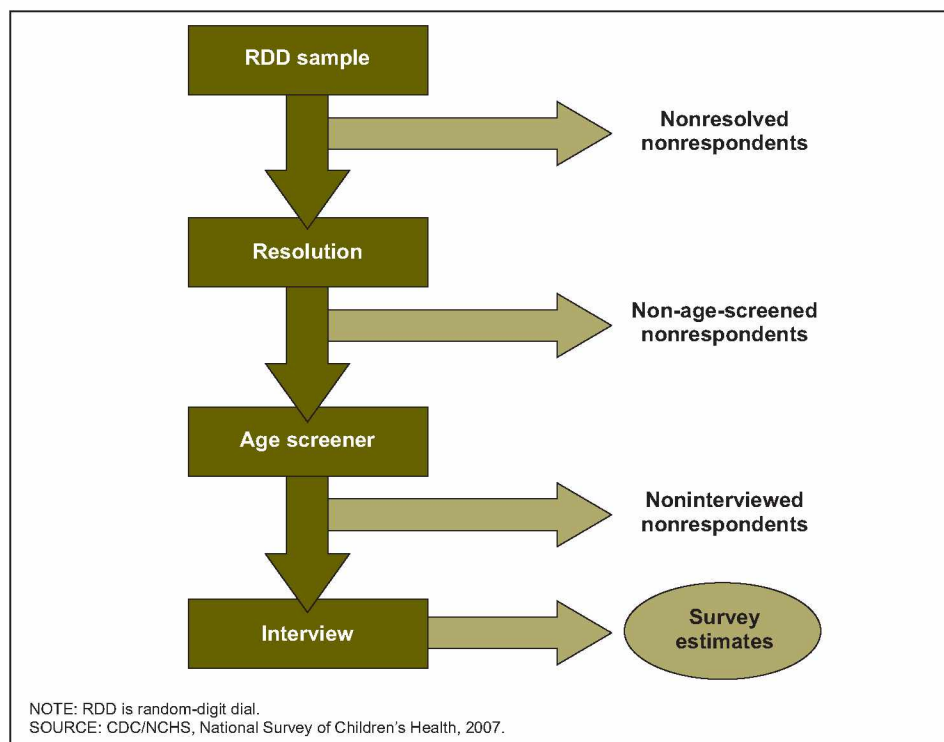
**Figure. Stages and types of nonrespondents in the 2007 National Survey of Children's Health**

assumes that each unit in the target population is, a priori, either a respondent or a nonrespondent:

$$\text{Bias}(\bar{y}_r) = \frac{M}{N}(\bar{Y}_r - \bar{Y}_m)$$

where $M$ is the number of nonrespondents in the population, $N$ is the total number of units in the target population, $\bar{Y}_r$ is the mean for respondents in the target population, and $\bar{Y}_m$ is the mean for nonrespondents in the target population.

The second formulation assumes that each unit ($i$) in the target population has a propensity ($\rho_i$) to respond:

$$\text{Bias}(\bar{y}_r) \approx \frac{\sigma_{y\rho}}{\bar{\rho}}$$

where $\sigma_{y\rho}$ is the correlation between the survey variable and the response propensity ($\rho$), and $\bar{\rho}$ is the mean response propensity in the population. In either formulation then, the bias is related to both the response rate and the degree to which the respondents differ from the nonrespondents with respect to the survey variable.

The response rate is known, or at least estimated, from the results of the survey data collection operation. Table 1 presents the national weighted response rate and its components. The response rate was calculated in accordance with the American Association for Public Opinion Research standards for Response Rate 4 (11). This response rate calculation recognizes that some cases of unknown eligibility (e.g., telephone lines that rang with no answer, or households in which the person answering the phone refused to say whether the household included children) were in fact eligible. In accordance with Council of American Survey Research Organizations guidelines, the proportion of eligible cases among those with unknown eligibility was assumed to be the same as the proportion of eligible cases among those with known eligibility. Although this response rate is on the upper end of the expected range for an RDD survey, 50%–60% nonresponse represents a potential for substantial

nonresponse bias. However, this is only a potential. A meta-analysis of nonresponse bias studies (10) revealed little to no relationship between the nonresponse rate and nonresponse bias. In fact, there was more variation in nonresponse bias between estimates from the same survey than between estimates from different surveys with differing response rates.

The more important factor contributing to nonresponse bias is the degree to which respondents differ from nonrespondents in regard to the survey variables. This quantity is generally unknown, and nonresponse bias analyses attempt to measure this difference in either a direct or an indirect way. From a review of the nonresponse bias literature, Groves (10) identified the following five nonresponse bias study designs and discussed the strengths and weaknesses of the design alternatives:

- Comparing response rates across subgroups.
- Using rich sampling frame data or supplemental matched data.
- Studying variation within the existing survey.
- Comparing similar estimates from other sources.
- Contrasting alternative post-survey adjustments for nonresponse.

The present report gives the results of studies based on four of these five designs. (Alternative post-survey adjustments for nonresponse are not available for the 2007 NSCH.) Each of these approaches has its weaknesses (10). Although there was no guarantee of the outcome, it was hoped that using several different approaches would overcome the weaknesses of any individual approach and would yield an accurate picture of nonresponse bias.

## Information Available on Nonrespondents

Several of the approaches to assessing nonresponse bias rely on the availability of information on both respondents and nonrespondents. Because NSCH is an RDD survey, the

information available on nonrespondents is very limited. Table 2 shows the information known for both respondents and nonrespondents in the 2007 NSCH. Because this information is available on the sampling frame and is not collected during the survey itself, it is referred to here as the "frame information." The first two variables—residential listed status and advance letter status—are case-specific. The remaining variables are ecological; that is, they contain information not about each case specifically but about the telephone exchange containing the case's telephone number. (A telephone exchange is the area code plus the first three digits of the telephone number.) For example, although the income of each case is unknown, the median income for households sharing the case's telephone exchange is known. This ecological information is based on census-tract-level data, aggregated to the telephone-exchange level. Note that telephone exchanges vary widely in terms of the number of people they contain, from fewer than 10 to tens of thousands, and so there can be significant individual variation within a telephone exchange.

## Key Survey Estimates

In assessing nonresponse bias, this report will focus on six selected survey estimates that represent the six major content areas for the survey: health, insurance coverage, health care utilization, health care quality, child and family well-being, and neighborhood characteristics. The following estimates were selected from among the key national indicators for children of all ages presented in MCHB's *The National Survey of Children's Health 2007* (12):

- The proportion of children in excellent or very good health.
- The proportion of children with consistent insurance coverage (i.e., with no periods of uninsurance) during the past 12 months.
- The proportion of children who have had one or more medical preventive care visits in the past 12 months.

- The proportion of children who receive coordinated, ongoing, comprehensive care within a medical home.
- The proportion of children whose families ate a meal together every day in the past week.
- The proportion of children usually or always safe in their community or neighborhood.

The survey respondent was a parent or guardian who lived in the household and who knew about the health and health care of the child. Data collected represent the experiences and perceptions of those respondents, and estimates may be subject to measurement errors (such as respondent memory, classification, and reporting errors) that are not considered in this nonresponse report.

# NSCH Weighting

This report seeks to answer two questions:

- What level of bias would be present in the key survey estimates if no post-survey adjustments for nonresponse were performed? That is, what is the effect of nonresponse on the raw estimates?
- How well do the post-survey adjustments for nonresponse mitigate the raw nonresponse bias?

To answer these questions, each analysis presented in the next section is preformed twice: first using only the base weights (i.e., the weights that reflect the probabilities of telephone number selection but do not reflect post-survey adjustments) and then using either the nonresponse-adjusted weights (the weights that have been adjusted for nonresponse at each stage) or the final weights that have been both adjusted for nonresponse at each stage and raked to population control totals. For a full description of the weighting procedures, see "Design and Operation of the National Survey of Children's Health, 2007" (8).

# Assessing Nonresponse Bias in the 2007 NSCH

## Comparing Response Rates Across Subgroups

A comparison of response rates across subgroups could reveal the presence of nonresponse bias in a survey. If the response rate is lower for a particular subgroup relative to that of other subgroups, that could indicate that the subgroup is underrepresented in the final sample and, to the extent that the key survey estimate is different for that particular subgroup than for other subgroups, there would be bias in the overall survey estimate. Similarly, if the response rate is higher for a particular subgroup relative to other subgroups, that would indicate that the subgroup is overrepresented in the final sample, and, to the extent that the key survey estimate is different for that particular subgroup than for other subgroups, there would be bias in the overall survey estimate. On the other hand, if the response rate is the same across subgroups, or if the key survey estimate does not differ among subgroups, the key survey estimate could still be biased, but unequal response rates across these subgroups will have been ruled out as a source of bias.

Table 3 presents the national response rates for various subgroups. The response rates are presented first using only the base weights and then using the weights that have been sequentially adjusted for nonresponse at each stage. The subgroups were formed based on the frame information listed in Table 2; for each of the continuous variables in Table 2, cases were classified into two subgroups: those with values above and those with values below the median value of the variable for all sampled cases.

These tables show that it was more difficult to interview households in urban areas, in wealthier areas, and in areas with larger nonwhite populations.

The response rates were more than 5 percentage points higher for cases outside of metropolitan statistical areas (MSAs) than for cases inside MSAs, and about 3 to 4 percentage points lower for areas with higher household density. The response rates were lower in areas that were above the median in terms of measures associated with wealth (e.g., household income, home value, rental costs) and higher in areas with a relatively older population. Finally, the response rates were 5 to 6 percentage points higher in areas above the median in terms of percentage of the population that is white, and lower in areas above the median in terms of percentage of the population that is Hispanic, black, or Asian. As can be seen when comparing the base-weighted response rates with those using the adjusted weights, the weighting adjustments for nonresponse did little to remove these response rate differences.

There are two limitations to this approach. First, in order to form subgroups each continuous sampling frame variable in Table 2 had to be categorized into groups, resulting in a loss of some of the information contained in these variables. Second, the "adjusted" response rates presented in Table 3 necessarily reflect only the weighting adjustments for nonresponse at each stage and not the final raking of the weights to population control totals; the extent to which this final raking reduced the under- or overrepresentation of a particular subgroup in the final weighted sample is not captured by this analysis. The next section presents a similar approach that is not subject to the first limitation.

## Using Rich Sampling Frame Data or Supplemental Matched Data

In the previous section, response rates were compared among subgroups defined using sampling frame information (i.e., the variables listed in Table 2). The converse of that analysis is presented here. The frame information

is used to compare the respondents at each stage of the survey with all cases eligible for the stage. With the frame information for both respondents and nonrespondents at each stage, the stage-specific nonresponse bias in these variables can be measured directly. Next, the overall nonresponse bias in each frame variable for the survey is estimated. For this second step, the stage-specific measures of bias in the frame variables are used to estimate the total nonresponse bias in each frame variable across the stages of the survey. Finally, statistical models are employed to translate the estimated overall biases in the frame variables into estimates of bias in the key survey estimates. In this way, the transition is made from nonresponse bias in the frame variables to estimates of nonresponse bias in the key survey estimates.

For each stage of the survey, Table 4 shows a comparison of the frame information for the entire sample eligible for the stage and for the respondents to the stage, first using the base weights only and then using the weights that have been sequentially adjusted for nonresponse at each stage.

