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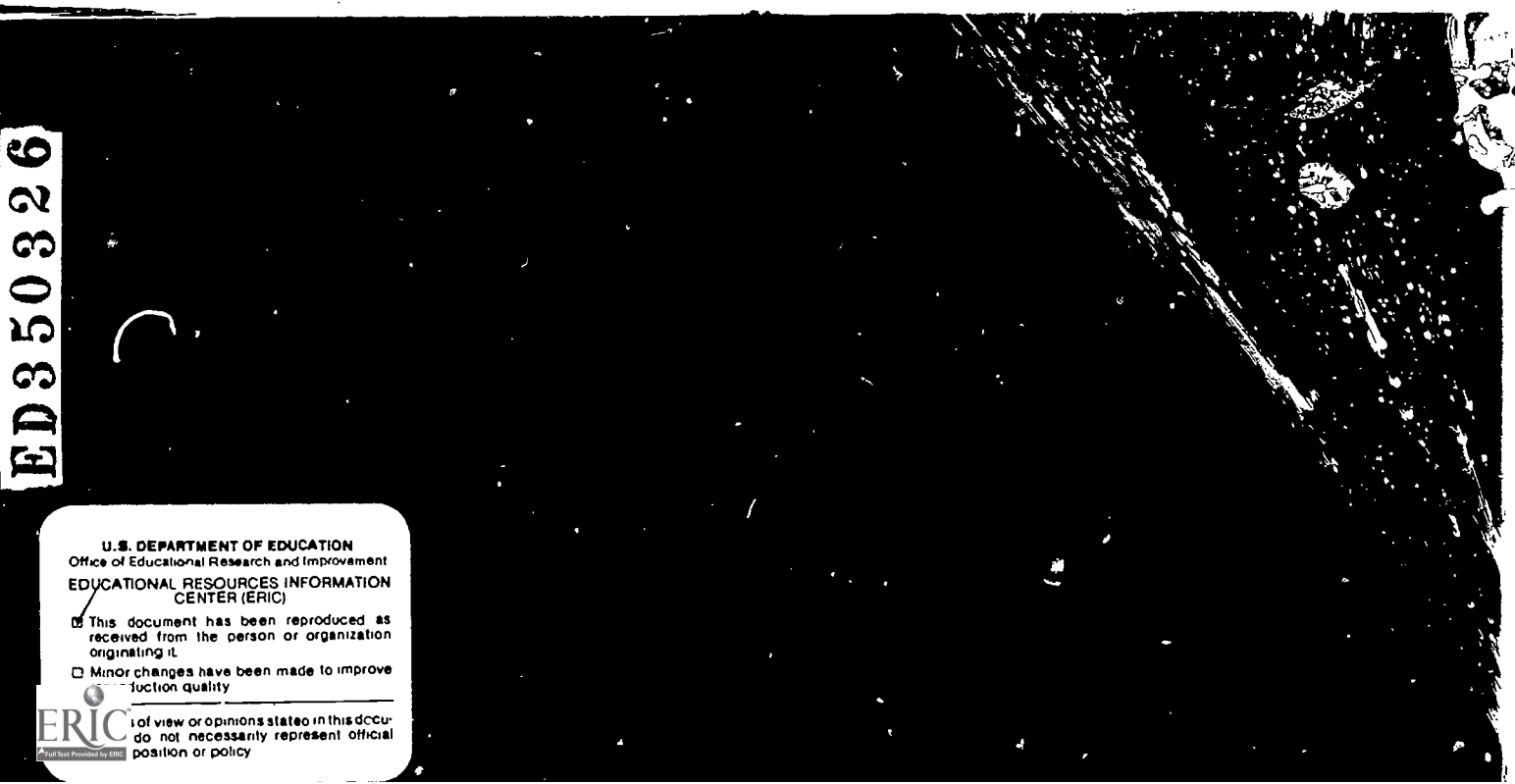
ABSTRACT

The National Household Education Survey (NHES) was conducted for the first time in 1991 as a way to collect data on the early childhood education experiences of young children and participation in adult education. Because the NHES methodology is relatively new, field tests were necessary. A large field test of approximately 15,000 households was conducted during the fall of 1989 to examine several methodological issues. This report describes the approach used to increase the number of Black and Hispanic American households and youth in the sample. During the field test, an approach that uses demographic information at the telephone exchange level to develop sampling strata was used to oversample Black and Hispanic American households. The yield of the field test sample design was compared to that which would have been expected without oversampling, and the effects of oversampling on the precision of survey estimates are reported. Oversampling did improve the precision of estimates of characteristics of Blacks and Hispanic Americans. Precision losses for overall totals and for non-Black and non-Hispanic American estimates are the price paid in order to improve the reliability of the estimates for Blacks and Hispanic Americans. Two tables and two figures report study data, and two appendixes contain screening ratios used to locate households of various groups and expected and observed sample sizes. (SLD)



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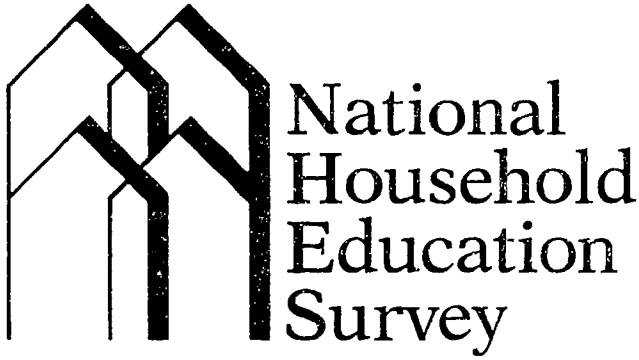
National Household Education Survey

Technical Report No. 5

Effectiveness of Oversampling Blacks and Hispanics in the NHES Field Test



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July 1992

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Foreword

The National Household Education Survey (NHES) represents a major new initiative of the National Center for Education Statistics (NCES). Between February and May of 1991, the NHES was fielded for the first time as a mechanism for collecting data on two different sectors of education policy interest: the early childhood education experience of young children and participation in adult education. Because the NHES methodology is relatively new and relies on some innovative approaches, a field test of the methodology was an essential first step in the development of the survey. Many of the methods of evaluated during the 1989 NHES field test were adopted for the full-scale survey.

