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# Vital and Health Statistics

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## Response Errors in Surveys of Children's Immunizations

February 1999



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



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Series 6:  
Cognition and Survey  
Measurement  
No. 8

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

Hyattsville, Maryland  
February 1999  
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# Preface

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Although five people are listed as authors on this report, there were many others whose efforts were crucial to the research it describes. The contributions of Kenneth Rasinski and Jared Jobe, who played key roles during the early stages of this study, and Curtis Bailey, Cheryl Gilbert, and Cathy Haggerty, who skillfully provided much-needed operations assistance, are gratefully acknowledged. Larry Barsalou, Karen Goldstein, Fred Smith, and Susan Chu reviewed earlier versions of the report. Also, without the cooperation of Steven Black, Kathleen Ensor, and Karen Walsh at the pediatric clinics, this project would not have been possible.

This research was carried out under U.S. Department of Health and Human Services contract 200-95-7009 from the National Center for Health Statistics (NCHS) to the National Opinion Research Center. Roger Tourangeau, Ph.D., was the principal investigator. Gordon Willis, Ph.D., and Pamela Ching, Sc.D., were the project officers for the contract. This research was supported in part by the Centers for Disease Control and Prevention (CDC) National Immunization Program, and partly from a grant to NCHS by the National Science Foundation.

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**Objectives**

Household surveys of childhood immunization, such as the NCHS National Health Interview Survey (NHIS), typically involve reporting by parents of the shots that their children have received. These reports are sometimes based on parents' memories, rather than on written vaccination records. However, the accuracy of reports based on memory alone is suspected to be poor (either biased or unreliable), and it is of interest to determine whether steps can be taken to improve such reports through manipulations that address the cognitive processes of the respondent.

**Methods**

The current study explored three likely causes of inaccurate reporting (poor initial encoding of the relevant events, limitations in recall at the time of the survey, and motivation to misreport information) and attempted to implement experimental procedures that may improve reporting. Accuracy was assessed through the checking of immunization histories by making use of written provider records.

**Results**

In three studies, it was found that parental recall of young children's immunizations was generally poor and that the use of retrieval cues was not helpful in improving recall performance. Further, an experiment that studied the influence of encoding limitations by querying respondents immediately after their children received immunizations suggested that much of the error in reporting is due to failure of initial encoding, and that steps to improve recall are therefore unlikely to be effective. It is concluded that the best approach to take for immunization surveys is to follow current NHIS practice—to depend largely on external sources of information, and in particular, on provider records.

**Keywords:** *health survey • memory • proxy reporting • record-check*

# Response Errors in Surveys of Children's Immunizations

by Gordon Willis, Ph.D., National Center for Health Statistics, Centers for Disease Control and Prevention; Angela Brittingham, M.A., Lisa Lee, Ph.D., and Roger Tourangeau, Ph.D., National Opinion Research Center; and Pamela Ching, National Immunization Program, Centers for Disease Control and Prevention

## Introduction

The President's Childhood Immunization Initiative (1) aimed to increase vaccination coverage among 2-year-olds, and several national surveys—in particular, the National Health Interview Survey (NHIS) in combination with the National Immunization Provider Record Check Study (NIPRCS), and the National Immunization Survey (NIS)—have monitored progress in meeting this goal (2–4). These surveys rely in part on the reports of parents for their data. Unfortunately, even the most conscientious parents may have difficulty in answering detailed questions about their children's vaccinations. During most of the period in which this research was carried out, children were supposed to receive at least 14 doses of 5 different vaccines by their second birthday. Subsequently, a vaccine for varicella (chicken pox) has been added to this list. Keeping track of children's vaccinations can be quite difficult. To reduce confusion, many pediatricians provide parents with an immunization (shot) card that lists the vaccinations their children have received. Respondents in both the NHIS and NIS surveys are encouraged to consult these cards when reporting about their children. However, apart from the finding that shot records may themselves contain substantial error (3), approximately one-half of the respondents do not have such cards available at the time of the interview

and must provide their answers without the aid of cards or other records (4).

The accuracy of these unaided reports in national surveys is still being explored. However, evaluations of the accuracy of parental responses to questions about vaccinations in other surveys suggest that they are prone to considerable error. For example, Goldstein and her colleagues found that parents overreported the number of vaccinations their children had received (5). Across a number of studies that compare parental reports with provider records, considerable error, often in the direction of overreporting, appears to be the rule (5–9). Some studies also find net underreporting (3, 10, 11), or a combination of under- and overreporting, depending on vaccine (4). Whatever the direction of the errors, the fact remains that there are many parents who provide inaccurate information about their children's vaccinations.

Although it is known that these estimates are often in error, it is of substantial interest to also determine (a) the likely reasons that response error occurs and (b) whether methods to reduce such error can be developed. The studies described here investigate specific sources of error in parents' survey reports about their children's vaccinations and explore methods for improving the accuracy of those reports. The hypotheses they test are partly derived from a model of the cognitive processes involved in answering questions. Over the last two decades, several models of the survey response process have appeared (12–17). Although the models differ in many

particulars, they share the assumption that reporting errors arise in surveys because of problems in one or more of the underlying cognitive processes through which survey reports are generated.

As applied to reports about children's vaccinations, these models point to at least three potential sources of error. First, some parents may never have encoded the relevant information in the first place; that is, they may not have attended to or understood relevant information about the administered vaccines, and as a result, this information may not be well-represented in memory. Several characteristics of vaccination episodes may discourage careful encoding: vaccinations are quite routine; the child may receive multiple vaccinations during a single visit to the pediatrician; the doctor or nurse may not take the time to identify the shots being administered during that visit; and parents may be too distracted to absorb this information. Second, if the respondent cannot retrieve this information from a shot card at the time of the interview, he or she must recall from memory information about each vaccine. Given the number of vaccinations and the similarity of the episodes in which they were administered, recall is likely to present a formidable challenge (4). Third, some respondents may be aware that their children are not fully vaccinated, but reticent to admit this.

In the preliminary stages of the research, cognitive testing was carried out of the vaccination questions to be used in the later experiments. Then, three more formal studies were conducted. The first of these, the Memory-Aid Study, investigated the effectiveness of retrieval aids—such as a medical events calendar—in facilitating recall. An Encoding Study then evaluated how accurately parents encoded information about vaccinations immediately after their child received them and how well they retained this information for several months following the vaccination episode. Finally, the Proxy Measures Study investigated whether parents can answer questions about the child's visits to the doctor more accurately than they can

direct questions about the child's vaccinations, so that answers to the doctor-visit items might serve as proxy measures of immunization status. Additionally, this study determined the effects of mode of administration as a method of reducing the effects of social desirability on reporting.

## Exploratory Phase: Cognitive Interviewing

One of the outgrowths of the recent collaboration between survey researchers and cognitive scientists has been the development of the cognitive interview. In this procedure, volunteer subjects talk aloud as they answer draft survey questions and respond to a variety of probe questions to identify the cognitive operations involved in answering the survey questions (16, 18, 19). A set of cognitive interviews was conducted during the pretesting phase of this study to determine sources of response error in reports on children's vaccination histories. During the interviews, a set of survey questions on immunizations was presented. Respondents (24 parents of children under age 4) were asked to point out unfamiliar terms, paraphrase questions or instructions, define terms, "think aloud" while arriving at their answers, and judge their confidence in their answers. Respondents were not

told prior to the interview that the interview would involve reporting of immunizations, so that they would not be tempted to review any shot records prior to the interview. They were also instructed not to refer to shot records in case they had these at the time of the interview. In general, the information collected from these respondents allowed the interviewer to assess respondents' familiarity with the terminology in the questionnaire and to determine how they arrived at their answers.

Respondents were also asked to use calendars during some of the interviews to determine whether these calendars helped them recall vaccinations. In the calendar-aided approach, information about the child's medical history (for example, major illness, injuries, visits to the doctor, or sources of medical care) or else about important personal events during the child's life (for example, change in residence, special celebrations, or vacations) was recorded on a calendar (using a *medical-events calendar* or a *personal events history calendar*, respectively). Throughout the interview, if a respondent had difficulties remembering vaccinations, he or she was asked to use the calendar to aid recall.

Table A lists the main vaccination questions on the tested questionnaires (taken from the NHIS and NIS). Twenty-four parents of children under 4 years of age were asked to recall whether their child had ever received five particular vaccines: DTP (diphtheria-tetanus-pertussis), Polio (oral or shot),

**Table A: Standard vaccination questions**

Introductory question:

Has [name] ever received an immunization, that is a shot or drops?

Specific questions:

- 1a. Has [child] ever received a DTP shot (sometimes called a DPT shot, diphtheria-tetanus-pertussis shot, baby shot, or three-in-one shot)?
  - b. How many DTP shots did [child] ever receive?
- 2a. Has [child] ever received a polio vaccine by mouth, pink drops, or by a polio shot?
  - b. How many polio vaccine shots did [child] ever receive?
- 3a. Has [child] ever received a measles or MMR (Measles-Mumps-Rubella) shot?
  - b. How many measles or MMR shots did [child] ever receive?
- 4a. Has [child] ever received an Hib shot?  
(This is for Meningitis and is called Hemophilus Influenza, Hib vaccine or H Flu vaccine)
  - b. How many Hib shots did [child] ever receive?
- 5a. Has [child] ever received a Hepatitis B shot?
  - b. How many Hepatitis B shots did [child] ever receive?

Global question:

In your opinion, has [child] received all of the recommended shots for (his/her) age?



MMR (Measles, Mumps, Rubella), Hib (Hemophilus Influenza Type B), and Hep B (Hepatitis B). They were also asked the number of doses of each received and a global question about whether their child had received all of the recommended vaccinations for his or her age.

## Understanding of Terms

When asked to define “vaccination,” most respondents correctly mentioned the prevention of illnesses, but only a few knew much about the particular vaccines and the diseases that vaccinations prevent. When asked whether they knew what illnesses Hib, MMR, and DTP vaccinations prevent, most of the respondents could not give a complete or correct answer. None of the 12 parents who were specifically asked knew what the Hib vaccination was, and 4 parents thought it was an abbreviation for Hepatitis B. The results were similar for the other vaccines. There was also some confusion about combination vaccines (DTP/Hib and DTP/Hepatitis B) and TB tests. This finding suggests that responses might be more accurate if the terms were explained more carefully at the time of questionnaire administration.

## Recall of Vaccination Information

Nearly all respondents (23 out of 24) reported that their children had received one or more DTP, Polio, and MMR vaccinations. For Hib and Hepatitis B, respondents tended to indicate either that their children had not received the vaccination or that they did not know. The greatest number of “don’t know” responses was for Hib. Overall though, respondents were generally very confident about whether or not their child had received a particular vaccination. Perhaps because the polio vaccine is particularly salient (the “pink drops”), confidence in responses for this vaccine was particularly high. Most respondents (15 of the 16 who were asked this) were also very sure that they knew whether

their child was up to date overall in his or her vaccinations.

Respondents tended to estimate the number of doses of each vaccine their child had received based on beliefs about the recommended number of doses, the frequency with which the child received care, memories of the vaccination card, and conversations with their child’s pediatrician. It was concluded that methods that improve the quality of these estimates might increase the accuracy of responses.

## Calendars

The *personal events history calendar* was not helpful in eliciting responses about vaccinations. Only rarely did respondents remember doctors’ visits that occurred around major events, such as a move or a job change. Further, most respondents did not refer to the personal events calendar while answering the vaccination questions. Many did not remember any major personal events in the relevant period, and those who had did not associate them with doctor visits.

The *medical events calendar* seemed more helpful than the personal events calendar because it encouraged respondents to draw specifically on memories of doctor visits and illnesses. In particular, its structure was helpful in laying out the 2-year reference period clearly. This calendar seemed to help respondents recall the months in which their children received vaccinations, but not which vaccines were given. Overall, only the medical events calendar appeared to be worthy of further investigation.

## Memory-Aid Study

### Introduction

A memory-aid study was next conducted to allow the investigators to measure reporting accuracy when respondents reported from memory, and to manipulate variables that might improve reporting. Parents were interviewed about their children’s vaccinations, and the accuracy of those

reports was assessed by comparing them to the records of the child’s health care provider(s). The cognitive interviews suggested two possible means for improving vaccination reporting. The first was a medical events calendar: if memories for individual vaccination episodes had merged into a generic memory, a medical events calendar might help respondents to reconstruct the specific episodes (20). To test whether such a calendar might improve recall, half of the respondents were asked to record information about their child’s medical providers, illnesses, and pediatric visits on a calendar before answering immunization questions; the other half answered a standard set of questions about their children’s vaccinations without a calendar.

Based on the hypothesis that answers to the vaccination questions are often estimates, the experiment also sought to determine whether the answers might be improved if respondents had accurate anchoring information for these estimates as recall aids. The experiment therefore also varied the presentation of a *show card* listing the names of the vaccines and the number of doses recommended for each one.

In addition, the issue of whether answers were affected by the order in which the questions were asked was examined; questions concerning each specific vaccine were placed either before or after a global question asking whether the child had received all the vaccinations recommended for a child of that age. It was hypothesized that answering the specific questions first might lead to more careful consideration of the child’s status on each vaccine and thus a more accurate appraisal of the child’s overall up to date status.

