National Health Interview Survey/ National Immunization Provider Record Check Study

User=s Guide for the 1998 Public-Use Data File

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U.S. Department of Health and Human Services
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and
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Glossary of Commonly Used Terms and Abbreviations

4:3:1	Child has received 4 or more DTP, 3 or more polio, and 1 or more MCV vaccinations.
4:3:1:3	Child has received 4 or more DTP, 3 or more polio, 1 or more MCV, and 3 or more Hib vaccinations.
4:3:1:3:3	Child has received 4 or more DTP, 3 or more polio, 1 or more MCV, 3 or more Hib, and 3 or more hepatitis B vaccinations.
CAPI	Computer-assisted personal interviewing
CDC	Centers for Disease Control and Prevention
DTaP	Diphtheria, tetanus, acellular pertussis
DTP	Diphtheria, tetanus, pertussis
Hep B	Hepatitis B
Hib	*Haemophilus influenzae* type b
IHQ	Immunization History Questionnaire
IPV	Inactivated poliovirus vaccine
MCV	Measles-containing vaccine
MMR	Measles, mumps, rubella
NCHS	National Center for Health Statistics
NHIS	National Health Interview Survey
NHIS/IM	National Health Interview Survey Immunization Supplement
NIP	National Immunization Program
NIPRCS	National Immunization Provider Record Check Study
NRFUS	Nonresponse Follow-Up Survey
OPV	Oral poliovirus vaccine

Chapter 1. Introduction

Since 1991, national estimates of vaccination coverage have been available through the National Health Interview Survey - Immunization Supplement (NHIS/IM), sponsored by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) and conducted by the Census Bureau. The NHIS questionnaire includes a core module that collects demographic information on all household members, a module of health questions about one sampled adult, and a module of health questions about one sampled child.[1] At the end of the core interview, the NHIS/IM is administered for the sampled child and all other children in the household between the ages of 12 and 35 months. The NHIS/IM asks for a vaccination history of the child. Respondents can either report vaccination dates from a written shot record, if one is available for the child, or they can report the total number of doses for each vaccine from memory recall if no shot record is available.

Reliance on household reports of childhood immunizations has two potential inaccuracies that influence the estimation of vaccination coverage (Zell et al. 1996). First, a large proportion (61%) of respondents rely only on memory recall to report their child's immunization history, which is subject to the potential bias inherent in recall data. In 1998, only 39% of respondents used a shot card to report all or some of their child's vaccinations. Second, even when shot records are used, dates of vaccinations may be missing if the respondent did not have the shot record at the time of the immunization or the original shot record has been lost. Thus, the validity of the vaccination coverage estimates produced from the NHIS has been a major concern. Therefore, to determine the accuracy of the household responses in the NHIS, the NCHS and the National Immunization Program (NIP) of the CDC implemented the National Immunization Provider Record Check Study (NHIS/NIPRCS) in 1994. Its purpose is to evaluate the accuracy of household reports of children's immunization histories by comparing the household reports with the reports from the children's immunization providers, and to produce national estimates of vaccination coverage using both the household and provider reports (Ezzati-Rice et al. 1996; Peak and Cadell 1996). The estimates of vaccination coverage from the NHIS/NIPRCS are also used to adjust for non-telephone coverage bias in the National Immunization Survey (NIS), a telephone survey of households with children aged 19-35 months.

The NHIS/NIPRCS produces estimates of coverage for nine vaccines and series of vaccines. Table 1.1 lists these vaccines and the number of doses required to be up-to-date for each vaccine and series.

[1] For details on the NHIS sample design and data collection procedures, see the documentation on the NHIS Web site: http://www.cdc.gov/nchs/nhis.htm

Table 1.1: Vaccines and Combinations of Vaccines Monitored in the 1998 NHIS/NIPRCS	
DTP	4 or more doses of diphtheria-tetanus-pertussis vaccine
DTP3	3 or more doses of diphtheria-tetanus-pertussis vaccine
Polio	3 or more doses of polio vaccine
MCV	1 or more doses of measles-containing vaccine
Hib	3 or more doses of *Haemophilus influenzae* type b vaccine
Hep B	3 or more doses of hepatitis B vaccine
4:3:1	4 or more doses of DTP, 3 or more doses of polio, and 1 or more doses of measles-containing vaccine
4:3:1:3	4 or more doses of DTP, 3 or more doses of polio, 1 or more doses of measles-containing vaccine, and 3 or more doses of Hib vaccine
4:3:1:3:3	4 or more doses of DTP, 3 or more doses of polio, 1 or more doses of measles-containing vaccine, 3 or more doses of Hib, and 3 or more doses of hepatitis B vaccine

General Information about the 1998 NHIS/NIPRCS

The NHIS/NIPRCS begins with households that completed an NHIS/IM for a child or children aged 12-35 months. As part of completing the Immunization Supplement, the parent or legal guardian is asked to sign a permission form allowing the survey staff to contact the child's medical providers. Only households that signed permission forms are eligible for the NHIS/NIPRCS. The permission form has space for the names and addresses of up to three providers. It also contains identifying information and the signature of the parent or guardian. Permission forms are valid for one year from the date of the interview. The permission forms are sent to the NHIS/NIPRCS contractor for data collection, Abt Associates Inc.

All providers for whom households gave adequate locating information are mailed an Immunization History Questionnaire (IHQ). (See Appendix B for a copy of the 1998 IHQ.) A label on the IHQ gives the child's name, date of birth, and gender, so the provider can locate the child's records. The form includes a grid for the provider to record the date of each vaccination the child has received. The provider is asked to enter all known vaccinations, whether they were given at that practice or elsewhere. In addition to the child's immunization history, the form collects characteristics of the provider's practice, such as whether the practice is a public or private facility and the types of care provided.

The returned IHQs are reviewed for legibility and consistency, and edited as appropriate before being sent to a vendor for data entry. The data from the IHQ are entered in a database, with 100% double-keying, and the raw data file is returned to the contractor for cleaning and further editing.

In 1998, a Nonresponse Follow-Up Survey (NRFUS) was conducted with households who were not eligible for the original NIPRCS data collection, because (1) the permission form was refused or not valid, (2) there was inadequate information to contact providers, or (3) the household respondent reported the child had not received any vaccines or was unsure if the child had received any vaccinations. Eligible households were recontacted and asked for permission to request the eligible child's immunization records from his or her providers. If the household consented, IHQs were sent to the providers as in the original study.

The immunization information reported by the households and providers is compared for each child. If discrepancies are discovered, the case is eligible for reconciliation. That process contacts the providers, the household, or both to resolve the inconsistencies between the reports. The household is asked to verify some information and whether any additional providers should be contacted, and the providers are asked about specific vaccination dates or whether another provider could have immunization records for the child. If discrepancies remain in the data after these contacts, either the provider information or a combination of the household and provider information is considered to be the most accurate or the "best values" for immunization information.

The NHIS interviews were conducted between January and December of 1998. Data collection for the 1998 NHIS/NIPRCS began in May 1999 and continued through October 2000. The NRFUS was conducted between February and December 2000. Reconciliation for both the original data and the NRFUS data was conducted between June and August 2001.

The 1998 NHIS/NIPRCS public-use data file (PUF) includes data for 2,966 children with completed NHIS/IM interviews. The variables included in the file come from the 1998 NHIS and the 1998 NHIS/NIPRCS IHQ. The NHIS variables were selected from the following NHIS data files: Household, Family, Person, Sample Adult, Sample Child, and Immunization Supplement.

For further information on the NHIS data products, please contact the NCHS Data Dissemination Branch:

Phone: 301-458-4901
FAX: 301-458-4035
E-mail: nhislist@cdc.gov
Internet: http://www.cdc.gov/nchs/nhis.htm

Chapter 2. Sample and Data Collection

2.1 Summary of 1998 Sample

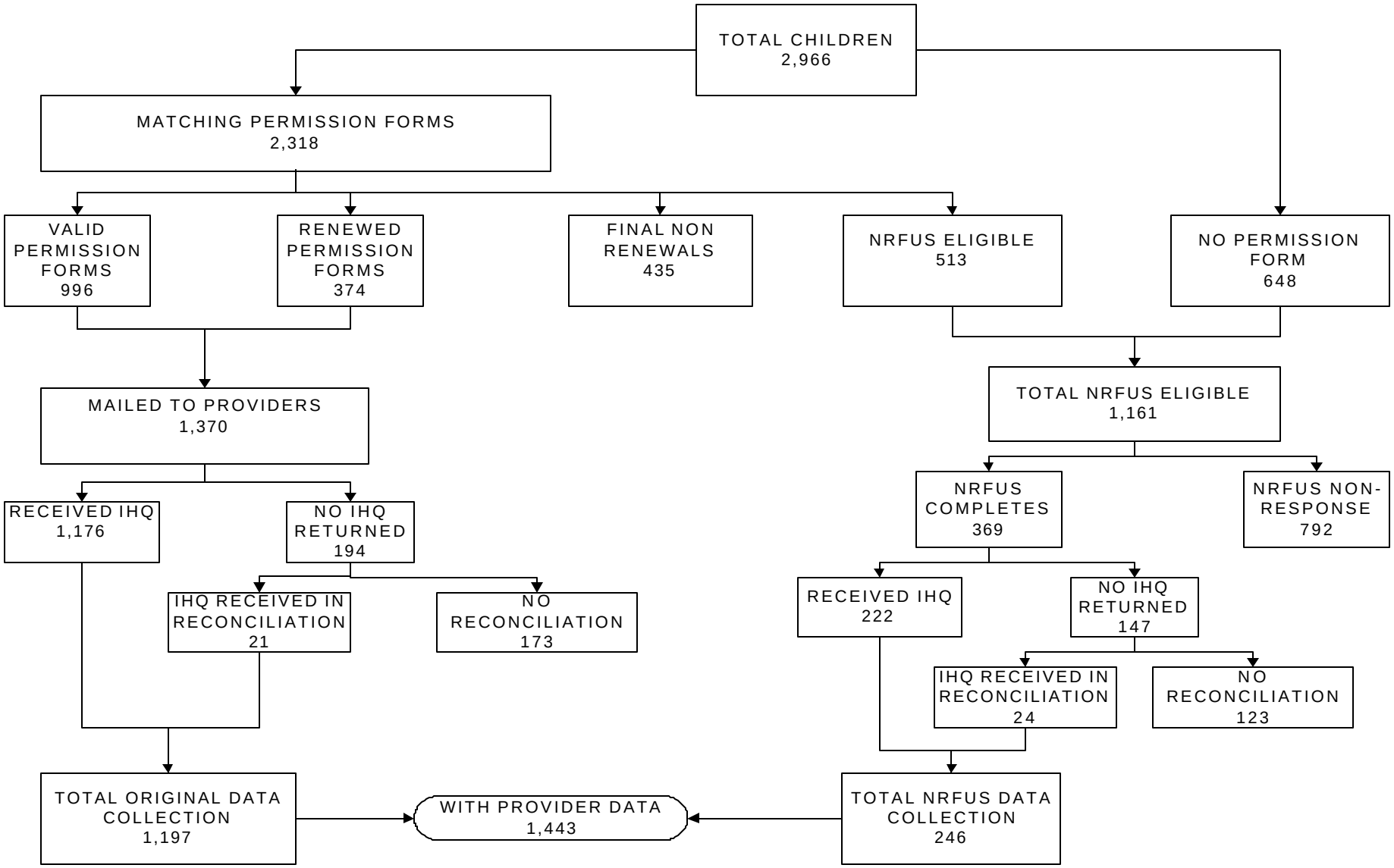
The 1998 NHIS/NIPRCS sample contains 2,966 children aged 12-35 months with a completed NHIS/IM. Of these children, 894 (30.1%) were aged 12-18 months at the time of the NHIS interview and 2,072 (69.9%) were 19-35 months. IHQs were mailed to the providers for the 1,370 children (46%) who had valid original or renewed permission forms. Providers returned IHQs with vaccination data for 1,197 (87%) of the children. Provider data were collected in the NRFUS for an additional 246 children. In total, 1,443 (49%) of the children with a completed NHIS/IM had provider data. (See Figure 2.1.)

