

## 6. WEIGHTING

The objective of the National Household Education Surveys Program (NHES:2007) surveys is to make inferences about the entire civilian, noninstitutionalized population for the domains of interest. Weighting is necessary to account for differential probabilities of selection and to reduce potential bias due to nonresponse and differential coverage of subpopulations. However, weighting is only effective in reducing bias to the extent that the auxiliary variables used in weighting are related to the outcomes of interest. Even after weighting adjustments are made, some bias, if it exists, is likely to remain. The purpose of the bias analysis is to assess the bias in the final weighted estimates from the NHES:2007, to the extent possible.

To accomplish this, three sets of weights were used in the bias analysis. The first set corresponds to the main random digit dialing (RDD) sample and is described in Hagedorn et al. (2008).<sup>33</sup> This set does not contain any of the Bias Study sample. The other two sets were created for the Bias Study analysis. The weights differ in their treatment of Bias Study sample households that were coded as nonrespondents in the Telephone Research Center (TRC) before being sent to the field. As described in chapter 5, the reduced treatment method treats the status in the TRC as final, and the full treatment method assigns the status based on the entire TRC and field effort. For all three sets of weights, the estimates were adjusted to totals of persons living in both telephone and non-telephone households so the estimates represent the same population.

The weighting process for the two sets of Bias Study sample weights are described below.

### 6.1 Household-Level Weights

The primary purpose of the Screener in NHES:2007 was to provide information required to assess the eligibility of household members for an extended interview. Household-level information that is of analytic interest was also collected during the extended interview. Since no data intended for analyses were collected at the household level only, as with the RDD sample, household-level weights were calculated solely to provide general characteristics of the Bias Study sample and for use as a basis for computing person-level weights for the analysis of the extended interview data.

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<sup>33</sup> The weighting procedures used for NHES:2007 are similar to those used in NHES:2005. (See Hagedorn et al. 2006.)

The area sample for the Bias Study was designed to be an equal probability sample of addresses within phone match status.<sup>34</sup> The household-level weight for the Bias Study sample was thus the product of three factors:

- weight associated with the differential sampling of addresses with a telephone number match and those without ( $A_j$ );
- adjustment for Screener nonresponse ( $C_j$ ); and
- poststratification adjustment to align estimates with external population totals ( $E_j$ ).

The procedures for computing the Bias Study household-level weights follow. The procedure for the full treatment and reduced treatment weights differ only in the assignment of response status in step 2.

1. Addresses with a telephone number match were sampled at twice the rate of addresses without a matching telephone number. Therefore, the household-level base weight,  $A_j$ , was set equal to 1 for addresses with a telephone number match and 2 for addresses without a match.
2. The second weighting factor adjusts for households that did not respond to the NHES:2007 Screener. Each household in the NHES Bias Study sample was classified as either a respondent ( $R$ ), a nonrespondent ( $NR$ ), or an ineligible case ( $I$ ). The classification differed for the full treatment and reduced treatment methods, as was shown in exhibit 5-1.

The base weights of the nonrespondent cases were distributed to the base weights of the respondent cases within a nonresponse adjustment cell. A Chi-Square Automatic Interaction Detection (CHAID) analysis was used to identify characteristics most associated with Screener nonresponse. (For a description of the CHAID analysis, refer to section 6.3.) These characteristics, which were primarily geographic characteristics associated with the ZIP code, were used to form the cells for nonresponse adjustment of the household weights. The same set of characteristics was considered for the Bias Study as for the RDD sample. One additional variable, whether the address had a valid matching phone number, was also a potential candidate. This variable was not relevant for the RDD sample, but was shown to be an important predictor of nonresponse in the Bias Study sample. All other variables identified by CHAID as important predictors of Screener nonresponse for the Bias Study sample were also identified as important predictors for the RDD sample.<sup>35</sup>

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<sup>34</sup> The PSUs and segments within PSUs were sampled such that all addresses ultimately had the same probability of selection, hence there is no weighting adjustment factor accounting for that level of sample development.

<sup>35</sup> Characteristics used in household nonresponse adjustment for the Bias Study sample included whether the household had a telephone number match, census division, percentage White in the ZIP Code, median home value in the ZIP Code, and whether an answering machine message was ever left.

The same nonresponse adjustment cells were used for both sets of Bias Study weights. Table 6-1 contains the cells used for Screener nonresponse adjustment in the NHES:2007 Bias Study, along with the estimated Screener unit response rate for each cell under both the full treatment and reduced treatment. The nonresponse adjustment factor,  $C_{j(c)}$ , applied to each responding household  $j$  in adjustment cell  $c$  is

$$C_{j(c)} = \frac{\sum_{h \in R_c \cup NR_c} A_h}{\sum_{h \in R_c} A_h},$$

where  $A_h$  is the weight for household  $h$  associated with differential sampling of addresses with a telephone number match and those without, and  $R_c$  and  $NR_c$  are the sets of respondents and nonrespondents in cell  $c$ , respectively. Note that these sets of respondents and nonrespondents are defined differently for the full treatment and reduced treatment methods, according to exhibit 5-1.

3. The final step in computing the household weight was to adjust to known national control totals in order to account for household-level over- or under-coverage in the address lists used for sampling and to enable the production of estimates for the RDD sample, full treatment Bias Study sample, and reduced treatment Bias Study sample that represent the same population. Poststratification was used to accomplish this task. Poststratification adjusts survey weights to known population totals. The characteristics used in poststratification were census region and presence of children under 18 years of age. Table 6-2 presents the control totals used for poststratifying the household-level weights. The variables used in poststratification of the household weights were the same for the Bias Study sample as for the RDD sample; for the RDD sample, these variables were chosen to address differences in landline telephone coverage rates with respect to region in which the household is located and presence of children in the household. The control totals for poststratification were obtained from the March 2006 CPS.

The final household-level weight for household  $j$ ,  $HHW_j$ , is given by

$$HHW_j = A_j \cdot C_{j(c)} \cdot E_{j(d)},$$

where  $E_{j(d)}$  is the poststratification adjustment factor described above for adjustment cell  $d$ , where household  $j$  has the attributes corresponding to poststratification cell  $d$ .

**Table 6-1. Screener nonresponse adjustment cells: NHES:2007 Bias Study**

Cell	Nonmatching or mismatched telephone number	Census division	Percent White	Median home value	Answering machine message left	Full treatment estimated response rate (percent) <sup>1</sup>	Reduced treatment estimated response rate (percent) <sup>2</sup>
1	1	1,5,9	0,1,2,3,4,5,6	†	†	48	48
2	1	1,5,9	7	0,1,2,3,4	†	79	79
3	1	1,5,9	7	5,6,7,8,9	†	59	59
4	1	1,5,9	8,9	0,1,2,3,4,5	†	53	53
5	1	1,5,9	8,9	6,7,8,9	†	54	54
6	1	2,4	†	0	†	79	79
7	1	7	†	0	†	63	63
8	1	2,4,7	†	1	†	51	51
9	1	2,4,7	†	2,3,4	†	68	68
10	1	2,4,7	†	5,6,7,8,9	†	48	48
11	1	3	†	†	†	71	71
12	1	6,8	†	†	†	78	78
13	2	1,2,3,6,8	†	0,1,2,3,4,5	1	81	53
14	2	4,5,7,9	†	0,1,2,3,4,5	1	70	45
15	2	†	†	6,7,8,9	1	66	45
16	2	†	0,1,2	†	2	64	54
17	2	†	3,4,5,6,7	0,1,2	2	83	70
18	2	†	3,4,5,6,7	3,4,5	2	94	76
19	2	†	3,4,5,6,7	6,7,8,9	2	77	65
20	2	†	8,9	†	2	88	78

† Not applicable. In these situations, either no cases in the cell had the condition or the cell consisted of all values of the particular variable.

<sup>1</sup> The estimated response rate is the number of completed interviews divided by the sum of the number of completed interviews and nonresponses, weighted by the probability of selection. Cases found in the field to be nonresidential are considered ineligible and are excluded.

<sup>2</sup> The estimated response rate for cells with a nonmatching or mismatched telephone number is the same as in the full treatment method. For cells with a matching phone number (nonmatching or mismatched telephone number = 2), the estimated response rate is the number of completed interviews in the TRC, divided by the number of cases attempted in the TRC, weighted by the probability of selection.

NOTE: Category codes were as follows: Nonmatching or mismatched telephone number: 1 = no match or incorrect match; 2 = match. Census Division: 0 = Alaska and Hawaii; 1 = New England; 2 = Middle Atlantic; 3 = East North Central; 4 = West North Central; 5 = South Atlantic; 6 = East South Central; 7 = West South Central; 8 = Mountain; 9 = Pacific (excluding Alaska and Hawaii). Percent White: 0 = less than 10 percent, 1 = 10 to 19 percent, 2 = 20 to 29 percent, 3 = 30 to 39 percent, 4 = 40 to 49 percent, 5 = 50 to 59 percent, 6 = 60 to 69 percent, 7 = 70 to 79 percent, 8 = 80 to 89 percent, 9 = 90 percent or more. Median home value: 0 = below the 10th percentile in sample, 1 = 10th to 19th percentile in sample, 2 = 20th to 29th percentile in sample, 3 = 30th to 39th percentile in sample, 4 = 40th to 49th percentile in sample, 5 = 50th to 59th percentile in sample, 6 = 60th to 69th percentile in sample, 7 = 70th to 79th percentile in sample, 8 = 80th to 89th percentile in sample, 9 = 90th percentile in sample or higher. Answering machine message left: 1 = yes; 2 = no.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Surveys Program (NHES), 2007.

**Table 6-2. Control totals for poststratifying the NHES:2007 household-level weights: CPS:2006**

Census region <sup>1</sup>	Control total <sup>2</sup>
Total	114,510,050
Northeast	
No children under 18 in household	13,993,709
Children under 18 in household	7,137,051
South	
No children under 18 in household	27,173,229
Children under 18 in household	14,638,867
Midwest	
No children under 18 in household	17,390,279
Children under 18 in household	8,981,331
West	
No children under 18 in household	15,731,203
Children under 18 in household	9,464,380

<sup>1</sup> The following states and the District of Columbia are in each census region: Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT; South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV; Midwest: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI; West: AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY.

<sup>2</sup> The control totals are numbers of households.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey (CPS), March 2006.

## **6.2 Person-Level Weights for the School Readiness (SR), Parent and Family Involvement in Education (PFI), and Adult Education for Work-Related Reasons (AEWR) Interviews**

As described in chapter 3, a sampling algorithm was used to limit the number of persons sampled in each household while maintaining the sampling rates required to attain the target sample sizes. The sampling was based on information collected in the Screener interview from the adult household member who responded to the Screener. For the SR and PFI Surveys, the eligibility of the sampled child was later verified or updated when the parent/guardian most knowledgeable about the child responded to the SR or PFI interview, provided that person was not the Screener respondent. For the AEWR Survey, an eligible adult was defined to be a person 16 years of age or older who was not enrolled in grade 12 or below, not institutionalized, and not on active duty in the U.S. Armed Forces. Because sampling eligibility was defined in terms of the data collected in the Screener, the weighting procedures were developed with possible misclassification (i.e., children sampled for the SR survey who were found to be eligible for the PFI survey and vice versa; adults sampled for AEWR as participants who were found to be

nonparticipants and vice versa) taken into account so that the estimates would not incur bias due to misclassification.

The household-level weight was used as the base weight for each of the person-level (e.g., SR, PFI, and AEWR interview) weights. The person-level weight for sampled person  $k$  in household  $j$ ,  $PW_{jk}$ , is the product of the household weight,  $HHW_j$ , and four weight adjustment factors:

- weight associated with sampling the person's domain in the given household ( $A_{jk}$ );
- weight associated with sampling the person from among all eligible persons in the given domain in the household ( $B_{jk}$ );
- weight associated with extended interview (SR, PFI or AEWR) unit nonresponse ( $C_{jk}$ ); and
- adjustment associated with raking<sup>36</sup> the person-level weights to Census Bureau estimates of the number of persons in the target population ( $D_{jk}$ ).

The same procedures were used to compute the person-level weight adjustments in the Bias Study sample as in the RDD sample. The weighting steps for the full treatment and reduced treatment methods were also the same, but the input household-level weights and set of sampled persons differed based on the classification of the household in step 2 of the household-level weighting process. The steps for the person-level weights are described below.

1. The first step in developing the person-level weights was to account for the probability of sampling the person's domain in the given household. For both SR and PFI, if there was an eligible child in the household, then one child was selected for the survey. Thus, the factor for sampling in both the SR and PFI domain was always equal to 1.

Exhibit 6-1 gives the weighting factors,  $A_{jk}$ , used to account for the probability of sampling the adult domains for AEWR, based on the household composition. Note that the domain probabilities of selection are given in table 3-1. For example, if there were no eligible children in the household and there were two eligible adults—one adult education participant and one adult education nonparticipant—then the adult education participant was sampled with probability 0.3637 and the adult education nonparticipant was sampled with probability 0.1819. In such an example, if the adult education participant was sampled, then the weighting factor  $A_{jk}$  for that adult was 2.7493, which is the reciprocal of the probability of sampling the adult domain. If the adult education nonparticipant was sampled, then the weighting factor  $A_{jk}$  was 5.4985.

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<sup>36</sup> See step 4 below for a definition and detailed discussion of raking.

**Exhibit 6-1. Weighting factors to account for domain sampling for adults: NHES:2007**

Number of SR eligible children in household	Number of PFI eligible children in household	Number of adults in household, by adult education participation status		Weighting factor associated with domain sampling	
		Adult education participant	Adult education nonparticipant	Adult education participant	Adult education nonparticipant
0	0	0	1 or more	—	3.6657
0	0	1 or more	0	1.8328	—
0	0	1 or more	1 or more	2.7493	5.4985
0	1 or more	0	1 or more	—	6.8249
0	1 or more	1 or more	0	3.4125	—
0	1 or more	1 or more	1 or more	5.1187	10.2374
1 or more	0	0	1 or more	—	6.8249
1 or more	0	1 or more	0	3.4125	—
1 or more	0	1 or more	1 or more	5.1187	10.2374
1 or more	1 or more	0	1 or more	—	14.6628
1 or more	1 or more	1 or more	0	7.3314	—
1 or more	1 or more	1 or more	1 or more	10.9971	21.9941

— Indicates that factor is not applicable because there are no adults in the given domain in the household.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Surveys Program (NHES), 2007.

- The second adjustment, which accounted for the probability of sampling person  $k$  from among all eligible persons in the given domain in household  $j$ , is

$$B_{jk} = N_{jk},$$

where  $N_{jk}$  is the number of persons in household  $j$  in the same sampling domain as person  $k$ .

For each sampled person  $jk$ , the unadjusted person-level weight,  $UPW_{jk}$ , can be written as the product of the household-level weight and the adjustments for within-household sampling. That is, for sampled person  $jk$ , the unadjusted person-level weight is

$$UPW_{jk} = HHW_{jk} \cdot A_{jk} \cdot B_{jk}.$$

- The next step was to adjust for persons (most knowledgeable parents/guardians in the case of the SR and PFI interviews, and the sampled adults themselves in the case of the AEWR interview) who did not respond to the extended interview. Each extended interview case was classified as either a respondent ( $R$ ) or a nonrespondent ( $NR$ ), depending on whether or not the extended interview was completed for the sampled person. The unadjusted person-level weights ( $UPW$ ) of the nonrespondents were distributed to the unadjusted person-level weights of the respondents within a nonresponse adjustment cell. For the SR and PFI Surveys, the nonresponse adjustment cells were created using a home ownership indicator and grade (where enrolled children with no grade equivalent were included in the cell containing the modal grade for their age; that is, they were assigned to the grade in which most children their age

are enrolled). These variables were used because they are available for all sampled children (both respondents and nonrespondents) and are associated with SR/PFI interview response propensity. See table 6-3 for a list of SR/PFI nonresponse adjustment cells. For the RDD sample, Census region and age/grade combinations were used to form the SR/PFI nonresponse adjustment cells.

**Table 6-3. School Readiness/Parent and Family Involvement in Education (SR/PFI)-NHES:2007 interview nonresponse adjustment cells: NHES:2007 Bias Study**

Explanatory variable (Home ownership/ Grade or equivalent from Screener)	Number of respondents in cell for full treatment	Completion rate for full treatment (percent)	Number of respondents in cell for reduced treatment	Completion rate for reduced treatment (percent)
Own/all grades	1,038	79.4	873	81.0
Rent or other/Unenrolled or preschool through 8th grade	304	74.1	270	75.0
Rent or other/9th through 12th grade	73	57.5	61	56.2

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness (SR) Survey of the National Household Education Surveys Program, 2007.

