

IMPROVING VALIDITY OF PARENTAL REPORTS OF CHILD IMMUNIZATION STATUS IN A TELEPHONE SURVEY

Lois M. Haggard & Donald Z. Gray, University of Utah
Lois M. Haggard, Survey Research Center, 2120 Annex Building,
University of Utah, Salt Lake City, UT 84112

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Abstract. The U.S. Public Health Service has established a goal of having at least 90% of all two-year-olds immunized by the year 2000. Because parental reports offer a cost effective method of measuring a child's immunization status, it will be important to examine the extent to which recall errors or socially desirable responses affect the accuracy of these reports. A telephone survey pilot study was conducted to compare parental reports with clinic immunization records under the following experimental conditions: Notifying parents in an advance letter, embedding immunization questions among other more threatening topics, and alerting parents to the possibility that researchers could verify their responses. The prenotification letter did significantly improve cooperation rate, but not parents' ability to locate the child's immunization record. Parents' reports of the number of doses their child had received matched clinic records from 29.5% to 70.5% of the time depending on the vaccine. The experimental manipulations yielded no significant improvements on the accuracy of parents' reports of the number of doses. In fact, respondents who received the prenotification letter were more likely to over report the number of vaccine doses their child had received. Results suggest that it may not be necessary to invest in additional efforts aimed at increasing response rates and validity of parental reports of childhood immunization rates, and that a prenotification letter may be counterproductive.

Currently the U.S. government invests large amounts of money in the nation's immunization system, \$259 million during fiscal year 1992 (Public Health Service, 1992), much of which is spent on interventions aimed at achieving the goal of at least 90% of all children completely vaccinated by two years of age. Achieving the 90% goal is among the strategic health initiatives outlined in the Public Health Service's Healthy People Year 2000. To support the initiative, the Centers for Disease Control and Prevention will soon begin conducting a national random digit dial telephone survey of immunization status (Crankshaw, 1994).

For immunization interventions to be developed and implemented, and for programs to be properly evaluated, an accurate measure of childhood immunization status must be employed. There is currently no standardized, validated measure of immunization status. In the absence of such a measure, individual programs must design their own measures and contend individually with the accompanying issues of faulty parental recollection, socially desirable responding, and varying definitions of compliance. This study focuses on design of a telephone survey parental-report measure of a child's immunization status aimed at maximizing reliability and validity.

Recent research conducted in Utah suggests that substantial numbers of young children in the state have not been adequately immunized (Utah Department of Health, 1992; Abbotts & Osborn, 1993). Current estimates of the percentage of all two year olds having received recommended immunizations range from roughly 40% to 90%, depending on the method used to measure immunization status. The liberal estimate of 90% was obtained in a recent survey conducted by the Utah Department of Health in which the parent was asked simply whether he or she believed a specified child's immunizations were up to date. The more conservative and potentially more realistic estimate of 40% was obtained by the Utah Department of Health in their 1992 annual retrospective survey of parents upon a specified child's entry to kindergarten. One explanation for the large discrepancy in the two estimates is that the topic of compliance with childhood immunization requirements is a sensitive one for parents. In other words, it is socially desirable for one's children to be up-to-date on their immunizations, and this social desirability may bias parent's reports of a child's immunization status under certain conditions.

One recent study (Bobo et al., 1993) used a telephone survey to examine immunization status in the context of a case control study of neurological disorders in children. This study had the advantage of having obtained access to the children's medical records to validate parents' accounts of their child's immunization status. Bobo et al. note that parental error rates were low (2.1% to 4.1%, depending on the vaccine and dose number) and that parent and provider

dates were usually off by only a day. In addition, the authors reported that in most cases (74%), parents stated they were reading their child's vaccine record when answering questions about dates and dose numbers for the various vaccines.

It is hypothesized that three aspects of the Bobo et al.'s study led to their low error rates. First, the high proportion of parents who were actually reading from the immunization record probably increased overall accuracy substantially. Parents were sent a prenotification letter asking them to find the specified child's immunization records and be prepared to read them over the phone.

Second, the immunization questions in Bobo et al.'s survey may have been desensitized by virtue of their having been embedded among a topic (neurological disorders) that was at least, if not more threatening than immunization compliance. One documented method of desensitizing a sensitive topic for a survey respondent is to embed the topic in the context of a series of more threatening questions (Bradburn & Sudman, 1979).

Third, the parents were aware that the researchers could check their responses against the child's medical records. Parents were notified early in the interview of that component of the research project. We may presume that the parents were aware that any errors in reporting on their part could potentially be discovered by the researchers. As Reid (1970) reported, observations tend to be more careful when the subjects are aware that their observations are being checked.

METHODS

Overview

A pretest was conducted for the purposes of refining and validating a telephone survey parental-report measure of childhood immunization status. The validation study employed an embedded experiment in which respondents were randomly assigned to one of eight experimental conditions that varied procedures related to facilitation of reliable and valid responding. Parental reports of child immunization status were compared to state immunization records to provide a measure of validity.