## Method

### Sampling Pretest

A pretest was first conducted to determine the sample size necessary to obtain sufficient numbers of children who were not up to date on vaccinations, according to a criterion of 4 Diphtheria/Tetanus/Pertussis (DTP), 3 Polio, 1 Measles/Mumps/Rubella

(MMR), 3 Hemophilus Influenza (Hib), and 3 Hepatitis B (Hep B). The most common definition of up to date status has been the “4-3-1-3” designation, which excludes Hep B. However, the full 4-3-1-3-3 criterion was used for this study because the President’s Childhood Immunization Initiative (1) has modified the definition of up to date status by age 2 to include Hep B. This change will likely be increasingly implemented in immunization survey practice starting in the year 2000.

The pediatric clinic in Chicago, where parents were to be recruited, provided the National Opinion Research Center (NORC) with a file containing the chart numbers, names, and birthdates of 2- and 3-year-olds ( $n = 3,482$ ). A sample of 100 children between the ages of 24 and 47 months was selected systematically and their medical records were reviewed to obtain vaccination information. These records contained vaccination information for 94 of the 100 sample children. The records indicated that substantial numbers of children were not up to date: Just over one-third of the children had received all recommended doses for DTP, Polio, and MMR. When the Hepatitis B and Hib vaccines were considered as well, so that the full 4-3-1-3-3 criterion was used, only about 12 percent of children were up to date. Although some of the children may have received vaccinations from other medical providers, the pretest indicated that oversampling for children who were behind in their vaccinations would probably not be necessary. Overall, the sampling pretest indicated that this respondent group was much less likely than the general population to contain fully immunized children.

## Sample

The 221 respondents in the Memory-Aid Study were the primary caretakers (usually parents) of 2- and 3-year-old children who attended a private pediatric clinic that serves a generally lower-income area of Chicago. The clinic provided NORC with a list of all 2- and 3-year-old children—ranging in age from 24 to 47 months—who were patients there, along with caretakers’ names and addresses.

Children were sampled from this list and randomly assigned to experimental groups. In recruiting respondents to report about the sample child, the person who usually took him or her for visits to the doctor was asked for. A very high percentage of respondents (94 percent) were the mothers or female guardians of the sample child; another 5 percent were grandparents; and the remaining few were fathers, aunts, or uncles. About 85 percent of the respondents had completed high school and 46 percent had some college education.

## Questionnaire

The key questionnaire items were the same vaccination history questions used in the NIS and NHIS (see [Appendix I](#)). This standard set of questions first asks respondents whether the child had ever received any vaccinations, in either the form of shots or drops. If the child had ever received a vaccination, respondents were then asked whether the child had received each specific vaccine (DTP, Polio, MMR, Hib, and Hep B), and, if so, the number of doses they had received for each one. Besides the standard questions about the five recommended vaccines, we added similar items about vaccinations for smallpox, varicella, and pneumococcal disease; children were unlikely to have received any of these vaccines (this study was done before the varicella vaccine was given regularly), and these items were included to determine whether respondents had a general tendency to overreport vaccinations. Finally, the standard vaccination history questions included an item assessing the child’s global vaccination status (“In your opinion, has [child] received all of the recommended shots for his/her age?”).

In addition to the vaccination history items, the questionnaire included items assessing the respondents’ knowledge about vaccines. For each vaccine, the respondent was asked what illness or illnesses the vaccination was intended to prevent, and how many doses the child was supposed to have received by 2 years of age. Finally, the last section of the questionnaire collected

basic demographic information about the respondent.

## Procedure

Each respondent was paid \$30 to travel to the NORC Chicago office to participate in a 20-minute interview. Three interviewers completed a total of 221 interviews. Respondents were presented the questionnaire under one of eight conditions, produced by crossing *calendar* (medical events calendar versus no calendar), *show card* (immunization show card versus no show card), and *presentation order* (global or specific vaccination items first) variables according to a 2×2×2 factorial design.

The calendar-aided questionnaire attempted to create a rich set of contextual and chronological cues to prompt accurate recall of the number and dates of each vaccination. Under this approach, half of the respondents recorded health-related information on a medical events calendar before they answered the five standard vaccination questions. After completing the calendar, the respondents were administered the standard questionnaire items. The calendar-aided questionnaires were contrasted with questionnaires that included only the standard vaccination questions. The second experimental variable was whether the respondent was presented a show card that listed each vaccination and the number of doses recommended by 2 years of age (see [Appendix I](#)). In half of the questionnaires, respondents were given a show card while answering the standard vaccination questions; in the remaining half, respondents answered the vaccination questions without the aid of the show card. The final experimental variable was the order in which global and specific vaccination questions were asked. In half the questionnaires, the global vaccination status item came after the questions about the specific vaccines; in the remaining half of the questionnaires, the global item preceded the items on each vaccination series.

## Collection of Vaccination Record Data

At the conclusion of the interview, respondents were asked to list all of the medical providers from which the child had received medical care and to sign a permission form giving the investigators access to the child's medical records (NCHS Institutional Review Board clearance was obtained for all information-gathering procedures used in this research project). Any additional medical providers (beyond those at the clinic from which the children had originally been selected) were contacted and asked to provide information about the vaccinations they had administered to the sample child. Completed medical records were obtained for 189 of the 221 sample children (85.5 percent).

## Coding of Parental Reports and Medical Record Data

Measures of the accuracy of parental reports about their child's vaccination status were derived by comparing the respondent's answers to the questionnaire items with the child's medical records. Based on the questionnaire data, children could be classified as being reported up to date for each vaccine (if the number of doses reported for the vaccine matched or exceeded the recommended number) or not up to date. Similarly, the child's overall (4-3-1-3-3) up to date status could be determined from the medical records. Although there are multiple performance measures that can be used (4), four measures of the accuracy of the respondents'

reports for each vaccine were constructed:

1. The net bias (the difference between the percent classified as up to date in the two data sources)
2. The parental report false negative rate (the proportion of children reported as NOT up to date in the questionnaire who were classified as up to date based on medical record data)
3. The false positive rate (the proportion of children reported as up to date in the questionnaire who were classified as NOT up to date based on medical record data)
4. The phi correlation between the questionnaire report and medical records regarding up to date status

The net bias indicates whether respondents, in aggregate, have misreported (either overreported or underreported) the child's vaccination status. The false negative and false positive rates measure the frequency of the two types of errors (of omission and of commission) that parents may make. The phi correlation captures the magnitude of the relationship between the parent's report and the vaccination record; a higher degree of agreement between these two sources of information yields a higher value.

## Results

### Overall Accuracy

In general, there was little relationship between parental reports and the child's actual vaccination status. Reports concerning whether the child

had ever received each vaccine, regardless of the number, were first examined. Table B shows the various measures of accuracy of parents' responses to questions concerning whether the children had ever received each of the five basic vaccines. There was a significant relationship between the parental report and the vaccination record only for the MMR vaccine (Chi-square (1) = 10.14,  $p < 0.01$ ) and the Hepatitis B vaccine (Chi-square (1) = 10.47,  $p < 0.01$ ). Although false negative rates were generally below 5 percent (Hib is an exception), the false positive rates were quite high, ranging from 67 to 100 percent, indicating that regardless of whether the child had received a given vaccine, the respondents were prone to report that he or she had received it. It should be noted, however, that the sample sizes used to calculate false-positives were generally small, since most children had received at least one dose of each vaccine.

Overreporting was also evident on the questions concerning vaccines the children were unlikely to have received: the smallpox, varicella, and pneumococcal vaccines. The smallpox vaccine is no longer administered in the United States, the varicella vaccine was being introduced at the time of this survey, and the pneumococcal vaccine is rarely given to children. However, 24 percent of the respondents reported that their child had received the smallpox vaccination, 30 percent reported the varicella vaccine, and 3 percent reported the vaccine for pneumococcal disease.

**Table B. Memory-Aid Study: Percent of children who had ever received a vaccination according to medical records and respondents, and parental response accuracy measures**

Vaccine	(n) <sup>1</sup>	Percent who received according to records	Percent who received according to respondents	Net bias	False negative		False positive		Phi
					Rate	(n) <sup>2</sup>	Rate	(n) <sup>3</sup>	
DTP	185	95.1	99.5	4.4	0.6	(176)	100	(9)	-0.02
Polio	185	94.6	98.9	4.3	1.1	(175)	100	(10)	-0.02
MMR	181	80.1	92.8	12.7	4.1	(145)	80.6	(36)	0.24
Hib	166	94.6	81.3	-13.3	17.8	(157)	66.7	(9)	0.09
Hepatitis B	176	75.6	92.6	17.0	3.8	(133)	81.4	(43)	0.24

<sup>1</sup>Totals are less than 189 because of "Don't Know" and "Refusal" answers, and because of interviewer coding errors.

<sup>2</sup>(n) is the number of children who had received a shot of this type, and is the base for potential false negative parental reports.

<sup>3</sup>(n) is the number of children who had NOT received a shot of this type, and is the base for potential false positive parental reports.

NOTE: Reports are in response to the question "Has [child] ever received a \_\_\_\_\_ (shot/vaccine)?"

A second analysis ascertained the child’s up to date status by taking into account the number of each vaccine that was both reported and received. **Table C** shows the levels of accuracy, by vaccine, and for the global status (4-3-1-3-3) question, for respondents who reported that the sample child had received at least one dose of each vaccine (or who had ever received a vaccine, in the case of the global item), and who were then asked either the number received (for the individual vaccines) or whether their child was up to date (for the global question). Using a percent of up to date reports according to both provider records and respondent reports as data, reports were found to be significantly more accurate than chance only for the global item (Chi-square (1) = 10.11,  $p < 0.01$ ) and for MMR (Chi-square (1) = 4.55,  $p < 0.05$ ).

However, even for those items, there were high levels of error in the respondents’ reports. On the global status item, about 83 percent of the respondents whose children were *not* up to date, according to medical records, reported that the children had received all of their recommended vaccinations. The net bias on the global status item is quite large (53.4 percent) and is in the direction of overreporting. Similarly, almost all respondents indicated that their children had received one or more doses of the MMR vaccine (only one dose is recommended), including 26 of 27 of the respondents reporting on

children who had *not* received that vaccine, according to their medical records.

In contrast to the global status and MMR questions, responses to the questions about three of the four other specific vaccines show net underreporting. These four vaccines all require three to four doses. The false negative rates for these vaccines ranged from 44 percent for polio to 56 percent for Hib; that is, about half the respondents whose children had received all the recommended doses for these vaccines did not report that the child had received enough doses for them to be up to date. For each of these vaccines, the false-positive rates are somewhat lower (ranging from about 41 to 44 percent) but indicate that a number of parents also mistakenly overreport their child’s status. Chance levels of accuracy would yield false negative and false positive rates that do not differ significantly from 50 percent. In fact, for the four vaccines involving multiple recommended doses, the phi correlations, false positive rates, and false negative rates all indicate approximately chance levels of accuracy. Interestingly, although a small sample was used in this study, the pattern of over- and underreporting of single vaccines was markedly similar to those reported by Ezzati-Rice and colleagues (4).

Overall then, respondents were not very accurate in reporting how many vaccinations their children received. The

results suggest that many respondents were uncertain about their child’s vaccination status and had a tendency to respond that the child had received each of the vaccinations they were asked about. This tendency leads to over-reporting on the global question and the questions concerning whether the child had *ever* received a particular vaccine. Further, because respondents were uncertain about the number of doses the child received, those reporting about up to date children were likely to underreport the number of doses and those reporting about children who were not up to date were likely to overreport the number.

### Effects of the Experimental Variables

The three experimental variables (use of the calendar, presentation of the show card, and global question order) had little impact on whether the respondent’s report agreed with the records regarding the child’s up to date status. As **table D** shows, parents’ accuracy was similar across the eight versions of the questionnaire. The mean number of vaccines for which parents reported their child’s status accurately did not differ significantly across versions of the questionnaire ( $F(7,181) = 0.77$ , n.s.). There appears to be a drop in accuracy for the two versions in which neither a calendar nor a show card was presented. However, when accuracy in these versions (that is,

**Table C. Memory-Aid Study: Child’s vaccination status according to medical records and respondents, and parental response accuracy measures**

Vaccine	(n) <sup>1</sup>	Percent up to date according to records	Percent up to date according to respondent	Net bias	False negative		False positive		Phi
					Rate	(n) <sup>2</sup>	Rate	(n) <sup>3</sup>	
DTP . . . . .	158	70.9	45.6	-25.3	52.7	(112)	41.3	(46)	0.05
Polio . . . . .	165	78.2	52.7	-25.5	44.2	(129)	41.7	(36)	0.12
MMR . . . . .	149	81.9	99.3	17.4	0.0	(122)	96.3	(27)	0.17
Hib . . . . .	123	81.3	43.9	-37.4	56.0	(100)	43.5	(23)	0.00
Hepatitis B . . . . .	142	45.8	47.2	1.4	49.2	(65)	44.2	(77)	0.07
Global . . . . .	189	34.9	88.4	53.5	1.5	(66)	82.9	(123)	0.23

0.0 Quantity more than zero but less than 0.05.

<sup>1</sup>(n) is the number of children for whom parents reported that the child had ever received this vaccination, or for the Global (4-3-1-3-3) measure, that the child had received ANY vaccination.