For the AEWI interview, three variables were used to create the nonresponse adjustment cells. The first was an indicator of whether the sampled adult was the Screener respondent, the second was the adult education participation status of the adult (as reported by the Screener respondent), and the third was the sex of the adult. The variables were the same as with the RDD sample, but some collapsing of categories was necessary because of smaller sample sizes. These variables were used because they are available for all sampled adults (both respondents and nonrespondents) and are associated with AEWI interview response propensity. (See table 6-4 for a list of the AEWI interview nonresponse adjustment cells.) The nonresponse adjustment factor,  $C_{jk(c)}$ , applied to each respondent  $jk$  in adjustment cell  $c$  is

$$C_{jk(c)} = \frac{\sum_{h \in R_c \cup NR_c} UPW_h}{\sum_{h \in R_c} UPW_h},$$

where  $UPW_h$  is the unadjusted person-level weight for sampled person  $h$ . Thus, for each sampled person  $jk$ , the nonresponse-adjusted person-level weight,  $NPW_{jk}$ , can be written as

$$NPW_{jk} = UPW_{jk} \cdot C_{jk(c)}.$$

Extreme weights may occasionally result when households or persons are sampled at very different rates. Additionally, the procedures used for nonresponse adjustment and poststratification may contribute to extreme weights. A few unexpectedly large sampling weights can seriously inflate the variance of the survey estimates. Thus, for

a small number of records, weight trimming procedures may be used to reduce the impact of such large weights on the estimates produced from the sample. Weight trimming refers to the process of artificially adjusting a few extreme weights (those that are unusually large relative to other weights for members of the same subgroup) to reduce their impact on the weighted estimates.

**Table 6-4. Adult Education for Work-Related Reasons (AEWR)-NHES:2007 interview nonresponse adjustment cells: NHES:2007 Bias Study**

Explanatory variables (Indicator of whether the sampled adult was the Screener respondent/adult education participation status from Screener/sex)	Number of respondents in cell for full treatment	Completion rate for full treatment (percent)	Number of respondents in cell for reduced treatment	Completion rate for reduced treatment (percent)
Screener respondent/adult education participant/male	118	81.7	103	81.5
Screener respondent/adult education participant/female	273	77.9	237	78.2
Screener respondent/adult education nonparticipant/male	145	79.2	129	81.1
Screener respondent/adult education nonparticipant/female	222	82.1	189	82.5
Not Screener respondent/both participation statuses/both sexes	307	40.4	273	40.7

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Surveys Program, 2007.

The variability in the nonresponse adjusted person-level weights was examined by population subgroups to determine whether trimming would be desirable. For the SR, PFI, and AEWR person-level weights, there was not enough variability to justify trimming.

4. The final stage of person-level weighting involved raking the nonresponse-adjusted person-level weights, *NPW*, to national control totals. Raking was proposed by Deming and Stephan (1940) as a way to ensure consistency between complete counts and sample data from the 1940 U.S. Census of population. The raking procedure typically improves the reliability of survey estimates, and also corrects for the bias due to persons not covered by the survey. Additionally, raking provides the ability to generate population estimates that match external estimates, in particular for the Bias Study, to generate population estimates comparable to the RDD sample. The raking procedure is carried out in a sequence of adjustments: first, the base weights are adjusted to one marginal distribution (or dimension) and then the second marginal distribution, and so on. One sequence of adjustments to the marginal distributions is known as a cycle or iteration. The procedure is repeated until convergence of weighted totals to all sets of marginal distributions is achieved. (See Deming and Stephan 1940 for further details on raking and the convergence process.)

This additional raking adjustment, following the household-level poststratification adjustment, is required because the extended interviews involve new eligibility criteria

and a new level of sampling. That is, although the household-level poststratification adjustment aligned the weighted totals of the household weights with the household-level control totals, the raking of the person-level weights is required in order to align the person-level weights with the person-level control totals and adjust for differential coverage rates at the person level.

The raking procedure for the SR and PFI weights involved raking the nonresponse-adjusted person-level weights to national totals obtained using percentage distributions from the October 2005 Current Population Survey (CPS) and the total number of children from the March 2006 CPS. The October 2005 CPS contains variables not available on the March 2006 CPS, but the totals in the latter are more current. The control total for a raking cell is the proportion in that cell from the October 2005 CPS multiplied by the estimate of the total number of children from the March 2006 CPS.

The four raking dimensions used for the SR interview weights were race/ethnicity of the child (Black, non-Hispanic/Hispanic/other), household income categories (\$25,000 or less/\$25,001 or more), a cross of census region (Northeast/South/Midwest/West) and urbanicity (urban/rural), and a cross of home tenure (rent/own or other) and grade of child (with those enrolled in school but having no grade equivalent assigned to the modal grade for their age). The three raking dimensions used for the PFI interview weights were a cross between race/ethnicity of the child (Black, non-Hispanic/Hispanic/other) and household income categories (\$10,000 or less/\$10,001–\$25,000/\$25,001 or more), a cross of census region (Northeast/South/Midwest/West) and urbanicity (urban/rural), and a cross of home tenure (rent/own or other) and grade of child (with those enrolled in school but having no grade equivalent assigned to the modal grade for their age). These raking variables were the same ones used in the RDD sample weighting, but with some collapsing of categories because of smaller sample sizes. This collapsing of categories was done in order to make the raking adjustment more stable. In general this would be expected to result in less variation in the weights and, therefore, a decrease in variances, relative to what the variances would have been if collapsing had not been done. For the RDD survey, these raking dimensions were used because they include important analysis variables (e.g., grade) and characteristics that have been shown to be associated with telephone coverage (e.g., race/ethnicity) (Blumberg and Luke 2006). Tables 6-5 and 6-6 show the control totals used for raking the SR and PFI interview weights, respectively.

For the AEWI interview, the four dimensions for the raking cells were a cross of the adult's race/ethnicity (Black, non-Hispanic/Hispanic/other) and household income (\$10,000 or less/\$10,001–\$25,000/\$25,001 or more), a cross of age (16–29 years/30–49 years/50 years or more) and sex, a cross of census region (Northeast/South/Midwest/West) and urbanicity (urban/rural), and a cross of home tenure (rent/own or other) and highest educational attainment (less than high school diploma/high school diploma or equivalent/some college). These raking dimensions were generally the same ones used for the RDD sample; however, the cross of age, sex, and household size was replaced with age by sex, and collapsing across regions in rural areas. The collapsing of categories was necessary because of smaller sample sizes for the Bias Study sample. The elimination of household size as a raking variable for the Bias Study sample is justifiable, since it was used in the RDD weighting to account for any

noncoverage of single, young males based on evidence of higher rates of cell-phone only households among this group, which is not an issue in the area sample.

**Table 6-5. Control totals for raking the School Readiness (SR)-NHES:2007 person-level interview weights: NHES:2007 Bias Study**

Total		8,734,486
Race/ethnicity of child		Control total <sup>2</sup>
Black, non-Hispanic		1,319,184
Hispanic		1,918,622
Other		5,496,680
Household income		Control total <sup>2</sup>
\$25,000 or less		2,331,634
\$25,001 or more		6,402,852
Census region <sup>1</sup>	Urbanicity	Control total <sup>2</sup>
Northeast	All	1,417,809
South	Urban	2,301,791
South	Rural	858,488
Midwest	Urban	1,539,271
Midwest	Rural	521,193
West	All	2,095,934
Home tenure	Age/grade of child	Control total <sup>2</sup>
Rent	Unenrolled	1,714,544
Rent	Preschool	1,350,853
Own or other	Unenrolled	2,429,177
Own or other	Preschool	3,239,912

<sup>1</sup> The following states and the District of Columbia are in each census region: Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT; South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV; Midwest: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI; West: AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY.

<sup>2</sup> The control totals are numbers of people.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 2006 and October 2005.

**Table 6-6. Control totals for raking the Parent and Family Involvement in Education (PFI)-NHES:2007 person-level interview weights: NHES:2007 Bias Study**

Total		53,185,978
Race/ethnicity of child	Household income	Control total <sup>2</sup>
Black, non-Hispanic	\$10,000 or less	1,672,661
Black, non-Hispanic	\$10,001-\$25,000	1,998,302
Black, non-Hispanic	\$25,001 or more	4,226,716
Hispanic	\$10,000 or less	952,408
Hispanic	\$10,001-\$25,000	2,735,705
Hispanic	\$25,001 or more	6,240,396
Other	\$10,000 or less	1,416,805
Other	\$10,001-\$25,000	3,411,705
Other	\$25,001 or more	30,531,280
Census region <sup>1</sup>	Urbanicity	Control total <sup>2</sup>
Northeast	Urban	8,046,784
Northeast	Rural	1,488,933
South	Urban	13,986,891
South	Rural	5,216,625
Midwest	Urban	8,749,595
Midwest	Rural	2,962,588
West	Both urbanities	12,734,562
Home tenure	Grade of child	Control total <sup>2</sup>
Rent	Transitional kindergarten/kindergarten/pre-1st grade	1,186,672
Rent	1st grade	1,328,422
Rent	2nd grade	1,166,716
Rent	3rd grade	1,216,608
Rent	4th grade	1,082,817
Rent	5th grade	1,105,484
Rent	6th grade	1,045,527
Rent	7th grade	1,045,227
Rent	8th grade	1,124,203
Rent	9th grade	1,113,763
Rent	10th grade	1,081,231
Rent	11th grade	918,851
Rent	12th grade	757,865
Own or other	Transitional kindergarten/kindergarten/pre-1st grade	2,715,226
Own or other	1st grade	2,806,353
Own or other	2nd grade	2,750,847
Own or other	3rd grade	2,698,323
Own or other	4th grade	2,767,402
Own or other	5th grade	2,941,790
Own or other	6th grade	3,007,403
Own or other	7th grade	3,097,426

See notes at end of table.

**Table 6-6. Control totals for raking the Parent and Family Involvement in Education (PFI)-NHES:2007 person-level interview weights: NHES:2007 Bias Study—Continued**

Home tenure—Continued	Age/grade of child—Continued	Control total <sup>2</sup>
Own or other	8th grade	3,115,756
Own or other	9th grade	3,157,928
Own or other	10th grade	3,283,568
Own or other	11th grade	3,496,583
Own or other	12th grade	3,173,987

<sup>1</sup> The following states and the District of Columbia are in each census region: Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT; South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV; Midwest: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI; West: AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY.

<sup>2</sup> The control totals are numbers of people.

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 2006 and October 2005.

The control totals for raking the AEWI interview weights, shown in table 6-7, were obtained from the March 2006 CPS. The raking iterations were continued until the estimated totals were within 1 of all the control totals.

The final person-level weight for each sampled person  $jk$  is

$$PW_{jk} = NPW_{jk} \cdot D_{jk}(d),$$

where  $D_{jk}(d)$  is the raking adjustment factor for raking cell  $d$ , where person  $jk$  has the attributes corresponding to the levels of the dimensions of raking cell  $d$ .

**Table 6-7. Control totals for raking the Adult Education for Work-Related Reasons (AEWR)-NHES:2007 person-level weights: NHES:2007 Bias Study**

Total		216,827,342
Race/ethnicity	Household income	Control total <sup>2</sup>
Black, non-Hispanic	\$10,000 or less	3,040,804
Black, non-Hispanic	\$10,001-\$25,000	5,143,163
Black, non-Hispanic	\$25,001 or more	16,137,645
Hispanic	\$10,000 or less	1,827,866
Hispanic	\$10,001-\$25,000	5,398,828
Hispanic	\$25,001 or more	20,753,194
Other	\$10,000 or less	7,481,096
Other	\$10,001-\$25,000	21,434,761
Other	\$25,001 or more	135,609,985
Age	Sex	Control total <sup>2</sup>
16-29 years	Male	22,799,648
16-29 years	Female	22,825,035
30-49 years	Male	41,617,822
30-49 years	Female	42,862,494
50 years or more	Male	39,941,394
50 years or more	Female	46,780,949
Urbanicity	Census region <sup>1</sup>	Control total <sup>2</sup>
Urban	Northeast	34,452,602
Urban	South	57,024,617
Urban	Midwest	36,023,610
Urban	West	43,867,176
Rural	All regions	45,459,337
Home tenure	Educational attainment	Control total <sup>2</sup>
Rent	Less than high school diploma	13,341,302
Rent	High school diploma or equivalent	30,037,210
Rent	Some college	14,598,715
Own or other	Less than high school diploma	18,474,160
Own or other	High school diploma or equivalent	81,142,050
Own or other	Some college	59,233,905

<sup>1</sup> The following states and the District of Columbia are in each census region: Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT; South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV; Midwest: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI; West: AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY.

<sup>2</sup> The control totals are numbers of people.

NOTE: Details may not sum to totals because of rounding.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 2006.

### **6.3 Chi-Square Automatic Interaction Detection (CHAID) Analysis**

As mentioned in section 6.2, Screener nonresponse adjustment cells for weighting were formed based on the results from an analysis used to identify characteristics most associated with Screener nonresponse. A univariate profile of Screener unit response rates by the characteristics of the geographic areas, as presented in chapter 5, is difficult to interpret because there are many characteristics and some of the characteristics are correlated. In order to study the interrelationships among characteristics and the Screener unit response rate, a multivariate analysis was conducted. The goal of the multivariate analysis was to better understand the complex relationships among the characteristics by examining the characteristics simultaneously with regard to unit response rates, and to determine if groups of households had extremely different unit response rates. Nonresponse bias in the estimates may appear when the characteristics of the respondents and nonrespondents are different. (See chapter 2 for a more detailed discussion of the relationship between response propensities and nonresponse bias.) By identifying groups with different unit response rates, the characteristics of the respondents and nonrespondents can be used as an indicator of the potential for nonresponse bias, and thus using these characteristics to form cells for nonresponse adjustment may reduce nonresponse bias (Little 1986).

The characteristics of the geographic areas corresponding to the sampled addresses were used to identify groups with different unit response rates. The multivariate analysis was done using a categorical search algorithm called Chi-Square Automatic Interaction Detection (CHAID). This algorithm is similar to the continuous search algorithms LISREL and Automatic Interaction Detector (AID) that have been used for a number of years, but it is designed especially to handle categorical data like those available for the Bias Study sample. CHAID first identifies the characteristic of the data that is the best predictor of response. Then, within the levels of that characteristic, CHAID identifies the next most likely response predictor(s), and so forth, until a tree is formed with all potential response predictors. The final result is a division of the entire dataset into cells by attempting to determine sequentially the cells that have the greatest discrimination with respect to the unit response rates. In other words, it divides the dataset into groups so that the unit response rate within cells is as constant as possible, and the unit response rate between cells is as different as possible. This automatic procedure was done by specifying that the minimum number of households in any group had to be greater than or equal to 100 and the split of the variables into subgroups had to be statistically significant using a chi-square test at the 95 percent significance level.

Since many of the variables in the CHAID model, such as median home value, have multiple response categories, the program must take this into account. The CHAID software does this in two ways. First, it allows the dataset to be split into subgroups separately within each level of the characteristic chosen in the previous round of CHAID selection. For example, census division categories are grouped differently within each of the phone number match categories. (For an example, see table 6-1.) Second, the procedure selects variables irrespective of the number of response categories that variable may have since the procedure collapses categories together to get meaningful categories.

All of the characteristics in the model are tested, and the one with the response categories having the largest discrimination with respect to the unit response rates is identified.<sup>37</sup> Table 6-1 contains the summary of this analysis as it relates directly to weighting the data. In this case, telephone number match was the variable chosen as most associated with response propensity. Among cases without a telephone number match, census division was identified as the characteristic next-most-associated with response propensity. Among cases with a telephone number match, whether an answering machine message was left was identified as the characteristic next-most-associated with response propensity. The process of identifying the characteristic most associated with Screener response propensity, conditional on the characteristics already identified, continued until the final 20 cells shown in table 6-1 were formed. In addition to telephone number match status, census division, and the answering machine message indicator, the final 20 cells were formed using percent White in the ZIP code and median home value in the ZIP code. Although the ZIP code-level variables (i.e., percent Black, percent Asian, percent Hispanic, percent renters, college graduates and household income decile) were considered in the CHAID analysis, they were not selected as discriminators of response propensity in this multivariate analysis, given the other characteristics. The range of unit response rates among some of the cells suggests that interactions among some characteristics may be present. For example, for cells 1 through 5 (phone number matched cases in the New England, South Atlantic, or Pacific census divisions), the Screener unit response rates range from 48 to 79 percent.