A large field test of approximately 15,000 households was conducted during the fall of 1989. A number of methodological issues associated with collecting and analyzing data on education issues from a random digit dialing telephone survey were examined. This report is one of five that describe the 1989 NHES Field Test experience. The five reports are the first in a series of technical publications pertaining to the design and conduct of the NHES that NCES hopes to continue in the years to come. NCES believes that the reports contained in this series will provide users of the NHES data with a better understanding of the NHES methodology and that they will assist the survey design efforts of others.

The first report in this series, *Overview of the National Household Education Survey Field Test*, describes the design of the field test and the outcomes of the field test data collection activities. It reports on the response rates obtained, both unit and item, and the burden associated with survey participation. Each of the next four reports in the series focuses on a specific issue that was examined in the 1989 NHES field test.

The second report, *Telephone Undercoverage Bias of 14- to 21-Year-Olds and 3- to 5-Year-Olds*, analyzes data from the Current Population Survey to identify the extent of telephone coverage for two distinct populations of interest and the bias associated with this type of undercoverage for estimates of school dropouts and early childhood education program participation. Methods for adjusting survey estimates to partially reduce this bias are developed and evaluated.

The third report, *Multiplicity Sampling for Dropouts in the NHES Field Test*, examines a technique that was used to increase the coverage of 14- to 21-year-olds and to capture more dropouts in the sample. The report describes the effectiveness of the multiplicity sample in achieving these goals.

The fourth report, *Proxy Reporting of Dropout Status in the NHES Field Test*, focuses on measurement errors arising from the use of proxy respondents. During the 1989 Field Test, a knowledgeable household member was used as a source of information on the school enrollment of each sampled 14- to 21-year-old in the household. In addition, 14- to 21-year-olds were asked to report on their own school enrollment. The report describes the correspondence between the responses given by proxy respondents with those provided by the youths themselves.

The fifth report, *Effectiveness of Oversampling Blacks and Hispanics in the NHES Field Test*, describes the approach used to increase the number of black and Hispanic households/youth in the sample. During the field test, an approach that uses demographic information at the telephone exchange level to develop sampling strata was used to oversample black and Hispanic households. The report examines the yield of the field test sample design versus that which would have been expected without oversampling. The effects of oversampling on the precision of survey estimates are reported.

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Acknowledgments

Many individuals made significant contributions to the 1989 National Household Education Survey (NHES) Field Test and to the preparation of this report. The authors gratefully acknowledge their efforts. The 1989 Field Test was conducted by Westat Incorporated under contract with the U.S. Department of Education, National Center for Education Statistics (NCES). Lance N. Hodes was the corporate officer at Westat with oversight responsibility for the NHES Field Test. J. Michael Brick was the Westat project director. In addition to his management of the day-to-day project activities, he contributed significantly to the design and methodology of the Field Test. Mary Collins served as the associate project director for the NHES Field Test and was a major contributor to all phases of the study. In her role as survey manager, Carin A. Celebuski led the development of the Field Test dropout component questionnaires. Jacque Wernimont and David R. Martin, both Westat senior systems analysts, played major roles during the design and implementation of the survey and creating the database used in the analyses found in this report.

Critical technical review of this report was provided by NCES staff Michael Cohen, Bob Burton, Marilyn McMillen, and Jeffrey A. Owings, Branch Chief, Longitudinal and Household Studies Branch. James Massey of the National Center for Health Statistics also reviewed the report. The authors wish to thank each of these individuals for their careful reading of this report and for their comments and suggestions.

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Introduction

During the fall of 1989, the Field Test of the National Household Education Survey (NHES) was conducted by the National Center for Education Statistics (NCES) to explore the feasibility of collecting education data by telephone from a sample of persons in their households. The NHES is the first major attempt by NCES to go beyond its traditional surveys, which rely upon school-based data collection systems and are typically conducted by mail or in-person data collection methods.

A household survey has the potential to provide the types of data needed to study current issues in education, particularly those which can not be adequately addressed through a school-based survey. Such issues include dropping out of school, adult and continuing education, preschool education, the status of former teachers, and home-based education. Consequently, the NHES methodology may greatly enhance the scope of issues covered by the data collection activities of NCES.

Since the NHES data collection methods were untested for education surveys, the Field Test was developed to evaluate the use of this approach. Two topics of broad policy interest were included in the Field Test: the early childhood education characteristics of 3- to 5-year-olds, and the educational status of 14- to 21-year-olds with a special focus on youth who dropped out of school before completing high school. By including both of these study areas in the Field Test, the ability to use the NHES to study multiple, complex topics, employing different sampling requirements and respondent rules could be evaluated.

Westat, Inc., under contract with NCES, conducted all of the Field Test interviews using computer-assisted telephone interviewing (CATI) methods. The use of CATI methods made sampling respondents for interviews easy and nearly invisible to the telephone respondent, an important benefit when several persons may be sampled in a household. CATI also directed the interviewers through complex skip patterns and provided the opportunity to incorporate edit checks to help resolve inconsistencies in the data while the respondents were still on the telephone. Another major advantage of CATI was that data analysis could begin soon after data collection ended, because data entry and many of the edit checks were done during the interview.

The sampling scheme used in the Field Test was a variant of the Mitofsky-Waksberg random digit dial (RDD) procedure[1] in which every residential telephone number has the same chance of being drawn into the sample. Because of the need for more precise estimates of blacks and Hispanics, special sampling methods were used to increase the sample size for these persons. The design for the Field Test was essentially the same as planned for a full-scale NHES study, except the overall sample size was smaller.

The sample resulted in collecting data from 15,037 households representing all civilian, noninstitutionalized persons in the 50 states and the District of Columbia. Although only persons living in telephone households could be sampled for the Field Test, adjustments were made in the weights so that the estimates of persons living in both telephone and nontelephone households could be produced.

