# National Immunization Survey-Teen

## A User's Guide for the 2023 Public-Use Data File


**Centers for Disease Control and Prevention**

**National Center for Immunization and Respiratory Diseases**



**Presented by:**

**NORC at the University of Chicago**

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# Acknowledgments

The development and production of the NIS-Teen public-use data files is a team effort that has included contributions from many individuals (listed in alphabetical order) in two organizations:

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NORC at the University of Chicago – Rachel Francis, Benjamin Skalland, Kirk Wolter, and Maggie Yarbrough.

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# Convention for Bolding Text

The Data User's Guide uses **bold** font to highlight substantive changes in the methodology or study design from the previous year’s Guide.

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# 1. Introduction

In 1992, the Childhood Immunization Initiative (CII) (CDC 1994) was established to 1) improve the delivery of vaccines to children; 2) reduce the cost of childhood vaccines; 3) enhance awareness, partnerships, and community participation; 4) improve vaccinations and their use; and 5) monitor vaccination coverage and occurrences of disease. The Healthy People 2020 objectives later established a target for adolescents aged 13–15 years of 80% coverage with ≥1 Tdap, ≥1 MenACWY, and the recommended number of HPV doses (≥2 or ≥3), and 90% coverage for ≥2 varicella vaccine doses. To fulfill the CII mandate of monitoring vaccination coverage and marking progress toward achieving those objectives, the National Immunization Survey (NIS) Family of Surveys with an adolescent component called the NIS-Teen was implemented by the National Center for Immunization and Respiratory Diseases (NCIRD) and the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) in 2006 (https://www.cdc.gov/nis/about/index.html).

The target population for the NIS-Teen is non-institutionalized adolescents aged 13–17 years living in United States households at the time of the interview. The official coverage estimates reported from the 2023 NIS-Teen are proportions of adolescents up-to-date with respect to the recommended numbers of doses of all routinely recommended vaccines for adolescents and selected catch-up vaccines (Wodi et al. 2023). These vaccines and their recommended numbers of doses are:

- Tetanus, diphtheria, and acellular pertussis vaccine (Tdap) – 1 dose;
- Quadrivalent meningococcal vaccine (MenACWY) – 2 doses;
- Human papillomavirus vaccine (HPV) – 2 or 3 doses, depending on age at first dose[1];
- Measles, mumps, and rubella vaccine (MMR) – 2 doses;

[1] The 2-dose HPV vaccination schedule was approved in October 2016 for adolescents who received their first dose before age 15 (Meites, Kempe, and Markowitz, 2016). Therefore, changes in vaccination due to the new recommendation would be reflected in the 2023 NIS-Teen data for adolescents receiving HPV vaccinations after that time (see Walker et al., 2018).

- Hepatitis B vaccine (Hep B) – 3 doses;
- Varicella zoster (chicken pox) vaccine – 2 doses among adolescents with no varicella disease history;
- Hepatitis A vaccine (Hep A) – 2 doses;
- COVID-19 – 1 or more doses with updated (2023-24) formula; and
- Seasonal influenza vaccine – 1 dose annually.

The NIS-Teen is conducted as an add-on to the National Immunization Survey - Child (NIS-Child)[2], which seeks to estimate vaccination coverage rates among children aged 19–35 months. The NIS-Child uses a random digit dialing (RDD) telephone survey[3] to identify households containing children aged 19–35 months and interviews the adult who is most knowledgeable about the child's vaccinations. If an eligible household is identified and the NIS-Child interview is completed, the household is then screened for the presence of 13–17 year-old adolescents. Households that do not contain a 19–35 month old child are not administered the NIS-Child interview but are immediately screened for the presence of a 13–17 year-old adolescent. If a household containing one or more adolescents aged 13–17 years is identified, a 13–17 year-old adolescent is randomly chosen, and the adult who is most knowledgeable about the teen's vaccinations is interviewed. With consent of the teen's parent or guardian, the NIS-Teen also contacts (by mail) the teen's vaccination provider(s) to request information on vaccinations from the teen's medical records. NIS-Teen sampling, data collection, and weighting operations are conducted by NORC at the University of Chicago.

Samples of telephone numbers are drawn independently, for each calendar quarter, within selected geographical areas. For the 2023 NIS-Teen, there are 59 geographic strata for which vaccination coverage levels can be estimated, including 5 local areas; the remaining 54 are either an entire state, the District of

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[2] More information about the NIS-Child is available at https://www.cdc.gov/nis/php/datasets-child/index.html.
[3] The NIS-Child used a landline-only sampling frame during 1995–2010, a dual-frame design in 2011–2017 which included both landline and cell-phone sampling frames, and a single-frame cell-phone sample since 2018.

Columbia, a U.S. territory (the U.S. Virgin Islands, Guam, or Puerto Rico), or a "rest of state" area. This design makes it possible to produce annual estimates of vaccination coverage levels within each of the 59 estimation areas with a specified degree of precision (a coefficient of variation of approximately 6.5%). Further, by using the same data collection methodology and survey instruments in all estimation areas and across years, the NIS-Teen produces comparable vaccination coverage levels among estimation areas and over time.

When the NIS-Teen was first conducted in Quarter 4 of 2006 and Quarter 4 of 2007, the survey was designed to produce estimates at the national level only. Starting in 2008, the NIS-Teen was expanded to produce estimates in 56 areas, including the 50 states, District of Columbia, and 5 local areas that receive federal Section 317 immunization grants (Bexar County, TX; City of Chicago, IL; City of Houston, TX; New York City, NY; Philadelphia County, PA). These areas are called *estimation areas*. **In 2023, the NIS-Teen included the U.S. Virgin Islands, Guam, and Puerto Rico as additional estimation areas.** As noted throughout this report, some procedures differed for territories when compared to the rest of the United States, including the creation of separate survey weight variables for analyses that are to include territories.

Data for Guam and the U.S. Virgin Islands are not included in the 2023 public-use data file to protect respondent confidentiality, as the sampling fractions were large in these small-population areas. Interested researchers can access data for Guam and the U.S. Virgin Islands by submitting a proposal and working through the Research Data Center. The link and guidelines for developing a proposal are located at https://www.cdc.gov/rdc.

**For the 2023 NIS-Teen, household interviews began on January 5, 2023 and ended on December 30, 2023. Provider data collection extended from January 2023 through March 2024. A total sample, including the territory samples, of approximately 17.5 million telephone numbers yielded household interviews for 43,635 teens, 17,241 of whom had adequate provider data (provider-reported**

**vaccination data adequate to determine whether the teen was up-to-date with respect to the recommended vaccination schedule). The 2023 NIS-Teen public-use data file (which includes data from Puerto Rico but does not include data for the U.S. Virgin Islands or Guam) contains data for 42,920 teens with completed household interviews, and more extensive data (e.g., provider-reported vaccination histories and facility data) for 17,021 teens with adequate provider data (including 117 unvaccinated teens). Data were collected in the U.S. Virgin Islands and Guam in 2023, although adolescents in these areas are not included on the public-use data file in order to protect their confidentiality.**

NIS-Teen vaccination coverage estimates are based on provider-reported vaccination histories from adolescents with adequate provider data (APD). In 2014, the household questionnaire was shortened to reduce the length of the household interview, decrease respondent burden, and potentially improve survey response rates. Questions that were previously used to define APD were no longer available, thus necessitating a modification to the APD definition used by the NIS-Teen beginning in 2014 (for more details, see CDC, 2015a; CDC, 2015b). NIS-Teen estimates for 2023 will be directly comparable to NIS-Teen estimates published since 2014, but not to estimates published prior to 2014.

The weights included in this public-use data file allow data analysts to conduct several different types of analysis, depending on interests and aims. One can choose to analyze all teens with completed household interviews or only the subset of teens for whom the provider-reported data are adequate. CDC publishes estimates of vaccination coverage based on provider-reported vaccination histories using the subset of teens for whom the provider-reported data are adequate. Parental reported vaccination status is subject to recall error (Dorell et al. 2011, Ojha et al. 2013). Also, one can choose to include or exclude teens who reside in territories in the analysis. Previous NIS-Teen public-use files have provided analysts with these capabilities as well. Section 6 of this user's guide provides information about the creation of the weight variables included in the 2023 NIS-Teen public-use data file, and Section 8 provides guidance for their use.

Vaccination coverage estimates for 2023 are available on the *TeenVaxView* website, https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/index.html.

The accompanying codebook (NCIRD, 2024) documents the contents of the 2023 NIS-Teen public-use data file, and Section 7 of this user's guide describes these contents in detail. For reference, the accompanying "Alphabetical Listing of Variables in the NIS-Teen Public-Use Data Files" CSV file provides a full list of variables in the 2023 and previous public-use data files. NIS-Teen data and documentation for 2015 to the present are available at: https://www.cdc.gov/nis/php/datasets-teen/index.html.

Additional information on the NIS-Teen is available at: https://www.cdc.gov/nis/about/index.html.

For additional information on the NIS-Teen public-use data file, please contact the NCIRD Information Dissemination Staff:


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# 2. Sample Design

The NIS-Teen uses two phases of data collection to obtain vaccination information for a large national probability sample of teens: (1) a RDD telephone survey designed to identify households with adolescents aged 13–17 years, followed by (2) the Provider Record Check, a mailed survey to teens' vaccination providers. This section summarizes these two phases of data collection. Descriptions of the history and general design of the NIS family of surveys are given by Ezzati Rice et al. (1995), Zell et al. (2000), Smith et al. (2001a, 2005), Jain et al. (2009), and Wolter et al. (2017a).

## 2.1. The NIS-Teen RDD Telephone Survey

The NIS-Teen RDD telephone survey phase uses independent, quarterly samples of telephone numbers. Sampling frames were provided by Marketing Systems Group (MSG). Cellular phone numbers were sampled within estimation areas in each quarter of 2023. Table C.1 (in Appendix C) lists the estimation areas for the 2023 NIS-Teen by state or territory and shows the estimated number of teens living in each state or territory and estimation area in 2023.

Because the NIS-Teen is an add-on survey to the NIS-Child, the NIS-Teen uses the same sampling frame and sampling methodology as the NIS-Child. In 2023, this was a single-frame cellular phone sampling design, with telephone numbers sampled only from a sampling frame of cellular phone numbers. Prior to 2011, the NIS-Teen was based on a landline telephone sample. A cellular phone sample was added to the survey in 2011 in order to address the rapid rise of cellular phone-only households. As cellular phone penetration has increased, fewer and fewer households, especially households with children, have relied only on a landline telephone. Because the proportion of households with children that are reachable only by landline telephone is now very small – only 0.3% in 2023 (Blumberg and Luke 2024) – the landline sample was dropped beginning in 2018, and the NIS-Teen now uses only a cellular phone sample. A discussion of this change and its impact is given by Nguyen et al. (2019).

The target sample size of completed telephone interviews in each estimation area is designed to achieve an approximately equal coefficient of variation of 6.5% for an estimator of vaccination coverage derived from provider-reported vaccination histories, given a true coverage parameter of 50%. Cellular phone sample sizes were chosen to meet the target coefficient of variation of 6.5%.

Since 2019, the NIS sample design has included a modification to increase the efficiency of data collection. Immunization Information Systems (IIS) are state or local confidential, computerized, population-based data systems that collect and consolidate vaccination doses administered by participating vaccination providers to persons residing in a given geopolitical area. In participating geographic estimation areas, a two-phase RDD sample of cellular phone numbers is selected, with the second-phase sample stratified by the status of the telephone number in the corresponding IIS:

- Stratum 1: Phone number associated with a 19-35 month old child in the IIS
- Stratum 2: Phone number associated with a 13-17 year old adolescent in the IIS (but not with a 19-35 month old child in the IIS)
- Stratum 3: Phone number associated with a 6-18 month or 3-12 year old child in the IIS (but not with a 19-35 month old child or 13-17 year old adolescent in the IIS)
- Stratum 4: Phone number not associated with a 6 month to 17 year old child in the IIS

In the second phase of sampling, phone numbers falling into Strata 1, 2, and 3 were oversampled. The method was designed to maximize the effective sample sizes for the NIS family of surveys, given a fixed cost for data collection, within each of the participating geographic estimation areas. **For the 2023**

**sample, 33 areas participated in this two-phase sampling process to increase efficiency of sampling.**[4]

**In 2023, including the U.S. territory samples, 39.5% of teens with a completed household interview were determined to have adequate provider data. Excluding territories, this proportion was 40.2%. The percentage of teens with adequate provider data in 2023 varies among the non-territory estimation areas (from 29.2% in California to 53.9% in Vermont); among the U.S. territories, the percentages were 26.8% in the U.S. Virgin Islands, 34.2% in Guam, and 26.2% in Puerto Rico (see Appendix C)**. The phrase "adequate provider data" means that sufficient vaccination history information was obtained from the provider(s) to determine whether the teen is up-to-date with respect to the recommended vaccination schedule. Unvaccinated teens are also considered to have adequate provider data. These are teens for whom either (1) the respondent reported during the household interview that the teen had received no vaccinations and has no providers, or (2) the respondent reported during the household interview that the adolescent had received no vaccinations but has one or more providers, and those providers all reported administering no vaccinations. The number of unvaccinated teens in the sample is small (**119 in 2023**, including the U.S. territory samples).

In 2014, the definition of adequate provider data was expanded to include all adolescents with provider-reported vaccination data (plus unvaccinated teens) (CDC, 2015a; CDC, 2015b). In 2021, the NIS-Teen began collecting data on COVID-19 vaccination, and the definition of adequate provider data was further revised to exclude adolescents for whom only COVID-19 vaccinations were reported; this change was made to maintain consistency in the definition between 2021 and prior years.

[4] The participating geographic areas in 2023 were Alaska, Arkansas, Connecticut, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Mississippi, Missouri, Nebraska, Nevada, New Mexico, New York – City of New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania – Philadelphia County, Rhode Island, South Dakota, Tennessee, Utah, Vermont, Washington, Wisconsin, Wyoming, the U.S. Virgin Islands, and Puerto Rico. Not all of these areas utilized the IIS-NIS integration design in every quarter of 2023; Philadelphia County and Wisconsin used the integration design only in quarters 3 and 4.

The design and implementation of the NIS-Teen cellular phone sample involve three procedures. First, statistical models predict the number of sample cellular phone numbers needed in each estimation area to meet the target precision requirements, and, from among the entire NIS-Child sample of telephone numbers, this number of telephone numbers are "flagged" to be part of the NIS-Teen sample. Second, the sample for an estimation area is divided into random sub-samples called replicates. By releasing replicates as needed, it is possible to spread the interviews for each sampling area evenly across the entire calendar quarter. Third, an automated procedure eliminates numbers on the NIS do-not-call list from the sample before the interviewers dial them.

In 2014 and 2015, an automated process was implemented to remove cellular phone numbers flagged as having no recent activity and that were therefore very likely to be non-working cellular phone numbers. In 2016, a different automated process found to be more efficient in removing non-working cellular phone numbers was used. Following a July 2016 Federal Communications Commission (FCC) declaratory ruling (FCC 16-72, CG Docket No. 02-278) stating that the federal government and contractors working on behalf of the federal government are not subject to the restrictions on cellular phone dialing in the Telephone Consumer Protection Act of 1991 (TCPA, 47 U.S.C. 227), the NIS transitioned from manual dialing of cellular phones to auto-dialing cellular phones in November 2016. After this transition, the automated process to remove non-working cellular phone numbers was no longer cost effective, and beginning in 2017 this process was no longer used in the cellular phone sample.

## 2.2. The NIS-Teen Provider Record Check

At the end of the household interview, consent to contact the adolescent's vaccination provider(s) is requested from the parent/guardian. When oral consent is obtained, each provider is mailed an immunization history questionnaire (IHQ). This mail survey portion of the NIS-Teen is the Provider Record Check (PRC).

The instructions ask vaccination providers to mail or fax the IHQ back upon completion. Two weeks after the initial mailing, a telephone call is made to providers who have still not responded, to remind and encourage them to complete the form and either mail or fax the information back. In some instances, provider-reported vaccination histories are completed over the telephone. The data from the questionnaires are edited, entered, cleaned, and merged with the household information from the RDD survey to produce a teen-level record.

## 2.3. Summary of Data Collection

Table 1 presents selected operational results of NIS-Teen data collection for calendar year 2023 for the NIS-Teen sample. To facilitate comparisons with prior NIS-Teen surveys, the numbers, which are presented in Table 1 and discussed in this section, exclude the U.S. territory samples. **Adolescents aged 13–17 years during 2023 data collection were born between January 2005 and December 2010.**

**The total cellular phone RDD sample (in replicates that were released for use) consisted of 16,423,606 telephone numbers. Of these, 31,540 were eliminated before release to the telephone centers as numbers on the NIS do-not-call list, and the remaining 16,392,066 were sent to the telephone centers to be dialed. A total of 1,062,946 active personal cellular phone numbers (APCNs) were identified as shown in Row F. Among the identified APCNs, 823,204 (77.4%) were successfully screened. Of these, 60,494 (7.3%) were deemed eligible for the NIS-Teen interview. Respondents were eligible if the cellular phone belonged to an adult living in a household with at least one age-eligible teen. Among the identified eligible households, 41,112 (68.0%) completed the household interview.**

A standard approach for measuring response rates in telephone surveys has been defined by the Council of American Survey Research Organizations (CASRO 1982). The CASRO response rate is equivalent to "RR3" of the American Association for Public Opinion Research (AAPOR) Standard Definitions (AAPOR 2023). **In 2023, the CASRO response rate (Row J) was 24.4%. The NIS-Teen CASRO**

**response rate equals the product of the resolution rate (46.4%, Row E), the screening completion rate (77.4%, Row G), and the interview completion rate among eligible households (68.0%, Row I).** The resolution rate is the percentage of the total telephone numbers selected that are classifiable as non-working, non-residential, or residential. The screening completion rate is the percentage of known households that are successfully screened for the presence of age-eligible teens. The interview completion rate is the percentage of households with one or more age-eligible teens that complete the household interview.

**Row K of Table 1 shows that household interviews were completed for 41,194 age-eligible teens[5]. Rows L through O give results for the Provider Record Check phase. Specifically, Row L gives the rate of obtaining oral consent from household respondents to contact their teen's vaccination providers – 52.0% in 2023.** The number of immunization history questionnaires mailed to vaccination providers exceeds the number of completed interviews for teens with consent because some teens have more than one vaccination provider. **Of the questionnaires mailed to providers of teens, 28,839 (84.8%, Row N) were returned. Among the teens with completed household interviews, 16,568 (40.2%, Row O) had adequate vaccination histories based on provider reporting (16,453) or were determined to be unvaccinated (115). The other 59.8% of teens lacked adequate provider data for a variety of reasons, such as the parent or guardian did not give consent to contact the teen's provider(s), the provider(s) did not respond, or the provider(s) responded but did not report any vaccinations for the teen despite the parent or guardian indicating that the teen has received vaccinations.**

[5] This figure may differ from that in Row I because some completed interviews were removed when edits to the teen's date of birth rendered the teen ineligible. Differences may also occur because Row I excludes teens initially sampled in the U.S. territories, while row K excludes teens currently living in the U.S. territories. Thus, Row I reflects the removal of teens not sampled but currently living in U.S. territories, and the addition of teens sampled but not currently living in U.S. territories.

In 2023, data from the Health Insurance Module (HIM) were collected (see Section 3.1). **Among the 41,194 teens with completed household interviews, 22,417 (54.4%, Row P) completed the HIM.**

For each estimation area and each state or territory, Table C.1 (see Appendix C) shows the number of teens with completed household interviews and the number of teens with adequate provider data.

**Table 1: Selected Operational Results (Excluding U.S. Territories), National Immunization Survey – Teen, 2023**

| Row | Key Indicator | Cellular Phone Sample | | Formula |
|---|---|---|---|---|
| | | Number | Percent | |
| | **Household Phase** | | | |
| A | Total Selected Telephone Numbers in Released Replicates | 16,423,606 | -- | -- |
| B | Phone Numbers Resolved before Computer-Assisted Telephone Interviewing | 31,540 | 0.2% | B/A |
| C | Total Phone Numbers Released to Telephone Centers | 16,392,066 | -- | A-B |
| D | Advance Letters Mailed | 0 | 0.0% | D/C |
| E | Resolved Phone Numbers[1] – *Resolution Rate* | 7,628,014 | 46.4% | E/A |
| F | Households Identified – *APCN Rate*[2] | 1,062,946 | 13.9% | F/E |
| G | Households Successfully Screened[3] – *Screener Completion Rate* | 823,204 | 77.4% | G/F |
| H | Eligible Households – *Eligibility Rate*[4] | 60,494 | 7.3% | H/G |
| I | Households with Completed Household Interviews – *Interview Completion Rate* | 41,112 | 68.0% | I/H |
| J | CASRO[5] Response Rate[6] | -- | 24.4% | -- |
| K | Age-Eligible Teens with Completed Household Interviews[7] | 41,194 | -- | -- |
| | **Provider Phase** | | | |
| L | Teens with Consent to Contact Vaccination Providers | 21,438 | 52.0% | L/K |
| M | Immunization History Questionnaires Mailed to Providers | 34,006 | -- | -- |
| N | Immunization History Questionnaires Returned from Providers | 28,839 | 84.8% | N/M |
| O | Teens with Adequate Provider Data | 16,568 (includes 115 unvaccinated teens) | 40.2% | O/K |
| | **Modules** | | | |
| P | Age-Eligible Teens with Completed Household Interview and Completed Health Insurance Module | 22,417 | 54.4% | P/K |

[1] A phone number is resolved if it was determined to be either a non-working number or a working residential number. This row includes phone numbers resolved before computer-assisted telephone interviewing (CATI) (Row B). The numbers resolved before CATI interviewing are those on the NIS do-not-call list.
[2] Active personal cellular phone number (APCN) rate.
[3] The household screener screens for non-minor-only cellular phone households with age-eligible children.
[4] Of the screened households, the proportion that were non-minor-only cellular phone households with age-eligible children.
[5] CASRO, Council of American Survey Research Organizations.
[6] The response rate is the number of households with a completed household interview divided by the estimated number of eligible households in the sample. The number of eligible households was estimated using the CASRO assumptions; these assumptions are that the rate of households among the unresolved telephone numbers is the same as the observed rate of households among the resolved telephone numbers, and the rate of eligible households among unscreened households is the same as the observed rate of eligible households among screened households. Under these assumptions, the CASRO response rate is equal to the product of the resolution rate, the screener completion rate, and the interview completion rate.
[7] Rows K-P reflect the removal of teens with an ineligible best date of birth, the removal of teens who were not sampled but reported living in a U.S. territory, and the addition of teens sampled in a U.S. territory who reported living in the non-territory United States.

## 2.4. Informed Consent, Security, and Confidentiality of Information

The introduction to the telephone survey and oral consent assure the respondent of the confidentiality of his/her responses and the voluntary nature of the survey. Informed consent is obtained from the person in the household most knowledgeable about the eligible teen's vaccination history (generally the parent or guardian of the teen). Informed consent to contact the teen's vaccination provider(s) is obtained at the end of the interview.

Information in the NIS-Teen is collected and processed under high security. To ensure privacy of the respondents and confidentiality of sensitive information, standards have been established for release of data from this survey. All CDC staff and contractor staff involved with the NIS-Teen sign confidentiality agreements and follow instructions to prevent disclosure.

All information in the NIS-Teen is collected under strict confidentiality and can be used only for research [Section 308(d) of the Public Health Service Act, 42 U.S. Code 242m(d), the Privacy Act of 1974 (5 U.S. Code 552a)]. Prior to public release, the contents of the public-use data file go through extensive review by the NCIRD Disclosure Review Board to protect participant privacy as well as data confidentiality.

# 3. Content of NIS-Teen Questionnaires

This section describes the questionnaires used in the 2023 NIS-Teen telephone interview of households and in the NIS-Teen Provider Record Check.

## 3.1. Content of the Household Questionnaire

The computer-assisted telephone interview (CATI) questionnaire used in the RDD phase of NIS-Teen data collection consists of two parts: a screener to identify households with adolescents aged 13-17 years and an interview portion. The questionnaire is modeled on the Immunization Supplement to the National Health Interview Survey (NHIS) (NCHS 1999). The NIS-Teen CATI questionnaire has been translated into Spanish, and LanguageLine Solutions® (formerly part of AT&T) is used for real-time translation into many other languages (Wall et al. 1995). Table 2 summarizes the content of each section of the NIS-Teen household interview. The CATI questionnaire is available at https://www.cdc.gov/nis/php/datasets-teen/index.html.

In the first section, the household is initially screened to ensure that the cellular phone is used by an adult (i.e., to ensure it is not a minor-only cellular phone), and then screened for the presence of children aged 19-35 months. If the household contains such a child, the NIS-Child interview is conducted before the household is screened for the NIS-Teen survey; if the household does not contain such a child, the household immediately proceeds to the NIS-Teen screener.

In the next section with the NIS-Teen screener, the purpose of the survey is explained to the respondent, and the ages of all the children in the household are obtained. If the household contains one or more adolescents aged 13-17 years, a 13-17 year-old adolescent is randomly chosen to be the subject of the interview, this teen's date of birth is collected, and the respondent is asked whether he/she is the most knowledgeable person for this teen's vaccination history. If the respondent indicates that another person in the household is more knowledgeable, the interviewer asks to speak to him/her at that time. If that person is unavailable to be interviewed, the name of the most knowledgeable person is recorded, and a callback is scheduled for a later date.

**Table 2: Content of the Household Interview, National Immunization Survey – Teen, 2023**

| Questionnaire Section | Content of Section |
|---|---|
| Section S | Screening questions to determine NIS-Child eligibility |
| NIS-Teen Screener | Screening questions to roster children and to determine NIS-Teen eligibility |
| Section B | Ever vaccinated and flu, Td/Tdap, meningococcal, and HPV vaccination questions |
| Section C | Teen and household health questions, demographic and socioeconomic questions |
| Section D | Provider information and request for consent to contact the teen's vaccination provider(s) |
| Section E | Health Insurance Module (HIM) |

The standard NIS-Teen questionnaire formerly included Section A following the NIS-Teen Screener, which asked about vaccinations recorded on a paper "shot card" sometimes given to families to track vaccination dates and dosages. After asking whether the respondent has a shot card of the teen's vaccination history, he/she was asked whether the shot card was easily accessible. If so, the interview proceeded with Section A (which asked respondents with shot cards about the shots on the card), followed by Section C; if not, it proceeded with Section B followed by Section C. Beginning in Q1/2014, Section A was eliminated from the regular household questionnaire and all respondents were administered Section B. Section B was also shortened. The remaining Section B questions are a limited set of questions regarding flu, Td/Tdap, meningococcal, and HPV vaccinations; questions about measles, varicella, hepatitis A, and hepatitis B vaccines were removed. In 2015 and 2016, Section A was reinstated for Guam respondents, but was discontinued for all respondents beginning in 2017.