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<sup>37</sup> Variables identified in previous analyses as being associated with response propensity were selected from among the variables available for both responding and nonresponding units. For the Bias Study, little information is available for nonresponding households, limiting the selection of characteristics for the CHAID analysis. Information associated with key characteristics of interest, such as participation in early childhood programs, activities, or adult education, and correlates of these, such as maternal employment or educational attainment, are not available for nonrespondents, and therefore cannot be used for nonresponse adjustment purposes.

The range of unit response rates among the 20 cells suggested that the key characteristics identified by CHAID should be used in creating weighting adjustments. As a result, these 20 cells were used in the adjustment for Screener nonresponse. These results suggest that the weighting adjusts for some of the important characteristics associated with nonresponse bias.

## **6.4 Sampling Errors**

In surveys with complex sample designs, such as NHES:2007, direct estimates of the sampling errors assuming a simple random sample will typically underestimate the variability in the estimates (Wolter 1985). The NHES:2007 Bias Study sample design and estimation included procedures that deviate from the assumption of simple random sampling, such as oversampling addresses with a phone number match, sampling persons within households with differential probabilities, and raking to control totals.

One method for computing sampling errors to reflect these aspects of the sample design and estimation is the replication method. Replication involves splitting the entire sample into a set of groups or replicates based on the actual sample design of the survey. The survey estimates can then be computed for each of the replicates by creating replicate weights that mimic the actual sample design and estimation procedures used in the full sample. The variation in the estimates computed from the replicate weights can then be used to estimate the sampling errors of the estimates from the full sample. The replication method was used to produce the standard errors of estimates for the bias analysis. All standard error calculations were performed using the WesVar software.

A total of 80 replicates were defined for NHES:2007 Bias Study sample. This number was chosen to match the number of replicates for the RDD survey. The specific replication procedure used for NHES:2007 Bias Study was the jackknife (JKn) replication method (Wolter 1985).<sup>38</sup> It involved dividing the sample into 80 random subsamples (replicates) for the computation of the replicate weights. The first 39 replicates were formed based on the sample design, and the remaining 41 replicates were “pseudo” replicates in which the full sample weights were used. The extra 41 replicates do not contribute anything to the variance but were created to simplify variance calculations. In each replicate, a replicate weight was developed using the same weighting procedures that were used to develop the full sample weight.

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<sup>38</sup> The jackknife (JK1) replication method was used for the RDD sample weights. A description can be found in Hagedorn et al. (2008).

Replicate weights were created for each of the NHES:2007 surveys: the SR, the PFI, and the AEW. The procedures for forming the Bias Study replicate weights for each of these surveys are described below. The procedure for the RDD sample can be found in Hagedorn et al (2008).<sup>39</sup>

1. Variance strata and variance units were formed to reflect the sample design. For the 29 noncertainty PSUs, variance strata were defined as the strata used for sampling (see section 3.2), which contained 2 or 3 sampled PSUs (variance units) per stratum. For the 1 certainty PSU, 5 variance strata were formed by pairing sampled segments (variance units) within the PSU.
2. The first 39 replicates were created using the JK<sub>n</sub> method. The replicate 1 base weights were assigned by multiplying the full-sample base weight for the first variance unit in the first variance stratum by zero and the other variance units in the first variance stratum by a factor of  $n_h/(n_h - 1)$ , where  $n_h$  is the number of variance units in the variance stratum (equal to 2 for the first variance stratum). The full sample weights for all variance units in the remaining variance strata were multiplied by a factor of 1. This process was repeated for each of the remaining variance units to form the rest of the 39 replicates. The weights for replicates 40 through 80 were set equal to the full sample weights.
3. Using the exact same weighting procedures described earlier in this chapter for each of the sets of full sample weights, the other adjustments (i.e., sampling adjustments, nonresponse adjustments, and raking adjustments) were applied to every replicate base weight for completed interviews. In other words, the weighting steps were applied 80 times.
4. The difference in the methods used for the full sample and for the replicate weights was that the raking iterations were stopped when the replicate weights converged to within 10 of the control totals rather than 1, which was used in the full sample weighting.

The replication procedure for the NHES:2007 surveys involves the calculation of 81 estimates, including an estimate using the full sample weight and estimates using each of the 80 replicate weights.

The JK<sub>n</sub> variance estimator,  $v(\hat{\theta})$ , has the form

$$v(\hat{\theta}) = \sum_{k=1}^G \frac{n_k - 1}{n_k} (\hat{\theta}_{(k)} - \hat{\theta})^2,$$

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<sup>39</sup> The procedures for forming replicates for the NHES:2007 RDD sample are the same as the procedures used in NHES:2005. (See Hagedorn et al. 2006.)

where  $\theta$  is the population parameter of interest;  $\hat{\theta}$  is the estimate of  $\theta$  based on the full sample;  $\hat{\theta}_{(k)}$  is the estimate of  $\theta$  based on the observations included in the  $k$ th replicate; and  $n_k$  is number of variance units in the variance stratum corresponding to replicate  $k$ .

## 6.5 Significance Tests

All differences discussed in this report are significant at the 95 percent confidence level, based on a 2-sided  $t$ -test. While some relatively small differences (3 to 5 percentage points) might be statistically significant when sample sizes are large, the discussion is limited to differences that are potentially of substantive importance. Differences of substantive importance are defined as differences of 5 percentage points or more or relative differences of 3 or more (i.e., when one estimate is 3 or more times larger than the other). The Bias Study was designed to allow detection of a 5 percentage point difference in key statistics. For NHES, this is considered a meaningful threshold to use to identify which statistically significant differences are of substantive significance.

When the comparison involves correlated samples, the standard error in the  $t$ -test was calculated to appropriately account for the correlation. An example of a comparison with correlated samples is the nonresponse bias analysis, in which the bias is the difference between the estimate from the reduced treatment method, which includes only Bias Study respondents finalized in the TRC or with no matching telephone number or a mismatched number, and the full treatment method, which includes all Bias Study respondents.

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## 7. AN OVERVIEW OF BIAS

This chapter provides an overview of the bias in the NHES:2007 estimates. Section 7.1 provides some methodological issues to consider when comparing the estimates from the NHES:2007 Bias Study sample to estimates from other sources. The estimates from the Bias Study sample are intended to give an indication of the bias in the random digit dialing (RDD) sample estimates. However, the Bias Study estimates are themselves potentially subject to bias. Section 7.2 compares the estimates from the Bias Study sample to those from an external source as a check of the reasonableness of the Bias Study estimates; the external source used for this comparison is the Current Population Survey (CPS). The Bias Study sample and RDD sample estimates are computed using weights adjusted for nonresponse and raked to population totals, as described in chapter 6. To evaluate the effect of the weighting adjustments on bias in the RDD estimates, section 7.3 contains a comparison of NHES:2007 RDD estimates before and after the adjustments. In section 7.4, the Bias Study estimates are compared to the final, adjusted estimates from the NHES:2007 RDD sample. Differences reflect the overall bias in the RDD sample estimates, including nonresponse and noncoverage bias. A breakdown of the components of bias is given in chapter 8.

### 7.1 Methodological Considerations in Data Comparisons

Sample and nonsampling errors, sample sizes, methods of survey administration, the timing of surveys, and response rates all affect the data collected and any comparisons made (Bradburn 1983; Groves 1989). In addition, question wording variation, question order, question context, and respondent recall can have a major impact on survey responses (Bradburn 1983; Groves 1989). While comparisons of the Bias Study estimates and RDD sample estimates are intended to give an indication of the noncoverage and nonresponse bias in the RDD estimates, the differences might also be attributable to noncoverage or nonresponse in the Bias Study sample as well as other sources of sampling or nonsampling error. Similar issues are important when comparing the Bias Study estimates to external sources. As a result, it is important to note some general methodological issues.

Every survey, including the NHES:2007 Bias Study, is subject to both sampling error and nonsampling error. Sampling errors occur because the data are collected from a sample rather than a census of the population. Because the sample of addresses selected for the Bias Study is just one of the many possible samples that could have been selected, estimates produced from the Bias Study sample may differ from estimates that would have been produced from other samples. In the same way, the data

from the NHES:2007 RDD sample and the CPS are also subject to sampling error. Nonsampling errors are errors made in the collection and processing of data and may be caused by population coverage limitations and data collection, processing, and reporting procedures. The sources of nonsampling error are typically problems like unit and item nonresponse, the differences in respondents' interpretations of the meaning of the questions, response differences related to the particular time the survey was conducted, and mistakes in data preparation. Although the NHES surveys are designed to account for sampling error and minimize nonsampling error, the estimates presented in this chapter are subject to both types of error. These types of errors are not unique to NHES, but are common to all sample surveys.

Population coverage is an issue that arises in the examination of results of any telephone survey because households without telephones are excluded from the sample. The NHES:2007 RDD data, which were obtained from a sample of residential landline telephone numbers, were statistically adjusted to reduce the effects of population noncoverage due to lack of telephone ownership. As a result, the estimates from RDD sample sum to the total number of eligible persons in all households, not just those in households with telephones. Although these statistical adjustments may be useful in reducing biases in aggregates for the whole population, more serious biases may exist for estimates of segments of the population with relatively low telephone coverage rates (Brick, Burke, and West 1992). Unlike the RDD sample, the Bias Study sample includes households without telephones. However, it is still subject to population noncoverage. The address lists used for sampling have been shown to provide poorer coverage of rural areas (O'Muircheartaigh, Eckman, and Weiss 2002). The Bias Study data were statistically adjusted to reduce the effects of population noncoverage (see chapter 6), but some noncoverage bias might still remain.

Timing of survey administration in terms of the years in which surveys were conducted or the time of year they were administered also may affect responses (Groves 1989). The time of the year when the data are collected can affect responses to questions related to specific topics such as school attendance. It is important to keep in mind that the data collection period can be an important factor to consider when comparing Bias Study and CPS estimates. The Telephone Research Center (TRC) data collection periods for the NHES:2007 Bias Study sample and RDD sample were the same.

Variation in response rates across surveys can also result in differences in the estimates. To the extent that nonrespondents are different from respondents, low response rates may introduce biases into the survey estimates. In the Bias Study, the overall unit response rate was 54.0 for School Readiness (SR), 51.4 for Parent and Family Involvement in Education (PFI), and 41.0 for Adult Education for Work-Related Reasons (AEWR). For the RDD sample, the overall unit response rate was 40.7 percent for SR, 39.1 percent for PFI, and 33.0 percent for AEWR. These response rates are given in table 5-6, and

unit response rates for NHES:2007 are discussed more thoroughly in chapter 5. Unit response rates for the comparable data sources discussed in this chapter were 83.3 percent for CPS March 2006 and 89.5 percent for CPS October 2005.

The mode of administration (e.g. telephone interview versus face-to-face interview) is another factor related to responses (Groves 1989). For example, differences in mode can affect question wording, question context, or the interviewer-respondent interaction. Interviews were conducted by telephone for the NHES RDD sample, the Bias Study reduced treatment, and the Bias Study full treatment (see chapter 4). Therefore, differences in these estimates can not be attributed to mode effects.

Because NHES data are adjusted with a raking procedure to match CPS population totals, the Bias Study and RDD sample estimates exactly match CPS estimates for the characteristics used in the raking, provided the categorization is the same as that used in raking. Because the standard error of an estimate is a measure of sampling error variance, a standard error of 0 indicates the absence of sampling error variance. When NHES estimates of totals are adjusted to exactly match CPS totals (through the raking adjustment), all sampling error in those estimated totals is eliminated, under the assumption that the CPS total is the true population value. Any NHES estimate of a characteristic not specifically controlled for in the raking adjustment would not be expected to exactly match CPS totals for one or more of the reasons discussed earlier in this section.

### **7.1.1 General Comments on the Comparisons**

The estimates to be presented here are just some of the multitude of comparisons that could be made between NHES:2007 Bias Study estimates and the RDD sample and CPS estimates using different variables and categorizations of those variables. The items included in these comparisons were selected because they include important characteristics of persons and households, or because they are key outcome variables from the surveys. When many comparisons are made, some will undoubtedly show statistically significant differences. The main purpose of the comparisons is to explore the overall quality of the data and to determine whether there are some differences in estimates of substantive importance that need to be investigated further.

### **7.1.2 Other Data Considerations**

As is true for most surveys, responses were not obtained for all the NHES:2007 data items for all interviews. Despite the high item response rate, all NHES:2007 missing data items were imputed. The median Bias Study item response rates for items in the SR, PFI, and AEWB surveys were 99.3, 99.4, and 99.8 percent, respectively.<sup>40</sup> The CPS estimates provided as comparison data also contain imputed data.

Another data consideration is age. The CPS includes respondents ages 15 and older, whereas Adult Education for Work-Related Reasons (AEWR)-NHES:2007 Bias Study adults were at least 16 years old. For the purpose of the comparisons pertaining to adults in this chapter, this difference in the age subgroup was accounted for by restricting tabulations of the CPS data to persons ages 16 and older.

## **7.2 Comparison of NHES:2007 Bias Study Estimates to an External Source**

This section presents a comparison for selected estimates from the NHES:2007 Bias Study with estimates from the CPS. In the bias analysis presented in section 7.4, estimates from the full Bias Study will be used as the standard by which to evaluate bias in the RDD estimates, since the response rates for the Bias Study are higher than for the main study RDD sample, and undercoverage bias from the address-based sampling frame is believed to be less of an issue than undercoverage from the RDD sampling frame. The comparison in this section is intended to provide an indication of the reasonableness of the selected NHES:2007 Bias Study estimates for this purpose. The CPS was selected for this comparative analysis because it included topical information and samples comparable to those used in the NHES:2007 surveys. Historically, the CPS has been used as the extant source to which NHES demographic estimates have been compared. For these comparisons, the SR, PFI, and AEWB Bias Study estimates were calculated using adjusted weights.

### **7.2.1 Current Population Survey (CPS)**

The CPS is a monthly household survey conducted by the Bureau of the Census to provide information about employment, unemployment, and other characteristics of the civilian noninstitutionalized population. The CPS respondent is a household member age 15 or older and the

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<sup>40</sup> The median RDD Study item response rates for items in the SR, PFI, and AEWB surveys were 99.3, 99.0, and 99.7 percent, respectively.

survey is conducted each month with a sample of approximately 72,000 households located in 754 primary sampling units. The U.S. Department of Education is a joint sponsor of the annual October supplement to the CPS, which provides specific information on educational topics.

CPS data from October 2005 and March 2006<sup>41</sup> were used for comparison with estimates from SR, PFI, and AEWB surveys. The October 2005 supplement contains the most recently available CPS data regarding enrollment status and grade by type of school in which students are enrolled, and the March 2006 supplement contains the most recent CPS data on age, race/ethnicity by educational attainment, industry, and occupation. The October 2005 CPS data were collected on 71,270 households and 137,809 individuals; and the March 2006 CPS data were on 71,700 households and 135,028 individuals. The data comparisons below for SR, PFI, and AEWB cover key estimates including ages of subject, student grade, enrollment status, school type, sex, and highest level of educational attainment.

The CPS public-use data files do not contain the information required to compute standard errors directly. However, the CPS provides documentation on computing approximate standard errors using generalized variance functions (GVFs). GVFs are functions that model the variance (or standard error) of survey estimates based on the value of the estimates. Further information on the CPS GVFs can be found on the CPS website, at <http://www.census.gov/cps>. The GVFs were used to obtain approximate standard errors for each of the CPS estimates presented in this chapter.

## 7.2.2 Comparability of the NHES:2007 Bias Study and CPS Distributions

**Age of persons.** Table 7-1 shows NHES:2007 Bias Study and 2005 CPS estimates of the age distribution of the population as indicated by the age of persons who were subjects of NHES interviews (i.e., children/youth from ages 3 to 20 and enrolled in grade 12 or below and noninstitutionalized adults ages 16 or older and not enrolled in grade 12 or below). All observed differences are 1 percentage point or less, with estimates not exhibiting statistically significant differences when applying 95 percent confidence intervals.

**School type and student grade level.** Estimates of the number of children enrolled in kindergarten through grade 12, by school type and by student grade level, are presented in table 7-2 for the Bias Study PFI survey and for CPS:2005. Estimates of the number of children at each grade level from kindergarten through grade 12 are not significantly different. Number estimates are rounded to the

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<sup>41</sup> The October 2005 and March 2006 CPS data were the most recent available at the time this report was drafted. Generally, the CPS shows little variation over 1- and 2-year time spans.

nearest thousand for ease of interpretation. The NHES:2007 Bias Study estimates show that there were 53,186,000 children enrolled in kindergarten through grade 12, and the CPS:2005 estimates show that there were 53,328,000 children (a difference of 142,000 children or 0.3 percent of the NHES estimate). The percentage distributions for grade are nearly identical between NHES:2007 and CPS:2005 because grade was used for raking. The numbers of children enrolled in public and private school are also comparable.