An example will be useful. Looking at the "listed" variable in Table 4, using the base weights reveals that 40.84% of the entire sample of telephone numbers are residential-listed, and among the resolved cases (i.e., the respondents to the resolution stage), 36.50% are residential-listed. That is, using the unadjusted base weights, the resolved cases are 10.62% less residential-listed than they would be under full response to the resolution stage of the survey; after the resolution stage, without any adjustment for nonresolution, the sample is biased downward 10.62% in terms of residential-listed status. However, using the weights that have been adjusted for nonresolution, 40.84% of the resolved cases are residential-listed; that is, all of the bias in residential-listed status due to nonresolution has been removed by the nonresponse adjustment. (This is to be expected because residential-listed status was one of the variables used to form the nonresponse adjustment cells.)

Moving to the age-screener stage and using only the unadjusted base

weights, among all resolved households 86.39% are residential-listed, and among age-screener respondents 87.30% are residential-listed. That is, the age-screener respondents are 1.05% more residential-listed than they would be if there were full response at the age-screener stage, meaning that an upward bias of 1.05% was introduced in residential-listed status at the age-screener stage. However, using the nonresolution-adjusted weights, 88.29% of resolved households are listed and, using the weights that were adjusted for nonresponse to the age-screener, 88.29% of age-screened households are listed. Thus, the weighting adjustment for non-age-screening removed all the bias introduced by nonresponse to the age-screener stage.

Finally, moving to the interview stage and using only the base weights, among households with an age-eligible child 84.39% are residential-listed and 86.34% of the completed interviews are residential-listed; that is, households completing the interview were 2.31% more residential-listed than all households that screened as eligible to complete the interview, indicating an upward bias of 2.31% at the interview stage. Using the weights adjusted for non-age-screening, 85.45% of the age-eligible households are listed and, using the weights that were adjusted for nonresponse to the interview, 85.84% of interviewed households are listed. Thus, the interview nonresponse adjustment lowered, but did not completely eliminate, the residential-listed bias introduced due to interview nonresponse.

Multiplying together the biases at the resolution, age-screener, and interview stages calculated using only the base weights, it was estimated that the eligible household population identified and interviewed is 7.59% less residential-listed than the eligible household population as a whole. In making this multiplication, it is assumed (a) that the proportion residential-listed among unresolved cases that are really households, is equal to the proportion residential-listed among the resolved households, and (b) that the proportion residential-listed among the non-age-screened households that are really

age-eligible is equal to the proportion residential-listed among the age-screened eligible households. (These are the same types of assumptions that were made when calculating the response rates in this report.) By doing the same calculation but using the weights that were sequentially adjusted for nonresponse to each stage, it was estimated that the eligible household population identified and interviewed is 0.46% more residential-listed than the eligible household population as a whole. That is, although it was estimated that a bias of about 7%–8% in residential-listed status was introduced due to nonresponse at the resolution, age-screener, and interview stages, the weighting adjustments for nonresponse eliminated nearly all of that bias.

As shown in Table 4, this is generally the case for the other frame variables as well—although nonresponse introduced biases, the nonresponse adjustments substantially reduced those biases. The variables with the largest biases remaining after the nonresponse adjustments are advance letter status (−1.25%), the percentage of the population that is Hispanic in the telephone exchange (−2.25%), and the percentage of the population that is non-Hispanic black in the telephone exchange (−2.09%).

Table 5 shows the observed means of the frame variables for respondents and the means that would be expected under full response. For example, using the base weight, the median household income in the telephone exchange for respondents who completed the interview is $55,940. Table 4 shows the estimated median income to be 0.65% less than would be expected under full response; that is, the median household income in the telephone exchange is expected to be $56,305 under full response:

$$\$56{,}305 = \frac{\$55{,}940}{(1 - 0.0065)}.$$

These biases in the frame information translate into biases in the key survey estimates only to the extent that the frame information is related to the key survey estimates. To examine these relationships, for each key survey

estimate a logistic regression model was filled on the respondents of the form:

$$p_i = \frac{e^{X_i'\beta}}{1 + e^{X_i'\beta}} \ ,$$

where $p_i$ is the probability that the $i$th respondent's child is positive for the key survey variable (e.g., is in excellent or very good health and had consistent insurance coverage in the past 12 months), $X_i'$ is a vector containing the frame information for the $i$th child, and $\beta$ is a vector of unknown parameters to be estimated.

Evaluating the fitted model first at the observed means of the frame information and then at the expected means of the frame information from Table 5 yields an estimate of the bias in each key survey estimate that can be attributed to biases in the frame variables due to nonresponse. These estimates of biases in the key survey estimates are shown in Table 6, first using the base weights only and then using the weights that have been sequentially adjusted for nonresponse at each stage.

As these tables show, the biases in the frame information translate into smaller biases in the key survey estimates. It is estimated that the largest bias when the base weights are used is in the proportion of children whose families ate a meal together every day in the past week (1.05% bias), but this bias is reduced to −0.10% when the nonresponse-adjusted weights are used. The largest absolute bias when the nonresponse-adjusted weights are used is in the proportion of children with a medical home (0.35% bias).

Although these results suggest that differences between respondents and nonrespondents in terms of the frame information lead to very little bias in the key survey estimates, this does not necessarily mean that the key survey estimates are biased very little. It is possible that there are differences between the respondents and nonrespondents that are not reflected in the frame information. Additionally, the results in this section do not reflect the final raking of the nonresponse-adjusted weights to population control totals. This final raking could have reduced or

increased bias, but if it did, that reduction or increase was not captured in the analysis in this section. The next section presents an analysis that makes use of the final, raked weights.

## Studying Variation Within the Existing Survey

In a level-of-effort analysis, those respondents who respond only after a great deal of interviewing effort has been applied are assumed to resemble nonrespondents. Given this assumption, a difference in a survey estimate between "high-effort" respondents and "low-effort" respondents would indicate that a difference exists between the respondents and nonrespondents, and therefore the survey estimate is biased.

This "interviewing effort" is measured in three ways: verbal refusal status, nonverbal refusal status [i.e., whether the respondent "hung up during the introduction" (HUDI)], and the number of calls placed. It is assumed that respondents who verbally refused at least once, who nonverbally refused at least once, or who required more calls before completing the interview are high-effort respondents and resemble the nonrespondents with respect to the key survey variables.

Table 7 compares the key survey estimates for converted verbal-refusal cases with those for cases that completed the interview without verbally refusing. The comparison is made first using the base weights and then using the final weights that have been adjusted for nonresponse and raked to population control totals. Table 8 compares converted HUDIs with cases that completed without an HUDI, and Table 9 compares households completing the interview in five or more calls with those completing in four or fewer calls. If high-effort respondents resemble nonrespondents, then a difference in the survey estimate between converted refusals and nonrefusals, between converted HUDIs and non-HUDIs, or between those completing in five or more calls and those completing in four or fewer calls would suggest the presence of nonresponse bias.

The following summarizes the findings of the level-of-effort analyses for each of the key survey estimates presented in the tables:

- The percentage of children in excellent or very good health is significantly higher for converted refusals and significantly lower for converted HUDIs and households completing in five or more calls.
- The percentage of children with consistent insurance in the past 12 months is significantly higher for converted refusals and significantly lower for converted HUDIs and households completing in five or more calls.
- The percentage of children with one or more medical preventive care visits in the past 12 months is not significantly different for converted refusals, converted HUDIs, or households completing in five or more calls.
- The percentage of children with a medical home is significantly higher for converted refusals and significantly lower for converted HUDIs and households completing in five or more calls.
- The percentage of children whose families ate a meal together every day in the past week is not significantly different for converted refusals but is significantly lower for converted HUDIs and for households completing in five or more calls.
- The percentage of children usually or always safe in the community or neighborhood is significantly higher for converted refusals and significantly lower for converted HUDIs and households completing in five or more calls.

Conclusions that could be drawn from this level-of-effort analysis rely on the assumption that high-effort respondents resemble nonrespondents with respect to the survey variables. The validity of this assumption is highly questionable, and some studies have found that it does not hold (13,14). To test the assumption, the level-of-effort analyses were repeated using the frame information shown in Table 2.

Ideally, the same analyses would have been conducted, but instead of using the key survey variables (the values of which were lacking for nonrespondents), the frame information (which was available for both respondents and nonrespondents) would be used. That is, low-effort and high-effort respondents would be compared with nonrespondents. However, the definition of "nonrespondent" must be based on the definition of "respondent." If respondents are defined as all interviewed cases (as they were in the level-of-effort analyses above), then by the fact that they were interviewed it is known that they are households with children. To compare them fairly with nonrespondents, the nonrespondents would have to be defined in the same way; that is, nonresolved nonrespondents would have to be defined as households with children whose telephone number was never resolved; non-age-screened nonrespondents would have to be defined as households with children who were never age-screened; and noninterviewed nonrespondents would have to be defined as households with children who were never interviewed. Yet if the telephone number was never resolved or never age-screened, there is no way to know whether the number belongs to a household with children. Therefore, if respondents are defined as all interviewed households, the corresponding nonrespondents cannot be identified at the resolution and screener stages.

Therefore, in testing the assumptions, respondents and nonrespondents were defined at each stage separately; that is, at the resolution stage, respondents are all resolved telephone numbers and nonrespondents are all nonresolved telephone numbers; at the age-screening stage, respondents are all age-screened households and nonrespondents are telephone numbers that have been resolved as households but have not been age-screened; and at the interviewing stage, respondents are all age-eligible interviewed households and nonrespondents are all age-eligible households that were not interviewed. This test of the assumptions, then, is not

a full test of the level-of-effort analyses described above. Nevertheless, in defining nonrespondents and respondents differently at each stage, it is still possible to test the assumption that high-effort respondents resemble nonrespondents within each stage.

In testing the assumption, low-effort respondents at each stage are defined in three ways: as those cases completing the stage without refusing, those completing the stage without an HUDI, and those completing the stage in four or fewer calls. High-effort respondents are correspondingly defined as those cases completing the stage after refusing during the stage, those completing the stage after an HUDI during the stage, and those completing the stage in five or more calls.

Tables 10–12 show, for the frame variables, the percentage difference between nonrespondents and respondents at each stage and the percentage difference between high- and low-effort respondents at each stage, where "effort" is defined based on refusal status, HUDI status, and the number of calls for the stage. The tables also indicate which of the differences are significant at the 0.05, 0.01, and 0.001 levels.

Table 10 suggests that the difference between converted refusals and nonrefusals is not indicative of the difference between nonrespondents and respondents. For the frame variables, the refusal/nonrefusal difference and the nonrespondent/respondent difference disagree in sign or magnitude for the majority of the comparisons. In fact, the correlation between the refusal/nonrefusal differences and the nonrespondent/respondent differences is actually negative (−0.49).

The difference between HUDI and non-HUDI is a better indicator of the nonrespondent/respondent difference. Table 11 shows that the sign of the HUDI/non-HUDI difference is the same as the sign of the nonrespondent/respondent difference for 25 of the 34 comparisons. The correlation between the HUDI/non-HUDI differences and the nonrespondent/respondent differences is 0.72, indicating fairly good agreement.

The high-call-attempt/low-call-attempt difference is the best predictor

of the nonrespondent/respondent difference. Table 12 shows that the signs of the differences agree for 46 of the 51 comparisons. The correlation between the high-call-attempt/low-call-attempt differences is very high at 0.98.