<sup>2</sup>(n) is the number of children who had received at least the recommended number of vaccines of that type (or who were globally up to date), and who provide the basis for false negatives through parental reporting of fewer shots (or, a report that the child was globally not up to date).

<sup>3</sup>(n) is the number of children who had received LESS than the recommended number of vaccines of that type (or who were globally NOT up to date), and who provide the basis for false positives through parental reporting of a greater number of shots (or, a report that the child was up to date).

NOTE: Reports are in response to the question “How many \_\_\_\_\_ (shots/vaccines) did [child] ever receive?”



mean number of vaccines reported accurately) is directly compared to accuracy in the versions using a memory aid, no significant differences are found ( $F(1,187) = 2.13, p < 0.15$ ). Analyses of reporting on individual vaccines showed similar results. Three-way logit analyses were carried out examining the effects of the experimental variables on answers to the global question and the five questions on specific vaccines. There was only one significant effect out of 42 possible (7 effects in each model  $\times$  6 models).

## Knowledge About Vaccinations

One possible explanation for the respondents' low accuracy is their failure to encode the relevant information when the vaccines were given to children. Even if respondents knew the child had been vaccinated, they may not have been told by the physician what the vaccine was for, or they may have found it difficult to understand what they were told. This hypothesis was tested by comparing the reports of parents who demonstrated a high level of knowledge about vaccinations with those demonstrating a low level. A knowledge score that combined accuracy in naming the diseases the vaccines are intended to prevent and accuracy regarding the number of recommended doses was calculated for each respondent. Respondents were divided into two groups based on the median knowledge score. Those above the median in their knowledge about vaccinations gave more accurate reports than those below it, correctly reporting the child's status on an average of 2.6 out of the 5 vaccines (versus 1.7 for the respondents below the median);  $t(170) = -4.11, p < 0.01$ . Because half of the respondents received a show card listing the vaccines and their recommended doses, this should have improved their knowledge scores. Respondents who received the show card were more accurate on the questions about the number of recommended doses for each vaccine (answering an average of 2.1 versus 1.5 for no-show card group);  $t(187) = -2.45, p < 0.05$ . However, as already reported, the show card itself

**Table D. Memory-Aid Study: Mean number of vaccines reported accurately by parents and percent of parents who reported accurately on the global question**

Global question	Calendar		No calendar	
	Show card	No show card	Show card	No show card
Mean number of vaccines for which parents reported child's status accurately				
Global first . . . . .	2.1	2.0	2.5	1.9
Global last . . . . .	2.6	2.1	2.1	1.8
Percent of parents who reported accurately on the global question				
Global first . . . . .	52.2	48.1	52.0	27.3
Global last . . . . .	55.6	52.4	42.1	32.0

did not improve accuracy on the key vaccination-history questions.

In general, respondents' knowledge about vaccinations was quite limited. For instance, on DTP, 47 percent of the respondents were unable to name even one disease prevented by the vaccine and only 9 percent could name all three. The results were similar for the other vaccines, with the exception of Hepatitis B. Perhaps because of that vaccine's name, 78 percent were able to identify the disease prevented by the Hepatitis B vaccine. Performance was also poor on the items assessing knowledge of the number of doses recommended for each vaccine.

## Discussion

The most striking findings from the Memory-Aid Study were the low levels of reporting accuracy and the effects of knowledge about vaccinations on accuracy. Overall, respondents performed barely above chance in reporting the vaccination status of sample children. Further, none of the three experimental variables (calendar, show card, and order of global and specific questions) had significant effects on reporting accuracy. A further pattern found in the study is that when a child has never received a particular vaccine, parents tend to falsely report that the child had received it.

The best predictor of accuracy was the level of knowledge about the vaccinations. It is possible that many respondents have difficulty encoding information about the vaccinations their children received at each visit to the

doctor simply because they lack the necessary background knowledge. This suggests that procedural variations designed to prompt fuller recall, such as those tested in the Memory-Aid Study, will have limited impact, since respondents have stored little information in memory in the first place. To test this hypothesis, in the next study parents' encoding of information about the vaccines their children had received, as well as the time course of forgetting of this information, were examined more directly.

## Encoding Study

### Introduction

This study examined two sources of error that may reduce the accuracy of parental reports. First, parents' reports may be in error because they encoded little information about the vaccinations at the time they were administered. If information is not well encoded initially, the accuracy of reports will be low regardless of available retrieval cues. Second, parents' memories about vaccinations may degrade over time. In this study, an attempt was made to measure both encoding and forgetting by assessing parents' recall of vaccinations immediately and 10 weeks after a doctor visit. If poor encoding is the source of reporting errors, reporting accuracy should be low even when parents are interviewed immediately after the child's visit to the doctor. If memory retention is a problem, then performance after 10 weeks should be

markedly lower than immediately after the doctor's visit.

Parents whose children had just received one or more vaccinations were interviewed as they left a vaccination clinic at a private health maintenance organization in Oakland, California. Parents were asked which vaccines, if any, their child had received that day. The parents' reports were compared with the clinic's records. This comparison provided a basis for assessing the accuracy of the initial encoding of information about the visit, since the interval between encoding and retrieval was only a few minutes. To examine how this information was transformed in memory over time, respondents were contacted again after 10 weeks had elapsed. At the same time, we interviewed an additional group of parents whose children had also been vaccinated at the clinic during the same period as the first group of respondents, but who were not interviewed previously; this comparison group allowed us to determine whether the initial interview affected the encoding and retention of information in memory.

## Method

### Sample

Respondents were parents of children who were patients at a private pediatric clinic in Oakland, California. All of the children were less than 7 years of age. Of the parents interviewed, 81 percent were the mothers of the children and 19 percent were fathers. Respondents were highly educated, with 97 percent having completed high school and 46 percent having obtained a college degree.

### Procedure

Data were collected in two waves. During the first wave, two NORC interviewers visited the vaccination clinic and were stationed outside of the clinic exit. Parents arrived at the clinic with their child and signed the clinic's consent form, which listed the names of the vaccines that the child was to receive that day. Parents were also given an information sheet that described the

risks and benefits of each vaccine. After the child was vaccinated, a doctor or nurse either filled out the child's vaccination card or gave them a new card. As they were leaving the clinic, an interviewer asked them to participate in the survey. A total of 103 parents agreed to take part. About two-thirds of these parents ( $n = 70$ ) completed a short interview about their child's medical visit and also provided information to enable investigators to contact them later (parents were instructed not to refer to shot records during administration of the interview). The remaining parents ( $n = 33$ ) were asked only for locating information so they could be contacted later. Every respondent was asked to sign a form giving the researchers permission to obtain information from the child's medical record regarding that day's visit.

The second wave of data collection was done by telephone 10 weeks after the initial data collection. Of the 103 respondents, 80 were successfully contacted and reinterviewed. Of these 80, 54 had been asked the vaccination questions 10 weeks earlier and the remaining 26 had not. In Wave 2, respondents were asked about the medical treatment the child received during his or her doctor visit 10 weeks earlier.

### Questionnaires

The questionnaire gave respondents two opportunities to report vaccinations. First, respondents answered a general ("free recall") question that asked what had happened during the medical visit that day ("To start off, would you tell me in your own words what happened during the child's visit today?"). Later, respondents were asked more specific questions ("cued recall") about whether the child had received any shots that day and the purpose of the shots ("Did [child] get any shots today? What were the shots for?"). The follow-up questionnaire used when parents were contacted 10 weeks later was essentially the same, but with minor changes to reflect the passage of time (see [Appendix II](#)).

## Coding of the Parents' Responses

A comparison of answers to the free recall and cued recall questions revealed virtually no differences between the two sets of responses. For example, 36 parents reported the polio vaccine in response to the free recall question, and 38 parents reported it in the cued recall question. The phi correlations between the two types of questions were highly significant for all five vaccines, with the lowest being 0.71 for Hib. Therefore, responses to the two types of questions were combined in the remaining analyses, so that if a parent reported that the child had received a vaccine in response to either item, the parent was counted as having reported the vaccine. Further, a parent was counted as reporting a particular vaccination even if the respondent only named one component of the vaccine (for example, "measles" for MMR). If a parent had indicated that the child received the combination Hib/DTP shot, or "Tetramune," both Hib and DTP were counted as having been reported.

As in the Memory-Aid Study, four measures of accuracy were constructed by comparing the parent's report with the vaccination record. These accuracy measures were the net bias (the difference between the proportions of children who received the vaccine according to the medical record and the parent's report), the false negative rate for each vaccine (the proportion of children who received the vaccine according to the record but whose parents did not report it), the false positive rate (the proportion of children who did not receive the vaccine but whose parents reported it), and the phi correlation between the parent's report and the medical record.

## Results

### Accuracy of Wave 1 Responses

Even immediately after the vaccinations had been administered, most parents had little knowledge about which vaccinations their children had received that day. Although children had received an average of three

vaccinations during their visit to the clinic, parents correctly named only about half of these; across the five shots, the false negative rate averaged 49 percent. Parents also occasionally reported shots their children had not received (overall, the false positive rate was 18 percent) but, in general, underreporting was more prevalent than overreporting. McNemar tests showed significant underreporting for every shot except MMR (all  $p$ 's <0.01, which was significantly overreported ( $z = 3.21$ ). Overall, only two vaccines (DTP and Polio) were reported with better than chance accuracy (Chi-square (1) = 7.01,  $p < 0.01$  for DTP and Chi-square (1) = 12.17,  $p < 0.1$  for polio), and even these two were systematically underreported.

Table E lists the four accuracy measures by vaccine for the Wave 1 reports. The type and magnitude of the reporting errors differed greatly by vaccine. The four vaccines that most of the children had received—Hepatitis B, DTP, Polio, and Hib—were generally underreported, with the net bias ranging from -24.3 percent to -64.3 percent. The tendency toward underreporting of these four vaccines was also apparent in the high false negative rates, which ranged from 33.9 percent for polio to 86.5 percent for Hib. Averaging across the five vaccines, parents were about as likely *not* to report a vaccine their child had received as to report it.

Hib was the most underreported vaccine of all, which is consistent with the results of the Memory-Aid Study. As the false negative and false positive rates demonstrate, many parents

mistakenly reported that their child did not receive this vaccine and no parents mistakenly reported that the child did receive it. The tendency to not report Hib—whether or not the child actually received it—could be due to its complicated name and the unfamiliarity of the relevant disease (a form of meningitis). Overall, as the Memory-Aid Study demonstrated, many parents are completely unfamiliar with the Hib vaccine.

The general tendency to underreport was apparent for all vaccines except MMR. Only one dose of MMR is required by 2 years of age, but the results of the Memory-Aid Study suggested that parents are relatively more familiar with this vaccine (especially the measles component) than the others. This greater familiarity with the vaccine may account for the overreporting. Although only 4.3 percent of the children received the vaccine during their visit, 21.4 percent of parents reported it.

### Accuracy of Wave 2 Responses

After a 10-week period, parental reports were only slightly less accurate than they were immediately after the vaccinations were given (table F). In the second wave of data collection, reports about DTP and polio were still significantly related to whether the child had received these vaccinations (for DTP, Chi-square (1) = 8.54,  $p < 0.01$ ; for polio, Chi-square (1) = 4.75,  $p < 0.05$ ). The average false negative rate during Wave 2 was 54.6 percent, only a slight increase over the 49.4 percent

average rate in Wave 1. The average false positive rate across the five vaccines—14.1 percent in Wave 1—rose only to 18.2 percent in Wave 2. These slight increases in the error rates may reflect some memory loss.

Table F reveals that differences in accuracy across the types of vaccines are just as apparent in Wave 2 as they were in Wave 1. For the four shots received by most of the children (Hepatitis B, DTP, Polio, Hib), underreporting was common and the net biases were negative. This is apparently due to the fact that so many children received these four shots, creating more opportunities for false negatives than for false positives. For MMR, which few of the sample children actually received that day, net overreporting was observed.

### Comparison of Wave 1 and Wave 2

Phi correlations were computed to examine the consistency between Wave 1 and Wave 2 reports for the 54 respondents who answered the vaccination questions in both. These correlations reveal that in Wave 2 parents tended to reproduce the answers they gave 10 weeks earlier, regardless of their accuracy (DTP,  $\phi = 0.52$ ; polio,  $\phi = 0.59$ ; MMR,  $\phi = 0.39$ ;  $p < 0.01$  for all comparisons). In fact, comparing the phi correlations between responses in the two waves to the phi correlations in tables E and F confirm that parents' responses are generally more consistent than they are accurate. McNemar tests indicated that there was no significant

**Table E. Encoding Study, Wave 1: Percent of children who received a vaccination during a specific visit according to medical records and respondents, and parental response accuracy measures**

Vaccine	(n) <sup>1</sup>	Percent who received according to records	Percent who received according to respondents	Net bias	False negative		False positive		Phi
					Rate	(n) <sup>2</sup>	Rate	(n) <sup>3</sup>	
DTP	70	82.9	51.5	-31.4	41.4	(58)	16.7	(12)	0.32
Polio	70	80.0	55.7	-24.3	33.9	(56)	14.3	(14)	0.42
MMR	70	4.3	21.4	17.1	33.3	(3)	19.4	(67)	0.23
Hib	70	74.3	10.0	-64.3	86.5	(52)	0.0	(18)	0.20
Hepatitis B	70	85.7	44.3	-41.4	51.7	(60)	20.0	(10)	0.20

0.0 Quantity more than zero but less than 0.05.

<sup>1</sup>(n) is the total number of children in the initial interview sample (those for whom parents completed an initial interview about the child's medical visit).