**Table 7-1. Percentage distribution for age of subjects of interviews: SR-NHES:2007 Bias Study, PFI-NHES:2007 Bias Study, AEW-NHES:2007 Bias Study, and CPS:2005**

Age category	SR-NHES:2007 Bias Study, PFI-NHES:2007 Bias Study and AEW-NHES:2007 Bias Study <sup>1</sup>		CPS:2005	
	Percent	s.e.	Percent	s.e.
3–5 years	4	0.1	4	0.1
6–9 years	6	0.1	6	0.1
10–15 years	9	0.2	9	0.1
16–19 years	5	0.6	6	0.1
20–29 years	15	0.5	14	0.1
30–39 years	13	0.9	14	0.1
40–49 years	17	0.9	16	0.1
50–59 years	14	1.0	14	0.1
60 or more years	17	1.0	17	0.1

<sup>1</sup> Estimates of children ages 3 through 6 and not yet enrolled in kindergarten were obtained from the School Readiness (SR) Survey. Estimates of children/youth ages 3 through 20 and enrolled in kindergarten through grade 12 were obtained from the Parent and Family Involvement in Education (PFI) Survey. Estimates of adults ages 16 and older, not enrolled in grade 12 or below, and not on activity duty in the U.S. Armed Forces were obtained from the Adult Education for Work-Related Reasons (AEWR) Survey. Parent respondents to the SR and PFI Surveys are not included in calculations for adult estimates.

NOTE: s.e. is standard error.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness Survey of the National Household Education Surveys Program (NHES), 2007; Parent and Family Involvement in Education Survey of the NHES, 2007; and Adult Education for Work-Related Reasons Survey of the NHES, 2007. U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Table 7-2. Number of children in kindergarten through grade 12, by school type and by student grade level: PFI-NHES:2007 Bias Study and CPS:2005**

School type and grade	PFI-NHES:2007 Bias Study		CPS:2005	
	Number (thousands)	s.e. (thousands)	Number (thousands)	s.e. (thousands)
Total number of children in kindergarten through 12th grade	53,186	0	53,328	330
School type <sup>1</sup>				
Public	46,867	801	48,018	320
Private	5,269	868	5,309	124
Homeschooled	1,050	273	—	—
Student grade level				
Kindergarten	3,902	0	3,912	107
1	4,135	0	4,146	110
2	3,918	0	3,928	107
3	3,950	40	3,925	107
4	3,850	0	3,860	106
5	4,012	40	4,058	109
6	4,053	0	4,064	109
7	4,143	0	4,154	110
8	4,240	0	4,251	111
9	4,272	0	4,283	112
10	4,365	0	4,376	113
11	4,415	0	4,427	113
12	3,932	0	3,942	107

<sup>1</sup> CPS does not isolate homeschoolers, some of whom may also be attending school for a certain number of hours per week.

NOTE: s.e. is standard error. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program, 2007; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

Table 7-3 shows estimates of the number of children enrolled in kindergarten through grade 12 in public versus private schools. There are no statistically significant differences of 5 percentage points or more between PFI-NHES:2007 Bias Study and CPS:2005 with respect to enrollment in public and private schools across grade levels.

**Table 7-3. Number and percentage of children in kindergarten through grade 12 enrolled in public and private schools: PFI-NHES:2007 Bias Study and CPS:2005**

Child's current grade	School type					
	Public			Private		
	Number (thousands)	Percent	s.e.	Number (thousands)	Percent	s.e.
<b>PFI-NHES:2007 Bias Study</b>						
K	3,204	84	5.9	611	16	5.9
1, 2	7,129	92	1.9	611	8	1.9
3, 4	7,103	94	2.1	438	6	2.1
5, 6	6,861	88	3.5	966	12	3.5
7, 8	7,538	90	3.9	844	10	3.9
9, 10	7,519	88	3.1	1,039	12	3.1
11, 12	7,514	91	3.2	760	9	3.2
<b>CPS:2005</b>						
K	3,349	86	1.0	563	14	1.0
1,2	7,153	89	0.6	921	11	0.6
3,4	7,031	90	0.6	755	10	0.6
5, 6	7,270	90	0.6	852	10	0.6
7, 8	7,574	90	0.6	831	10	0.6
9, 10	7,967	92	0.5	692	8	0.5
11, 12	7,675	92	0.5	695	8	0.5

NOTE: s.e. is standard error. For the National Household Education Surveys Program: 2007, kindergarten (K) includes grades reported as kindergarten, transitional kindergarten, and prefirst grade. Children who are homeschooled are not included.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program, 2003; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Household income: SR.** Table 7-4 presents Bias Study SR and CPS estimates of the percentage of children ages 3 through 6, not yet enrolled in kindergarten who resided in households with particular income categories. Across income categories, estimates from both surveys are comparable.

**Table 7-4. Percentage of children ages 3 through 6 not yet enrolled in kindergarten, by household income: SR-NHES:2007 Bias Study and CPS:2005**

Household income	SR-NHES:2007 Bias Study		CPS:2005	
	Percent	s.e.	Percent	s.e.
\$15,000 or less	15	1.7	15	0.7
\$15,001 to \$30,000	18	2.4	18	0.8
\$30,001 to \$50,000	18	2.8	21	0.8
Over \$50,000	50	2.9	47	1.0

NOTE: s.e. is standard error. Current Population Survey estimates exclude cases with missing income data. Because of rounding, percentages may not add to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness Survey of the National Household Education Surveys Program, 2007; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Household income by race/ethnicity: SR.** Table 7-5 compares SR-NHES:2007 Bias Study and CPS:2005 estimates of household income by race/ethnicity for children ages 3 through 6, not yet enrolled in kindergarten. For preschoolers of a race/ethnicity other than White, non-Hispanic, the percentage with a household income from \$30,001 to \$50,000 is higher for the CPS than the Bias Study sample. The rest of the estimates are comparable.

**Table 7-5. Number and percentage of children ages 3 through 6 not yet enrolled in kindergarten, by household income and race/ethnicity: SR-NHES:2007 Bias Study and CPS:2005**

Race/ethnicity	Number of children (thousands)	Household income							
		Less than \$15,000		\$15,001 to \$30,000		\$30,001 to \$50,000		More than \$50,000	
		Percent	s.e.	Percent	s.e.	Percent	s.e.	Percent	s.e.
SR-NHES:2007 Bias Study									
White, non-Hispanic	4,933	9	2.3	10	1.9	21	3.8	60	4.6
Other	3,801	23	3.7	28	5.2	13	3.2	36	4.9
CPS:2005									
White, non-Hispanic	4,882	8	0.7	11	0.8	21	1.1	60	1.3
Other	3,876	24	1.3	27	1.3	21	1.2	29	1.4

# Rounds to zero.

NOTE: Shading indicates a significant difference of 5 percentage points or more. s.e. is standard error. Current Population Survey percentage estimates exclude cases with missing income data. Because of rounding, percentages may not add to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness Survey of the National Household Education Surveys Program, 2007; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Household income: PFI.** Table 7-6 presents PFI-NHES:2007 Bias Study and CPS:2005 estimates of the percentage of children in kindergarten through grade 12, who resided in households with particular income ranges. Across income categories, estimates from both surveys are comparable; the observed differences of 4 percentage points or less were not significant.

**Table 7-6. Percentage of children in kindergarten through grade 12, by household income: PFI-NHES:2007 Bias Study and CPS:2005**

Household income	PFI-NHES:2007 Bias Study		CPS:2005	
	Percent	s.e.	Percent	s.e.
\$15,000 or less	13	0.6	13	0.3
\$15,001 to \$30,000	15	1.2	16	0.3
\$30,001 to \$50,000	17	2.2	20	0.3
Over \$50,000	55	2.2	51	0.4

NOTE: s.e. is standard error. Current Population Survey estimates exclude cases with missing income data. Because of rounding, percentages may not add to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program, 2007; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Household income by race/ethnicity: PFI.** Table 7-7 presents PFI-NHES:2007 Bias Study and CPS:2005 estimates of household income by race/ethnicity for children in kindergarten through grade 12. The estimates are comparable.

**Table 7-7. Number and percentage of children in kindergarten through grade 12, by household income and race/ethnicity: PFI-NHES:2007 Bias Study and CPS:2005**

Race/ethnicity	Number of children (thousands)	Household income							
		Less than \$15,000		\$15,001 to \$30,000		\$30,001 to \$50,000		More than \$50,000	
		Percent	s.e.	Percent	s.e.	Percent	s.e.	Percent	s.e.
PFI-NHES:2007 Bias Study									
White, non-Hispanic	30,959	7	0.9	9	0.8	16	3.4	69	3.6
Other	22,227	22	1.5	24	3.0	18	2.5	37	3.5
CPS:2005									
White, non-Hispanic	31,689	6	0.3	10	0.3	19	0.4	64	0.5
Other	21,639	23	0.5	24	0.5	22	0.5	32	0.6

NOTE: s.e. is standard error. Current Population Survey percentage estimates exclude cases with missing income data. Because of rounding, percentages may not add to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program, 2003; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Public and private schools by race/ethnicity.** Estimates from PFI-NHES:2007 and CPS:2005 of the number and percent of children in kindergarten through grade 12 enrolled in public and private schools by race/ethnicity are presented in table 7-8. Estimates are comparable.

**Table 7-8. Number and percentage of children in kindergarten through grade 12 in public and private schools, by race/ethnicity: PFI-NHES:2007 Bias Study and CPS:2005**

Race/ethnicity	PFI-NHES:2007 Bias Study					CPS:2005				
	Number of children (thousands)	Public Percent	s.e.	Private Percent	s.e.	Number of children (thousands)	Public Percent	s.e.	Private Percent	s.e.
White, non-Hispanic	30,959	90	2.2	10	2.2	31,689	87	0.3	13	0.3
Other	22,227	90	2.1	10	2.1	21,639	94	0.3	6	0.3

NOTE: s.e. is standard error. Percentages include only those students for whom public/private enrollment was reported, that is, children whose parents indicated they were enrolled in school.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program, 2007; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005.

**Family structure and parents' highest level of education.** Table 7-9 presents estimates of the percentage of children in kindergarten through grade 12 by family structure and by parents' highest level of education for PFI-NHES:2007 Bias Study and CPS:2005-2006. The estimate for the percentage of children who had both mother and father in the household was 6 percentage points higher in PFI-NHES:2007 Bias Study (74 percent) compared to CPS:2006 (68 percent), and the percentage of children who had a mother only in the household was 5 percentage points lower in PFI-NHES:2007 Bias Study (19 percent) compared to CPS:2006 (24 percent). In addition, the percentage of children whose parents' highest level of education was some college was 5 percentage points lower in PFI-NHES:2007 Bias Study (28 percent) compared to CPS:2005 (33 percent), and the percentage of children whose parents' highest level of education was graduate school was 5 percentage points higher in PFI-NHES:2007 Bias Study (18 percent) compared to CPS:2005 (13 percent). The reason for these differences are unclear but consistent with the differences observed between the CPS data and the NHES:2007 RDD survey (Hagedorn et al, 2008).

**Table 7-9. Percentage of children in kindergarten through grade 12, by family structure and parents' highest level of education: PFI-NHES:2007 Bias Study and CPS: 2005–2006**

Family and community characteristics	PFI-NHES:2007 Bias Study		CPS:2005-2006	
	Percent	s.e.	Percent	s.e.
Family structure				
Mother and father	74	1.8	68	0.4
Mother	19	1.6	24	0.3
Father	4	0.4	5	0.2
Nonparent guardian(s)	3	0.5	4	0.1
Parents' highest education				
Less than high school	7	1.2	9	0.2
High school graduate	25	2.3	24	0.3
Some college	28	2.1	33	0.4
College graduate	22	2.1	21	0.3
Graduate school	18	2.1	13	0.2

NOTE: Shading indicates a significant difference of 5 percentage points or more. s.e. is standard error. Mother and father refer to birth, adoptive, step, or foster parents. Because of rounding, percentages may not add to 100. In households with two mothers/female guardians or two fathers/male guardians, parents' highest level of education for PFI-NHES:2007 was derived by taking into account the education level of both parents. Current Population Survey percentage estimates by family structure are for children ages 5 through 17, excluding emancipated minors, from CPS March 2006. Current Population Survey percentage estimates by parents' highest education are approximated by highest education attainment within households, from CPS October 2005.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education Survey of the National Household Education Surveys Program (NHES), 2007; and U.S. Department of Commerce, Bureau of the Census, Current Population Survey, October 2005 and March 2006.

**Adult population, by sex and age.** Table 7-10 shows estimates of the adult population by sex and age. As discussed in chapter 6, the AEW weights were raked to control totals of age by sex from the CPS. Therefore, estimates from the two surveys are expected to be comparable. The age estimates for both males and females from AEW-NHES:2007 Bias Study and CPS:2006 are not substantively different.

**Table 7-10. Percentage distribution of the adult population, by sex and age: AEW-NHES:2007 Bias Study and CPS:2006**

Age	AEWR-NHES:2007 Bias Study				CPS:2006			
	Male		Female		Male		Female	
	Estimate	s.e.	Estimate	s.e.	Estimate	s.e.	Estimate	s.e.
Total number of adults <sup>1</sup> (thousands)	104,359	0	112,468	0	104,359	345	112,468	335
16 to 24 years	8	0.9	5	0.7	6	0.1	6	0.1
25 to 34 years	8	1.5	10	1.1	9	0.1	9	0.1
35 to 44 years	8	1.2	9	0.9	10	0.1	10	0.1
45 to 54 years	11	1.4	10	1.0	10	0.1	10	0.1
55 years and older	13	0.9	18	0.8	14	0.1	17	0.1

<sup>1</sup>Includes civilian, noninstitutionalized adults, ages 16 or older, not enrolled in elementary or secondary school, and not on active duty in the U.S. Armed Forces at the time of the interview.

NOTE: The percentages provided in this table are cell percentages. That is, for each data set, these percentages sum to 100 across all age-sex cells. Due to rounding, the percentages shown here may not sum to 100.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program, 2007. U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 2006.

**Adult population by highest educational attainment and race/ethnicity.** Race/ethnicity was also used in raking the AEW weights. Since CPS:2006 is the source of the control totals for raking NHES:2007, estimates of number of adults in each race/ethnicity group are expected to be comparable. The estimates of totals for the non-Hispanic White and other race/ethnicity groups shown in table 7-11 are not identical, however, because the NHES:2007 Bias Study data were raked to a three-category race/ethnicity variable (Black, non-Hispanic; Hispanic; and White, non-Hispanic or others), whereas a two-category race/ethnicity variable (White, non-Hispanic versus others) is used in the comparison.

As depicted in table 7-11, AEW-NHES:2007 Bias Study and CPS:2006 estimates of educational attainment by race/ethnicity are comparable in most cases. However, the percentage of adults with less than a high school education for race/ethnicities other than White, non-Hispanic was 6 percentage points lower for the AEW-NHES:2007 Bias Study than the CPS:2006; the reason for this difference is unclear.

**Table 7-11. Percentage distribution of the adult population, by highest educational attainment and race/ethnicity: AEW-NHES:2007 Bias Study and CPS:2006**

Race/ethnicity	Number of adults (thousands)	Highest educational attainment							
		Less than high school		High school diploma		Associate's or some college		Bachelor's or higher	
		Percent	s.e.	Percent	s.e.	Percent	s.e.	Percent	s.e.
<b>AEWR-NHES:2007 Bias Study</b>									
Total adults <sup>1</sup>	216,827	15	0.1	31	1.4	29	1.3	26	1.0
White, non-Hispanic	153,894	12	1.1	30	2.3	29	1.9	29	2.2
All other races	62,933	20	2.5	32	4.9	29	3.7	19	3.8
<b>CPS:2006</b>									
Total adults	216,827	15	0.1	32	0.2	28	0.2	26	0.2
White, non-Hispanic	151,076	10	0.1	32	0.2	29	0.2	29	0.2
All other races	65,751	26	0.3	31	0.3	24	0.3	19	0.3

<sup>1</sup>Includes civilian, noninstitutionalized adults, ages 16 or older, not enrolled in elementary or secondary school, and not on active duty in the U.S. Armed Forces at the time of the interview.

NOTE: Shading indicates a significant difference of 5 percentage points or more. Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program, 2007. U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 2006.

**Work for pay or income in the past 12 months.** In table 7-12, the estimates of employment status from the AEW-NHES:2007 Bias Study and CPS:2006 are presented for adults aged 16 or older. About 70 percent of adults reported that they worked for pay or income in the past 12 months in AEW and about 69 percent reported working in CPS:2006.