Of the 2,966 children, best values for vaccination dates could be determined for 1,691 (57.0%). The number of children with best values for vaccination dates is greater than the number of children with provider vaccination data. Some children without provider vaccination data have best vaccination values because they are 4:3:1:3 up-to-date from a household shot card. For the children without best values, up-to-date status was imputed. (The imputation procedures are described in Section 3.6.) Table 2.1 shows the results of the provider data collection and best value construction for the two age groups. See Appendices F and G for tables summarizing the distribution of the sample by various demographic characteristics.

Table 2.1: Distribution of Children with Provider and Best Value Data by Age Group, 1998 NHIS/NIPRCS

		Children aged 12-18 months	Children aged 19-35 moths	Total
Total Number of Children		894	2,072	2,966
Number of children with requests mailed to providers	Original	n/a	n/a	1,370
	Original + NRFUS	n/a	n/a	1,739
Number of children with provider data	Original	347	850	1,197
	Original + NRFUS	418	1,025	1,443
Number of children with best values	Original	439	1,044	1,483
	Original + NRFUS	497	1,194	1,691
Number of children with imputed best values		397	878	1,275

FIGURE 2.1: 1998 NHIS/NIPRCS SAMPLE



2.2 NHIS Immunization Supplement

The U.S. Bureau of the Census collects data for the NHIS under a contract with the NCHS. Census Bureau interviewers conduct personal, in-home interviews with individuals in sampled households. For the Family Core component of the NHIS Basic Module, all members of an eligible household who are at home at the time of the interview and 17 years of age and over are asked to participate and to respond for themselves. For children and those adults not at home during the interview, information is provided by a knowledgeable adult family member (18 years of age or over) residing in the household. For the Sample Adult questionnaire, one adult per family is randomly selected; this individual responds for him/herself to the questions in this interview. Information for the Sample Child questionnaire is obtained from a knowledgeable adult in the household.

The 1998 NHIS interview was conducted using a computer-assisted personal interviewing (CAPI) version of the NHIS questionnaire. Interviewers administered the instrument using laptop computers, entering responses directly into the computer during the household interview. This computerized mode of administration offers distinct advantages in timeliness of the data and improved data quality. The data for the NHIS/IM are collected for children selected for the Sample Child questionnaire, and all other children in the household between the ages of 12 and 35 months.

2.3 National Immunization Provider Record Check Study

The data in the provider record check study are collected in two phases: original data collection and reconciliation. In the original data collection, immunization records are collected from the providers. In reconciliation, the data collected from the providers are compared and reconciled with the data collected from the household. During reconciliation, some new IHQs are received for children for whom provider data were not obtained in the original data collection.

2.3.1 Original Data Collection

Once the NHIS/IM is completed, the names and addresses of immunization providers identified by household respondents are written on permission forms. The NHIS CAPI questionnaire captures whether a permission form was completed (or Agenerated@), and whether the permission form was signed by the child=s parent or legal guardian. An electronic file of eligible household ID numbers with child and household data is forwarded to the NHIS/NIPRCS contractor, Abt Associates Inc., where it is entered into a case management and tracking system. The Regional Offices of the Census Bureau send the signed permission forms to the contractor.

The first step in data collection matches the permission forms with the file of eligible households. The file is loaded into a case management system. After the forms have been matched, provider names, addresses and telephone numbers are entered from the hard-copy permission forms. After data entry and editing are completed, a scannable label with a bar code is printed for each case ID and attached to the appropriate permission form in order to facilitate tracking and reporting.

Once the provider address information has been entered, the next step is to check its completeness. (Complete addresses are necessary to mail questionnaires to immunization providers.) When the household did not supply a complete address for a provider, locating clerks use multiple methods to find additional information, including searching a database of providers from the NIS and calling Directory Assistance.

After the provider addresses have been reviewed and updated, the initial requests are mailed. The initial mailing packet includes the following documents:

- A cover letter from the Director of the NCHS describing the purpose of the NHIS/NIPRCS, the importance of provider participation, and how the parent=s consent was obtained. Separate letters are used for cases with a parent=s signature and cases with an interviewer=s signature verifying a parent=s verbal consent during a telephone contact.

- An excerpt from the permission form signed by the parent or guardian, or signed by the interviewer for cases with verbal consent.

- An Immunization History Questionnaire labeled with sufficient information to identify the child whose immunization records are requested.

- An excerpt from an article in the *Morbidity and Mortality Weekly Report (MMWR)* containing information on national vaccination rates.

- A pre-addressed, postage-paid return envelope.

Providers are asked to complete the IHQ, or to attach a copy of the child=s immunization records. Providers are also given the option to return the forms by mail, or to a toll-free fax number. Reminder/thank you postcards are mailed two weeks after the initial mailing. The postcards contain the CDC logo to identify study sponsorship, a Athank-you@ to those who have already returned the original IHQ, and a brief message about the need for and importance of collecting these data to measure vaccination coverage among children in the U.S.

The IHQ used in 1998 was very similar to the one used in 1997. Only two small changes were made between the years. A check box was added to the DTP-Hib row in the shot grid so the provider could indicate if the vaccination administered was a DTP-Hib or DtaP-Hib. The response categories to Question 5 on the second page of the IHQ were updated. (See Appendix B.)

Reminder packets containing a second copy of the IHQ are mailed three weeks after the postcard mailing (five weeks from the initial mailing) to providers who have not yet returned the IHQ from the first mailing. A one-page letter reiterates the importance of provider participation and requests return of the completed questionnaire. Seven weeks after the initial mailing, provider offices that still have not responded to the initial request or subsequent mailed reminders receive

a telephone prompt from an experienced interviewer trained to elicit cooperation and record medical information. The prompting call is a final attempt to complete and return the provider questionnaires. Generally, these prompting calls serve to remind providers to return the completed questionnaires, and they provide an opportunity to mail or fax new materials to those providers who request them. In some cases, the questionnaire is completed with the interviewer over the telephone.

The IHQ is then manually edited. If a provider returned a copy of the child's medical records, the information is transcribed onto a new IHQ. Every IHQ is reviewed by a quality control clerk. The cases are then sent to a vendor for data entry. The forms are keyed twice for verification. The data from the IHQs are then merged with the NHIS data to create the initial dataset.

2.3.2 Nonresponse Follow-Up Survey

In 1998, a NRFUS was conducted for the NHIS/NIPRCS. The NRFUS followed up with households with children who completed the NHIS immunization supplement but:

- did not complete a permission form to contact the providers;
- the provider contact information was inadequate; or
- reported no shots, or were uncertain of the child's vaccination status.

The first step in the NRFUS was to send households for which an address was available a packet that included a cover letter, a provider information sheet to list provider names and addresses, and a form granting permission to contact providers. Two weeks after the packet was mailed, the households were contacted by telephone. The telephone interviewer asked the household respondent for provider information and permission to contact those providers.

If the household gave permission to contact a provider, an Immunization History Questionnaire was sent to the provider following the same protocol as the original provider data collection described in Section 2.3.1 above.

A total of 1,161 were cases identified as eligible for NRFUS. Of these cases, provider data were obtained for 222 cases.

The results for all the cases in the initial data collection for the 1998 NRFUS are listed in Table 2.2.

Table 2.2: 1998 NRFUS Results	
Inadequate information to field case	257
Refusal	120
Unlocatable	375
Other final non-interview (e.g., other language, child in foster care)	40
Permission renewed - provider did not respond	104
Provider responded - no immunization data	43
Provider responded with immunization data*	222
TOTAL CASES	1,161

*Of these 222 cases, 154 were in the 19-35 month age range.

2.3.3 Matching and Reconciliation

In matching and reconciliation, every case with provider data is reviewed and compared with the corresponding data from the NHIS/IM interview. For cases in which the household and provider data are discrepant, or where provider data are missing, either the household, the provider, or both are recontacted by telephone or mail to clarify the discrepant data.

The first step in the matching process is to classify the cases into ten adjudication groups. First, the cases are separated by whether a shot card was used in the initial household interview. Cases with shot cards are further divided into five groups, depending on whether there is a discrepancy between the dates and/or doses of the household and provider reports. Cases in which the household reported only the number of doses of each vaccine from recall are divided into four groups. Finally, cases in which multiple providers responded for a child but the provider reports disagreed form the tenth adjudication group. Table 2.3 defines the adjudication groups and gives the number of children in each in 1998.

A matching sheet is printed for every case. The matching sheet displays key data items for the child, and all of the household and provider-reported vaccination data. The matching sheets from each adjudication group are reviewed for discrepancies. Cases that need reconciliation because of differences between household and provider reports of the number or dates of specific vaccinations are assigned problem codes that describe the type of discrepancy. These cases are sent to a specially trained team of telephone interviewers and supervisors for reconciliation. Additionally, sample children for whom no providers responded in the initial data collection are sent to reconciliation. (See Figure 2.2 for an illustration of the reconciliation process.)

In reconciliation, the providers are called, and interviewers attempt to resolve the discrepancy. The providers are asked to check their medical records to verify the information returned on the IHQ or reported by the household. Providers are also asked whether they know of any other vaccination providers for the child.

If the provider is unable to reconcile the discrepancy or cannot be reached, or if the problem appears to be in the household data, telephone interviewers attempt to contact the household to

Table 2.3: Distribution of Cases by Adjudication Group before Reconciliation, 1998 NHIS/NIPRCS[1]

Adjudication Group	Description	Original Cases w/ Provider Data	Requiring Reconciliation	NRFUS Cases w/ Provider Data	Requiring Reconciliation
Household reports from shot record					
R1	All dates and numbers of doses matched provider reports	63	6	1	1
R2	All number of doses matched provider reports, but at least one date was discrepant	60	48	0	0
R3	At least one discrepancy in number of doses; all discrepancies involved a household over-report	77	67	52	44
R4	At least one discrepancy in number of doses; all discrepancies involved a household under-report	160	99	3	3
R5	At least two discrepancies in number of doses; at least one over-report and one under-report	67	59	2	2
Household reports from memory (recall)					
H1	No discrepancies in number of doses (including cases where the household responded "Don=t Know@)	149	23	39	16
H2	At least one discrepancy in number of doses; all discrepancies involved a household over-report	132	89	95	41
H3	At least one discrepancy in number of doses; all discrepancies invovled a household under-report	205	25	7	3
H4	At least two discrepancies in number of doses; at least one over-report and one under-report	115	99	6	4
Multiple provider reports					
M	Non-identical reports from two or more providers	148	87	17	9
Total number of children:		1176[2]	602	222	123

[1] The distribution of adjudication groups in this table is different than the values of the variable ADJ_GRP in the final data file. This table shows the number of cases in each group before reconciliation. A case may have a different adjudication group after reconciliation is completed.