Respondents in sampled households were asked a series of screening questions. This interview, called the Screener, was used to enumerate all the members of the household, determine the eligibility of each person in the household for the early childhood education (3- to 5-year-olds) and youth (14- to 21-year-olds) studies, and obtain some data on the characteristics of the household. A total of 4,374 households had at least one person enumerated in the Screener who was eligible for an extended interview. The response rate to the Screener was 79 percent.

The early childhood education interview was conducted with the parent or guardian who knew the most about each sampled 3- to 5-year-old child's care and education. Accordingly, this interview was called the Parent Interview. Of the 1,551 children identified in the Screener, parents completed interviews for 1,530 children, a completion rate of 99 percent.

If the household contained any 14- to 21-year-olds, then a Household Respondent Interview (HRI) was attempted for each of these members. The HRI was used to determine the current and previous educational status of the youth; this interview could be completed by any adult household member who knew about the educational activities of the youth, including self-reports by the youth. Of the 4,441 youths identified in the Screener, HRIs were completed for 4,313 youths, for a 97 percent completion rate. As part of a special methodological study of multiplicity sampling, mothers in a subsample of the households were asked to complete

the HRI for their 14- to 21-year-old children who did not live in their household. These youth are included in the numbers stated above.

A Youth Interview (YI) was then attempted for a subsample of the 14- to 21-year-olds in the household. All the youths who were not currently enrolled in school and did not have a high school diploma or equivalent (as reported in the HRI), and a sample of all other youths, were targeted for the YI. The interview contained more detailed items on the educational experiences of the youth that could only be answered by the youth. Of the 1,863 youths sampled, 1,604 completed the YI, a completion rate of 86 percent. These numbers include a sample of 133 youth who did not live in the sampled households, but were included through the multiplicity sample when their mothers completed the HRI.

This report describes the impact of the test of sampling procedures used to increase the sample size for blacks and Hispanics in the Field Test, one of several methodological studies undertaken in the Field Test. The Field Test is described in greater detail in another report entitled *Overview Report on the 1989 National Household Education Survey Field Test*, the first in a series of reports on the Field Test. The Overview Report describes the sample design, the data collection methods and instruments, the response rates, and other salient aspects of the collection and analysis process for the Field Test.

Procedures for oversampling to improve the reliability of estimates for blacks and Hispanics in a random digit dial telephone survey are relatively innovative and untested. If oversampling proved to be successful in the Field Test, the same technique could be used to improve the estimates for blacks and Hispanics in future full-scale surveys. Oversampling was accomplished by doubling the sampling rates in geographic areas (telephone exchanges) which had large proportions of either black or Hispanic residents.

The next section includes a brief review of the oversampling design used for the NHES Field Test. Section 3 provides an evaluation of the oversampling design by examining the sample yields and comparing the yield with the expected sample sizes if no oversampling had been carried out. Furthermore, this section includes a study of precision levels of the estimates coming from the NHES sample compared to the estimates expected from an equal probability sample of the same total size. The last section summarizes the findings of the study and suggests procedures for future studies.

Description of the Oversampling Design

The methods available for oversampling in a random digit dial telephone survey are limited. The method used in the Field Test was developed and described in detail by Mohadjer.[2] The procedure utilizes a data tape produced by the Donnelley Marketing Information Services. Donnelley sells computer tapes containing 1980 census characteristics for telephone exchanges which can be used to stratify the exchanges by the density of the black and Hispanic population. The exchanges in different strata can then be sampled at different rates to oversample those with high concentrations of blacks and Hispanics.

This approach differs from the typical RDD sample which does not employ oversampling. In the typical design, a list of all telephone area codes and existing prefix numbers is obtained from AT&T and a frame of all the possible first 8-digit telephone numbers is established. A simple random sample is then selected from this frame. A random 2-digit number is added to the sampled 8-digit number to create a first-stage sample of telephone numbers.

The first-stage numbers are then dialed and each number is identified as residential or nonresidential. The numbers which are residential are retained as the first stage sampled units, while the nonresidential numbers are discarded. The second stage of sampling consists of taking each of the first 8 digits of the retained sampled telephone numbers and adding a set of random 2-digit numbers to form the desired sample of 10-digit telephone numbers. Since the second stage sample is generated using the first 8 digits of the retained number, these first 8 digits are called clusters.

To specify the oversampling procedures, preliminary research was conducted to determine 1) how to stratify telephone exchanges and 2) the best rate for oversampling the strata. A summary of this research is given in appendix B. Telephone exchanges with 20 percent or more blacks or 20 percent or more Hispanics were identified and oversampled at a rate of 2 to 1. Clusters with 20 percent or more blacks or 20 percent or more Hispanics will be referred to as

high minority clusters, and the remainder of clusters will be referred to as low minority clusters.

For the NHES Field Test, a sample of 1,000 residential clusters was required, with the high minority clusters having twice the chance of selection as the low minority clusters. The first step was to stratify the clusters. A random sample of 10,000 clusters from the AT&T tape was selected and matched against the Donnelley tape to create a file with information on percent of the population which was blacks and Hispanics for each cluster. The sample of 10,000 clusters was sampled to control the cost of the matching process.

The following distribution was observed for the initial sample of 10,000 exchanges.

Not found on Donnelley	2,044
Classified as low minority	5,928
Classified as high minority	2,028
Total	10,000

Exchanges with 20 percent or more blacks or 20 percent or more Hispanics were designated as high minority clusters and the other clusters were designated as low minority clusters. The clusters not found on the Donnelley tape were denoted as low minority clusters because there was no evidence that oversampling in these clusters would yield a higher sample of blacks or Hispanics.

The Donnelley tape used in this study was created in 1985 and did not include newly created exchanges. As Mohadjer noted in her evaluation of the tapes for oversampling, it is likely that the effectiveness of the tapes will decay with time.