**Table 7-12. Percentage of adults who worked for pay or income in the past 12 months: AEW-NHES:2007 Bias Study and CPS:2006**

Work history, past 12 months	AEWR-NHES:2007 Bias Study		CPS:2006	
	Estimate	s.e.	Estimate	s.e.
Total number of adults <sup>1</sup> (thousands)	216,827	†	216,827	†
Worked in the past 12 months	70	1.8	69	0.2
Did not work in the past 12 months	30	1.8	31	0.2

† Not applicable.

<sup>1</sup>Includes civilian, noninstitutionalized adults, ages 16 or older, not enrolled in elementary or secondary school, and not on active duty in the U.S. Armed Forces at the time of the interview.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program (NHES), 2007. U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 2006.

### **7.2.3 Summary**

Overall, the comparisons of selected estimates from NHES:2007 Bias Study with comparable data from the CPS have provided an indication of the reasonableness in using the NHES:2007 Bias Study estimates as the standard by which to evaluate bias in the RDD estimates. Although the estimates presented here are just some of the multitude of comparisons that could be made between NHES:2007 Bias Study estimates and the CPS using different variables and categorizations, this approach has proven useful in determining whether significant differences in estimates exist.

### **7.3 Effect of the Weighting Adjustments on Bias**

The NHES:2007 estimates were produced using weights that were adjusted for nonresponse and calibrated (raked) to population totals. These adjustments were intended to reduce the nonresponse and noncoverage bias in the estimates. The process for weighting the RDD sample was similar to that for the Bias Study sample, as described in chapter 6. The variables used in the weighting adjustments were chosen because they were related to response propensity, noncoverage, and the key survey statistics. A complete description of the weighting process for the NHES:2007 RDD surveys can be found in Hagedorn et al. (2008).

In this section, the effect of the weighting adjustments on the NHES:2007 RDD sample estimates is evaluated. Tables 7-13, 7-14, and 7-15 provide estimates computed using weights at three different stages of weighting for the SR, PFI, and AEWR surveys, respectively. The first set of estimates uses unadjusted weights reflecting only the probabilities of selection. The second set of estimates is produced using weights adjusted for unit nonresponse to the Screener and the extended interview. The third set uses the final weights, reflecting all nonresponse and calibration adjustments. The estimates chosen for comparison include key outcome variables from the surveys as well as key demographics. In section 7.4, the same set of estimates is considered in the evaluation of bias in the published final RDD estimates compared to the final estimates from the Bias Study.

As shown in tables 7-13, 7-14, and 7-15, there are no substantive differences (i.e., differences of 5 percentage points or more) between the unadjusted estimates and the nonresponse adjusted estimates. Considered together with the results provided in chapter 8, this is an indication that there is little evidence of nonresponse bias in the NHES:2007 estimates.

There are some differences between the nonresponse adjusted estimates and final estimates. The differences indicate potential noncoverage bias prior to raking that was reduced through the raking process. For the SR survey (table 7-13), estimates after the raking adjustments are lower than the nonresponse adjusted estimates for the proportion of preschoolers who participate in center-based care, recognize all colors, count to 20 or higher, and write their first name; who have parents who believe it is essential to prepare their child for kindergarten by teaching them the alphabet and sharing; who have a family member that reads to them everyday in the past week; whose parents took three or more outings with them in the past month; who have household incomes above \$50,000; and who have both a mother and father in the household. In addition, the final estimates are higher than the nonresponse adjusted estimates for the proportion of preschoolers who live in a home that is not owned, have parents with a high school diploma or below, are below the poverty threshold, have household incomes below \$15,000, and have a mother only in the household. Many of the estimates that differ before and after the raking adjustments are related to the variables used in raking: race/ethnicity, household income, region, urbanicity, home tenure, age, and enrollment status.

For the PFI and AEWB surveys (tables 7-14 and 7-15, respectively), no substantive differences were found between the nonresponse adjusted estimates and final estimates for the key survey outcome variables. Results for the demographic variables are similar to those for the SR survey. For the PFI survey, the final estimates are higher than the nonresponse adjusted estimates for the proportion of children who live in a home that is not owned, are below the poverty threshold, and have household incomes below \$15,000. The final estimates are lower than the nonresponse adjusted estimates for the proportion of children who have household incomes above \$50,000 and who have both a mother and father in the household. Race/ethnicity, household income, region, urbanicity, home tenure, and grade were used in the raking adjustment for the PFI survey, and these characteristics are related to many of these demographic variables. For the AEWB survey, the final estimates are higher than the nonresponse adjusted estimates for the proportion of adults ages 24 years or younger, who do not own their home, and who never married. The final estimates are lower than the nonresponse adjusted estimates for the proportion of adults who are ages 55 years or older, who are currently married, and who have a household income above \$50,000. Age, home tenure, and household income were among the variables used in the raking adjustment for the AEWB survey, and an indicator for single adults was used in the household-level poststratification adjustment. The differences found in this evaluation indicate the raking adjustments were effective in reducing noncoverage bias in these estimates.

Differences were found for the same set of characteristics when comparing the unadjusted estimates to the final estimates, with a few exceptions. The difference between the unadjusted estimate and final estimate of the proportion of adults who have a household income above \$50,000 is not of

substantive importance, possibly indicating nonresponse bias and noncoverage bias in the unadjusted estimate that were acting in opposite directions. In addition, the final estimates are lower than the unadjusted estimates for the proportion of preschoolers who have parents who believe it is essential to prepare their child for kindergarten by teaching the child numbers. The final estimates are higher than the unadjusted estimates for the proportion of preschoolers who are age 3 and have a household income between \$15,001 and \$30,000, the proportion of children who have parents with a high school diploma or below and have a mother only in the household, and the proportion of adults ages 25 to 34. These differences indicate potential overall bias in these unadjusted estimates that was reduced through the nonresponse and raking adjustments.

The final, fully adjusted estimates from the NHES:2007 RDD sample were also compared with estimates from previous NHES collections, the CPS, and other relevant extant data sources, similar to the analysis in section 7.2. The results of these comparisons can be found in Hagedorn et al (2008). The comparisons indicated the estimates from the NHES:2007 RDD sample were reasonable, although some differences were found between the NHES:2007 and CPS estimates of household income, parents' highest level of education, and family structure.

#### **7.4 An Examination of Overall Bias**

In addition to the comparison of estimates to external sources, an assessment of overall bias can be done by comparing the published estimates from the RDD survey that use the final, fully adjusted weights to the estimates from the Bias Study under the full treatment (completed extended interviews from FT/RT and FTO cells of figure 4-1; see section 5.2 for an explanation of what is meant by full and reduced treatment). Because the Bias Study sample and data collection effort are designed to capture both telephone nonrespondents and nontelephone households, differences between estimates from the Bias Study and estimates from the RDD sample may be a reflection of either nonresponse or noncoverage bias, or both. This section examines these differences in estimates of characteristics of the target populations for the NHES:2007 surveys. The items included in these comparisons were selected because they include important demographic and socioeconomic characteristics of persons and households, or because they are key outcome variables from the surveys.

**Table 7-13. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the School Readiness Survey: NHES:2007 RDD**

Characteristic	Sample size	SR respondents with unadjusted weights		SR respondents with nonresponse adjusted weights		SR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Participation in center-based care	1,759	68.2	0.90	68.8	0.93	55.3	0.89
Specific skills							
Recognizes all colors	2,265	88.4	0.63	88.2	0.64	82.5	1.02
Counts to 20 or higher	1,747	69.4	1.09	69.6	1.11	63.2	1.30
Recognizes all letters	891	36.0	1.17	36.6	1.21	31.8	1.19
Writes first name	1,709	67.9	1.03	67.8	1.15	59.8	1.27
Holds a pencil	2,298	87.6	0.70	87.5	0.74	86.8	0.95
Speech is often understandable to a stranger	2,170	84.2	0.85	84.2	0.89	81.1	1.20
Reads or pretends to read storybooks	2,582	97.9	0.36	97.9	0.35	98.0	0.31
Parents believe it is essential to do certain things to prepare child for kindergarten							
Teach child the alphabet	1,582	62.4	0.97	62.2	1.05	56.3	1.25
Teach child about sharing	1,732	69.0	1.10	68.2	1.15	61.8	1.37
Teach child to read	1,226	47.2	1.11	47.6	1.20	45.0	1.36
Teach child numbers	1,507	59.2	1.12	59.0	1.19	54.1	1.37
Show child how to hold a pencil	1,104	43.5	1.29	43.7	1.37	40.9	1.37
Family member read to child everyday in the past week	1,575	62.2	0.96	61.7	1.02	55.3	0.97
Parents report usually doing certain reading-related activity with child							
Ask child what is in a picture	1,390	53.4	1.13	54.4	1.24	55.5	1.26
Stop reading and point out letters	818	30.6	1.15	31.3	1.30	31.1	1.46
Ask child to read with parent	589	22.1	0.89	22.9	1.02	23.6	1.26
Talk about the story and what happened	1,419	54.4	1.24	54.9	1.34	56.1	1.44

See notes at end of table.

**Table 7-13. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the School Readiness Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	SR respondents with unadjusted weights		SR respondents with nonresponse adjusted weights		SR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Parents did home activities with child in the past week <sup>1</sup>	1,088	42.3	1.20	41.5	1.34	37.7	1.20
Parents took 3 or more outings with child in the past month <sup>2</sup>	1,175	46.0	1.12	46.0	1.14	39.0	1.10
Child watches 2 or more hours of TV in a typical weekday	1,538	57.8	1.04	57.5	1.04	61.6	1.19
Child has a disability	453	17.2	0.89	17.4	0.93	17.6	1.00
Child's age							
3 years	1,098	37.8	1.04	38.2	1.14	43.0	1.24
4 years	1,159	45.5	1.19	45.6	1.31	42.8	1.41
5 years and older	376	16.7	0.98	16.2	0.99	14.2	0.89
Child's sex							
Male	1,279	50.1	1.00	50.0	1.02	50.3	1.16
Female	1,354	49.9	1.00	50.0	1.02	49.7	1.16
Household urbanicity							
Urban	2,217	80.8	1.01	81.9	1.02	79.9	0.43
Rural	416	19.2	1.01	18.1	1.02	20.1	0.43
Home tenure							
Own	1,945	77.4	0.85	75.1	0.81	61.3	0.47
Rent/other	688	22.6	0.85	24.9	0.81	38.7	0.47

See notes at end of table.

**Table 7-13. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the School Readiness Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	SR respondents with unadjusted weights		SR respondents with nonresponse adjusted weights		SR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
<b>Parents' educational attainment</b>							
High school diploma or below	603	20.2	0.83	20.4	0.87	27.8	1.26
Beyond high school diploma	2,030	79.8	0.83	79.6	0.87	72.2	1.26
<b>Parents' language</b>							
Both/only parent(s) speak(s) English	2,218	87.7	0.65	86.8	0.73	84.9	0.79
One of two parents speaks English	45	1.4	0.23	1.5	0.26	1.5	0.30
No parent speaks English	370	11.0	0.61	11.7	0.68	13.6	0.77
<b>Mothers' employment status</b>							
35 hours or more per week	959	35.6	1.06	35.9	1.07	36.4	1.44
Less than 35 hours per week	597	23.9	0.87	23.6	0.90	20.9	0.94
Looking for work	108	3.6	0.36	3.5	0.37	5.5	0.70
Not in labor force	927	35.5	1.08	35.5	1.16	35.8	1.48
No mother in household	42	1.5	0.28	1.4	0.28	1.5	0.30
<b>Poverty status</b>							
Poor	412	13.3	0.66	13.5	0.71	22.5	0.81
Nonpoor	2,221	86.7	0.66	86.5	0.71	77.5	0.81
<b>Household income</b>							
Less than \$15,000	251	7.7	0.52	7.9	0.55	14.5	0.93
\$15,001 to \$30,000	356	12.1	0.84	12.5	0.90	17.4	1.09
\$30,001 to \$50,000	446	16.6	0.88	16.5	0.85	17.1	0.82
More than \$50,000	1,580	63.6	1.03	63.0	1.01	51.0	0.82

See notes at end of table.

**Table 7-13. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the School Readiness Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	SR respondents with unadjusted weights		SR respondents with nonresponse adjusted weights		SR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Family structure							
Mother and father	2,192	85.6	0.73	85.3	0.79	78.7	0.96
Mother	346	11.2	0.63	11.7	0.70	17.2	0.92
Father	40	1.4	0.25	1.3	0.23	1.4	0.28
Nonparent guardian(s)	55	1.7	0.27	1.7	0.30	2.6	0.54

<sup>1</sup> Told child a story; taught child letters, words, or numbers; taught child songs or music; did arts and crafts with child; played sports, active games or exercised together; and played board games or did puzzles with child.

<sup>2</sup> Any three or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the child was not a player.

NOTE: Shading indicates a significant difference of 5 percentage points or more between the unadjusted and final estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness (SR) Survey of the National Household Education Surveys Program, 2007.

**Table 7-14. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD**

Characteristic	Sample size	PFI respondents with unadjusted weights		PFI respondents with nonresponse adjusted weights		PFI respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Parents participate in 5 or more activities in the student's school <sup>1</sup>	5,576	55.1	0.59	55.4	0.60	53.0	0.62
Parents report school provides information very well							
About how student is doing in school	6,385	61.7	0.60	61.7	0.65	60.9	0.76
About how to help student with his/her homework	4,740	45.6	0.57	46.2	0.59	46.6	0.65
About why student is placed in particular groups or classes	4,481	43.7	0.55	44.0	0.58	44.5	0.65
About how to help student plan for college or vocational school	2,064	33.4	0.74	33.7	0.79	34.0	0.86
About the family's expected role at student's school	5,024	48.4	0.60	48.9	0.64	48.4	0.72
Parent reports being very satisfied with 4 or more aspects of the student's school <sup>2</sup>	7,263	70.3	0.54	70.3	0.56	69.8	0.62
Parents participated in 5 or more home learning activities <sup>3</sup>	2,213	46.4	0.87	46.7	0.94	47.0	1.02
Parents took 3 or more outings with student in the past month <sup>4</sup>	5,321	51.1	0.67	51.5	0.72	49.5	0.77
Parents check to see that student's homework gets done	8,190	83.7	0.49	84.3	0.53	85.4	0.46
Parents received information about free tutoring	4,552	42.5	0.58	42.9	0.62	43.9	0.65

See notes at end of table.

**Table 7-14. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	PFI respondents with unadjusted weights		PFI respondents with nonresponse adjusted weights		PFI respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Parent expects student to earn a college degree or higher	4,360	72.4	0.87	72.4	0.93	69.6	1.02
Family plans to help pay for student's education after high school	4,700	83.6	0.68	83.3	0.73	81.3	0.84
Student participated in school activities	5,965	59.0	0.66	58.0	0.72	56.0	0.76
Student has a disability	2,463	23.2	0.58	22.8	0.61	23.9	0.68
Student's sex							
Male	5,498	51.8	0.60	51.6	0.64	51.8	0.74
Female	5,183	48.2	0.60	48.4	0.64	48.2	0.74
Home tenure							
Own	8,438	81.3	0.49	78.9	0.46	70.0	0.24
Rent/other	2,243	18.7	0.49	21.1	0.46	30.0	0.24
Parents' educational attainment							
High school diploma or below	2,578	22.7	0.53	23.3	0.52	27.8	0.56
Beyond high school diploma	8,103	77.3	0.53	76.7	0.52	72.2	0.56
Parents' language							
Both/only parent(s) speak(s) English	9,437	90.5	0.31	89.6	0.33	88.5	0.34
One of two parents speaks English	159	1.2	0.12	1.3	0.13	1.4	0.16
No parent speaks English	1,085	8.3	0.30	9.1	0.30	10.2	0.32

See notes at end of table.