This test of the assumptions, then, supports the idea that high-effort respondents resemble nonrespondents when effort is defined in terms of the number of call attempts. (But note that just because this assumption holds for the frame variables, it need not hold for the key survey variables.) Returning to the analysis of the key survey variables by the number of calls needed to complete the survey (Table 9), and accepting the assumption that respondents requiring five or more calls to complete resemble nonrespondents, it would appear that the final estimates of the percentage of children in excellent or very good health, the percentage with consistent insurance coverage in the past 12 months, the percentage with a medical home, the percentage whose families ate a meal together every day in the past week, and the percentage usually or always safe in the community or neighborhood are all too high (i.e., they are biased upward).

To turn the differences between those completing in five or more calls and those completing in four or fewer calls into numerical estimates of bias for each key survey estimate, the five-or-more-calls respondent mean of the key survey estimate is assigned to all nonrespondents. The results are presented in Table 13. For example, when the base weights are used, the percentage of children in excellent or very good health based on all respondents is 87.27%, and Table 9 shows that the rate for respondents completing in five or more calls is 86.04%. According to Table 1, the response rate using base weights is 46.6% (and therefore the nonresponse rate is 53.4%). Assigning a weight of 0.466 to the 87.27% estimate for respondents, and assuming an estimate of 86.04% for the nonrespondents and assigning them a weight of 0.534, results in an overall estimate for both respondents and nonrespondents of the percentage of children in excellent or very good health of 86.61%.

With this method, the largest estimated bias across the key survey estimates was in the estimate of the percentage of children with a medical home (1.56% using base weights; 1.86% using final weights). Since the estimates of the biases are similar when the base weights and final weights are used, the weighting adjustments seem to have had little effect on the bias.

## Comparing Similar Estimates From Other Sources

The National Health Interview Survey (NHIS) produces national-level estimates of health outcomes based on personal household interviews. Because NHIS is a face-to-face survey, the response rate is much higher than that of NSCH; in 2007, the overall response rate for the child component of NHIS was 76.5%, compared with 46.7% for the 2007 NSCH. In addition, NHIS covers households that do not have landline telephone service, whereas NSCH does not. NHIS is thus a higher quality source of national-level estimates of the health of children. By taking the NHIS estimates as "truth" and comparing NSCH estimates with corresponding estimates from NHIS, the bias in the NSCH estimates due to noncoverage and nonresponse can be estimated. This comparison is done for the estimates of the percentage of children in excellent or very good health and the percentage of children with consistent insurance in the past 12 months. (NHIS estimates are not available for the other key NSCH estimates.)

Table 14 shows a comparison of the national estimates of the percentage of children reported to be in excellent or very good health from the 2007 NSCH and the 2007 NHIS for all children and for age, gender, race, and household education subgroups. Table 15 shows the same comparisons for the national estimates of the percentage of children with consistent insurance in the past 12 months. The NSCH estimates are presented using both the NSCH base weights and the NSCH final weights;

the NHIS estimates are presented using the final NHIS weights.

Examination of Table 14 reveals that when the base weights are used, the NSCH estimate of the percentage of children in excellent or very good health is somewhat higher than the corresponding NHIS estimate. The NSCH weighting adjustments moved the estimate closer to the NHIS estimate, but the final weighted NSCH estimate remains 1.76 percentage points higher than the NHIS estimate, a difference that is statistically significant. This result is consistent with the level-of-effort analysis, which found evidence of upward bias in the NSCH estimate (see Table 13).

The final NSCH estimates are also significantly higher than the NHIS estimates for several of the subgroups in Table 14 (children aged 0–4 years, children aged 12–17 years, males, non-Hispanic white children, and children whose mother has more than a high school education). The NSCH estimate is significantly lower than the NHIS estimate for Hispanic children and for children whose mother has less than a high school education.

Table 15 shows that the overall NSCH estimate of the percentage of children with consistent insurance in the past 12 months is similar to the corresponding NHIS estimate when the NSCH base weights are used; however, the NSCH weighting adjustments moved the final NSCH estimates lower: the NSCH estimate is 2.5 percentage points lower than the NHIS estimate when the final NSCH weights are used. The final NSCH estimate is also significantly lower than the NHIS estimate for most of the subgroups (children aged 0–4 years, children aged 5–9 years, males, females, Hispanic children, non-Hispanic black children, children in each mother's education category, and children whose father's education level is high school graduate or beyond).

The finding that the NSCH estimate of the percentage of children with consistent insurance in the past 12 months is significantly lower than the NHIS estimate is surprising. Based on the frame information analysis, finding bias in this estimate was unexpected;

and based on the level-of-effort analysis, the NSCH estimate was expected to be biased upward, not downward. It should be noted that these analyses measured nonresponse bias and not bias due to noncoverage, so the differences seen between the NSCH and NHIS estimates could be due to NSCH's noncoverage of no-phone and cell-phone-only households. Another explanation may be that although the concept of "consistent insurance" was the same in both NSCH and NHIS, the survey questions on which this estimate is based differed somewhat between the two surveys.

# Conclusions

Assessing the extent to which nonresponse produces biased survey estimates is difficult, particularly in a multistage RDD survey where little is known about the nonrespondents. In this report, the most commonly used methods were applied; each has its shortcomings, but multiple approaches were taken with the hope of drawing reasonably accurate conclusions about the level of nonresponse bias in key survey estimates.

In general, it was found that the interviewed population was more likely to live in rural and other areas with lower household density when compared with the nonresponding population. The interviewed population was also more likely to live in areas associated with higher levels of home ownership, lower home values, and a greater percentage of non-Hispanic white persons. Even when the nonresponse-adjusted weights were used, minor differences by home ownership, home values, and race remained. Table 16 presents the resulting estimates of bias for each key NSCH estimate. These findings are summarized below, and some possible limitations are discussed.

## Children in Excellent or Very Good Health

The reported national estimates of the percentage of children in excellent or very good health are likely too high. The final, national estimate is 84.37%,

with a 95% confidence interval of 83.67%–85.03%. Based on the frame information analysis and the level-of-effort analysis, it is estimated that this percentage is biased by 0.12% and 0.98%, respectively. (Note that the biases are presented here in percentage terms, not absolute terms, so that a 0.98% bias in an estimate of 84.37% means that the reported estimate is 0.98% higher than the true value; that is, the true value is 84.37%/1.0098 = 83.55%.) Similarly, if the corresponding NHIS estimate is taken as the true value, the NSCH estimate is found to be too high (1.76 percentage point bias, or 2.13% bias).

## Children With Consistent Insurance in the Past 12 Months

Inconsistent measures were obtained for the bias in the estimates of percentage of children with consistent insurance in the past 12 months. The final, national estimate is 84.90% (84.23%–85.54%), and the estimates of bias are 0.06% (from the frame analysis) and 0.42% (from the level-of-effort analysis). Both of these bias estimates imply that the true value is within the reported 95% confidence interval. However, when compared with the corresponding estimate from NHIS, the NSCH estimate was found to have a statistically significant bias of −2.50 percentage points, or −2.86% bias. This inconsistency between the measures of bias may be due to the fact that the comparison with the NHIS estimate is measuring both noncoverage and nonresponse bias, whereas the frame analysis and level-of-effort analysis are measuring only nonresponse bias. Additionally, because the survey questions used to define "consistent insurance" differed between NSCH and NHIS, the estimates produced from the two surveys may not be measuring the same construct.

## Children With One or More Preventive Medical Care Visits in the Past 12 Months

There was no evidence of significant bias in the percentage of children with one or more preventive medical care visits in the past 12 months. The final, national estimate is 88.50% (87.98%–89.02%). The estimated bias is 0.01% from the frame analysis and −0.10% from the level-of-effort analysis.

## Children With a Medical Home

The estimate of the percentage of children with a medical home is likely too high. The final, national estimate is 57.52% (56.68%–58.37%), and the bias estimates are 0.35% (frame analysis) and 1.86% (level-of-effort analysis).

## Children Whose Families Ate a Meal Together Every Day in the Past Week

Measures of the bias in the estimates of percentage of children whose families ate a meal together every day in the past week were inconsistent. The final, national estimate is 45.78% (44.96%–46.61%), and the estimates of bias are −0.10% (frame analysis) and 0.80% (level-of-effort analysis).

## Children Usually or Always Safe in the Community or Neighborhood

The final, national estimate of the percentage of children usually or always safe in the community or neighborhood is 86.05% (85.45%–86.66%). The estimates of bias are 0.16% (frame analysis) and 0.40% (level-of-effort analysis), indicating that the final estimate is slightly too high.

## Limitations

This report focused on six survey estimates. Each estimate was selected to represent its associated content area: health, insurance coverage, health care utilization, health care quality, child and family well-being, and neighborhood characteristics. However, evidence of nonresponse bias (or lack thereof) for one estimate does not indicate the presence (or absence) of nonresponse bias for all other estimates within the content area. Nonresponse bias can and does vary for every survey estimate. Still, the scope of any nonresponse bias analysis must be limited to selected survey estimates, and there is no reason to believe that the selected survey estimates are more or less susceptible to nonresponse bias than any others.

As with any nonresponse bias analysis, the findings are limited by the information that is available about the nonrespondents. Throughout, models were used and assumptions were made, some or all of which may be inaccurate or incomplete. In transforming the measured bias in the frame information into bias in the key survey estimates, models were used to relate the frame information to the key survey estimates; however, because the frame variables (which are nearly all at the telephone-exchange level and not at the case level) are not strongly related to the key survey estimates, the models may not have had much power to detect bias in those estimates. The level-of-effort analysis relied on the assumption that those responding only after five or more call attempts resemble nonrespondents with respect to the key survey variables. Although this was shown to be true with respect to the frame variables, it need not be true for the key survey variables. Finally, comparison of the key survey estimates with those obtained from NHIS relied on the assumption that the NHIS estimates are accurate, which may not be the case if NHIS suffers from nonresponse or other forms of bias. Moreover, the NHIS estimates were available for only two of the six key survey variables. To the extent that the

models and assumptions used in the present analyses are not valid, the conclusions may be incorrect.

Still, use of four different approaches consistently revealed no evidence of significant bias in the proportion of children with preventive medical care visits, with families who ate daily meals together, or those living in safe neighborhoods. Bias was found (although none greater than 3%) in national estimates of the proportion of children in excellent or very good health, with consistent health insurance coverage, and with a medical home. However, the level and direction of the bias depended on the approach used to measure it. Thus, no consistent evidence was found of significant bias in six survey estimates that represent the six major content areas of the 2007 National Survey of Children's Health.

# References

1. Groves RM, Lyberg LE. An overview of nonresponse issues in telephone surveys. In: Groves RM, Biemer PP, Lyberg LE, Massey JT, Nicholls WL, Waksberg J, eds. Telephone survey methodology. New York, NY: John Wiley and Sons, 191–212. 1988.

2. Groves RM, Couper MP. Nonresponse in household interview surveys. New York, NY: John Wiley and Sons. 1998.

3. Nicoletti C, Peracchi F. Survey response and survey characteristics: Microlevel evidence from the European Community Household Panel. J Royal Stat Soc A 168(4):763–81. 2005.

4. Ireys HT, Nelson RP. New federal policy for children with special health care needs: Implications for pediatricians. Pediatrics 90(3):321–7. 1992.

5. Maternal and Child Health Bureau. Strategic plan: FY 2003–2007. Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services. 2003. Available from: http://mchb.hrsa.gov/research/documents/mchbstratplan0307.pdf.