The subsampling rate for the high minority clusters was 0.166 while for the low minority clusters the subsampling rate was 0.083. A systematic sample using the appropriate sampling rate produced a sample of 337 clusters from the 2,028 high minority clusters. Similarly, a systematic sample of 663 clusters was selected from the 7,972 low minority clusters.

Evaluation of the Oversampling Design

Although oversampling increases the sample yield (decreasing the amount of screening required to locate rare groups), it also results in sampling rates and weights for the portion of the population coming from the oversampled clusters that are different from those in the remainder of clusters. This difference will create an increase in sampling variances that will partially reduce the effectiveness of the larger black and Hispanic samples.

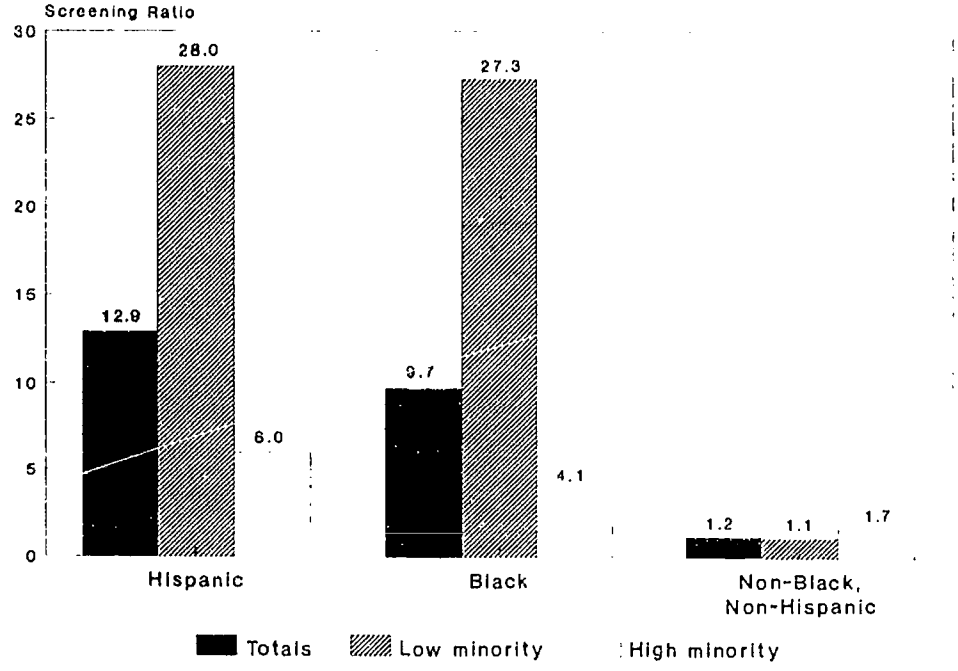
Comparison of Yields in the High and Low Minority Clusters

A total of 15,037 households were screened in the NHES Field Test, of which 11,096 were fully enumerated. The vast majority of the households which were not enumerated were screened and found to have no members in the target age groups. If all household members were over 65 years old, the household was not enumerated. During refusal conversion, only those households with members in the targeted age groups were enumerated. In addition, a few enumerated households with no race/ethnicity data were excluded from this analysis. For the remainder of the enumerated households, the race/ethnicity of the first person listed in the enumeration (who was the Screener respondent) was used as the race/ethnicity of the household. There were six households with missing values for the race/ethnicity of the first enumerated person. In these households, the race/ethnicity of the first person in the enumeration list who had a non-missing value for race/ethnicity was used for classification.

Of the 11,096 fully enumerated households, 7,541 households were enumerated within the low minority clusters, and 3,555 households were enumerated within the high minority clusters. Figure 1 shows the average number of households that had to be screened to locate a household with a specific type of member. These averages are called screening ratios. The figure shows that the screening ratio for Hispanic households was about five times higher in the low minority clusters than in the high minority clusters, and was about seven times higher in the low minority clusters than in the high minority clusters for black households.

Another measure of the effectiveness of the oversampling is the ratio of the observed sample size with the oversampling scheme to the expected sample size if the same size sample had been selected without oversampling. The expected numbers in the sample were computed by reallocating the sample to the low and high minority clusters so that all clusters had the same probabilities of selection. This was

Figure 1. — Screening ratios required to locate household of various racial/ethnic groups



Source: 1989 National Household Education Survey Field Test

accomplished by dividing the screening sample size in high minority clusters by two to give an expected distribution by race/ethnicity for that stratum using the rate applied in the low minority cluster stratum. The screening sample sizes for both strata were then multiplied by a constant so that the total screening sample was equal to the observed 11,096 households.

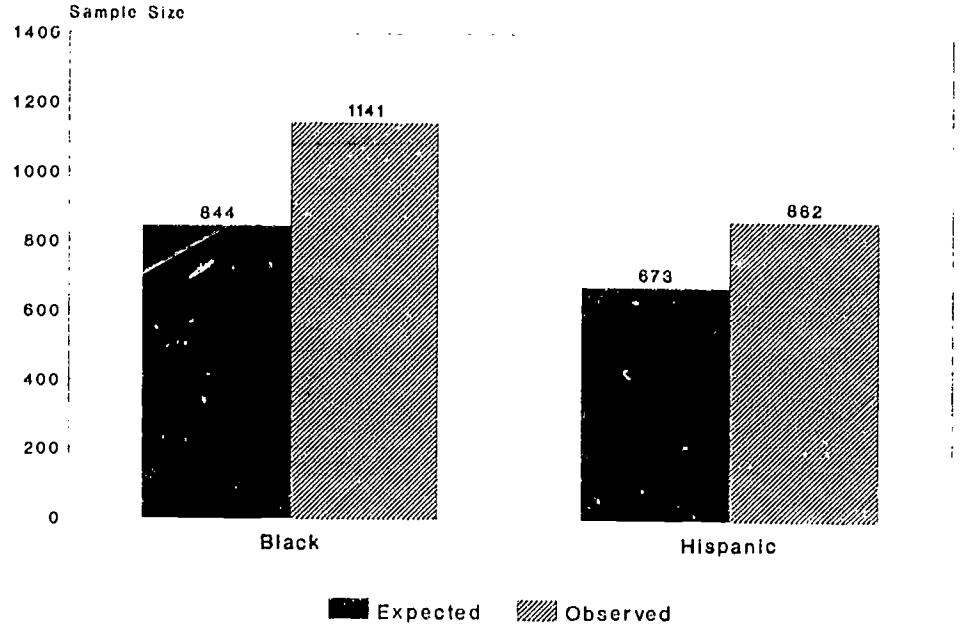
Figure 2 shows the ratios of the observed to the expected sample sizes for black and Hispanic households. The figure indicates that the oversampling resulted in increasing the number of Hispanic households by nearly 30 percent and the number of black households by 35 percent. In terms of increasing the sample size of households for the groups, the oversampling procedure was effective.