**Table 7-14. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	PFI respondents with unadjusted weights		PFI respondents with nonresponse adjusted weights		PFI respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
<b>Mothers' employment status</b>							
35 hours or more per week	4,993	44.7	0.60	45.2	0.67	44.2	0.66
Less than 35 hours per week	2,290	23.9	0.47	23.4	0.48	21.8	0.44
Looking for work	393	3.4	0.19	3.4	0.21	4.6	0.33
Not in labor force	2,611	24.9	0.53	24.8	0.57	26.1	0.59
No mother in household	394	3.2	0.18	3.2	0.19	3.3	0.21
<b>Poverty status</b>							
Poor	1,291	11.7	0.37	12.4	0.42	19.2	0.33
Nonpoor	9,390	88.3	0.37	87.6	0.42	80.8	0.33
<b>Household income</b>							
Less than \$15,000	824	6.6	0.32	6.9	0.35	12.2	0.32
\$15,001 to \$30,000	1,321	11.4	0.38	12.1	0.43	15.0	0.40
\$30,001 to \$50,000	1,799	16.3	0.46	16.6	0.47	16.4	0.45
More than \$50,000	6,737	65.7	0.54	64.4	0.56	56.4	0.46
<b>Family structure</b>							
Mother and father	7,995	79.1	0.45	78.0	0.50	72.7	0.54
Mother	1,876	14.8	0.40	15.8	0.44	20.0	0.55
Father	356	2.9	0.18	2.9	0.19	3.0	0.21
Nonparent guardian(s)	454	3.3	0.21	3.3	0.25	4.3	0.39
<b>School type</b>							
Public	8,978	86.9	0.40	86.8	0.45	88.2	0.45
Private	1,392	13.1	0.40	13.2	0.45	11.8	0.45

See notes at end of table.

**Table 7-14. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	PFI respondents with unadjusted weights		PFI respondents with nonresponse adjusted weights		PFI respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
School size							
Under 300	1,480	15.5	0.47	14.9	0.51	14.9	0.57
300-599	3,142	31.3	0.62	30.9	0.62	31.3	0.69
600-999	2,756	27.0	0.57	27.4	0.58	26.7	0.60
1,000 or more	2,910	26.1	0.56	26.7	0.56	27.0	0.52

<sup>1</sup> Any 5 or more of the following: Attended a general school meeting; attended a meeting of the parent-teacher organization or association; went to a regularly scheduled parent-teacher conference with the student's teacher; attended a school or class event because of the student; served as a volunteer in the student's classroom or elsewhere in the school; participated in fundraising for the school; served on a school committee; and met with a guidance counselor in person.

<sup>2</sup> Any 4 or more of the following: School student attends this year; teachers student has this year; academic standards of the school; order and discipline at the school; and way that school staff interact with parents.

<sup>3</sup> Any 5 or more of the following: Told student a story; did arts and crafts with student; played sports, active games or exercised together; worked on projects such as building, making, or fixing something with student not as a chore; talked with student about family history or ethnic heritage; and played board games or did puzzles with student.

<sup>4</sup> Any 3 or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the child was not a player.

NOTE: Shading indicates a significant difference of 5 percentage points or more between the unadjusted and final estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education (PFI) Survey of the National Household Education Surveys Program, 2007.

**Table 7-15. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Adult Education for Work-Related Reasons Survey: NHES:2007 RDD**

Characteristic	Sample size	AEWR respondents with unadjusted weights		AEWR respondents with nonresponse adjusted weights		AEWR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Participates in adult education for work related reasons	3,356	36.0	0.68	37.0	0.73	37.6	0.95
Participates in employer-supported AEWR	2,379	74.2	0.91	75.2	1.14	73.2	1.58
Participates in distance education	1,964	56.2	1.21	56.5	1.33	54.4	1.67
Participates in program to earn a college or university degree	694	7.0	0.31	7.6	0.38	9.7	0.55
Participates in program to earn a vocational or technical diploma	383	3.7	0.25	3.7	0.31	4.1	0.38
Participates in formal apprenticeship program	79	0.9	0.12	1.0	0.14	1.4	0.25
Participates in work-related training or courses	2,899	31.5	0.70	32.2	0.73	31.2	0.90
Participates in 4 or more informal work related learning activities <sup>1</sup>	2,334	27.5	0.68	28.6	0.83	27.6	1.07
Has any condition that limits ability to work	1,190	14.1	0.47	12.9	0.50	13.5	0.68

See notes at end of table.

**Table 7-15. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Adult Education for Work-Related Reasons Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	AEWR respondents with unadjusted weights		AEWR respondents with nonresponse adjusted weights		AEWR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
<b>Age</b>							
16 to 24 years	438	5.8	0.33	6.7	0.41	12.1	0.70
25 to 34 years	738	10.4	0.61	12.0	0.77	16.4	0.92
35 to 44 years	1,091	17.8	0.66	19.9	0.94	19.4	0.81
45 to 54 years	1,595	22.8	0.76	23.0	0.83	20.6	0.83
55 years and older	3,848	43.2	0.79	38.4	0.90	31.6	0.41
<b>Home tenure</b>							
Own	6,289	83.7	0.62	83.4	0.73	70.3	0.34
Rent/other	1,421	16.3	0.62	16.6	0.73	29.7	0.34
<b>Marital status</b>							
Never married	1,320	13.5	0.49	14.0	0.55	22.3	0.80
Currently married	4,329	68.1	0.69	70.4	0.75	61.5	0.86
Other	2,061	18.4	0.58	15.6	0.58	16.2	0.58
<b>Household income</b>							
Less than \$15,000	838	9.4	0.42	8.7	0.47	11.1	0.35
\$15,001 to \$30,000	1,182	14.4	0.56	13.0	0.63	15.0	0.57
\$30,001 to \$50,000	1,495	18.7	0.65	18.5	0.70	20.9	0.92
More than \$50,000	4,195	57.5	0.80	59.8	0.90	53.0	0.90
<b>Language spoken most at home</b>							
English	7,277	93.7	0.45	92.6	0.58	90.1	0.63
Spanish	244	3.6	0.35	4.3	0.45	6.0	0.48
Other language	136	2.0	0.27	2.2	0.31	2.3	0.30
English and Spanish equally	52	0.7	0.12	0.9	0.23	1.6	0.63
English and other language equally	‡	‡	‡	‡	‡	‡	‡

See notes at end of table.

**Table 7-15. Unadjusted, nonresponse adjusted, and final estimates for various characteristics from the Adult Education for Work-Related Reasons Survey: NHES:2007 RDD—Continued**

Characteristic	Sample size	AEWR respondents with unadjusted weights		AEWR respondents with nonresponse adjusted weights		AEWR respondents with final weights	
		Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)	Standard error
Employment status							
Employed	4,311	56.3	0.85	58.4	1.00	58.2	1.09
Unemployed but looking for work	250	3.5	0.41	3.7	0.50	5.7	0.76
Not in the labor force	3,149	40.2	0.79	37.9	0.95	36.1	1.04

‡ Reporting standards not met.

<sup>1</sup> Any 4 or more of the following: Received on-the-job demonstrations of equipment, techniques, or procedures by a supervisor or coworker; received other supervised training or mentoring on the job; self-paced study using books, procedures manuals, audio tapes, or videos; self-paced study using computer-based software tutorials; attended “brown-bag” or informal presentations; attended conferences, trade shows, or conventions related to the adult’s work or profession; and read professional journals, trade publications, or work-related magazines.

NOTE: Shading indicates a significant difference of 5 percentage points or more between the unadjusted and final estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program, 2007.

Table 7-16 contains estimates from the RDD sample and the Bias Study sample of various characteristics from the SR Survey. The Bias Study sample yielded larger estimates of the percentage of preschoolers who can count to 20 or higher and the percentage of preschoolers whose speech is often understandable to a stranger. Additionally, the Bias Study estimate of the percentage of preschoolers who watch two or more hours of television in a typical weekday is higher. Although there are some differences in estimates between the two samples, it is likely that these differences were found mainly as a result of having examined so many characteristics.<sup>42</sup> There is no systematic relationship among these differences that would be indicative of bias.

There is a difference in the estimates of the percentage of preschoolers whose mothers are not in the labor force (36 percent from the RDD sample versus 26 percent from the Bias Study sample). This difference may be an indication of accessibility, with mothers who are not in the labor force being more available and more willing to complete the interview by telephone than mothers with other employment status. One other curious difference is in the sex distribution of preschoolers; the Bias Study sample estimated 62 percent of preschoolers to be male, compared to 50 percent for the RDD sample and 52 percent for the CPS sample in October 2005; the reason for this difference is unclear.<sup>43</sup>

In table 7-17, estimates from the RDD sample and the Bias Study sample of characteristics from the PFI Survey are compared. There are no significant differences of 5 percentage points or more. However, there are some smaller differences of statistical significance. For instance, the estimated percentage of parents who report the school provides information very well about how to help the student plan for college or vocational school is 34 percent for the RDD sample, which is 13 percent lower than the Bias Study estimate. In addition, the estimated percentage of students in schools of size 1,000 or more is 12 percent lower for the RDD sample than the Bias Study sample (27 percent versus 31 percent).

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<sup>42</sup> Another possible explanation for the differences is the later data collection for the field portion of the Bias Study sample. However, the mean and median age-in-months at the time of interview of preschoolers in the RDD sample were compared to that for the Bias Study sample, and no significant differences were found. While the Bias Study preschoolers may have had more months of preschool/daycare, this can not be tested, and therefore there is not evidence to attribute the differences to the data collection schedules.

<sup>43</sup> The skewed sex distribution for the Bias Study sample is also evident before weighting adjustments (see Appendix G) and for the reduced effort (see chapter 8). To evaluate the effect of the skewed sex distribution on the analysis of overall bias, the Bias Study weights were re-raked, including sex as an additional raking dimension. The analysis in Table 7-16 was then reproduced with the new weights. The conclusions remained the same, with a few exceptions. First, the difference between the RDD sample and Bias Study sample estimates of the percentage of preschoolers who can count to 20 or higher was no longer of substantive importance after re-raking. The estimated bias was -5.2 percentage points before re-raking and -4.8 percentage points after. Second, the difference in the percentage of preschoolers of age 4 years was statistically significant after re-raking. The estimated bias was 5.5 percentage points (not significant) before re-raking and 6.7 percentage points after. Finally, the difference in the percentage of preschoolers whose mother was looking for work increased from -4.5 percentage points (not of substantive importance) before re-raking to a statistically significant and substantive difference of -5.5 percentage points after.

**Table 7-16. Estimates of overall bias for various characteristics from the School Readiness Survey: NHES:2007 RDD and NHES:2007 Bias Study**

Characteristic	All RDD sample SR respondents			All Bias Study sample SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Participation in center-based care	1,759	55.3	0.89	177	51.1	2.29	4.2	2.46	8.2
Specific skills									
Recognizes all colors	2,265	82.5	1.02	249	85.6	2.34	-3.1	2.55	-3.6
Counts to 20 or higher	1,747	63.2	1.30	198	68.4	2.27	-5.2	2.61	-7.6
Recognizes all letters	891	31.8	1.19	93	29.4	2.89	2.4	3.12	8.2
Writes first name	1,709	59.8	1.27	193	60.4	3.08	-0.6	3.33	-0.9
Holds a pencil	2,298	86.8	0.95	252	86.7	1.90	#	2.12	0.1
Speech is often understandable to a stranger	2,170	81.1	1.20	249	87.3	2.17	-6.2	2.48	-7.1
Reads or pretends to read storybooks	2,582	98.0	0.31	289	99.2	0.45	-1.2	0.55	-1.2
Parents believe it is essential to do certain things to prepare child for kindergarten									
Teach child the alphabet	1,582	56.3	1.25	171	57.7	2.72	-1.4	2.99	-2.5
Teach child about sharing	1,732	61.8	1.37	177	57.8	2.97	4.0	3.27	6.9
Teach child to read	1,226	45.0	1.36	139	48.0	3.47	-3.0	3.73	-6.3
Teach child numbers	1,507	54.1	1.37	155	51.7	2.64	2.4	2.98	4.6
Show child how to hold a pencil	1,104	40.9	1.37	121	37.9	2.88	3.0	3.19	8.0
Family member read to child everyday in the past week	1,575	55.3	0.97	169	56.9	4.02	-1.6	4.14	-2.8

See notes at end of table.

**Table 7-16. Estimates of overall bias for various characteristics from the School Readiness Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample SR respondents			All Bias Study sample SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents report usually doing certain reading-related activity with child									
Ask child what is in a picture	1,390	55.5	1.26	159	52.9	4.00	2.6	4.20	4.9
Stop reading and point out letters	818	31.1	1.46	95	31.9	4.14	-0.8	4.39	-2.6
Ask child to read with parent	589	23.6	1.26	84	29.7	3.05	-6.1	3.30	-20.6
Talk about the story and what happened	1,419	56.1	1.44	165	60.3	3.18	-4.3	3.49	-7.0
Parents did home activities with child in the past week <sup>3</sup>	1,088	37.7	1.20	123	41.7	3.23	-4.0	3.45	-9.5
Parents took 3 or more outings with child in the past month <sup>4</sup>	1,175	39.0	1.10	138	46.0	3.71	-7.0	3.87	-15.3
Child watches 2 or more hours of TV in a typical weekday	1,538	61.6	1.19	179	71.1	2.10	-9.5	2.41	-13.3
Child has a disability	453	17.6	1.00	37	14.1	3.34	3.5	3.49	24.8
Child's age									
3 years	1,098	43.0	1.24	128	43.9	2.86	-0.9	3.12	-2.1
4 years	1,159	42.8	1.41	116	37.3	2.64	5.5	2.99	14.8
5 years and older	376	14.2	0.89	48	18.8	3.08	-4.6	3.20	-24.4

See notes at end of table.

**Table 7-16. Estimates of overall bias for various characteristics from the School Readiness Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample SR respondents			All Bias Study sample SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Child's sex									
Male	1,279	50.3	1.16	169	62.3	2.97	-12.0	3.19	-19.3
Female	1,354	49.7	1.16	123	37.7	2.97	12.0	3.19	31.9
Household urbanicity									
Urban	2,217	79.9	0.43	247	80.8	1.62	-0.9	1.67	-1.2
Rural	416	20.1	0.43	45	19.2	1.62	0.9	1.67	4.9
Home tenure									
Own	1,945	61.3	0.47	201	62.1	0.87	-0.8	0.99	-1.3
Rent/other	688	38.7	0.47	91	37.9	0.87	0.8	0.99	2.1
Parents' educational attainment									
High school diploma or below	603	27.8	1.26	91	34.5	3.80	-6.7	4.00	-19.5
Beyond high school diploma	2,030	72.2	1.26	201	65.5	3.80	6.7	4.00	10.3
Parents' language									
Both/only parent(s) speak(s)									
English	2,218	84.9	0.79	254	88.0	2.48	-3.1	2.60	-3.5
One of two parents speaks									
English	45	1.5	0.30	‡	‡	‡	0.5	0.78	50.0
No parent speaks English	370	13.6	0.77	29	11.0	2.60	2.6	2.71	23.9

See notes at end of table.

**Table 7-16. Estimates of overall bias for various characteristics from the School Readiness Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample SR respondents			All Bias Study sample SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
<b>Mothers' employment status</b>									
35 hours or more per week	959	36.4	1.44	111	41.6	3.34	-5.2	3.64	-12.6
Less than 35 hours per week	597	20.9	0.94	69	20.4	3.21	0.5	3.35	2.3
Looking for work	108	5.5	0.70	23	10.0	2.49	-4.5	2.59	-44.7
Not in labor force	927	35.8	1.48	83	26.1	2.65	9.7	3.04	37.2
No mother in household	42	1.5	0.30	6!	1.9!	1.18!	-0.4	1.21	-20.2
<b>Poverty status</b>									
Poor	412	22.5	0.81	80	24.5	2.19	-2.0	2.34	-8.1
Nonpoor	2,221	77.5	0.81	212	75.5	2.19	2.0	2.34	2.6
<b>Household income</b>									
Less than \$15,000	251	14.5	0.93	52	15.3	1.71	-0.8	1.94	-5.3
\$15,001 to \$30,000	356	17.4	1.09	62	17.6	2.39	-0.2	2.63	-0.9
\$30,001 to \$50,000	446	17.1	0.82	50	17.6	2.77	-0.5	2.89	-2.9
More than \$50,000	1,580	51.0	0.82	128	49.5	2.92	1.5	3.03	3.0

See notes at end of table.

**Table 7-16. Estimates of overall bias for various characteristics from the School Readiness Survey: NHES:2007 RDD and NHES:2007 Bias Study —Continued**

Characteristic	All RDD sample SR respondents			All Bias Study sample SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Family structure									
Mother and father	2,192	78.7	0.96	219	73.4	4.36	5.3	4.46	7.2
Mother	346	17.2	0.92	60	22.4	3.09	-5.2	3.23	-23.1
Father	40	1.4	0.28	6!	1.9!	1.18!	-0.5	1.21	-25.5
Nonparent guardian(s)	55	2.6	0.54	7	2.3	0.96	0.3	1.10	11.6

# Rounds to zero.

! Interpret with caution.

‡ Reporting standards not met.

<sup>1</sup> Bias is estimated as the difference between the “all RDD sample SR respondents” estimate and the “all Bias Study sample SR respondents” estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the “all Bias Study sample SR respondents” estimate, and is expressed as a percentage.