<sup>2</sup>(n) is the number of children in the initial interview sample who had received a shot of this type, and is the base for potential false negative reports.

<sup>3</sup>(n) is the number of children in the initial interview sample who had NOT received a shot of this type, and is the base for potential false positive reports.

NOTE: Reports are in response to the question "What were the shots or immunizations [child] received for?", asked as the parents were leaving the clinic.

**Table F. Encoding Study, Wave 2: Percent of children who received a vaccination during a specific visit according to medical records and respondents, and parental response accuracy measures**

Vaccine	(n) <sup>1</sup>	Percent who received according to records	Percent who received according to respondents	Net bias	False negative		False positive		Phi
					Rate	(n) <sup>2</sup>	Rate	(n) <sup>3</sup>	
DTP	80	80.0	45.0	-35.0	46.9	(64)	12.5	(16)	0.33
Polio	80	80.0	61.2	-18.8	32.8	(64)	37.5	(16)	0.25
MMR	80	2.5	22.5	20.0	50.0	(2)	26.9	(78)	0.08
Hib	80	73.8	17.5	-56.3	78.0	(59)	4.8	(21)	0.20
Hepatitis B	80	86.3	31.3	-55.0	65.2	(69)	9.1	(11)	0.19

<sup>1</sup>(n) is the total number of children in the initial interview sample (those for whom parents completed an initial interview about the child's medical visit).

<sup>2</sup>(n) is the number of children in the initial interview sample who had received a shot of this type, and is the base for potential false negative reports.

<sup>3</sup>(n) is the number of children in the initial interview sample who had NOT received a shot of this type, and is the base for potential false positive reports.

NOTE: Reports are in response to the question "What were the shots or immunizations [child] received for?", asked 10 weeks after the visit to the clinic.

forgetting (failure to report vaccinations that they had previously reported) or new reporting (reporting vaccines that they did not report previously).

Further, to determine whether previous questioning affected recall, Wave 2 accuracy measures for the group that was questioned about vaccines during Wave 1 (n = 54) was compared with those of the group that was not (n = 26). The two groups performed similarly in terms of false negative and false positive reports. Chi-square tests were then carried out to determine whether there was a relationship between being questioned previously and reporting each vaccine (regardless of whether vaccine was actually received), or between being questioned previously and reporting each vaccine accurately. Respondents who were previously questioned were more likely to report Hepatitis B and less likely to report MMR vaccinations than were respondents not previously questioned (for Hepatitis B, 38.9 percent versus 15.4 percent and, for MMR, 20.4 percent versus 42.3 percent; p < 0.05 for both comparisons). However, there were no significant effects for the other types of vaccines and there were no significant relationships between being questioned previously and reporting accuracy. In summary, previous questioning increased the number of reports for Hepatitis B and MMR, but did not affect the accuracy of the reports for any vaccines.

As a final analysis, although previous studies have sometimes

focused on subgroup differences in reporting accuracy (3), none of the demographic characteristics of either the respondents or of the sample children were significantly related to reporting accuracy in either Wave 1 or 2.

## Discussion

The results from the Encoding Study suggest that a major source of vaccination-related reporting error may be failure to encode the details of what had occurred during the vaccination episode. As they left the pediatric clinic minutes after the child had been vaccinated, only 12 respondents out of a total of 70, or about 17 percent, reported all of the vaccinations their children had received and only those vaccinations. Ten weeks later, the proportion declined to 11 percent; only 9 out of 80 respondents accurately described the vaccinations their children had received. In both interviews, the relationships between which shots were reported and which shots the child had received were little better than chance, despite the fact that parents had signed consent forms that listed the vaccines the child was getting, received information sheets about the vaccines, witnessed the vaccinations themselves, and received a shot record to take home (although they were asked not to look at them during the interview). It seems quite likely that many respondents were aware that the child received one or more vaccinations during the visit, but that they were simply guessing which ones.

## Proxy Measures Study

### Introduction

Taken together, the results of the Memory-Aid Study and Encoding Study suggest that further efforts to improve recall for specific vaccinations (for example, through enhancements to the calendar) are likely to yield little payoff. If parents never absorb the information in the first place, they cannot recall their children's vaccinations later on. It may be better to ask them instead about events they can recall. One relevant type of event that parents may find easier to recall is their child's visit to the pediatrician's office. If parents can report accurately on their adherence to the recommended schedule of well-baby visits, then it may be possible to infer the child's vaccination status. Further, if parents are reluctant to report accurately to an interviewer because they do not wish to reveal that their child is not up to date, then a self-administered questionnaire format, which allows more confidential reporting, may help. The Proxy Measures Study examined the effectiveness both of the use of indirect questions and of self-administration in yielding accurate measures of children's vaccination status.

In the Proxy Measures Study, a set of indirect questions that inquired specifically about the child's medical visits was developed and tested. Parents were asked whether their child always had a usual source of care, whether the child made all the recommended



“well-baby” visits, whether the child received vaccinations during these visits, and what the doctor said about the child’s vaccination status. It was concluded that answers to these questions would provide a basis for inferring, statistically, the child’s vaccination status.

Further, patterns of overreporting in the Memory-Aid Study pointed to the possible influence of social desirability on responses. Parents may be reluctant to tell an interviewer that their child has not received all their recommended shots. Therefore, a self-administered questionnaire may alleviate these concerns by allowing parents to report, without embarrassment, that their child is not up to date. In the Proxy Measures Study, data were collected through both interviewer-administered and self-administered questionnaires.

## Method

### Sample Selection

Subjects were the primary caregivers of 2- and 3-year-old children from the same pediatric clinic in Chicago from which the Memory-Aid Study respondents were recruited. The initial goal was to interview 150 respondents. The clinic provided NORC with a list of all 2- and 3-year-old children who had been patients there within the 12 months prior to sample selection. Prior experience with the clinic suggested that much of the address and telephone information in clinic records was outdated. As a result, a large sample of 599 children was fielded, and field work was continued until 153 cases were completed.

Record checking was done prospectively: Interviewers trained in medical records abstraction obtained vaccination records for each child. Data sufficient to determine whether the child was up to date on all vaccinations were available for 134 of the 153 children. Complete data from all providers the parent listed was obtained for 118 children; for 16 cases, the data from one or more providers were missing, but the interviewer was still able to determine that the child had received all the

recommended shots based on the records collected. Thus, the sample size was 134 in some analysis and 118 for others requiring complete data. Data were not available for the remaining children primarily for one of two reasons: the records could not be located by the provider or the provider did not respond to repeated requests for the records.

### Questionnaires

The questionnaire included the standard vaccination questions that appear in the NIS and NHIS surveys (see [Appendix III](#)). As in the Memory-Aid Study, additional items on the smallpox, pneumococcal disease, and varicella vaccines were included as well. While answering the standard questions, respondents viewed a show card that listed recommended vaccines and the number of doses that children should receive before 2 years of age. Immediately after the questions on the individual vaccines, respondents were administered the global question, in which they were asked whether the child had received all recommended shots for his or her age. The questionnaire also included, in the final two sections, items that tested the respondent’s knowledge about vaccinations and a set of demographic questions.

A major purpose of the Proxy Measures Study was to determine whether the child’s vaccination status could be determined from the parent’s responses to an additional set of questions about the child’s pediatric care, in order to assess whether responses to these indirect questions provided the basis for a more accurate classification of the children than the parents’ responses to the standard questions on vaccinations. The indirect questions appeared either directly before the standard vaccination questions or immediately after them.

The second experimental variable was whether the questionnaire was self-administered (SAQ) or administered by an interviewer (IAQ). In the IAQ condition, the interviewer both read the questions and recorded the respondent’s answers. In the SAQ, the respondent read and completed a paper

questionnaire without help from the interviewer; the interviewer was present but did not observe the answers given by the respondent.

### Procedure

Six experienced interviewers were trained to recruit and interview respondents at their homes. The family member listed in the clinic record as the child’s guardian (usually the mother) was contacted. In most cases, this person had primary responsibility for the child’s health care or was able to refer the interviewer to the person with primary responsibility, who then served as the respondent for the study. Respondents were then sent a letter explaining the purpose of the study, and an interviewer visited the household and conducted the interview in person. These interviews lasted an average of 20 minutes.

The children about whom the parents were interviewed ranged in age from 24 to 47 months. All of the respondents were female, about three-quarters had at least a high school degree, and about 16 percent of them were currently married, with the remainder being single or formerly married.

At the conclusion of the interview, respondents were asked permission to use vaccination information from the child’s medical records and to indicate all the sources from which their child had received medical care. For respondents who gave consent, these additional doctors were contacted and asked to provide information about the vaccinations they had administered to the respondent’s child. Only one respondent declined to give consent to obtain vaccination records, and no medical records were obtained for this case.

### Coding of Parents’ Reports

The parental reports were analyzed in the same way as in earlier studies. For each child, it was determined whether the child was up to date on each vaccine, based on the parent’s report and the medical records. Reports about the number of doses of each

vaccine that the child had received were used to determine whether the child was up to date for that vaccine. Overall reports of up to date status were based on answers to the global question, “In your opinion, has [CHILD’S NAME] received all of the recommended shots for his or her age?”

## Results

### Overall Accuracy

As [table G](#) shows, similar to the previous experiments, parents frequently incorrectly reported their child’s overall vaccination status on the global question and their status on each vaccine. Unlike the first (Memory-Aid) study, the errors were all in the direction of overreporting, with significant levels of overreporting (by McNemar test) for DTP ( $z = 2.19, p < 0.05$ ), MMR ( $z = 4.90, p < 0.01$ ), Hepatitis B ( $z = 2.11, p < 0.05$ ), and the global status item ( $z = 7.95, p < 0.01$ ).

Clearly, parents have difficulty reporting the actual number of vaccines their child received. They were no more accurate in reporting whether their child had *ever* received a vaccine. Among the small number of children not receiving a particular vaccine, parents usually incorrectly reported that the child did receive the vaccine. False positive rates ranged from 89 to 100 percent across the five vaccines; phi correlations ranged from  $-0.08$  to  $0.04$ .

Overreporting was also evident in responses to the varicella, pneumococcal

disease, and smallpox items. Although the medical records indicated that only 7 children in the sample had received the varicella vaccine, 27 parents (23 percent) reported that their child had received it (these analyses are based on the 118 children for whom complete vaccination records could be obtained). Four of these parents were correct in their assessment and 23 were mistaken. Even though the smallpox vaccine is no longer given, 14 parents (12 percent) believed that their children had been vaccinated against this disease. Further, four parents (3 percent) reported that their child received the vaccine for pneumococcal disease; the records indicated that none of the children received it. The relatively low number of false positives on pneumococcal disease (compared with varicella and smallpox) suggests that parents base their responses in part on how familiar they are with a particular vaccine. As was the case with the Hib vaccine, parents may be more likely to indicate their child has received a vaccine or to overreport the number of doses received if they have heard of it.

### Effects of Questionnaire Mode and Order of the Indirect Questions

Although the overreporting of overall up to date status in the Memory-Aid Study might be due to effects of social desirability, no evidence was found that collecting the data via self-administered questionnaires

improved the accuracy of reports. Of the parents who completed an IAQ, 91 percent reported their child as up to date, versus 95 percent of those who completed an SAQ (Chi-square (1) =  $0.84, n.s.$ ). In addition, the mean number of doses reported for each vaccine was quite similar for those who completed the SAQ and the IAQ. Likewise, the percent reporting up to date status correctly did not differ by mode of data collection or whether the indirect questions came before or after the standard questions (see [table H](#)).

### Inferring Vaccination Status From Indirect Questions

Contrary to expectation, parents’ reports about events related to vaccination status did not predict actual status. There was little variability in the responses to these items. Most parents indicated that they had always had a regular doctor for their child (97 percent), that they made all well-baby visits (87 percent), and that the doctor had not indicated that the child was behind in his or her vaccinations (88 percent). An examination was made of the relationship between whether the child was up to date according to the records and whether the parent reported that the child had always had a regular doctor, made all the well-baby visits, and was never said to be behind in his or her shots. As [table J](#) shows, phi values were near zero, and none of these three measures was significantly related to actual up to date status.

**Table G. Proxy Measures Study: Child’s vaccination status according to medical records and respondents, and parental response accuracy measures**

Vaccine	(n) <sup>1</sup>	Percent who received according to records	Percent who received according to respondents	Net bias	False negative		False positive		Phi
					Rate	(n) <sup>2</sup>	Rate	(n) <sup>3</sup>	
DTP	118	65.3	78.0	12.7	20.8	(77)	75.6	(41)	0.04
Polio	117	70.1	72.6	2.5	28.0	(82)	74.3	(35)	-0.02
MMR	115	79.1	100.0	20.9	0.0	(91)	100.0	(24)	0.00
Hib	98	69.4	79.6	10.2	20.6	(68)	80.0	(30)	0.01
Hepatitis B	106	51.9	65.1	13.2	27.3	(55)	56.9	(51)	0.17
Global	129	41.1	93.0	51.9	7.3	(53)	90.8	(76)	0.11

0.0 Quantity more than zero but less than 0.05.

<sup>1</sup>(n) is the total number of children in the initial interview sample (those for whom parents completed an initial interview about the child’s medical visit).

