

UNFOLDING THE ANSWERS? INCOME NONRESPONSE AND INCOME BRACKETS IN THE NATIONAL HEALTH INTERVIEW SURVEY

John R. Pleis, James M. Dahlhamer, and Peter S. Meyer

National Center for Health Statistics, 3311 Toledo Road, Hyattsville, Maryland 20782

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Introduction

Analyses of 2001 data comparing item/concept nonresponse rates across seven federal surveys confirmed major discrepancies between income and other survey items (Dahlhamer et al., 2004). That is, the nonresponse rate, which includes refusals and “don’t know” responses, for income questions was disproportionately high relative to other survey questions. Nonresponse rates for demographic, labor force, program participation, and insurance coverage items/concepts were under 8.0% for the majority of surveys, with several items producing nonresponse rates less than 5.0%. In contrast, two surveys produced nonresponse rates in excess of 20.0% for each of eight income sources, including rates of 50.0% or higher for interest and dividends and income from retirement, survivor, or disability pensions. Nonresponse rates for total income amounts (person, family, or household) were also high, ranging from 9.0% to 39.5%.

That analysis included the National Health Interview Survey (NHIS), a face-to-face, multi-purpose household health survey administered continuously by the National Center for Health Statistics, Centers for Disease Control and Prevention.¹ Weighted item nonresponse rates (“don’t know” and refusal responses combined) for an exact amount question on annual total family income² grew from 25.0% in 1997 to a 31.9% in 2005. Considering the documented association between socioeconomic status (SES) and various health outcomes, the relatively high income nonresponse raises concerns about the analytic usability of NHIS income data. Currently, the NHIS uses a process of multiple

imputation for income and personal earnings and publishes these files shortly after the release of annual microdata to address some of the concerns associated with the high levels of nonresponse.

In response to these quality concerns, we developed a research agenda for better understanding income nonresponse on the NHIS. Among the goals are bias assessment, improvement of imputation strategies, and nonresponse reduction through question redesign. Initial analyses explored the relationship between various respondent, family/household, and geographic characteristics and income nonresponse (don’t know and refusal responses combined) and nonresponse type (refused versus “don’t know”). Through multivariate analyses, several correlates of income nonresponse were identified (Pleis and Dahlhamer, 2003; Pleis and Dahlhamer, 2004; Pleis and Dahlhamer, 2005). Of particular concern was the possibility that income nonresponse was related to income itself, an intractable type of problem known as nonignorable nonresponse. During the second quarter of 2006 (April – June), a portion of the NHIS sample was selected to participate in a field test that evaluated alternative ways to ask respondents about family income. This paper will focus on preliminary results from the first 8 weeks of the field test.

Methods

As described in more detail in Meyer et al. (2007), certain households in the NHIS are designated as “screeners” (approximately 15% of the initial sample). This terminology refers to the fact that for certain households the interview is only conducted if at least one of the household members is Hispanic, black, or Asian. If no household members meet this criterion (i.e., if all household members are non-Hispanic white, non-Hispanic American Indian or Alaska Native, non-Hispanic Native Hawaiian or Other Pacific Islander, or any combination thereof), the interview is terminated and no further information is gathered. That is, these households are “screened out”. For this field test, “screened out” households were used to evaluate the alternative series of income-related questions described above. We were able to accomplish this partly because our previous research has not shown a strong association between income response rates and race/ethnicity, after adjustment for other socio-demographic variables

¹ For more information, visit the NHIS Web site at www.cdc.gov/nchs/nhis.htm.

² “Now I am going to ask about the total combined income {for you/of your family} in {previous calendar year}, including income from all sources we have just talked about such as wages, salaries, Social Security or retirement benefits, help from relatives and so forth. Can you tell me that amount before taxes?”

(e.g., age, sex) (Pleis and Dahlhamer, 2003; Pleis and Dahlhamer, 2004). Although we were primarily interested in evaluating the alternative income-related questions, the entire Family Core module was administered to the respondents in the field test. This was done to minimize context effect, since the income-related questions are asked at the end of the Family Core module, and to also provide a more accurate representation of how respondents would react to alternative income-related questions in the context of a complete interview.