[2] The number of children with provider data before reconciliation is less than the total number with provider data in the data file, because in reconciliation some providers returned data for children whom provider data were not returned in the initial data collection.

resolve the discrepancy. When contacted, the original household respondent or another knowledgeable adult is asked whether a shot card is available for the child. If the household has a shot card, specific dates are verified. If no shot card is available, the household respondent is asked to verify that the child had received vaccinations.

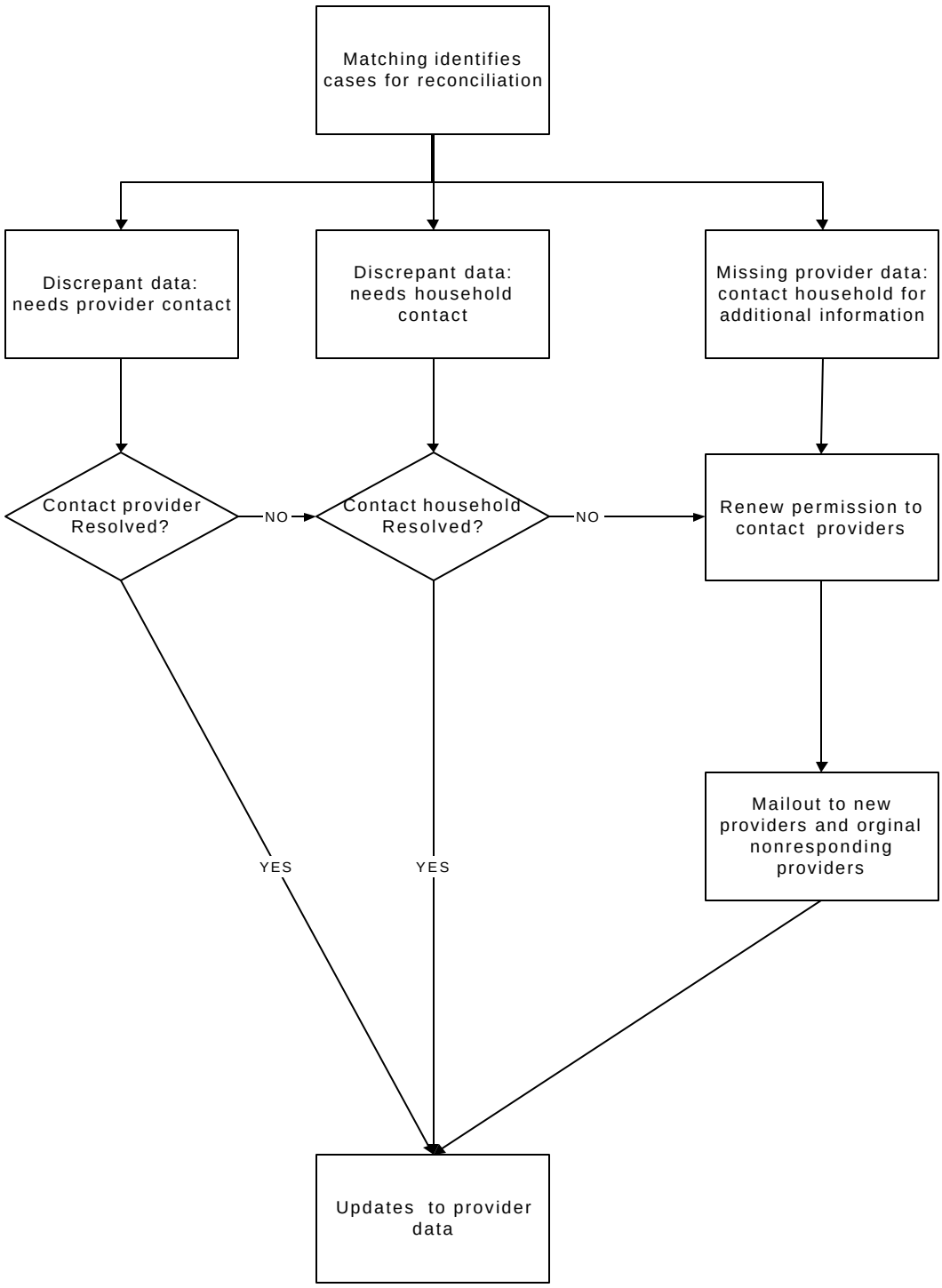
For those cases in which none of the providers for a child responded with vaccination data, a telephone interviewer contacts the household, verifies the names and addresses of providers previously reported, and asks for any other providers who may have immunization information for the child. This group includes cases in which:

- The provider reported never treating the child.
- The provider reported treating the child but not having immunization records, or indicated that the immunization records had been forwarded to another provider.
- No provider responded for the child.
- The provider contact information originally reported by the household was inadequate.
- An original provider responded with some vaccination information, but it appeared that the child may have had another vaccination provider.

These households are mailed an advance letter that includes a provider information form and a consent form that the respondent can return by mail. Ten days after the advance letter is mailed, telephone interviewers attempt to contact the household by phone. The interviewer confirms the provider information originally reported by the respondent, and probes the respondent for additional providers. The interviewer obtains verbal consent to recontact the original providers and to contact any additional providers. In 1998, 341 cases in which the original provider never responded were eligible for reconciliation. However, if a household had been recontacted in the NRFUS, it was not called again, but some providers who had not responded in the NRFUS data collection were recontacted, as the permission form collected in the NRFUS was still valid.

Matching sheets were reviewed separately for the cases that had provider data from the original data collection and the NRFUS. However, reconciliation was conducted simultaneously for the two groups.

Figure 2.2: Flow Diagram of 1998 NHIS/NIPRCS Reconciliation Process



Of the 1,066 total cases eligible for reconciliation, the provider gave new information to reconcile a discrepancy in 145 cases. Seventeen discrepancies in provider data were resolved by reviewing the original IHQ. In 46 cases, the household reconciled a discrepancy. Additionally, providers returned data for 45 children for whom provider data were not returned in the initial data collection. These additional data were added to the original provider data for estimation. Table 2.4 summarizes the impact reconciliation had on the numbers of vaccinations reported.

Table 2.4: Reconciliation for 1998 NHIS/NIPRCS

Total number of children in reconciliation	1,066
Number of children with changes to provider-reported number of doses	
DTP	155
Polio	125
MCV	115
Hib	157
Hep B	141
Varicella	95
Number of children aged 19-35 months who were **not** 4:3:1:3 up-to-date	
Before reconciliation	174
After reconciliation	140
Change in 4:3:1:3 up-to-date status	-34
Number of children with changes to shot dates	
Changes to household-reported shot dates	36
Changes to provider-reported shot dates	198

2.4 Data Processing

After reconciliation is completed, the new data are combined with the original data for the estimation of vaccination coverage rates. The combined data are reviewed for certain kinds of discrepancies that may remain, including:

- the date of birth, name, or gender given by the provider did not match the NHIS data;
- multiple providers reported different dates of birth;
- the provider reported a MCV or varicella shots before 9 months of age;
- vaccination dates before the date of birth;

- a single provider report that contained consecutive vaccination dates within 28 days, or multiple provider reports had vaccination dates within 14 days; and
- vaccination dates that were out of sequence.

If the discrepancy can be resolved by reviewing the dates of other vaccinations the child had received (e.g., it may be evident that part of the date was transposed or incorrectly written), the data are then edited.

Once all the data have been edited, a disposition code (DISPCODE) that indicates the completeness and validity of the immunization data is assigned to every case with provider data. Cases with DISPCODE equal to 7 have provider data, but the completeness of the provider data is unknown. Therefore, cases with DISPCODE = 7 are not used in calculating the estimates of vaccination coverage. All other cases with a nonmissing DISPCODE are considered to have usable provider data.

2.5 Informed Consent, Security, and Confidentiality of Information

The data collection procedures of the NHIS assure the respondent of the confidentiality of his/her responses and the voluntary nature of the survey. Informed consent is obtained from the respondent (generally the parent or guardian of the child) to participate in the household interview and also (at the end of the interview) to contact the child's vaccination providers.

Information in the NHIS/NIPRCS is collected and processed under high security. To ensure privacy of the respondents and confidentiality of sensitive information, NCHS has established standards for release of data from all NCHS surveys. All CDC staff and contractor staff involved with the NHIS/NIPRCS sign the NCHS confidentiality agreement and follow procedures to prevent disclosure.

All information in the NHIS/NIPRCS is collected under strict confidentiality and can be used only for research purposes [Section 308(d) of the Public Health Service Act, 42 U.S. Code 242m(d), and the Privacy Act of 1974 (5 U.S. Code 552a)]. Prior to the public release, the

contents of the public-use data file go through an extensive review by the NCHS Disclosure Review Board to protect confidentiality of the participants as well as the data.

Chapter 3. Estimation of Vaccination Coverage

3.1 NHIS Weighting Information

The NHIS uses a multistage sample design to represent the civilian noninstitutionalized population of the U.S.; each person interviewed has a known probability of selection. The resulting sampling weights (initially equal to the reciprocal of the selection probability) are adjusted for unit nonresponse and poststratified to population control totals from the Census by sex, age, and race/ethnicity. Thus, each respondent has a sample weight that can be used to produce national estimates.

The foundation for the 1998 NHIS/NIPRCS sampling weight is a child-level weight that comes from the NHIS Immunization Supplement data file. This Final Annual Weight (WTFA_IM) is included in the public-use data file. It includes design, nonresponse, and poststratification adjustments for sample children under 18 years of age and additional children aged 12-35 months in sampled households. See Appendix H for summary statistics of the Final Annual Weight.

3.2 Provider-Adjusted Estimates

The provider-adjusted method of estimation produces estimates of percentages of children who are up-to-date for various vaccines and combinations of vaccines. The provider-adjusted estimates are calculated by first dividing the children into a set of weighting classes for each vaccine. Within each weighting class, the proportion of children with usable provider data who are up-to-date is calculated, and then applied to the total number of children within the weighting class. The estimated numbers of up-to-date children and the total numbers of children are then summed to produce an overall coverage estimate for that vaccine. These estimates are comparable to the estimates produced in the National Immunization Survey (Stokley et al. 2000; Bartlett et al. 2001). Section 4.1 gives detailed instructions for calculating provider-adjusted estimates.

3.3 Best Values

The best values combine the household and provider data to produce a vaccination report judged to be most accurate for each child. Because the best value vaccination dates include data from both sources, more children have best values for vaccination dates than have provider data. The inclusion of more children reduces the potential bias in estimates calculated using the best values for vaccination dates.

For the 1998 NHIS/NIPRCS, best values for vaccination dates were developed for two main groups of children: children with no provider data who were 4:3:1:3 up-to-date according to the household report from a shot card; and all children who had usable provider-reported vaccination information (See section 2.4 for definition of useable provider data).

For the children who were 4:3:1:3 up-to-date from a shot card, the household-reported vaccination dates were evaluated to see whether they were consistent with the date of birth and the vaccination schedule. The record was also checked for the degree of agreement between vaccination dates. If the record met these criteria, then the shot card dates were inserted as best values for vaccination dates, along with any edits to the dates that seemed warranted, such as transposed dates or reports with the same month and day but in which the year was inconsistent.

For the children with usable provider data, the household and provider reports were compared. If the household used a shot card and there was no agreement between the two sources, the household-reported vaccination dates were considered unusable, and the provider vaccination dates were used as the best values for dates. (Provider reports that appeared to be inadequate or for the wrong child were previously excluded. See Section 2.4 for the definition of usable provider data.) If there was some agreement between the provider-reported and household-reported vaccination dates, the household information was deemed usable, and these shot card vaccination dates were used to supplement the provider vaccination dates to create a composite vaccination record. If the household reported from recall, the provider-reported dates were used as the best values. Children with best value vaccination dates were assigned a flag (BESTVAL=1) so that they can easily be identified in the data file.