<sup>2</sup>(n) is the number of children in the initial interview sample who had received a shot of this type, and is the base for potential false negative reports.

<sup>3</sup>(n) is the number of children in the initial interview sample who had NOT received a shot of this type, and is the base for potential false positive reports.

NOTE: Reports are in response to the question “How many \_\_\_\_\_ (shots/vaccines) did [child] ever receive?”

## Discussion

In the final Proxy Measures Study, the approach taken attempted to sidestep problems related to reporting errors due to encoding failure by asking questions instead about information the respondent was likely to have encoded—in particular, whether the child had missed any well-baby visits. Further, an attempt was made to reduce social desirability pressures by using self-administered questionnaires. Neither of these methods increased the accuracy of the parents' reports. The direction of reporting errors suggests that parents were not simply guessing when they did not know their child's vaccination status, but were systematically overreporting. This overreporting was as common in the self-administered condition as it was under interviewer administration.

## General Discussion

One consistent finding from all three experiments is that, consistent with past research, parents' unaided reports about their children's vaccination status were inaccurate. Similarly, across vaccines, there were high rates of both types of errors—reports that children had not received all the recommended doses when the records indicated that they had, and reports that children had received all the recommended doses when the records showed that they had not. Leaving aside MMR (for which only a single dose is recommended), for those reporting that the child had received a vaccine at least once, the false negative rates for the vaccines in the Memory-Aid and Proxy Measures Studies ranged from 20.6 to

56.0 percent; the false positive rates ranged from 41.3 to 80.0 percent. For MMR, the rate of false positives was near 100 percent in both studies.

What accounts for these low levels of accuracy? Three possible sources of error in parents' reports were examined—encoding failure, forgetting, and deliberate misreporting. Of these, the evidence most strongly supports encoding failure as a source of reporting error. In the Encoding Study, parents had difficulty identifying the shots their children received minutes after they had received them; only about one respondent in six was able to report accurately the vaccines their children received that day. It is possible that the respondents would have done better had the interviewer used a more sensitive, recognition-based test, rather than a cued recall item. Still, the respondents had several opportunities to learn which

**Table H. Proxy Measures Study: Mean number of doses of each vaccine reported by parent, percent of parents who correctly identified the number of doses their child received, and the percent who correctly indicated that their child had received the recommended number of doses, by type of vaccine and experimental variable**

Vaccine	(n) <sup>1</sup>	Self-administered (SAQ)		Interviewer administered (IAQ)	
		Standard questions first	Proxy questions first	Standard questions first	Proxy questions first
Mean number of doses reported by the parent					
DTP	105	3.5	3.6	3.7	3.6
Polio	103	3.0	3.1	3.0	2.9
MMR	106	1.0	1.2	1.1	1.1
Hib	98	3.0	3.0	2.5	2.6
Hepatitis B	104	2.3	2.1	2.1	2.8
Percentage of parents who correctly identified the number of doses their child received					
DTP	118	42.3	34.4	42.3	50.0
Polio	118	42.3	28.1	23.1	38.2
MMR	118	53.9	56.3	53.9	73.5
Hib	118	34.6	28.1	23.1	23.5
Hepatitis B	118	34.6	34.4	34.6	32.4
Percentage of parents who correctly indicated whether or not their child had received at least the number of recommended doses					
DTP	118	53.8	46.9	57.7	64.7
Polio	118	53.8	53.1	50.0	55.9
MMR	118	61.5	62.5	69.2	82.4
Hib	118	50.0	62.5	46.1	47.1
Hepatitis B	118	65.4	56.3	42.3	64.7
Percentage of parents who correctly indicated that their child either was or was not up to date, overall					
Global question	118	42.3	37.5	23.1	44.1

<sup>1</sup>(n) is the sample size.

NOTE: This table includes only the 118 cases for which all medical records were available.

vaccines the child was to receive that day. Further, an additional finding supports an encoding failure hypothesis; in the Memory-Aid Study, the more respondents knew about the vaccines, the more accurately they reported. In general, respondents' knowledge about the vaccinations was very limited. Few respondents, for example, knew the number of doses recommended for each vaccine (see [table K](#)). Knowledge about the vaccines might serve to facilitate encoding of vaccinations at the time they were given.

There is less evidence from this study that retrieval failure accounts for much inaccuracy. Some losses over time were observed in the Encoding Study; the proportion of respondents who correctly reported which vaccines their child received during the relevant visit dropped slightly over 10 weeks. On the whole, though, there was surprising consistency between the immediate reports and those given 10 weeks later. The respondents in the Encoding Study seemed to remember what they knew at the time of the first interview well enough; the problem was that this information was generally inaccurate. The failure to find any significant effects of either the calendar or show card in the Memory-Aid study also suggests that forgetting was not an important source of error; if memory failure is not responsible for most misreporting, memory aids will, of course, not have much effect on reporting accuracy.

The evidence from this study is less clear regarding the influence of deliberate misreporting as a source of error. Self-administration often increases the proportion of respondents willing to make embarrassing admissions (21). If respondents are willing to admit they use illicit drugs on self-administered questionnaires, it seems unlikely they would withhold the information that their child had missed a vaccination or a well-baby visit. However, the Proxy Measures Study produced no indication that self-administration or the use of indirect (and presumably less sensitive) questions reduced reporting errors. On the other hand, when respondents were asked the overall vaccination status of their children in both the Memory-Aid and Proxy Measures Studies, they

**Table J. Proxy Measures Study: Proxy measures of up to date status**

Parent reported that . . .	(n) <sup>1</sup>	Percent up to date according to records	Phi
Child always had a regular doctor			
Yes . . . . .	129	41.9	0.06
No . . . . .	4	25.0	
Child went to all well-baby visits			
Yes . . . . .	116	43.1	0.11
No . . . . .	18	27.8	
Doctor indicated that child was up to date			
Yes . . . . .	113	44.3	0.14
No . . . . .	14	21.4	

<sup>1</sup>(n) is the sample size.

**Table K. Percent of respondents reporting correct number of recommended doses, by study and vaccine**

Vaccine	Memory-Aid study	Proxy measures study
DPT (4) . . . . .	30	28
Polio (3) . . . . .	47	26
MMR (1) . . . . .	35	32
Hib (3) . . . . .	23	27
Hep B (3) . . . . .	47	31

tended to overreport the proportion of children who had received all the recommended vaccinations. There is some evidence, then, of a general tendency toward overreporting on the global status question. However, this may not reflect the influence of social desirability of the responses as much as it does respondents' mistaken beliefs that their children are up to date.

Given the sketchy information that parents seem to have about their children's vaccinations, a natural question is how the respondents are able to answer the standard vaccination questions at all, if they do not have access to shot cards. During the cognitive pretests and again during the Memory-Aid and Proxy Measures Studies, information was gathered on the strategies respondents used to answer the vaccination questions. The protocols generated by the respondents were coded in the cognitive interviews; in addition, an item was included in the Memory-Aid and Proxy Measures questionnaires asking respondents what strategy they used in answering the vaccination questions. The results were

reasonably consistent across the studies; the most popular strategy seemed to be to attempt to recall the information on the vaccination card ([table L](#)). The respondents were apparently aware of the shortcomings of their memories of specific vaccination episodes and, in answering the questions, most of them used strategies that attempted to rely on other information instead.

## Limitations and Caveats

Clearly, although the basic results of the study were replicated in several sites, there may be limitations in the external validity of the findings, especially because a random sample of the relevant population was not studied. To the extent that the subject populations were atypical, or for whatever reasons represent a biased sampling of the relevant domain, the study may not serve as a clear description of either the cognitive processing, or the survey reporting tendencies, of parents who are administered immunization questions. On the one hand, the respondents were



**Table L. Strategies for recalling vaccinations, by study**

Strategy	Number of cognitive interviews	Memory-Aid		Proxy measures	
		Number	Percent	Number	Percent
Recall each visit to the doctor . . . . .	22	51	(27)	31	(24)
Recall information on child's shot card . . . . .	20	74	(39)	70	(55)
Recall the number of vaccinations the child was supposed to get . . . . .	14	21	(11)	4	(3)
Recall what doctor had told them about child's vaccination status . . . . .	7	18	(9)	17	(13)
Recall whether they had taken the child to all scheduled doctor visits . . . . .	---	20	(11)	6	(5)
Other strategy . . . . .	22	5	(3)	—	—

--- Not applicable.

— Quantity zero.

at about the educational level of the general public, so one might conclude that they were fairly representative. On the other hand, respondents tended to be less likely than the general public to have fully immunized their children, and for a number of associated reasons may have been less able to report on this topic. On balance, especially given the severely low levels of accurate reporting that were observed, the interviewers had few indications that even the use of a large, randomly selected sample would materially change the results. At the same time, it is important not to over-generalize these results.

## Recommendations for Survey Practice

If failure to encode the relevant information in the first place is the primary reason that vaccination reporting accuracy is so low, it will be difficult to increase accuracy through improvements to the questions or aids provided to respondents (such as the show card). Asking parents to recall their children's vaccinations may be, for many, to ask for information they simply do not have. The best methods to improve reporting may be the ones already used in the NIS and the NHIS: (a) encouraging respondents to use their vaccination cards and (b) obtaining medical provider data and then developing statistical corrections based on the relationship between the survey reports and the provider data. The movement toward the use of medical

provider records in national surveys such as the NIS and NHIS/NIPRCS therefore appears to be a step in the right direction.

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## Appendix I: Materials Used in Memory-Aid Study

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### Memory-Aid Study Questionnaire

Case ID: \_\_\_\_\_

Start time: \_\_\_\_\_

Date: \_\_\_\_\_

End time: \_\_\_\_\_

Interviewer: \_\_\_\_\_

---

## SURVEY OF CHILDREN'S HEALTH NORC University of Chicago

Information contained on this form which would permit identification of any individual or establishment has been collected with a guarantee that it will be held in strict confidence by the contractor and NCHS, will be used only for purposes stated in this study, and will not be disclosed or released to anyone other than authorized staff of NCHS without the consent of the individual or the establishment in accordance with Section 308(d) of the Public Health Service Act (42 U.S.C. 242m). Public reporting burden for this collection of information is estimated to be 30 average minutes per response. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to PHS Reports Clearance Officer, ATTN: PRA; Humphrey Building, Room 721-H, 200 Independence Avenue, SW; Washington, DC 20201; and to the Office of Management and Budget, Paperwork Reduction Project (0920-0264), Washington, DC 20503.

**VERSION 1: CALENDAR, SHOW CARD  
GLOBAL QUESTION FIRST**

INTERVIEWER: GIVE RESPONDENT A COPY OF THE CONSENT FORM.

We request that you read and then sign this consent form. Please follow along while I read it aloud.

READ CONSENT FORM TO RESPONDENT AND OBTAIN CONSENT, AS INDICATED BY RESPONDENT'S SIGNATURE ON THE CONSENT FORM.

INTERVIEWER, PLEASE INDICATE TYPE OF INTERVIEW (CHECK ONE):

One parent only \_\_\_\_\_

Two parents

parent 1 (primary caretaker) \_\_\_\_\_

parent 2 (secondary caretaker) \_\_\_\_\_



# Children's Health Questionnaire

INTERVIEWER: COMPLETE THE VACCINATION HISTORY CALENDAR BEFORE PROCEEDING TO SECTION A.

## SECTION A: VACCINATION HISTORY

I would like to confirm your child's name. Is it [CHILD'S NAME] \_\_\_\_\_?

Let me confirm that [CHILD'S NAME]'s birthdate is \_\_\_\_\_?  
MO    DAY    YR

A1. Has [NAME OF CHILD] ever received an immunization, that is a shot or drops?

- YES ..... 1
- NO ..... 2 GO TO B1
- DON'T KNOW ..... 6
- REFUSED ..... 7

A2. In your opinion, has [CHILD NAME] received all of the recommended shots for (his/her) age?

- YES ..... 1
- NO ..... 2
- DON'T KNOW ..... 6
- REFUSED ..... 7

INTERVIEWER: DISPLAY SHOW CARD 1 FOR QUESTIONS A3 THROUGH A7.A.

A3. Has [NAME OF CHILD] ever received a D-T-P shot (sometimes called a D-P-T shot, diphtheria- tetanus-pertussis shot, baby shot, three-in-one shot, DTaP, or it may have been included as part of the Tetramune shot)?

- YES ..... 1
- NO ..... 2 GO TO A4
- DON'T KNOW ..... 6 GO TO A4
- REFUSED ..... 7

A3.A. How many D-T-P shots did [NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

A4. Has [NAME] ever received a polio vaccine by mouth, pink drops or by a polio shot?

- YES ..... 1
- NO ..... 2 GO TO A5
- DON'T KNOW ..... 6 GO TO A5
- REFUSED ..... 7

A4.A. How many polio vaccines did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A5. Has [CHILD NAME] ever received a measles or M-M-R (Measles-Mumps-Rubella) shot?