All data from the field test presented here were collected during the first 8 weeks of the 2nd quarter of 2006 (April – May). Although the field test was conducted over a 13-week continuous period in the 2nd quarter of 2006, only estimates based on the first 8 weeks were available at the time these results were presented. All estimates are presented as unadjusted percents, percentage distributions, or percentiles. Statistical significance was evaluated at the $\alpha = 0.05$ level and all estimates are unweighted. SAS statistical software was used for data management, estimate calculation, and evaluation of statistical significance (SAS Institute Inc., 2003).

Current and Alternative Tested NHIS Income Questions

As described in more detail in Meyer et al. (2007), the NHIS consists of three main modules: Family Core, Sample Child, and Sample Adult. The current NHIS income-related questions, which are administered at the end of the Family Core, can be grouped into three sections. Listed in the order in which they appear, these question groupings are:

- Income source questions (12 possible sources)
- Income amount questions (income in last calendar year)
 - Exact amount
 - $\geq \$20,000 / < \$20,000$ (if no reply to exact amount)
 - Income intervals (if reply given to $\geq \$20,000 / < \$20,000$)
- Program participation questions (e.g., food stamps; Women, Infants, and Children (WIC))

No changes were made to the questions related to program participation for the field test. At the present time, each income source is asked about in a separate question. The original intent of the income source questions was to assist NHIS respondents to recall what items were considered income for the purposes of reporting an income amount. However,

approximately 90% of all families report a maximum of three income sources (out of a possible 12), and these sources are usually employment, self-employment, and interest income. Thus, asking all income source questions of all family members would appear to be unnecessary (Pleis and Dahlhamer, 2004). Further, because of the small number of sources typically reported, there may be an increase in respondent fatigue and annoyance from asking all twelve sources, resulting in elevated rates of nonresponse to other income-related questions (e.g., income amount questions) that follow the source related questions. In an effort to deal with this issue, we field tested an alternative way of asking about income sources. Instead of asking about all income sources individually, the respondent was simply shown a flashcard and then was asked which sources were applicable. In addition, a category for no income source was included. The flashcard that was used is shown below:

- None
- Wages and salaries
- Self-employment
- Social Security
- Disability Pension
- Retirement Pension
- Supplemental Security Income
- Cash Assistance
- Other government assistance
- Interest
- Dividends
- Child Support
- All other sources

Currently, after the questions about income sources are asked, the next set of questions deal with the amount of family income in the last calendar year. The first question asks the respondent to provide the exact amount of the family's income in the last calendar year. If the respondent does not provide an answer to the exact amount question, the respondent is asked to provide the family's income in relation to \$20,000 (greater than or equal to, or less than). If an answer is given to this question, the respondent is shown a list of income intervals and asked to place the family's income into one of the intervals. If the family's income is less than \$20,000, the respondent is shown a list of income intervals in \$1,000 increments. If the family's income is \$20,000 or more, the respondent is shown a list of income intervals in \$1,000 increments up to \$35,000. If the family's income is \$35,000 or more, the respondent is shown a list of income intervals in \$5,000 increments up to a final category of \$75,000 and over. The income follow-up questions, particularly

the income interval questions, have rather poor response rates historically: the response rate to the income interval questions in the 2005 NHIS was 17.5%. This is not a problem that is singular to the NHIS. Consequently, very few of the non-responders to the initial total amount of family income questions provided income data that are sufficiently bounded and detailed for use in income calculations. For example, one of the most utilized income variables in NHIS data is the poverty ratio: the ratio of family income to the Federal poverty threshold (DeNavas-Walt et al., 2006). In the current NHIS, income needs to be reported in at least interval form to be used in the calculation of the poverty ratio. Thus, the poor response rate to the income interval follow-up question leads to a relatively high proportion of persons with an “unknown” poverty ratio (29% (weighted) in the 2005 NHIS). The problem of high nonresponse to income questions is widespread across surveys.