6. van Dyck P, Kogan MD, Heppel D, Blumberg SJ, Cynamon ML, Newacheck PW. The National Survey of Children's Health: A new data resource. Matern Child Health J 8(3):183–8. 2004.

7. U.S. Department of Health and Human Services. Healthy People Initiative (ongoing). Available from: http://healthypeople.gov/2020/default.aspx.

8. Blumberg SJ, Foster EB, Frasier AM, et al. Design and operation of the National Survey of Children's Health, 2007. National Center for Health Statistics. Vital Health Stat 1(55). 2012. Available from: http://www.cdc.gov/nchs/data/series/sr_01/sr01_055.pdf.

9. Lepkowski JM. Telephone sampling methods in the United States. In: Groves RM, Biemer PP, Lyberg LE, Massey JT, Nicholls WL, Waksberg J, eds. Telephone survey methodology. New York, NY: John Wiley and Sons, 73–98. 1988.

10. Groves RM. Nonresponse rates and nonresponse bias in household surveys. Public Opin Q 70(5):646–75. 2006.

11. American Association for Public Opinion Research (AAPOR). Standard definitions: Final dispositions of case codes and outcome rates for surveys. 5th ed. Lenexa, KS: AAPOR. 2008.

12. U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration, Maternal and Child Health Bureaus. The National Survey of Children's Health 2007. Rockville, MD: HHS. 2009. Available from: http://mchb.hrsa.gov/nsch/07main/moreinfo/pdf/nsch07.pdf.

13. Fitzgerald R, Fuller L. I hear you knocking but you can't come in: The effects of reluctant respondents and refusers on sample survey estimates. Sociol Methods Res 11(1):3–32. 1982.

14. Lin I-F, Schaeffer NC. Using survey participants to estimate the impact of nonparticipation. Public Opin Q 59(2):236–58. 1995.

**Table 1. National weighted response rates**

| Weights used | Resolution rate | Screener completion rate | Interview completion rate | CASRO[1] response rate |
|---|---|---|---|---|
| | Percent | | | |
| Base . . . . . . . . . . . . . . . . . . . . . | 81.9 | 86.3 | 66.0 | 46.6 |
| Adjusted . . . . . . . . . . . . . . . . . | 81.9 | 86.4 | 66.0 | 46.7 |

[1]CASRO is Council of American Survey Research Organizations. The CASRO response rate is the product of the resolution rate, the age-screener completion rate, and the interview completion rate.

**Table 2. Information available for both respondents and nonrespondents**

| Variable name | Description |
|---|---|
| Listed. . . . . . . . . . . . . . . . . . . . . . . . . | Indicator of residential listed status. |
| Advance_letter . . . . . . . . . . . . . . . . . . . . | Indicator of advance letter sent status. |
| MSA . . . . . . . . . . . . . . . . . . . . . . . . . . | Indicator of metropolitan statistical area (MSA) status. |
| Median_HH_income. . . . . . . . . . . . . . . . . . | Median household (HH) income in the telephone exchange. |
| Median_home_val . . . . . . . . . . . . . . . . . . . | Median home value in the telephone exchange. |
| Median_rent. . . . . . . . . . . . . . . . . . . . . . | Median rent in the telephone exchange. |
| Median_years_educ. . . . . . . . . . . . . . . . . . | Median years of education of the population in the telephone exchange. |
| College_graduate . . . . . . . . . . . . . . . . . . | Percentage of the population in the telephone exchange that are college graduates. |
| Approx_median_age . . . . . . . . . . . . . . . . . | Approximate median age of the population in the telephone exchange. |
| Hispanic_p . . . . . . . . . . . . . . . . . . . . . . | Percentage of the population in the telephone exchange that is Hispanic. |
| White_p . . . . . . . . . . . . . . . . . . . . . . . . | Percentage of the population in the telephone exchange that is non-Hispanic white. |
| Black_p . . . . . . . . . . . . . . . . . . . . . . . . | Percentage of the population in the telephone exchange that is non-Hispanic black. |
| Asian_pacif_p. . . . . . . . . . . . . . . . . . . . . | Percentage of the population in the telephone exchange that is non-Hispanic Asian or Pacific Islander. |
| Household_density . . . . . . . . . . . . . . . . . . | Household density in the telephone exchange. |
| Percent_listed . . . . . . . . . . . . . . . . . . . . | Percentage of telephone numbers in the telephone exchange that are residential-listed. |
| Owner_occupied_p . . . . . . . . . . . . . . . . . . | Percentage of homes in the telephone exchange that are owner-occupied. |
| Rent_other_p. . . . . . . . . . . . . . . . . . . . . | Percentage of homes in the telephone exchange that are rented or otherwise not owner-occupied. |

**Table 3. National response rates by frame variables using base weights and nonresponse-adjusted weights**

| Frame variable[1] | Value | Using base weights | Using nonresponse-adjusted weights |
|---|---|---|---|
| | | Percent | |
| Listed . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | Not listed | 40.89 | 40.85 |
| | Listed | 43.10 | 43.03 |
| Advance_letter . . . . . . . . . . . . . . . . . . . . . . . . | Not sent | 41.48 | 41.53 |
| | Sent | 42.33 | 42.37 |
| MSA. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | Outside of MSA | 51.25 | 51.38 |
| | In MSA | 45.71 | 45.79 |
| Median_HH_income . . . . . . . . . . . . . . . . . . . . | Below median | 47.60 | 47.72 |
| | Above median | 45.72 | 45.76 |
| Median_home_val . . . . . . . . . . . . . . . . . . . . | Below median | 49.12 | 49.26 |
| | Above median | 44.28 | 44.33 |
| Median_rent . . . . . . . . . . . . . . . . . . . . . . . . . | Below median | 49.43 | 49.58 |
| | Above median | 44.01 | 44.06 |
| Median_years_educ . . . . . . . . . . . . . . . . . . . | Below median | 46.59 | 46.73 |
| | Above median | 46.66 | 46.67 |
| College_graduate. . . . . . . . . . . . . . . . . . . . . . | Below median | 46.89 | 47.03 |
| | Above median | 46.39 | 46.39 |
| Approx_median_age. . . . . . . . . . . . . . . . . . . . | Below median | 45.43 | 45.53 |
| | Above median | 48.01 | 48.05 |
| Hispanic_p . . . . . . . . . . . . . . . . . . . . . . . . . . | Below median | 49.44 | 49.56 |
| | Above median | 43.84 | 43.95 |
| White_p. . . . . . . . . . . . . . . . . . . . . . . . . . . . | Below median | 43.80 | 43.91 |
| | Above median | 49.22 | 49.30 |
| Black_p . . . . . . . . . . . . . . . . . . . . . . . . . . . . | Below median | 47.86 | 48.00 |
| | Above median | 45.31 | 45.29 |
| Asian_pacif_p . . . . . . . . . . . . . . . . . . . . . . . | Below median | 48.73 | 48.73 |
| | Above median | 44.64 | 44.80 |
| Household_density . . . . . . . . . . . . . . . . . . . . | Below median | 49.00 | 48.97 |
| | Above median | 45.37 | 45.52 |
| Percent_listed. . . . . . . . . . . . . . . . . . . . . . . . | Below median | 45.56 | 45.65 |
| | Above median | 47.01 | 47.08 |
| Owner_occupied_p. . . . . . . . . . . . . . . . . . . . | Below median | 45.23 | 45.15 |
| | Above median | 47.74 | 47.92 |
| Rent_other_p . . . . . . . . . . . . . . . . . . . . . . . . | Below median | 47.73 | 47.92 |
| | Above median | 45.26 | 45.18 |

[1]See Table 2 for description of each variable name.

## Table 4. Use of frame information to compare respondents and nonrespondents at each stage

| Frame variable[1] | Stage[2] | Using base weights | | | Using nonresponse-adjusted weights | | |
|---|---|---|---|---|---|---|---|
| | | All cases eligible for the stage | Respondents at the stage | Percent difference[2] | All cases eligible for the stage | Respondents at the stage | Percent difference[2] |
| | | Percent | | | | | |
| Listed . . . . . . . . . . . . . . . . . . . | 1. Resolution | 40.84 | 36.50 | −10.62 | 40.84 | 40.84 | 0.00 |
| | 2. Age screener | 86.39 | 87.30 | 1.05 | 88.29 | 88.29 | 0.00 |
| | 3. Interview | 84.39 | 86.34 | 2.31 | 85.45 | 85.84 | 0.46 |
| | Overall | . . . | . . . | −7.59 | . . . | . . . | 0.46 |
| Advance_ letter . . . . . . . . . . . . . | 1. Resolution | 33.51 | 29.01 | −13.43 | 33.51 | 31.88 | −4.84 |
| | 2. Age screener | 79.14 | 80.01 | 1.10 | 79.67 | 80.20 | 0.66 |
| | 3. Interview | 78.03 | 80.90 | 3.68 | 78.12 | 80.53 | 3.09 |
| | Overall | . . . | . . . | −9.25 | . . . | . . . | −1.25 |
| MSA . . . . . . . . . . . . . . . . . . . | 1. Resolution | 81.72 | 81.24 | −0.59 | 81.72 | 81.83 | 0.14 |
| | 2. Age screener | 81.97 | 81.57 | −0.49 | 82.12 | 82.13 | 0.01 |
| | 3. Interview | 83.58 | 82.81 | −0.93 | 84.27 | 84.22 | −0.05 |
| | Overall | . . . | . . . | −1.99 | . . . | . . . | 0.09 |
| College_graduate . . . . . . . . . . . . | 1. Resolution | 26.27 | 26.15 | −0.44 | 26.27 | 26.28 | 0.06 |
| | 2. Age screener | 25.74 | 25.78 | 0.14 | 25.81 | 25.84 | 0.14 |
| | 3. Interview | 26.12 | 26.24 | 0.46 | 26.11 | 26.26 | 0.61 |
| | Overall | . . . | . . . | 0.17 | . . . | . . . | 0.81 |
| Hispanic_p . . . . . . . . . . . . . . . | 1. Resolution | 12.80 | 12.58 | −1.75 | 12.80 | 12.78 | −0.13 |
| | 2. Age screener | 12.38 | 11.99 | −3.15 | 12.54 | 12.49 | −0.45 |
| | 3. Interview | 13.06 | 12.46 | −4.58 | 13.85 | 13.61 | −1.68 |
| | Overall | . . . | . . . | −9.20 | . . . | . . . | −2.25 |
| White_p . . . . . . . . . . . . . . . . . | 1. Resolution | 67.85 | 68.03 | 0.27 | 67.85 | 67.85 | 0.00 |
| | 2. Age screener | 69.72 | 70.40 | 0.98 | 69.68 | 69.80 | 0.19 |
| | 3. Interview | 69.40 | 70.44 | 1.49 | 68.70 | 69.14 | 0.63 |
| | Overall | . . . | . . . | 2.76 | . . . | . . . | 0.81 |
| Black_p . . . . . . . . . . . . . . . . . | 1. Resolution | 12.23 | 12.36 | 1.04 | 12.23 | 12.26 | 0.25 |
| | 2. Age screener | 11.23 | 11.04 | −1.70 | 11.06 | 11.01 | −0.49 |
| | 3. Interview | 10.78 | 10.50 | −2.62 | 10.61 | 10.41 | −1.85 |
| | Overall | . . . | . . . | −3.27 | . . . | . . . | −2.09 |
| Asian_pacif_p . . . . . . . . . . . . . . | 1. Resolution | 4.37 | 4.28 | −2.18 | 4.37 | 4.36 | −0.29 |
| | 2. Age screener | 4.05 | 3.97 | −2.03 | 4.10 | 4.09 | −0.34 |
| | 3. Interview | 4.10 | 3.97 | −3.11 | 4.17 | 4.18 | 0.16 |
| | Overall | . . . | . . . | −7.15 | . . . | . . . | −0.47 |
| Percent_listed . . . . . . . . . . . . . . | 1. Resolution | 65.60 | 65.26 | −0.51 | 65.60 | 65.47 | −0.19 |
| | 2. Age screener | 70.13 | 70.32 | 0.27 | 70.13 | 70.14 | 0.02 |
| | 3. Interview | 69.85 | 70.19 | 0.48 | 69.67 | 69.75 | 0.11 |
| | Overall | . . . | . . . | 0.25 | . . . | . . . | −0.05 |
| Owner_occupied_p . . . . . . . . . . . . | 1. Resolution | 65.88 | 65.91 | 0.04 | 65.88 | 65.90 | 0.02 |
| | 2. Age screener | 68.70 | 68.90 | 0.29 | 68.71 | 68.72 | 0.01 |
| | 3. Interview | 69.32 | 69.64 | 0.46 | 69.29 | 69.46 | 0.26 |
| | Overall | . . . | . . . | 0.79 | . . . | . . . | 0.29 |
| Rent_other_p. . . . . . . . . . . . . . . | 1. Resolution | 34.12 | 34.09 | −0.08 | 34.12 | 34.10 | −0.04 |
| | 2. Age screener | 31.30 | 31.10 | −0.63 | 31.29 | 31.28 | −0.02 |
| | 3. Interview | 30.68 | 30.36 | −1.05 | 30.71 | 30.54 | −0.58 |
| | Overall | . . . | . . . | −1.75 | . . . | . . . | −0.64 |