Section C collects information about the health of the selected teen, including recent doctor visits and history of chicken pox disease, asthma, and other health conditions. Section C also obtains information that includes the relationship of respondent to the teen, race and Hispanic origin of the teen, household income, educational attainment of the mother, and other information on the socioeconomic characteristics of the household and the teen.

In the Provider Section (Section D) of the NIS-Teen household interview, identifying information (such as name, address, and telephone number) for the teen's vaccination provider(s) is requested, as well as the full names of the teen and the respondent, so that NIS-Teen personnel can contact the provider(s) and identify the teen whose vaccination information the NIS-Teen is requesting. After this information is obtained, consent to contact the teen's vaccination provider(s) is requested. When oral consent and sufficient identifying information are obtained, the immunization history questionnaire is mailed to the teen's vaccination provider(s).

A Health Insurance Module (HIM) (Section E) is administered upon completion of the Provider Section to collect data regarding the types of medical insurance coverage the teen has had since age 11 years. If a respondent provided consent to contact medical providers and completed the Provider Section, he/she flowed directly into the HIM. If, however, consent or any other critical provider question was refused, the call was terminated and the respondent was called back later to attempt to complete the Provider Section and obtain consent. Only upon callback on which consent was granted or a second refusal given within the Provider Section was the respondent asked the HIM.

## 3.2. Content of the Immunization History Questionnaire (IHQ)

The IHQ mailed to the vaccination providers is designed to be simple and brief, to minimize provider burden and encourage survey participation. The structure and content of this form were initially derived from the National Immunization Provider Record Check Study (NHIS/NIPRCS), which collected and reconciled vaccination data from the providers of respondents to the Immunization Supplement to the National Health Interview Survey (Bartlett et al., 2001). The IHQ consists of two double-sided pages. Page 1 includes space for the label that gives the teen's name, date of birth, and sex. The remainder of page 1 contains questions about the facility and vaccination provider. Page 2 gives instructions for filling out the shot grid, which appears on page 3. Page 4 thanks the vaccination provider for providing the information, and lists websites and telephone numbers that can be used to obtain more information about the NIS-Teen and the National Center for Immunization and Respiratory Diseases. The IHQ is available at https://www.cdc.gov/nis/php/datasets-teen/index.html.

# 4. Data Preparation and Processing Procedures

The household and provider data collection in the NIS-Teen incorporate extensive data preparation and processing procedures. During the household interview, the CATI system supports reconciliation of critical errors as interviewers enter the data. After completion of interviewing for a quarter, post-CATI editing and data cleaning produce a final interview data file. The editing of the provider data begins with a manual review of returned immunization history questionnaires, data entry of the questionnaires, and cleaning of the provider data file. After the provider data are merged with the household interview data and responses from multiple providers for a teen are consolidated into a single vaccination history, the editing continues. A quality assurance check is performed based on the name, sex, and date of birth of the teen to ensure that the provider completed the questionnaire for the correct teen and to confirm age-eligibility (age 13-17 years at time of interview). Editing of the provider-reported vaccination dates then attempts to resolve specific types of discrepancies in the provider data. The end product is an analytic file containing household and provider data for use in estimating vaccination coverage.

## 4.1. Data Preparation

The editing and cleaning of NIS-Teen data involve several steps. First, the CATI system enables interviewers to reconcile potential errors while the respondent is on the telephone. Further cleaning and editing take place in a post-CATI clean-up stage, involving an extensive review of data values, cross tabulations, and the coding of verbatim responses for race and ethnicity. The next step involves the creation of numerous composite variables. Provider data are cleaned in a separate step. After these steps have been completed, imputations are performed for item non-response on selected variables, and weights are calculated. The procedures and rules of the National Health Interview Survey serve as the standard in all stages of data editing and cleaning (http://www.cdc.gov/nchs/nhis.htm).

### *4.1.1. Editing in the CATI System*

The CATI software checks consistency across data elements and does not allow interviewers to enter invalid values. Catching potential errors early increases the efficiency of post-survey data cleaning and processing.

To prevent an overly complicated CATI system, out-of-range and inconsistent responses produce a warning screen, allowing the interviewer to correct errors in real time. This allows the interviewer to reconcile errors while the respondent is on the telephone. CATI warning screens focus on items critical to the survey, such as those that determine a teen's eligibility (e.g., date of birth).

A CATI system cannot simultaneously incorporate every possible type of error check and maximize system performance. To reconcile this trade-off, post-CATI edits are used to resolve problems that do not require access to the respondent, as well as unanticipated logic problems that appear in the data.

### *4.1.2. Post-CATI Edits*

The post-CATI editing process produces final, cleaned data files for each quarter. The steps in this process, implemented after all data collection activities for a quarter are completed, are described below.

*Initial Post-CATI Edits and File Creation*

After completion of interviewing each quarter, the raw data are extracted from the CATI data system and used to create two files: the sample file and the interview data file. The sample file contains one record for each sampled telephone number and summary information for telephone numbers and households. The interview data file contains one record for each eligible sampled teen and all data the household reported for the teen.

Following creation of these two files, a preliminary analysis of each file identifies out-of-range values and extraneous codes. The first check verifies the eligibility status of teens, based on date of birth and date of interview. Once the required corrections are verified, invalid values are replaced with either an appropriate data value or a missing value code.

*Frequency Review*

After the pre-programmed edits are run, frequency distributions of all variables in each file are produced and reviewed. Each variable's range of values is examined for any invalid values or unusual distributions. If blank values exist for a variable, they are checked to see whether they are allowable and whether they occur in excessive numbers. Any problems are investigated and corrected as appropriate.

*File Crosschecks*

Crosscheck programs ensure that cases exist across files in a consistent manner. Specifically, checks ensure that each case in the interview data file is also present in the sample file and that each case in the sample file was released to the telephone centers. Checks also ensure that no duplicate households exist in the sample file and no duplicate teens exist in the interview data file.

When all checks have been performed, the final quarterly interview data file is created. Programmers and statisticians then create composite variables constructed from basic variables for each teen. Sampling weights (described in Section 6 of this Guide) are added to each record.

#### ***4.1.3. Editing of Provider Data***

Six to eight weeks after the close of household data collection for a quarter, the majority of the immunization history questionnaires have been collected from providers. The data from the hard-copy questionnaires are entered and independently re-entered to provide 100% verification. The provider data file is cleaned, in a similar fashion to the household data file, for out-of-range values and consistency. A computer program back-codes all "other shot" verbatim responses into the proper vaccine category (e.g., Recombivax counts as Hep B). These translations come from a file that contains all such verbatim responses ever encountered in the NIS-Teen. Also, the provider data file is checked for duplicate records, and exact duplicates are removed. If the provider data contain a date of birth, sex, or name for the teen that differs from the household interview for that teen, the questionnaire is re-examined to determine whether it may have been filled out for the incorrect teen. Provider data that appear to have been filled out for the wrong teen are removed from the provider database. When a teen has data from multiple providers, decision rules are applied to produce the most complete picture of the teen's vaccination history.

Once these data have been cleaned, they are combined with the household data file. Information from up to eight providers can be added to a teen's record. If more than one provider reported vaccination data for the teen, the data from the multiple provider reports are combined into a single history for the teen, called the "synthesized provider-reported vaccination history." The determination of whether the teen is up-to-date for recommended vaccines and vaccine series is based on the teen's synthesized provider-reported vaccination history.

Many variables in the household data file are checked against or verified with the provider data file. For example, a teen's date of birth as recorded by the provider is checked against the date of birth as given by the household, to verify that the provider was reporting for that specific teen and to form a "best" date of birth for the teen.

## 4.2. Limitations of Data Editing Procedures

Although data editing procedures were used for the NIS-Teen, the data user should be aware that some inconsistent data might remain in the public-use data file. The variables that indicate whether a teen is up-to-date on each vaccine or series (on which the estimates of vaccination coverage are based) are derived from provider-reported data, and the NIS-Teen does not re-contact households or providers to attempt to reconcile potential discrepancies in provider-reported vaccination dates or to resolve date-of-birth reporting errors. However, the provider-reported data are manually reviewed and edited to correct specific reporting errors. Some adolescents considered to have adequate provider data may have incomplete vaccination histories. These incomplete histories arise from three primary sources: 1) the household does not identify all vaccination providers, 2) some but not all providers respond with vaccination data, and 3) providers respond with vaccination data but fail to list all the vaccinations in the teen's medical record. Even with these limitations, the NIS-Teen overall is a rich source of data for assessment of up-to-date status and age-appropriate vaccination. Also, NIS-Teen is the only source to provide comparable provider-reported vaccination data across states and local areas in the United States.

## 4.3. Variable-Naming Conventions

The names of variables follow a systematic pattern as much as possible. The codebook for the public-use data file groups the variables into ten broad categories according to the source of the data (household or provider) and the content of the variable (NCIRD, 2024). See Section 7 of this report for detailed information on the contents of the public-use data file.

## 4.4. Missing Value Codes

Missing value codes for each variable can be found in the codebook (NCIRD, 2024). For household variables, the missing value codes usually are 77 for DON'T KNOW and 99 for REFUSED. Some household variables may also contain blanks, if the question was not asked. The variables developed from the immunization history questionnaire generally do not have specific missing value codes.

## 4.5. Imputation for Item Non-Response

The NIS-Teen uses imputation primarily to replace missing values in the socioeconomic and demographic variables used in weighting. Missing values of these variables are imputed for all teens with a completed household interview – i.e., all teens appearing on the public-use data file. Missing values of health insurance variables are also imputed for teens with adequate provider data. A sequential hot-deck method is used to assign imputed values (Ford 1983). Class variables are used to separate respondents into cells. Donors and recipients must agree on the categories of the class variables, which include the estimation area. Within the categories of the class variables, respondents are sorted by variables related to the variable to be imputed. The last case with an observed value is used as the donor for up to four recipients. The variable labels in the codebook (NCIRD, 2024) identify variables that contain imputed values. These variables include the sex, Hispanic origin, race, and health insurance status of the teen; the education level, age group, marital status, and mobility status of the mother; and the income-to-poverty ratio of the household. Codebooks from 2015 to present are available at: https://www.cdc.gov/nis/php/datasets-teen/index.html.

## 4.6. Vaccine-Specific Recoding of Verbatim Responses

On the IHQ, providers can list vaccinations in the "other" section of the IHQ shot grid. After data collection, these vaccinations are reclassified into the listed categories, if possible, using a vaccination recoding table. This table is reviewed by NCIRD personnel to ensure the vaccinations are recoded into the appropriate category or categories (for combination vaccinations).

## 4.7. Subsets of the NIS-Teen Data

The NIS-Teen public-use data file contains data for all adolescents aged 13–17 years who have a completed household interview. An interview is considered complete if the respondent completed Section C of the questionnaire. As explained in Section 6 of this guide, each teen with a completed household interview is assigned a weight (**RDDWT_C** for the United States, excluding territories; **RDDWT_C_TERR** for the United States, including territories) for use in estimation.

The NIS-Teen uses the synthesized provider-reported vaccination histories to form the estimates of vaccination coverage because the provider data are considered more accurate than household-reported data. Thus, the most important sub-set of the data consists of teens with adequate provider data. For these teens, one or more providers returned the immunization history questionnaire that included vaccination data. Unvaccinated teens are also considered to have adequate provider data. As discussed in Section 7 below, the **PDAT2** variable identifies the teens with adequate provider data (**PDAT2**=1). These teens have a separate weight (**PROVWT_C** for the United States, excluding territories; **PROVWT_C_TERR** for the United States, including territories)**,** which should be used to form estimates of vaccination coverage (see Section 6).

## 4.8. Confidentiality and Disclosure Avoidance

To prevent identification of participants in the NIS-Teen and the resulting disclosure of information, certain items from the questionnaires are not included in the public-use data file. In addition, some of the released variables either are top- or bottom-coded, or have their categories collapsed. Variable labels indicate which variables have been collapsed or recoded. These decisions are reviewed by the NCIRD Disclosure Review Board to ensure the public-use data files meet acceptable levels of disclosure risk.

# 5. Quality Control and Quality Assurance Procedures

A major contributor to NIS-Teen data quality is its sample management system, which in 2023 managed over 230 estimation area by quarter samples and used a number of performance measures to track their progress toward completion. Important aspects of the quality assurance program for the RDD component of the NIS-Teen included on-line interviewer monitoring; on-line provider look-ups in a database system integrated with the CATI system, including names, addresses, and telephone numbers of vaccination providers; and automated range-edits and consistency checks. These and other quality assurance procedures contributed to a reduction in total data collection cost by minimizing interviewer labor and overall burden to respondents. Khare et al. (2000), Khare et al. (2001), and the *National Immunization Survey: Guide to Quality Control Procedures* (CDC 2002) address quality assurance procedures.

The Provider Record Check component used quality control measures at four junctions: prior to mailing packets to providers; during the telephone prompting effort; during the editing of returned questionnaires; and during and after their data entry. The final quality assurance activities were implemented during post-processing of the returned questionnaires or vaccination records. All returned questionnaires were examined to identify and correct any obvious errors prior to data entry and then key-entered with 100% verification. The keying error rate is estimated, by way of a second verification process, to be less than 1%.

# 6. Sampling Weights

The two phases (RDD-phase and provider-phase) of data collection result in a separate sampling weight for each teen that has data at that phase. The RDD-phase sampling weights permit analyses of data from teens with completed household interviews. Each teen with adequate provider data (the subset of teens with completed household interviews on which official estimates of vaccination coverage are based) has a provider-phase sampling weight. In 2023, the RDD-phase sampling weight variable for producing estimates for teens with completed household interviews in the United States excluding territories is called **RDDWT_C**, and the RDD-phase weight variable for producing estimates for the United States including territories is called **RDDWT_C_TERR**. The provider-phase sampling weight variable for producing estimates for teens with adequate provider data in the United States excluding territories is called **PROVWT_C**, and the provider-phase weight variable for producing estimates for the United States including territories is called **PROVWT_C_TERR**. See Section 8 of this user's guide for more information about the weights included in the data file and the proper way to use them.

A sampling weight may be interpreted as the approximate number of teens in the target population that a teen in the sample represents. Thus, for example, the sum of the sampling weights of teens that are up-to-date (on a particular vaccine or series of vaccines) yields an estimate of the total number of teens in the target population who are up-to-date. Dividing this sum by the total of the sampling weights for all teens gives an estimate of the corresponding vaccination coverage rate.

This section describes how these weights are developed and adjusted so as to achieve an accurate representation of the target population. The base weights reflect each telephone number's probability of being selected into the sample; the adjustments take into account non-resolution of residential/non-residential/non-working status of a telephone number, non-response to the screener, subsampling of one eligible teen in the household, non-response to the household interview, number of telephone lines in the household, raking for differential coverage rates, non-response by providers, and a final raking adjustment.

## 6.1. Base Sampling Weight

In each quarterly NIS-Teen sample, each teen with a completed household interview receives a base sampling weight. The base sampling weight is equal to the inverse of the probability the phone number was sampled from the sampling frame for the quarter and estimation area.

## 6.2. Adjustments for Non-Resolution of Telephone Numbers and Screener Non-Response

Non-response occurs in population-based surveys when respondents cannot be reached during the survey period, are not available at the time of the interview, or refuse to participate. Thus, the sum of the base sampling weights of teens with completed household interviews will underestimate the size of the target population in the estimation area, because not all sampled households respond to all stages of data collection up to the household interview. As a result, the base sampling weights must be adjusted so they can accurately reflect the number of teens in the target population that each sampled teen with a completed household interview represents.

Some sampled households with age-eligible teens fail to complete the household interview because of unit non-response: for some telephone numbers, it is never determined whether or not the number is a working residential number despite multiple call attempts; for some households it is never determined whether or not the household contains age-eligible teens; and some households with age-eligible teens do not complete the household interview. To compensate for these types of unit non-response, the sampling weights of teens with a completed household interview are adjusted to account for the estimated number of age-eligible teens in households whose telephone numbers are never resolved; the estimated number of age-eligible teens in households that fail to complete the screening interview; and the estimated number of age-eligible teens in households that fail to complete the household interview because of unit non-response. Each of these adjustments is carried out within each estimation area by forming weighting cells based on the Metropolitan Statistical Area (MSA) status of the wire center associated with the cellular phone number (MSA/non-MSA). Each of the non-response adjustments for territories was done at the estimation area level. That is, no weighting cells were formed for territories. Each cell in each stage of adjustment is ensured to have sufficient resolved/responding cases (usually 20) at that stage of adjustment. The cells with a deficient number of responding cases are collapsed into neighboring cells, i.e., both MSA categories are collapsed if either of the cells have a deficient number of responding cases. Once the adjustment cells are formed, the weights of the unresolved/non-responding records from the previous adjustment step are distributed to the weights of the resolved/responding records within each cell.

## 6.3. Adjustment for Subsampling of One Teen per Household

In households with more than one teen, only one teen is selected randomly per household for the NIS-Teen interview. The non-response adjusted age screener weight is adjusted to account for the teens that are not selected. Each household's age screener weight is adjusted by multiplying it by the total number of eligible teens reported in the household (up to a maximum of 3).

## 6.4. Adjustment for Interview Non-Response

Some households that are determined to be eligible fail to complete the household interview for the selected teen. To compensate for this third type of unit non-response, the sampling weights of teens with a completed household interview are adjusted to account for teens who live in households that failed to complete the household interview. Similar to the first two types of unit non-response, the adjustment is carried out within estimation areas by forming weighting cells based on MSA status. For territories, the interview non-response adjustment was done at the estimation area level, i.e., no weighting cells were formed for the territory interview non-response adjustment. Each weighting cell for the interview non-response adjustment must have sufficient responding cases (usually 15); cells with a deficient number of responding cases are collapsed with neighboring cells, i.e., both MSA categories are collapsed if either of the cells have a deficient number of responding cases. Once the adjustment cells are formed, the weights of the non-responding records from the previous adjustment step are distributed to the weights of the responding records within each cell.

## 6.5. Adjustment for Multiple Cellular Phones and Deriving Annual Weights

Once the non-response-adjusted interview weights for teens are computed, these weights are adjusted for additional cellular phones in the household. Because households with multiple cellular phones have a greater chance of being sampled, each teen's household interview weight is adjusted by dividing it by the total number of cellular phones used by parents or guardians (up to a maximum of 3).

Up to the previous step, the sampling weights are adjusted separately for each quarter, and the weights in each quarter pertain to the target population. However, annual vaccination coverage estimates are obtained from data for four consecutive quarters, so the weights in each quarterly file are adjusted when the data from the four quarters are combined. The adjustment factor is proportional to the number of households with completed household interviews in each quarter and estimation area.

## 6.6. Post-Stratification

Survey weights must be adjusted to provide weights for the full target population of teens aged 13-17 years. Weights are first adjusted to population control totals by telephone status. Teens in dual landline and cellular phone households are adjusted to the population estimate of teens living in dual user households within each estimation area, and teens in cellular phone-only households within each estimation area are weighted to represent teens in cellular phone-only households. Teens in landline-only and phoneless households, which are excluded from the sample, are accounted for in the raking step described below.

The control totals used for the 2023 NIS-Teen are derived from a combination of 2022 census population estimates and the combined 2020, 2021, and 2022 one-year American Community Survey (ACS) data for the United States and Puerto Rico, with adjustments for mortality, foreign immigration, and migration between states to produce population totals as of July 1, 2023. For the U.S. Virgin Islands and Guam, the control totals are derived from the 2010 Census data. The proportion of teens by detailed telephone status (landline-only, landline and cellular phone dual-user, cellular phone-only, phoneless) within each estimation area in the United States were derived using a similar small area modeling approach as described in Blumberg et al. (2011). These modeled telephone status estimates are applied to the control total for the total number of teens age 13-17 years in the estimation area to estimate the number of teens age 13-17 years by telephone status within the estimation area.

To reduce sampling variability and improve the precision of estimation, extreme weights are trimmed within an estimation area. RDD sampling weight values exceeding the median weight plus three times the interquartile range of the weights within an estimation area are truncated to that threshold. This weight trimming prevents teens with unusually large weights from having an unusually large impact on vaccination coverage estimates.

The final step in adjusting the RDD sampling weights is a raking adjustment (Deming 1943) of the trimmed, telephone status adjusted weights. The raking procedure uses estimation area-level control totals for maternal education categories, teen's race/ethnicity, age group of the teen, sex of the teen, and telephone status. Raking makes it possible to incorporate additional variables into the weighting and to use more detailed categories for those variables. Briefly, raking takes each variable in turn and applies a proportional adjustment to the current weights of the teens who belong to the same category of the variable. After a number of iterations over all the variables, the raked weights have totals that match all the desired control totals. At this point, as before, the weights that exceed the median weight plus three times the interquartile range of the weights within an estimation area are truncated to that threshold. The raking step is applied again after the truncation of the weights and the weights are rechecked for extreme weights and truncated as before. The process is iterated up to five times.

The sampling weights after all the foregoing adjustments constitute the "RDD sampling weights" (**RDDWT_C** for the United States excluding territories; **RDDWT_C_TERR** for the United States including territories).

## 6.7. Adjustment for Provider Non-Response

**Among the 41,194 teens with a completed household interview (excluding territories), 16,568 (40.2%) had adequate provider data.** To maintain consistency with the adequate provider data definition used in previous years prior to the introduction of COVID-19 vaccines, adolescents were not considered as having adequate provider data if the only vaccinations reported were COVID-19 vaccinations. The definition of teens with adequate provider data includes unvaccinated teens. These are teens for whom the respondent reported during the household interview that the teen had received no vaccinations and has no providers, or for whom one or more providers were reported but those providers reported administering no vaccinations. **Among the 16,568 teens with adequate provider data, 115 were unvaccinated teens.** Failure to obtain adequate provider data for the remaining 24,626 teens (59.8%) was attributable to:

- parent or guardian not giving consent to contact the teen's vaccination provider(s) (47.8%);
- consent to contact vaccination providers obtained but no providers returned the immunization history questionnaire (7.2%); and
- one or more providers returned the immunization history questionnaire, but no providers reported any non-COVID-19 vaccination data, despite the parent or guardian indicating that the teen has received vaccinations (4.0%).

The 24,626 teens for whom a household interview was completed but adequate provider data were not obtained are classified as “partial non-responders” because they have only a partial response to the NIS-Teen as a whole.

Empirical results for the NIS-Child suggest that children with adequate provider data have characteristics believed to be associated with a greater likelihood of being up-to-date, compared with children who had missing provider data. Specifically, children with adequate provider data are more likely to live in households that have higher total family income, have a white mother, and live outside a principal city of an MSA. Also, a child with missing provider data is less likely to live in the state where the mother lived when the child was born. These factors indicate a potential lack of continuity of health care, and are associated with lower vaccination rates (Coronado et al. 2000). An adjustment is made to the RDD sampling weights of the NIS-Child to account for these differences; otherwise, estimated vaccination coverage rates may be biased. A similar adjustment is also made to the RDD sampling weights of the NIS-Teen.

To reduce potential bias in estimators of vaccination coverage attributable to partial non-response, a weighting-class adjustment is used in each estimation area (Brick and Kalton, 1996). This adjustment involves three steps. In the first step, sampled teens are classified according to the quintile of their estimated probabilities of having adequate provider data. In the statistical literature these probabilities are called response propensities (Rosenbaum and Rubin 1983, 1984; Rosenbaum 1987). Teens that have similar response propensities will also be similar with respect to variables that are strongly associated with the probability of having adequate provider data. In this important respect, teens in each class are comparable. Because of this comparability, any sub-sample of teens in a class may represent all teens in the class. Therefore, the weighting-class adjustment uses the teens with adequate provider data to represent all teens in the class.

In the second step of this weighting-class adjustment, within each class an adjustment factor redistributes the RDD sample weights of the teens with missing provider data to the weights of the teens that have adequate provider data. These adjusted sampling weights of teens with adequate provider data are initial non-response-adjusted provider-phase weights.

Within an estimation area, the sums of non-response adjusted weights of teens with adequate provider data for the various levels of important socio-demographic variables (such as race/ethnicity) may not be equal to corresponding population totals. To reduce bias attributable to these differences, raking was used in the third step to adjust the non-response adjusted weights to match estimation area control totals. Control totals for these variables were estimated using the weighted totals from the sample of teens with completed household interviews. Smith et al. (2001b, 2005) describe the development of this approach in more detail. These raked weights of teens with adequate provider data are called "final provider-phase weights" (**PROVWT_C** for the United States excluding territories and **PROVWT_C_TERR** for the United States including territories). Because of the comparability of teens within each weighting class, any estimate that uses data only from the teens with adequate provider data, along with their provider-phase sampling weights, will have less bias attributable to differences between teens with adequate provider data and teens with missing provider data.

Appendix B summarizes the distribution of the sampling weights in each estimation area.

# 7. Contents of the Public-Use Data File

The NIS-Teen public-use data file contains a record for each eligible teen for whom Section C of the household interview was completed, along with household-reported vaccination information and demographic information about the teen and the teen's mother. For teens with immunization history questionnaires containing vaccination data returned by one or more providers, the file also contains provider characteristic variables, as well as variables based on the teen's synthesized provider-reported vaccination history: the age of the teen at each vaccination, the number of each type of vaccination received, and indicators of whether the teen is up-to-date with respect to various recommended vaccines and vaccine series.

The public-use data file consists of ten sections, the contents of which are described below in detail. For additional information, users are encouraged to consult the codebook (NCIRD, 2024). The codebook is divided into the ten sections described below and contains variable names, labels, and response frequencies (for categorical variables). The codebook also indicates the questionnaire item or items that serve as the ultimate source for each variable and, for selected variables, gives additional information about the variable in the "Notes" field. Codebooks and Household Interview Questionnaires from 2015 to present are located at: https://www.cdc.gov/nis/php/datasets-teen/index.html.

**Before describing the sections of the public-use data file below, we first summarize the differences between the 2022 and 2023 NIS-Teen public-use data files:**

- **A new 2023 estimation area variable (ESTIAPT23) has been added and the 2022 estimation area variable (ESTIAPT22) has been dropped (see Table 5). Although data were collected for the U.S. Virgin Islands and Guam in 2023, teens in these areas are not included on the public-use data file in order to protect confidentiality.**
- **In Section B of the NIS-Teen questionnaire, questions TIS_BTET_REASON, TIS_BMEN_REASON, and TIS_BHPV_REASON ask, for teens who have not already**

**received the required number of Tetanus, Meningitis, and HPV doses respectively, the main reason for not receiving them. The answer given is either coded into one of the categories provided as a response option in the questionnaire, or recorded verbatim and later backcoded into one of the questionnaire response option codes or into one of an additional set of codes assigned only during backcoding. Each code has a corresponding variable included on the NIS-Teen public-use data file for each of the three shot types (TET_REAS_1-TET_REAS_27, MEN_REAS_1-MEN_REAS_26, and HPVI_REAS_1-HPVI_REAS_32). In 2023, a new code was added for verbatim responses indicating that teens did not receive a vaccination due to distrust in the government or CDC. Three new variables were added to the NIS-Teen public-use data file to capture these responses (TET_REAS_28, MEN_REAS_27, and HPVI_REAS_33).**

- **A new up-to-date indicator (P_U13HPV_15INT) has been added to the file to identify teens considered up-to-date for HPV by age 13.**

## 7.1. Section 1: ID, Weight, and Flag Variables

**SEQNUMT** is the unique teen identifier. (Because only one teen is selected per household, **SEQNUMT** is also a unique household identifier.) **PDAT2** indicates which teens are considered to have adequate provider data. As described in Section 6 of this report, **RDDWT_C**/**RDDWT_C_TERR** and **PROVWT_C**/**PROVWT_C_TERR** are the final household- and provider-phase weights, respectively. **PROVWT_C**/**PROVWT_C_TERR** should be used when analyzing the provider-reported data, i.e., the variables in Sections 7, 8, and 9 of the public-use data file.