Because of the relatively poor performance of the current follow-up income questions, several changes to the income amount questions were made for the field test. First, the wording was changed to the question that asks for the family’s total amount of family income in the last calendar year. The wording of the current question is as follows:

“Now I am going to ask about the total combined income {for you/of your family} in 2005, including income from all sources we have just talked about such as wages, salaries, Social Security or retirement benefits, help from relatives and so forth. Can you tell me that amount before taxes?”

The revised wording as tested is as follows:

“When answering the next question, please remember to include your income PLUS the income of all family members living in this household. What is your best estimate of {your total income/the total income of all family members} from all sources, before taxes, in 2005?”

In addition to this wording change, the follow-up income questions were changed by replacing them with a series of unfolding bracket questions. A flowchart demonstrating the path for the new income follow-up questions used in the field test is shown in Figure 1. These questions utilized a series of income brackets, and respondents answering the complete path of questions would answer either 2 or 3 questions. In the current fielded version of the NHIS, the complete path of income follow-up questions consists of 2 questions. The first alternative follow-up income question asks the respondent if the

family’s income is less than \$50,000. This starting point was chosen because it was reasonably close to the current median family income in the United States (DeNavas-Walt et al., 2006) and should provide meaningful information, even if it is the only follow-up question answered. It is also worth noting that these alternative follow-up income questions also include the ability to determine if all respondents have incomes that are below the poverty threshold. This is accomplished by asking all respondents whose family income is less than \$35,000 if their income is also below the poverty threshold for their particular family. Since the poverty threshold varies depending on the family’s size and the number of children, the poverty threshold asked about in the question will also vary depending on the familial composition. The poverty threshold dollar amount is programmed to be pre-filled into the questions based on the family’s size.

Results

Table 1 compares two different ways of gathering income source information for the five most common income sources in the United States. Based on the results, the proportion of respondents who reported salary or self-employment income was similar for the current approach (asking about all sources in separate questions) and the alternative approach (having the respondent select all applicable income sources from a list). However, statistically significant differences were seen when examining Social Security, interest, and dividends. In particular, the differences between the two income source data collection methods were the most striking for interest and dividend income. The percentages of respondents reporting interest income and dividend income were at least two times as high for the current approach as for the tested approach.

Because the income source questions are asked directly before asking for the total amount of family income, there could be an impact on income response rates and income distributions by changing the way in which income source data are collected. However, the question that asks for the total amount of family income in the past calendar year also had a slight wording change for the test, and this could also have an impact on response rates and income distributions. Unfortunately, due to sample size concerns, these two changes were not tested separately, and their effects are confounded. Respondents receiving alternative income source questions (i.e., who chose all applicable sources from a list) also received the family income amount questions with revised wording. The results in Table 2 show that the combined effect of these changes resulted in a slight

improvement in response rates for the total amount of family income question. Although the decline in total item nonresponse (i.e., refusals plus “don’t know” responses) for income was not statistically significant, the decrease in the refusal rate was statistically significant. In fact, the refusal rate declined from 24.5% to 21.3% ($p = 0.04$) which is of interest since refusals often are more difficult to convert through question redesign efforts than are “don’t know” responses. Although the “don’t know” rate increased for the alternative path, the difference was not statistically significant.

Table 3 shows a comparison of selected percentiles from income distributions for data collected under the current approach (asking all income source questions separately and keeping the wording to the total amount question unchanged) and the tested approach (asking respondents to choose all applicable income sources from a list and changing the wording to the total amount of family income question). Although no statistical testing was performed, the distribution of total family income as ascertained by the tested questions appears to be shifted to the left (lower incomes) of the distribution as ascertained by the current questions, and the inter-quartile ranges (a rough measure of dispersion) are similar.