See footnotes at end of table.

**Table 4. Use of frame information to compare respondents and nonrespondents at each stage—Con.**

| Frame variable[1] | Stage[2] | Using base weights | | | Using nonresponse-adjusted weights | | |
|---|---|---|---|---|---|---|---|
| | | All cases eligible for the stage | Respondents at the stage | Percent difference[2] | All cases eligible for the stage | Respondents at the stage | Percent difference[2] |
| | | Value (dollars) | | | Value (dollars) | | |
| Median_HH_income . . . . . . . . . . . | 1. Resolution | $53,584 | $53,306 | −0.52 | $53,584 | $53,601 | 0.03 |
| | 2. Age screener | 54,353 | 54,304 | −0.09 | 54,497 | 54,503 | 0.01 |
| | 3. Interview | 55,964 | 55,940 | −0.04 | 56,271 | 56,405 | 0.24 |
| | Overall | . . . | . . . | −0.65 | . . . | . . . | 0.28 |
| Median_home_val. . . . . . . . . . . . | 1. Resolution | 224,262 | 220,427 | −1.71 | 224,262 | 223,967 | −0.13 |
| | 2. Age screener | 218,615 | 216,971 | −0.75 | 220,847 | 220,923 | 0.03 |
| | 3. Interview | 219,596 | 215,737 | −1.76 | 222,574 | 222,085 | −0.22 |
| | Overall | . . . | . . . | −4.16 | . . . | . . . | −0.32 |
| Median_rent . . . . . . . . . . . . . . . | 1. Resolution | 573 | 568 | −0.90 | 573 | 573 | −0.01 |
| | 2. Age screener | 569 | 566 | −0.50 | 571 | 571 | −0.03 |
| | 3. Interview | 577 | 573 | −0.82 | 582 | 582 | 0.05 |
| | Overall | . . . | . . . | −2.20 | . . . | . . . | 0.01 |
| | | Median (years) | | | Median (years) | | |
| Median_years_educ. . . . . . . . . . . | 1. Resolution | 13.17 | 13.17 | −0.05 | 13.17 | 13.18 | 0.01 |
| | 2. Age screener | 13.15 | 13.16 | 0.05 | 13.15 | 13.16 | 0.02 |
| | 3. Interview | 13.17 | 13.18 | 0.10 | 13.16 | 13.17 | 0.10 |
| | Overall | . . . | . . . | 0.10 | . . . | . . . | 0.13 |
| Approx_median_age . . . . . . . . . . | 1. Resolution | 37.23 | 37.21 | −0.04 | 37.23 | 37.22 | −0.03 |
| | 2. Age screener | 37.18 | 37.25 | 0.18 | 37.20 | 37.22 | 0.04 |
| | 3. Interview | 36.60 | 36.64 | 0.12 | 36.47 | 36.49 | 0.06 |
| | Overall | . . . | . . . | 0.26 | . . . | . . . | 0.08 |
| | | Number of residents | | | Number of residents | | |
| Household_density . . . . . . . . . . . | 1. Resolution | 2.53 | 2.52 | −0.07 | 2.53 | 2.53 | 0.07 |
| | 2. Age screener | 2.57 | 2.56 | −0.34 | 2.57 | 2.57 | −0.08 |
| | 3. Interview | 2.63 | 2.62 | −0.40 | 2.65 | 2.64 | −0.16 |
| | Overall | . . . | . . . | −0.82 | . . . | . . . | −0.17 |

0.00 Quantity more than zero but less than 0.005.

. . . Category not applicable.

[1]See Table 2 for description of each variable name.

[2](Respondent mean at this stage − All eligible cases mean)/All eligible cases mean.

[3]The overall percentage is equal to the product of the percent difference across the resolution, age-screener, and interview stages. This provides an estimate of the percent difference in the frame variable between the interview respondents and the nonrespondents (at any stage) who are eligible for the interview (i.e., households with children); that is, it is an estimate of the over- or underrepresentation of the interviewed households compared with the eligible population as a whole. This technique assumes that the mean of the frame variable for the eligible nonrespondents is equal to the observed mean of the frame variable for the respondents. Using residential "Listed" as an example, it assumes that, among the nonresolved numbers that are actually households, the proportion listed is equal to proportion listed among the resolved households; and it assumes that, among the non-age-screened households that actually contain children, the proportion listed is equal to the proportion listed among the age-screened-eligible households.

**Table 5. Observed and expected means of frame variables for respondents through the interview stage**

| Frame variable[1] | Using base weights | | Using nonresponse-adjusted weights | |
|---|---|---|---|---|
| | Observed | Expected | Observed | Expected |
| | Percent | | | |
| Listed . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 86.34 | 93.44 | 85.84 | 85.45 |
| Advance_letter . . . . . . . . . . . . . . . . . . . . . . . . . . | 80.90 | 89.15 | 80.53 | 81.55 |
| MSA. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 82.81 | 84.49 | 84.22 | 84.15 |
| College_graduate. . . . . . . . . . . . . . . . . . . . . . . . . | 26.24 | 26.20 | 26.26 | 26.05 |
| Hispanic_p . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 12.46 | 13.72 | 13.61 | 13.93 |
| White_p. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 70.44 | 68.54 | 69.14 | 68.58 |
| Black_p. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 10.50 | 10.85 | 10.41 | 10.64 |
| Asian_pacif_p . . . . . . . . . . . . . . . . . . . . . . . . . . . | 3.97 | 4.28 | 4.18 | 4.20 |
| Percent_listed. . . . . . . . . . . . . . . . . . . . . . . . . . . . | 70.19 | 70.02 | 69.75 | 69.79 |
| Owner_occupied_p. . . . . . . . . . . . . . . . . . . . . . . . | 69.64 | 69.10 | 69.46 | 69.26 |
| Rent_other_p . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 30.36 | 30.90 | 30.54 | 30.73 |
| | Value (dollars) | | | |
| Median_HH_income . . . . . . . . . . . . . . . . . . . . . . | $55,940 | $56,305 | $56,405 | $56,247 |
| Median_home_val . . . . . . . . . . . . . . . . . . . . . . . . | 215,737 | 225,110 | 222,085 | 222,790 |
| Median_rent . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 573 | 585 | 582 | 582 |
| | Years | | | |
| Median_years_educ . . . . . . . . . . . . . . . . . . . . . . | 13.18 | 13.17 | 13.17 | 13.16 |
| Approx_median_age. . . . . . . . . . . . . . . . . . . . . . . | 36.64 | 36.55 | 36.49 | 36.46 |
| | Number of residents | | | |
| Household_density. . . . . . . . . . . . . . . . . . . . . . . . | 2.62 | 2.64 | 2.64 | 2.65 |

[1]See Table 2 for description of each variable name.

**Table 6. Estimates of nonresponse bias in key survey variables attributable to biases in frame information**

| Key survey variable | Using base weights | | | Using nonresponse-adjusted weights | | |
|---|---|---|---|---|---|---|
| | Model evaluated at observed respondent means of frame information[1] | Model evaluated at means of frame information expected under full response | Estimated bias[2] | Model evaluated at observed respondent means of frame information[1] | Model evaluated at means of frame information expected under full response | Estimated bias[2] |
| | Percent | | | | | |
| Percentage of children in excellent or very good health . . | 88.24 | 88.39 | −0.17 | 86.43 | 86.32 | 0.12 |
| Percentage of children with consistent insurance coverage in the past 12 months . . . . . . . . . . . . . . . | 88.74 | 89.00 | −0.30 | 86.73 | 86.68 | 0.06 |
| Percentage of children with one or more medical preventive care visits in the past 12 months . . . . . . . . | 89.04 | 89.05 | −0.01 | 89.19 | 89.19 | 0.01 |
| Percentage of children with a medical home. . . . . . . . | 61.75 | 61.67 | 0.13 | 59.30 | 59.10 | 0.35 |
| Percentage of children whose families ate a meal together every day in the past week. . . . . . . . . . . . . | 42.99 | 42.55 | 1.05 | 45.00 | 45.04 | −0.10 |
| Percentage of children usually or always safe in the community or neighborhood. . . . . . . . . . . . . . . . . . | 90.84 | 90.86 | −0.03 | 89.45 | 89.30 | 0.16 |

[1]Although the logistic regression models were evaluated at the observed means of the frame information, the results are not the observed means of the key survey variables (e.g., the final estimates of the proportion of children in excellent or very good health, or the proportion of children with a medical home), as would be the case for linear regression models.
[2](Model evaluated at observed means – Model evaluated at expected means)/Model evaluated at expected means.

**Table 7. Comparison of nonrefusals and converted refusals**

| Key survey variable | Using base weights | | | | Using final weights | | | |
|---|---|---|---|---|---|---|---|---|
| | Estimate for nonrefusals | Estimate for converted refusals | Percent difference[1] | *p* value for test of no difference | Estimate for nonrefusals | Estimate for converted refusals | Percent difference[1] | *p* value for test of no difference |
| | Percent | | | | Percent | | | |
| Percentage of children in excellent or very good health . . | 86.92 | 88.57 | 1.90 | < 0.01 | 83.72 | 86.90 | 3.80 | < 0.01 |
| Percentage of children with consistent insurance coverage in the past 12 months . . . . . . . . . . . . . . . | 87.30 | 89.72 | 2.78 | < 0.01 | 84.33 | 87.14 | 3.33 | < 0.01 |
| Percentage of children with one or more medical preventive care visits in the past 12 months . . . . . . . . . | 88.48 | 88.40 | −0.10 | 0.87 | 88.57 | 88.22 | −0.39 | 0.59 |
| Percentage of children with a medical home. . . . . . . . | 61.04 | 63.47 | 3.97 | < 0.01 | 56.84 | 60.22 | 5.95 | < 0.01 |
| Percentage of children whose families ate a meal together every day in the past week. . . . . . . . . . . . . | 43.15 | 42.81 | −0.79 | 0.68 | 45.95 | 45.12 | −1.82 | 0.41 |
| Percentage of children usually or always safe in the community or neighborhood. . . . . . . . . . . . . . . . . . | 88.76 | 90.15 | 1.57 | < 0.01 | 85.60 | 87.85 | 2.63 | < 0.01 |

[1](Converted refusal respondent mean − Nonrefusal respondent mean)/Nonrefusal respondent mean.