The ratios shown in the two figures and the numbers used in the computation of these ratios are given in the detailed tables in appendix A. The detailed tables also give these statistics for the number of persons in groups, such as event and status dropouts[3] and 3-to 5-year-olds. In general, the screening ratios and the ratios of expected to observed sample sizes for the groups other than the blacks and Hispanics were not very large. The only large ratios were the ratios of the observed to expected sample sizes for event and status dropouts. The sample sizes for the dropouts increased 9 percent and 5 percent, respectively. These gains were realized because the proportion of black and Hispanics who are dropouts is somewhat greater than the national average.

Statistical Efficiency of Oversampling

Although oversampling increased the size of the sample for blacks and Hispanics, it also resulted in different sampling rates. The differential sampling rates increased the sampling errors of certain statistics computed for the NHES Field Test data. In this section we will compute estimates of the increases in sampling errors arising from the oversampling of high minority clusters.

Figure 2. -- Expected and observed sample sizes for black and Hispanic households



Note: Expected sample sizes are computed for an equal probability design and observed sample sizes are based on the oversampling design of the same total number of cases.
Source: 1989 National Household Education Survey Field Test

The mean design effect (which is one plus the relative increase in variance) arising from the different sampling rates[4] can be approximated by the following:

where $(kP_1 + P_2)(\frac{P_1}{k} + P_2)$

P_1 = proportion of the total Hispanic (or black) population in oversampled clusters;

P_2 = $1 - P_1$, and

k = ratio of sampling rates in the oversampled exchanges to sampling rates in the remainder of exchanges

Another way of representing this relationship is

$$\Phi = n \frac{\sum_i \sum_j W_{ij}^2}{(\sum_i \sum_j W_{ij})^2}$$

where

W_{ij} = sampling weight for the jth individual in the ith cluster,

i = 1 for high minority clusters, 2 for low minority clusters, and

n = sample size.

This statistic (ϕ) estimates the component of the design effect due to differential sampling rates used in the NHES sample design. Differences in the sampling weights are partially due to oversampling

the high minority clusters. They are also attributable to the use of the modified Waksberg procedure, multiplicity sampling, differential nonresponse, and bias adjustments among different parts of the sample. However, the contributions of the factors associated with all but the oversampling are virtually eliminated when the ratio of ϕ for the full sample to ϕ for the sample excluding the high minority clusters is computed. These ratios, which reflect the design effect due to the oversampling by clusters, are the key components used in the analysis.

Table 1 shows some statistics related to the efficiency of oversampling for the status dropout sample in the NHES Field Test. These statistics are provided for estimates of the total number of status dropouts and for the characteristics (e.g., age, family income, and sex) of status dropouts. The statistics are the estimated design effects due to differential sampling rates, the ratios of observed over expected (self-weighting) sample sizes, and the ratios of observed over expected variances. The sample sizes for the estimates of the number of status dropouts are equal to the total number of youths in each of the specified categories. The sample sizes reported for the estimates of characteristics of status dropouts are equal to the total number of status dropouts within each race/ethnicity category. These are the sample sizes that would be used to estimate any characteristic of status dropouts, for example gender.

The estimated design effects in table 1 are the ratios of ϕ for the overall NHES sample to ϕ when the effect of oversampling the high minority clusters is excluded. These reflect the appropriate increase in variance due to oversampling clusters. It can be seen that the design effects are all relatively low when compared to the increase in sample sizes resulting

Table 1.—Statistical efficiency of oversampling for estimates of status dropouts

Status dropouts	Sample size	Relative design effect due to oversampling clusters	Ratio of sample size to self-weighting sample	Ratio[1] of S^2_D to S^2_C
Number				
Total	4,288	1.05	1.00	1.05
Race/Ethnicity				
Non-Black, Non-Hispanic	3,311	1.05	0.92	1.14
Black, Non-Hispanic	538	1.13	1.47	0.77
Hispanic	439	1.13	1.34	0.84
Characteristics				
Total	316	1.08	1.05	1.01
Race/Ethnicity				
Non-black, Non-Hispanic	226	1.08	0.94	1.13
Black, Non-Hispanic	37	1.23	1.52	0.77
Hispanic	53	1.25	1.41	0.83

[1] S^2_C is the variance for a similar design where no oversampling is carried out for the minority groups and S^2_D is the variance for the design used in the field test. The ratio is the relative design effect due to oversampling clusters divided by the ratio of the sample sizes.

Source: 1989 National Household Education Survey Field Test.

from the oversampling of high minority clusters. The sample sizes for Hispanics and black non-Hispanics were increased by about 40 percent for the total sample and by about 50 percent for the status dropouts.

The last column in table 1 shows the overall impact of the oversampling. It is the ratio of the variance for the Field Test design with oversampling (S_D^2) to the expected variance for a sample with no oversampling (S_C^2). A value of the ratio that is less than one indicates that oversampling improves the precision of the estimate. For estimates of both the number and characteristics of status dropouts the ratios are smaller than one for the black and Hispanic domains. For estimates of the characteristics of status dropouts, the estimates for totals are about one.