The main motivation behind this field test was the rather poor performance of the current follow-up questions asked of respondents who do not provide an answer to the initial total amount of family income question. The path completion rates for the current and field tested follow-up income questions are shown in Table 4 for the two sub-types of nonresponse (refusals, don’t knows). Although the path completion rates are much higher under the tested questions for both types of nonresponse, the differential is greatest for initial “don’t know” responses to the total amount of family income question. For those “don’t know” respondents, the path completion rates under the tested questions were over 4 times as high as those under the current income follow-up questions, and for refusals, the path completion rates under the alternative questions were almost 4 times as high as those for the current income follow-up questions.

We also examined the patterns of response to the tested income follow-up questions for the two subtypes of nonresponse (refusals, don’t knows) for the total amount of family income question. The results are shown in Table 5. No respondents who initially refused subsequently indicated that their family income was less than the poverty threshold, but approximately 9% of those who provided an initial “don’t know” response did. Further, nearly 3

times as many respondents who initially provided a “don’t know” response to the total amount of family income question subsequently said their income was less than \$50,000 (43%), compared with respondents who initially refused the total amount of family income question (15%). However, among respondents who indicated that their income was “\$50,000 or higher”, results are very similar for respondents who initially refused the total amount of family income question (38%) and for those who initially provided a “don’t know” response (36%). But these response patterns should be examined with caution due to the high proportion of respondents who initially refused the total amount of family income question and did not answer any of the alternative follow-up income questions (47%).

As mentioned previously, one of the most analyzed income variables in NHIS data is the ratio of family income to the federal poverty threshold. Table 6 shows percent distributions of poverty level based on current and test questions. The test income questions resulted in substantially fewer respondents with an “unknown” poverty status (14%) compared with the current sequence of income questions (32%). The proportion of respondents who were below the poverty threshold increased by a smaller amount using the test questions than did the proportion of respondents at or about the poverty threshold (increase of 26%). This finding suggests that the “unknowns” with respect to the poverty ratio in the current NHIS are composed of unequal proportions of persons with incomes below and persons with incomes at or above the poverty threshold. This finding has implications with respect to assumptions about the bias of unknown values for these groups of respondents.

Discussion

Based on preliminary results from the field test, asking follow-up income questions in a series of unfolding brackets could achieve superior results to those is currently seen in the NHIS. Further, because of higher response rates for these alternative income questions, more information is available for respondents who initially do not provide an answer to the total amount of family income question. Our data indicate that there are differing income distributions for the two sub-types of nonresponse (refusals, don’t knows). For example, “don’t know” respondents appear to have lower income than refusers, which may have implications for future questionnaire design efforts or imputation strategies. Because we did not find any initial refusers with an income below the Federal poverty threshold, the results for this study could be used to establish lower bounds when

performing income imputation; “don’t know” responders would have a lower income bound of zero, but the lower bound for refusers could be above zero. This field test also showed the importance of the first follow-up income question. If the first follow-up income question (income in relation to \$50,000) was answered, the path completion rates for initial “don’t know” and refusal responses were relatively high and were similar to each other (77% vs. 76%) (results not shown). This finding highlights the relative importance of the first follow-up question, the choice of the reference income value, and their impact on response rates.

While the results for the bracketed follow-up income questions indicated a positive impact on response, the results for gathering income source data via a flashcard were somewhat mixed. Specifically, source reporting was similar for salary and self-employment but disparate for interest and dividends. Notably, the differences were greatest for sources at the end of the list, which may indicate a primacy effect. However, this difference, and incorporating a shorter total income amount question, did not appear to affect the overall income distributions. In fact, the refusal rate for the total amount of family income question decreased. This can be viewed as a desirable result since refusals are generally more difficult to convert through alternative design strategies than are “don’t know” responses.