**Table 8. Comparison of non-HUDIs and converted HUDIs**

| Key survey variable | Using base weights | | | | Using final weights | | | |
|---|---|---|---|---|---|---|---|---|
| | Estimate for non-HUDIs | Estimate for converted HUDIs | Percent difference[1] | *p* value for test of no difference | Estimate for non-HUDIs | Estimate for converted HUDIs | Percent difference[1] | *p* value for test of no difference |
| | Percent | | | | Percent | | | |
| Percentage of children in excellent or very good health . . | 88.85 | 83.60 | −5.91 | < 0.01 | 86.41 | 80.13 | −7.28 | < 0.01 |
| Percentage of children with consistent insurance coverage in the past 12 months . . . . . . . . . . . . . . . | 88.68 | 85.80 | −3.25 | < 0.01 | 86.16 | 82.29 | −4.49 | < 0.01 |
| Percentage of children with one or more medical preventive care visits in the past 12 months . . . . . . . . . | 88.61 | 88.13 | −0.54 | 0.33 | 88.74 | 88.00 | −0.83 | 0.21 |
| Percentage of children with a medical home. . . . . . . . | 63.68 | 56.63 | −11.08 | < 0.01 | 60.31 | 51.74 | −14.22 | < 0.01 |
| Percentage of children whose families ate a meal together every day in the past week. . . . . . . . . . . . . | 43.71 | 41.60 | −4.84 | < 0.01 | 46.29 | 44.74 | −3.34 | 0.09 |
| Percentage of children usually or always safe in the community or neighborhood. . . . . . . . . . . . . . . . . . | 90.00 | 86.85 | −3.50 | < 0.01 | 87.19 | 83.68 | −4.02 | < 0.01 |

[1](Converted HUDI respondent mean − Non-HUDI respondent mean)/Non-HUDI respondent mean.

NOTE: HUDI is hung up during the introduction.

## Table 9. Comparison of low-call-attempt respondents and high-call-attempt respondents

| Key survey variable | Using base weights | | | | Using final weights | | | |
|---|---|---|---|---|---|---|---|---|
| | Estimate for respondents with 4 or fewer calls | Estimate for respondents with 5 or more calls | Percent difference[1] | p value for test of no difference | Estimate for respondents with 4 or fewer calls | Estimate for respondents with 5 or more calls | Percent difference[1] | p value for test of no difference |
| | Percent | | | | Percent | | | |
| Percentage of children in excellent or very good health . . | 89.06 | 86.04 | −3.39 | < 0.01 | 86.72 | 82.83 | −4.49 | < 0.01 |
| Percentage of children with consistent insurance coverage in the past 12 months . . . . . . . . . . . . . . . | 88.51 | 87.34 | −1.32 | 0.01 | 85.92 | 84.23 | −1.96 | 0.01 |
| Percentage of children with one or more medical preventive care visits in the past 12 months . . . . . . . . . | 88.09 | 88.72 | 0.72 | 0.17 | 88.25 | 88.66 | 0.47 | 0.45 |
| Percentage of children with a medical home. . . . . . . . | 64.11 | 59.79 | −6.74 | < 0.01 | 60.53 | 55.55 | −8.22 | < 0.01 |
| Percentage of children whose families ate a meal together every day in the past week. . . . . . . . . . . . . | 44.01 | 42.43 | −3.59 | 0.02 | 46.83 | 45.10 | −3.69 | 0.04 |
| Percentage of children usually or always safe in the community or neighborhood. . . . . . . . . . . . . . . . . | 89.98 | 88.42 | −1.74 | < 0.01 | 87.04 | 85.40 | −1.88 | < 0.01 |

[1](5-or-more-call respondent mean − 4-or-fewer-call respondent mean)/(4-or-fewer-call respondent mean).

## Table 10. Use of frame information to compare nonrespondents and respondents, and nonrefusals and converted refusals, at each stage

| Frame variable[1] | Stage[2] | Nonrespondent/ respondent | High-/low-effort respondents[3] |
|---|---|---|---|
| | | Percent difference[4,5] | |
| Listed . . . . . . . . . . . . . . . . . . . . . . . . . . | Age screener | −6.59 *** | −0.40 |
| | Interview | −6.15 *** | 1.86 * |
| Advance_letter . . . . . . . . . . . . . . . . . . . . | Age screener | −7.65 *** | −0.68 |
| | Interview | −10.43 *** | 6.47 *** |
| MSA. . . . . . . . . . . . . . . . . . . . . . . . . . . | Age screener | 3.55 *** | 2.77 *** |
| | Interview | 2.69 *** | 0.27 |
| Median_HH_income . . . . . . . . . . . . . . . . . . | Age screener | 0.68 * | 3.94 *** |
| | Interview | 0.06 | 2.52 ** |
| Median_home_val . . . . . . . . . . . . . . . . . . . | Age screener | 5.53 *** | 5.78 *** |
| | Interview | 5.52 *** | 1.04 |
| Median_rent . . . . . . . . . . . . . . . . . . . . . . | Age screener | 3.68 *** | 3.60 *** |
| | Interview | 2.37 *** | 1.10 |
| Median_years_educ . . . . . . . . . . . . . . . . . . | Age screener | −0.35 *** | 0.50 *** |
| | Interview | −0.31 ** | 0.41 * |
| College_graduate. . . . . . . . . . . . . . . . . . . . | Age screener | −1.05 ** | 3.28 *** |
| | CSHCN interview[6] | −1.41 * | 2.29 * |
| Approx_median_age. . . . . . . . . . . . . . . . . . . | Age screener | −1.30 *** | −0.09 |
| | Interview | −0.35 * | 1.00 *** |
| Hispanic_p . . . . . . . . . . . . . . . . . . . . . . . | Age screener | 23.75 *** | −3.59 * |
| | Interview | 13.50 *** | −15.81 *** |
| White_p. . . . . . . . . . . . . . . . . . . . . . . . . | Age screener | −7.08 *** | 1.98 *** |
| | Interview | −4.42 *** | 4.59 *** |
| Black_p. . . . . . . . . . . . . . . . . . . . . . . . . | Age screener | 12.35 *** | −11.28 *** |
| | Interview | 8.66 *** | −6.29 ** |
| Asian_pacif_p . . . . . . . . . . . . . . . . . . . . . | Age screener | 15.26 *** | 6.66 ** |
| | Interview | 8.43 ** | −4.45 |
| Household_density . . . . . . . . . . . . . . . . . . . | Age screener | 2.53 *** | 0.71 *** |
| | Interview | 1.20 *** | −1.24 ** |
| Percent_listed . . . . . . . . . . . . . . . . . . . . . | Age screener | −1.93 *** | 0.51 ** |
| | Interview | −1.36 *** | 0.65 |
| Owner_occupied_p. . . . . . . . . . . . . . . . . . . | Age screener | −2.06 *** | 1.27 *** |
| | Interview | −1.64 *** | 1.45 ** |
| Rent_other_p . . . . . . . . . . . . . . . . . . . . . | Age screener | 4.57 *** | −2.80 *** |
| | Interview | 3.76 *** | −3.30 ** |

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

[1]See Table 2 for description of each variable name.

[2]For this analysis, it is not possible for a case to refuse at the resolution stage.

[3]High-effort respondents are those who refused at the stage before completing the stage. Low-effort respondents completed the stage without refusing.

[4]The percent difference for nonrespondent/respondent was calculated as follows: (Nonrespondent mean − Respondent mean)/Respondent mean.

[5]The percent difference for high-/low-effort respondents was calculated as follows: (High-effort respondent mean − Low-effort respondent mean)/Low-effort respondent mean.

[6]CSHCN is children with special health care needs.

**Table 11. Use of frame information to compare nonrespondents and respondents, and non-HUDIs and converted HUDIs, at each stage**

| Frame variable[1] | Stage[2] | Nonrespondent/ respondent | High-/low-effort respondents[3] |
|---|---|---|---|
| | | Percent difference[4,5] | |
| Listed . . . . . . . . . . . . . . . . . . . . . . | Age screener | −6.59 *** | −2.05 *** |
| | Interview | −6.15 *** | −1.36 |
| Advance_letter . . . . . . . . . . . . . . . . . . . . | Age screener | −7.65 *** | −1.37 *** |
| | Interview | −10.43 *** | 1.98 |
| MSA. . . . . . . . . . . . . . . . . . . . . . | Age screener | 3.55 *** | −1.69 *** |
| | Interview | 2.69 *** | −0.80 |
| Median_HH_income . . . . . . . . . . . . . . . . . . | Age screener | 0.68 * | −4.53 *** |
| | Interview | 0.06 | −4.52 *** |
| Median_home_val . . . . . . . . . . . . . . . . . . | Age screener | 5.53 *** | −3.85 *** |
| | Interview | 5.52 *** | −1.60 |
| Median_rent . . . . . . . . . . . . . . . . . . . . | Age screener | 3.68 *** | −3.55 *** |
| | Interview | 2.37 *** | −2.87 * |
| Median_years_educ . . . . . . . . . . . . . . . . . . | Age screener | −0.35 *** | −1.29 *** |
| | Interview | −0.31 ** | −1.19 *** |
| College_graduate. . . . . . . . . . . . . . . . . . | Age screener | −1.05 ** | −7.36 *** |
| | Interview | −1.41 * | −6.51 *** |
| Approx_median_age . . . . . . . . . . . . . . . . . . | Age screener | −1.30 *** | −0.94 *** |
| | Interview | −0.35 * | −0.26 |
| Hispanic_p . . . . . . . . . . . . . . . . . . . . . | Age screener | 23.75 *** | 23.63 *** |
| | Interview | 13.50 *** | 15.05 ** |
| White_p. . . . . . . . . . . . . . . . . . . . . | Age screener | −7.08 *** | −4.91 *** |
| | Interview | −4.42 *** | −5.70 *** |
| Black_p . . . . . . . . . . . . . . . . . . . . . . | Age screener | 12.35 *** | 5.21 *** |
| | Interview | 8.66 *** | 17.95 *** |
| Asian_pacif_p . . . . . . . . . . . . . . . . . . . . | Age screener | 15.26 *** | 2.90 |
| | Interview | 8.43 ** | 5.77 |
| Household_density . . . . . . . . . . . . . . . . . . | Age screener | 2.53 *** | 2.22 *** |
| | Interview | 1.20 *** | 1.10 * |
| Percent_listed . . . . . . . . . . . . . . . . . . . | Age screener | −1.93 *** | −0.96 *** |
| | Interview | −1.36 *** | −0.72 |
| Owner_occupied_p. . . . . . . . . . . . . . . . . . | Age screener | −2.06 *** | −1.49 *** |
| | Interview | −1.64 *** | −1.81 *** |
| Rent_other_p . . . . . . . . . . . . . . . . . . . | Age screener | 4.57 *** | 3.32 *** |
| | Interview | 3.76 *** | 4.19 *** |

* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

[1] See Table 2 for description of each variable name.