## 7.2. Section 2: Household-Reported Vaccination and Health Information

As of 2017, all respondents are administered Section B of the household questionnaire, where they are asked whether they recall the teen getting flu, Td/Tdap, meningococcal, and HPV vaccinations, and for the number of meningococcal and HPV vaccinations.

Respondents are then administered Section C of the household interview, wherein information about the health of the selected teen and the teen's family, as well as demographic information about the teen and the teen's mother, is collected.

Section 2 of the public-use data file contains vaccination information collected in Section B, and the health information collected in Section C of the household questionnaire. **IMM_ANY** indicates whether the respondent reported that the teen has had a vaccination of any type. For each type of vaccine asked about in Section B (excluding seasonal influenza), a set of variables stores the information collected about that vaccine type; additional variables store the responses to the health questions in Section C.

The household-reported vaccination and health variables are described in more detail below. Household Interview Questionnaires from 2015 to present are located at: https://www.cdc.gov/nis/php/datasets-teen/index.html.

### *7.2.1. Household-Reported Tetanus Vaccine Variables*

Section B respondents that said the teen has received a vaccination of any type (IMM_ANY=1) are asked whether they recall the teen getting any Tetanus booster vaccinations. Variable **TET_ANY** indicates whether any Tetanus booster vaccinations were reported for the teen. All respondents reporting that the teen has not received any Tetanus booster vaccinations are then asked the reason the teen didn't receive Tetanus booster vaccinations. Variables **TET_REAS_1-TET_REAS_5, TET_REAS_7**, and **TET_REAS_10-TET_REAS_28** store the answers to this choose-all-that-apply question and reflect the coding of open-ended responses into the reason categories existing on the questionnaire as well as into newly-created reason categories.

### *7.2.2. Household-Reported Meningococcal Vaccine Variables*

Section B respondents who said the teen has received a vaccination of any type (IMM_ANY=1) are asked whether they recall the teen getting any meningococcal vaccinations, and if so, they are asked for the number of meningococcal vaccinations they recall. Variable **MEN_ANY** indicates whether any meningococcal vaccinations were reported for the teen. Variable **MEN_NUM_TOT** stores the total number of meningococcal vaccinations reported by the respondent. All respondents reporting that the teen has not received any meningococcal vaccinations, are then asked the reason the teen didn't receive meningococcal vaccinations. Variables **MEN_REAS_1-MEN_REAS_7** and **MEN_REAS_10-MEN_REAS_27** store the answers to this choose-all-that-apply question and reflect the coding of open-ended responses into the reason categories existing on the questionnaire as well as into newly-created reason categories.

### *7.2.3. Household-Reported Human Papillomavirus (HPV) Vaccine Variables*

Section B respondents that said the teen has received a vaccination of any type (IMM_ANY=1) are asked whether they recall the teen getting any HPV vaccinations, and if so, they are asked for the number of HPV vaccinations they recall. Variable **HPVI_ANY** indicates whether any HPV vaccinations were reported for the teen. Variable **HPVI_NUM_TOT** stores the total number of HPV vaccinations reported by the respondent.

All respondents reporting that the teen has received a vaccination of any type (IMM_ANY=1), regardless of whether they reported the teen has received an HPV vaccination, are asked whether a doctor or other health care professional has ever recommended that the teen receive HPV vaccinations (**HPVI_RECOM**), and if so, the respondent is asked at what age the doctor recommended the teen should start receiving HPV shots (variable not included on the public-use file).

All respondents reporting that the teen received fewer than the recommended number of HPV vaccinations (two if the teen is under 15 years of age, three if the teen is 15 years or older) are asked how likely it is that the teen will receive HPV vaccinations in the next twelve months (**HPVI_INTENTR**). Those responding "Not too likely", "Not likely at all", or “Not Sure/Don’t Know” are asked the reason the teen won't receive HPV vaccinations in the next twelve months. Variables **HPVI_REAS_1-HPVI_REAS_3, HPVI_REAS_5-HPVI_REAS_6**, and **HPVI_REAS_9-HPVI_REAS_33** store the answers to this choose-all-that-apply question and reflect the coding of open-ended responses into the reason categories existing on the questionnaire as well as into newly-created reason categories.

#### *7.2.4. Household-Reported Health Variables*

All respondents are asked whether the selected teen has ever had the chicken pox (**CPOX_HAD**) and, if so, they are asked the age of the teen in years at the time when the teen had the chicken pox (**CPOX_AGE**). Those unable to give an exact age are asked to report an age range (**CPOX_AGER**).

All respondents are then asked the age of the teen at the time of his or her last check-up (**CKUP_AGE**). If the teen's age at the last check-up was 13 years or more, the respondent is asked whether the teen had an 11-12 year old well-child exam (**CKUP_11_12**); if the respondent is unable or unwilling to answer this question he or she is asked whether or not the teen's last check-up was more than, exactly, or less than [age of teen - 12] years ago (**CKUP_LAST**).

All respondents are asked the number of times the teen has seen a health care professional in the last 12 months (**VISITS**); whether the teen has been told by a health professional that he or she has asthma (**ASTHMA**); whether the teen has ever been told by a health professional that he or she has a lung condition other than asthma, a heart condition, diabetes, a kidney condition, sickle cell anemia or other anemia, or a weakened immune system caused by a chronic illness or by medicines taken for a chronic illness (**RISK_EVER**); whether the teen currently has any of these conditions (**RISK_NOW**); and whether any other members of the teen's household currently have any of these conditions (**RISK_HH**). Finally, the respondent is asked the number of times in the past 12 months the teen has missed school due to illness or injury (**NOSCHOOLR**).

## 7.3. Section 3: Demographic, Socio-Economic, and Other Household/Teen Information

Section 3 of the NIS-Teen public-use data file consists of information collected during the household screening interview and the demographic information collected in Section C of the household main interview. To protect confidentiality, many of these variables have been collapsed, top-coded, or bottom-coded from the original, fully-detailed versions; the variable labels (see the public-use date file codebook) indicate which variables have been collapsed or recoded. Codebooks and Household Interview Questionnaires from 2015 to present are located at: https://www.cdc.gov/nis/php/datasets-teen/index.html.

**AGE** is the age of the selected teen in years based on the teen's best date of birth and the screener completion date, and **SEX** gives the sex of the selected teen, with missing values imputed. The language in which the interview was conducted is stored in variable **LANGUAGE**, and **C5R** gives the relationship of the respondent to the selected teen.

**C1R** and **CHILDNM** give the number of people and children, respectively, in the household.

The teen's Hispanic origin indicator, race with three categories, and race/ethnicity with four categories are presented in variables **I_HISP_K, RACE_K**, and **RACEETHK**, respectively; for each of these variables, missing values have been imputed. **EDUC_TR** gives the teen's grade in school at the time of the interview.

The age, education level, and marital status of the mother of the selected teen are stored in variables **AGEGRP_M_I**, **EDUC1**, and **MARITAL2** (married vs. not married), with missing values imputed.

The categorized total combined income for the teen's family is given by **INCQ298A**; **INCPOV1** gives the family's poverty status (at or above poverty, income > $75,000; at or above poverty, income <= $75,000; below poverty; unknown), and **INCPORAR** gives the ratio of the family's income to the poverty level. **INCPORAR_I** gives the same ratio after missing values of family income have been imputed. Household tenure is given by **RENT_OWN**.

The number of landline telephone numbers in the household, the number of working cellular phones household members have available for personal use, and the number of these cellular phones that are usually used by parents or guardians are given by **NUM_PHONE, NUM_CELLS_HH**, and **NUM_CELLS_PARENTS**, respectively.

Variable **CEN_REG** gives the census region of the respondent's current residence, and **MOBIL_I** indicates whether the mother's current state of residence is the same as her state of residence at the time of the teen's birth.

## 7.4. Section 4: Geographic Variables

Variables **ESTIAPT23** and **STATE** give the 2023 estimation area and state of residence, respectively, for each teen. **EST_GRANT** indicates which of the 50 states, District of Columbia, and 5 local areas that receive federal Section 317 immunization grants (Bexar County, TX; City of Chicago, IL; City of Houston, TX; New York City, NY; Philadelphia County, PA) the teen resides in.

## 7.5. Section 5: Number of Providers Identified and Consent Variables

Variable **D7** indicates whether the respondent gave consent to contact the teen's providers. If **D7**=1, then consent was granted; if **D7**=2 then consent was explicitly denied; and if **D7** is missing, consent was not granted because the respondent broke off the interview before being explicitly asked for consent.

Variable **D6R** gives the number of providers identified by the respondent. Note that sometimes respondents report erroneous provider counts and sometimes report the same provider more than one time, and **D6R** does not reflect the cleaning or de-duplication of the initially reported provider count. Variable **NUM_PROVR** gives the number of providers identified for teens with consent to contact the providers and reflects the cleaning and de-duplication of the initially reported provider count. For teens without consent, **NUM_PROVR** is set to 0.

## 7.6. Section 6: Number of Responding Providers Variables

Variable **N_PRVR** indicates the number of providers returning IHQs with vaccination information for the teen. That is, **N_PRVR** is the number of IHQs that were returned for the teen that contain information on the IHQ shot grid.

## 7.7. Section 7: Characteristics of Providers Variables

This section summarizes the information collected in IHQ questions 4, 5b, 6, and 7 across the teen's providers who returned IHQs.

**WELLCHILD** indicates whether the teen had an 11-12 year old well child exam or check-up based on responses to IHQ question 4. If any of the teen's providers that returned IHQs reported that the teen had a well child exam, then **WELLCHILD**=1. If all of the teen's providers that returned IHQs reported that the teen did not have a well child exam, then **WELLCHILD**=2. If none of the teen's providers that returned IHQs reported that the teen had a well child exam, but at least one provider left the question blank or selected “Don’t Know”, or if no IHQs were returned for the teen, then **WELLCHILD**=3 (unknown).

**FACILITY** indicates the facility type of the teen's vaccination providers based on responses to IHQ question 5b. If all of the teen's providers who returned IHQs containing vaccination (i.e. shot grid) data (see Section 6 variable **N_PRVR**) reported their facility type to be:

- a public health department-operated clinic, community health center, rural health clinic, migrant health center, Indian Health Service-operated center, tribal health facility, or urban Indian health care facility, then **FACILITY**=1 (all public facilities);
- a hospital-based clinic, then **FACILITY**=2 (all hospital facilities);
- a private practice, then **FACILITY**=3 (all private facilities);
- a military health care facility, WIC clinic, school-based health center, pharmacy, or other type of facility, then **FACILITY**=4 (all military/WIC/school/pharmacy or other facilities).

If the responses of providers that returned IHQs containing shot grid data fell into more than one of the above bulleted categories, **FACILITY**=5 (mixed); otherwise, if at least one of the teen's providers returned an IHQ containing shot grid data, **FACILITY**=6 (unknown). If none of the teen's providers returned an IHQ containing shot grid data, **FACILITY** is set to missing.

The Vaccines For Children (VFC) program is a federally-funded program that provides vaccines at no cost to children who might not otherwise be vaccinated because of inability to pay (http://www.cdc.gov/vaccines/programs/vfc/index.html). CDC buys vaccines at a discount and distributes them to awardees—i.e., state health departments and certain local and territorial public health agencies—which in turn distribute them at no charge to those private physicians' offices and public health clinics registered as VFC providers. **VFC_ORDER**, based on responses to IHQ question 6, indicates whether the teen's vaccination providers order vaccines from a state or local health department to administer to children. If all of the teen's providers that returned IHQs containing shot grid data (see Section 6 variable **N_PRVR**) reported that they order vaccines from a state or local health department to administer to children, then **VFC_ORDER**=1 (all providers); if at least one of the teen's providers that returned an IHQ containing shot grid data reported that the practice orders vaccines from a state or local health department to administer to children and the teen's other providers that returned IHQs containing shot grid data reported either that they did not order such vaccines or that they did not know whether or not they did, then **VFC_ORDER**=2 (some but possibly or definitely not all providers); if all of the teen's providers that returned IHQs containing shot grid data reported that they do not order vaccines from a state or local health department to administer to children, then **VFC_ORDER**=3 (no providers); if none of the conditions for **VFC_ORDER**=1, 2, or 3 was met but at least one of the teen's providers returned an IHQ containing shot grid data, **VFC_ORDER**=4 (unknown). If none of the teen's providers returned an IHQ containing shot grid data, **VFC_ORDER** is set to missing. Note that having a provider that orders VFC vaccine does not imply that the child is VFC-entitled; providers enrolled in the VFC program could also vaccinate children who are not VFC-entitled.

**REGISTRY** is based on responses to IHQ question 7 and indicates whether the teen's vaccination providers reported the teen's vaccinations to a community or state immunization registry (also known as an Immunization Information System, or IIS). If all of the teen's providers that returned IHQs containing shot grid data (see Section 6 variable **N_PRVR**) indicated that they reported to a registry, then **REGISTRY**=1 (all providers); if at least one of the teen's providers that returned an IHQ containing shot grid data indicated that the practice reported to a registry and the teen's other providers that returned IHQs containing shot grid data indicated that they did not report to a registry, that they did not know whether or not they reported to a registry, or that the question is not applicable, then **REGISTRY**=2 (some but possibly or definitely not all providers); if all of the teen's providers that returned IHQs containing shot grid data indicated that they did not report to a registry or that the question is not applicable, then **REGISTRY**=3 (no providers); if none of the conditions for **REGISTRY**=1, 2, or 3 was met but at least one of the teen's providers returned an IHQ containing shot grid data, **REGISTRY**=4 (unknown). If none of the teen's providers returned an IHQ containing shot grid data, **REGISTRY** is set to missing.

## 7.8. Section 8: Provider-Reported Up-To-Date Vaccination Variables

This section contains vaccination count and up-to-date variables based on the teen's synthesized provider-reported vaccination history. To facilitate data processing and to accommodate the large and continually growing number of vaccination types covered by the NIS-Teen, the provider-reported vaccination data are organized around the concept of vaccine categories and vaccine types within vaccine category. The vaccine categories correspond to the sections of the IHQ shot grid, and the vaccine types correspond to the type boxes on the IHQ shot grid. For each vaccine category, an "unknown" vaccine type is created for vaccinations that are reported without a type box being checked. Table 3 shows the vaccine categories and types for the 2023 NIS-Teen public-use data file.

For each vaccine category (except for COVID-19, see below), Section 8 of the public-use data file contains a variable named **P_NUM*YYY*** – where "YYY" is the vaccine category abbreviation given in Table 3 – that stores the number of vaccinations in that vaccine category in the teen's synthesized provider-reported vaccination history. For each vaccine category and type combination, Section 8 also contains a variable named **P_NUM*YYY_TT*** – where "YYY" is the vaccine category abbreviation and "TT" is the vaccine type code given in Table 3 – that stores the number of vaccinations in that vaccine category of that vaccine type in the teen's synthesized provider-reported vaccination history.

For each **P_NUM*YYY*** and **P_NUM*YYY_TT*** variable described above, there are corresponding variables of the form **P_N13*YYY*** and **P_N13*YYY_TT*** that count only vaccinations that the teen received prior to age 13 years.

This section of the public-use data file also contains up-to-date (UTD) indicators for a variety of recommended vaccines and vaccine series. These variables' names begin with "**P_UTD**"; the variable labels indicate what is needed to be considered up-to-date for each variable, and the "Notes" field in the codebook shows the vaccine type codes (see Table 3) being included when determining whether the teen is up-to-date. For each "**P_UTD**" variable there is a corresponding variable whose name begins with "**P_U13**" that indicates whether the teen was up-to-date for the particular vaccine or vaccine series by age 13 years.

Note that it is possible that the administration of the NIS-Teen interview itself prompts some respondents to vaccinate their teens following the interview; to ensure that the vaccination rate estimates aren't artificially boosted because of this, the "**P_NUM**", "**P_N13**", "**P_UTD**", and "**P_U13**" variables in this section of the public-use data file count only vaccinations received before the date the household interview was completed.

In 2021, the NIS-Teen began collecting provider-reported COVID-19 vaccination data. Detailed information about the number, types, and age-at-vaccination of COVID-19 doses are not included on the NIS-Teen public-use data file to protect respondent confidentiality, but the following three up-to-date indicators have been included on the file since 2022: **P_UTDCOV1** identifies teens who have received at least 1 dose of COVID-19 vaccination, **P_UTDCOV_FULL** identifies teens who are considered “fully vaccinated" with 2+ doses (or 1+ dose of Johnson & Johnson/Janssen), and **P_UTDCOV_BOOST** identifies teens who are "fully vaccinated" and have also received at least one booster dose.

This section also contains some additional UTD variables specific to human papillomavirus (HPV) vaccines. **P_UTDHPV11**, **P_UTDHPV12**, and **P_UTDHPV13** are conditional up-to-date indicators showing whether a teen has received exactly 1, exactly 2, or 3 or more HPV vaccinations, given that the teen has received at least one. Teens that have received no HPV vaccinations will have missing values for these variables. **P_UTDHPV3C** is the conditional HPV vaccination series completion indicator for the 3-dose series. It indicates, among teens that have received at least one HPV vaccination, whether the teen completed the series of three doses. This variable is limited to teens with at least one HPV vaccination where the interview completion date follows the date of the first HPV vaccination by at least 6 months, as 6 months is the minimum amount of time required to complete the 3-dose HPV vaccine series. **P_UTDHPV_15** indicates teens that either have received 3 or more HPV doses or have received 2 or more HPV doses with the 1st dose before age 15 years. **P_UTDHPV_15INT** indicates teens that either have received 3 or more HPV doses or have received 2 or more HPV doses with the 1st dose before age 15 years and at least 5 months minus 4 days between the 1st and 2nd doses. **P_U13HPV_15INT** identifies teens who met these criteria by age 13. **P_UTDHPV3C_15INT** is the conditional HPV vaccination series completion indicator for either the 3-dose or 2-dose series. This variable uses the same criteria as P_UTDHPV_15INT but is limited to teens with at least one HPV vaccination and 6 months between the first HPV dose date and the household interview date.

Finally, this section includes two UTD variables specific to Meningococcal Serogroup B (MenB), both of which identify teens who have received at least 2 doses of MenB at age 10 or later with the appropriate interval between doses dependent on brand (4 weeks apart for Bexeros, or 6 months apart for Trumenba). The two variables differ in the treatment of Meningococcal doses of unknown type: **P_UTDMENB_S** uses a strict definition of UTD status which excludes all doses of unknown type, while **P_UTDMENB_L** uses a lenient definition of UTD status in which doses of unknown type are assumed to be the type most likely to result in the teen meeting the UTD criteria.

**Table 3: Vaccine Categories and Vaccine Types, National Immunization Survey - Teen, 2023**

| Vaccine Category Abbreviation[1] | Vaccine Category Description | Vaccine Type Code | Vaccine Type Description |
|---|---|---|---|
| TDP | Td/Tdap-containing, given after age 6 years | 11 | Td |
| TDP | Td/Tdap-containing, given after age 6 years | 14 | Tdap |
| TDP | Td/Tdap-containing, given after age 6 years | 15 | Td/Tdap-containing, unknown type |
| HEPB | Hepatitis B-containing | 61 | 0.5 ml Recombivax |
| HEPB | Hepatitis B-containing | 62 | 1.0 ml Recombivax |
| HEPB | Hepatitis B-containing | 63 | Engerix |
| HEPB | Hepatitis B-containing | 64 | Hepatitis B-only, unknown type |
| HEPB | Hepatitis B-containing | 43 | HepB-Hib |
| HEPB | Hepatitis B-containing | HB | Hepatitis B-containing, unknown type |
| FLU | Seasonal influenza-containing | FZ | Fluzone |
| FLU | Seasonal influenza-containing | FV | Fluvirin |
| FLU | Seasonal influenza-containing | FN | Injected influenza, other/unknown type |
| FLU | Seasonal influenza-containing | FM | Flumist |
| FLU | Seasonal influenza-containing | FL | Influenza-containing, unknown type |
| MCV | Measles-containing | 30 | MMR-only |
| MCV | Measles-containing | 31 | Measles-only |
| MCV | Measles-containing | 32 | Measles-Mumps (through backcoding) |
| MCV | Measles-containing | 33 | Measles-Rubella (through backcoding) |
| MCV | Measles-containing | VM | MMR-Varicella |
| MCV | Measles-containing | MM | Measles-containing, unknown type |
| VAR | Varicella-containing | VO | Varicella-only |
| VAR | Varicella-containing | VM | MMR-Varicella |
| VAR | Varicella-containing | VA | Varicella-containing, unknown type |
| HEPA | Hepatitis A-containing | HO | HepA-only (Havrix or Vaqta) |
| HEPA | Hepatitis A-containing | HA | HepA-containing, unknown type |
| MEN | Meningococcal serogroup ACWY | 80 | MenACWY (Menactra or Menveo) |
| MEN | Meningococcal serogroup ACWY | 81 | MPSV4 (Menomune) |
| MEN | Meningococcal serogroup ACWY | 82 | Meningococcal serogroup ACWY, unknown type |
| MENB | Meningococcal serogroup B | BT | MenB-FHbp |
| MENB | Meningococcal serogroup B | BB | MenB-4C |
| MENB | Meningococcal serogroup B | BU | Meningococcal serogroup B, unknown type |
| MENU | Meningococcal, unknown serogroup | - | - |
| HPV | Human Papillomavirus | CV | Cervarix (2vHPV) |
| HPV | Human Papillomavirus | 4V | Gardasil 4 (4vHPV) |

| Vaccine Category Abbreviation[1] | Vaccine Category Description | Vaccine Type Code | Vaccine Type Description |
|---|---|---|---|
| HPV | Human Papillomavirus | 9V | Gardasil 9 (9vHPV) |
| HPV | Human Papillomavirus | UV | Gardasil, unknown valency |
| HPV | Human Papillomavirus | HP | HPV, unknown type |
| COV | COVID-19 | CP | Pfizer-BioNTech |
| COV | COVID-19 | CM | Moderna |
| COV | COVID-19 | CJ | Johnson & Johnson/Janssen |
| COV | COVID-19 | CN | Novavax |
| COV | COVID-19 | CX | COVID-19, unknown type |

[1] If another vaccine type is reported that is not on this list, it is either coded with the appropriate shot category with "unknown type" code (if it belongs in one of the existing NIS-Teen shot categories), or in an "Other" shot category (if it does not belong to an existing NIS-Teen shot category). Shots in the "Other" shot category are not included in the synthesized vaccination history variables, while shots coded to the shot category-specific "unknown type" codes are included except where variables are restricted to specific subtypes (as described in the variable labels/notes).

## 7.9. Section 9: Provider-Reported Age-At-Vaccination Variables

This section contains variables storing the teen's age in years, months, and days at each vaccination in the synthesized provider-reported vaccination history, along with the vaccine types of those vaccinations.

For each vaccine category, variables ***YYY*_AGE1 - *YYY*_AGE9** store the age in years of the teen when the vaccination was administered for up to nine vaccinations in the teen's synthesized provider-reported vaccination history, where "**YYY**" is the vaccine category abbreviation given in Table 3. Variables ***YYY*_MAGE1 - *YYY*_MAGE9** store the age in months of the teen when each vaccination was administered. Variables ***YYY*_DAGE1 - *YYY*_DAGE9** store the age in days of the teen when each vaccination was administered. For vaccine categories that contain multiple vaccine types, variables **X*YYY*TY1 - X*YYY*TY9** give the corresponding vaccine type code (see Table 3).

*Unlike the vaccination count and up-to-date variables in Section 8 of the public-use data file, the variables in Section 9 include vaccinations given both before and after the household interview was completed*. If desired, users can limit the Section 9 variables to only those before the household interview date by examining the corresponding Section 8 "**P_NUM**" variable and limiting the analysis of the Section 9 variables to only the first *n* variables, where *n* is equal to the number of vaccinations in the vaccine category before the household interview date as indicated by the corresponding "**P_NUM**" variable.

Users of the NIS-Teen public-use data file should be aware that the age-at-vaccination variables included in Section 9 may contain a small number of vaccination ages that are implausible according to the recommended immunization schedules (https://www.cdc.gov/vaccines/hcp/imz-schedules/child-adolescent-age.html). Such ages may arise if a medical provider inadvertently records an erroneous vaccination date or if a vaccination date is incorrectly transcribed onto an IHQ. The quality control procedures of the NIS-Teen address implausible ages to every extent possible. Suspicious dates are manually reviewed and corrected if there is evidence either from the household interview or from another provider that the date is incorrect. In rare cases, however, when there is no further information with which to correct the reported vaccination date, the vaccination is treated as having actually occurred and the implausible age at vaccination persists on the data file. The data user should consider these issues in deciding how to analyze the NIS-Teen data.

## 7.10. Section 10: Health Insurance Module Variables

The Health Insurance Module (HIM) (Section E) gathers information on the health insurance coverage of the selected teen. Prior to 2016, seven variables containing HIM data were included in the NIS-Teen public-use data file:

- TIS_INS_1: "Is the teen covered by health insurance provided through employer or union?";
- TIS_INS_2: "Is the teen covered by any MEDICAID plan?";
- TIS_INS_3: "Is the teen covered by CHIP?";
- TIS_INS_3A: "Is the teen covered by any MEDICAID plan or CHIP?";
- TIS_INS_4_5: "Is the teen covered by Indian Health Service, Military Health Care, TRICARE, CHAMPUS, or CHAMP-VA?";
- TIS_INS_6: "Is the teen covered by any other health insurance or health care plan?"; and

- TIS_INS_11: “Since age 11, was there any time when the teen was not covered by health insurance?”

In 2016, these variables were replaced by two health insurance variables, INS_STAT_I and INS_BREAK_I, which summarize the teen’s health insurance status and history across all of the insurance questions listed above, while also incorporating the imputation of missing values and coding of open-ended responses. In 2017, INS_STAT_I was replaced with INS_STAT2_I, which provides a different categorization of teens with both private and non-private, non-Medicaid insurance.