Another way of viewing these results is by considering the size of the equivalent simple random sample that is needed to achieve these precision levels. For example, a simple random sample 14 percent smaller (the effective sample size is 3,688) could be expected to produce estimates for the non-black and non-Hispanic population of the same reliability as the Field Test. On the other hand, the effective sample for estimates of the Hispanic population is 5,274, nearly 1,000 more than the actual sample size.

Table 2 shows similar statistics for the sample of 3- to 5-year-olds who were in any type of care or educational arrangement at the time of interview. The sample sizes reported for estimates of the number of children in any type of care are equal to the total samples of 3- to 5-year-olds for each race/ethnicity category. The sample sizes for characteristics of children in care/preschool/after school care and those in care with an educational component are equal to the corresponding sample sizes for each of the race/ethnicity categories. The increases in the design effects due to oversampling were low (less than 15 percent) compared to the increase in the size of the samples for the minority groups (around 40 percent). Again, the ratios of the observed over expected variances are less than one for the minority groups, close to one for the total sample, and higher than one for the non-black non-Hispanic group. These ratios indicate the effectiveness of the oversampling in improving the precision for estimates of minorities, while estimates of non-black and non-Hispanics are somewhat less precise.

Summary

The screening ratios for blacks and Hispanics in the high minority clusters are substantially lower (5 to 7 times lower) than those in the low minority clusters for these groups. This finding suggests a disproportionate concentration of blacks and Hispanics in the high minority clusters, which is one condition needed to make oversampling effective. As a result, the sample sizes for the minorities groups were greater than would have been achieved without oversampling. The sample of 14- to 21-year-old blacks was increased by nearly 50 percent, and the sample of 14- to 21-year-old Hispanics was increased by about one-third. For 3- to 5-year-olds, the increases in the sample sizes for blacks and Hispanics were about 40 to 45 percent.

Oversampling resulted in improving the precision of estimates of characteristics of blacks and Hispanics. The variances of these statistics were about 20 to 30 percent less than would have been found if oversampling had not been used. There were losses in precision of 5 percent to 15 percent for the non-black, non-Hispanic estimates and even smaller precision losses for estimates of totals. These precision losses for overall totals and for non-black and non-Hispanic estimates is the price paid in order to improve the reliability of the estimates for black and Hispanic estimates.

The use of this oversampling procedure for future studies is recommended when the goal is to increase the precision of estimates for blacks and Hispanics and the design is similar to that used in the Field Test. The results from the Field Test showed that the method was effective in increasing the sample sizes for blacks and Hispanics, and did not result in large increases in variances for the non-black and non-Hispanic groups.

Oversampling issues still need to be addressed in future studies, especially the amount of oversampling required to achieve the analytic objectives of the survey. Improvements in the reliability of the estimates for blacks and Hispanics may be important enough to the survey objectives to incur even greater losses in efficiency in estimates of totals. Revising

Table 2.—Statistical efficiency of oversampling for estimates of children in some types of care

3- to 5-year-olds in some types of arrangements	Sample size	Relative design effect due to over-sampling clusters	Ratio of sample size to self-weighting sample	Ratio[1] of S^2_D to S^2_C
Number in any care/preschool arrangement				
Total	1,527	1.06	1.01	1.05
Race/Ethnicity				
Non-Black, Non-Hispanic	1,158	1.05	0.92	1.14
Black, Non-Hispanic	178	1.11	1.49	0.77
Hispanic	191	1.13	1.41	0.81
Characteristics of those in care/ preschool/afterschool arrangement				
Total	1,056	1.05	0.99	1.06
Race/Ethnicity				
Non-Black, Non-Hispanic	831	1.04	0.92	1.13
Black, Non-Hispanic	118	1.09	1.42	0.77
Hispanic	107	1.14	1.38	0.83
Characteristics of children in care with an educational component				
Total	567	1.06	0.99	1.07
Race/Ethnicity				
Non-Black, Non-Hispanic	446	1.04	0.92	1.13
Black, Non-Hispanic	80	1.12	1.44	0.77
Hispanic	41	1.15	1.24	0.93

[1] S^2_C is the variance for a similar design where no oversampling is carried out for the minority groups and S^2_D is the variance for the design used in the field test. The ratio is the relative design effect due to oversampling clusters divided by the ratio of the sample sizes.

Source: 1989 National Household Education Survey Field Test

the oversampling rates for either the black or the Hispanic exchanges can help accomplish this objective.

Other methods for increasing the size of the sample of minorities could also be investigated. For example, Blair and Czaja[5] discuss screening techniques for increasing the sample size for blacks. Waksberg's[6] comments on this method reveal some potential shortcomings for this method, especially for Hispanics. The screening method does not appear to be efficient compared to the procedure used in the Field Test because of the distribution of the oversampled groups in telephone clusters for a national sample.

Another factor that should be considered for future studies is the age of the information in the Donnelley tape. As Mohadjer noted, the usefulness of the data decays over time. Once a new tape with 1990 Census data is prepared, it would be prudent to purchase and use the new tape for future surveys.

The above mentioned oversampling issues are planned topics for study using the results from future NHES data collection efforts. The need for statistics by race and ethnicity can best be satisfied by continuing these research efforts.

References

1. Waksberg, J., "Sampling Methods for Random Digit Dialing," *Journal of the American Statistical Association*, Vol. 73, No. 361, March 1978.

2. Mohadjer, Leyla, "Stratification of Prefix Areas for Sampling Rare Populations," *Telephone Survey Methodology*, John Wiley & Sons, 1988.

3. A status dropout is defined as a 14- to 21-year old who was not enrolled in school in October of the current year and did not have a high school diploma or equivalent. Event dropouts are defined as the subset of status dropouts who were enrolled in school in October of the previous year. In other words, a status dropout is someone who is not currently enrolled and does not have a diploma or equivalent, and an event dropout is a someone who left school within the last year.