[2] For this analysis, it is not possible for a case to HUDI at the resolution stage.

[3] High-effort respondents are those who had an HUDI at the stage before completing the stage. Low-effort respondents completed the stage without an HUDI.

[4] The percent difference for nonrespondent/respondent was calculated as follows: (Nonrespondent mean − Respondent mean)/Respondent mean.

[5] The percent difference for high-/low-effort respondents was calculated as follows: (High-effort respondent mean − Low-effort respondent mean)/Low-effort respondent mean.

NOTE: HUDI is hung up during interview.

**Table 12. Use of frame information to compare nonrespondents and respondents, and low-call-attempt respondents and high-call-attempt respondents, at each stage**

| Frame variable[1] | Stage | Nonrespondent/ respondent | High-/low-effort respondents[2] |
|---|---|---|---|
| | | Percent difference[3,4] | |
| Listed . . . . . . . . . . . . . . . . . . . . . . . . . | Resolution | 65.76 *** | 68.73 *** |
| | Age screener | −6.59 *** | −3.24 *** |
| | Interview | −6.15 *** | −2.25 ** |
| Advance_letter . . . . . . . . . . . . . . . . . . . . . | Resolution | 85.85 *** | 89.46 *** |
| | Age screener | −7.65 *** | −3.34 *** |
| | Interview | −10.43 *** | 2.03 * |
| MSA . . . . . . . . . . . . . . . . . . . . . . . . . . | Resolution | 3.31 *** | 4.61 *** |
| | Age screener | 3.55 *** | 3.49 *** |
| | Interview | 2.69 *** | 2.47 *** |
| Median_HH_income . . . . . . . . . . . . . . . . . . | Resolution | 2.88 *** | 4.34 *** |
| | Age screener | 0.68 * | −0.03 |
| | Interview | 0.06 | 0.45 |
| Median_home_val . . . . . . . . . . . . . . . . . . . | Resolution | 9.63 *** | 8.54 *** |
| | Age screener | 5.53 *** | 4.48 *** |
| | Interview | 5.52 *** | 5.60 ** |
| Median_rent . . . . . . . . . . . . . . . . . . . . . | Resolution | 5.01 *** | 5.72 *** |
| | Age screener | 3.68 *** | 2.71 *** |
| | Interview | 2.37 *** | 2.83 ** |
| Median_years_educ . . . . . . . . . . . . . . . . . . | Resolution | 0.26 *** | 0.68 *** |
| | Age screener | −0.35 *** | −0.49 *** |
| | Interview | −0.31 ** | −0.26 |
| College_graduate . . . . . . . . . . . . . . . . . . . | Resolution | 2.44 *** | 5.12 *** |
| | Age screener | −1.05 ** | −1.28 ** |
| | Interview | −1.41 * | −0.45 |
| Approx_median_age . . . . . . . . . . . . . . . . . . | Resolution | 0.19 *** | −0.08 |
| | Age screener | −1.30 *** | −1.42 *** |
| | Interview | −0.35 * | −0.33 * |
| Hispanic_p . . . . . . . . . . . . . . . . . . . . . . | Resolution | 9.86 *** | 2.96 ** |
| | Age screener | 23.75 *** | 30.71 *** |
| | Interview | 13.50 *** | 11.13 ** |
| White_p . . . . . . . . . . . . . . . . . . . . . . . | Resolution | −1.51 *** | −0.55 ** |
| | Age screener | −7.08 *** | −7.19 *** |
| | Interview | −4.42 *** | −4.37 *** |
| Black_p . . . . . . . . . . . . . . . . . . . . . . . | Resolution | −5.70 *** | −2.63 *** |
| | Age screener | 12.35 *** | 7.73 *** |
| | Interview | 8.66 *** | 12.46 *** |
| Asian_pacif_p . . . . . . . . . . . . . . . . . . . . | Resolution | 12.32 *** | 6.68 *** |
| | Age screener | 15.26 *** | 16.33 *** |
| | Interview | 8.43 ** | 11.86 ** |
| Household_density . . . . . . . . . . . . . . . . . . | Resolution | 0.41 *** | 0.42 *** |
| | Age screener | 2.53 *** | 2.84 *** |
| | Interview | 1.20 *** | 1.25 *** |
| Percent_listed . . . . . . . . . . . . . . . . . . . . | Resolution | 2.82 *** | 2.12 *** |
| | Age screener | −1.93 *** | −1.92 *** |
| | Interview | −1.36 *** | −1.12 *** |
| Owner_occupied_p . . . . . . . . . . . . . . . . . . | Resolution | −0.24 ** | 0.11 |
| | Age screener | −2.06 *** | −2.70 *** |
| | Interview | −1.64 *** | −1.45 *** |
| Rent_other_p . . . . . . . . . . . . . . . . . . . . . | Resolution | 0.47 ** | −0.22 |
| | Age screener | 4.57 *** | 6.08 *** |
| | Interview | 3.76 *** | 3.39 *** |

\* $p < 0.05$

\*\* $p < 0.01$

\*\*\* $p < 0.001$

[1]See Table 2 for description of each variable name.

[2]High-effort respondents are those who completed the stage in five or more calls. Low-effort respondents completed the stage in four or fewer calls.

[3]The percent difference for nonrespondent/respondent was calculated as follows: (Nonrespondent mean − Respondent mean)/Respondent mean.

[4]The percent difference for high-/low-effort respondents was calculated as follows: (High-effort respondent mean − Low-effort respondent mean)/Low-effort respondent mean.

**Table 13. Estimates of nonresponse bias in the key survey variables, based on comparison of all respondents and respondents with five or more calls**

| Key survey variable | Using base weights | | | | Using final weights | | | |
|---|---|---|---|---|---|---|---|---|
| | All respondents | Respondents with 5 or more calls | Respondents and nonrespondents[1] | Percent bias[2] | All respondents | Respondents with 5 or more calls | Respondents and nonrespondents[1] | Percent bias[2] |
| | Percent | | | | | | | |
| Percentage of children in excellent or very good health . . | 87.27 | 86.04 | 86.61 | 0.76 | 84.37 | 82.83 | 83.55 | 0.98 |
| Percentage of children with consistent insurance coverage in the past 12 months . . . . . . . . . . . . . . | 87.81 | 87.34 | 87.56 | 0.29 | 84.90 | 84.23 | 84.54 | 0.42 |
| Percentage of children with one or more medical preventive care visits in the past 12 months . . . . . . . . | 88.47 | 88.72 | 88.61 | −0.15 | 88.50 | 88.66 | 88.59 | −0.10 |
| Percentage of children with a medical home. . . . . . . . | 61.56 | 59.79 | 60.62 | 1.56 | 57.52 | 55.55 | 56.47 | 1.86 |
| Percentage of children whose families ate a meal together every day in the past week. . . . . . . . . . . . . | 43.07 | 42.43 | 42.73 | 0.80 | 45.78 | 45.10 | 45.42 | 0.80 |
| Percentage of children usually or always safe in the community or neighborhood. . . . . . . . . . . . . . . . . | 89.06 | 88.42 | 88.72 | 0.39 | 86.05 | 85.40 | 85.71 | 0.40 |

[1](Estimate for all respondents * Response rate) + (Estimate for respondents with 5 or more calls * Nonresponse rate).
[2](Estimate for all respondents − Estimate for respondents and nonrespondents)/Estimate for respondents and nonrespondents.

**Table 14. Percentage of children in excellent or very good health: Comparison of estimates from the National Survey of Children's Health and the National Health Interview Survey**

| Characteristic | NSCH[1] | | | | | | NHIS[2] | | | Comparison using final weights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Using base weights | | | Using final weights | | | Using final weights | | | | | |
| | Estimate | Lower 95% limit | Upper 95% limit | Estimate | Lower 95% limit | Upper 95% limit | Estimate | Lower 95% limit | Upper 95% limit | Percent difference | Lower 95% limit | Upper 95% limit |
| | Percent | | | | | | | | | Percentage points | | |
| Overall . . . . . . . . . . . . . . . . | 87.27 | 86.78 | 87.76 | 84.37 | 83.67 | 85.03 | 82.61 | 81.53 | 83.64 | 1.76 | 0.50 | 3.02 |
| Child's age | | | | | | | | | | | | |
| 0–4 years . . . . . . . . . . . . . | 90.08 | 89.22 | 90.94 | 87.76 | 86.48 | 88.93 | 82.99 | 81.16 | 84.67 | 4.77 | 2.63 | 6.91 |
| 5–11 years . . . . . . . . . . . . . | 86.67 | 85.82 | 87.53 | 83.31 | 82.12 | 84.42 | 84.10 | 82.51 | 85.57 | −0.79 | −2.71 | 1.13 |
| 12–17 years . . . . . . . . . . . . | 85.97 | 85.16 | 86.78 | 82.84 | 81.65 | 83.97 | 80.66 | 78.83 | 82.37 | 2.18 | 0.07 | 4.29 |
| Child's gender | | | | | | | | | | | | |
| Male. . . . . . . . . . . . . . . . . . | 86.73 | 86.05 | 87.42 | 83.87 | 82.91 | 84.80 | 82.25 | 80.76 | 83.64 | 1.62 | −0.10 | 3.34 |
| Female . . . . . . . . . . . . . . . | 87.85 | 87.15 | 88.55 | 84.92 | 83.91 | 85.88 | 82.99 | 81.52 | 84.37 | 1.93 | 0.20 | 3.66 |
| Child's race/ethnicity | | | | | | | | | | | | |
| Hispanic . . . . . . . . . . . . . . | 71.68 | 69.60 | 73.76 | 68.38 | 65.97 | 70.70 | 72.13 | 69.68 | 74.46 | −3.75 | −7.12 | −0.38 |
| Non-Hispanic white only. . . . . . | 91.94 | 91.53 | 92.34 | 91.00 | 90.38 | 91.59 | 87.73 | 86.40 | 88.94 | 3.27 | 1.87 | 4.67 |
| Non-Hispanic black only. . . . . . | 81.76 | 80.31 | 83.21 | 80.43 | 78.71 | 82.04 | 77.59 | 74.93 | 80.04 | 2.84 | −0.21 | 5.89 |
| Non-Hispanic other. . . . . . . . . | 88.08 | 86.52 | 89.64 | 86.54 | 84.52 | 88.34 | 82.92 | 78.80 | 86.37 | 3.62 | −0.61 | 7.85 |
| Mother's education level | | | | | | | | | | | | |
| Less than high school . . . . . . . | 65.26 | 62.52 | 68.00 | 63.03 | 59.99 | 65.98 | 68.03 | 64.85 | 71.05 | −5.00 | −9.31 | −0.69 |
| High school graduate . . . . . . . | 83.13 | 81.85 | 84.41 | 81.08 | 79.50 | 82.56 | 80.36 | 78.13 | 82.41 | 0.72 | −1.91 | 3.35 |
| More than high school. . . . . . . | 91.97 | 91.53 | 92.41 | 90.71 | 90.04 | 91.34 | 88.85 | 87.66 | 89.94 | 1.86 | 0.55 | 3.17 |
| Father's education level | | | | | | | | | | | | |
| Less than high school . . . . . . . | 67.71 | 64.64 | 70.78 | 64.76 | 61.17 | 68.19 | 69.25 | 65.67 | 72.61 | −4.49 | −9.43 | 0.45 |
| High school graduate . . . . . . . | 86.71 | 85.58 | 87.85 | 84.55 | 82.98 | 86.00 | 83.01 | 80.86 | 84.97 | 1.54 | −1.01 | 4.09 |
| More than high school. . . . . . . | 92.84 | 92.35 | 93.32 | 91.92 | 91.19 | 92.60 | 90.98 | 89.78 | 92.05 | 0.94 | −0.39 | 2.27 |

[1]NSCH is National Survey of Children's Health.
[2]NHIS is National Health Interview Survey.