<sup>3</sup> Told child a story; taught child letters, words, or numbers; taught child songs or music; did arts and crafts with child; played sports, active games or exercised together; and played board games or did puzzles with child.

<sup>4</sup> Any three or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the child was not a player.

NOTE: Shading indicates a significant difference of 5 percentage points or more.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness (SR) Survey of the National Household Education Surveys Program, 2007.

**Table 7-17. Estimates of overall bias for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD and NHES:2007 Bias Study**

Characteristic	All RDD sample PFI respondents			All Bias Study sample PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents participate in 5 or more activities in the student's school <sup>3</sup>	5,576	53.0	0.62	566	52.1	2.22	0.9	2.30	1.7
Parents report school provides information very well									
About how student is doing in school	6,385	60.9	0.76	668	58.2	2.20	2.7	2.33	4.6
About how to help student with his/her homework	4,740	46.6	0.65	525	47.9	2.07	-1.3	2.17	-2.7
About why student is placed in particular groups or classes	4,481	44.5	0.65	496	45.6	1.67	-1.1	1.79	-2.4
About how to help student plan for college or vocational school	2,064	34.0	0.86	237	38.9	1.65	-4.9	1.86	-12.6
About the family's expected role at student's school	5,024	48.4	0.72	539	46.9	1.93	1.5	2.06	3.2
Parent reports being very satisfied with 4 or more aspects of the student's school <sup>4</sup>	7,263	69.8	0.62	798	73.7	1.87	-3.9	1.97	-5.3
Parents participated in 5 or more home learning activities <sup>5</sup>	2,213	47.0	1.02	229	42.2	2.28	4.8	2.50	11.4

See notes at end of table.

**Table 7-17. Estimates of overall bias for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample PFI respondents			All Bias Study sample PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents took 3 or more outings with student in the past month <sup>6</sup>	5,321	49.5	0.77	559	50.3	2.09	-0.8	2.23	-1.6
Parents check to see that student's homework gets done	8,190	85.4	0.46	885	87.9	0.99	-2.5	1.09	-2.8
Parents received information about free tutoring	4,552	43.9	0.65	465	42.6	2.15	1.3	2.25	3.1
Parent expects student to earn a college degree or higher	4,360	69.6	1.02	424	67.2	2.87	2.4	3.05	3.6
Family plans to help pay for student's education after high school	4,700	81.3	0.84	475	83.1	2.19	-1.8	2.35	-2.2
Student participated in school activities	5,965	56.0	0.76	624	55.8	1.89	0.2	2.04	0.4
Student has a disability	2,463	23.9	0.68	257	23.0	2.16	0.9	2.26	3.9
Student's sex									
Male	5,498	51.8	0.74	575	51.8	2.10	#	2.23	#
Female	5,183	48.2	0.74	548	48.2	2.10	#	2.23	#
Home tenure									
Own	8,438	70.0	0.24	837	69.7	0.80	0.3	0.84	0.4
Rent/other	2,243	30.0	0.24	286	30.3	0.80	-0.3	0.84	-1.0

See notes at end of table.

**Table 7-17. Estimates of overall bias for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample PFI respondents			All Bias Study sample PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents' educational attainment									
High school diploma or below	2,578	27.8	0.56	326	31.7	2.31	-3.9	2.38	-12.3
Beyond high school diploma	8,103	72.2	0.56	797	68.3	2.31	3.9	2.38	5.7
Parents' language									
Both/only parent(s) speak(s)									
English	9,437	88.5	0.34	1012	90.9	1.29	-2.4	1.33	-2.6
One of two parents speaks									
English	159	1.4	0.16	22	2.1	0.61	-0.7	0.63	-33.3
No parent speaks English	1,085	10.2	0.32	66	7.0	1.17	3.2	1.21	45.7
Mothers' employment status									
35 hours or more per week	4,993	44.2	0.66	521	47.0	2.12	-2.8	2.22	-6.0
Less than 35 hours per week	2,290	21.8	0.44	260	21.1	1.68	0.7	1.74	3.3
Looking for work	393	4.6	0.33	45	4.1	0.56	0.5	0.65	12.2
Not in labor force	2,611	26.1	0.59	241	23.4	1.24	2.7	1.37	11.5
No mother in household	394	3.3	0.21	56	4.4	0.55	-1.1	0.59	-25.0
Poverty status									
Poor	1,291	19.2	0.33	221	19.7	1.05	-0.5	1.10	-2.5
Nonpoor	9,390	80.8	0.33	902	80.3	1.05	0.5	1.10	0.6
Household income									
Less than \$15,000	824	12.2	0.32	153	12.9	0.64	-0.7	0.72	-5.4
\$15,001 to \$30,000	1,321	15.0	0.40	179	15.2	1.22	-0.2	1.28	-1.3
\$30,001 to \$50,000	1,799	16.4	0.45	171	16.6	2.23	-0.2	2.27	-1.2
More than \$50,000	6,737	56.4	0.46	620	55.3	2.22	1.1	2.27	2.0

See notes at end of table.

**Table 7-17. Estimates of overall bias for various characteristics from the Parent and Family Involvement Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample PFI respondents			All Bias Study sample PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Family structure									
Mother and father	7,995	72.7	0.54	823	74.1	1.88	-1.4	1.96	-1.9
Mother	1,876	20.0	0.55	204	18.6	1.61	1.4	1.70	7.5
Father	356	3.0	0.21	54	4.0	0.42	-1.0	0.47	-25.0
Nonparent guardian(s)	454	4.3	0.39	42	3.3	0.55	1.0	0.67	30.3
School type									
Public	8,978	88.2	0.45	989	89.9	1.65	-1.7	1.71	-1.9
Private	1,392	11.8	0.45	114	10.1	1.65	1.7	1.71	16.8
School size									
Under 300	1,480	14.9	0.57	167	14.6	1.51	0.3	1.61	2.1
300-599	3,142	31.3	0.69	321	28.8	2.59	2.5	2.68	8.7
600-999	2,756	26.7	0.60	286	25.8	1.81	0.9	1.91	3.5
1,000 or more	2,910	27.0	0.52	323	30.8	1.65	-3.8	1.73	-12.3

# Rounds to zero.

<sup>1</sup> Bias is estimated as the difference between the “all RDD sample PFI respondents” estimate and the “all Bias Study sample PFI respondents” estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the “all Bias Study sample PFI respondents” estimate, and is expressed as a percentage.

<sup>3</sup> Any 5 or more of the following: Attended a general school meeting; attended a meeting of the parent-teacher organization or association; went to a regularly scheduled parent-teacher conference with the student’s teacher; attended a school or class event because of the student; served as a volunteer in the student’s classroom or elsewhere in the school; participated in fundraising for the school; served on a school committee; and met with a guidance counselor in person.

<sup>4</sup> Any 4 or more of the following: School student attends this year; teachers student has this year; academic standards of the school; order and discipline at the school; and way that school staff interact with parents.

<sup>5</sup> Any 5 or more of the following: Told student a story; did arts and crafts with student; played sports, active games or exercised together; worked on projects such as building, making, or fixing something with student not as a chore; talked with student about family history or ethnic heritage; and played board games or did puzzles with student.

<sup>6</sup> Any 3 or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the child was not a player.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education (PFI) Survey of the National Household Education Surveys Program, 2007.

Table 7-18 contains a comparison of estimates from the RDD and Bias Study samples of characteristics from the AEW Survey. There are differences in the marital status estimates, with the RDD sample yielding a higher estimate (62 percent) of currently married adults than the Bias Study sample (56 percent). With an estimate of 56 percent from the March 2006 Current Population Survey (CPS),<sup>44</sup> it is likely that the bias is in the RDD estimate, and that this may be indicative of the relative inaccessibility and undercoverage of unmarried adults.

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<sup>44</sup> Based on independent tabulations of the March 2006 CPS data.

**Table 7-18. Estimates of overall bias for various characteristics from the Adult Education for Work-Related Reasons Survey: NHES:2007 RDD and NHES:2007 Bias Study**

Characteristic	All RDD sample AEWR respondents			All Bias Study sample AEWR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Participates in adult education for work-related reasons	3,356	37.6	0.95	495	39.1	1.76	-1.5	2.00	-3.8
Participates in employer-supported AEWR	2,379	73.2	1.58	347	70.0	3.57	3.2	3.90	4.6
Participates in distance education	1,964	54.4	1.67	285	60.1	2.98	-5.7	3.41	-9.4
Participates in program to earn a college or university degree	694	9.7	0.55	124	9.4	0.81	0.3	0.98	3.0
Participates in program to earn a vocational or technical diploma	383	4.1	0.38	56	4.2	0.70	-0.1	0.80	-1.9
Participates in formal apprenticeship program	79	1.4	0.25	5!	0.5!	0.33!	0.9	0.42	197.9
Participates in work-related training or courses	2,899	31.2	0.90	416	33.2	1.49	-2.0	1.74	-6.0
Participates in 4 or more informal work-related learning activities <sup>3</sup>	2,334	27.6	1.07	324	29.2	2.25	-1.6	2.49	-5.4
Has any condition that limits ability to work	1,190	13.5	0.68	153	15.2	2.63	-1.7	2.71	-11.2

See notes at end of table.

**Table 7-18. Estimates of overall bias for various characteristics from the Adult Education for Work-Related Reasons Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample AEWR respondents			All Bias Study sample AEWR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
<b>Age</b>									
16 to 24 years	438	12.1	0.70	104	13.1	1.17	-1.0	1.36	-7.8
25 to 34 years	738	16.4	0.92	168	17.5	1.86	-1.1	2.08	-6.3
35 to 44 years	1,091	19.4	0.81	131	16.9	1.31	2.5	1.54	14.8
45 to 54 years	1,595	20.6	0.83	217	21.4	1.75	-0.8	1.94	-3.6
55 years and older	3,848	31.6	0.41	445	31.1	1.20	0.5	1.27	1.6
<b>Home tenure</b>									
Own	6,289	70.3	0.34	794	70.1	0.79	0.2	0.86	0.3
Rent/other	1,421	29.7	0.34	271	29.9	0.79	-0.2	0.86	-0.8
<b>Marital status</b>									
Never married	1,320	22.3	0.80	249	24.2	1.42	-1.9	1.63	-7.7
Currently married	4,329	61.5	0.86	531	55.9	2.06	5.6	2.23	10.1
Other	2,061	16.2	0.58	285	20.0	1.69	-3.8	1.79	-18.9
<b>Household income</b>									
Less than \$15,000	838	11.1	0.35	194	10.6	0.54	0.5	0.64	4.5
\$15,001 to \$30,000	1,182	15.0	0.57	212	16.1	1.24	-1.1	1.36	-6.7
\$30,001 to \$50,000	1,495	20.9	0.92	188	23.1	1.59	-2.2	1.84	-9.3
More than \$50,000	4,195	53.0	0.90	471	50.3	1.30	2.8	1.58	5.5

See notes at end of table.

**Table 7-18. Estimates of overall bias for various characteristics from the Adult Education for Work-Related Reasons Survey: NHES:2007 RDD and NHES:2007 Bias Study—Continued**

Characteristic	All RDD sample AEW respondents			All Bias Study sample AEW respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Language spoken most at home									
English	7,277	90.1	0.63	999	92.4	1.60	-2.3	1.72	-2.5
Spanish	244	6.0	0.48	39	4.7	1.08	1.3	1.19	26.3
Other language	136	2.3	0.30	18	2.1	0.89	0.2	0.94	9.0
English and Spanish equally	52	1.6	0.63	8	0.7	0.31	0.9	0.70	142.4
English and other language equally	‡	‡	‡	‡	‡	‡	‡	‡	‡
Employment status									
Employed	4,311	58.2	1.09	627	61.2	1.93	-3.0	2.21	-4.8
Unemployed but looking for work	250	5.7	0.76	44	5.0	1.28	0.7	1.49	13.1
Not in the labor force	3,149	36.1	1.04	394	33.8	1.35	2.3	1.70	6.8

! Interpret with caution.

‡ Reporting standards not met.

<sup>1</sup> Bias is estimated as the difference between the “all RDD sample AEW respondents” estimate and the “all Bias Study sample AEW respondents” estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the “all Bias Study sample AEW respondents” estimate, and is expressed as a percentage.

<sup>3</sup> Any 4 or more of the following: Received on-the-job demonstrations of equipment, techniques, or procedures by a supervisor or coworker; received other supervised training or mentoring on the job; self-paced study using books, procedures manuals, audio tapes, or videos; self-paced study using computer-based software tutorials; attended “brown-bag” or informal presentations; attended conferences, trade shows, or conventions related to the adult’s work or profession; and read professional journals, trade publications, or work-related magazines.

NOTE: Shading indicates a significant difference of 5 percentage points or more.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program, 2007.

## 8. COMPONENTS OF BIAS

Chapter 7 discussed an examination of overall bias in estimates from the NHES:2007 surveys. In this chapter, we examine separately the two major potential components of bias, nonresponse bias and noncoverage bias. As discussed in chapter 1, nonresponse bias occurs when sampled units fail to respond to the survey request and those units differ in some systematic fashion from those that do respond. Noncoverage bias occurs when units that are not included on the sampling frame differ in a systematic way from units that are included on the sampling frame. Section 8.1 examines nonresponse bias in estimates from the NHES:2007 surveys, and section 8.2 contains an evaluation of noncoverage bias in NHES:2007.

### 8.1 An Examination of Nonresponse Bias

As discussed in chapter 3, prior to selecting the sample for the Bias Study, telephone numbers were matched to addresses to the extent possible. When a telephone number was available for a sampled address, the case was attempted by the Telephone Research Center (TRC) using the standard telephone data collection protocol. When the Screener could not be completed by telephone (due to noncontact, unit nonresponse, or the lack of a matching telephone number), the case was sent to the field for attempts to complete an interview, as described in chapter 4.

Thus, nonresponse bias can be assessed by examining differences in estimates from the reduced effort (completed extended interviews from FT/RT cells of figure 4-1) and the full effort (completed extended interviews from FT/RT and FTO cells of figure 4-1).<sup>45</sup> Nonmatched cases (Bias Study cases with no telephone number match available) could not be attempted by the TRC, but were attempted in the field. Thus, it should be noted that the reduced effort estimates were calculated using data from both the TRC respondents and the nonmatched cases, in order to eliminate the effect nonmatched cases would have on estimates of nonresponse bias. The weighting and estimation approach used to include the nonmatched cases in the reduced effort estimates is discussed in chapter 6.

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<sup>45</sup> As discussed in chapter 5, in the reduced effort, the Telephone Research Center (TRC) status is treated as the final household status for Bias Study cases attempted in the TRC. In the full effort, the final household status is based on efforts in both the TRC and in the field. For example, a case that was a final refusal in the TRC but responded to the Screener in the field is treated as a nonrespondent in the reduced effort but as a respondent in the full effort. A total of 4,894 cases was respondents with the full effort, and 4,235 were respondents under the reduced effort.

To better understand the rationale for including the nonmatched cases in both sets, consider the difference between the reduced and full effort estimates as

$$\begin{aligned}\hat{d} &= \hat{y}_R - \hat{y}_F \\ &= \sum_{trc} w_i y_i + \sum_{nm} w_i y_i - (\sum_{trc} w'_i y_i + \sum_{field} w'_i y_i + \sum_{nm} w'_i y_i)\end{aligned}$$

where the subscript sum over *trc* is the respondents in the TRC, *nm* sums over the respondents in the nonmatched cases, *field* sums over the respondents in the field, and the case weights ( $w_i$  and  $w'_i$ ) are defined in chapter 6 for the two effort levels. If the weights were identical for the two sets, then it is clear that including the nonmatched cases would have no effect on the estimated difference. The weights do differ, mainly due to the adjustments to population control totals, so this simple result does not hold exactly but the inclusion of the nonmatched cases in both sets should still essentially cancel.

The analyses in Chapter 7 established the effectiveness of the nonresponse adjustments and calibration adjustments in reducing the amount of potential bias in the examined variables. Thus, this chapter focuses on measuring the potential bias in fully weighted estimates (i.e., those computed using nonresponse adjustments and raking). This provides the basis for evaluating the potential for bias due to nonresponse and noncoverage in the published estimates. Nonetheless, as was demonstrated in section 7.3, analyses looking at base-weighted estimates are informative and all analyses shown in this section are replicated using base weights in appendix G. Note that the unadjusted base weight is the product of the household base weight and the reciprocal of the child's or adult's within-household selection probability.