**INS_STAT2_I** identifies the teen’s current health insurance coverage status. If the teen has a form of private health insurance and is not covered by any other type of health insurance, he/she is classified as (1) Private only. If the teen is on any form of Medicaid, alone or in addition to other forms of insurance, he/she is classified as (2) Any Medicaid. If the teen is not covered by Medicaid but is covered by some other type of health insurance (including, but not limited to, CHIP, Indian Health Service, Military Health Care, TRICARE, CHAMPUS, or CHAMP-VA), either alone or in combination with private insurance, he/she is classified as (3) Other. If the teen is not covered by any kind of health insurance, he/she is classified as (4) Uninsured.

**INS_BREAK_I** describes the teen’s coverage history since age 11 and indicates whether there have been any breaks in coverage during this period. A teen may be (1) currently insured but uninsured at some point since age 11, (2) currently insured and never uninsured since age 11, (3) currently uninsured but insured at some point since age 11, or (4) currently uninsured and never insured since age 11.

Both variables are available only for teens with adequate provider data. Beginning in 2022, these variables are available for teens from all estimation areas, whereas prior to 2022, they were not available from teens residing in U.S. territories.

# 8. Analytic and Reporting Guidelines

Data from the NIS-Teen public-use data file can be used to produce national, state, and estimation-area estimates of vaccination coverage rates using the **PROVWT_C** weight (**PROVWT_C_TERR** if territories are to be included).

Information in the data file can also be used to calculate standard errors of the estimated vaccination coverage rates that reflect the complex sample design of the NIS-Teen. The file includes estimation area and state identifiers (**ESTIAPT23** and **STATE**) as well as a stratum identifier, **STRATUM**. The sample is stratified by the 59 geographic estimation areas.

Demographic and socioeconomic variables in the file can be used to obtain national vaccination coverage rates for sub-groups of the population. Data users should, however, be aware that estimates for such sub-groups at the state or estimation area level will generally have large standard errors because of small sample sizes. The CDC standard for precision of sub-group estimates is that relative standard error (the ratio of the standard error to the estimate) should be less than 0.3, and each analytic cell should contain at least 30 respondents.

## 8.1. Use of NIS Sampling Weights

The 2023 NIS-Teen public-use data file contains two teen-level sets of weights. The **RDDWT_C** variable gives the household-phase weight for all teens in the United States excluding territories (**RDDWT_C_TERR** if territories are to be included). These weights should be used to form estimates from teens with completed household interviews. The weights reflect the stratified sample design and also have been adjusted for unit non-response, for the selection of one teen per household, for the number of telephone lines in the household, for calibration to population control totals, and for the exclusion of non-telephone and landline-only teens. The weight variables **PROVWT_C**/**PROVWT_C_TERR** apply to teens with adequate provider data. These weights should be used to form estimates of vaccination coverage using variables from Sections 7, 8, and 9 of the public-use data file (see Section 7 of this user's guide). Table 4 presents a summary of the appropriate weights and stratum variables to use for various types of analyses.

**Table 4: Summary of Weights and Stratum Variables, National Immunization Survey - Teen, 2023**

| Weight Variable | Population* | Sample Frame | Strata | Stratum Variable |
|---|---|---|---|---|
| RDDWT_C | United States excluding territories | Single Frame Cellular Phone | Estimation Area | STRATUM |
| RDDWT_C_TERR | United States including territories | Single Frame Cellular Phone | Estimation Area | STRATUM |
| PROVWT_C | United States excluding territories, teens with adequate provider data | Single Frame Cellular Phone | Estimation Area | STRATUM |
| PROVWT_C_TERR | United States including territories, teens with adequate provider data | Single Frame Cellular Phone | Estimation Area | STRATUM |

* Each weight will contain a missing value for all records that are not included in the population covered by the weight.

The NIS-Teen public-use data file does not contain any provider-level weights. The NIS-Teen does not sample providers directly; rather, they are included in the survey through the teens they vaccinate. A user of the file should not attempt provider-level analyses (e.g., estimate the percentage of providers in the United States that are private providers), because the NIS-Teen sample was not designed for that purpose.

## 8.2. Estimation and Analysis

### *8.2.1. Estimating Vaccination Coverage Rates*

Vaccination coverage rates are ratio estimators, as described in the statistical literature on methods for complex sample surveys. Because of the adjustment to the sampling weights for provider-phase non-response, statistical analyses require only data from teens with adequate provider data (**PDAT2** = 1), along with their final provider sampling weights (**PROVWT_C**/**PROVWT_C_TERR**). To summarize the statistical methodology by which vaccination coverage rates and their standard errors are obtained from these data, let $Y_{hi}$ be an indicator, for the *i*th teen with adequate provider data in the *h*th stratum of the NIS-Teen sampling design, equal to 1 if the teen is up-to-date according to the provider data and 0 otherwise. Also, let $W_{hi}$ denote the value of **PROVWT_C/PROVWT_C_TERR** for this teen. Then, letting $\hat{Y}_h = \sum_{i=1}^{n_h} W_{hi} Y_{hi}$ and $\hat{T}_h = \sum_{i=1}^{n_h} W_{hi}$ , the national estimator of the vaccination coverage rate may be expressed as

$$\hat{\theta} = \frac{\sum_{h=1}^{L} \hat{Y}_h}{\sum_{h=1}^{L} \hat{T}_h}$$

where $L$ denotes the number of strata, and $n_h$ denotes the number of sampled teens with adequate provider data in the $h$th stratum.

Letting $L$ instead denote the number of strata in a state, the above formula can also be used to calculate vaccination coverage rates for states (regardless of whether the state contains only one or more than one stratum).

#### *8.2.2. Estimating Standard Errors of Vaccination Coverage Rates*

The Taylor series method can be used to estimate the sampling variance of vaccination coverage rates for the U.S., the states, and estimation areas. Letting $Z_{hi} = \frac{W_{hi}(Y_{hi} - \hat{\theta})}{\sum_{h=1}^{L} \hat{T}_h}$ and $\bar{Z}_h = \frac{\sum_{i=1}^{n_h} Z_{hi}}{n_h}$

yields an estimator of the variance of the estimated vaccination coverage rate, $\hat{\theta}$, equal to

$$v(\hat{\theta}) = \sum_{h=1}^{L} \frac{n_h}{n_h - 1} \sum_{i=1}^{n_h} (Z_{hi} - \bar{Z}_h)^2 .$$

The standard error is the square root of the variance. The estimation of standard errors for estimates of vaccination coverage rates in the NIS-Teen can be implemented in specialized statistical software such as SUDAAN (Research Triangle Institute 2008), SAS (SAS Institute Inc. 2009), R (Lumley 2010), and Stata

(Stata Corporation 2009). Several examples of the use of SAS, R, and SUDAAN to estimate vaccination coverage rates and their standard errors for estimation areas and states can be found in the accompanying example SUDAAN, SAS, and R analysis programs (available for download at https://www.cdc.gov/nis/php/datasets-teen/index.html). For all procedures, the option of with-replacement sampling of primary sampling units within stratum is used, because the sampling fractions for households within an estimation area are all quite small. For all estimates, the variable **STRATUM** is used as the stratum variable and the household/teen identifier (**SEQNUMT**) is used as the primary sampling unit identifier. The data file should be sorted first on **STRATUM** and then on **SEQNUMT** within **STRATUM** before running the programs for SUDAAN and SAS.

## 8.3. Combining Multiple Years of NIS-Teen Data

### *8.3.1. Estimation of Multi-Year Means*

With release of the 2023 NIS-Teen public-use data file, fifteen years of public-use NIS-Teen data are now available. The precision of estimates of vaccination coverage for sub-domains (e.g., by race/ethnicity of teen) within estimation areas or states can be improved by combining multiple years of NIS-Teen data. Data users should, however, be aware that estimates from combined years of NIS-Teen data represent an average over multiple years. Although combining multiple years of NIS-Teen data will yield a larger sample size for estimation areas and states, the composition of the population in a geographic area may change over time, making interpretation of the results difficult. Furthermore, if vaccination administration schedules or vaccination coverage changes over time, the estimate of vaccination coverage for the combined time period applies to a hypothetical population that existed at the middle of the time period, making interpretation of the results even more difficult. Given the use of independent RDD samples in the NIS-Teen, it is also possible that a teen could appear in more than one public-use data file. Finally, given the change to the definition of adequate provider data in 2014 and its effect on NIS-Teen vaccination coverage rate estimates as described in the introduction, users should exercise caution when interpreting results from a combination of years prior to 2014 with years 2014 and later.

To estimate a multi-year mean for a given NIS-Teen variable, the weights in each participating file (RDD-phase weights **RDDWT** in 2008-2011, **RDDWT_D** in 2012-2017, and **RDDWT_C** in 2018-2023; and provider-phase weights **PROVWT** in 2008-2011, **PROVWT_D** in 2012-2017, and **PROVWT_C** in 2018-2023) should be divided by the number of years being combined. For example, if data for 2017-2023 for teens with adequate provider data are to be combined, then the weights in the seven files – **PROVWT_D** in 2017 and **PROVWT_C** in 2018-2023 – should be divided by 7 to obtain revised weights, which should be saved as a new variable, say **NEWWT**. It is necessary to use **NEWWT** in the analysis to obtain correct weighted estimates for teens aged 13-17 years. Furthermore, the teen ID numbers (**SEQNUMT**) in the files are unique only within a year, not across years. It is important for the user to create revised, unique ID numbers when combining data from multiple years.

The following SAS code can be used:

**YRSEQT** = 1 * (**YEAR** || **SEQNUMT**);

**YEAR** is the 4-digit year variable for the NIS-Teen data year (e.g., 2023).

To produce valid estimates of sampling variability and valid confidence intervals for multi-year coverage rates and other multi-year means, it is necessary to use specialized software such as SAS, SUDAAN, R, or Stata.

There is an important complication for variance estimation when combining multiple years, because some estimation areas are removed and other new areas are added each year (see Section 2 above for more information about rotating estimation areas). The variance strata for 2011-2023 are defined by the variables **STRATUM_D** (for 2011) and **STRATUM** (for 2012-2023), with **STRATUM_D** and **STRATUM** being a combination of the estimation area variable for that year and the sampling frame (landline or cellular phone). The estimation area variables **ESTIAPT11-ESTIAPT23** define mutually exclusive and exhaustive geographic areas. However, they are not exactly the same areas. For example,

**Dallas County, TX, was a separate estimation area in 2011, 2016, and 2019 but not in 2012-2015, 2018, and 2020-2023. Tarrant County, TX, was a separate estimation area in 2018, but not in 2011-2017 and 2019-2023. Other areas, such as New York City, NY and Rest of New York, are estimation areas in all years.**

To make inferences concerning multi-year means, the user must take two actions. First, he/she must define and save a new stratum variable with a common name for all years included in the analysis. Second, he/she must define a common set of estimation domains that can be supported by each of the files included in the multi-year analysis. To take these actions, the user should follow the following seven-step procedure (or its equivalent):

i. Compute and save the new, common variance-stratum variable for each year participating in the analysis. The variable should be defined by the equation

   **STRATUMV** = **STRATUM_D**, for teens in the 2011 public-use data file

   = **STRATUM**, for teens in the 2012-2023 public-use data files

ii. Compute and save the new, common weight variable, **NEWWT**, as instructed above for each year participating in the analysis.

iii. Compute and save the new, unique teen identification numbers, **YRSEQT**, as instructed above for each year participating in the analysis.

iv. Compute and save a variable defining the common estimation domains to be studied for each year participating in the analysis. For example, one could use the CDIAP (Common Denominator Estimation Area) variable set forth in Table 5 or states as geographic domains.

v. Merge the multiple files into one consolidated file in a format compatible with the specialized software to be used.

vi. Sort the consolidated file by **YEAR**, **STRATUMV**, and **YRSEQT**.

vii. Run the specialized software on the consolidated file, computing estimates, variance estimates, and confidence intervals. For SUDAAN users, sampling levels or stages may be specified by the statement

```
NEST YEAR STRATUMV YRSEQT / PSULEV = 3;
```

the specification of weights by

```
WEIGHT NEWWT;
```

and the specification of estimation domains, for example, by the two statements

```
CLASS YEAR CDIAP STATE;
TABLES CDIAP;
```

or

```
CLASS YEAR CDIAP STATE;
TABLES STATE;
```

#### *8.3.2. Estimation of Multi-Year Contrasts*

Considerations similar to those for multi-year means arise in the estimation of contrasts between NIS-Teen years. For example, a typical contrast of interest would be the difference between the vaccination coverage parameters in 2022 and in 2023. As when combining multiple years of NIS-Teen data to estimate multi-year means, users should exercise caution when combining multiple years of data to estimate multi-year contrasts. The composition of the population in a geographic area may change over time, and it is possible that a teen could appear in more than one public-use data file. Furthermore, given the change in the definition of adequate provider data in 2014, users should be aware that NIS-Teen vaccination coverage estimates from 2014 and later, which use the revised definition, are not directly comparable to those from NIS-Teen 2013 and prior, which used the previous adequate provider data definition.

To make inferences concerning a multi-year contrast, the user will need to work with the original weights reported on the files and store them in a common variable. One must not divide the original weights by the number of years included in the contrast. For the example, one may define the new, common weight variable as

**NEWWT2** = **PROVWT**, if the teen is in the 2011 public-use data file

= **PROVWT_D**, if the teen is in the 2012-2017 public-use data files

= **PROVWT_C**, if the teen is in the 2018-2023 public-use data files.

The user should follow the seven-step procedure set forth in the section on multi-year means, using **NEWWT2** in lieu of **NEWWT**. In SUDAAN, the user should also specify the contrast of interest through use of a CONTRAST statement or an appropriate regression model. For example, to compare the Td/Tdap-containing vaccine up-to-date estimate from 2022 to the 2023 estimate, SUDAAN users can use the following WEIGHT, VAR, and CONTRAST statements:

```
WEIGHT NEWWT2;
VAR P_UTDTD;
CONTRAST YEAR = (-1 1);
```

**Table 5: Cross-Walk Between Annual Estimation Areas, ESTIAPT08-ESTIAPT23, and Common Denominator Estimation Area (CDIAP), National Immunization Survey - Teen, 2023***

| CDIAP | Area Name | ESTIAPT08 (2008) | ESTIAPT09 (2009) | ESTIAPT10 (2010) | ESTIAPT11 (2011) | ESTIAPT12 (2012) | ESTIAPT13 (2013) | ESTIAPT14 (2014) | ESTIAPT15 (2015) |
|---|---|---|---|---|---|---|---|---|---|
| 20 | Alabama | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 74 | Alaska | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 |
| 66 | Arizona | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| 46 | Arkansas | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| | California | | | | | | | | |
| 68 | CA-Los Angeles County | 68 | 69 | 68 | 68 | 68 | 68 | 68 | 68 |
| 68 | CA-Rest of State | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| 60 | Colorado | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 1 | Connecticut | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | Delaware | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| 12 | District of Columbia | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 22 | Florida | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 25 | Georgia | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 72 | Hawaii | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 75 | Idaho | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| | Illinois | | | | | | | | |
| 35 | IL-City of Chicago | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 34 | IL-Rest of State | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | Indiana | | | | | | | | |
| 36 | IN-Lake County | 36 | 96 | 36 | 36 | 36 | 36 | 36 | 36 |
| 36 | IN-Marion County | 36 | 37 | 36 | 36 | 36 | 36 | 36 | 36 |
| 36 | IN-Rest of State | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| 56 | Iowa | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| 57 | Kansas | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 27 | Kentucky | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 |
| 47 | Louisiana | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| 4 | Maine | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 14 | Maryland | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| 2 | Massachusetts | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | Michigan | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |
| 40 | Minnesota | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 28 | Mississippi | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| 58 | Missouri | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| 61 | Montana | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| 59 | Nebraska | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 |
| 73 | Nevada | 73 | 73 | 73 | 73 | 73 | 73 | 73 | 73 |
| 5 | New Hampshire | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 8 | New Jersey | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| CDIAP | Area Name | ESTIAPT08 (2008) | ESTIAPT09 (2009) | ESTIAPT10 (2010) | ESTIAPT11 (2011) | ESTIAPT12 (2012) | ESTIAPT13 (2013) | ESTIAPT14 (2014) | ESTIAPT15 (2015) |
|---|---|---|---|---|---|---|---|---|---|
| 49 | New Mexico | 49 | 49 | 49 | 49 | 49 | 49 | 49 | 49 |
| | New York | | | | | | | | |
| 11 | NY-City of New York | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 10 | NY-Rest of State | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 29 | North Carolina | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| 62 | North Dakota | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 41 | Ohio | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 |
| 50 | Oklahoma | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 76 | Oregon | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| | Pennsylvania | | | | | | | | |
| 17 | PA-Philadelphia County | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| 16 | PA-Rest of State | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| 6 | Rhode Island | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 30 | South Carolina | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 63 | South Dakota | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| 31 | Tennessee | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| | Texas | | | | | | | | |
| 55 | TX-Bexar County | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| 54 | TX-City of Houston | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| 51 | TX-Dallas County | 51 | 52 | 52 | 52 | 51 | 51 | 51 | 51 |
| 51 | TX-El Paso County | 51 | 53 | 53 | 53 | 51 | 51 | 53 | 53 |
| 51 | TX-Hidalgo County | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 107 |
| 51 | TX-Travis County | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 51 | TX-Tarrant County | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 51 | TX-Rest of State | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 64 | Utah | 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 7 | Vermont | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 18 | Virginia | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| 77 | Washington | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |
| 19 | West Virginia | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| 44 | Wisconsin | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 65 | Wyoming | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| - | Puerto Rico | - | - | - | - | - | - | 106 | 106 |

**Table 5 (continued): Cross-Walk Between ESTIAPT08-ESTIAPT23 and Common Denominator Estimation Area (CDIAP), National Immunization Survey - Teen, 2023**

| CDIAP | Area Name | ESTIAPT16 (2016) | ESTIAPT17 (2017) | ESTIAPT18 (2018) | ESTIAPT19 (2019) | ESTIAPT20 (2020) | ESTIAPT21 (2021) | ESTIAPT22 (2022) | ESTIAPT23 (2023) |
|---|---|---|---|---|---|---|---|---|---|
| 20 | Alabama | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 74 | Alaska | 74 | 74 | 74 | 74 | 74 | 74 | 74 | 74 |
| 66 | Arizona | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| 46 | Arkansas | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| | California | | | | | | | | |
| 68 | CA-Los Angeles County | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| 68 | CA-Rest of State | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| 60 | Colorado | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 1 | Connecticut | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | Delaware | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| 12 | District of Columbia | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 22 | Florida | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| 25 | Georgia | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| 72 | Hawaii | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 |
| 75 | Idaho | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| | Illinois | | | | | | | | |
| 35 | IL-City of Chicago | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| 34 | IL-Rest of State | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| | Indiana | | | | | | | | |
| 36 | IN-Lake County | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| 36 | IN-Marion County | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| 36 | IN-Rest of State | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| 56 | Iowa | 56 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |
| 57 | Kansas | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| 27 | Kentucky | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 |
| 47 | Louisiana | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| 4 | Maine | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 14 | Maryland | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| 2 | Massachusetts | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 38 | Michigan | 38 | 38 | 38 | 38 | 38 | 38 | 38 | 38 |
| 40 | Minnesota | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| 28 | Mississippi | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| 58 | Missouri | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| 61 | Montana | 61 | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| 59 | Nebraska | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 |
| 73 | Nevada | 73 | 73 | 73 | 73 | 73 | 73 | 73 | 73 |
| 5 | New Hampshire | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 8 | New Jersey | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |

| CDIAP | Area Name | ESTIAPT16 (2016) | ESTIAPT17 (2017) | ESTIAPT18 (2018) | ESTIAPT19 (2019) | ESTIAPT20 (2020) | ESTIAPT21 (2021) | ESTIAPT22 (2022) | ESTIAPT23 (2023) |
|---|---|---|---|---|---|---|---|---|---|
| 49 | New Mexico | 49 | 49 | 49 | 49 | 59 | 59 | 59 | 59 |
| | New York | | | | | | | | |
| 11 | NY-City of New York | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 10 | NY-Rest of State | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 29 | North Carolina | 29 | 29 | 29 | 29 | 39 | 39 | 39 | 39 |
| 62 | North Dakota | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| 41 | Ohio | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 |
| 50 | Oklahoma | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| 76 | Oregon | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| | Pennsylvania | | | | | | | | |
| 17 | PA-Philadelphia County | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| 16 | PA-Rest of State | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| 6 | Rhode Island | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 30 | South Carolina | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 63 | South Dakota | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| 31 | Tennessee | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| | Texas | | | | | | | | |
| 55 | TX-Bexar County | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| 54 | TX-City of Houston | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| 51 | TX-Dallas County | 52 | 52 | 51 | 52 | 51 | 51 | 51 | 51 |
| 51 | TX-El Paso County | 53 | 53 | 51 | 53 | 51 | 51 | 51 | 51 |
| 51 | TX-Hidalgo County | 51 | 51 | 107 | 51 | 51 | 51 | 51 | 51 |
| 51 | TX-Travis County | 51 | 108 | 51 | 51 | 51 | 51 | 51 | 51 |
| 51 | TX-Tarrant County | 51 | 51 | 109 | 51 | 51 | 51 | 51 | 51 |
| 51 | TX-Rest of State | 51 | 51 | 51 | 51 | 51 | 51 | 51 | 51 |
| 64 | Utah | 64 | 64 | 64 | 64 | 64 | 64 | 64 | 64 |
| 7 | Vermont | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 18 | Virginia | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| 77 | Washington | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |
| 19 | West Virginia | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| 44 | Wisconsin | 44 | 44 | 44 | 44 | 44 | 44 | 44 | 44 |
| 65 | Wyoming | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| - | Puerto Rico | 106 | - | - | 106 | 106 | 106 | 106 | 106 |

*This table can be used to derive a Common Denominator Estimation Area (CDIAP) variable for use in multi-year NIS-Teen analyses. This is necessary because certain areas may be included as separate estimation areas in one year but subsumed within other estimation areas in another year. The CDIAP variable can be derived for each year by mapping the codes in the year-specific estimation area variable column (e.g., ESTIAP08 for the 2008 NIS-Teen) to the corresponding codes in the CDIAP column.

# 9. Summary Tables

Appendix C contains seven tables. Appendix Table C.1 lists the 59 estimation areas for the 2023 NIS-Teen by state. At the national level and for each state and estimation area, it provides the estimated population total of teens aged 13-17 years in 2023 and (from 2023 NIS-Teen data collection) the number of teens with completed household interviews and number of teens with adequate provider data.

Appendix Tables C.2 through C.5 summarize pairs of variables: age of teen by maternal education (Appendix Table C.2), age of teen by family poverty status (Appendix Table C.3), race/ethnicity of teen by family poverty status (Appendix Table C.4), age of teen by race/ethnicity of teen (Appendix Table C.5), and age of teen by sex of teen (Appendix Table C.6). Each of these tables gives the unweighted and weighted counts of teens for whom the household interview was completed and the unweighted and weighted counts of teens with adequate provider data.

Appendix Table C.7 presents estimates of vaccination coverage and 95% confidence intervals obtained from SAS. The data user should obtain the same estimates from the 2023 NIS-Teen public-use data file.

Appendix D shows the vaccine type codes used in the 2023 NIS-Teen public-use data file.

Appendix E contains four tables and time-series charts**.** Table E.1 and Figure E.1 show key components of the NIS-Teen landline sample response rates and the landline sample CASRO response rates by year of the survey. Table E.2 and Figure E.2 show key components of the NIS-Teen cellular phone sample response rates and the cellular phone sample CASRO response rates. Table E.3 and Figure E.3 show the CASRO response rates for the combined landline and cellular phone samples. Table E.4 and Figure E.4 show vaccination coverage rate estimates since 2006.

Appendix F presents key response rate components and the CASRO response rate by estimation area in the 2023 NIS-Teen.

# 10. Assessment of Total Survey Error in the NIS-Teen

Assessing the validity of the NIS-Teen estimates of vaccination coverage is a critical and ongoing aspect of the NIS surveillance program. CDC frequently conducts evaluation studies and controlled experiments to understand the causes and impacts of sampling and nonsampling errors on the estimates and enable formulation of methodological refinements that have the demonstrated capacity to improve data quality. As landline phone use decreased and cellular phone use increased dramatically over the past decade, and the NIS-Teen transitioned first from a single-frame landline RDD sampling design to a dual-frame landline and cellular phone RDD design and then to a single-frame cellular phone RDD design, CDC has monitored the NIS-Teen estimates utilizing a Total Survey Error (TSE) approach.

TSE is the sum of the errors that arise at every step of a survey, including both sampling error and nonsampling errors such as sampling-frame coverage, nonresponse, and measurement errors (Mulry and Spencer, 1991). Pooling information from multiple evaluations of their precision and accuracy, we have conducted TSE analyses for the 2009-2013 NIS-Child and NIS-Teen data (Molinari et al. 2011; NORC 2011; Pineau et al. 2012; Pineau et al. 2013; Skalland et al. 2016; Wolter et al. 2017b) and for the 2018-2022 NIS-Child and NIS-Teen data (see the Data User's Guides for the 2018-2022 NIS-Child and NIS-Teen public use data files). Data User's Guides from 2015 to present are located at: https://www.cdc.gov/nis/php/datasets-teen/index.html.