Despite the usefulness of this study, it is subject to some limitations. First, it was not a true experimental design. The impact on income nonresponse for each change in the current income-related NHIS questions could not be distinguished; only the combined effect of the changes could be evaluated. This was done to ensure that the unfolding bracket follow-up income questions had adequate sample size. In addition, the relatively large number of initial refusers to the total amount of family income question who did not answer any follow-up income questions leads to some interpretation uncertainty. Although initial refusers appear to have a higher income distribution than the initial “don’t know” responses, the result is somewhat dependent on the assumption of equal income distributions between the initial refusals who did not answer any follow-up income questions and those who at least indicated their family’s income in relation to \$50,000. This may be an untenable assumption. For the alternative income questions, 47% of initial refusers and 21% of initial “don’t know” respondents to the question about total amount of family income would not answer any follow-up income questions, suggesting that refusers have greater sensitivity to the income amount questions than do initial “don’t know” respondents. Future

research might focus on these two groups of initial refusers (those who answered at least one follow-up question, and those who did not answer any follow-up questions) and examine demographic differences, which may provide useful results for future income-related question design strategies.

Disclaimer: The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the Department of Health and Human Services, the Centers for Disease Control and Prevention, and the National Center for Health Statistics.

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Figure 1

Flow Chart for Field Tested Alternative
Income Follow-up Questions

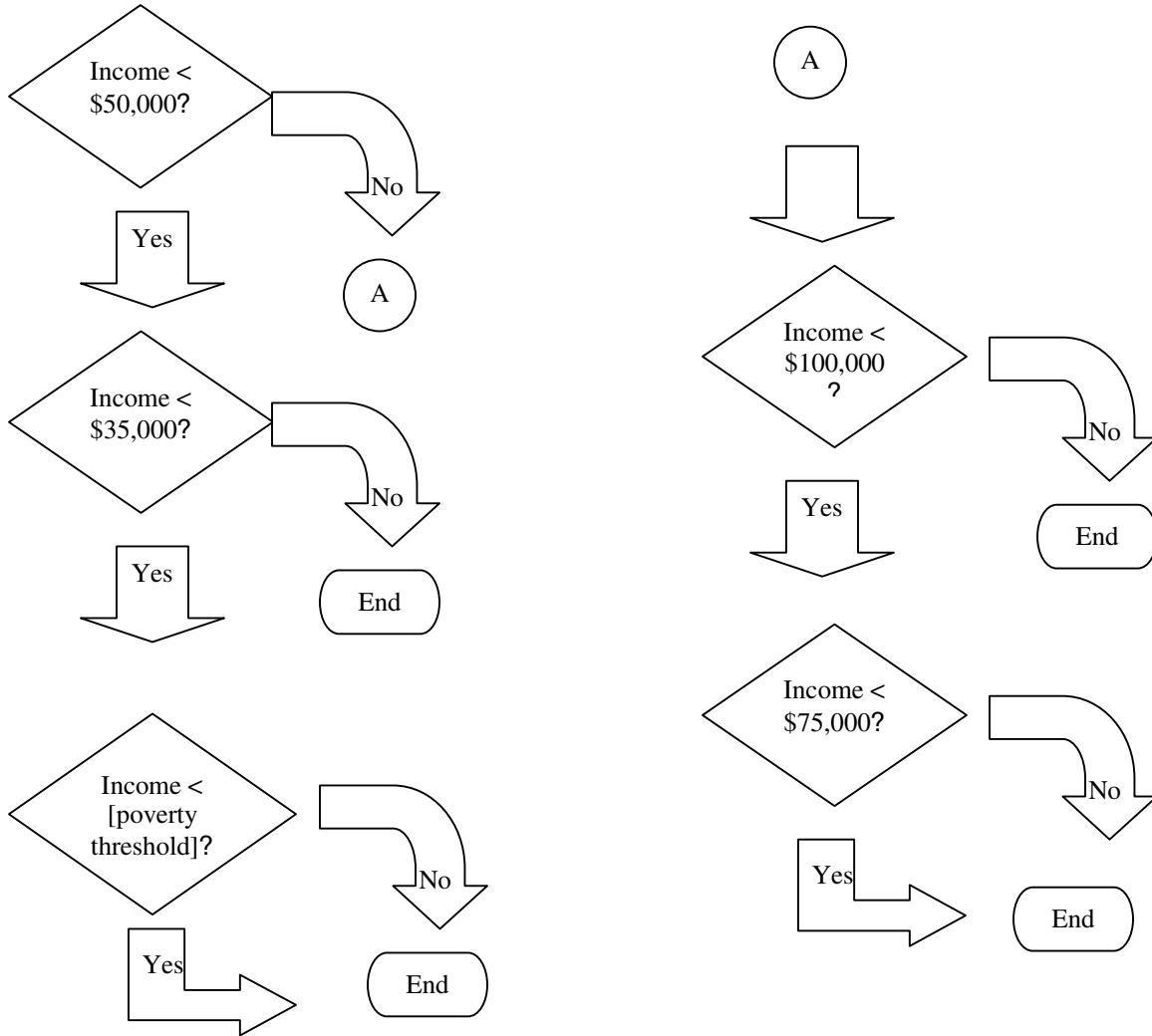


TABLE 1		
Comparison of Income Source Reporting, for Current & Tested Questions, NHIS 2006, 2 nd Quarter (Weeks 1 – 8)		
Source	Percent Reporting Source	