3.4 Best Value Weights

The sample weights of children with best values for vaccination dates were adjusted to account for children without best values. The method used to adjust the weights was similar to the method used in the 1996 NHIS/NIPRCS, in order to maintain comparability between the years. A total of 11 weighting classes were formed using the following criteria: the vaccination status according to the household report (up-to-date, not up-to-date, missing), shot card use (shot card used, no shot card), and education of the respondent (high school or less, college or higher, missing). These three variables resulted in 18 cells; some cells were collapsed when they contained too few cases. Table 3.1 shows the 11 cells used in the weighting.

Table 3.1: Weighting Classes for Adjusting the Weights of Children with Best Values, 1998 NHIS/NIPRCS

4:3:1:3 status according to household	Shot card		No shot card		
	High school or less, or missing	College or higher	High school or less	Education missing	College or higher
Up-to-date	1	2	3	5	4
Not up-to-date	6	7	8		9
Missing			10		11

The sample weight for the children with best values was adjusted by multiplying the NHIS/IM weight for the child (WTFA_IM) by the ratio of the sum of the weights for all children in the weighting class to the sum of the weights for children with best values. In addition to this adjustment, the weights were adjusted through raking (Lohr 1999; Izrael et al. 2000) so that the sum of the weights agreed with the population control totals for poverty status, race/ethnicity, and telephone status in the U.S. (This adjustment was not done in 1996.) The result of the raking is the best value weight (WT_BV2). See Appendix H for summary statistics of the NHIS/IM weights and the best value weights.

3.5 Imputed Best Values

For children without best values, imputation was used to calculate a total number of doses for each antigen and the up-to-date status of the child. The variables considered for forming imputation classes were the same as those used to form the weighting classes for children with best values: whether a child was up-to-date on the 4:3:1:3 series according to the household report, whether a shot card was used, and the education of the respondent. Some of the 18 cells in the cross-classification of the three variables were collapsed after looking at the distribution of children in the sample. Cells that contained few donors relative to the recipients were collapsed, resulting in a total of seven imputation classes.

Table 3.2 Imputation Classes for Imputing Missing Best Values, 1998 NHIS/NIPRCS

4:3:1:3 status according to jousehold	Shot Card		No Shot Card	
	High school or less, or missing	College or higher	High school or less or missing	College Or higher
Up-to-date	1	2	3	
Not up-to-date	4	5	6	
Missing			7	

Within each imputation class, a hot-deck imputation procedure was used to impute the number of doses of each vaccine and series using data from children with non-missing best values. Cases in which best values were imputed are marked by the variable IMP_FLAG.

3.6 Children Aged 12-18 Months

In the absence of a standard definition of Aup-to-date@ for children between 12 and 18 months of age for either a specific vaccine or a series of vaccines, the best values were used to calculate weighted percentages of children receiving one or more doses of each vaccine. See Appendix C for a table with these estimates.

Chapter 4. Calculating Estimates of Vaccination Coverage and Standard Errors

As mentioned in the previous chapter, the NHIS/NIPRCS uses several methods for producing estimates of vaccination coverage. This chapter provides the user of the data set with instructions for replicating these methods.

4.1 Provider-Adjusted Estimates of Vaccination Coverage

As described in Section 3.2, the provider-adjusted estimates use the children with usable provider data to estimate the proportion of children who are up-to-date in the sample as a whole. The steps required to obtain the estimates are given below:

Step 1: Use the sample weight WTFA_IM in the following steps.

Step 2: All children between the ages of 19 and 35 months for whom the NHIS/IM was completed are divided into weighting classes specific to each vaccine. The weighting classes form two main groups according to whether the household used a shot card. All children belonging to households that used shot cards to report the number and dates of vaccinations are in the first group, and children from households that reported from memory recall belong to the second group. Within each main group, children are divided into subgroups by the number of doses reported by the household. Table 4.1 shows the weighting classes for calculating the provider-adjusted estimate of DTP coverage.

The weighting classes for the other vaccines appear in Appendix D in the column "Number of Doses Reported by Household."

Step 3: Sum the weights (WTFA_IM) of children with usable provider data in each weighting class. This gives the estimated number of children with provider data. Call this Sum 1. (See Column 1 in Table 4.2.)

Next, sum the sample weights of all children with usable provider data who are up-to-date on the specific vaccine. This gives the estimated number of children who are up-to-date among children with provider data. Call this Sum 2. (See Column 2 in Table 4.2.)

Compute the ratio [Sum 2/Sum 1]. This gives the proportion of children with usable provider data who are up-to-date in this weighting class. (See Column 3 in Table 4.2.)

Table 4.1: Weighting Classes for DTP, 1998 NHIS/NIPRCS	
Use of Shot Card	**Number of Doses of DTP**
Shot Card Used	4+
	3
	2
	1
	0
No Shot Card	4+
	3
	2
	1
	0
	All*
	Don=t know/Missing

* The household respondent was not able to give the total number of shots received, but indicated that the child was up-to-date on this vaccine.

Step 4: Apply this proportion to the total weighted number of children in the weighting class. The total weighted number of children is obtained by simply aggregating the sample weights of all children. (See Column 4 in Table 4.2) This product gives the estimated number of children who are up-to-date in that weighting class. (See Column 5 in Table 4.2)

Step 5: Aggregate the estimated numbers of children who are up-to-date on the specific vaccine over all weighting classes. (See the Total entry in Column 5 in Table 4.2.)

Step 6: Divide the number obtained in Step 5 by the total estimated number of children over all the weighting classes. This is simply the sum of the weights of all children who completed the NHIS/IM. (See the Total entry in Column 4 in Table 4.2.)

Step 7: The number obtained in Step 6 (when multiplied by 100) gives the percentage of children who are up-to-date on the specific vaccine. This is the provider-adjusted estimate of coverage for that vaccine.

Table 4.2: Calculation of Provider-Adjusted Estimate for DTP, 1998 NHIS/NIPRCS					
Weighting Class	**(1) Sum of the weights of all children with usable provider data**	**(2) Sum of the weights of children who are up-to-date among children in (1)**	**(3)=(2)/(1) Proportion of children who are up-to-date**	**(4) Sum of the weights of all children with and without provider data**	**(5)=(4)x(3) Estimated number of children who are up-to-date**
Shot Card 4+	781,124	717,454	.9185	1,335,447	1,226,594
3	222,407	158,752	.7138	430,386	307,205
2	59,425	41,005	.6900	104,114	71,842
1	19,124	16,909	.8842	51,220	45,288
0	4,098	0	.0000	9,947	0
No Shot Card 4+	41,724	40,033	.9595	92,261	88,522
3	74,109	58,459	.7888	172,726	136,251
2	37,472	34,416	.9184	84,957	78,028
1	28,516	16,484	.5781	52,130	30,134
0	37,235	32,531	.8737	119,833	104,694
All[1]	1,185,159	1,024,153	.8641	2,369,006	2,047,172
Don=t Know/ Missing	270,517	215,101	.7951	635,944	505,669
Total	2,760,910	2,355,297	.8531	5,457,971	4,641,399
Percentage of children who are up-to-date for DTP: [4,641,272/5,457,971]x100 =					**85.04**

[1] AAll@ indicates that the household respondent was not able to give the total number of shots received, but reported that the child was up-to-date on this vaccine.

This example includes data from both the original data collection and the NRFUS. Provider-adjusted estimates can be calculated including or excluding the provider data collected in the NRFUS. These cases can be identified by using the variable NRF_FLG.

See Appendix A for the provider-adjusted estimates of coverage for other vaccines and series. The estimates including NRFUS cases can be found in the column "Final Provider-Adjusted Estimates." Provider-adjusted estimates without NRFUS cases will correspond to the column labeled "Initial + Reconciliation" in the table in the appendix.

4.2 Best Value Estimates and Using Imputed Best Values

Best value estimates should be calculated using the best value weight (WT_BV2), which incorporates an adjustment for children without best values. When using the imputed best values, the NHIS/IM sampling weight (WTFA_IM) should be used. Cases for which best values were imputed are flagged in the data set (IMP_FLAG = 1).

Any estimates of vaccination coverage calculated using the best values for vaccination dates must include the NRFUS cases. The best value weight (WT_BV2) was calculated using all cases with provider data, and excluding the NRFUS cases would produce inaccurate results.

See Appendix A for the coverage estimates for each vaccine and series using the best value and imputed best value data.

4.3 Calculating Standard Errors

4.3.1 Standard Errors of NHIS Estimates

Data users should refer to the report *Design and Estimation for the 1995-2004 National Health Interview Survey* (Series 2, No. 130), available on the NCHS Web site http://www.cdc.gov/nchs/nhis.htm, for detailed instructions on how to calculate standard errors (using SUDAAN) for the 1998 NHIS estimates.

4.3.2 Standard Errors of Best Value Estimates

Vaccination coverage rates are ratio estimates, and the Taylor linearization method can be used to compute the standard errors of these estimates (Nixon et al. 1996). For computing the standard errors of best value estimates of vaccination coverage rates, the "pseudostrata" created for the NHIS with two PSUs per stratum were first considered. Because only a subset of the sample of children had best values, many of the strata were empty, in the sense that the two PSUs in the stratum did not have children with best values. Therefore, the 336 NHIS strata were collapsed to 203 strata such that each stratum had two PSUs containing children with best values. The standard errors of the best value estimates were computed using SUDAAN software (Shah et al. 1997).

Appendix E gives an example of a SAS program that calls SUDAAN to calculate standard errors, including the specifications for collapsing the 1998 NHIS strata. For the 1997 NHIS/NIPRCS, strata were manually collapsed as needed to ensure a minimum of two PSUs per stratum. For 1998, an algorithm (SAS program) was used to collapse the strata. Applying that program to 1997 could yield a somewhat different set of collapsed strata and therefore standard errors might differ slightly. Other software such as STATA (Stata Corporation 2001) or SAS (SAS Institute Inc. 1999) can also be used to estimate the standard errors by the Taylor linearization method.

The standard errors of the best value estimates for all vaccines and series can be found in Appendix A.

4.3.3 Standard Errors of Estimates Based on Imputed Best Values

Treating the imputed best values as if they were responses and then computing the variance estimates, using a standard method like Taylor linearization, generally results in underestimation of the variance. Alternative methods of variance estimation take into account the presence of imputed values and adjust for this underestimation. A jackknife variance estimation method suggested by Rao and Shao (1992) was used to compute the variance of the estimates based on imputed values. (For details of this procedure, see the internal methodology report. Abt Associates Inc. 2002.) The table in Appendix A includes the standard errors.

Chapter 5. Public-Use Data File

This chapter contains details about the 1998 NHIS/NIPRCS data file and information for users and analysts of these data. The data file is in ASCII format. A code book and a program for reading the data into SAS are available with this data file.

5.1 File Description

Data in the PUF come from two sources: the 1998 NHIS/IM and the 1998 NHIS/NIPRCS. The source of each variable is noted in the code book. Data are provided at the child level; that is, each child has one record, which includes the household and provider information. The data file contains 2,966 records for children aged 12-35 months. If more than one child was interviewed in a household, the household variables, including the ID number, are included in each child=s record.