**An assessment based on 2023 NIS-Teen data was conducted in 2024 (CDC, 2024), with results summarized in this report. The full report is available at:** https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/downloads/Error-Profile-2023-NIS-Teen.pdf

## 10.1 Comparisons of NIS-Teen Data to External Sources

*Comparison of Demographic Distributions*. Demographic distributions (age, sex, race/ethnicity, mother's education, and mother's age) among adolescents with adequate provider data were compared to benchmark values for adolescents aged 13-17 years derived from the U.S. Census Bureau's Population

Estimates Program (PEP) and American Community Survey (ACS) data. ACS data are located at: https://www.census.gov/programs-surveys/acs. **When using design weights that have not been calibrated to external population totals, demographic distributions as estimated by the survey are generally close to the benchmark distributions. Before calibration, the NIS-Teen somewhat over-represented non-Hispanic White-only adolescents, under-represented Hispanic adolescents, and over-represented adolescents whose mothers are college graduates. When using final weights that have been calibrated to external population totals, the differences between survey estimates and population values narrowed, but the 2023 NIS-Teen still over-represented adolescents whose mothers are college graduates (44.9% in survey, 37.9% in population) and under-represented adolescents whose mothers have some college but not a four-year degree (22.8% in survey, 30.1% in population).**

*Comparison to IISAR Vaccination Coverage Rates*. Next, NIS-Teen vaccination coverage rate estimates were compared to vaccination coverage rates reported in the Immunization Information Systems Annual Report (IISAR). Sponsored and conducted by NCIRD, the IISAR is an annual assessment of immunization information systems (IIS)[6] activity among the 64 immunization program awardees, which include the 50 states, 6 cities (Chicago, District of Columbia, Houston, New York City, Philadelphia, and San Antonio), and 8 U.S. territories. To evaluate each awardee's performance, the immunization program manager in the awardee area is asked to complete a self-administered, web-based questionnaire asking for demographic and immunization information, public and private provider site participation levels, and information about achievement of IIS functional standards. NCIRD provides competitive supplemental funds to awardees that met high data timeliness and participation (child and adolescent) in the IIS. During the period 2013-2017, six awardees were recognized as IIS *sentinel sites*, including Michigan, Minnesota, North Dakota, New York City, Oregon, and Wisconsin. Because of increased timeliness and higher child

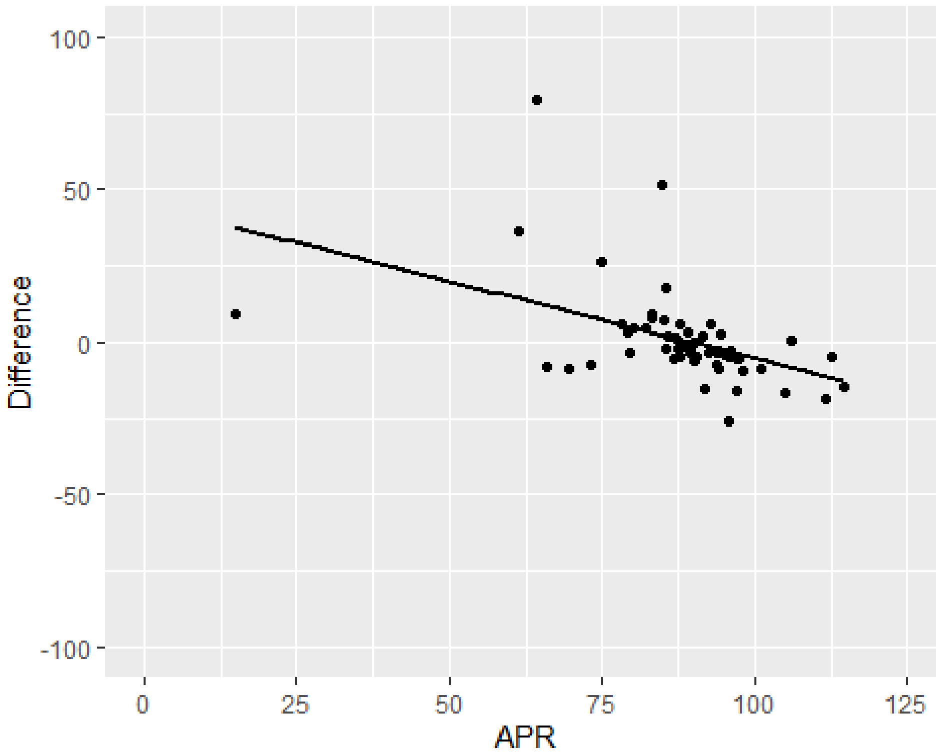
[6] State IIS are computer databases that aspire to contain information about all of the doses of all vaccines administered to all children resident within the state. State IIS vary in their completeness of both children included and the vaccinations they received.

and adolescent saturation levels in the IIS, vaccination coverage rates reported in IISAR by sentinel sites are thought to be relatively more accurate than vaccination rates reported by non-sentinel sites. Information about the IISAR can be found at: https://www.cdc.gov/iis/annual-report-iisar/index.html.

**Vaccination coverage rate estimates from the 2022 NIS-Teen were compared to those from the 2022 IISAR. The 2022 IISAR was the most recent available, and so the 2022 comparison served as the most current information available about the relative accuracy of the 2023 NIS-Teen. There was variation in the level of agreement between NIS-Teen vaccination coverage rate estimates and IISAR vaccination coverage rates, including some areas where the NIS-Teen estimate was greater and some where the IISAR estimate was greater. However, the adolescent participation rate – the proportion of adolescents in the IIS jurisdiction with two or more vaccine doses in the IIS database[7] – was determined to be a reasonable indicator of the quality of the corresponding IIS database, as the IIS vaccination coverage rate was found to increase as the adolescent participation rate increased, and it was observed (Figure 1) that the difference between NIS-Teen and IISAR vaccination coverage rates declines as the adolescent participation rate increases (i.e., as the quality of the IIS increases). These findings are consistent with the view that IIS vaccination coverage rates converge towards NIS-Teen vaccination coverage rates as the quality of the IIS increases.**

[7] When setting the denominator for the participation rate calculation, some IIS use an external estimate of the number of adolescents living in the jurisdiction rather than a count of adolescents in the IIS itself; this results in some IIS reporting a participation rate of over 100 percent.

**Figure 1: Scatter Plot of Percentage Point Difference between 2022 NIS-Teen and Immunization Information Systems Annual Report (IISAR) Vaccination Coverage Rates for One or More Doses of Tdap vs. Immunization Information Systems (IIS) Adolescent Participation Rate (APR) with Regression Line: 56 Estimation Areas**




Note for Figure 1: A positive difference indicates the NIS-Teen vaccination coverage rate estimate was higher than the corresponding IISAR estimate, and a negative difference indicates the NIS-Teen vaccination coverage rate estimate was lower than the corresponding IISAR estimate.

*Comparison of Health Insurance Distributions*. NIS-Teen health insurance distributions were compared to similar distributions produced by the Current Population Survey (CPS) (https://www.census.gov/programs-surveys/cps.html), the National Health Interview Survey (NHIS) (https://www.cdc.gov/nchs/nhis/index.htm), and the American Community Survey (ACS) (https://www.census.gov/programs-surveys/acs). All of these surveys use somewhat different definitions of insurance status and report for different age ranges of adolescents. **Nevertheless, we found the NIS-Teen distributions to be broadly similar to those from the CPS, NHIS, and ACS, but with some differences. NIS-Teen estimates of percent of adolescents with any public insurance (44.1% in 2022, 43.6% in 2023) were higher than most of the corresponding benchmark estimates (39.2% (NHIS), 36.5% (CPS), and 39.2% (ACS) in 2022; 35.8% (CPS) in 2023), and the NIS-Teen estimates of**

**uninsured adolescents (3.4% in 2022, 3.8% in 2023) were lower than the estimates from the benchmark surveys (4.9% (NHIS), 5.5% (CPS), and 5.5% (ACS) in 2022; 6.0% (CPS) in 2023).**

*Comparison to State Immunization Surveys*. **A comparison was undertaken of NIS-Teen vaccination coverage rate estimates to published estimates based on IIS data from two states in 2022 and 2023: (a) the Iowa Immunization Registry Information System (IRIS), sponsored and conducted by the Iowa Department of Health and Human Services (Iowa HHS, 2023) and (b) Oregon's Immunization Information System, called ALERT IIS, conducted by the Oregon Health Authority (Oregon Immunization Program, 2023). The NIS-Teen and the IIS in these two states displayed reasonably similar vaccination coverage rates for 1+ Tdap and 1+ MenACWY, but the NIS-Teen coverage estimates were higher than the IIS estimates for HPV.**

## 10.2 Assessment of Total Survey Error for NIS-Teen Vaccination Coverage Estimates

**Next, an assessment of all sources of error in the 2023 NIS-Teen was conducted, including sample-frame coverage error, nonresponse error, and measurement error; the component errors were then combined to assess total survey error. The change in total survey error between the 2022 NIS-Teen and 2023 NIS-Teen was also estimated.**

*Coverage Error.* The NIS-Teen cellular phone RDD sampling frame fails to cover the landline-only and phoneless households; vaccination coverage rates in the former were estimated using data collected in the 2017 NIS-Teen and vaccination coverage rates in the latter were estimated using data collected in the 2012 NHIS Provider Record Check**.** The vaccination coverage rates in the landline-only population tended to be less than the vaccination coverage rates in the population covered by the cellular phone sampling-frame, and the results were somewhat mixed with regard to the phoneless households. **Because the sampling-frame uncovered population is so small relative to the covered population, however,**

**mean sampling-frame coverage error was estimated to be 0.1 percentage points or less for 1+ Tdap, 1+ MenACWY, and UTD HPV.**

*Nonresponse Error*. **Nonresponse error in the 2023 NIS-Teen was assessed through comparison of the 2023 NIS-Teen to the cellular phone domain within the 2022 NHIS.** NHIS does not offer direct estimates of vaccination coverage rates. Instead, a model-based technique was used to impute NHIS vaccination status, and then the resulting NHIS vaccination coverage rates (treated as vaccination coverage rates void of nonresponse error) were compared to NIS-Teen vaccination coverage rates, with the difference treated as nonresponse error in the NIS-Teen. **Despite nonresponse in the 2023 NIS-Teen, including household nonresponse, non-consent to contact vaccination providers, and provider nonresponse, mean nonresponse error in vaccination rates was estimated to be modest and not statistically significant at the 0.05 level when using either design weights or final weights that account for the survey's nonresponse adjustment.**

*Measurement Error*. A form of measurement error called "provider under-reporting" was assessed. Sometimes called "under-ascertainment," provider under-reporting error arises when an adolescent with adequate provider data is truly vaccinated but is reported as unvaccinated for one or more recommended doses in the adolescent's provider-reported vaccination history. Under-reporting error can occur if the household respondent fails to nominate all of the adolescent's vaccination providers, if one or more of the adolescent's nominated vaccination providers fails to report a vaccination history for the adolescent, or if one or more of the adolescent's nominated providers reports a vaccination history but fails to report all of the vaccinations the adolescent has received. **Underreporting error was estimated using data from projects sponsored by CDC in which the 2017 NIS-Teen sample of adolescents in 20 jurisdictions and the 2019 NIS-Teen sample of adolescents in 8 jurisdictions were matched to the state or local IIS for the jurisdiction.** In this work, the standard of truth for a given adolescent is taken to be the synthesis of the NIS-Teen and IIS vaccination histories. In prior studies conducted in 2012, 2013, 2018, 2019, 2020, 2021, and 2022 using similar methods, measurement error was found to be the largest component of error in the NIS-Teen vaccination coverage rate estimates for most vaccines. **Similar conclusions were reached for the 2023 NIS-Teen, where it was estimated that measurement error decreased observed vaccination coverage rates by about 2 to 5 percentage points due to provider underreporting of vaccinations.**

*Total Survey Error*. Finally, all of the component errors were combined to assess the distribution of total error in the NIS-Teen vaccination coverage rates, using a Monte Carlo technique. The mean of the distribution is an estimate of the total error, and the 2.5 and 97.5 percentiles of the distribution form a 95% credible interval for the total error. The estimated component errors and total survey errors are presented in Table 6. **For the ≥1 Tdap vaccination coverage rate, the mean of the TSE distribution was found to be -4.6 percentage points with a 95% credible interval of (-6.7, -2.0) percentage points. That is, the NIS-Teen ≥1 Tdap vaccination coverage rate was on average about 4.6 percentage points too low. For the ≥1 MenACWY vaccination coverage rate, the mean of the TSE distribution was found to be -4.2 percentage points with a 95% credible interval of (-6.1, -1.9) percentage points. For UTD HPV, the mean of the TSE distribution was found to be -5.2 (-8.8, 1.3) percentage points overall, -3.9 (-8.3, 0.9) percentage points for females, and -6.2 (-11.3, -0.8) percentage points for males. Under-ascertainment of the provider-reported vaccination history is the largest source of error for all vaccines.**

*Change in Total Survey Error*. **Change in TSE between the 2022 and 2023 NIS-Teen was measured using the bridging cohort method introduced by NCIRD (Yankey, Hill, Elam-Evans, et al. 2015).** Each survey year includes adolescents born within 24 quarterly birth cohorts. Every pair of adjacent survey years spans 28 quarterly birth cohorts, of which 20 are in common and 8 are not in common. **The set of quarterly birth cohorts in common comprise the *bridging cohort*, and for 2022 and 2023, the bridging cohort extends from adolescents born in January 2005 through adolescents born in December 2009.**

**Table 6: Mean and 95% Credible Interval for the Estimated Total Survey Error (TSE) Distribution and Component Error Distributions for National Vaccination Coverage Rate Estimates, National Immunization Survey - Teen, 2023**

| Vaccine or Series | Component | Mean TSE (percentage points) | 95% Credible Interval (percentage points) |
|---|---|---|---|
| 1+ Tdap | TSE (final weighted) | -4.6 | (-6.7, -2.0)** |
| | TSE (design weighted) | -4.9 | (-6.9, -2.2)** |
| | Noncoverage error | 0.0 | (0.0, 0.2) |
| | Nonresponse error | -0.2 | (-2.6, 2.6) |
| | Measurement error | -4.7 | (-5.8, -3.5)** |
| | Sampling error | 0.0 | (-1.2, 1.4) |
| 1+ MenACWY | TSE (final weighted) | -4.2 | (-6.1, -1.9)** |
| | TSE (design weighted) | -4.1 | (-6.0, -1.8)** |
| | Noncoverage error | 0.0 | (0.0, 0.2) |
| | Nonresponse error | -0.0 | (-2.2, 2.5) |
| | Measurement error | -4.1 | (-5.2, -2.9)** |
| | Sampling error | 0.0 | (-1.2, 1.3) |
| UTD HPV* | TSE (final weighted) | -5.2 | (-8.8, -1.3)** |
| | TSE (design weighted) | -4.3 | (-7.9, -0.4)** |
| | Noncoverage error | 0.1 | (0.0, 0.2) |
| | Nonresponse error | -1.9 | (-5.9, 2.2) |
| | Measurement error | -2.5 | (-3.9, -1.0)** |
| | Sampling error | 0.0 | (-1.4, 1.5) |
| UTD HPV* among females | TSE (final weighted) | -3.9 | (-8.3, 0.9) |
| | TSE (design weighted) | -4.0 | (-8.4, 0.7) |
| | Noncoverage error | 0.1 | (-0.1, 0.2) |
| | Nonresponse error | -1.8 | (-6.7, 3.3) |
| | Measurement error | -2.3 | (-4.3, -0.2)** |
| | Sampling error | 0.0 | (-2.0, 2.1) |
| UTD HPV* among males | TSE (final weighted) | -6.2 | (-11.3, -0.8)** |
| | TSE (design weighted) | -4.3 | (-9.4, 1.2) |
| | Noncoverage error | 0.1 | (0.0, 0.3) |
| | Nonresponse error | -1.8 | (-7.4, 4.0) |
| | Measurement error | -2.6 | (-4.6, -0.5)** |
| | Sampling error | 0.0 | (-2.1, 2.1) |

* ≥3 doses, or ≥2 doses if 1st dose before age 15 and at least 5 months – 4 days between 1st and 2nd doses.

** 95% credible interval excludes zero.

Consider a vaccination coverage rate estimated from the bridging cohort as of a given adolescent age, such as 13 years. Two estimates are possible, one using the sample of adolescents in the bridging cohort within the 2022 NIS-Teen sample and the second using the corresponding sample of adolescents within the 2023 NIS-Teen sample. Ideally, the two estimators should exhibit the same statistical expectation (i.e., average value in hypothetical repeated sampling). A large difference between the two estimates may signal a change in the statistical expectation from one survey year to the next, which could result from a change in the distribution of sampling-frame coverage error, nonresponse error, or measurement error. Differences may also result simply from the effects of random sampling error.

**For 1+ Tdap by age 13 years, 1+ MenACWY by age 13 years, and UTD HPV by age 13 years, differences were found between the 2022 and 2023 national-level vaccination coverage rate estimates for the bridging cohort, with estimates for all vaccine series between 1.6 and 2.9 percentage points lower for the bridging birth cohort based on the 2023 than when based on the 2022 sample. The differences were found to be statistically significant at the 0.05 level for 1+ Tdap and 1+ MenACWY. The 2023 estimate for the bridging cohort was 2.9 percentage points lower for 1+ Tdap, 2.4 percentage points lower for 1+ MenACWY, 2.2 percentage points lower for UTD HPV overall, -1.6 percentage points lower for UTD HPV among females, and -2.8 percentage points lower for UTD HPV among males.**

**Overall, the results suggest a change in total survey error between 2022 and 2023, which may be due in part to a shortened PRC data collection period in 2023. Provider data collection closed approximately one month earlier in 2023, resulting in a lower return rate for provider data (85% in 2023, compared with 88% in 2022) and a higher proportion of adolescents having only partial provider data (37% in 2023, compared with 33% in 2022), which could lead to an increase in measurement error due to incomplete vaccination histories. The full assessment of change in total survey error is available at:** https://www.cdc.gov/vaccines/imz-managers/coverage/teenvaxview/downloads/Error-Profile-2023-NIS-Teen.pdf.

# 11. Limitations

The findings in this report are subject to at least four limitations. First, because NIS-Teen is a telephone survey, results are weighted to be representative of all adolescents aged 13-17 years. Although statistical adjustments were made to account for non-response and households without cellular phones, some bias might remain. Second, underestimates of vaccination coverage might have resulted from the exclusive use of provider-reported vaccination histories because completeness of these records is unknown. Third, although national estimates of vaccination coverage are precise, estimates for state and local areas should be interpreted with caution because their sample sizes are smaller and their confidence intervals generally are wider than those for national estimates. Finally, analysis of trends across data years that span from 2010 and earlier to 2011-2017 and from 2011-2017 to 2018-2023 are subject to potential bias that may remain after weighting adjustments because of the switch from landline to dual landline and cellular phone frames in 2011, and from dual landline and cellular phone frames to a single cellular phone frame in 2018 (Nguyen et al. 2019). In addition, analysis of trends across data years that span from 2011 to 2017 are subject to potential bias that may remain after weighting adjustments because of the expansions and reductions of the share of the total sample that came from the cellular phone frame across these years and because of the change in the definition of adequate provider data in 2014.

# 12. Citations for NIS-Teen Data

In publications please acknowledge the original data source. The citation for the 2023 NIS-Teen public-use data file is:

U.S. Department of Health and Human Services (DHHS). National Center for Immunization and Respiratory Diseases. The 2023 National Immunization Survey - Teen, Atlanta, GA: Centers for Disease Control and Prevention, 2024.

Information about the NIS-Teen is located at https://www.cdc.gov/nis/about/index.html.

The NIS-Teen public-use data file is located at https://www.cdc.gov/nis/php/datasets-teen/index.html.

Please place the acronym “NIS-Teen” in the titles, keywords, or abstracts of journal articles and other publications in order to facilitate retrieval of such materials in bibliographic searches.

The following publications use past and current NIS-Teen data:

**2023**

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# Appendix A: Glossary of Abbreviations and Terms

| | |
|---|---|
| 1:3:2:1 | The series of 1 or more Td/Tdap vaccinations, 3 or more Hep B vaccinations (or 2 or more Hep B 1.0 ml Recombivax vaccinations), 2 or more MMR vaccinations, and 1 or more VAR vaccinations (or a history of chicken pox disease) |
| 1:3:2:1:2 | The series of 1 or more Td/Tdap vaccinations, 3 or more Hep B vaccinations (or 2 or more Hep B 1.0 ml Recombivax vaccinations), 2 or more MMR vaccinations, 1 or more MEN vaccinations, and 2 or more VAR vaccinations (or a history of chicken pox disease) |
| 1:1:3 | The series of 1 or more Tdap vaccinations at or after age 10 years, 1 or more MenACWY vaccinations and 3 or more HPV vaccinations prior to age 13 years. |
| AAPOR | American Association for Public Opinion Research |
| ACS | American Community Survey |
| APCN | Active Personal Cellular Phone Number |
| CASRO | Council of American Survey Research Organizations |
| CATI | Computer-assisted telephone interviewing |
| CDC | Centers for Disease Control and Prevention |
| CII | Childhood Immunization Initiative |
| COV | COVID-19 |
| CPS | Current Population Survey |
| DHHS | U.S. Department of Health and Human Services |
| DOB | Date of birth |
| FLU | Seasonal influenza vaccine |
| H1N1 | Monovalent 2009 H1N1 Influenza Vaccine |
| Hep A | Hepatitis A vaccine |
| Hep B | Hepatitis B vaccine |
| HIM | Health insurance module |
| HPV | Human papillomavirus |
| IAP | Immunization Action Plan |
| IHQ | Immunization history questionnaire |
| MCV | Measles-containing vaccine |
| MenACWY | Quadrivalent meningococcal conjugate vaccine |

| | |
|---|---|
| MenB | Serogroup B meningococcal vaccine |
| MPSV4 | Quadrivalent meningococcal polysaccharide vaccine |
| MEN | Meningococcal vaccine |
| MMR | Measles, mumps, and rubella vaccine |
| MSA | Metropolitan Statistical Area |
| NCHS | National Center for Health Statistics |
| NCIRD | National Center for Immunization and Respiratory Diseases |
| NIPRCS | National Immunization Provider Record Check Study |
| NIS | National Immunization Survey |
| NIS-Child | National Immunization Survey - Child |
| NIS-Teen | National Immunization Survey - Teen |
| NHIS | National Health Interview Survey |
| NIP | National Immunization Program |
| PRC | Provider Record Check |
| PUF | Public-use data file |
| PUMS | Public-Use Microdata Sample |
| RDD | Random digit dialing |
| SC | Shot card |
| Td | Tetanus and diphtheria toxoids adsorbed |
| Tdap | Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine, adsorbed |
| UTD | Up-to-date |
| WRN | Working Residential Number |
| VFC | Vaccines for Children program |
| VAR | Varicella vaccine |

# Appendix B: Summary Statistics for Sampling Weights by Estimation Area

**Table B.1: Distribution of Sampling Weights* for Teens with Completed Household Interviews, National Immunization Survey - Teen, 2023**

| State/Estimation Area | n | Sum[§] | Minimum | Maximum | Mean | Coefficient of Variation |
|---|---|---|---|---|---|---|
| U.S. National[†] | 41,194 | 21,553,315.94 | 4.40 | 10,291.20 | 523.21 | 163.25 |
| Alabama | 805 | 329,996.62 | 20.02 | 1,401.79 | 409.93 | 66.66 |
| Alaska | 562 | 48,731.15 | 7.04 | 282.91 | 86.71 | 72.85 |
| Arizona | 836 | 486,181.50 | 5.65 | 1,867.27 | 581.56 | 74.74 |
| Arkansas | 756 | 207,115.21 | 12.27 | 843.66 | 273.96 | 77.19 |
| California | 912 | 2,536,255.14 | 11.33 | 10,291.20 | 2,780.98 | 84.74 |
| Colorado | 813 | 366,676.27 | 9.34 | 1,310.67 | 451.02 | 62.09 |
| Connecticut | 362 | 224,181.35 | 10.64 | 1,916.08 | 619.29 | 75.59 |
| Delaware | 770 | 61,232.03 | 18.85 | 235.63 | 79.52 | 58.57 |
| District of Columbia | 847 | 29,453.24 | 4.51 | 108.42 | 34.77 | 86.17 |
| Florida | 776 | 1,288,105.41 | 5.52 | 6,573.44 | 1,659.93 | 100.46 |
| Georgia | 555 | 764,424.26 | 9.02 | 5,590.36 | 1,377.34 | 97.36 |
| Hawaii | 768 | 81,017.23 | 22.42 | 296.11 | 105.49 | 58.41 |
| Idaho | 607 | 144,734.72 | 5.95 | 798.72 | 238.44 | 70.02 |
| Illinois | 1,734 | 817,828.98 | 13.80 | 1,678.92 | 471.64 | 72.33 |
| IL-City of Chicago | 556 | 149,159.61 | 15.36 | 835.81 | 268.27 | 70.54 |
| IL-Rest of State | 1,178 | 668,669.37 | 13.80 | 1,678.92 | 567.63 | 62.46 |
| Indiana | 741 | 463,418.38 | 24.04 | 1,946.35 | 625.40 | 70.21 |
| Iowa | 578 | 215,260.48 | 16.31 | 1,218.68 | 372.42 | 69.67 |
| Kansas | 728 | 206,882.96 | 4.40 | 988.15 | 284.18 | 83.56 |
| Kentucky | 726 | 294,250.39 | 7.10 | 1,359.55 | 405.30 | 69.84 |
| Louisiana | 918 | 309,595.90 | 11.83 | 1,076.33 | 337.25 | 76.52 |
| Maine | 759 | 76,145.38 | 8.46 | 275.24 | 100.32 | 55.37 |
| Maryland | 1,168 | 395,920.01 | 5.48 | 1,556.38 | 338.97 | 113.98 |
| Massachusetts | 730 | 400,148.18 | 16.73 | 1,599.73 | 548.15 | 67.53 |
| Michigan | 541 | 628,360.95 | 6.33 | 3,751.10 | 1,161.48 | 75.91 |
| Minnesota | 813 | 381,839.11 | 9.13 | 1,417.66 | 469.67 | 69.75 |
| Mississippi | 637 | 206,067.02 | 20.76 | 992.41 | 323.50 | 71.92 |
| Missouri | 606 | 405,863.13 | 12.41 | 2,004.05 | 669.74 | 73.91 |
| Montana | 790 | 70,257.73 | 7.39 | 258.71 | 88.93 | 63.03 |
| Nebraska | 612 | 139,390.48 | 19.02 | 662.70 | 227.76 | 60.39 |
| Nevada | 871 | 207,526.50 | 5.74 | 772.86 | 238.26 | 82.33 |
| New Hampshire | 667 | 78,229.52 | 20.16 | 329.09 | 117.29 | 60.36 |
| New Jersey | 884 | 590,855.00 | 13.95 | 1,984.64 | 668.39 | 64.72 |
| New Mexico | 697 | 142,737.96 | 11.78 | 693.01 | 204.79 | 70.78 |
| New York | 1,430 | 1,132,010.83 | 7.00 | 2,526.99 | 791.62 | 69.83 |
| NY-City of New York | 593 | 455,339.90 | 7.00 | 2,372.15 | 767.86 | 76.29 |
| NY-Rest of State | 837 | 676,670.93 | 15.78 | 2,526.99 | 808.45 | 65.29 |
| North Carolina | 863 | 690,559.60 | 16.70 | 2,737.66 | 800.18 | 82.84 |
| North Dakota | 590 | 49,802.82 | 11.48 | 267.75 | 84.41 | 71.86 |
| Ohio | 675 | 755,166.64 | 9.72 | 3,819.40 | 1,118.77 | 73.46 |
| Oklahoma | 720 | 282,746.48 | 15.86 | 1,246.72 | 392.70 | 69.81 |
| Oregon | 682 | 252,234.68 | 7.62 | 1,072.71 | 369.85 | 62.62 |
| Pennsylvania | 1,975 | 781,128.03 | 9.42 | 3,912.95 | 395.51 | 167.68 |
| PA-Philadelphia County | 1,152 | 92,462.80 | 16.12 | 260.49 | 80.26 | 68.73 |
| PA-Rest of State | 823 | 688,665.23 | 9.42 | 3,912.95 | 836.77 | 101.24 |

| State/Estimation Area | n | Sum§ | Minimum | Maximum | Mean | Coefficient of Variation |
|---|---|---|---|---|---|---|
| Rhode Island | 453 | 60,997.22 | 7.79 | 489.89 | 134.65 | 91.37 |
| South Carolina | 845 | 341,419.98 | 6.70 | 1,144.43 | 404.05 | 65.18 |
| South Dakota | 645 | 63,054.49 | 8.92 | 290.12 | 97.76 | 58.58 |
| Tennessee | 540 | 456,535.53 | 4.70 | 3,014.64 | 845.44 | 89.87 |
| Texas | 2,496 | 2,218,821.52 | 10.27 | 8,397.42 | 888.95 | 184.28 |
| TX-Bexar County | 786 | 149,567.84 | 11.76 | 590.73 | 190.29 | 67.90 |
| TX-City of Houston | 629 | 138,066.16 | 28.66 | 664.51 | 219.50 | 73.54 |
| TX-Rest of State | 1,081 | 1,931,187.53 | 10.27 | 8,397.42 | 1,786.48 | 121.99 |
| Utah | 486 | 282,737.22 | 11.16 | 1,789.86 | 581.76 | 76.54 |
| Vermont | 414 | 35,945.61 | 4.45 | 276.86 | 86.83 | 76.54 |
| Virginia | 842 | 547,970.95 | 9.21 | 3,355.38 | 650.80 | 119.41 |
| Washington | 521 | 477,530.97 | 5.02 | 3,284.20 | 916.57 | 78.72 |
| West Virginia | 750 | 106,216.44 | 23.26 | 401.70 | 141.62 | 54.14 |
| Wisconsin | 958 | 379,711.54 | 13.45 | 1,250.41 | 396.36 | 71.46 |
| Wyoming | 740 | 40,043.25 | 4.87 | 170.91 | 54.11 | 70.74 |
| Puerto Rico | 1,726 | 178,027.05 | 2.98 | 353.05 | 103.14 | 89.94 |
| U.S. Virgin Islands | 332 | 7,320.00 | 1.69 | 85.79 | 22.05 | 101.61 |
| Guam | 383 | 15,120.00 | 7.82 | 118.34 | 39.48 | 69.99 |

*Distribution of RDDWT_C_TERR.