- YES ..... 1
- NO ..... 2 GO TO A6
- DON'T KNOW ..... 6 GO TO A6
- REFUSED ..... 7

A5.A. How many measles or M-M-R shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A6. Has [CHILD NAME] ever received an Hib shot? (This is for Meningitis and is called Hemophilus Influenza {HA-MA-FI-LAS IN-FLU-EN-Z}, H-I-B vaccine, H Flu vaccine, or it might have been included as part of the Tetramune shot?)

- YES ..... 1
- NO ..... 2 GO TO A7
- DON'T KNOW ..... 6 GO TO A7
- REFUSED ..... 7

A6.A. How many Hib shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A7. Has [CHILD NAME] ever received a Hepatitis B shot? This might have been called "Heptavax" or "Engerix B."

- YES ..... 1
- NO ..... 2 GO TO A8
- DON'T KNOW ..... 6 GO TO A8
- REFUSED ..... 7

A7.A. How many Hepatitis B shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

INTERVIEWER: REMOVE SHOW CARD 1.

- A8. Has [CHILD NAME] ever received a varicella or chicken pox shot?
- YES ..... 1
  - NO ..... 2 GO TO A9
  - DON'T KNOW ..... 6 GO TO A9
  - REFUSED ..... 7

- A8.A. How many varicella shots did [CHILD NAME] ever receive?
- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

- A9. Has [CHILD NAME] ever received shots to prevent pneumococcal disease?
- YES ..... 1
  - NO ..... 2 GO TO A10
  - DON'T KNOW ..... 6 GO TO A10
  - REFUSED ..... 7

- A9.A. How many pneumococcal shots did [CHILD NAME] ever receive?
- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

- A10. Has [CHILD NAME] ever received a smallpox shot?
- YES ..... 1
  - NO ..... 2 GO TO A11
  - DON'T KNOW ..... 6 GO TO A11
  - REFUSED ..... 7

- A10.A. How many smallpox shots did [CHILD NAME] ever receive?
- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

A11. Has [CHILD NAME] received any other vaccinations that I have not asked you about?

- YES ..... 1
- NO ..... 2 GO TO A12
- DON'T KNOW ..... 6 GO TO A12
- REFUSED ..... 7 GO TO A12

A11.A. How many other shots are there (that I have not asked you about)?

- Number ..... RECORD NAMES AND DATES
- REFUSED ..... GO TO A12

A11.B. What is the name of the [FIRST, SECOND, ...] other shot?

- FOUR-IN-ONE ..... 01
- BCG (TUBERCULOSIS) ..... 02
- TYPHOID ..... 03
- YELLOW FEVER ..... 04
- MALARIA ..... 05
- DTaP ..... 06
- DTP/Hib ..... 07
- DTP/Hep B ..... 08
- OTHER (SPECIFY) ..... 95
- DON'T KNOW ..... 96 GO TO A12/ NEXT SHOT
- REFUSED ..... 97 GO TO A12/ NEXT SHOT

A12. Are you the person who took [CHILD NAME] for most of (his/her) shots? (Most means at least 1/2 of the shots.)

- YES ..... 1
- NO ..... 2
- DON'T KNOW ..... 6
- REFUSED ..... 7

A13. In answering these questions about how many vaccinations [CHILD NAME] has received, did you mostly ...

- Try to remember each visit to the doctor  
in which a vaccination was given? ..... 01
- Try to recall information from the shot card? ..... 02
- Try to remember the number of vaccinations  
the child was supposed to get? ..... 03
- Try to remember something the doctor had told you  
about your child's vaccination status? ..... 04
- Try to recall whether you had taken the child to  
all scheduled checkup or well-baby visits? ..... 05
- Or did you do something else? ..... 06
- Specify \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

A14. Do you have a shot record that shows all the vaccinations your child has received?

YES ..... 01

NO ..... 02

A14.A. When was the last time you looked at it?

RIGHT BEFORE COMING TO THE INTERVIEW ..... 01

WITHIN THE LAST WEEK ..... 02

WITHIN THE LAST MONTH ..... 03

MORE THAN A MONTH AGO ..... 04

DON'T KNOW/CAN'T REMEMBER ..... 06

REFUSED ..... 07

**SECTION B: KNOWLEDGE ABOUT VACCINATIONS**

B1. What illnesses is the MMR shot supposed to prevent?

---

DON'T KNOW ..... 6

REFUSED ..... 7

B1.A. How many MMR shots is a child supposed to receive by age two?

NUMBER OF SHOTS \_\_\_\_\_

DON'T KNOW ..... 96

REFUSED ..... 97

B2. What illnesses is the DTP shot supposed to prevent?

---

DON'T KNOW ..... 6

REFUSED ..... 7

B2.A. How many DTP shots is a child supposed to receive by age two?

NUMBER OF SHOTS \_\_\_\_\_

DON'T KNOW ..... 96

REFUSED ..... 97

B3. How many doses of the Polio vaccine is a child supposed to receive by age two?

NUMBER OF DOSES \_\_\_\_\_

DON'T KNOW ..... 96

REFUSED ..... 97

B4. What illness is the Hib shot supposed to prevent?

---

DON'T KNOW ..... 6

REFUSED ..... 7

B4.A. How many Hib shots is a child supposed to receive by age two?

- NUMBER OF SHOTS \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

B5. What illness is the Hepatitis B shot supposed to prevent?

- 
- DON'T KNOW ..... 6
  - REFUSED ..... 7

B5.A. How many Hepatitis B shots is a child supposed to receive by age two?

- NUMBER OF SHOTS \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

B6. Did [CHILD'S NAME]'s doctor recommend a schedule of check-ups or well-baby visit for when he/she was a newborn?

- YES ..... 01
- NO ..... 02
- DON'T KNOW ..... 96 GO TO B11
- REFUSED ..... 97 GO TO B11

B7. When were these visits to have taken place?

IF A CALENDAR WAS COMPLETED, INDICATE THESE DATES ON THE CALENDAR.

- LIST DATES: \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

B8. Did you go to all of these visits according to the doctor's recommended schedule?

- YES ..... 01 GO TO B11
- NO ..... 02
- DON'T KNOW ..... 96
- REFUSED ..... 97

B9. How many visits had to be rescheduled?

- Number of visits \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

B10. How many did you miss?

- Number of visits \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

B11. When was the date of your last visit to the pediatric clinic?

[ENTER DATE] \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
 MO DAY YR

- WITHIN THE LAST WEEK ..... 01
- WITHIN THE LAST MONTH ..... 02
- MORE THAN A MONTH AGO ..... 03
- DON'T KNOW/CAN'T REMEMBER ..... 06
- REFUSED ..... 07

**SECTION C: DEMOGRAPHICS**

C1. Including the adults and all the children, how many people live in your household?

NUMBER OF PEOPLE \_\_\_\_\_

C1A. How many children do you have who are above the age of 4 years?

NUMBER OF CHILDREN \_\_\_\_\_

C1B. How many children do you have who are under the age of 4 years?

NUMBER OF CHILDREN \_\_\_\_\_

C1C. How many children do you have ages 2 through 4 years?

NUMBER OF CHILDREN \_\_\_\_\_

C2. What is your relationship to [CHILD NAME]?

- MOTHER (STEP, FOSTER, ADOPTIVE) OR FEMALE  
 GUARDIAN ..... 01
- FATHER (STEP, FOSTER, ADOPTIVE) OR MALE  
 GUARDIAN ..... 02
- SISTER OR BROTHER (STEP/FOSTER/HALF/ADOPTIVE) 03
- IN-LAW OF ANY TYPE ..... 04
- AUNT/UNCLE ..... 05
- GRANDPARENT ..... 06
- OTHER FAMILY MEMBER ..... 07
- FRIEND ..... 08
- DON'T KNOW ..... 96
- REFUSED ..... 97

C3. What is the highest level of education you have completed?

- LESS THAN HIGH SCHOOL ..... 01
- SOME HIGH SCHOOL ..... 02
- HIGH SCHOOL GRADUATE/GED ..... 03
- SOME COLLEGE/VOCATIONAL SCHOOL ..... 04
- COLLEGE/VOCATIONAL SCHOOL GRADUATE ..... 05

PROFESSIONAL/GRADUATE SCHOOL .....	06
DON'T KNOW .....	96
REFUSED .....	97

C4. Are you now married, widowed, divorced, separated, or have you never been married?

MARRIED .....	01
WIDOWED .....	02
DIVORCED .....	03
SEPARATED .....	04
NEVER MARRIED .....	05
DON'T KNOW .....	96
REFUSED .....	97

C5. Aside from the pediatric clinic, how many other sources of care has [CHILD NAME] ever had?

Number of sources \_\_\_\_\_

---

INTERVIEWER: GIVE RESPONDENT A COPY OF THE PERMISSION FORM.

As part of this study we would like to obtain a limited amount of vaccination information from your child's medical files. To obtain this information we will need your permission indicated by signing this form. Note that there is no penalty for choosing not to allow NORC access to this information. Payment for your participation in the study does not depend on whether you choose to sign the form. Please be assured that like all of the information you have given us in this study, your child's vaccination information will be treated with complete confidentiality.

READ PERMISSION FORM TO RESPONDENT. OBTAIN PERMISSION TO CONTACT CHILD'S HEALTH CARE PROVIDERS, AS INDICATED BY RESPONDENT'S SIGNATURE ON THE PERMISSION FORM.



# Medical Events History Calendar

Case ID: \_\_\_\_\_

Date: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Primary \_\_\_\_\_ Secondary \_\_\_\_\_

## Vaccination History Calendar

4715

	1991	1992	1993	1994	1995
	J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S
<b>A1. Date of Birth</b>	Please mark the month the child was born with an X. Next mark the current month with an X. Draw a line connecting the 2 X's. This is the period we are interested in.				
<b>A2. Providers of Medical Care</b>	Below, please note each source of medical care for the child (such as a doctor, clinic or HMO). For each source, mark the month in which the child began receiving care from that source with an X; next, mark the last month in which the child received care from that source with an X. Finally, draw a line connecting the beginning and ending dates. Above the line write the name of the doctor or clinic.				
Name of first source:					
Name of second source:					
Name of third source:					
Name of fourth source:					
<b>A3. Illnesses and Injuries</b>	Please note any months during which the child had an illness that lasted more than a few days (such as an earache or chicken pox). Also, note any months in which the child suffered a serious injury. Mark the months with an X and indicate the nature of the illness or injury above the X.				
<b>A4. Medical Visits</b>	Please note with an X any months during which the child visited a doctor, a nurse, or some other medical provider. Include any stays in a hospital or visits to an emergency room. Above the X, indicate briefly the reason for each visit (e.g., routine care, an earache, a fever). Circle all those appointments that were for routine well--baby care.				
<b>A5. Vaccinations</b>	For each of the medical visits noted above, indicate those during which the child received a vaccination (that is, a shot or oral medicine to prevent an illness). Beneath the X for each visit, indicate which vaccinations the child received during that visit. If you are unsure about which illness the child was vaccinated for, put a question mark below the X for the visit. Add any additional medical visits in which the child was vaccinated. In addition, please note any month during which your child was scheduled to visit a health care provider, but missed the appointment. Please mark these with an M.				

## Memory-Aid Study: Show Card

### Recommended Number of Doses by Age 2 for Each Vaccine

DPT .....	4
Polio .....	3
MMR .....	1
Hib .....	3
Hep B .....	3

## Example of Data Abstraction Form

### Vaccination History Form-Child Immunization Project

Clinic/Physician Name: \_\_\_\_\_

To protect each child's privacy, records are identified only by number, not by name. Please refer to the attached Permission Form for the child's name and other identifying information.

Please complete this form and detach it from the Permission Form. Keep the Permission Form for your records and return this form to us in the postage-paid envelope provided.

**Instructions:**

Enter the dates (month/day/year) that each vaccination was given.

**Example:**

Polio/OPV	5/30/95	8/30/95			
-----------	---------	---------	--	--	--

Child's ID Number: \_\_\_\_\_

Vaccine	Dates Vaccinations Given				
Polio/OPV					
DTP					
MMR/Measles					
Hepatitis B					
Hib					
Varicella					

If no vaccinations were given please check here \_\_\_\_\_.

If no vaccination record is found please check here \_\_\_\_\_.



3. When was CHILD'S NAME born?

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
 MO DAY YR

4. What is the child's MR number?

Number \_\_\_\_\_

5. What is your relation to CHILD'S NAME?

MOTHER .....	01
FATHER .....	02
STEPMOTHER .....	03
STEPFATHER .....	04
GRANDMOTHER .....	05
GRANDFATHER .....	06
AUNT .....	07
UNCLE .....	08
OTHER FEMALE RELAT .....	09
OTHER MALE RELAT .....	10
NONRELATIVE .....	11

6. What is the highest level of education you have completed?

DID NOT FINISH HIGH SCHOOL .....	00
HIGH SCHOOL GRADUATE .....	01
VOCATIONAL, TRADE SCHOOL AFTER HS .....	02
ATTENDED COLLEGE .....	03
COLLEGE GRADUATE .....	04
ATTENDED GRADUATE/PROF SCHOOL .....	05

7. Are you currently in school?

YES .....	1
NO .....	2

8. What is your marital status? Are you now ...

Married .....	1
Not married, but living with a partner .....	2
Widowed .....	3
Divorced .....	4
Separated, or .....	5
Have you never been married? .....	6

9. How would you describe yourself? Are you ...

Hispanic .....	1
Black, not of Hispanic origin .....	2
White, not of Hispanic origin .....	3
Asian/Pacific Islander .....	4

- Native American/American Indian/Eskimo ..... 5
- Or something else? ..... 6

10. How many brothers and sisters does CHILD'S NAME have?  
 \_\_\_\_\_ NUMBER OF SIBLINGS (IF NONE, ENTER 0 AND GO TO SECTION B)

11. Is CHILD'S NAME the oldest among his/her brothers and sisters, the second oldest, or what?
- OLDEST ..... 1
  - 2ND OLDEST ..... 2
  - 3RD OLDEST ..... 3
  - 4TH OLDEST ..... 4
  - 5TH OR LATER CHILD ..... 5

**SECTION B. TODAY'S VISIT**

The next few items concern CHILD NAME's visit to the clinic.