5.2 Data Cleaning

Data from the Immunization History Questionnaire were checked for internal consistency, including skip-pattern logic and out-of-range or otherwise invalid values. The provider data file was checked for duplicate records from the same provider. When a child had data from more than one IHQ, decision rules were applied to produce the most complete record of the child=s immunization history. The analyst should refer to the documentation provided by the NCHS for data collected in the NHIS or the NHIS/IM.

As described in Sections 2.3.3 and 2.4, some provider data may have been edited as a result of the reconciliation and file preparation processes.

For shot date variables from the IHQ, if the day of the month was missing, it was imputed to A15" for the purpose of calculating the age in days at the time of vaccination. If this value created a vaccination date before the child=s date of birth, the value would be changed to be equal to the date of birth.

5.3 Missing Value Codes

A standard coding scheme, based on the NHIS protocol, designates Arefused@ and Adon=t know@ responses on all variables. ARefused@ responses are coded as A7@ (with leading 9s filling the width of the field), and Adon=t know@ responses are coded as A9@ (again, with leading 9s). A code of A8@ indicates Anot ascertained@ responses, which typically occur when an in-the-universe respondent had a blank field or the field contained an invalid code.

Because the appropriateness of some questions depended on the availability of shot records, not all questions were asked of all respondents. Cases that were not eligible to answer specific questions are coded as A. <BLANK: NOT IN UNIVERSE>." The notes in the code book describe the universe for each question.

5.4 Variable Naming Conventions

The provider data from the Immunization History Questionnaires are used to create numerous child-level composite variables, as described below. The names of the variables giving the number of doses received for each vaccine begin with P_NUM. For example, P_NUMHEP gives the number of doses of hepatitis B vaccine received by the child according to the provider data.

The provider data are also used to form variables for age in days and age in months at each vaccination. For age in days and age in months, either 4 or 8 variables are created, depending on the number of doses recommended for the vaccine. The variable names for age in months end with AGn, where n is the dose number. For example, HEPAG1 to HEPAG8 give age in months for 8 possible doses of hepatitis B vaccine. Similarly, for age in days at vaccination, the variable names start with D and end with AGn. DHEPAG1 to DHEPAG8 give age in days for 8 possible hepatitis B vaccination doses.

An up-to-date status indicator variable was created for each vaccine. These variables use the best values. Each of these variables begins with B_UTD. For example, the variable B_UTDHEP indicates whether the child received 3 or more doses of hepatitis B vaccine.

To accommodate the large number of types of vaccinations, a vaccination-type variable was created for each shot or dose. For example, the vaccination-type variable for DTP indicates whether the specific dose was a DTP, DTaP, DT, unknown (unmarked) type of DTP, DTP-Hib, DTaP-Hib, or an unknown (unmarked) type of DTP-Hib vaccination.

5.5 Changes from 1997 NHIS/NIPRCS Data File

5.5.1 New Variables

Ten variables were added to the public-use data file in 1998.

> **AGEGRP** - This variable recodes the child's age in months (ICAGEMR) into 4 categories (12-18 months, 19-24 months, 25-29, and 30-35 months.)

HEP_BRTH - This variable indicates whether the provider indicated on the IHQ that the child received a hepatitis B shot at birth. The provider may have indicated that the child received the birth dose, without giving a date for that dose.

NCARER1 - This variable is a composite of the variables NCARE_11 to NCARE_14. It indicates whether all, some, or none of the child's providers reported that they provide comprehensive child care.

NCARER2 - This variable is a composite of the variables NCARE_21 to NCARE_24. It indicates whether all, some, or none of the child's providers reported that they provide acute illness care.

NCARER3 - This variable is a composite of the variables NCARE_31 to NCARE_34. It indicates whether all, some, or none of the child's providers reported that they provide follow-up visits.

NCARER4 - This variable is a composite of the variables NCARE_41 to NCARE_44. It indicates whether all, some, or none of the child's providers reported that they provide after-hours phone coverage.

NCARER5 - This variable is a composite of the variables NCARE_51 to NCARE_54. It indicates whether all, some, or none of the child's providers reported that they provide programs or services for the Women, Infant and Children (WIC) program.

NCARER6 - This variable is a composite of the variables NCARE_61 to NCARE_64. It indicates whether all, some, or none of the child's providers reported that they provide other types of services.

NRF_FLG - This variable indicates whether the provider data for the child were collected in the NRFUS.

VFC_PRO - This composite variable combines the responses to VFC_PRO1 to VFC_PRO4 to indicate whether any of the child's providers participate in the Vaccines for Children (VFC) program.

5.5.2 Variables with Different Response Categories

Additionally, two variables have new response categories. A checkbox was added to the IHQ to distinguish DTP-Hib and DTaP-Hib combination shots. All variables that indicate the type of DTP or Hib shot given now include this as a potential type of

vaccine. The categories for the variable FACTYPE also changed from 1997. (See Appendix B for the new IHQ.)

5.6 Explanatory Notes for Specific Variables

ADJ_GRP

The adjudication groups are used for assessing agreement and consistency between the provider report(s) and the household report of vaccinations. See Section 2.3.3 for a detailed explanation of the matching and reconciliation procedures.

Household reports from shot record

R1 All dates and numbers of doses match provider reports

R2 All numbers of doses match provider reports, but at least one date is discrepant

R3 At least one discrepancy in number of doses; all discrepancies involve a household over-report

R4 At least one discrepancy in number of doses; all discrepancies involve a household under-report

R5 At least two discrepancies in number of doses; at least one over-report and one under-report

Household reports from memory recall

H1 No discrepancies in number of doses (includes cases where the household responds ADon=t Know@)

H2 At least one discrepancy in number of doses; all discrepancies involve a household over-report

H3 At least one discrepancy in number of doses; all discrepancies involve a household under-report

H4 At least two discrepancies in number of doses; at least one over-report and one under-report

Multiple provider reports

M Non-identical reports from two or more providers

DISPCODE

The DISPCODE refers to the completeness and validity of the immunization information from all the Immunization History Questionnaires returned for the child.

1 All identified providers responded, no problems indicated in cross-check between household and provider shot dates.

2 All identified providers responded, no shot card to cross-check.

3 All identified providers responded, poor immunization history matching results.

4 All identified providers responded, poor immunization history matching

results, additional mismatch indicators present.

5 Some but not all identified providers responded, but provider information indicates 4:3:1:3:3 up-to-date.

6 Some but not all identified providers responded, but provider information matches shot card immunization history.

7 Some but not all identified providers responded, completeness of provider immunization history is unknown.

8 Some but not all identified providers responded, but provider information indicates 4:3:1:3:3 up-to-date when immunizations after the interview date are included.

9 Some but not all identified providers responded, but provider information indicates at least as many doses for each vaccine as the household respondent (or at least 1 dose for MCV).

10 Some but not all identified providers responded, but the household reported an inexact number of vaccinations (AAll,@ ADon=t Know,@ ARefused@ or missing) for one or more vaccines, and any exact responses meet previous criteria (for DISPCODE 9).

11 Some but not all identified providers responded, but definite number of shots was reported by household not from a shot card for one or more vaccines, and any other vaccines meet previous criteria (for DISPCODE 9 or 10).

When analyzing children with provider data, cases with DISPCODE = 7 should not be included.

NUM_DTP, NUM_POLI, NUM_MMR, NUM_HIB, NUM_HEPB, NUM_CPOX

These variables were calculated by totaling the number of each type of vaccination reported by the household respondent in the NHIS/IM, either from a shot card or from recall.

PSU

The variable identifies the primary sampling unit (PSU) and is used in variance estimation. Refer to the NHIS/IM documentation for more information.

STRATUM

To calculate the standard errors of the best value estimates of vaccination coverage, the original NHIS strata need to be collapsed. See Appendix E for an example program.

5.7 Flags

The following flag variables are included in the data file:

BDOBFLAG - A value of 1 indicates that no provider date of birth information was obtained and BEST_DOB is the date of birth reported by the household respondent.

BESTVAL - A value of 1 indicates that best value vaccination dates were determined. A value of 2 indicates that the child does not have best values.

BRDOBFLG- A value of 1 indicates that BEST_DOB was assigned after recontacting the household and/or providers to reconcile differences.

IMP_FLAG - A value of 1 indicates that the best value vaccination status was imputed.

PRO_FLAG - A value of 1 indicates that the child was 4:3:1:3 up-to-date according to the household=s shot record. A value of 2 indicates the child was not 4:3:1:3 up-to-date. The value is missing for children in households that did not use shot cards.

5.8 Data Alerts

This section details known problems with the data.

Considerable time elapsed between the 1998 NHIS/IM data collection and the collection of vaccination data from providers, in some cases up to two years. The consent given by respondents was good for one year only, and in many cases it was necessary to renew the permission form before sending the Immunization History Questionnaires to providers. In total, 1,805 valid permission forms with complete provider information were collected by the Census Bureau. Of those, 809 cases that expired before a questionnaire could be mailed to the provider. However, 374 of those cases were recontacted and renewed permission, and an IHQ was sent to the provider. Between the number of valid forms collected, and the forms that expired, a relatively low percentage of children ended up with provider vaccination data.

Although all provider-reported shot dates are reviewed and sent for reconciliation, some inconsistencies may remain in the data that could not be verified. These include shot dates that are too close together, and certain shots given before 38 days of age that are not recommended. Further, any variables derived from the provider reports (e.g., VISITS) may contain inaccuracies if those data could not be reconciled or verified.

5.9 Code Book

A complete listing of the variables included in the public-use data file is available in the *1998 National Health Interview Survey/National Immunization Provider Record Check Study Public-use Data File Code Book*. The code book contains a table of contents and an alphabetic list of variables. Then each variable is listed with either 1) the frequency of a given response, the response value, and the formatted response label; 2) a count of missing and non-missing values with summary statistics; or 3) a count of missing/non-missing values.

For categorical variables, the code book gives the frequency of each category. For continuous variables, the mean, median, minimum, and maximum values are displayed.

5.10 Guidelines for Citation of Data

Any published material derived from the data should acknowledge NCHS as the original source. The suggested citation to appear at the bottom of all tables is as follows:

> Source: CDC, NIP and NCHS (2002), 1998 National Health Interview Survey/National Immunization Provider Record Check Study

In a bibliography, the citation should read:

> U.S. Department of Health and Human Services. 1998 National Health Interview Survey/National Immunization Provider Record Check Study (machine readable data file and documentation). National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville, MD, 2002.

The published material should also include a disclaimer that credits any analyses, interpretations, or conclusions reached to the author (recipient of the data file) and not to NCHS, which is responsible only for the initial data. Consumers who wish to publish a technical description of the data should make an effort to ensure that the description is not inconsistent with that published by the NCHS.

Please place the acronym NHIS/NIPRCS in the titles, keywords, or abstracts of journal articles and other publications in order to facilitate retrieval of such materials in bibliographic searches.