4. Kish, L., *Survey Sampling*, New York, John Wiley & Sons, 1965, Page 429.

5. Blair, J. and Czaja, R., "Locating a Special Population Using Random Digit Dialing", *Public Opinion Quarterly*, Vol. 46, pp. 585-590, 1982.

6. Waksberg, J., "A Note on Locating a Special Population Using Random Digit Dialing", *Public Opinion Quarterly*, Vol. 47, pp. 576-578, 1983.

APPENDIX A

Detailed Tables

Table A-1.—Sample size and screening ratio for the high and low minority clusters

	Total				Low minority clusters				High minority clusters			
	Total	Hispanic	Black, Non-Hispanic	Non-Black, Non-Hispanic	Total	Hispanic	Black, Non-Hispanic	Non-Black, Non-Hispanic	Total	Hispanic	Black, Non-Hispanic	Non-Black, Non-Hispanic
No. of households enumerated [1]	11,096	862	1,141	9,093	7,541	269	276	6,996	3,555	593	865	2,097
No. of households with 14-21 year olds	3,114	300	393	2,421	,129	100	97	1,932	985	200	296	489
No. of 14-21 year olds	4,288	439	538	3,311	2,920	146	132	2,642	1,368	293	406	669
No. of event dropouts	84	14	12	58	48	3	2	43	36	11	10	15
No. of status dropouts	316	53	37	226	195	15	8	172	121	38	29	54
No. of households with 3-5 year olds	1,364	171	153	1,040	910	49	36	825	454	122	117	215
No. of 3-5 year olds	1,527	191	178	1,158	1,018	56	47	915	509	135	131	243
No. of 3-5 years olds in care/ preschool/school	1,056	107	118	831	733	33	33	667	323	74	85	164
No. of 3-5 year olds in care with education component[2]	567	41	80	446	394	17	21	356	173	24	79	90
Screening Ratios												
Ratio to get race/ethnic household	1.00	12.87	9.72	1.22	1.00	28.03	27.32	1.08	1.00	5.99	4.11	1.70
Ratio to get household with 14-21 year olds	3.56	2.87	2.90	3.76	3.54	2.69	2.85	3.62	3.61	2.97	2.92	4.29
Ratio to get 14-21 year olds	2.59	1.96	2.12	2.75	2.58	1.84	2.09	2.65	2.60	2.02	2.13	3.13
Ratio to get event dropouts	37.07	21.43	95.08	156.78	157.10	89.67	138.00	162.70	98.75	53.91	86.50	139.80
Ratio to get status dropouts	35.11	16.26	30.84	40.23	38.67	17.93	34.50	40.67	29.38	15.61	29.83	38.83
Ratio to get household with 3-5 year olds	8.13	5.04	7.46	8.74	8.29	5.49	7.67	8.48	7.83	4.86	7.39	9.75
Ratio to get 3-5 year olds	7.27	4.51	6.41	7.85	7.41	4.80	5.87	7.65	6.98	4.39	6.60	8.63
Ratio to get 3-5 year olds in care/preschool/school	10.51	8.06	9.67	10.94	10.29	8 15	8.36	10.49	11.01	8.01	10.18	12.79
Ratio to get 3-5 year olds in care with education component[2]	19.57	21.02	14.26	20.39	19.41	15.82	13.14	19.65	20.55	24.71	14.66	23.30

[1]Excludes all households that were not enumerated and those with missing values for race/ethnicity of the members of the household.

[2]At least one care/preschool arrangement with an educational component, excluding kindergarten and first grade.

Source: 1989 National Household Education Survey Field Test

Table A-2.—Expected sample sizes, and the ratio of observed samples size expected if no oversampling is carried out

Characteristics of Sample	Total				Low minority clusters				High minority clusters			
	Total	Hispanic	Black, Non-Hispanic	Non-Black, Non-Hispanic	Total	Hispanic	Black, Non-Hispanic	Non-Black, Non-Hispanic	Total	Hispanic	Black, Non-Hispanic	Non-Black, Non-Hispanic
Expected Sample Yields with Equal Probability Sampling												
No. of households enumerated[1]	11,096	673	844	9,579	8,979	320	329	8,330	2,117	353	515	1,249
No. of households with 14-21 year olds	3,122	238	292	2,592	2,535	119	116	2,301	586	119	176	291
No. of 14-21 year olds	4,291	348	399	3,544	3,477	174	157	3,146	814	174	242	398
No. of event dropouts	79	10	8	60	57	4	2	51	21	7	6	9
No. of status dropouts	304	40	27	237	232	18	10	205	72	23	17	32
No. of households with 3-5 year olds	1,354	131	113	1,110	1,084	58	43	982	270	73	70	128
No. of 3-5 year olds	1,515	147	134	1,234	1,212	67	56	1,090	303	80	78	145
No. of 3-5 years olds in care/ preschool/school	1,065	83	90	892	873	39	39	794	192	44	51	98
No. of 3-5 year olds in care with education component[2]	572	35	60	477	469	20	25	424	103	14	35	54
Ratio of Observed over Expected Sample size (in percents)												
No. of households enumerated	100%	128%	135%	95%	84%	84%	84%	84%	168%	168%	168%	168%
No. of households with 14-21 year olds	100	134	147	92	84	84	84	84	168	168	168	168
No. of 14-21 year olds	100	134	147	92	84	84	84	84	168	168	168	168
No. of event dropouts	109	152	161	96	84	84	84	84	168	168	168	168
No. of status dropouts	105	141	152	94	84	84	84	84	168	168	168	168
No. of households with 3-5 year olds	101	141	149	92	84	84	84	84	168	168	168	168
No. of 3-5 year olds	101	140	144	92	84	84	84	84	168	168	168	168
No. of 3-5 year olds in care/preschool/school	99	138	142	92	84	84	84	84	168	168	168	168
No. of 3-5 year olds in care with education component[2]	99	124	144	92	84	84	84	84	168	168	168	168

[1]Excludes all households that were not enumerated and those with missing values for race/ethnicity of the members of the household.