1. To start off, would you tell me in your own words what happened during the child's visit today?

	YES	NO
a) CHILD RECEIVED IMMUNIZATION(S) .....	_____ 1	_____ 2

**IF YES, LIST IMMUNIZATIONS:**

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_

b) CHILD RECEIVED ROUTINE EXAM .....	_____ 1	_____ 2
c) CHILD WAS TREATED FOR AN ACUTE ILLNESS .....	_____ 1	_____ 2

**IF YES, RECORD ILLNESS (E.G., EAR INFECTION):**

\_\_\_\_\_  
 \_\_\_\_\_

d) CHILD RECEIVED FOLLOW-UP TREATMENT FOR EARLIER CONDITION .....	_____ 1	_____ 2
--	---------	---------

**IF YES, RECORD EARLIER CONDITION:**

\_\_\_\_\_  
 \_\_\_\_\_

e) CHILD TREATED FOR A CHRONIC CONDITION .....	_____ 1	_____ 2
--	---------	---------

**IF YES, PROBE FOR AND RECORD CONDITION:**

\_\_\_\_\_  
 \_\_\_\_\_

f) CHILD TREATED FOR AN EMERGENCY .....	_____ 1	_____ 2
---	---------	---------

**If YES, PROBE FOR AND RECORD NATURE OF EMERGENCY**

\_\_\_\_\_  
 \_\_\_\_\_

g) OTHER ..... 1 ..... 2

**If YES: RECORD NATURE OF OTHER TREATMENTS**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**BOX A: DID R SAY THE CHILD RECEIVED ANY SHOTS OR IMMUNIZATIONS?**

YES ..... 1 (SKIP TO QUESTION 3)  
 NO ..... 2 (GO TO QUESTION 2)

2. Did CHILD'S NAME get any shots today?

YES ..... 1  
 NO ..... 2 (SKIP TO QUESTION 4)

3. What were the shots for? (IF NECESSARY, PROBE: What diseases will the shots prevent?)

	YES	NO
a) POLIO/ORAL POLO/OPV/IPV .....	_____ 1	_____ 2
b) HAEMOPHILUS INFLUENZAE TYPE B/HIB/H FLU/MENINGITIS .....	_____ 1	_____ 2
c) MEASLES/MUMPS-MEASLES-RUBELLA/MMR .....	_____ 1	_____ 2
d) DIPHTHERIA-TETANUS-PERTUSSIS/DPT/DT/ THREE-IN-ONE SHOT .....	_____ 1	_____ 2
e) HEPATITIS B/HEP B .....	_____ 1	_____ 2
f) COMBINED HIB-DTP/FOUR-IN-ONE/TETRAMUNE .....	_____ 1	_____ 2
g) VARICELLA/CHICKEN POX I .....	_____ 1	_____ 2
h) OTHER: SPECIFY _____	_____ 1	_____ 2
_____		
_____		

4. Did your child receive any (other) immunizations by mouth today?

YES ..... 1  
 NO ..... 2 (SKIP TO BOX B)

5. What were these (other) immunizations for?

	YES	NO
a) POLIO/ORAL POLIO/OPV .....	_____ 1	_____ 2
b) OTHER: SPECIFY _____	_____ 1	_____ 2
_____		
_____		

**BOX B: DID R REPORT ANY SHOTS/VACCINATIONS? (2 OR 4 = 1)**

YES ..... 1 (GO TO QUESTION 6)  
 NO ..... 2 (SKIP TO QUESTION 8)

- 6. Did the doctor, a nurse, or someone else give the shots (or administer the oral vaccines)?
  - DOCTOR ..... 1
  - NURSE ..... 2
  - SOMEONE ELSE ..... 3
- 7. Did you receive a shot record or immunization card showing what shots CHILD'S NAME got today?
  - YES ..... 1
  - NO ..... 2
- 8. Has your child received any immunizations—either here or somewhere else—before today?
  - YES ..... 1
  - NO ..... 2 (SKIP TO QUESTION 10)
  - NOT SURE, DON'T KNOW ..... 3 (SKIP TO QUESTION 10)
- 9. Can you recall the number of earlier visits—either here or somewhere else—when CHILD'S NAME received an immunization?
  - ONE ..... 1
  - TWO ..... 2
  - THREE OR MORE ..... 3
- 10. During today's visit, did anyone mention to you whether CHILD'S NAME has received all of the recommended shots?
  - YES, I WAS TOLD CHILD HAS HAD ALL SHOTS ..... 1
  - NO, I WAS TOLD CHILD STILL NEEDS SHOTS ..... 2
  - NO, I WASN'T TOLD EITHER WAY ..... 3
- 11. Did you discuss the schedule for any future visits for immunizations for CHILD'S NAME?
  - YES ..... 1
  - NO ..... 2

**SECTION C. FOLLOW-UP INFORMATION**

It would help us greatly if we could contact you for more information about your child's health later on.

1. Could I please have your telephone number?  
( ) TELEPHONE NUMBER

2. Could I have your home address?  
\_\_\_\_\_  
\_\_\_\_\_



**SECTION D. DATA ON VISIT FROM MEDICAL RECORD**

Visit Date:        /        /         
                   MO    DAY    YR

Child's Name: \_\_\_\_\_

1) Immunizations Received

	YES	NO
OPV/Oral Polio .....	_____ 1	_____ 2
Haemophilus Influenzae B/HIB .....	_____ 1	_____ 2
Diphtheria-Pertussis-Tetanus/DPT .....	_____ 1	_____ 2
Combined DPT-HIB/Tetramune .....	_____ 1	_____ 2
Hepatitis B/Hep B .....	_____ 1	_____ 2
Measles-Mumps-Rubella/MMR/Measles .....	_____ 1	_____ 2
Varicella/Chicken Pox .....	_____ 1	_____ 2
Other Immunizations .....	_____ 1	_____ 2

Specify: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

2) Other Treatments Received

	YES	NO
Any Other Treatments Received? .....	_____ 1	_____ 2

Specify: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

— Thank you very much for helping with this study! —

## Encoding Study Follow-Up Questionnaire

DATE OF INTERVIEW COMPLETION: \_\_\_\_\_  
MO DAY YR

RESPONDENT NUMBER: \_\_\_\_\_

INTERVIEWER: \_\_\_\_\_

RESPONDENT NAME: \_\_\_\_\_

RESPONDENT PHONE NUMBER: \_\_\_\_\_

RESPONDENT ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

CHILD'S NAME: \_\_\_\_\_

CHILD'S DATE OF BIRTH: \_\_\_\_\_

Hi. May I please speak with RESPONDENT NAME?

IF NOT AVAILABLE, ASK WHEN TO CALL BACK, AND INDICATE THE DATE AND TIME BELOW.

ONCE YOU ARE SPEAKING WITH RESPONDENT:

Hi. I'm \_\_\_\_\_ from the National Opinion Research Center. We spoke with you two months ago at the Injection Clinic during a study for the U.S. Public Health Service. We need to ask you a few follow-up questions, which should take less than five minutes. Is now a convenient time for you?

To begin with, do you remember taking CHILD'S NAME to the injection clinic on

DATE OF CLINIC VISIT: \_\_\_\_\_?

These questions will be concerning that visit to the clinic.

**SECTION B. THE VISIT**

1. To start off, would you tell me in your own words what happened during the child's visit on DATE? YES NO

a) CHILD RECEIVED IMMUNIZATION(S) ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2  
**IF YES, LIST IMMUNIZATIONS:**  
 1) \_\_\_\_\_  
 2) \_\_\_\_\_  
 3) \_\_\_\_\_  
 4) \_\_\_\_\_

b) CHILD RECEIVED ROUTINE EXAM ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2

c) CHILD WAS TREATED FOR AN ACUTE ILLNESS ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2  
**IF YES, RECORD ILLNESS (E.G., EAR INFECTION):**  
 \_\_\_\_\_  
 \_\_\_\_\_

d) CHILD RECEIVED FOLLOW-UP TREATMENT FOR EARLIER CONDITION ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2  
**IF YES, RECORD EARLIER CONDITION:**  
 \_\_\_\_\_  
 \_\_\_\_\_

e) CHILD TREATED FOR A CHRONIC CONDITION ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2  
**IF YES, PROBE FOR AND RECORD CONDITION:**  
 \_\_\_\_\_  
 \_\_\_\_\_

f) CHILD TREATED FOR AN EMERGENCY ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2  
**If YES, PROBE FOR AND RECORD NATURE OF EMERGENCY**  
 \_\_\_\_\_  
 \_\_\_\_\_

g) OTHER ..... \_\_\_\_\_ 1 \_\_\_\_\_ 2  
**If YES: RECORD NATURE OF OTHER TREATMENTS**  
 \_\_\_\_\_  
 \_\_\_\_\_

**BOX A: DID R SAY THE CHILD RECEIVED ANY SHOTS OR IMMUNIZATIONS?**

YES ..... 1 (SKIP TO QUESTION 3)

NO ..... 2 (GO TO QUESTION 2)

2. Did CHILD'S NAME get any shots during the visit?
- YES ..... 1
- NO ..... 2 (SKIP TO QUESTION 4)
3. What were the shots for? (IF NECESSARY, PROBE: What diseases will the shots prevent?)
- |  | YES     | NO      |
|--|---------|---------|
| a) POLIO/ORAL POLIO/OPV/IPV .....                            | _____ 1 | _____ 2 |
| b) HAEMOPHILUS INFLUENZAE TYPE B/HIB/H FLU/MENINGITIS .....  | _____ 1 | _____ 2 |
| c) MEASLES/MUMPS-MEASLES-RUBELLA/MMR .....                   | _____ 1 | _____ 2 |
| d) DIPHTHERIA-TETANUS-PERTUSSIS/DPT/DT/THREE-IN-ONE SHOT ... | _____ 1 | _____ 2 |
| e) HEPATITIS B/HEP B .....                                   | _____ 1 | _____ 2 |
| f) COMBINED HIB-DTP/FOUR-IN-ONE/TETRAMUNE .....              | _____ 1 | _____ 2 |
| g) VARICELLA/CHICKEN POX .....                               | _____ 1 | _____ 2 |
| h) OTHER: SPECIFY .....                                      | _____ 1 | _____ 2 |
- \_\_\_\_\_
- \_\_\_\_\_

4. Did your child receive any (other) immunizations by mouth during the visit on DATE?
- YES ..... 1
- NO ..... 2 (SKIP TO BOX B)
5. What were these (other) immunizations for?
- |                               | YES     | NO      |
|-------------------------------|---------|---------|
| a) POLIO/ORAL POLIO/OPV ..... | _____ 1 | _____ 2 |
| b) OTHER: SPECIFY .....       | _____ 1 | _____ 2 |
- \_\_\_\_\_
- \_\_\_\_\_

**BOX B: DID R REPORT ANY SHOTS/VACCINATIONS? (2 OR 4 = 1)**

YES ..... 1 (GO TO QUESTION 6)

NO ..... 2 (SKIP TO QUESTION 8)

6. Did the doctor, a nurse, or someone else give the shots (or administer the oral vaccines)?
- DOCTOR ..... 1
- NURSE ..... 2
- SOMEONE ELSE ..... 3
7. Did you receive a shot record or immunization card showing what shots CHILD'S NAME got during the visit on DATE?
- YES ..... 1
- NO ..... 2
8. Had your child received any immunizations—either at that clinic or somewhere else—before that particular visit to the clinic?
- YES ..... 1
- NO ..... 2 (SKIP TO QUESTION 10)
- NOT SURE, DON'T KNOW ..... 3 (SKIP TO QUESTION 10)

9. Can you recall the number of earlier visits—either at that clinic or somewhere else—when CHILD’S NAME received an immunization?