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APPENDICES

APPENDIX A
ESTIMATES OF VACCINATION COVERAGE RATES AMONG CHILDREN AGED 19-35 MONTHS

Estimates of vaccination coverage in the 1998 NHIS/NIPRCS

	Provider-Adjusted Estimates				Best Value Estimates			
Vaccination and Series [1]	Initial [2]	Initial + NRFUS[3]	Initial + Reconciliation [4]	Final Provider Adjusted[5]	Final Best Values [6]		Including Imputed Best Values [7]	
					Estimate	S.E.	Estimate	Rao-Shao S.E.
DTP	84.9	84.0	85.4	85.0	85.2	1.3	86.4	1.5
DTP3	95.4	95.4	95.9	96.1	96.1	0.7	96.4	0.6
POLIO	91.3	91.2	91.5	91.7	92.3	1.0	92.8	1.2
MCV	91.7	92.0	92.8	93.0	93.8	0.9	94.2	1.1
HIB	94.0	93.5	94.2	94.0	94.2	0.9	94.4	0.8
HEP B	88.3	87.7	89.3	89.1	89.6	1.1	90.3	0.9
4:3:1	81.2	80.4	81.5	81.4	82.2	1.4	83.6	1.6
4:3:1:3	80.1	79.3	80.6	80.4	81.1	1.4	82.3	1.6
4:3:1:3:3	74.9	73.8	76.1	75.6	76.1	1.5	77.4	1.5

[1] 4:3:1means up-to-date with 4 or more doses of DTP, 3 or more doses of polio, and 1 or more doses of MCV. 4:3:1:3 includes 3 or more doses of Hib, and 4:3:1:3:3 includes 3 doses or more of Hep B.

[2] Provider-adjusted estimates are calculated from provider-reported data. See Section 4.1 for a complete description of how provider adjusted estimates are calculated. The initial estimate is calculated from unreconciled data and cannot be reproduced using the public-use file.

[3] This estimate includes the NRFUS cases, but does not include the data from reconciliation. It cannot be reproduced using the public-use file.

[4] This estimate does not include the cases with provider data collected in the NRFUS.

[5] This estimate includes the NRFUS cases, and reconciliation for both the initial and NRFUS cases.

[6] The Final Best Value estimates include the NRFUS cases and are calculated using the weight WT_BV2. See Section 4.2 for a description of the procedures to calculate best values. See Section 4.3 for a description of the standard errors.

[7] The up-to-date status is imputed for children who do not have best vaccination values. See Section 3.5 for a description of the imputation process.

APPENDIX B
1998 NHIS/NIPRCS IMMUNIZATION HISTORY QUESTIONNAIRE

NATIONAL IMMUNIZATION PROVIDER RECORD CHECK STUDY
IMMUNIZATION HISTORY QUESTIONNAIRE

INSTRUCTIONS: Please review your records and complete this questionnaire for the child identified below. Then mail it in the postage-paid envelope provided or fax it to: FAX: 1-800-293-5155

The Immunization History Questionnaire is voluntary. The National Center for Health Statistics, the Centers for Disease Control and Prevention, their contractors or grantees will use this information only for statistical purposes in health research, and no information which identifies the child, the child=s family, doctors or medical care providers will ever be released or published. (Title 42, United States Code, Section 242k.)

FOR OFFICE USE ONLY	For LABEL placement (printed from *NIPTRACK*)
TYPE Telephone Mail Fax	

1. Which of the following best describes your records of immunization for this child? (Check only one box.)
   - 1 **G** a. Have immunization record for this child. (Go to item 2 below.)
   - 2 **G** b. Have provided care to this child, but do not have his/her immunization record. (Go to question 3 on next page.)
   - 3 **G** c. Have no record of providing care to this child. (Return questionnaire to CDC as instructed above.)
   - 4 **G** d. Other: _____

2. Referring to all sources of immunization history, please specify below the month, day and year when each of the following immunizations was given, either by your office or by another provider (OP), as documented in your records. If you prefer, you may attach a copy of the complete immunization history and complete Questions 3 through 12.

   Circle the "OP" for any immunization given by another provider, after the date for that immunization. Please see item 12.

	Dates of immunization (MM - DD - YYYY)				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
DT/DTP/DTaP (check one box per date)	___-___-____ OP **9** *DT* **9** *DTP* **9** *DTaP*	___-___-____ OP **9** *DT* **9** *DTP* **9** *DTaP*	___-___-____ OP **9** *DT* **9** *DTP* **9** *DTaP*	___-___-____ OP **9** *DT* **9** *DTP* **9** *DTaP*	___-___-____ OP **9** *DT* **9** *DTP* **9** *DTaP*
DTP-Hib (Tetramune or Acthib/DTP) DTaP-Hib (TriHibit)	___-___-____ OP **9** *DTP/Hib* **9** *DTaP/Hib*	___-___-____ OP **9** *DTP/Hib* **9** *DTaP/Hib*	___-___-____ OP **9** *DTP/ Hib* **9** *DTaP/Hib*	___-___-____ OP **9** *DTP/Hib* **9** *DTaP/Hib*	___-___-____ OP **9** *DTP/HIb* **9** *DTaP/HIb*
Hib	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP
Hepatitis B (enter date or check box)	___-___-____ OP **9** *Administered at birth*	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP
Polio (OPV or IPV) (check one box per date)	___-___-____ OP **9** *OPV* **9** *IPV*	___-___-____ OP **9** *OPV* **9** *IPV*	___-___-____ OP **9** *OPV* **9** *IPV*	___-___-____ OP **9** *OPV* **9** *IPV*	___-___-____ OP **9** *OPV* **9** *IPV*
MMR	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP
Measles only	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP
Varicella	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP
Other Vaccines (Specify)	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP	___-___-____ OP

3. What was the date of this child's first visit for any reason to this place of practice?

_____ - _____ - _____ or 8 **G** Don't Know
mm dd yyyy

4. What was the date of this child's most recent visit for any reason to this place of practice?

_____ - _____ - _____ or 8 **G** Don't Know
mm dd yyyy

5. Which types of care does this facility routinely provide? (Check all that apply.)

1 **G** a. Comprehensive well-child care (examination, anticipatory guidance, screening)
2 **G** b. Acute illness care
3 **G** c. Follow-up visits
4 **G** d. After-hours telephone coverage
5 **G** e. WIC Program/services
6 **G** f. Other (Describe:)

6. Which of the following best describes this facility? (Check only one box, representing the most specific description.)

1 **G** a. Federally-qualified health center, including community/migrant/rural/ Indian health center
2 **G** b. Hospital-based clinic, including university clinic and residency teaching practice
3 **G** c. Private practice, including solo, group practice or HMO
4 **G** d. Public health department-operated clinic
5 **G** e. Military health care facility
6 **G** f. Other (Describe:)

7. Is this facility a Vaccines for Children provider?

1 **G** a. Yes 2 **G** b. No 3 **G** c. Unknown

8a. Was this facility ever this child's medical home for primary care? (**Medical home**: the place where care is delivered or directed by practitioners known to the child and family, who are able to manage or facilitate essentially all aspects of pediatric care.)

1 **G** a. Yes (Go to question 8b.) 2 **G** b. No (Go to item 9.) 3 **G** c. Unknown (Go to item 9.)

8b. If Yes, what specialty is (was) this child's primary care provider?

1 **G** a. Pediatrician
2 **G** b. Family Physician
3 **G** c. General practitioner
4 **G** d. Other (Describe)_____

9. Name of person completing questionnaire: (print)_____

Phone: (_____) _____ Signature:

10. According to your records, what is this child's date of birth? _____-_____-_____ or 8 **G** Don't know
mm dd yyyy

11. According to your records, did this child ever use another last name (excluding names prior to adoption)?

1 **G** Yes [Specify name(s):] _____ 2 **G** No

INSTRUCTIONS: If you know of other providers that may have immunization records for this child, please continue with item 12. Otherwise, return this questionnaire to CDC. Call 1-877-652-1244 (toll-free) with any questions. Thank you.

12. Please enter below the names, addresses and telephone numbers of other providers who may have an immunization record for this child, and the name and address for any provider of immunizations with OP circled in item 2.

(1) _____ (2) _____

_____ _____

_____ _____

(_____) _____ (_____) _____

APPENDIX C
ESTIMATES OF VACCINATION COVERAGE AMONG CHILDREN AGED 12-18 MONTHS

Weighted Best Value Estimates of Vaccination Coverage among Children Aged 12-18 Months (n=497), 1998 NHIS/NIPRCS

Vaccine/ Series	Percent of children receiving number of doses of vaccines										
	None		**1**		**2**		**3**		**4+**		Total
	Est (%)	S.E.	Est (%)	S.E.	Est (%)	S.E.	Est (%)	S.E.	Est (%)	S.E.	
DTP	-	-	2.0	0.8	4.5	1.0	62.1	2.3	31.4	2.4	**100.0**
Polio	-	-	1.8	0.7	31.6	2.5	66.6*	2.5	-	-	**100.0**
MCV	35.3	2.5	64.7*	2.5	-	-	-	-	-	-	**100.0**
Hib	-	-	3.3	0.8	6.6	1.5	90.1*	1.7	-	-	**100.0**
HepB	1.9	0.8	1.4	0.5	12.1	1.8	84.6*	1.7	-	-	**100.0**

Note: A dash in the cell means the sample contained no children in this category.

*This number may include children who have more than the recommended number of doses (i.e., more than 1 MCV or varicella vaccination, or more than 3 polio, Hib, or Hep B vaccinations.)

APPENDIX D
WEIGHTING CLASSES AND CALCULATIONS FOR PROVIDER-ADJUSTED ESTIMATES

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
DTP

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, 4+	554323	781124	717454	91.85	1335447	1226594	
3	207979	222407	158752	71.38	430386	307205	
2	44689	59425	41005	69.00	104114	71842	
1	32096	19124	16909	88.42	51220	45288	
0	5849	4098	0	0.00	9947	0	
No Shot Card, 4+	50537	41724	40033	95.95	92261	88522	
3	98617	74109	58459	78.88	172726	136246	
2	47485	37472	34416	91.84	84957	78025	
1	23614	28516	16484	57.81	52130	30136	
0	82598	37235	32531	87.37	119833	104698	
All	1183847	1185159	1024153	86.41	2369006	2047058	
DK/Missing	365427	270517	215101	79.51	635944	505639	
Total	2697061	2760910	2355297	85.31	5457971	4641272	85.04

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
DTP3

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, 3+	762302	1003531	973426	97.00	1765833	1712860	
2	44689	59425	50518	85.01	104114	88509	
1	32096	19124	17994	94.09	51220	48194	
0	5849	4098	4098	100.00	9947	9947	
No Shot Card, 3+	149154	115833	112159	96.83	264987	256582	
2	47485	37472	37472	100.00	84957	84957	
1	23614	28516	26423	92.66	52130	48304	
0	82598	37235	37235	100.00	119833	119833	
All	1183847	1185159	1141610	96.33	2369006	2281956	
DK/Missing	365427	270517	252753	93.43	635944	594184	
Total	2697061	2760910	2653688	96.12	5457971	5245326	96.10

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
POLIO

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, 3+	748655	936664	866605	92.52	1685319	1559257	
2	44854	87854	58772	66.90	132708	88782	
1	40637	38654	35447	91.70	79291	72710	
0	10790	23006	18908	82.19	33796	27777	
No Shot Card, 3+	103386	78769	78769	100.00	182155	182155	
2	59058	56973	52815	92.70	116031	107561	
1	44433	45835	36693	80.05	90268	72260	
0	97641	52371	49728	94.95	150012	142436	
All	1177961	1180653	1087406	92.10	2358614	2172283	
DK/Missing	369646	260131	238392	91.64	629777	577128	
Total	2697061	2760910	2523535	91.40	5457971	5002349	91.65

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
MCV

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, 1+	755383	1016229	968533	95.31	1771612	1688463	
0	89553	69949	41291	59.03	159502	94154	
No Shot Card, 1+	225286	175104	169910	97.03	400390	388513	
0	157173	88736	82596	93.08	245909	228894	
All	1090502	1116107	1051192	94.18	2206609	2078268	
DK/Missing	379164	294785	260374	88.33	673949	595277	
Total	2697061	2760910	2573896	93.23	5457971	5073569	92.96