Subjects

Two-hundred and forty parents were selected from the state immunization records system. To be eligible, parents must have had children who 1) were

between 20 and 28 months of age on March 24th, 1994, 2) had previously been seen in the clinic for at least two immunization visits, and 3) were currently due or overdue for a subsequent inoculation (as of January 1994).

Of the 240 cases, 95 were considered ineligible (wrong number, disconnected number, etc.). Of the remaining 145 cases, 24 refused to be interviewed, and 74 were completed interviews. There were 4 partial interviews, 10 "no answers," and 33 were not interviewed for some other reason (e.g., repeated scheduled callbacks). The cooperation rate was 73%, and the response rate was 49%.

The City/County Health Department records were considered the "true" source of information in the validation aspect of the study. This study did not consult medical records outside the City/County Health Department system. Thus, validation analyses include only parents who indicated that the target child had received all his or her immunizations at the City/County Health Department clinic. In addition, the analyses include no parents who reported the child had received any vaccines after the date the City/County Health Department immunization record was pulled.

Experimental Design

Validity of parental reports of child immunization status was examined in a 2 (prenotification letter) by 2 (ask permission to consult child's medical record) by 2 (embed immunization status items in a series of more threatening questions) between-subjects experimental design (see Figure 1) that was embedded in the survey procedure and questionnaire. The design also included one four-level repeated measures component: vaccine type -- diphtheria/ tetanus/ pertussis (DTP), polio, measles/ mumps/ rubella (MMR), and haemophilus influenzae B (HIB).

Cell sizes of from $n=7$ to $n=10$ were achieved initially, but were reduced to $n=4$ to $n=7$ after the omission of ineligible parents (child received vaccinations after record draw date, or from another provider). Small cell sizes precluded analysis of interaction effects on the between-subjects variables, so only the main effects were examined.

Dependent Variables

Cooperation rate. Cooperation rates of the "letter" and "no letter" groups were compared, using the following formula: Interviews/ (Interviews + Partial + Respondent Refusals).

Ability to find immunization record. Parents'

Figure 1. Experimental Design and Proposed Cell Sizes

NO PRENOTIFICATION LETTER

		Asked permission to consult child's medical record?	
		NO	YES
Was question embedded in a series of more threatening questions?	NO	n=10	n=10
	YES	n=10	n=10

WITH PRENOTIFICATION LETTER

		Asked permission to consult child's medical record?	
		NO	YES
Was question embedded in a series of more threatening questions?	NO	n=10	n=10
	YES	n=10	n=10

abilities to find the official immunization record, as well as their abilities to find any sort of immunization record (e.g., baby book, etc.) were compared across the "letter" and "no letter" conditions.

Time to find record. The number of minutes parents took to find the immunization record was compared across the "letter" and "no letter" conditions.

Validity of parental reports. Validity of parental reports was measured as the discrepancy between the number of vaccine doses reported by the parent, and those reported in the City/County Health Department records for each vaccine type. The implicit assumption in this calculation is that the health department records are 100% accurate. It is acknowledged that this is not necessarily the case. Nevertheless, there is assumed to be a high negative correlation between discrepancies and validity of the parents' reports.

Theory on social desirability bias would predict that parents, especially those whose children are under immunized, will over estimate the number of vaccine doses received by the target child. Thus, the number of doses reported by the parent minus the number of doses on record would be an adequate measure of discrepancy induced by social desirability bias. However, parents without a record at hand may

merely have faulty recollections of the number of doses, and may be in error in either direction. Thus, the absolute value of respondents' discrepancies will also be used as a measure of discrepancy.

Procedure

The use of familiar words, casual, nonthreatening language, and open questions was employed wherever feasible to decrease sensitivity of the topic for parents whose child may not be up to date on his or her immunizations (Lee, 1993).

Interviews were conducted in the University of Utah Survey Research Center's CATI facility between March 24th and April 5th, 1994.

RESULTS

Cooperation Rate by Receipt of Letter

In the group that received the letter, completed interviews, partial interviews, and respondent refusals totaled 36, 0, and 4 out of a total of 68 eligible cases. The figures in the "no letter" group were 38, 4, and 20. Cooperation rates (I/I+P+R) were calculated at 90.0% and 61.3%, respectively. A test of proportions yielded a z-score of 5.18, $p \leq .001$.

Ability to Find Immunization Record

Overall, 54 respondents (73%) were able to find their child's official immunization record, and an additional four respondents were able to find some other sort of record, for a total of 58 respondents (78.4%) who were able to find some sort of record containing information on the target child's immunization status.