[2]At least one care/preschool arrangement with an educational component, excluding kindergarten and first grade.

NOTE: See page 3 for a description of the computation of expected sample sizes.

SOURCE: 1989 National Household Education Survey Field Test

APPENDIX B

Oversampling Procedure Design Considerations

This appendix contains a summary of the procedures used to determine the oversampling rates and the definitions of which exchanges were to be oversampled for the Field Test of the NHES. The development of these recommendations was done by Joseph Waksberg. When this design work was conducted, the only topic included in the Field Test was dropouts. Later investigations confirmed the findings also applied to the population of 3- to 5-year-olds.

The method of oversampling recommended for the NHES Field Test was to use the Donnelley tape to identify telephone prefix areas with high percentages of blacks or Hispanics and oversampling these prefix areas. The implications of this method of oversampling were explored for the following four sample designs:

1. Oversampling areas that are over 10 percent black or Hispanic at the rate of 2 to 1;

2. Oversampling areas with over 10 percent black or Hispanic at the rate of 3 to 1;

3. Oversampling areas with over 20 percent black or Hispanic at the rate of 2 to 1; and

4. Oversampling areas with over 20 percent black or Hispanic at the rate of 3 to 1.

Note that the oversampling is within prefix areas rather than restricted to black and Hispanic households. It would, of course, have been possible to subsample non-black and non-Hispanic households in high minority prefix areas to create a self-weighting sample for persons who are not black or Hispanic. However, because of the extensive screening required to locate a single dropout, it was clear that this loss in sample size would be quite inefficient. (It would yield only a few additional black and Hispanic dropouts.)

All of the samples were constrained to achieve 18,000 screened households. The usual practice in comparing sample designs is to have a constant cost as the constraint. This would require a cost function that was not developed. Furthermore, the screening effort is the dominant factor in the cost of data collection so that a constant number of screened households is a good approximation to what one would get by fixing the costs.

Before discussing the features of the various designs, it is worth noting that the numbers shown in the attached tables should be considered approximations rather than firm figures. The main reasons for this follow:

a. The proportion of the black, Hispanic, and other population in prefix areas stratified by percent blacks or Hispanics is based on 1980 data. (These data will not be updated until results of the 1990 Census are available.)

b. In estimating the percentages of households in the various density strata, the national mean household size for each race/ethnic group is applied in each density stratum. Also, the distribution of 14-21 year olds and dropouts among density strata was assumed to be the same as the total population, separately for each race/ethnic group;

c. No allowance was made for differential undercoverage of blacks or Hispanics;

d. In estimating variances and design effects for characteristics of dropouts, the population variances of the characteristics were assumed to be equal within the density strata.

However, our past experience with approximations of this type is that they are a reasonable guide to what will be found in practice.

Table B-1 is a summary of the results. It shows how the four oversampling options compare to a self-weighting sample with the same number of screeners. The comparisons are shown for estimates of number of dropouts and for their characteristics. For each of these, table B-1 contains data on design effects, the expected number of dropouts in the survey, and the variances. The relative design effects reflect the increase in variances arising from differential sampling rates. The variances show the combined effect of the design effects and the changes in sample size. The results are not identical for estimates of dropouts and their characteristics because the

appropriate sample size for estimates of number of dropouts is the number of screeners and the sample size for characteristics of dropouts is the number of dropouts.

The implications of table B-1 on the precision of the results are in the third and sixth column of table B-1. As one might expect, oversampling improves the reliability of statistics on blacks and Hispanics, but there is a loss in precision for other dropouts, and for the total. Oversampling at the rate of 3 to 1 does not appear to be a useful option. There is a slight improvement in variances for blacks, but an increase in variances for all other groups. Most of the increases are sizeable. For the 2 to 1 oversampling strategy, using areas with over 20 percent minority is somewhat better than approach using areas with over 10 percent minority. Since separate analyses will be desired for blacks and Hispanics, this option is recommended.

It should be recognized that although this appears to be the best option, the actual reductions in the expected variances will be fairly modest—18 percent for blacks and 8 percent for Hispanics. The sample sizes were small; for blacks, the oversampling should increase the number of dropouts from 76 to 102 and for Hispanics from 89 to 102.

Table B-1.—Expected statistical efficiency of oversampling minority areas for the NHES Field Test

Sample option	Estimates of number of dropouts			Estimates of characteristics of dropouts		
	Design effect	Ratio of sample size to self-weighting sample	Ratio of σ^2 to self-weighting sample	Design effect	Ratio of sample size to self-weighting sample	Ratio of σ^2 to self-weighting sample
Oversampling in areas with > 10% minority						
Oversampling rate 2 to 1						
Non-Black, Non-Hispanic	1.12	.96	1.17	1.12	.92	1.22
Black	1.06	1.26	.84	1.06	1.25	.85
Hispanic	1.10	1.17	.94	1.10	1.17	.94
Total	1.13	1.02	1.11	1.13	1.01	1.12
Oversampling 3 to 1						
Non-Black, Non-Hispanic	1.32	.94	1.40	1.31	.88	1.49
Black	1.16	1.39	.83	1.16	1.39	.83
Hispanic	1.26	1.26	1.00	1.26	1.26	1.00
Total	1.33	1.02	1.31	1.33	1.02	1.30
Oversampling in areas with > 20% minority						
Oversampling rate 2 to 1						
Non-Black, Non-Hispanic	1.08	.96	1.13	1.08	.94	1.15
Black	1.10	1.34	.82	1.10	1.34	.82
Hispanic	1.12	1.22	.92	1.12	1.24	.90
Total	1.11	1.03	1.08	1.11	1.05	1.06
Oversampling rate 3 to 1						
Non-Black, non-Hispanic	1.23	.93	1.32	1.21	.91	1.33
Black	1.27	1.57	.81	1.27	1.57	.81
Hispanic	1.33	1.37	.97	1.33	1.38	.96
Total	1.28	1.04	1.23	1.30	1.08	1.20

Source: 1989 National Household Education Survey Field Test

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