	Sources Asked Separately (current) (n = 1,473)	Used Flashcard with List of Sources (tested) (n = 1,426)
Salary	59.4%	59.0%
Self-Employment	9.0%	7.8%
Social Security	17.0%	14.0%
Interest	20.8%	7.0%
Dividends	9.8%	4.2%

TABLE 2		
Comparison of Total Family Income Reporting, for Current & Tested Questions, NHIS 2006, 2 nd Quarter (Weeks 1 – 8)		
Type of Nonresponse	Percent not Responding	
	Sources Asked Separately (current) (n = 1,473)	Used Flashcard with List of Sources (tested) (n = 1,426)
Refused	24.5%	21.3%
Don't know	9.5%	11.5%
Total	34.0%	32.8%

TABLE 3		
Comparison of Percentiles from Total Family Income Distributions, for Current & Tested Questions, NHIS 2006, 2 nd Quarter (Weeks 1 – 8)		
Percent	Percentiles	
	Sources Asked Separately (current) (n = 972)	Used Flashcard with List of Sources (tested) (n = 960)
25%	\$29,000	\$23,000
50%	\$50,000	\$49,000
75%	\$85,000	\$80,000
Inter-quartile range	\$56,000	\$57,000

TABLE 4		
Comparison of Path Completion Rates for Follow-up Income Questions, for Current & Tested Questions, NHIS 2006, 2 nd Quarter (Weeks 1 – 8)		
Type of Nonresponse to Total Income Amount Question	Percent Completing Follow-ups	
	Current Follow-ups (n = 501)	Tested Follow-ups (n = 468)
Refusal	10.6%	40.0%
Don't know	14.3%	61.2%

TABLE 5		
Percent Distribution of Income Given in Response to Follow-up Income Questions (tested), NHIS 2006, 2 nd Quarter (Weeks 1 – 8)		
Income Category Given (tested)	Percent in Income Category	
	Initially Refused (n=304)	Initially Didn't Know (n = 164)
<i>Less than \$50,000:</i>		
\$0 – {Poverty Threshold}	0.0%	9.1%
>{Poverty Threshold} - \$34,999	7.5%	10.9%
\$35,000 - \$50,000	5.2%	11.5%
Unknown	2.3%	11.5%
Subtotal	15.0%	43.0%
<i>\$50,000 or higher:</i>		
\$50,000 - \$74,999	10.8%	12.7%
\$75,000 - \$99,999	8.5%	7.3%
\$100,000 or higher	7.9%	9.7%
Unknown	10.5%	6.7%
Subtotal	37.7%	36.4%
<i>Unknown</i>	47.2%	20.6%
TOTAL	100%	100%

TABLE 6		
Comparison of Percent Distributions of Poverty Level, for Current & Tested Questions, NHIS 2006, 2nd Quarter (Weeks 1 – 8)		
	Percent in Poverty Level Category	
Poverty Threshold	Current Questions (n = 1,473)	Tested Questions (n = 1,426)
Below	6.7%	7.8%
At/above	61.8%	78.0%
Unknown	31.5%	14.2%
TOTAL	100%	100%