Comparison of the "no letter" and "letter" groups indicated that the letter had no effect on a parent's ability to find the official immunization record. Of those in the "no letter" group, 73.7% found their official immunization records, compared with 72.2% in the "letter" group ($\chi^2_{(1)} = .02$, n.s.). This was also true of a parent's ability to find any sort of appropriate record (81.5% and 75% for "no letter" and "letter" groups, respectively, $\chi^2_{(1)} = .47$, n.s.).

Time to Find Record

Parents took, on average, 1.82 minutes to find their child's immunization record. Prenotification by letter did not significantly reduce this search time. Respondents in the "no letter" group took 1.87

minutes, while those in the "letter" group took 1.77 minutes ($F_{(1,57)} = .033$, n.s.).

Validity of Parental Report of Immunization Status

Accuracy of parental reports varied across vaccines. The most accurate reporting was found for polio (70.5% of all parents reporting same number of doses as medical record), followed by DTP (61.4%), MMR (50%), and HIB (29.5%).

Parents who were able to find the child's immunization record at home during the interview were no more or less likely to over report immunization doses than were other parents ($F_{(1, 25)} = .00$, n.s.). These parents were only marginally more accurate overall, according to the absolute difference measure ($F_{(1, 25)} = 2.95$, $p \leq .10$). Estimates of parents who could not find their child's record deviated from the health department record by .75, .50, 1.25, and .81 doses, on average, for DTP, polio, MMR, and HIB, respectively. Estimates of parents consulting the record deviated by .39, .30, .21, and .78 doses.

The three manipulated variables produced no significant improvements in validity of number of doses reported as measured by the discrepancy variable (parental reports minus health department record). On the contrary, the prenotification letter served to significantly increase the discrepancy between parental

report and health department record (see Table 1). There were marginal within-subjects interaction effects such that the embedded questions and the medical records request did improve the validity for some vaccines, but reduced the validity for others. The three manipulated variables had no significant effects on the absolute value measure of validity.

DISCUSSION

The results of this study demonstrate that greater than 70% of parents are able to locate a two-year-old child's immunization record during a telephone interview regardless of whether a prenotification letter is sent. In fact, a larger study subsequently conducted by the authors in which 603 parents were called yielded the same result: 74.3% of parents were able to locate the official immunization record. None of these 603 parents received a prenotification letter.

Sending a prenotification letter does not improve the probability that respondents will locate the immunization record. Apparently parents either know where the record is and can procure it in a few minutes, or not at all.

Although the parents in our study were able to locate the immunization record with the same

Table 1. Average discrepancy in number of doses: Parental report minus health department record.

Prenotification Letter	DTP	POLIO	MMR	HIB
NO (n=11)	.000	.091	.181	.091
YES (n=16)	.625	.375	.500	.688
Embedded Questions				
NO (n=17)	.471	.353	.294	.588
YES (n=10)	.200	.100	.500	.200
Medical Record Request				
NO (n=15)	.400	.333	.533	.333
YES (n=12)	.333	.167	.167	.583

BETWEEN-SUBJECTS EFFECTS

	df	F	sig.
Letter	1	4.83	≤.05
Embedded questions.....	1	1.17	n.s.
Medical record request	1	.01	n.s.
within-cells	19		

WITHIN-SUBJECTS EFFECTS

	df	F	sig.
Vaccine.....	3	.44	n.s.
Letter by vaccine.....	3	1.10	n.s.
Embedded ques. by vaccine.....	3	2.58	≤.10
Medical rcd. rqst. by vaccine....	3	2.37	≤.10
within-cells.....	57		

probability as in the Bobo et al. study, the responses they provided were less valid. In general, parents tended to over report the number of doses of vaccines their child had received. Although the modal discrepancy between parents' reports and the number of doses in the health department record was zero, the next most frequently encountered response category was to over report by one dose. Twenty to thirty percent of the parents we interviewed over reported by one dose, whereas only about 5% under reported by the same amount.

Reading from the immunization record yielded only a marginal improvement in validity of parental reports. However, the number of subjects in the "no record" group was small ($n=4$), and this effect may have reached statistical significance had the "no record" group been larger. Even so, interpretation of this finding is tricky, since being able to find a child's immunization record was not experimenter controlled, and is likely to be correlated with a parent's overall sense of importance of childhood immunizations.

Sending the prenotification letter did increase cooperation rate from 64% to 90%. However, sending a prenotification letter also appears to increase over reporting by parents. The reasons for this are unclear. Perhaps parents felt the survey was less anonymous because the researcher had their name and address. Further research would be required to replicate the effect, and to understand why a prenotification letter would cause parents to over report a child's immunization status.

In conclusion, while a prenotification letter did enhance cooperation rate in the telephone interview, it had no effect on a parent's ability to retrieve their child's immunization record, and it appears to have sensitized parents to the social desirability of the childhood immunization. These results suggest that it may not be cost effective to invest in additional efforts aimed at increasing response rates and validity of parental reports of childhood immunization rates, and in fact, some efforts may be counterproductive.

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