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
HIB

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, 3+	619122	818551	781680	95.50	1437673	1372914	
2	63692	91088	78728	86.43	154780	133777	
1	100835	80551	69789	86.64	181386	157152	
0	61287	95988	94686	98.64	157275	155142	
No Shot Card, 3+	87904	59404	59404	100.00	147308	147308	
2	38265	21361	17064	79.88	59626	47632	
1	46062	49865	48174	96.61	95927	92674	
0	198167	117262	113637	96.91	315429	305678	
All	1017229	1072111	1019708	95.11	2089340	1987217	
DK/Missing	464498	354729	316040	89.09	819227	729877	
Total	2697061	2760910	2598910	94.13	5457971	5129371	93.98

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
HEP B

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, 3+	661771	927801	858721	92.55	1589572	1471219	
2	81035	86819	66039	76.07	167854	127678	
1	45956	29496	25405	86.13	75452	64987	
0	56174	42062	23480	55.82	98236	54838	
No Shot Card, 3+	88645	93918	93918	100.00	182563	182563	
2	53446	40657	40657	100.00	94103	94103	
1	58020	58602	42039	71.74	116622	83660	
0	210793	135167	127346	94.21	345960	325942	
All	936619	990284	879074	88.77	1926903	1710510	
DK/Missing	504602	356104	310382	87.16	860706	750196	
Total	2697061	2760910	2467061	89.36	5457971	4865696	89.15

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
4:3:1

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, Up-to-Date	524980	712999	615462	86.32	1237979	1068626	
Not Up-to-Date	319956	373179	267973	71.81	693135	497728	
No Shot Card, Up-to-Date, All	1096101	1116443	934484	83.70	2212544	1851941	
Up-to-Date, Number	33102	19608	19608	100.00	52710	52710	
Not Up-to Date	325788	235712	179123	75.99	561500	426697	
DK/Missing	397134	302969	235596	77.76	700103	544417	
Total	2697061	2760910	2252246	81.58	5457971	4442119	81.39

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
4:3:1:3

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, Up-to-Date	455346	600745	504853	84.04	1056091	887516	
Not Up-to-Date	389590	485433	368219	75.85	875023	663738	
No Shot Card, Up-to-Date, All	954920	1006821	839034	83.33	1961741	1634816	
Up-to-Date, Number	26223	19608	19608	100.00	45831	45831	
Not Up-to-Date	423595	305724	237504	77.69	729319	566577	
DK/Missing	447387	342579	255458	74.57	789966	589070	
Total	2697061	2760910	2224676	80.58	5457971	4387548	80.39

Provider-adjusted estimates
Original Data + NRFUS
Children 19-35 months old
Weighted(weight -WTFA_IM)
4:3:1:3:3

Number of Doses Reported By Household	Without Provider Data	Total With Provider Data	Up_to_ date	Percent	Total	Final Provider adjusted up-to-date	Final Provider adjusted up-to-date(%)
Shot Card, Up-to-Date	400458	526078	433456	82.39	926536	763409	
Not Up-to-Date	444478	560100	389124	69.47	1004578	697921	
No Shot Card, Up-to-Date, Number	830162	906860	694400	76.57	1737022	1330071	
Up-to-Date, All	13515	17296	17296	100.00	30811	30811	
Not Up-to-Date	511015	386531	290224	75.08	897546	673916	
DK/Missing	497433	364045	265950	73.05	861478	629345	
Total	2697061	2760910	2090450	75.72	5457971	4125473	75.59

APPENDIX E
EXAMPLE OF A SAS PROGRAM THAT CALLS SUDAAN FOR CALCULATING STANDARD ERRORS

```
*******************************************************************************
SE_NIPR98.SAS

THIS PROGRAM  WILL PRODUCE ESTIMATES AND STANDARD ERRORS FOR BEST VALUE
UP-TO-DATE STATUS USING SAS- CALLABLE SUDAAN.

SUDAAN NOTES:
   1. ALL VARIABLES USED MUST BE NUMERIC.
   2. VARIABLES IN THE SUBGROUP STATEMENT MUST HAVE VALUES 1,2,...K
      WHERE K IS THE NUMBER OF LEVELS FOR EACH VARIABLE.
   3. DATA MUST BE SORTED ACCORDING TO THE SAMPLE DESIGN VARIABLES
      (STRATUM AND PRIMARY SAMPLING UNIT), SPECIFIED IN THE NEST STATEMENT.
*******************************************************************************;

title 'SUD_NIPR.SAS';

options nofmterr ls=80;

libname data v612  'c:\nprpuf98';     **** SPECIFY PATH TO SAS DATA SET;

proc format ;
        value utdf 1='UP-TO-DATE'
                   2='NOT UP-TO-DATE';
run;

data o;
set data.nprpuf98                                    /** SPECIFY NAME OF THE SAS DATA SET **/
(where=(19<=icagemr<=35 and bestval=1));   ** AGE 19-35 MO **
                                                     ** AND HAVE BEST VALUE **;
run;

/*****AUTOMATICALLY COLLAPSES STRATA TO HAVE AT LEAST TWO PSU PER STRATUM

If the original NHIS stratum has 2 PSUs with eligible children, it is  retained.  If the NHIS stratum contains
only one non-empty PSU, it is merged with the last retained stratum.    See the list of original and new collapsed
strata in the table following this program to collapse the strata manually.   ******/

/*** DEFINE UP-TO-DATE STATUS FOR EACH VACCINE AND SERIES ***/


proc sort nodupkey out=o1(keep=stratum psu);
by stratum psu ;

data o2(keep=stratum goodstra);
set o1;
by stratum psu ;
retain goodstra 1 ;

if first.stratum and ^last.stratum  then do;  /* STRATA WITH 2 PSU */
goodstra=stratum; end;

if last.stratum and first.stratum  then do;   /* STRATA WITH ONE PSU */
 output;    end;

proc sort nodupkey;
by stratum;

proc sort data=o;
by stratum;

data o;
merge o(in=_1) o2(in=_2);
by stratum;

if _1;
```

```
if _2 then stratum=goodstra;
format b_u: but: utdf.;

run;

proc sort;                          /* SORT BY NEST VARIABLES */
by stratum psu;
run;

proc crosstab data=o filetype=sas design=wr;                          /* CALLABLE SUDAAN PROCEDURE */
weight wt_bv2;
nest stratum psu/missunit;
subgroup b_utddtp b_utddt3 b_utdpol b_utdmmr b_utdhib b_utdhib b_utdhep
    b_utd431 butd4313 but43133;
levels      2 2 2 2 2 2 2 2 2 2;
tables   b_utddtp b_utddt3 b_utdpol b_utdmmr b_utdhib b_utdhib b_utdhep
    b_utd431 butd4313 but43133  ;
output / filename=se tablecell=default replace;
run;
```

COLLAPSED STRATA: Table to show which NHIS strata were collapsed in to new NHIS/NIPRCS strata for analysis

Stratum with 1 PSU	Stratum Collapsed Into
3	2
6	5
24	23
25	23
27	23
30	29
31	29
32	29
33	29
39	38
40	38
41	38
47	46
49	48
51	50
52	50
56	55
57	55
64	63
69	68
72	71
73	71
75	74
77	76
82	81
84	83
88	87
91	90
92	90
97	96
100	99
107	106
111	110
117	116
122	121
125	124
126	124
129	127
137	136
138	136
140	139
141	139
144	143
155	154
159	158
163	162
165	164
166	164
174	173
176	175
177	175
178	175
179	175
180	175
182	181
186	185
187	185

188	185
189	185
194	193
197	196
198	196
201	200
206	205
207	205
210	208
211	208
214	213
216	215
219	218
221	220
222	220
223	220
224	220
226	225
230	229
236	235
237	235
241	240
242	240
243	240
246	245
258	257
263	262
264	262
267	266
269	268
272	271
274	273
275	273
277	276
279	278
281	278
282	278
283	278
297	294
298	294
301	300
302	300
305	304
307	306
308	306
309	306
312	310
314	313
315	313
316	313
318	317
321	320
323	320
326	325
329	328
330	328
331	328
332	328
335	334
336	334

APPENDIX F
UNWEIGHTED DISTRIBUTION OF CHILDREN AGED 12-35 MONTHS IN THE 1998 NHIS/NIPRCS BY SELECTED DEMOGRAPHIC CHARACTERISTICS

UNWEIGHTED DISTRIBUTION OF CHILDREN AGED 12-35 MONTHS IN THE 1998 NHIS/NIPRCS BY SELECTED DEMOGRAPHICS CHARACHTERISTICS

Demographic Characteristic	Immunization Supplement (n	%)	Shot Card Users (n	%)	No Shot Card (n	%)	With Provider Data (n	%)	No Provider Data (n	%)
Total	2966		1129		1837		1443		1523	
Age of Child										
1. 12-18	894	30.1	351	31.1	543	29.6	418	29.0	476	31.3
2. 19-24	712	24.0	265	23.5	447	24.3	362	25.1	350	23.0
3. 25-29	575	19.4	225	19.9	350	19.1	292	20.2	283	18.6
4. 30-35	785	26.5	288	25.5	497	27.1	371	25.7	414	27.2
Gender of Child										
1. Male	1478	49.8	564	50.0	914	49.8	720	49.9	758	49.8
2. Female	1488	50.2	565	50.0	923	50.2	723	50.1	765	50.2
Race/Ethnicity of Child										
1. Hispanic	973	32.8	442	39.1	531	28.9	397	27.5	576	37.8
2. Black, nonHispanic	467	15.7	134	11.9	333	18.1	180	12.5	287	18.8
3. White, nonHispanic	1406	47.4	521	46.1	885	48.2	811	56.2	595	39.1
4. Other, nonHispanic	120	4.0	32	2.8	88	4.8	55	3.8	65	4.3
Poverty Status										
1. Below	618	20.8	277	24.5	341	18.6	241	16.7	377	24.8
2. Above	1788	60.3	706	62.5	1082	58.9	1004	69.6	784	51.5
3. Unknown	560	18.9	146	12.9	414	22.5	198	13.7	362	23.8
Income										
1. $20,000 and above	1966	66.3	717	63.5	1249	68.0	1070	74.2	896	58.8
2. Less than $20,000	868	29.3	385	34.1	483	26.3	338	23.4	530	34.8
3. Unknown	132	4.5	27	2.4	105	5.7	35	2.4	97	6.4
Education of Mother										
1. Less than High School	681	23.9	288	26.3	393	22.4	249	17.9	432	29.8
2. High School	752	26.4	282	25.8	470	26.8	352	25.3	400	27.6
3. Some College	817	28.7	318	29.1	499	28.5	448	32.2	369	25.4
4. College Graduate	564	19.8	200	18.3	364	20.8	338	24.3	226	15.6
5. Unknown	30	1.1	5	0.5	25	1.4	6	0.4	24	1.7