† Excludes U.S. territories.

§ The sum of the weights is an estimate of the total number of adolescents age 13-17 in the population.

**Table B.2: Distribution of Sampling Weights* for Teens with Adequate Provider Data, National Immunization Survey - Teen, 2023**

| State/Estimation Area | n | Sum[§] | Minimum | Maximum | Mean | Coefficient of Variation |
|---|---|---|---|---|---|---|
| U.S. National[†] | 16,568 | 21,553,315.94 | 6.45 | 35,443.62 | 1,300.90 | 181.91 |
| Alabama | 335 | 329,996.62 | 49.76 | 3,043.03 | 985.06 | 64.74 |
| Alaska | 249 | 48,731.15 | 26.17 | 676.45 | 195.71 | 71.49 |
| Arizona | 303 | 486,181.50 | 77.97 | 5,613.47 | 1,604.56 | 77.09 |
| Arkansas | 333 | 207,115.21 | 53.58 | 1,971.19 | 621.97 | 78.53 |
| California | 266 | 2,536,255.14 | 18.36 | 35,443.62 | 9,534.79 | 89.53 |
| Colorado | 332 | 366,676.27 | 20.41 | 3,389.77 | 1,104.45 | 70.39 |
| Connecticut | 155 | 224,181.35 | 76.76 | 4,990.61 | 1,446.33 | 75.93 |
| Delaware | 293 | 61,232.03 | 44.72 | 633.21 | 208.98 | 65.59 |
| District of Columbia | 301 | 29,453.24 | 8.00 | 380.61 | 97.85 | 107.62 |
| Florida | 283 | 1,288,105.41 | 16.05 | 19,367.02 | 4,551.61 | 99.57 |
| Georgia | 212 | 764,424.26 | 22.53 | 13,731.61 | 3,605.77 | 99.89 |
| Hawaii | 278 | 81,017.23 | 55.04 | 916.56 | 291.43 | 57.80 |
| Idaho | 275 | 144,734.72 | 14.97 | 1,779.92 | 526.31 | 76.73 |
| Illinois | 664 | 817,828.98 | 66.06 | 4,681.65 | 1,231.67 | 77.83 |
| IL-City of Chicago | 204 | 149,159.61 | 76.78 | 2,592.85 | 731.17 | 84.52 |
| IL-Rest of State | 460 | 668,669.37 | 66.06 | 4,681.65 | 1,453.63 | 68.72 |
| Indiana | 298 | 463,418.38 | 259.58 | 5,106.14 | 1,555.10 | 79.77 |
| Iowa | 248 | 215,260.48 | 54.33 | 2,933.85 | 867.99 | 73.52 |
| Kansas | 373 | 206,882.96 | 8.48 | 1,851.69 | 554.65 | 82.19 |
| Kentucky | 297 | 294,250.39 | 21.67 | 3,340.98 | 990.74 | 78.38 |
| Louisiana | 329 | 309,595.90 | 34.67 | 3,563.16 | 941.02 | 87.32 |
| Maine | 322 | 76,145.38 | 71.42 | 649.30 | 236.48 | 52.77 |
| Maryland | 476 | 395,920.01 | 13.26 | 3,751.25 | 831.76 | 111.92 |
| Massachusetts | 330 | 400,148.18 | 28.66 | 3,793.59 | 1,212.57 | 69.43 |
| Michigan | 249 | 628,360.95 | 101.10 | 8,948.54 | 2,523.54 | 86.23 |
| Minnesota | 325 | 381,839.11 | 30.80 | 3,781.49 | 1,174.89 | 67.62 |
| Mississippi | 243 | 206,067.02 | 51.58 | 2,768.20 | 848.01 | 71.70 |
| Missouri | 246 | 405,863.13 | 28.61 | 5,551.42 | 1,649.85 | 81.23 |
| Montana | 345 | 70,257.73 | 17.39 | 620.38 | 203.65 | 70.50 |
| Nebraska | 272 | 139,390.48 | 52.03 | 1,624.95 | 512.46 | 70.09 |
| Nevada | 325 | 207,526.50 | 35.15 | 2,423.81 | 638.54 | 87.83 |
| New Hampshire | 273 | 78,229.52 | 65.38 | 811.75 | 286.56 | 59.00 |
| New Jersey | 334 | 590,855.00 | 48.74 | 5,233.63 | 1,769.03 | 68.10 |
| New Mexico | 271 | 142,737.96 | 23.02 | 1,757.96 | 526.71 | 72.87 |
| New York | 559 | 1,132,010.83 | 23.05 | 6,904.43 | 2,025.06 | 74.21 |
| NY-City of New York | 228 | 455,339.90 | 23.05 | 6,904.43 | 1,997.10 | 84.08 |
| NY-Rest of State | 331 | 676,670.93 | 36.27 | 6,280.66 | 2,044.32 | 67.04 |
| North Carolina | 333 | 690,559.60 | 25.54 | 7,590.09 | 2,073.75 | 104.32 |
| North Dakota | 262 | 49,802.82 | 30.92 | 629.88 | 190.09 | 75.13 |
| Ohio | 280 | 755,166.64 | 96.33 | 9,768.94 | 2,697.02 | 80.18 |
| Oklahoma | 281 | 282,746.48 | 68.74 | 3,303.83 | 1,006.22 | 71.29 |
| Oregon | 300 | 252,234.68 | 26.20 | 2,790.92 | 840.78 | 65.71 |
| Pennsylvania | 786 | 781,128.03 | 32.76 | 9,476.92 | 993.80 | 166.64 |
| PA-Philadelphia County | 467 | 92,462.80 | 32.76 | 638.62 | 197.99 | 75.13 |
| PA-Rest of State | 319 | 688,665.23 | 33.39 | 9,476.92 | 2,158.83 | 97.67 |
| Rhode Island | 201 | 60,997.22 | 23.51 | 1,172.28 | 303.47 | 93.53 |
| South Carolina | 306 | 341,419.98 | 17.90 | 3,736.60 | 1,115.75 | 69.85 |
| South Dakota | 275 | 63,054.49 | 14.00 | 737.01 | 229.29 | 71.60 |
| Tennessee | 248 | 456,535.53 | 7.91 | 7,158.92 | 1,840.87 | 93.57 |
| Texas | 872 | 2,218,821.52 | 17.42 | 22,807.11 | 2,544.52 | 178.55 |

| State/Estimation Area | n | Sum§ | Minimum | Maximum | Mean | Coefficient of Variation |
|---|---|---|---|---|---|---|
| TX-Bexar County | 278 | 149,567.84 | 92.93 | 1,828.65 | 538.01 | 73.61 |
| TX-City of Houston | 214 | 138,066.16 | 49.67 | 2,135.02 | 645.17 | 72.35 |
| TX-Rest of State | 380 | 1,931,187.53 | 17.42 | 22,807.11 | 5,082.07 | 117.66 |
| Utah | 214 | 282,737.22 | 15.46 | 4,701.24 | 1,321.20 | 83.41 |
| Vermont | 223 | 35,945.61 | 6.45 | 589.33 | 161.19 | 79.08 |
| Virginia | 319 | 547,970.95 | 21.71 | 9,179.72 | 1,717.78 | 119.03 |
| Washington | 236 | 477,530.97 | 19.22 | 6,938.47 | 2,023.44 | 76.05 |
| West Virginia | 298 | 106,216.44 | 103.94 | 968.09 | 356.43 | 52.11 |
| Wisconsin | 426 | 379,711.54 | 72.60 | 2,727.16 | 891.34 | 74.96 |
| Wyoming | 314 | 40,043.25 | 7.45 | 440.88 | 127.53 | 74.15 |
| Puerto Rico | 453 | 178,027.05 | 14.88 | 1,309.52 | 393.00 | 94.52 |
| U.S. Virgin Islands | 89 | 7,320.00 | 2.34 | 309.65 | 82.25 | 100.03 |
| Guam | 131 | 15,120.00 | 16.22 | 395.95 | 115.42 | 85.92 |

* Distribution of PROVWT_C_TERR.

† Excludes U.S. territories.

§ The sum of the weights is an estimate of the total number of adolescents age 13-17 in the population.

# Appendix C: Summary Tables

**Table C.1: Estimated Population Totals and Sample Sizes of Teens Aged 13-17 Years by State and Estimation Area, National Immunization Survey - Teen, 2023**

| State/Estimation Area | Estimation Area Number (ESTIAPT23) | Estimated Population Total of Teens | Number of Teens with Complete Household Interviews | Number of Teens with Adequate Provider Data | Percent of Teens with Adequate Provider Data |
|---|---|---|---|---|---|
| U.S. National* | | 21,553,316 | 41,194 | 16,568 | 40.2 |
| Alabama | 20 | 329,997 | 805 | 335 | 41.6 |
| Alaska | 74 | 48,731 | 562 | 249 | 44.3 |
| Arizona | 66 | 486,181 | 836 | 303 | 36.2 |
| Arkansas | 46 | 207,115 | 756 | 333 | 44.0 |
| California | 68 | 2,536,255 | 912 | 266 | 29.2 |
| Colorado | 60 | 366,676 | 813 | 332 | 40.8 |
| Connecticut | 1 | 224,181 | 362 | 155 | 42.8 |
| Delaware | 13 | 61,232 | 770 | 293 | 38.1 |
| District of Columbia | 12 | 29,453 | 847 | 301 | 35.5 |
| Florida | 22 | 1,288,105 | 776 | 283 | 36.5 |
| Georgia | 25 | 764,424 | 555 | 212 | 38.2 |
| Hawaii | 72 | 81,017 | 768 | 278 | 36.2 |
| Idaho | 75 | 144,735 | 607 | 275 | 45.3 |
| Illinois | | 817,829 | 1,734 | 664 | 38.3 |
| IL-City of Chicago | 35 | 149,160 | 556 | 204 | 36.7 |
| IL-Rest of State | 34 | 668,669 | 1,178 | 460 | 39.0 |
| Indiana | 36 | 463,418 | 741 | 298 | 40.2 |
| Iowa | 56 | 215,260 | 578 | 248 | 42.9 |
| Kansas | 57 | 206,883 | 728 | 373 | 51.2 |
| Kentucky | 27 | 294,250 | 726 | 297 | 40.9 |
| Louisiana | 47 | 309,596 | 918 | 329 | 35.8 |
| Maine | 4 | 76,145 | 759 | 322 | 42.4 |
| Maryland | 14 | 395,920 | 1,168 | 476 | 40.8 |
| Massachusetts | 2 | 400,148 | 730 | 330 | 45.2 |
| Michigan | 38 | 628,361 | 541 | 249 | 46.0 |
| Minnesota | 40 | 381,839 | 813 | 325 | 40.0 |
| Mississippi | 28 | 206,067 | 637 | 243 | 38.1 |
| Missouri | 58 | 405,863 | 606 | 246 | 40.6 |
| Montana | 61 | 70,258 | 790 | 345 | 43.7 |
| Nebraska | 59 | 139,390 | 612 | 272 | 44.4 |
| Nevada | 73 | 207,527 | 871 | 325 | 37.3 |
| New Hampshire | 5 | 78,230 | 667 | 273 | 40.9 |
| New Jersey | 8 | 590,855 | 884 | 334 | 37.8 |
| New Mexico | 49 | 142,738 | 697 | 271 | 38.9 |
| New York | | 1,132,011 | 1,430 | 559 | 39.1 |
| NY-City of New York | 11 | 455,340 | 593 | 228 | 38.4 |
| NY-Rest of State | 10 | 676,671 | 837 | 331 | 39.5 |
| North Carolina | 29 | 690,560 | 863 | 333 | 38.6 |
| North Dakota | 62 | 49,803 | 590 | 262 | 44.4 |
| Ohio | 41 | 755,167 | 675 | 280 | 41.5 |
| Oklahoma | 50 | 282,746 | 720 | 281 | 39.0 |
| Oregon | 76 | 252,235 | 682 | 300 | 44.0 |
| Pennsylvania | | 781,128 | 1,975 | 786 | 39.8 |
| PA-Philadelphia County | 17 | 92,463 | 1,152 | 467 | 40.5 |

| State/Estimation Area | Estimation Area Number (ESTIAPT23) | Estimated Population Total of Teens | Number of Teens with Complete Household Interviews | Number of Teens with Adequate Provider Data | Percent of Teens with Adequate Provider Data |
|---|---|---|---|---|---|
| PA-Rest of State | 16 | 688,665 | 823 | 319 | 38.8 |
| Rhode Island | 6 | 60,997 | 453 | 201 | 44.4 |
| South Carolina | 30 | 341,420 | 845 | 306 | 36.2 |
| South Dakota | 63 | 63,054 | 645 | 275 | 42.6 |
| Tennessee | 31 | 456,536 | 540 | 248 | 45.9 |
| Texas | | 2,218,822 | 2,496 | 872 | 34.9 |
| TX-Bexar County | 55 | 149,568 | 786 | 278 | 35.4 |
| TX-City of Houston | 54 | 138,066 | 629 | 214 | 34.0 |
| TX-Rest of State | 51 | 1,931,188 | 1,081 | 380 | 35.2 |
| Utah | 64 | 282,737 | 486 | 214 | 44.0 |
| Vermont | 7 | 35,946 | 414 | 223 | 53.9 |
| Virginia | 18 | 547,971 | 842 | 319 | 37.9 |
| Washington | 77 | 477,531 | 521 | 236 | 45.3 |
| West Virginia | 19 | 106,216 | 750 | 298 | 39.7 |
| Wisconsin | 44 | 379,712 | 958 | 426 | 44.5 |
| Wyoming | 65 | 40,043 | 740 | 314 | 42.4 |
| Puerto Rico | 106 | 178,027 | 1,726 | 453 | 26.2 |

* Excludes U.S. territories.

**Table C.2: Estimated Population Totals and Sample Sizes by Age of Teen by Maternal Education, National Immunization Survey - Teen, 2023**

| Age of Teen in Years | Maternal Education | Teens with Completed Household Interviews* Unweighted Completes | Teens with Completed Household Interviews* Weighted Completes† | Teens with Adequate Provider Data* Unweighted Completes | Teens with Adequate Provider Data* Weighted Completes§ |
|---|---|---|---|---|---|
| 13 | <12 Years | 489 | 486,307 | 208 | 458,879 |
| 13 | 12 Years | 1,341 | 838,976 | 545 | 949,642 |
| 13 | >12, Non College Graduate | 1,848 | 869,619 | 779 | 863,865 |
| 13 | College Grad | 4,132 | 1,829,574 | 1,763 | 1,841,061 |
| 14 | <12 Years | 552 | 547,652 | 231 | 567,601 |
| 14 | 12 Years | 1,417 | 925,754 | 538 | 916,019 |
| 14 | >12, Non College Graduate | 2,022 | 985,747 | 806 | 947,296 |
| 14 | College Grad | 4,268 | 1,936,655 | 1,801 | 1,875,921 |
| 15 | <12 Years | 530 | 559,412 | 211 | 496,174 |
| 15 | 12 Years | 1,459 | 963,091 | 536 | 909,260 |
| 15 | >12, Non College Graduate | 2,032 | 999,077 | 814 | 1,057,840 |
| 15 | College Grad | 4,375 | 1,971,348 | 1,782 | 2,038,247 |
| 16 | <12 Years | 561 | 472,480 | 228 | 495,556 |
| 16 | 12 Years | 1,386 | 871,832 | 504 | 857,774 |
| 16 | >12, Non College Graduate | 2,207 | 1,006,265 | 869 | 1,037,657 |
| 16 | College Grad | 4,353 | 1,968,071 | 1,781 | 1,987,089 |
| 17 | <12 Years | 507 | 443,611 | 190 | 428,535 |
| 17 | 12 Years | 1,357 | 841,018 | 481 | 870,693 |
| 17 | >12, Non College Graduate | 2,130 | 1,007,833 | 832 | 1,010,074 |
| 17 | College Grad | 4,228 | 2,028,993 | 1,669 | 1,944,131 |
| Total | | 41,194 | 21,553,316 | 16,568 | 21,553,316 |

* Excludes U.S. territories.

† Weighted by single-frame cellular phone weight RDDWT_C.

§ Weighted by single-frame cellular phone weight PROVWT_C.

**Table C.3: Estimated Population Totals and Sample Sizes by Age of Teen by Poverty Status, National Immunization Survey - Teen, 2023**

| Age of Teen in Years | Poverty Status | Teens with Completed Household Interviews* Unweighted Completes | Teens with Completed Household Interviews* Weighted Completes† | Teens with Adequate Provider Data* Unweighted Completes | Teens with Adequate Provider Data* Weighted Completes§ |
|---|---|---|---|---|---|
| 13 | Above poverty, > $75K | 4,400 | 1,980,699 | 1,914 | 2,008,267 |
| 13 | Above poverty, <= $75K | 1,919 | 1,046,578 | 851 | 1,101,466 |
| 13 | Below poverty | 985 | 679,591 | 451 | 742,965 |
| 13 | Unknown | 506 | 317,608 | 79 | 260,749 |
| 14 | Above poverty, > $75K | 4,674 | 2,130,332 | 1,952 | 2,049,089 |
| 14 | Above poverty, <= $75K | 2,041 | 1,184,080 | 859 | 1,247,410 |
| 14 | Below poverty | 1,060 | 783,187 | 472 | 773,732 |
| 14 | Unknown | 484 | 298,210 | 93 | 236,606 |
| 15 | Above poverty, > $75K | 4,786 | 2,164,562 | 2,010 | 2,330,462 |
| 15 | Above poverty, <= $75K | 2,078 | 1,171,995 | 813 | 1,112,575 |
| 15 | Below poverty | 1,008 | 794,564 | 408 | 690,849 |
| 15 | Unknown | 524 | 361,807 | 112 | 367,636 |
| 16 | Above poverty, > $75K | 4,924 | 2,232,993 | 2,012 | 2,254,923 |
| 16 | Above poverty, <= $75K | 2,026 | 1,121,588 | 834 | 1,230,482 |
| 16 | Below poverty | 977 | 634,729 | 442 | 668,826 |
| 16 | Unknown | 580 | 329,339 | 94 | 223,845 |
| 17 | Above poverty, > $75K | 4,700 | 2,225,645 | 1,880 | 2,175,492 |
| 17 | Above poverty, <= $75K | 2,051 | 1,141,249 | 776 | 1,144,143 |
| 17 | Below poverty | 924 | 634,096 | 410 | 687,019 |
| 17 | Unknown | 547 | 320,466 | 106 | 246,779 |
| Total | | 41,194 | 21,553,316 | 16,568 | 21,553,316 |

* Excludes U.S. territories.

† Weighted by single-frame cellular phone weight RDDWT_C.

§ Weighted by single-frame cellular phone weight PROVWT_C.

**Table C.4: Estimated Population Totals and Sample Sizes by Race/Ethnicity by Poverty Status, National Immunization Survey - Teen, 2023**

| Race/Ethnicity of Teen† | Poverty Status | Teens with Completed Household Interviews* Unweighted Completes | Teens with Completed Household Interviews* Weighted Completes† | Teens with Adequate Provider Data* Unweighted Completes | Teens with Adequate Provider Data* Weighted Completes§ |
|---|---|---|---|---|---|
| Hispanic | Above poverty, > $75K | 2,894 | 1,834,490 | 1,075 | 1,825,684 |
| Hispanic | Above poverty, <= $75K | 2,162 | 1,647,303 | 887 | 1,744,554 |
| Hispanic | Below poverty | 1,796 | 1,565,911 | 756 | 1,527,334 |
| Hispanic | Unknown | 642 | 557,666 | 138 | 509,552 |
| Non-Hispanic White Only | Above poverty, > $75K | 15,849 | 6,591,845 | 6,866 | 6,555,324 |
| Non-Hispanic White Only | Above poverty, <= $75K | 5,138 | 2,405,813 | 2,144 | 2,425,305 |
| Non-Hispanic White Only | Below poverty | 1,636 | 911,834 | 785 | 974,575 |
| Non-Hispanic White Only | Unknown | 1,354 | 690,597 | 242 | 521,018 |
| Non-Hispanic Black Only | Above poverty, > $75K | 1,730 | 1,058,371 | 610 | 1,095,479 |
| Non-Hispanic Black Only | Above poverty, <= $75K | 1,484 | 982,874 | 563 | 985,852 |
| Non-Hispanic Black Only | Below poverty | 874 | 711,322 | 348 | 692,336 |
| Non-Hispanic Black Only | Unknown | 285 | 202,908 | 40 | 138,978 |
| Non-Hispanic Other & Multiple Race | Above poverty, > $75K | 3,011 | 1,249,525 | 1,217 | 1,341,746 |
| Non-Hispanic Other & Multiple Race | Above poverty, <= $75K | 1,331 | 629,500 | 539 | 680,365 |
| Non-Hispanic Other & Multiple Race | Below poverty | 648 | 337,098 | 294 | 369,147 |
| Non-Hispanic Other & Multiple Race | Unknown | 360 | 176,260 | 64 | 166,067 |
| Total | | 41,194 | 21,553,316 | 16,568 | 21,553,316 |

* Excludes U.S. territories.

† Race/ethnicity is respondent-reported and the categories presented here are mutually exclusive.

§ Weighted by single-frame cellular phone weight RDDWT_C.

¶ Weighted by single-frame cellular phone weight PROVWT_C.

**Table C.5: Estimated Population Totals and Sample Sizes by Age of Teen by Race/Ethnicity, National Immunization Survey - Teen, 2023**

| Age of Teen in Years | Race/Ethnicity of Teen† | Teens with Completed Household Interviews* Unweighted Completes | Teens with Completed Household Interviews* Weighted Completes† | Teens with Adequate Provider Data* Unweighted Completes | Teens with Adequate Provider Data* Weighted Completes§ |
|---|---|---|---|---|---|
| 13 | Hispanic | 1,375 | 1,012,458 | 543 | 1,053,631 |
| 13 | Non-Hispanic White Only | 4,521 | 1,956,142 | 1,994 | 2,016,177 |
| 13 | Non-Hispanic Black Only | 855 | 595,151 | 317 | 570,315 |
| 13 | Non-Hispanic Other & Multiple Races | 1,059 | 460,724 | 441 | 473,324 |
| 14 | Hispanic | 1,595 | 1,224,996 | 634 | 1,264,359 |
| 14 | Non-Hispanic White Only | 4,710 | 2,112,845 | 1,998 | 2,007,604 |
| 14 | Non-Hispanic Black Only | 840 | 565,683 | 305 | 530,076 |
| 14 | Non-Hispanic Other & Multiple Races | 1,114 | 492,285 | 439 | 504,798 |
| 15 | Hispanic | 1,565 | 1,250,121 | 586 | 1,227,863 |
| 15 | Non-Hispanic White Only | 4,848 | 2,173,648 | 2,057 | 2,202,139 |
| 15 | Non-Hispanic Black Only | 908 | 609,068 | 308 | 627,179 |
| 15 | Non-Hispanic Other & Multiple Races | 1,075 | 460,091 | 392 | 444,340 |
| 16 | Hispanic | 1,527 | 1,098,991 | 579 | 1,086,125 |
| 16 | Non-Hispanic White Only | 5,032 | 2,181,940 | 2,036 | 2,157,151 |
| 16 | Non-Hispanic Black Only | 898 | 576,026 | 322 | 578,447 |
| 16 | Non-Hispanic Other & Multiple Races | 1,050 | 461,692 | 445 | 556,353 |
| 17 | Hispanic | 1,432 | 1,018,803 | 514 | 975,145 |
| 17 | Non-Hispanic White Only | 4,866 | 2,175,513 | 1,952 | 2,093,150 |
| 17 | Non-Hispanic Black Only | 872 | 609,547 | 309 | 606,630 |
| 17 | Non-Hispanic Other & Multiple Races | 1,052 | 517,592 | 397 | 578,509 |
| Total | | 41,194 | 21,553,316 | 16,568 | 21,553,316 |

* Excludes U.S. territories.

† Race/ethnicity is respondent-reported and the categories presented here are mutually exclusive.

§ Weighted by single-frame cellular phone weight RDDWT_C.

¶ Weighted by single-frame cellular phone weight PROVWT_C.

**Table C.6: Estimated Population Totals and Sample Sizes by Age and Sex of Teen, National Immunization Survey - Teen, 2023**

| Age of Teen in Years | Sex | Teens with Completed Household Interviews* Unweighted Completes | Teens with Completed Household Interviews* Weighted Completes† | Teens with Adequate Provider Data* Unweighted Completes | Teens with Adequate Provider Data* Weighted Completes§ |
|---|---|---|---|---|---|
| 13 | Male | 4,086 | 2,062,492 | 1,710 | 2,058,010 |
| 13 | Female | 3,724 | 1,961,983 | 1,585 | 2,055,436 |
| 14 | Male | 4,376 | 2,247,481 | 1,821 | 2,206,418 |
| 14 | Female | 3,883 | 2,148,327 | 1,555 | 2,100,419 |
| 15 | Male | 4,358 | 2,302,061 | 1,741 | 2,326,719 |
| 15 | Female | 4,038 | 2,190,867 | 1,602 | 2,174,803 |
| 16 | Male | 4,450 | 2,219,762 | 1,776 | 2,283,246 |
| 16 | Female | 4,057 | 2,098,887 | 1,606 | 2,094,830 |
| 17 | Male | 4,325 | 2,208,131 | 1,663 | 2,165,535 |
| 17 | Female | 3,897 | 2,113,324 | 1,509 | 2,087,899 |
| Total | | 41,194 | 21,553,316 | 16,568 | 21,553,316 |

* Excludes U.S. territories.