**Table 15. Percentage of children with consistent insurance coverage in the past 12 months: Comparison of estimates from the National Survey of Children's Health and the National Health Interview Survey**

| Characteristic | NSCH[1] Using base weights | | | NSCH[1] Using final weights | | | NHIS[2] Using final weights | | | Comparison using final weights | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimate | Lower 95% limit | Upper 95% limit | Estimate | Lower 95% limit | Upper 95% limit | Estimate | Lower 95% limit | Upper 95% limit | Percent difference | Lower 95% limit | Upper 95% limit |
| | Percent | | | | | | | | | Percentage points | | |
| Overall . . . . . . . . . . . . . . . | 87.81 | 87.34 | 88.29 | 84.90 | 84.23 | 85.54 | 87.40 | 86.42 | 88.31 | −2.50 | −3.65 | −1.35 |
| *Child's age* | | | | | | | | | | | | |
| 0–4 years . . . . . . . . . . . . . | 87.83 | 86.84 | 88.83 | 85.01 | 83.61 | 86.31 | 89.84 | 88.23 | 91.24 | −4.83 | −6.85 | −2.81 |
| 5–11 years . . . . . . . . . . . . . | 87.19 | 86.35 | 88.02 | 84.56 | 83.42 | 85.62 | 87.08 | 85.46 | 88.54 | −2.52 | −4.41 | −0.63 |
| 12–17 years . . . . . . . . . . . . | 88.37 | 87.67 | 89.06 | 85.19 | 84.17 | 86.17 | 85.76 | 84.18 | 87.20 | −0.57 | −2.38 | 1.24 |
| *Child's gender* | | | | | | | | | | | | |
| Male. . . . . . . . . . . . . . . . . | 87.82 | 87.17 | 88.47 | 84.89 | 83.96 | 85.78 | 87.96 | 86.66 | 89.15 | −3.07 | −4.61 | −1.53 |
| Female . . . . . . . . . . . . . . . | 87.79 | 87.09 | 88.48 | 84.89 | 83.91 | 85.81 | 86.81 | 85.39 | 88.11 | −1.92 | −3.58 | −0.26 |
| *Child's race/ethnicity* | | | | | | | | | | | | |
| Hispanic . . . . . . . . . . . . . . | 74.84 | 72.82 | 76.85 | 71.73 | 69.41 | 73.95 | 79.80 | 77.74 | 81.71 | −8.07 | −11.09 | −5.05 |
| Non-Hispanic white only. . . . . . | 91.20 | 90.79 | 91.62 | 89.63 | 89.02 | 90.22 | 89.68 | 88.40 | 90.83 | −0.05 | −1.41 | 1.31 |
| Non-Hispanic black only. . . . . . | 85.25 | 83.76 | 86.75 | 83.07 | 81.23 | 84.77 | 90.37 | 88.39 | 92.05 | −7.30 | −9.84 | −4.76 |
| Non-Hispanic other. . . . . . . . . | 89.55 | 88.35 | 90.75 | 88.21 | 86.43 | 89.79 | 85.46 | 80.24 | 89.47 | 2.75 | −2.13 | 7.63 |
| *Mother's education level* | | | | | | | | | | | | |
| Less than high school . . . . . . . | 72.15 | 69.60 | 74.71 | 71.02 | 68.18 | 73.71 | 76.61 | 73.70 | 79.29 | −5.59 | −9.52 | −1.66 |
| High school graduate . . . . . . . | 83.76 | 82.50 | 85.02 | 80.90 | 79.30 | 82.41 | 86.31 | 84.25 | 88.14 | −5.41 | −7.90 | −2.92 |
| More than high school. . . . . . . | 91.47 | 91.02 | 91.93 | 89.75 | 89.07 | 90.39 | 91.75 | 90.69 | 92.70 | −2.00 | −3.20 | −0.80 |
| *Father's education level* | | | | | | | | | | | | |
| Less than high school . . . . . . . | 72.59 | 69.76 | 75.42 | 71.79 | 68.67 | 74.72 | 75.96 | 72.61 | 79.01 | −4.17 | −8.58 | 0.24 |
| High school graduate . . . . . . . | 84.29 | 82.94 | 85.63 | 80.95 | 79.12 | 82.65 | 84.96 | 82.67 | 87.00 | −4.01 | −6.80 | −1.22 |
| More than high school. . . . . . . | 92.54 | 92.08 | 93.01 | 91.01 | 90.27 | 91.70 | 92.71 | 91.48 | 93.77 | −1.70 | −3.05 | −0.35 |

[1]NSCH is National Survey of Children's Health.

[2]NHIS is National Health Interview Survey.

**Table 16. Estimates of nonresponse bias in key survey variables, based on method used to estimate bias**

| Key survey variable | Key survey estimate[1] (95% confidence interval) | Method[2] Frame information analysis | Method[2] Level-of-effort analysis | Method[2] Comparison with NHIS[3] estimate analysis |
|---|---|---|---|---|
| | | Percent | | |
| Percentage of children in excellent or very good health . . | 84.37 (83.67, 85.03) | 0.12 | 0.98 | 2.13 |
| Percentage of children with consistent insurance coverage in the past 12 months . . . . . . . . . . . . . . . | 84.90 (84.23, 85.54) | 0.06 | 0.42 | −2.86 |
| Percentage of children with one or more medical preventive care visits in the past 12 months . . . . . . . . | 88.50 (87.98, 89.02) | 0.01 | −0.10 | - - - |
| Percentage of children with a medical home. . . . . . . . | 57.52 (56.68, 58.37) | 0.35 | 1.86 | - - - |
| Percentage of children whose families ate a meal together every day in the past week. . . . . . . . . . . . . | 45.78 (44.96, 46.61) | −0.10 | 0.80 | - - - |
| Percentage of children usually or always safe in the community or neighborhood. . . . . . . . . . . . . . . . . | 86.05 (85.45, 86.66) | 0.16 | 0.40 | - - - |

- - - Data not available (not collected in NHIS).

[1]Key survey estimates use final weights that have been adjusted for nonresponse and raked to population control totals.

[2]Estimates of bias use nonresponse-adjusted or raked weights, depending on the analysis. Here, the biases are presented as percentages, not absolute terms, so that a 0.98% bias in an estimate of 84.37 means that the reported estimate is 0.98% higher than the true value (i.e., the true value is 84.37/1.0098 = 83.55).

[3]NHIS is National Health Interview Survey.

# Vital and Health Statistics
# Series Descriptions

**ACTIVE SERIES**

Series 1. **Programs and Collection Procedures**—This type of report describes the data collection programs of the National Center for Health Statistics. Series 1 includes descriptions of the methods used to collect and process the data, definitions, and other material necessary for understanding the data.

Series 2. **Data Evaluation and Methods Research**—This type of report concerns statistical methods and includes analytical techniques, objective evaluations of reliability of collected data, and contributions to statistical theory. Also included are experimental tests of new survey methods, comparisons of U.S. methodologies with those of other countries, and as of 2009, studies of cognition and survey measurement, and final reports of major committees concerning vital and health statistics measurement and methods.

Series 3. **Analytical and Epidemiological Studies**—This type of report presents analytical or interpretive studies based on vital and health statistics. As of 2009, Series 3 also includes studies based on surveys that are not part of continuing data systems of the National Center for Health Statistics and international vital and health statistics reports.

Series 10. **Data From the National Health Interview Survey**—This type of report contains statistics on illness; unintentional injuries; disability; use of hospital, medical, and other health services; and a wide range of special current health topics covering many aspects of health behaviors, health status, and health care utilization. Series 10 is based on data collected in this continuing national household interview survey.

Series 11. **Data From the National Health Examination Survey, the National Health and Nutrition Examination Surveys, and the Hispanic Health and Nutrition Examination Survey**—In this type of report, data from direct examination, testing, and measurement on representative samples of the civilian noninstitutionalized population provide the basis for (1) medically defined total prevalence of specific diseases or conditions in the United States and the distributions of the population with respect to physical, physiological, and psychological characteristics, and (2) analyses of trends and relationships among various measurements and between survey periods.

Series 13. **Data From the National Health Care Survey**—This type of report contains statistics on health resources and the public's use of health care resources including ambulatory, hospital, and long-term care services based on data collected directly from health care providers and provider records.

Series 20. **Data on Mortality**—This type of report contains statistics on mortality that are not included in regular, annual, or monthly reports. Special analyses by cause of death, age, other demographic variables, and geographic and trend analyses are included.

Series 21. **Data on Natality, Marriage, and Divorce**—This type of report contains statistics on natality, marriage, and divorce that are not included in regular, annual, or monthly reports. Special analyses by health and demographic variables and geographic and trend analyses are included.

Series 23. **Data From the National Survey of Family Growth**—These reports contain statistics on factors that affect birth rates, including contraception and infertility; factors affecting the formation and dissolution of families, including cohabitation, marriage, divorce, and remarriage; and behavior related to the risk of HIV and other sexually transmitted diseases. These statistics are based on national surveys of women and men of childbearing age.

**DISCONTINUED SERIES**

Series 4. **Documents and Committee Reports**—These are final reports of major committees concerned with vital and health statistics and documents. The last Series 4 report was published in 2002. As of 2009, this type of report is included in Series 2 or another appropriate series, depending on the report topic.

Series 5. **International Vital and Health Statistics Reports**—This type of report compares U.S. vital and health statistics with those of other countries or presents other international data of relevance to the health statistics system of the United States. The last Series 5 report was published in 2003. As of 2009, this type of report is included in Series 3 or another series, depending on the report topic.

Series 6. **Cognition and Survey Measurement**—This type of report uses methods of cognitive science to design, evaluate, and test survey instruments. The last Series 6 report was published in 1999. As of 2009, this type of report is included in Series 2.

Series 12. **Data From the Institutionalized Population Surveys**—The last Series 12 report was published in 1974. Reports from these surveys are included in Series 13.

Series 14. **Data on Health Resources: Manpower and Facilities**—The last Series 14 report was published in 1989. Reports on health resources are included in Series 13.

Series 15. **Data From Special Surveys**—This type of report contains statistics on health and health-related topics collected in special surveys that are not part of the continuing data systems of the National Center for Health Statistics. The last Series 15 report was published in 2002. As of 2009, reports based on these surveys are 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, and so compilations of Advance Data reports are no longer needed.

Series 22. **Data From the National Mortality and Natality Surveys**—The last Series 22 report was published in 1973. Reports from these sample surveys, based on vital records, are published in Series 20 or 21.

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, and so compilations of reports are no longer needed.

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

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

Centers for Disease Control and Prevention
National Center for Health Statistics
3311 Toledo Road
Hyattsville, MD 20782
_____

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300