

# THE EFFECT OF SCREENING ON COVERAGE IN THE NATIONAL HEALTH INTERVIEW SURVEY

Fred Meier, U.S. Bureau of the Census  
Thomas Moore, U.S. Bureau of the Census  
Fred Meier, FOB-3, DSMD, Room 3726, Washington DC, 20233

## Key Words: Coverage, Screening, NHIS

The Census Bureau<sup>1</sup> conducts the National Health Interview Survey (NHIS) for the National Center for Health Statistics (NCHS). The survey asks a wide variety of health related questions of the civilian, noninstitutionalized population of the United States. The NHIS data are obtained through personal interviews with household members. Interviews are conducted each week throughout the year in a probability sample of households.

One of NCHS's major objectives for the 1995-2004 NHIS design was to enhance the survey's ability to produce statistics for relatively small, but important, population subdomains, such as Blacks and Hispanics. To reach this goal, the Census Bureau worked with NCHS and Westat, Inc. to develop and implement a sample design to oversample Blacks and Hispanics.

The methodology employed the following steps:

- Form clusters of housing units within minority density strata. The cluster size varied by stratum.
- Select a systematic sample of clusters of housing units. This is the initial sample, and each selected cluster has the same probability of selection within a PSU.
- Subsample within strata to obtain the desired number of clusters to be sent to the field.
- Conduct final subsampling, or screening, in the field to delete some nonminority housing units while retaining all units containing at least one Black or Hispanic person.

In the 1985-1994 NHIS design, blocks with high concentrations of Blacks were oversampled during the initial sample selection, but screening was not used. The introduction of screening allowed us to increase the Black and Hispanic sample size and keep survey costs within budget. Nonminority households were dropped so that more minority households could be interviewed. This improved Black and Hispanic estimates, while maintaining sufficient reliability in nonminority estimates. We wondered whether the introduction of screening in 1995 would have any effect on coverage rates in the NHIS.

From 1991-1994, about 60,000 households were designated for interview each year. Of these, about 20% were ineligible for interview (vacant, demolished, etc.) leaving about 48,000 eligible households. The noninterview rate normally ranged between 4-6%, so we would complete interviews at about 45,500 households.

Starting in 1995, about 74,000 households were designated for interview. Again, about 20% were ineligible, and an additional 20% were screened out because all of the civilian household members were non-Black, non-Hispanic. This leaves about 44,000 eligible households. The nonresponse rate has increased slightly and we now complete interviews in about 40,500 households per year.

Prior to 1996, NHIS was conducted using a paper and pencil interviewing (PAPI) procedure. For the first six months of 1996, 25% of the sample was dropped from the main sample (the sample used to form estimates) and used to test a computer assisted personal interviewing (CAPI) procedure. For the latter six months of 1996, 50% of the sample was dropped from the main sample and used for CAPI testing. Beginning in 1997, all NHIS interviewing was done using CAPI.

This paper compares coverage rates after 1995, when screening was introduced, with the coverage from previous years. It also compares NHIS coverage rates with the coverage from another survey, the Current Population Survey (CPS), which does not screen households.

---

<sup>1</sup>This paper reports the results of research and analysis undertaken by Census Bureau staff. It has undergone a more limited review than official Census Bureau publications. This report is released to inform interested parties of research and to encourage discussion.

## NHIS Coverage by Race and Sex

NHIS sample persons are weighted up to the national level. The national weight is a product of four factors<sup>2</sup>:

1. The inverse of the probability of selection
2. A household nonresponse adjustment
3. A first-stage ratio adjustment
4. A second-stage ratio adjustment

The first stage-ratio adjustment is applied to non-selfrepresenting PSUs. This adjustment is intended to reduce variances by adjusting for differences between the PSUs which were selected and those which were not.

The second-stage ratio adjustment is used to bring the sum of the weights into agreement with known population totals. This adjustment is defined within various age/sex/race cells as

$$\frac{\text{independently estimated population total}}{\text{weighted population total}}$$

The coverage ratio in this paper is defined as the estimate of the number of persons in some category using weights after the first-stage adjustment to the estimate using weights after all four adjustments. More simply, the coverage ratio for a certain group is equivalent to the inverse of the second-stage factor. The coverage ratios are estimates based on sample data, and as such, have a standard error associated with them.

In January 1994, most of the major demographic surveys began to use population controls from the 1990 Decennial Census which included an adjustment for undercount. This undercount adjustment raised control totals which had an effect of lowering coverage ratios. The difference was larger for some population subgroups (such as Hispanics) than for others. Table 1 shows the coverage ratios for NHIS from 1991-1996.

This table shows that coverage is consistently better for non-Blacks than for Blacks and better for females than for males. These results are common among Census Bureau surveys. More importantly to this paper, except for the break in the time series when adjusted population controls were introduced in 1994, overall coverage remained level throughout this period.

<sup>2</sup>See [3] for additional information. The description of weighting was written for the 1985-1994 NHIS, but the concepts also apply to the 1995-2004 design.

Table 1: NHIS Coverage Ratios by Race and Sex 1991-1996

Year	Total	Black	Non-Black	Male	Female
1991	90.4%	83.1%	91.5%	89.3%	91.5%
1992	90.8%	82.5%	92.0%	89.2%	92.3%
1993	90.6%	82.6%	91.7%	89.4%	91.7%
1994	88.0%*	77.4%*	89.6%*	86.5%*	89.4%*
1995	88.9%	79.6%	90.1%	87.1%	90.6%
1996	87.7%	79.0%	89.5%	86.4%	89.1%

\* indicates significant difference from previous year

Table 2 shows the same information for each sex/race combination.