† Weighted by single-frame cellular phone weight RDDWT_C.

§ Weighted by single-frame cellular phone weight PROVWT_C.

**Table C.7: Estimated Vaccination Coverage*[†], With Selected Vaccines Among Adolescents Aged 13-17 Years[§], by State and Selected Area -- National Immunization Survey - Teen, United States, 2023**

| | BOTH SEXES ≥ 1 Td or Tdap[¶] | BOTH SEXES ≥ 1 Tdap** | BOTH SEXES ≥ 1 MenACWY[††] | FEMALE ≥1 dose HPV[§§] | FEMALE ≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** | MALE ≥1 dose HPV[§§] | MALE ≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** | BOTH SEXES ≥1 dose HPV[§§] | BOTH SEXES ≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** |
|---|---|---|---|---|---|---|---|---|---|
| | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) |
| US National[†††] | 90.5(±0.9) | 89.0(±1.0) | 88.4(±1.0) | 78.5(±1.8) | 64.0(±2.1) | 75.1(±2.0) | 59.0(±2.3) | 76.8(±1.4) | 61.4(±1.6) |
| Alabama | 91.6(±3.8) | 90.1(±4.1) | 86.7(±4.3) | 83.2(±6.9) | 65.7(±8.6) | 75.1(±7.7) | 55.0(±8.7) | 79.0(±5.2) | 60.3(±6.2) |
| Alaska | 82.4(±6.3) | 81.0(±6.4) | 74.9(±6.9) | 71.9(±10.4) | 57.1(±11.2) | 71.6(±9.3) | 52.0(±10.4) | 71.8(±6.9) | 54.4(±7.6) |
| Arizona | 87.8(±4.9) | 87.3(±4.9) | 89.4(±4.4) | 76.3(±8.3) | 63.6(±9.9) | 75.6(±8.4) | 62.6(±9.4) | 75.9(±5.9) | 63.1(±6.8) |
| Arkansas | 95.1(±2.9) | 92.4(±3.7) | 94.5(±3.0) | 74.4(±8.1) | 54.3(±9.8) | 75.2(±7.6) | 51.6(±9.5) | 74.8(±5.5) | 52.9(±6.8) |
| California | 88.3(±4.9) | 86.3(±5.2) | 85.0(±5.4) | 79.5(±8.2) | 64.7(±10.3) | 70.4(±10.9) | 50.8(±11.7) | 74.8(±7.0) | 57.6(±8.1) |
| Colorado | 93.5(±2.8) | 92.2(±3.1) | 89.9(±3.7) | 81.4(±7.2) | 68.8(±8.8) | 79.7(±7.3) | 68.3(±8.4) | 80.5(±5.1) | 68.5(±6.1) |
| Connecticut | 93.3(±5.4) | 93.3(±5.4) | 97.3(±3.0) | 79.3(±11.6) | 71.2(±13.4) | 84.1(±10.1) | 71.2(±12.8) | 81.7(±7.7) | 71.2(±9.3) |
| Delaware | 91.3(±4.1) | 90.6(±4.2) | 89.0(±4.6) | 85.2(±6.7) | 75.4(±7.8) | 83.7(±7.2) | 70.6(±8.9) | 84.4(±4.9) | 73.0(±6.0) |
| District of Columbia | 88.4(±4.9) | 88.0(±4.9) | 88.1(±5.1) | 84.1(±8.3) | 72.9(±10.8) | 88.2(±6.6) | 71.9(±10.3) | 86.1(±5.3) | 72.4(±7.5) |
| Florida | 90.6(±4.6) | 89.5(±4.7) | 80.8(±6.5) | 83.2(±7.4) | 76.6(±8.5) | 66.3(±11.3) | 52.7(±11.3) | 74.5(±7.2) | 64.4(±7.7) |
| Georgia | 91.1(±5.4) | 88.2(±6.0) | 91.6(±5.1) | 62.9(±13.0) | 32.1(±11.5) | 63.8(±13.2) | 48.5(±13.4) | 63.3(±9.2) | 40.5(±9.0) |
| Hawaii | 86.8(±4.4) | 86.2(±4.5) | 85.9(±4.6) | 91.7(±5.3) | 70.3(±9.2) | 83.3(±6.6) | 70.4(±8.0) | 87.4(±4.3) | 70.4(±6.1) |
| Idaho | 86.6(±5.3) | 86.6(±5.3) | 86.1(±5.5) | 70.1(±10.3) | 57.9(±10.9) | 72.9(±9.3) | 49.2(±10.2) | 71.5(±6.9) | 53.4(±7.5) |
| Illinois | 92.9(±2.3) | 92.5(±2.3) | 92.8(±2.2) | 84.5(±4.9) | 74.3(±6.0) | 76.9(±5.8) | 64.2(±6.4) | 80.6(±3.8) | 69.1(±4.5) |
| IL-City of Chicago | 88.3(±5.8) | 87.4(±5.8) | 90.0(±5.7) | 91.4(±5.8) | 78.4(±10.1) | 85.6(±9.8) | 70.9(±12.4) | 88.5(±5.7) | 74.6(±8.1) |
| IL-Rest of State | 93.9(±2.5) | 93.6(±2.5) | 93.4(±2.4) | 82.9(±5.8) | 73.4(±7.0) | 75.1(±6.7) | 62.7(±7.3) | 78.9(±4.5) | 67.9(±5.2) |
| Indiana | 97.4(±1.8) | 96.9(±2.0) | 95.4(±2.8) | 73.9(±9.9) | 55.2(±10.8) | 79.3(±8.1) | 68.1(±9.0) | 76.7(±6.4) | 61.8(±7.2) |
| Iowa | 93.5(±4.0) | 92.7(±4.1) | 92.2(±4.4) | 86.1(±7.2) | 69.8(±9.8) | 82.9(±8.2) | 66.6(±11.0) | 84.4(±5.5) | 68.2(±7.4) |
| Kansas | 89.3(±4.3) | 88.6(±4.4) | 90.7(±4.1) | 74.5(±8.5) | 59.4(±9.6) | 76.2(±7.5) | 61.3(±8.7) | 75.4(±5.7) | 60.4(±6.5) |
| Kentucky | 84.6(±5.6) | 84.0(±5.7) | 84.0(±5.7) | 69.9(±9.6) | 50.0(±10.4) | 62.2(±9.9) | 45.9(±9.9) | 66.0(±7.0) | 47.9(±7.2) |
| Louisiana | 91.5(±4.6) | 91.3(±4.6) | 89.5(±4.8) | 80.7(±7.5) | 66.8(±9.2) | 75.6(±8.8) | 65.6(±9.5) | 78.1(±5.8) | 66.2(±6.6) |
| Maine | 90.8(±3.7) | 89.7(±3.9) | 92.6(±3.5) | 73.3(±7.7) | 60.8(±8.6) | 71.9(±8.1) | 61.7(±8.6) | 72.6(±5.6) | 61.2(±6.1) |
| Maryland | 89.7(±4.6) | 88.6(±4.7) | 92.6(±3.4) | 83.7(±7.4) | 70.2(±9.0) | 78.8(±8.0) | 64.3(±9.1) | 81.2(±5.5) | 67.2(±6.4) |
| Massachusetts | 93.1(±3.8) | 91.3(±4.2) | 94.0(±3.5) | 93.8(±5.0) | 86.2(±6.4) | 85.5(±6.6) | 78.7(±7.6) | 89.6(±4.2) | 82.3(±5.1) |
| Michigan | 91.4(±4.9) | 88.8(±5.4) | 93.5(±4.2) | 86.6(±8.6) | 81.1(±9.4) | 72.9(±9.5) | 65.7(±10.5) | 79.6(±6.5) | 73.2(±7.1) |
| Minnesota | 93.7(±3.3) | 91.2(±4.1) | 91.4(±3.8) | 83.6(±7.6) | 72.3(±8.5) | 84.7(±5.9) | 66.1(±8.7) | 84.2(±4.8) | 69.2(±6.1) |

| | BOTH SEXES<br>≥ 1 Td or Tdap[¶] | BOTH SEXES<br>≥ 1 Tdap** | BOTH SEXES<br>≥ 1 MenACWY[††] | FEMALE<br>≥1 dose HPV[§§] | FEMALE<br>≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** | MALE<br>≥1 dose HPV[§§] | MALE<br>≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** | BOTH SEXES<br>≥1 dose HPV[§§] | BOTH SEXES<br>≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** |
|---|---|---|---|---|---|---|---|---|---|
| | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) |
| Mississippi | 92.6(±3.8) | 91.7(±3.9) | 62.9(±7.4) | 60.4(±10.8) | 39.3(±11.0) | 60.4(±10.3) | 37.6(±10.6) | 60.4(±7.5) | 38.4(±7.6) |
| Missouri | 88.7(±5.1) | 88.0(±5.2) | 88.0(±5.2) | 78.3(±9.6) | 60.2(±11.3) | 73.1(±10.3) | 55.2(±11.4) | 75.6(±7.1) | 57.7(±8.0) |
| Montana | 89.1(±4.0) | 88.7(±4.1) | 80.0(±5.1) | 74.0(±8.1) | 59.4(±9.3) | 77.4(±7.4) | 58.6(±8.7) | 75.7(±5.5) | 59.0(±6.4) |
| Nebraska | 93.6(±3.5) | 89.5(±4.9) | 92.2(±3.4) | 82.3(±8.0) | 67.9(±9.9) | 85.4(±7.5) | 66.9(±9.8) | 83.9(±5.4) | 67.4(±7.0) |
| Nevada | 91.6(±3.7) | 91.5(±3.7) | 84.1(±5.6) | 76.0(±7.5) | 50.7(±9.8) | 68.7(±9.8) | 46.5(±10.6) | 72.2(±6.3) | 48.5(±7.2) |
| New Hampshire | 92.3(±3.9) | 91.8(±3.9) | 93.4(±3.4) | 87.6(±7.2) | 75.1(±9.6) | 83.7(±6.3) | 66.2(±8.5) | 85.6(±4.7) | 70.6(±6.4) |
| New Jersey | 91.6(±3.6) | 90.3(±3.9) | 93.8(±3.2) | 61.9(±9.6) | 47.0(±9.8) | 69.5(±8.0) | 53.3(±8.6) | 65.8(±6.2) | 50.2(±6.5) |
| New Mexico | 91.9(±4.1) | 91.1(±4.4) | 92.8(±3.7) | 83.2(±8.0) | 56.9(±10.5) | 85.8(±7.0) | 64.7(±9.9) | 84.5(±5.3) | 60.9(±7.3) |
| New York | 93.6(±2.3) | 90.2(±2.9) | 95.3(±2.1) | 77.2(±6.4) | 69.3(±7.0) | 81.5(±5.6) | 67.8(±6.7) | 79.4(±4.3) | 68.6(±4.8) |
| NY-City of New York | 94.6(±3.1) | 91.4(±4.6) | 95.7(±3.0) | 77.9(±10.6) | 73.5(±10.9) | 86.3(±7.8) | 75.9(±10.1) | 82.2(±6.6) | 74.7(±7.4) |
| NY-Rest of State | 92.9(±3.2) | 89.4(±3.8) | 95.0(±2.8) | 76.7(±8.1) | 66.5(±9.0) | 78.2(±7.7) | 62.4(±8.9) | 77.5(±5.6) | 64.4(±6.3) |
| North Carolina | 90.3(±4.9) | 89.7(±5.0) | 91.7(±4.3) | 70.7(±10.8) | 64.4(±11.1) | 77.6(±8.6) | 62.7(±10.0) | 74.2(±6.9) | 63.5(±7.4) |
| North Dakota | 90.7(±4.6) | 90.1(±4.7) | 93.1(±3.9) | 86.4(±7.5) | 79.7(±8.6) | 81.2(±8.0) | 77.0(±8.5) | 83.7(±5.5) | 78.3(±6.0) |
| Ohio | 89.2(±4.6) | 88.0(±4.8) | 88.9(±4.9) | 79.8(±8.9) | 65.1(±10.6) | 78.7(±8.2) | 61.8(±10.1) | 79.2(±6.0) | 63.4(±7.3) |
| Oklahoma | 85.1(±4.8) | 85.0(±4.8) | 74.3(±6.1) | 71.7(±8.7) | 49.2(±10.1) | 55.9(±10.2) | 39.4(±9.9) | 63.7(±6.9) | 44.2(±7.1) |
| Oregon | 86.6(±5.0) | 85.7(±5.2) | 83.3(±5.4) | 82.3(±7.8) | 66.7(±9.4) | 82.0(±7.4) | 68.4(±8.9) | 82.1(±5.4) | 67.6(±6.5) |
| Pennsylvania | 90.0(±4.4) | 89.7(±4.5) | 92.1(±3.9) | 77.6(±7.9) | 66.9(±9.2) | 77.7(±8.4) | 64.3(±9.5) | 77.6(±5.8) | 65.6(±6.6) |
| PA-Philadelphia County | 94.2(±2.4) | 93.8(±2.5) | 95.5(±2.1) | 88.6(±5.9) | 76.1(±7.4) | 92.3(±3.7) | 80.1(±5.9) | 90.5(±3.5) | 78.1(±4.7) |
| PA-Rest of State | 89.4(±5.0) | 89.1(±5.0) | 91.7(±4.4) | 76.1(±9.0) | 65.7(±10.4) | 75.7(±9.4) | 62.2(±10.7) | 75.9(±6.5) | 63.9(±7.5) |
| Rhode Island | 96.6(±3.7) | 94.9(±4.4) | 96.4(±3.7) | 94.0(±5.4) | 87.2(±8.6) | 91.4(±7.7) | 81.4(±10.7) | 92.7(±4.7) | 84.2(±6.9) |
| South Carolina | 92.1(±4.1) | 92.1(±4.1) | 86.2(±4.7) | 77.5(±8.0) | 63.3(±9.4) | 79.8(±7.4) | 58.9(±9.4) | 78.7(±5.4) | 61.0(±6.7) |
| South Dakota | 90.1(±4.7) | 89.7(±4.7) | 91.1(±4.5) | 80.8(±9.3) | 69.0(±10.6) | 84.9(±7.3) | 75.4(±8.2) | 82.9(±5.9) | 72.3(±6.7) |
| Tennessee | 94.1(±3.4) | 92.5(±4.0) | 85.7(±5.5) | 81.5(±9.9) | 57.8(±13.0) | 74.0(±10.0) | 52.4(±11.2) | 77.7(±7.1) | 55.0(±8.6) |
| Texas | 86.1(±4.5) | 82.9(±5.2) | 85.5(±4.8) | 78.5(±7.7) | 61.2(±9.4) | 73.6(±8.6) | 53.9(±9.7) | 76.0(±5.8) | 57.5(±6.8) |
| TX-Bexar County | 86.0(±5.2) | 84.7(±5.5) | 87.4(±4.9) | 78.3(±8.8) | 62.7(±9.9) | 76.8(±8.8) | 52.6(±10.3) | 77.6(±6.2) | 57.6(±7.2) |
| TX-City of Houston | 90.6(±5.4) | 90.1(±5.4) | 91.2(±5.1) | 90.1(±7.1) | 72.5(±10.2) | 79.6(±10.2) | 68.3(±11.2) | 84.9(±6.2) | 70.5(±7.5) |
| TX-Rest of State | 85.8(±5.2) | 82.2(±5.9) | 85.0(±5.5) | 77.6(±8.9) | 60.3(±10.7) | 73.0(±9.8) | 53.0(±11.1) | 75.3(±6.6) | 56.6(±7.7) |
| Utah | 95.6(±3.0) | 94.7(±3.3) | 91.5(±5.0) | 80.1(±9.6) | 59.4(±12.8) | 77.4(±9.3) | 63.0(±10.9) | 78.7(±6.7) | 61.2(±8.4) |
| Vermont | 95.1(±3.6) | 93.4(±4.0) | 88.0(±5.7) | 80.8(±9.7) | 70.8(±10.7) | 86.2(±8.5) | 66.0(±11.2) | 83.6(±6.4) | 68.3(±7.8) |

| | BOTH SEXES<br><br>≥ 1 Td or Tdap[¶] | BOTH SEXES<br><br>≥ 1 Tdap** | BOTH SEXES<br><br>≥ 1 MenACWY[††] | FEMALE<br><br>≥1 dose HPV[§§] | FEMALE<br><br>≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** | MALE<br><br>≥1 dose HPV[§§] | MALE<br><br>≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** | BOTH SEXES<br><br>≥1 dose HPV[§§] | BOTH SEXES<br><br>≥ 3 doses HPV, or ≥ 2 doses HPV with age and interval restriction*** |
|---|---|---|---|---|---|---|---|---|---|
| | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) | % (95% CI) |
| Virginia | 94.0(±3.2) | 93.7(±3.2) | 87.5(±5.3) | 81.5(±9.3) | 59.1(±12.3) | 89.0(±6.1) | 66.4(±11.1) | 85.4(±5.6) | 62.9(±8.3) |
| Washington | 90.4(±4.3) | 90.4(±4.3) | 86.3(±5.4) | 79.5(±9.1) | 63.2(±10.8) | 84.0(±7.7) | 67.0(±10.6) | 81.8(±6.0) | 65.2(±7.6) |
| West Virginia | 91.6(±3.5) | 90.7(±3.7) | 91.8(±3.4) | 69.9(±8.5) | 54.8(±9.2) | 64.5(±8.5) | 45.0(±8.9) | 67.1(±6.0) | 49.8(±6.4) |
| Wisconsin | 92.6(±2.9) | 91.5(±3.0) | 89.8(±3.5) | 86.2(±5.4) | 74.4(±7.3) | 78.2(±6.9) | 65.7(±7.9) | 82.1(±4.5) | 69.9(±5.5) |
| Wyoming | 89.7(±4.1) | 89.1(±4.2) | 78.3(±5.5) | 73.3(±8.2) | 53.2(±9.9) | 75.1(±7.7) | 55.1(±9.5) | 74.2(±5.6) | 54.2(±6.9) |
| U.S. Virgin Islands | 90.5(±0.9) | 89.0(±1.0) | 88.4(±1.0) | 78.6(±1.7) | 64.1(±2.1) | 75.2(±2.0) | 59.1(±2.2) | 76.9(±1.3) | 61.5(±1.5) |
| Guam | 94.4(±4.3) | 90.0(±6.4) | 87.3(±9.4) | 69.2(±19.8) | 49.7(±22.1) | 68.0(±16.9) | 38.7(±19.1) | 68.6(±13.0) | 44.2(±14.8) |
| Puerto Rico | 73.0(±10.7) | 69.0(±11.0) | 67.6(±10.5) | 69.6(±15.0) | 46.2(±16.2) | 81.9(±11.4) | 57.0(±15.9) | 76.1(±9.4) | 51.9(±11.4) |

[*] Estimate presented as point estimate (%) ± 95% confidence interval (CI). Estimate=NA (Not Available) if the unweighted sample size for the denominator was <30 or (95% CI half width)/Estimate > 0.6.

[†] Estimates with 95% CI half-widths >10 may not be reliable.

[§] Adolescents in the 2023 NIS-Teen were born between January 2005 and January 2011. Vaccination coverage estimates include only adolescents who had adequate provider-reported immunization records.

[¶] ≥1 dose of tetanus toxoid-diphtheria vaccine (Td) or tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) at or after age ten years.

[**] ≥1 dose of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) at or after age ten years.

[††] ≥1 dose of quadrivalent meningococcal conjugate vaccine or meningococcal-unknown type vaccine.

[§§] ≥1 dose of human papillomavirus vaccine, either 9-valent (9vHPV), quadrivalent (4vHPV), or bivalent (2vHPV).

*** ≥3 doses of human papillomavirus vaccine, or ≥ 2 doses with the first dose before age 15 and at least 5 months minus 4 days between the first and second dose.

[†††] Excludes U.S. territories.

# Appendix D: Vaccine Type Codes

**Table D.1: Vaccine Type Codes, National Immunization Survey - Teen, 2023**

| Vaccine Code | Description |
|---|---|
| 11 | Td |
| 14 | Tdap |
| 15 | Td/Tdap-containing, unknown subtype |
| 30 | MMR-only |
| 31 | Measles-only |
| 32 | Measles-Mumps |
| 33 | Measles-Rubella |
| 43 | HepB-Hib |
| 4V | Human Papillomavirus, Gardasil (quadrivalent) |
| 61 | 0.5 ml Recombivax |
| 62 | 1.0 ml Recombivax |
| 63 | Engerix |
| 64 | Hepatitis B-only, unknown subtype checked |
| 80 | MenACWY (Menactra, Menveo) |
| 81 | MPSV4 (Menomune) |
| 82 | Meningococcal serogroup ACWY, unknown subtype |
| 9V | Human Papillomavirus, Gardasil (9-valent) |
| BB | MenB-4C |
| BT | MenB-FHbp |
| BU | Meningococcal serogroup B, unknown subtype |
| CJ | Johnson & Johnson/Janssen |
| CM | Moderna |
| CN | Novavax |
| CP | Pfizer-BioNTech |
| CX | COVID-19, unknown subtype |
| CV | Human Papillomavirus, Cervarix (bivalent) |
| FL | Seasonal Flu-containing, unknown subtype |
| FM | Seasonal Flumist |
| FN | Injected Seasonal Flu, other/unknown subtype |
| FV | Seasonal Fluvirin |
| FZ | Seasonal Fluzone |
| HA | Hepatitis A-containing, unknown subtype |
| HB | Hepatitis B-containing, unknown subtype |
| HO | Hepatitis A-only (Havrix or Vaqta) |

| Vaccine Code | Description |
|---|---|
| HP | Human Papillomavirus, unknown subtype |
| MM | Measles-containing, unknown subtype |
| VA | Varicella-containing, unknown subtype |
| VM | MMR-Varicella |
| VO | Varicella-only |
| UV | Human Papillomavirus, Gardasil (unknown valency) |

# Appendix E: Trends in the NIS-Teen Response Rates and Vaccination Coverage Rates, 2006-2023

**Table E.1: Key Indicators* from Landline Sample Household and Provider Data Collection by Survey Year, National Immunization Survey - Teen, 2006-2017†**

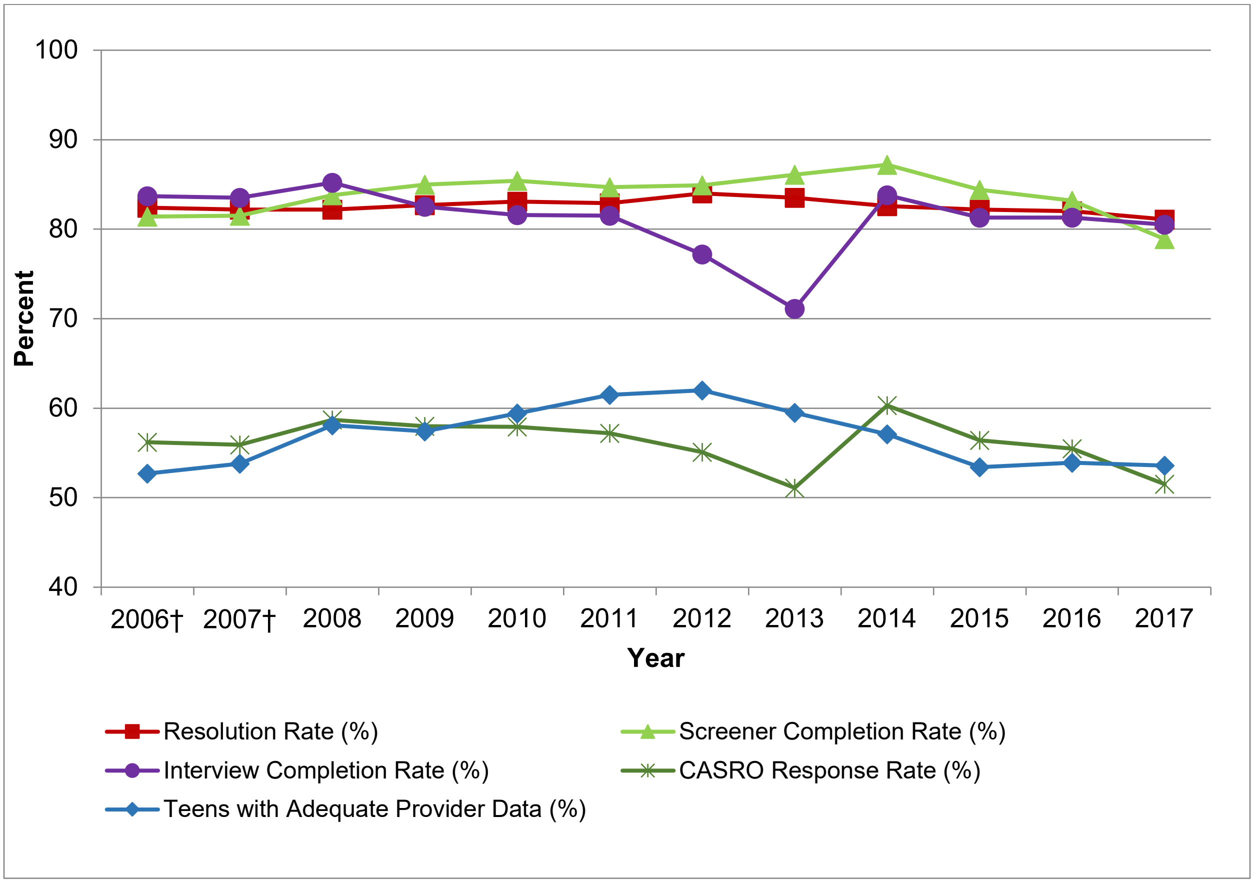
| Survey Year | Resolution Rate (%) | Screener Completion Rate (%) | Interview Completion Rate (%) | CASRO Response Rate (%) | Teens with Adequate Provider Data (%) |
|---|---|---|---|---|---|
| 2006§ | 82.4 | 81.4 | 83.7 | 56.2 | 52.7 |
| 2007§ | 82.2 | 81.5 | 83.5 | 55.9 | 53.8 |
| 2008 | 82.2 | 83.8 | 85.2 | 58.7 | 58.1 |
| 2009 | 82.7 | 85.0 | 82.5 | 58.0 | 57.4 |
| 2010 | 83.1 | 85.4 | 81.6 | 57.9 | 59.4 |
| 2011 | 82.9 | 84.7 | 81.5 | 57.2 | 61.5 |
| 2012 | 84.0 | 84.9 | 77.2 | 55.1 | 62.0 |
| 2013 | 83.5 | 86.1 | 71.1 | 51.1 | 59.5 |
| 2014 | 82.6 | 87.2 | 83.8 | 60.3 | 57.1 |
| 2015 | 82.2 | 84.4 | 81.3 | 56.4 | 53.4 |
| 2016 | 82.0 | 83.2 | 81.3 | 55.5 | 53.9 |
| 2017 | 81.1 | 78.9 | 80.5 | 51.5 | 53.6 |

* For the definitions of the key indicators see Table 1 of NIS-Teen Data User's Guides for the survey year of interest.