- ONE ..... 1
- TWO ..... 2
- THREE OR MORE ..... 3

10. During the visit on DATE did anyone mention to you whether CHILD’S NAME had received all of the recommended shots?

- YES, I WAS TOLD CHILD HAS HAD ALL SHOTS ..... 1
- YES, I WAS TOLD CHILD STILL NEEDS SHOTS ..... 2
- NO, I WASN’T TOLD EITHER WAY ..... 3

11. Since that visit on DATE, has CHILD’S NAME received any other vaccinations from any clinic?

- YES ..... 1
- NO ..... 2

IF YES, THEN ASK:

12. What vaccinations did CHILD’S NAME receive?

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## Appendix III: Materials Used in Proxy Measures Study

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### Proxy Measures Questionnaire

Case ID: \_\_\_\_\_

Start time: \_\_\_\_\_

Date: \_\_\_\_\_

End time: \_\_\_\_\_

Interviewer: \_\_\_\_\_



## **SURVEY OF CHILDREN'S HEALTH NORC University of Chicago**

Information contained on this form which would permit identification of any individual or establishment has been collected with a guarantee that it will be held in strict confidence by the contractor and NCHS, will be used only for purposes stated in this study, and will not be disclosed or released to anyone other than authorized staff of NCHS without the consent of the individual or the establishment in accordance with Section 308(d) of the Public Health Service Act (42 U.S.C. 242m). Public reporting burden for this collection of information is estimated to be 30 average minutes per response. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to PHS Reports Clearance Officer, ATTN: PRA; Humphrey Building, Room 721-H, 200 Independence Avenue, SW; Washington, DC 20201; and to the Office of Management and Budget, Paperwork Reduction Project (0920-0264), Washington, DC 20503.

## Children's Health Questionnaire

### SECTION A: VACCINATION HISTORY

I would like to confirm your child's name. Is it [CHILD'S NAME] \_\_\_\_\_?

Let me confirm that [CHILD'S NAME]'s birthdate is \_\_\_\_/\_\_\_\_/\_\_\_\_?  
MO DAY YR

*For use in Version 2 where Section B comes before Section A: IF ANSWER TO B4=YES THEN SKIP A1.*

A1. Has [NAME OF CHILD] ever received an immunization, that is a shot or drops?

- YES ..... 1
- NO ..... 2 GO TO B1
- DON'T KNOW ..... 6
- REFUSED ..... 7

INTERVIEWER: DISPLAY SHOW CARD 1 FOR QUESTIONS A2 THROUGH A6.A.

A2. Has [NAME OF CHILD] ever received a D-T-P shot (sometimes called a D-P-T shot, diphtheria- tetanus-pertussis shot, baby shot, three-in-one shot, DTaP, or it may have been included as part of the Tetramune shot)?

- YES ..... 1
- NO ..... 2 GO TO A3
- DON'T KNOW ..... 6 GO TO A3
- REFUSED ..... 7

A2.A. How many D-T-P shots did [NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A3. Now I'd like to ask more specifically about each vaccine.

Has [NAME] ever received a polio vaccine by mouth, pink drops or by a polio shot?

- YES ..... 1
- NO ..... 2 GO TO A4
- DON'T KNOW ..... 6 GO TO A4
- REFUSED ..... 7

A3.A. How many polio vaccines did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97



A4. Has [CHILD NAME] ever received a measles or M-M-R (Measles-Mumps-Rubella) shot?

- YES ..... 1
- NO ..... 2 GO TO A5
- DON'T KNOW ..... 6 GO TO A5
- REFUSED ..... 7

A4.A. How many measles or M-M-R shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

A5. Has [CHILD NAME] ever received an Hib shot? (This is for Meningitis and is called Hemophilus Influenza {HA-MA-FI-LAS IN-FLU-EN-Z}, H-I-B vaccine, H Flu vaccine, or it might have been included as part of the Tetramune shot?)

- YES ..... 1
- NO ..... 2 GO TO A6
- DON'T KNOW ..... 6 GO TO A6
- REFUSED ..... 7

A5.A. How many Hib shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

A6. Has [CHILD NAME] ever received a Hepatitis B shot? This might have been called "Heptavax" or "Engerix B."

- YES ..... 1
- NO ..... 2 GO TO A7
- DON'T KNOW ..... 6 GO TO A7
- REFUSED ..... 7

A6.A. How many Hepatitis B shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
  - DON'T KNOW ..... 96
  - REFUSED ..... 97

INTERVIEWER: REMOVE SHOW CARD

A7. Has [CHILD NAME] ever received a varicella or chicken pox shot?

- YES ..... 1
- NO ..... 2 GO TO A8
- DON'T KNOW ..... 6 GO TO A8
- REFUSED ..... 7

A7.A. How many varicella shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A8. Has [CHILD NAME] ever received shots to prevent pneumococcal disease?

- YES ..... 1
- NO ..... 2 GO TO A9
- DON'T KNOW ..... 6
- REFUSED ..... 7

A8.A. How many pneumococcal shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A9. Has [CHILD NAME] ever received a smallpox shot?

- YES ..... 1
- NO ..... 2 GO TO A10
- DON'T KNOW ..... 6 GO TO A10
- REFUSED ..... 7

A9.A. How many smallpox shots did [CHILD NAME] ever receive?

- NUMBER OF SHOTS \_\_\_\_\_
- ALL ..... 50
- DON'T KNOW ..... 96
- REFUSED ..... 97

A10. Has [CHILD NAME] received any other vaccinations that I have not asked you about?

- YES ..... 1
- NO ..... 2 GO TO A11
- DON'T KNOW ..... 6 GO TO A11
- REFUSED ..... 7 GO TO A11

A10.A. How many other *shots* are there (that I have not asked you about)?

- Number ..... RECORD NAMES AND DATES
- REFUSED ..... GO TO A11

A10.B. What is the name of the [FIRST, SECOND, . . .] *other* shot?

- FOUR-IN-ONE ..... 01
- BCG (TUBERCULOSIS) ..... 02

TYPHOID .....	03	
YELLOW FEVER .....	04	
MALARIA .....	05	
DTaP .....	06	
DTP/Hib .....	07	
DTP/Hep B .....	08	
OTHER (SPECIFY) .....	95	
DON'T KNOW .....	96	GO TO A11/ NEXT SHOT
REFUSED .....	97	GO TO A11/NEXT SHOT

A11. Are you the person who took [CHILD NAME] for most of (his/her) shots? (Most means at least 1/2 of the shots.)

YES .....	1
NO .....	2
DON'T KNOW .....	6
REFUSED .....	7

A12. In your opinion, has [CHILD NAME] received all of the recommended shots for (his/her) age?

YES .....	1
NO .....	2
DON'T KNOW .....	6
REFUSED .....	7

A13. In answering these questions about how many vaccinations [CHILD NAME] has received, did you mostly ...

Try to remember each visit to the doctor in which a vaccination was given? .....	01
Try to recall information from the shot card? .....	02
Try to remember the number of vaccinations the child was supposed to get? .....	03
Try to remember something the doctor had told you about your child's vaccination status? .....	04
Try to recall whether you had taken the child to all scheduled checkup or well-baby visits? .....	05
Or did you do something else? .....	06
Specify _____	
_____	
_____	

A14. Do you have a shot record that shows all the vaccinations your child has received?

YES .....	01
NO .....	02

A14.A. When was the last time you looked at it?

RIGHT BEFORE COMING TO THE INTERVIEW . . . . .	01
WITHIN THE LAST WEEK . . . . .	02
WITHIN THE LAST MONTH . . . . .	03
MORE THAN A MONTH AGO . . . . .	04
DON'T KNOW/CAN'T REMEMBER . . . . .	06
REFUSED . . . . .	07

## SECTION B: VISITS TO THE DOCTOR

B1. Sometimes when people move or are in the process of changing doctors, they may not have a specific doctor that they go to.

During the first two years of [CHILD NAME]'s life, did [he/she] always have a specific doctor or clinic to go to or were there times when [he/she] did not have a any specific doctor or clinic?

ALWAYS HAD SPECIFIC SOURCE OF CARE . . . . .	1	GO TO 3
TIMES WHEN DID NOT HAVE A SPECIFIC . . . . .	2	

B2. During the period before [CHILD NAME] turned two, how long did [he/she] not have a specific doctor or clinic to go to? Would you say a two months or less, two to six months, or six months or more?

TWO MONTHS OR LESS . . . . .	1
THREE TO SIX MONTHS . . . . .	2
SIX MONTHS OR MORE . . . . .	3

B3. Many doctors recommend a series of check-ups or "well-baby visits" before the baby turns two. Here is the schedule that many doctors follow, starting with visits every two months. Of course not everyone is able to make all of these visits. Do you think [CHILD] made all of these recommended routine visits?

YES, MADE ALL . . . . .	1	
MADE SOME AND MISSED SOME . . . . .	2	
MADE NONE . . . . .	3	GO TO B5

[REMOVE SHOW CARD 2]

B4. Often vaccinations—that is, shots or drops—are given during these routine visits. However, it is very common for children to miss one or more of their vaccinations. Sometimes parents are not able to keep the appointments, or sometimes the doctor might not be aware that the child was supposed to receive a particular vaccine. It is possible that many children will miss one or more their recommended vaccines.

Can you remember [CHILD NAME] getting any shots during these visits?

YES . . . . .	1
NO . . . . .	2

B5. Think back to the last time that [CHILD NAME] went to the doctor or clinic. Did [he/she] receive any vaccinations—that is, shots or pink drops?

YES . . . . .	1	
NO . . . . .	2	
DON'T KNOW . . . . .	96	END

B6. During that last visit, did the doctor or nurse say that [CHILD NAME] needed more shots or did the doctor say that [CHILD NAME] was now caught up on [his/her] vaccinations?

- CAUGHT UP ..... 1 END
- NEEDED MORE SHOTS ..... 2 GO TO 7
- DIDN'T SAY ..... 3 END
- DON'T REMEMBER ..... 96 END

B7. Do you recall which shots [CHILD NAME] still needs?

- YES ..... 1
- NO ..... 2 END

B8. Which vaccinations were those?

	YES	NO
HIB .....	_____ 1	_____ 2
DTP .....	_____ 1	_____ 2
MMR .....	_____ 1	_____ 2
POLIO .....	_____ 1	_____ 2
HEPATITIS B .....	_____ 1	_____ 2
OTHER (SPECIFY _____ _____ _____		

## SECTION C: KNOWLEDGE ABOUT VACCINATIONS

C1. What illnesses is the MMR shot supposed to prevent?

- 
- DON'T KNOW ..... 6
  - REFUSED ..... 7

C1.A. How many MMR shots is a child supposed to receive by age two?

- NUMBER OF SHOTS \_\_\_\_\_
- DON'T KNOW ..... 96
  - REFUSED ..... 97

C2. What illnesses is the DTP shot supposed to prevent?

- 
- DON'T KNOW ..... 6
  - REFUSED ..... 7

C2.A. How many DTP shots is a child supposed to receive by age two?

- NUMBER OF SHOTS \_\_\_\_\_
- DON'T KNOW ..... 96
  - REFUSED ..... 97

C3. How many doses of the Polio vaccine is a child supposed to receive by age two?

- NUMBER OF DOSES \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

C4. What illness is the Hib shot supposed to prevent?

- 
- DON'T KNOW ..... 6
  - REFUSED ..... 7

C4.A. How many Hib shots is a child supposed to receive by age two?

- NUMBER OF SHOTS \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

C5. What illness is the Hepatitis B shot supposed to prevent?

- 
- DON'T KNOW ..... 6
  - REFUSED ..... 7

C5.A. How many Hepatitis B shots is a child supposed to receive by age two?

- NUMBER OF SHOTS \_\_\_\_\_
- DON'T KNOW ..... 96
- REFUSED ..... 97

C6. When was the date of [CHILD NAME]'s last visit to the doctor?

- [ENTER DATE] \_\_\_\_/\_\_\_\_/\_\_\_\_  
                   MO  DAY  YR
- WITHIN THE LAST WEEK ..... 01
  - WITHIN THE LAST MONTH ..... 02
  - WITHIN THE LAST TWO MONTHS ..... 03
  - WITHIN THE LAST THREE MONTHS ..... 04
  - MORE THAN THREE MONTHS AGO ..... 05
  - DON'T KNOW/CAN'T REMEMBER ..... 06
  - REFUSED ..... 07

C7. What is the name of the doctor or clinic you saw at this last visit?

## SECTION D: DEMOGRAPHICS

D1. Including all the adults, the children, and yourself, how many people live in your household?

NUMBER OF PEOPLE \_\_\_\_\_

D2. HOUSEHOLD ENUMERATION

FIRST NAME \_\_\_\_\_

RELATION TO CHILD \_\_\_\_\_

AGE \_\_\_\_\_

D3. What is the highest level of education you have completed?

LESS THAN HIGH SCHOOL ..... 01

SOME HIGH SCHOOL ..... 02

HIGH SCHOOL GRADUATE/GED ..... 03

SOME COLLEGE/VOCATIONAL SCHOOL ..... 04

COLLEGE/VOCATIONAL SCHOOL GRADUATE ..... 05

PROFESSIONAL/GRADUATE SCHOOL ..... 06

DON'T KNOW ..... 96

REFUSED ..... 97

D4. Are you now married, widowed, divorced, separated, or have you never been married?

MARRIED ..... 01

WIDOWED ..... 02

DIVORCED ..... 03

SEPARATED ..... 04

NEVER MARRIED ..... 05

DON'T KNOW ..... 96

REFUSED ..... 97

D5. How many sources of care has [CHILD NAME] ever had?

Number of sources \_\_\_\_\_

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INTERVIEWER: CHECK THAT THIS NUMBER OF HEALTH CARE PROVIDERS IS LISTED ON BACK OF THE MEDICAL PROVIDER PERMISSION FORM.



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

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