Table 2: NHIS Coverage Ratios by Combined Race/Sex Cells 1991-1996

Year	Total	Black Male	Black Female	Non-Black Male	Non-Black Female
1991	90.4%	79.3%	86.5%	90.6%	92.2%
1992	90.8%	77.7%	86.7%	90.8%	93.2%
1993	90.6%	78.6%	86.1%	90.9%	92.6%
1994	88.0%*	73.8%	80.4%	88.3%	90.8%
1995	88.9%	76.9%	82.0%	88.6%	91.5%
1996	87.7%	76.3%	81.3%	88.5%	90.5%

\* indicates significant difference from previous year

The estimated standard errors for the coverage ratios of these groups are large enough that even the "known" drop in 1994 does not show up as significant. We can reduce the standard errors slightly by combining 1995 and 1996, but this still does not produce significant differences for any group.

## NHIS Coverage by Age

We examined coverage trends for each of the age/race/sex breakdowns used in the final step of the weighting in the post-stratification adjustment. These cells are generally the race/sex combinations in Table 2 broken down into age intervals 5-10 years wide. While the sample sizes are too small in most of these cells to make cell by cell comparisons meaningful, we looked for patterns that might indicate that something different was occurring in 1995-96 than in previous years as a result of

screening. We did not observe anything out of the ordinary.

As an example, Table 3 shows the coverage rates for Black males broken down by age. There does not seem to be any clear pattern in the data.

Age	1992	1993	1994	1995	1996
< 5	84.3%	83.1%	77.5%	75.9%	76.9%
5-9	86.7%	90.0%	82.9%	86.0%	78.7%
10-14	85.6%	90.7%	76.3%	87.5%	79.6%
15-19	76.5%	83.3%	70.2%	73.3%	71.4%
20-24	74.1%	65.3%	64.5%	62.3%	60.9%
25-29	69.9%	63.3%	64.3%	69.1%	66.6%
30-34	70.8%	73.8%	68.4%	65.3%	65.7%
35-44	76.2%	77.3%	70.8%	72.0%	74.0%
45-49	80.2%	80.1%	71.6%	79.0%	85.8%
50-54	71.3%	84.8%	79.0%	79.5%	85.6%
55-64	71.6%	71.4%	86.7%	86.2%	90.9%
65+	77.6%	75.1%	77.7%	90.7%	91.5%
Total	77.7%	78.6%	73.8%	76.9%	76.3%

### Comparison of NHIS and CPS

The Current Population Survey (CPS) collects primarily labor force data about each member 15 years old and over in each sample household. From 1990-1995, the CPS interviewed approximately 57,000 households each month. In 1996, the sample size was reduced to about 47,000 households per month. Before 1994, the CPS used paper and pencil interviewing. In January 1994, the CPS began using computer assisted interviewing.

As shown in Table 4, the CPS consistently experiences better overall coverage than the NHIS. Due to the larger sample size, the CPS coverage rates are less volatile month-to-month and quarter-to-quarter than the NHIS. Between 1991 and 1996, monthly CPS coverage rates ranged between 90.0% and 93.5%, while quarterly NHIS coverage rates ranged between 86.1% and 93.1%.

Year	CPS	NHIS
1991	93.0%	90.4%
1992	92.8%	90.8%
1993	91.8%	90.6%
1994	91.8%	88.0%
1995	92.3%	88.9%
1996	92.3%	87.7%

For CPS, coverage ratios did not decline when the adjusted population controls were introduced in 1994, but they did see a sharp decline in late 1993. It appears that the new population controls had more of an effect on NHIS than on CPS, but nothing in this comparison suggests that there was any effect due to screening starting in 1995.

The breakdowns by race and sex follow the same general patterns as the overall coverage with one notable exception. Coverage rates for Black males are similar in CPS and NHIS while CPS has better coverage of Black females, and non-Black males and females.

### Hispanic Coverage

To this point, coverage of the Hispanic population has not been mentioned. The main reason for this is that prior to 1995, the post-stratification procedure for NHIS used race cells of Black and Non-Black only. As a result, data on the coverage of Hispanics are not available prior to 1995.

Starting in 1995, NHIS changed the race(ethnicity) cells in the post-stratification to Hispanic, Black non-Hispanic, and Other non-Hispanic.

Table 5 shows a comparison of Hispanic coverage in CPS and NHIS for 1995-1996.

In 1995, coverage for Hispanics was significantly higher in NHIS than in CPS. This was the first year of a new sample design and research did not uncover a definitive reason for the higher Hispanic coverage. In 1996, coverage for Hispanics returned to normal levels.

Table 5 : CPS and NHIS Annual Coverage Ratios for Hispanics		
Year	CPS	NHIS
1995 - Total	82.1%	91.2%*
1995 - Male	78.0%	87.7%*
1995 - Female	86.1%	94.7%*
1996 - Total	84.1%	85.1%
1996 - Male	80.0%	82.0%
1996 - Female	88.2%	88.2%

\* indicates ratio significantly different from CPS

### Conclusions

With two years of data, it appears that the introduction of a screening procedure into the NHIS sampling procedure has had little to no effect, either positive or negative, on coverage rates. By comparison, the NHIS coverage rate dropped by 2.4% when the new control totals were introduced in 1994. It will be interesting to continue to track the trends as more years of data become available.

### References

- [1] Moore, TF. Features of the NHIS Sample Design, 1973-2004, internal Census Bureau Report. 1997.
- [2] Milliken, Chrissy. Monitoring Screening Procedures for the National Health Interview Survey. 1995 ASA proceedings.
- [3] Massey, JT; Moore, TF; Parsons, VL; Tadros, W. Design and Estimation for the National Health Interview Survey, 1985-1994. National Center for Health Statistics. Vital Health Stats 2(110). 1989.