† Excludes U.S. territories. The landline sample was removed from the NIS sample design beginning in 2018.

§ In 2006 and 2007, NIS-Teen was conducted only in Quarter 4.

**Figure E.1: Trends in Landline Sample Key Indicators from Household and Provider Data Collection by Survey Year, National Immunization Survey - Teen, 2006-2017***




* Excludes U.S. territories. The landline sample was removed from the NIS sample design beginning in 2018.

† In 2006 and 2007, NIS-Teen was conducted only in Quarter 4.

Figure E.1 presents a graphical representation of the data contained in Table E.1. It shows how selected key indicators from landline sample household and provider data collection performed throughout the years, from 2006 to 2017. Note that these data apply to the landline sample only, which was removed from the NIS sample design beginning in 2018.

**Table E.2: Key Indicators* from Cellular Phone Sample Household and Provider Data Collection by Survey Year, National Immunization Survey - Teen, 2011-2023†**

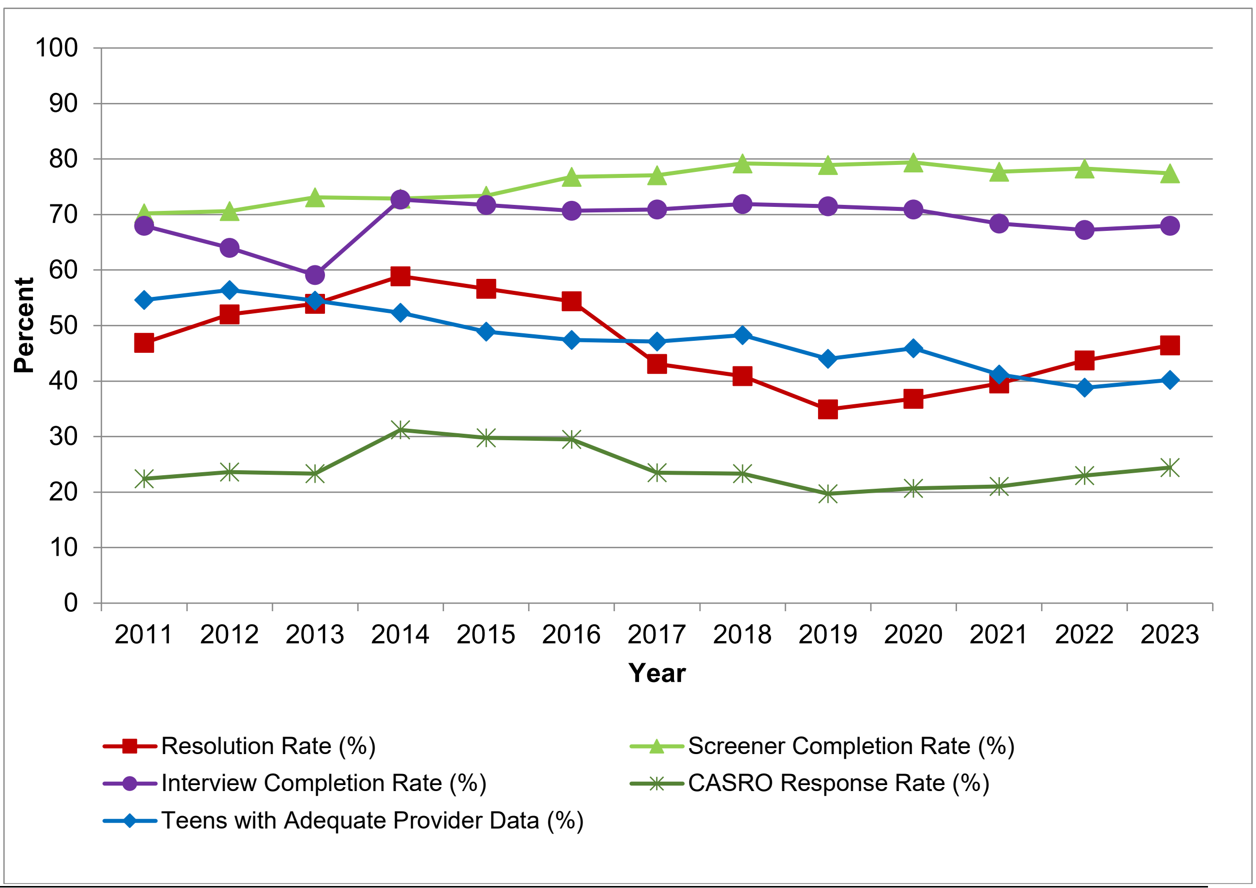
| Survey Year§ | Resolution Rate (%) | Screener Completion Rate (%) | Interview Completion Rate (%) | CASRO Response Rate (%) | Teens with Adequate Provider Data (%) |
|---|---|---|---|---|---|
| 2011 | 46.9 | 70.2 | 68.0 | 22.4 | 54.6 |
| 2012 | 52.0 | 70.6 | 64.0 | 23.6 | 56.4 |
| 2013 | 53.9 | 73.1 | 59.1 | 23.3 | 54.5 |
| 2014 | 58.9 | 72.9 | 72.7 | 31.2 | 52.3 |
| 2015 | 56.6 | 73.4 | 71.7 | 29.8 | 48.9 |
| 2016 | 54.4 | 76.8 | 70.7 | 29.5 | 47.4 |
| 2017 | 43.1 | 77.1 | 70.9 | 23.5 | 47.1 |
| 2018 | 40.9 | 79.2 | 71.9 | 23.3 | 48.3 |
| 2019 | 34.9 | 78.9 | 71.5 | 19.7 | 44.0 |
| 2020 | 36.8 | 79.4 | 70.9 | 20.7 | 45.9 |
| 2021 | 39.6 | 77.7 | 68.4 | 21.0 | 41.2 |
| 2022 | 43.7 | 78.3 | 67.2 | 23.0 | 38.8 |
| 2023 | 46.4 | 77.4 | 68.0 | 24.4 | 40.2 |

* For the definitions of the key indicators see Table 1 of NIS-Teen Data User's Guides for the survey year of interest.

† Excludes U.S. territories.

§ Cellular phone sample was added to the NIS-Teen in 2011.

**Figure E.2: Trends in Cellular Phone Sample Key Indicators from Household and Provider Data Collection by Survey Year, National Immunization Survey - Teen, 2011-2023***



* Excludes U.S. territories.

Figure E.2 presents a graphical representation of the data contained in Table E.2. It shows how selected key indicators from cellular phone sample household and provider data collection performed from 2011 to present. Note that these data apply to the cellular phone sample only. Cellular phone sample was added to the NIS in 2011.

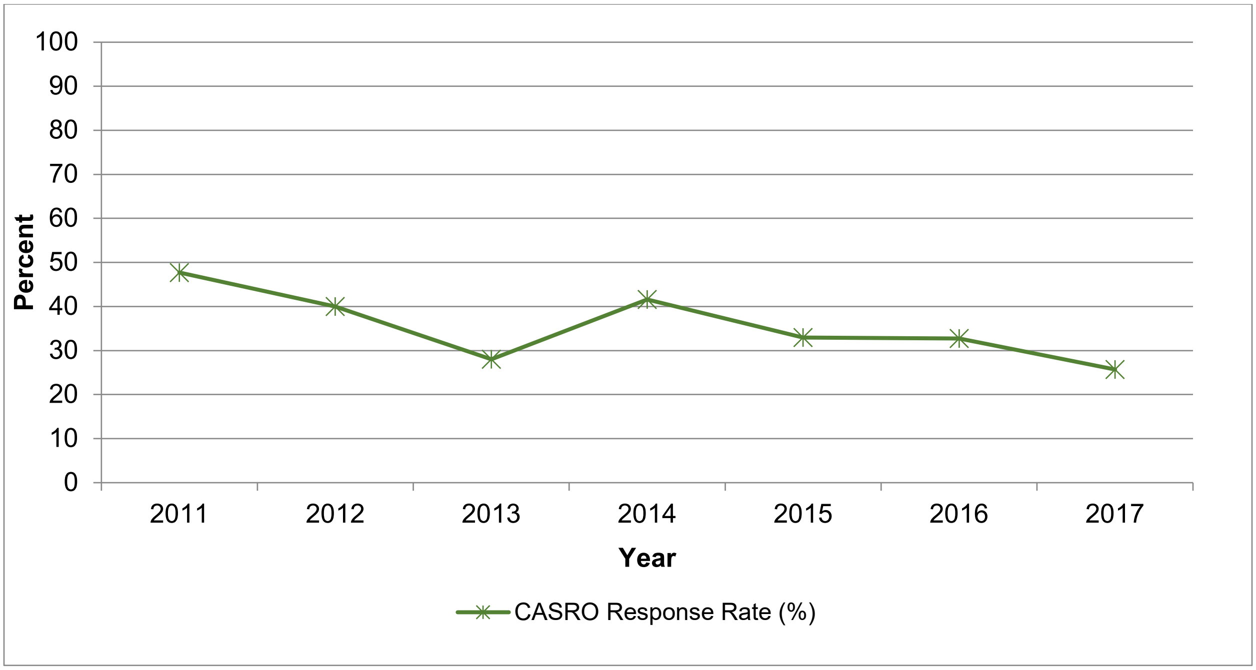
**Table E.3: CASRO Response Rate for the Combined Landline and Cellular Phone Samples by Survey Year, National Immunization Survey - Teen, 2011-2017***

| Survey Year† | CASRO Response Rate (%) |
|---|---|
| 2011 | 47.7 |
| 2012 | 40.0 |
| 2013 | 28.0 |
| 2014 | 41.6 |
| 2015 | 32.9 |
| 2016 | 32.7 |
| 2017 | 25.7 |

* Excludes U.S. territories.

† Cellular phone sample was added to the NIS-Teen in 2011. The NIS-Teen transitioned from a dual-frame landline and cellular phone RDD sample design to a single-frame cellular phone RDD sample design beginning in 2018.

**Figure E.3: Trend in CASRO Response Rate for the Combined Landline and Cellular Phone Samples by Survey Year, National Immunization Survey - Teen, 2011-2017***




* Excludes U.S. territories. The landline sample was removed from the NIS sample design beginning in 2018.

The response rate is the number of households with a completed household interview divided by the estimated number of eligible households in the sample. Within each sample type (landline or cellular phone), the number of eligible households was estimated using the CASRO assumptions; these assumptions are that the rate of households among the unresolved telephone numbers is the same as the observed rate of households among the resolved telephone numbers, and the rate of eligible households among unscreened households is the same as the observed rate of eligible households among screened households. Under these assumptions, within each sample type the CASRO response rate is equal to the product of the resolution rate, the screener completion rate, and the interview completion rate. For the combined samples, we have defined the CASRO response rate as the total number of households with a completed interview divided by the estimated total number of eligible households across both sample types, where the estimated total number of eligible households is equal to the sum of the estimated number of eligible households in the landline sample (using CASRO assumptions) and the estimated number of eligible households in the cellular phone sample (using CASRO assumptions). Table E.3 presents the CASRO response rate calculated in this way for the combined landline and cellular phone samples, by survey year, and Figure E.3 presents a graphical representation. Because the CASRO response rate is lower for the cellular phone sample than for the landline sample, the CASRO response rate for the combined landline and cellular phone samples was lower in years with a larger cellular phone sample and higher in years with a smaller cellular phone sample.

**Table E.4: Vaccine-Specific Coverage Levels among Teens Age 13-17 Years in the United States by Survey Year, National Immunization Survey - Teen, 2006-2023***

| Survey Year | ≥ 1 Td or Tdap† | ≥ 1 Tdap Since Age 10§ | ≥ 1 MenACWY¶ | FEMALE HPV UTD** | MALE HPV UTD** | ≥2 MMR§§ | ≥ 3 HepB¶¶ | VARICELLA History of Varicella Disease*** | VARICELLA ≥ 2 Doses Varicella Vaccine if Had No History of Varicella Disease |
|---|---|---|---|---|---|---|---|---|---|
| 2006††† | 60.1 | 10.8 | 11.7 | - | - | 86.9 | 81.3 | 69.9 | - |
| 2007††† | 72.3 | 30.4 | 32.4 | - | - | 88.9 | 87.6 | 65.8 | 18.8 |
| 2008 | 72.2 | 40.8 | 41.8 | 17.9 | - | 89.3 | 87.9 | 59.8 | 34.1 |
| 2009 | 76.2 | 55.6 | 53.6 | 26.7 | - | 89.1 | 89.9 | 52.7 | 48.6 |
| 2010 | 81.2 | 68.7 | 62.6 | 31.9 | - | 90.4 | 91.6 | 44.7 | 58.1 |
| 2011§§§ | 85.3 | 78.2 | 70.5 | 34.8 | 1.3 | 91.1 | 92.3 | 36.6 | 68.3 |
| 2012 | 88.5 | 84.6 | 74.0 | 33.4 | 6.8 | 91.4 | 92.8 | 30.6 | 74.9 |
| 2013 | 89.1 | 86.0 | 77.8 | 37.6 | 13.9 | 91.8 | 93.2 | 25.4 | 78.5 |
| 2014¶¶¶ | 89.8 | 87.6 | 79.3 | 39.7 | 21.6 | 90.7 | 91.4 | 21.0 | 81.0 |
| 2015 | 89.6 | 86.4 | 81.3 | 41.9 | 28.1 | 90.7 | 91.1 | 17.8 | 86.1 |
| 2016 | 90.6 | 88.0 | 82.2 | 43.0 | 31.5 | 90.9 | 91.4 | 15.2 | 85.6 |
| 2017 | 90.7 | 88.7 | 85.1 | 53.1 | 44.3 | 92.1 | 91.9 | 13.2 | 88.6 |
| 2018**** | 91.2 | 88.9 | 86.6 | 53.7 | 48.7 | - | - | - | - |
| 2019 | 91.9 | 90.2 | 88.9 | 56.8 | 51.8 | 91.9 | 91.6 | 9.1 | 90.6 |
| 2020 | 92.0 | 90.1 | 89.3 | 61.4 | 56.0 | 92.4 | 92.6 | 8.4 | 91.9 |
| 2021 | 92.2 | 89.6 | 89.0 | 63.8 | 59.8 | 92.2 | 92.3 | 7.3 | 91.5 |
| 2022 | 91.7 | 89.9 | 88.6 | 64.6 | 60.6 | 91.2 | 91.2 | 7.0 | 90.8 |
| 2023 | 90.5 | 90.1 | 86.7 | 64.0 | 59.0 | 93.4 | 87.7 | 7.3 | 91.7 |

* Excludes U.S. territories.

† ≥1 dose of tetanus toxoid-diphtheria vaccine (Td) or tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) at or after age ten years.

§ ≥1 tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) since at or after age ten years.

¶ ≥1 quadrivalent meningococcal conjugate vaccine or meningococcal -unknown type vaccine.

** Prior to 2017, ≥3 doses were required to be considered UTD. Beginning in 2017, adolescents are considered UTD if they have ≥3 doses, or 2 doses when the first HPV vaccine dose was initiated at age <15 years and there was at least 5 months minus 4 days between the first and second dose. This update to the HPV recommendation occurred in December 2016. Doses may be 9-valent (9vHPV), quadrivalent (4vHPV) or bivalent (2vHPV).

§§ ≥ 2 doses of measles-mumps-rubella vaccine.

¶¶ ≥3 doses of hepatitis B vaccine.

*** By parent/guardian report or provider records.

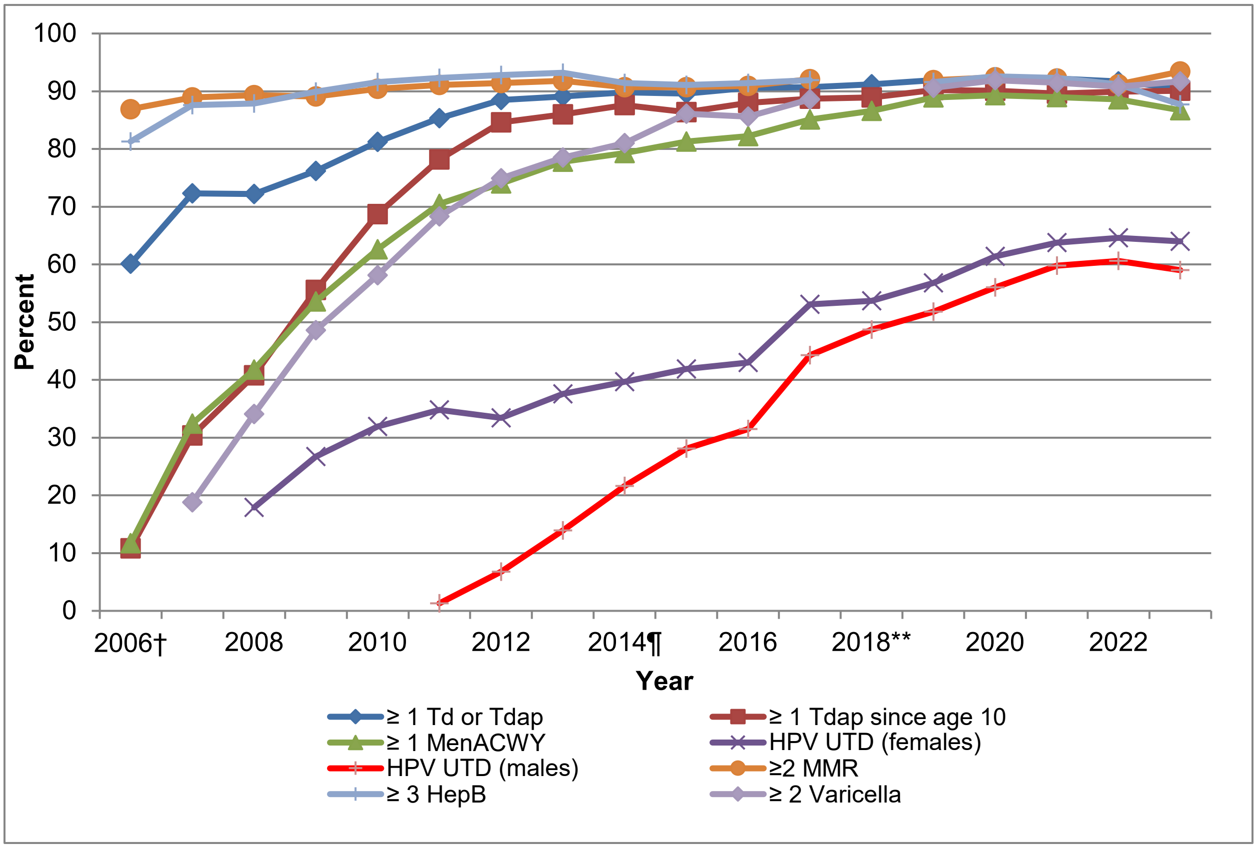
††† In 2006 and 2007, NIS-Teen was conducted only in Quarter 4.

§§§ Prior to 2011, estimates are single-frame, landline-sample estimates. From 2011-2017, estimates are dual-frame (landline plus cellular phone) estimates. From 2018 onward, estimates are single-frame, cellular phone estimates.

¶¶¶ Revised definition of adequate provider data (APD) implemented.

**** MMR, Hep B, and Varicella estimates are not available for 2018 due to a provider reporting error.

**Figure E.4: Trends in Vaccine-Specific Coverage Levels among Teens Aged 13-17 Years in the United States by Survey Year, National Immunization Survey - Teen, 2006-2023***




* Excludes U.S. territories.

† In 2006 and 2007, NIS-Teen was conducted only in Quarter 4.

§ Prior to 2011, estimates are single-frame, landline-sample estimates. From 2011-2017, estimates are dual-frame (landline plus cellular phone) estimates, and from 2018 onward estimates are single-frame, cellular phone sample estimates.

¶ Revised definition of adequate provider data (APD) implemented in 2014.

** MMR, Hep B, and Varicella estimates are not available for 2018 due to a provider reporting error.

Figure E.4 presents a graphical representation of selected data contained in Table E.4. It displays the trend in selected vaccine-specific coverage levels among teens aged 13-17 years from 2006 to 2023. Note that these data apply to the landline sample only from 2006-2010, to the dual-frame sample from 2011-2017, and to the cellular phone sample only from 2018 forward.

# Appendix F: Key NIS-Teen Response Rates by Area

**Table F.1: Key Indicators* for the Cellular Phone Sample by Estimation Area, National Immunization Survey - Teen, 2023**

| Area | Resolution Rate (%) | Screener Completion Rate (%) | Interview Completion Rate (%) | CASRO Response Rate (%) | Adolescents with Adequate Provider Data (%) |
|---|---|---|---|---|---|
| U.S. National† | 46.4 | 77.4 | 68.0 | 24.4 | 40.2 |
| Alabama | 51.1 | 77.9 | 66.1 | 26.3 | 41.6 |
| Alaska | 55.5 | 77.4 | 72.3 | 31.1 | 44.3 |
| Arizona | 40.4 | 79.5 | 67.4 | 21.6 | 36.2 |
| Arkansas | 54.0 | 76.7 | 69.7 | 28.9 | 44.0 |
| California | 41.3 | 78.9 | 63.0 | 20.5 | 29.2 |
| Colorado | 41.1 | 81.4 | 69.0 | 23.1 | 40.8 |
| Connecticut | 38.3 | 72.9 | 69.2 | 19.3 | 42.8 |
| Delaware | 42.7 | 76.7 | 66.0 | 21.6 | 38.1 |
| District of Columbia | 44.3 | 77.0 | 68.8 | 23.5 | 35.5 |
| Florida | 39.1 | 73.5 | 67.7 | 19.4 | 36.5 |
| Georgia | 45.5 | 71.7 | 69.0 | 22.5 | 38.2 |
| Hawaii | 36.5 | 77.1 | 62.8 | 17.6 | 36.2 |
| Idaho | 39.0 | 77.2 | 75.5 | 22.7 | 45.3 |
| Illinois | 49.4 | 78.3 | 64.8 | 25.0 | 38.3 |
| IL-City of Chicago | 49.4 | 76.9 | 61.8 | 23.4 | 36.7 |
| IL-Rest of State | 49.4 | 79.4 | 66.9 | 26.3 | 39.0 |
| Indiana | 47.7 | 79.5 | 67.5 | 25.6 | 40.2 |
| Iowa | 52.8 | 80.2 | 70.2 | 29.7 | 42.9 |
| Kansas | 50.4 | 79.1 | 70.6 | 28.1 | 51.2 |
| Kentucky | 46.6 | 75.6 | 69.9 | 24.6 | 40.9 |
| Louisiana | 51.7 | 75.5 | 67.3 | 26.2 | 35.8 |
| Maine | 42.2 | 81.1 | 71.4 | 24.4 | 42.4 |
| Maryland | 44.9 | 74.9 | 72.6 | 24.4 | 40.8 |
| Massachusetts | 48.9 | 80.7 | 69.1 | 27.3 | 45.2 |
| Michigan | 55.0 | 76.4 | 69.8 | 29.3 | 46.0 |
| Minnesota | 41.6 | 82.2 | 69.1 | 23.6 | 40.0 |
| Mississippi | 52.0 | 73.2 | 62.7 | 23.9 | 38.1 |
| Missouri | 48.9 | 76.2 | 68.6 | 25.6 | 40.6 |
| Montana | 42.8 | 80.1 | 73.0 | 25.0 | 43.7 |
| Nebraska | 47.2 | 79.9 | 72.9 | 27.5 | 44.4 |
| Nevada | 39.8 | 76.0 | 64.9 | 19.7 | 37.3 |
| New Hampshire | 44.2 | 79.2 | 67.5 | 23.6 | 40.9 |
| New Jersey | 45.5 | 77.7 | 61.0 | 21.6 | 37.8 |
| New Mexico | 42.1 | 78.9 | 70.2 | 23.3 | 38.9 |
| New York | 44.9 | 76.9 | 65.7 | 22.7 | 39.1 |

| Area | Resolution Rate (%) | Screener Completion Rate (%) | Interview Completion Rate (%) | CASRO Response Rate (%) | Adolescents with Adequate Provider Data (%) |
|---|---|---|---|---|---|
| NY-City of New York | 39.9 | 70.9 | 64.9 | 18.3 | 38.4 |
| NY-Rest of State | 47.0 | 80.1 | 66.3 | 24.9 | 39.5 |
| North Carolina | 42.2 | 77.6 | 66.7 | 21.8 | 38.6 |
| North Dakota | 50.1 | 77.1 | 69.4 | 26.8 | 44.4 |
| Ohio | 48.3 | 74.9 | 71.2 | 25.7 | 41.5 |
| Oklahoma | 51.7 | 78.3 | 67.6 | 27.4 | 39.0 |
| Oregon | 41.9 | 82.9 | 70.0 | 24.3 | 44.0 |
| Pennsylvania | 45.2 | 75.8 | 65.1 | 22.3 | 39.8 |
| PA-Philadelphia County | 44.9 | 74.0 | 64.3 | 21.4 | 40.5 |
| PA-Rest of State | 46.0 | 80.7 | 67.4 | 25.0 | 38.8 |
| Rhode Island | 41.3 | 75.4 | 67.3 | 21.0 | 44.4 |
| South Carolina | 44.7 | 78.8 | 66.7 | 23.5 | 36.2 |
| South Dakota | 52.1 | 76.4 | 71.8 | 28.6 | 42.6 |
| Tennessee | 45.3 | 74.5 | 63.1 | 21.3 | 45.9 |
| Texas | 43.0 | 76.1 | 65.2 | 21.4 | 34.9 |
| TX-Bexar County | 39.5 | 75.7 | 67.2 | 20.1 | 35.4 |
| TX-City of Houston | 44.2 | 75.7 | 63.1 | 21.1 | 34.0 |
| TX-Rest of State | 45.6 | 77.5 | 65.9 | 23.3 | 35.2 |
| Utah | 43.7 | 76.1 | 74.3 | 24.7 | 44.0 |
| Vermont | 39.5 | 72.0 | 78.9 | 22.4 | 53.9 |
| Virginia | 45.7 | 80.8 | 68.3 | 25.2 | 37.9 |
| Washington | 38.4 | 75.6 | 79.6 | 23.1 | 45.3 |
| West Virginia | 55.8 | 78.9 | 69.2 | 30.5 | 39.7 |
| Wisconsin | 46.0 | 79.1 | 69.6 | 25.3 | 44.5 |
| Wyoming | 61.5 | 73.7 | 71.4 | 32.3 | 42.4 |
| Puerto Rico | 50.4 | 82.0 | 63.5 | 26.2 | 26.2 |
| U.S. Virgin Islands | 59.9 | 77.1 | 62.2 | 28.7 | 26.8 |
| Guam | 39.5 | 67.7 | 53.6 | 14.3 | 34.2 |

[*] For the definition of the key indicators see Table 1.

[†] Excludes U.S. territories.