Demographic Characteristic	Immunization Supplement (n	%)	Shot Card Users (n	%)	No Shot Card (n	%)	With Provider Data (n	%)	No Provider Data (n	%)
Census Region										
1. Northeast	509	17.2	160	14.2	349	19.0	259	17.9	250	16.4
2. Midwest	640	21.6	226	20.0	414	22.5	360	24.9	280	18.4
3. South	1003	33.8	389	34.5	614	33.4	489	33.9	514	33.7
4. West	814	27.4	354	31.4	460	25.0	335	23.2	479	31.5
MSA										
1. 5,000,000 or more	440	14.8	159	14.1	281	15.3	183	12.7	257	16.9
2. 2,500,000 - 4,999,999	391	13.2	140	12.4	251	13.7	179	12.4	212	13.9
3. 1,000,000 - 2,499,999	680	22.9	246	21.8	434	23.6	319	22.1	361	23.7
4. 500,000 - 999,999	368	12.4	137	12.1	231	12.6	175	12.1	193	12.7
5. 250,000 - 499,999	330	11.1	129	11.4	201	10.9	166	11.5	164	10.8
6. Under 250,000	238	8.0	95	8.4	143	7.8	123	8.5	115	7.6
7. Non-MSA	519	17.5	223	19.8	296	16.1	298	20.7	221	14.5
RACE										
1. White	2117	71.4	847	75.0	1270	69.1	1104	76.5	1013	66.5
2. Black	467	15.7	130	11.5	337	18.3	180	12.5	287	18.8
3. AIAN	31	1.0	9	0.8	22	1.2	11	0.8	20	1.3
4. API	87	2.9	28	2.5	59	3.2	41	2.8	46	3.0
5. Other	179	6.0	87	7.7	92	5.0	71	4.9	108	7.1
6. Multiple race	72	2.4	23	2.0	49	2.7	32	2.2	40	2.6
7. Unknown	13	0.4	5	0.4	8	0.4	4	0.3	9	0.6
HISPAN_P										
0. Multiple Hispanic	37	1.2	16	1.4	21	1.1	13	0.9	24	1.6
1. Puerto Rican	82	2.8	27	2.4	55	3.0	31	2.1	51	3.3
3. Mexican-Mexicano	128	4.3	66	5.8	62	3.4	43	3.0	85	5.6
4. Mexican-American	431	14.5	204	18.1	227	12.4	180	12.5	251	16.5
5. Cuban/Cuban-American	19	0.6	5	0.4	14	0.8	10	0.7	9	0.6
6. Other Latin American	72	2.4	26	2.3	46	2.5	28	1.9	44	2.9
7. Other Spanish	9	0.3	4	0.4	5	0.3	7	0.5	2	0.1
8. Hispanic/Spanish,non-spec	191	6.4	92	8.1	99	5.4	85	5.9	106	7.0
9-11. Hispanic/Spanish, unk	4	0.1	2	0.2	2	0.1	0	0.0	4	0.3
12. Non Hispanic/Spanish Orig	1993	67.2	687	60.9	1306	71.1	1046	72.5	947	62.2

APPENDIX G
WEIGHTED DISTRIBUTION OF CHILDREN AGED 12-35 MONTHS IN THE 1998 NHIS/NIPRCS BY SELECTED DEMOGRAPHIC CHARACTERISTICS

WEIGHTED DISTRIBUTION OF CHILDREN AGED 12-35 MONTHS IN THE 1998 NHIS/NIPRCS BY SELECTED DEMOGRAPHIC CHARACTERISTICS
WEIGHT = WTFA_IM

Demographic Characteristic	Immunization Supplement (n %)		Shot Card Users (n %)		No Shot Card (n %)		With Provider Data (n %)		No Provider Data (n %)	
Total	7819081		2856590		4962491		3988076		3831005	
Age of Child										
1. 12-18	2361110	30.2	925476	32.4	1435634	28.9	1162856	29.2	1198254	31.3
2. 19-24	1911006	24.4	660605	23.1	1250401	25.2	1028140	25.8	882866	23.0
3. 25-29	1479575	18.9	546763	19.1	932812	18.8	762990	19.1	716585	18.7
4. 30-35	2067390	26.4	723746	25.3	1343644	27.1	1034090	25.9	1033300	27.0
Gender of Child										
1. Male	4001034	51.2	1478621	51.8	2522413	50.8	2052683	51.5	1948351	50.9
2. Female	3818047	48.8	1377969	48.2	2440078	49.2	1935393	48.5	1882654	49.1
Race/Ethnicity of Child										
1. Hispanic	1425138	18.2	614073	21.5	811065	16.3	577566	14.5	847572	22.1
2. Black, nonHispanic	1107459	14.2	324442	11.4	783017	15.8	435593	10.9	671866	17.5
3. White, nonHispanic	4892954	62.6	1820810	63.7	3072144	61.9	2796602	70.1	2096352	54.7
4. Other, nonHispanic	393530	5.0	97265	3.4	296265	6.0	178315	4.5	215215	5.6
Poverty Status										
1. Below	1319515	16.9	554459	19.4	765056	15.4	489892	12.3	829623	21.7
2. Above	5120887	65.5	1990709	69.7	3130178	63.1	2991342	75.0	2129545	55.6
3. Unknown	1378679	17.6	311422	10.9	1067257	21.5	506842	12.7	871837	22.8
Income										
1. $20,000 and above	5602855	71.7	2010466	70.4	3592389	72.4	3181473	79.8	2421382	63.2
2. Less than $20,000	1895346	24.2	787465	27.6	1107881	22.3	731145	18.3	1164201	30.4
3. Unknown	320880	4.1	58659	2.1	262221	5.3	75458	1.9	245422	6.4
Education of Mother										
1. Less than High School	1310662	17.4	495973	17.9	814689	17.0	472552	12.2	838110	22.9
2. High School	2022653	26.8	732396	26.5	1290257	27.0	991231	25.5	1031422	28.1
3. Some College	2271132	30.1	868064	31.4	1403068	29.3	1269459	32.7	1001673	27.3
4. College Graduate	1867986	24.7	661157	23.9	1206829	25.2	1130920	29.1	737066	20.1
5. Unknown	75396	1.0	9249	0.3	66147	1.4	17618	0.5	57778	1.6

Demographic Characteristic		Immunization Supplement (n %)		Shot Card Users (n %)		No Shot Card (n %)		With Provider Data (n %)		No Provider Data (n %)	
Census Region											
1.	Northeast	1451555	18.6	454378	15.9	997177	20.1	778502	19.5	673053	17.6
2.	Midwest	2055753	26.3	729544	25.5	1326209	26.7	1153017	28.9	902736	23.6
3.	South	2602610	33.3	951351	33.3	1651259	33.3	1296721	32.5	1305889	34.1
4.	West	1709163	21.9	721317	25.3	987846	19.9	759836	19.1	949327	24.8
MSA											
1.	5,000,000 or more	892784	11.4	314123	11.0	578661	11.7	401047	10.1	491737	12.8
2.	2,500,000 - 4,999,999	1096380	14.0	390505	13.7	705875	14.2	542057	13.6	554323	14.5
3.	1,000,000 - 2,499,999	1788403	22.9	604376	21.2	1184027	23.9	889436	22.3	898967	23.5
4.	500,000 - 999,999	967086	12.4	343555	12.0	623531	12.6	482015	12.1	485071	12.7
5.	250,000 - 499,999	878730	11.2	338293	11.8	540437	10.9	438720	11.0	440010	11.5
6.	Under 250,000	670397	8.6	238002	8.3	432395	8.7	356593	8.9	313804	8.2
7.	Non-MSA	1525301	19.5	627736	22.0	897565	18.1	878208	22.0	647093	16.9
RACE											
1.	White	5894818	75.4	2256302	79.0	3638516	73.3	3212091	80.5	2682727	70.0
2.	Black	1100534	14.1	314928	11.0	785606	15.8	429496	10.8	671038	17.5
3.	AIAN	80965	1.0	15743	0.6	65222	1.3	30600	0.8	50365	1.3
4.	API	275097	3.5	85102	3.0	189995	3.8	129344	3.2	145753	3.8
5.	Other	253701	3.2	113359	4.0	140342	2.8	92584	2.3	161117	4.2
6.	Multiple race	196240	2.5	65943	2.3	130297	2.6	89498	2.2	106742	2.8
7.	Unknown	17726	0.2	5213	0.2	12513	0.3	4463	0.1	13263	0.3
HISPAN_P											
0.	Multiple Hispanic	59949	0.8	26744	0.9	33205	0.7	22154	0.6	37795	1.0
1.	Puerto Rican	145377	1.9	44781	1.6	100596	2.0	52312	1.3	93065	2.4
3.	Mexican-Mexicano	176729	2.3	85533	3.0	91196	1.8	59790	1.5	116939	3.1
4.	Mexican-American	618190	7.9	281617	9.9	336573	6.8	254082	6.4	364108	9.5
5.	Cuban/Cuban-American	31149	0.4	7716	0.3	23433	0.5	17812	0.4	13337	0.3
6.	Other Latin American	113232	1.4	36467	1.3	76765	1.5	44739	1.1	68493	1.8
7.	Other Spanish	14299	0.2	6336	0.2	7963	0.2	11390	0.3	2909	0.1
8.	Hispanic/Spanish, non-spec	259631	3.3	121314	4.2	138317	2.8	115287	2.9	144344	3.8
9-11.	Hispanic/Spanish, unk	6582	0.1	3565	0.1	3017	0.1	0	0.0	6582	0.2
12.	Non Hispanic/Spanish Orig	6393943	81.8	2242517	78.5	4151426	83.7	3410510	85.5	2983433	77.9

APPENDIX H
DESCRIPTIVE STATISTICS FOR TWO SAMPLING WEIGHT VARIABLES INCLUDED IN THE 1998 NHIS/NIPRCS DATA FILE

DESCRIPTIVE STATISTICS FOR TWO SAMPLING WEIGHT VARIABLES INCLUDED IN 1998 NHIS/NIPRCS DATA FILE

NIPRCS 1998

WEIGHT - WTFA_IM

	NUMBER CHILDREN	SUM OF WEIGHTS	MINIMUM VALUE	MAXIMUM VALUE	MEAN	COEFFICIENT OF VARIATION
Total	2966	7819081	635	9536	2636.24	45.8590
Age of Child						
1. 12-18	894	2361110	706	9536	2641.06	45.6373
2. 19-35	2072	5457971	635	8587	2634.16	45.9656
Gender						
1. Male	1478	4001034	725	9536	2707.06	45.4107
2. Female	1488	3818047	635	7559	2565.89	46.1683
Race/Ethnicity						
1. Hispanic	973	1425138	635	7559	1464.68	44.0350
2. Black, nonHispanic	467	1107459	956	6449	2371.43	32.2906
3. White, nonHispanic	1406	4892954	1071	9536	3480.05	25.7149
4. Other, nonHispanic	120	393530	1001	7172	3279.42	29.5582

NIPRCS 1998

WEIGHT - WT_BV2

	NUMBER CHILDREN	SUM OF WEIGHTS	MINIMUM VALUE	MAXIMUM VALUE	MEAN	COEFFICIENT OF VARIATION
Total	1691	7819081.00	786.371	16626.70	4623.94	53.9324
Age of Child						
1. 12-18	497	2361110.05	914.912	15232.35	4750.72	53.1491
2. 19-35	1194	5457970.95	786.371	16626.70	4571.16	54.2503
Gender						
1. Male	847	3968952.92	786.371	16568.10	4685.89	53.7303
2. Female	844	3850128.08	815.381	16626.70	4561.76	54.1341
Race/Ethnicity						
1. Hispanic	512	1425137.99	786.37	13784.16	2783.47	56.6945
2. Black, nonHispanic	217	1107458.93	1217.83	16626.70	5103.50	52.8899
3. White, nonHispanic	901	4939885.08	1222.93	16568.10	5482.67	41.8391
4. Other, nonHispanic	61	346598.99	880.05	14060.23	5681.95	46.0745