Tables 8-1, 8-2, and 8-3 contain estimates of nonresponse bias for various characteristics from the School Readiness (SR), Parent and Family Involvement in Education (PFI), and Adult Education for Work-Related Reasons (AEWR) surveys, respectively. As is the case with all tables in this chapter, the estimates reflect skip patterns; the denominators of the percentages include only respondents to the item. As these tables demonstrate, the comparison of the full effort estimates to the reduced effort estimates yields no indication of nonresponse bias. There are no significant differences of 5 percentage points or more among any of the comparisons made in the tables. Comparisons using unadjusted base weights give the same conclusions.

**Table 8-1. Estimates of nonresponse bias for various characteristics from the School Readiness Survey: NHES:2007 Bias Study**

Characteristic	Reduced treatment SR respondents			Full treatment SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Participation in center-based care	143	51.0	2.13	177	51.1	2.29	-0.1	0.85	-0.2
Specific skills									
Recognizes all colors	207	85.0	2.35	249	85.6	2.34	-0.6	0.47	-0.7
Counts to 20 or higher	165	68.5	2.11	198	68.4	2.27	0.2	1.03	0.3
Recognizes all letters	78	29.6	3.59	93	29.4	2.89	0.2	1.11	0.7
Writes first name	158	59.4	3.13	193	60.4	3.08	-0.9	1.07	-1.5
Holds a pencil	210	86.6	2.13	252	86.7	1.90	-0.1	0.66	-0.1
Speech is often understandable to a stranger	207	86.2	2.43	249	87.3	2.17	-1.1	0.45	-1.3
Reads or pretends to read storybooks	242	98.8	0.62	289	99.2	0.45	-0.3	0.19	-0.3
Parents believe it is essential to do certain things to prepare child for kindergarten									
Teach child the alphabet	143	57.7	2.30	171	57.7	2.72	#	0.96	#
Teach child about sharing	149	58.7	2.50	177	57.8	2.97	0.9	1.10	1.6
Teach child to read	117	47.2	4.06	139	48.0	3.47	-0.8	1.06	-1.7
Teach child numbers	129	51.5	2.47	155	51.7	2.64	-0.2	0.85	-0.4
Show child how to hold a pencil	99	37.2	3.11	121	37.9	2.88	-0.7	0.98	-1.8
Family member read to child everyday in the past week	145	57.4	4.43	169	56.9	4.02	0.5	1.35	0.9

See notes at end of table.

**Table 8-1. Estimates of nonresponse bias for various characteristics from the School Readiness Survey: NHES:2007 Bias Study—  
Continued**

Characteristic	Reduced treatment SR respondents			Full treatment SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents report usually doing certain reading-related activity with child									
Ask child what is in a picture	133	52.8	3.86	159	52.9	4.00	-0.1	0.82	-0.2
Stop reading and point out letters	81	31.6	4.17	95	31.9	4.14	-0.4	0.76	-1.3
Ask child to read with parent	72	29.4	3.35	84	29.7	3.05	-0.3	0.90	-1.0
Talk about the story and what happened	140	59.6	3.29	165	60.3	3.18	-0.7	0.91	-1.2
Parents did home activities with child in the past week <sup>3</sup>	104	41.1	3.14	123	41.7	3.23	-0.6	1.01	-1.4
Parents took 3 or more outings with child in the past month <sup>4</sup>	115	46.3	3.82	138	46.0	3.71	0.3	1.29	0.7
Child watches 2 or more hours of TV in a typical weekday	151	71.4	2.30	179	71.1	2.10	0.4	0.96	0.6
Child has a disability	30	14.8	3.63	37	14.1	3.34	0.7	0.70	5.0
Child's age									
3 years	108	44.6	2.84	128	43.9	2.86	0.7	1.19	1.6
4 years	95	35.6	2.30	116	37.3	2.64	-1.7	1.21	-4.6
5 years and older	42	19.8	3.19	48	18.8	3.08	1.0	0.85	5.3
Child's sex									
Male	145	63.0	3.42	169	62.3	2.97	0.7	1.11	1.1
Female	100	37.0	3.42	123	37.7	2.97	-0.7	1.11	-1.9

See notes at end of table.

**Table 8-1. Estimates of nonresponse bias for various characteristics from the School Readiness Survey: NHES:2007 Bias Study—  
Continued**

Characteristic	Reduced treatment SR respondents			Full treatment SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Household urbanicity									
Urban	205	80.1	1.97	247	80.8	1.62	-0.7	0.44	-0.9
Rural	40	19.9	1.97	45	19.2	1.62	0.7	0.44	3.6
Home tenure									
Own	165	62.2	0.72	201	62.1	0.87	0.1	0.36	0.2
Rent/other	80	37.8	0.72	91	37.9	0.87	-0.1	0.36	-0.3
Parents' educational attainment									
High school diploma or below	76	34.3	3.40	91	34.5	3.80	-0.3	0.83	-0.9
Beyond high school diploma	169	65.7	3.40	201	65.5	3.80	0.3	0.83	0.5
Parents' language									
Both/only parent(s) speak(s)									
English	212	87.7	2.53	254	88.0	2.48	-0.3	0.31	-0.3
One of two parents speaks									
English	‡	‡	‡	‡	‡	‡	‡	‡	‡
No parent speaks English	26	11.3	2.62	29	11.0	2.60	0.3	0.32	2.7
Mothers' employment status									
35 hours or more per week	89	39.2	3.09	111	41.6	3.34	-2.5	0.66	-6.0
Less than 35 hours per week	55	20.2	3.24	69	20.4	3.21	-0.2	0.71	-1.0
Looking for work	23	11.3	2.58	23	10.0	2.49	1.3	0.31	13.0
Not in labor force	74	27.8	2.85	83	26.1	2.65	1.7	0.59	6.5
No mother in household	4!	1.5!	1.15!	6!	1.9!	1.18!	-0.4	0.48	-21.1!

See notes at end of table.

**Table 8-1. Estimates of nonresponse bias for various characteristics from the School Readiness Survey: NHES:2007 Bias Study—  
Continued**

Characteristic	Reduced treatment SR respondents			Full treatment SR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Poverty status									
Poor	61	24.7	2.29	80	24.5	2.19	0.2	0.39	0.8
Nonpoor	184	75.3	2.29	212	75.5	2.19	-0.2	0.39	-0.3
Household income									
Less than \$15,000	39	15.1	1.95	52	15.3	1.71	-0.2	0.50	-1.3
\$15,001 to \$30,000	47	17.5	2.65	62	17.6	2.39	-0.1	0.54	-0.6
\$30,001 to \$50,000	42	16.6	2.71	50	17.6	2.77	-1.0	0.64	-5.7
More than \$50,000	117	50.8	3.23	128	49.5	2.92	1.3	0.92	2.6
Family structure									
Mother and father	187	74.3	4.61	219	73.4	4.36	0.9	0.96	1.2
Mother	49	22.3	3.39	60	22.4	3.09	-0.1	0.88	-0.4
Father	4!	1.5!	1.15!	6!	1.9!	1.18!	-0.4	0.48	-21.1!
Nonparent guardian(s)	5	1.9	0.83	7	2.3	0.96	-0.4	0.46	-17.4

# Rounds to zero.

! Interpret with caution.

‡ Reporting standards not met.

<sup>1</sup> Bias is estimated as the difference between the reduced treatment SR respondent estimate and the full treatment SR respondent estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the full treatment SR respondent estimate, and is expressed as a percentage.

<sup>3</sup> Told child a story; taught child letters, words, or numbers; taught child songs or music; did arts and crafts with child; played sports, active games or exercised together; and played board games or did puzzles with child.

<sup>4</sup> Any three or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the child was not a player.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness (SR) Survey of the National Household Education Surveys Program, 2007.

**Table 8-2. Estimates of nonresponse bias for various characteristics from the Parent and Family Involvement in Education (PFI) Survey: NHES:2007 Bias Study**

Characteristic	Reduced treatment PFI respondents			Full treatment PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents participate in 5 or more activities in the student's school <sup>3</sup>	478	51.0	2.39	566	52.1	2.22	-1.1	0.53	-2.1
Parents report school provides information very well									
About how student is doing in school	568	58.5	2.15	668	58.2	2.20	0.3	0.49	0.5
About how to help student with his/her homework	449	48.6	2.04	525	47.9	2.07	0.7	0.50	1.5
About why student is placed in particular groups or classes	419	45.9	1.57	496	45.6	1.67	0.3	0.54	0.7
About how to help student plan for college or vocational school	205	40.1	1.60	237	38.9	1.65	1.1	0.72	2.8
About the family's expected role at student's school	460	47.5	1.92	539	46.9	1.93	0.6	0.54	1.3
Parent reports being very satisfied with 4 or more aspects of the student's school <sup>4</sup>	685	74.4	1.80	798	73.7	1.87	0.8	0.69	1.1
Parents participated in 5 or more home learning activities <sup>5</sup>	194	42.0	2.57	229	42.2	2.28	-0.3	0.62	-0.7
Parents took 3 or more outings with student in the past month <sup>6</sup>	472	49.5	2.25	559	50.3	2.09	-0.8	0.47	-1.6

See notes at end of table.

**Table 8-2. Estimates of nonresponse bias for various characteristics from the Parent and Family Involvement in Education (PFI) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Reduced treatment PFI respondents			Full treatment PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents check to see that student's homework gets done	748	87.3	1.06	885	87.9	0.99	-0.5	0.37	-0.6
Parents received information about free tutoring	396	42.1	2.25	465	42.6	2.15	-0.4	0.66	-0.9
Parent expects student to earn a college degree or higher	369	67.8	3.38	424	67.2	2.87	0.6	0.87	0.9
Family plans to help pay for student's education after high school	414	83.5	2.24	475	83.1	2.19	0.4	0.74	0.5
Student participated in school activities	531	55.8	2.25	624	55.8	1.89	0.1	0.72	0.2
Student has a disability	211	21.7	2.15	257	23.0	2.16	-1.3	0.63	-5.7
Student's sex									
Male	500	52.1	2.19	575	51.8	2.10	0.3	0.49	0.6
Female	459	47.9	2.19	548	48.2	2.10	-0.3	0.49	-0.6
Household urbanicity									
Urban	797	81.7	0.08	933	81.8	0.06	#	0.03	#
Rural	162	18.3	0.08	190	18.2	0.06	#	0.03	#
Home tenure									
Own	708	69.7	0.77	837	69.7	0.80	#	0.13	#
Rent/other	251	30.3	0.77	286	30.3	0.80	#	0.13	#

See notes at end of table.

**Table 8-2. Estimates of nonresponse bias for various characteristics from the Parent and Family Involvement in Education (PFI) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Reduced treatment PFI respondents			Full treatment PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents' educational attainment									
High school diploma or below	269	31.0	2.35	326	31.7	2.31	-0.7	0.54	-2.2
Beyond high school diploma	690	69.0	2.35	797	68.3	2.31	0.7	0.54	1.0
Parents' language									
Both/only parent(s) speak(s)									
English	861	90.8	1.18	1012	90.9	1.29	-0.1	0.24	-0.1
One of two parents speaks									
English	20	2.1	0.55	22	2.1	0.61	0.0	0.15	0.0
No parent speaks English	59	7.1	1.18	66	7.0	1.17	0.1	0.15	1.4
Mothers' employment status									
35 hours or more per week	445	46.4	2.27	521	47.0	2.12	-0.6	0.58	-1.3
Less than 35 hours per week	219	21.3	2.01	260	21.1	1.68	0.2	0.42	0.9
Looking for work	41	4.3	0.68	45	4.1	0.56	0.2	0.28	4.9
Not in labor force	207	23.7	1.43	241	23.4	1.24	0.3	0.74	1.3
No mother in household	47	4.3	0.51	56	4.4	0.55	-0.1	0.24	-2.3
Poverty status									
Poor	164	19.2	1.04	221	19.7	1.05	-0.5	0.24	-2.5
Nonpoor	795	80.8	1.04	902	80.3	1.05	0.5	0.24	0.6
Household income									
Less than \$15,000	115	13.1	0.64	153	12.9	0.64	0.1	0.33	0.8
\$15,001 to \$30,000	141	14.9	1.33	179	15.2	1.22	-0.3	0.37	-2.0
\$30,001 to \$50,000	152	16.4	2.26	171	16.6	2.23	-0.2	0.39	-1.2
More than \$50,000	551	55.7	2.32	620	55.3	2.22	0.4	0.48	0.7

See notes at end of table.

**Table 8-2. Estimates of nonresponse bias for various characteristics from the Parent and Family Involvement in Education (PFI) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Reduced treatment PFI respondents			Full treatment PFI respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Family structure									
Mother and father	706	73.2	2.04	823	74.1	1.88	-0.9	0.69	-1.2
Mother	172	19.6	1.83	204	18.6	1.61	0.9	0.69	4.8
Father	45	3.9	0.36	54	4.0	0.42	-0.2	0.24	-5.0
Nonparent guardian(s)	36	3.3	0.59	42	3.3	0.55	0.1	0.11	3.0
School type									
Public	840	89.3	1.71	989	89.9	1.65	-0.6	0.36	-0.7
Private	101	10.7	1.71	114	10.1	1.65	0.6	0.36	5.9
School size									
Under 300	148	15.2	1.50	167	14.6	1.51	0.6	0.33	4.1
300-599	275	28.3	2.63	321	28.8	2.59	-0.5	0.43	-1.7
600-999	241	26.1	1.84	286	25.8	1.81	0.4	0.70	1.6
1,000 or more	272	30.3	1.88	323	30.8	1.65	-0.5	0.58	-1.6

# Rounds to zero.

<sup>1</sup> Bias is estimated as the difference between the reduced treatment PFI respondent estimate and the full treatment PFI respondent estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the full treatment PFI respondent estimate, and is expressed as a percentage.

<sup>3</sup> Any five or more of the following: Attended a general school meeting; attended a meeting of the parent-teacher organization or association; went to a regularly scheduled parent-teacher conference with the student's teacher; attended a school or class event because of the student; served as a volunteer in the student's classroom or elsewhere in the school; participated in fundraising for the school; served on a school committee; and met with a guidance counselor in person.

<sup>4</sup> Any four or more of the following: School student attends this year; teachers student has this year; academic standards of the school; order and discipline at the school; and way that school staff interact with parents.

<sup>5</sup> Any five or more of the following: Told student a story; did arts and crafts with student; played sports, active games or exercised together; worked on projects such as building, making, or fixing something with student not as a chore; talked with student about family history or ethnic heritage; and played board games or did puzzles with student.

<sup>6</sup> Any three or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the student was not a player.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education (PFI) Survey of the National Household Education Surveys Program, 2007.

**Table 8-3. Estimates of nonresponse bias for various characteristics from the Adult Education for Work-Related Reasons (AEWR) Survey: NHES:2007 Bias Study**

Characteristic	Reduced treatment AEW respondents			Full treatment AEW respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Participates in adult education for work-related reasons	433	39.3	2.02	495	39.1	1.76	0.2	0.63	0.5
Participates in employer-supported AEW	307	69.5	3.68	347	70.0	3.57	-0.4	0.42	-0.6
Participates in distance education	251	61.3	2.96	285	60.1	2.98	1.2	0.86	2.0
Participates in program to earn a college or university degree	108	9.4	0.90	124	9.4	0.81	#	0.22	#
Participates in program to earn a vocational or technical diploma	48	4.1	0.69	56	4.2	0.70	-0.1	0.18	-2.4
Participates in formal apprenticeship program	5!	0.5!	0.32!	5!	0.5!	0.33!	#	0.03	#
Participates in work-related training or courses	368	33.8	1.66	416	33.2	1.49	0.6	0.62	1.8
Participates in 4 or more informal work-related learning activities <sup>3</sup>	290	29.8	2.49	324	29.2	2.25	0.7	0.58	2.4
Has any condition that limits ability to work	139	15.3	2.61	153	15.2	2.63	0.1	0.33	0.7

See notes at end of table.

**Table 8-3. Estimates of nonresponse bias for various characteristics from the Adult Education for Work-Related Reasons (AEWR) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Reduced treatment AEW respondents			Full treatment AEW respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Age									
16 to 24 years	89	13.6	1.20	104	13.1	1.17	0.5	0.28	3.8
25 to 34 years	143	16.8	1.93	168	17.5	1.86	-0.7	0.38	-4.0
35 to 44 years	111	17.2	1.42	131	16.9	1.31	0.3	0.42	1.8
45 to 54 years	195	21.3	1.76	217	21.4	1.75	-0.1	0.38	-0.5
55 years and older	393	31.2	1.16	445	31.1	1.20	0.1	0.19	0.3
Census region									
Northeast	233	25.6	4.64	259	25.7	4.68	-0.1	0.29	-0.4
Midwest	207	21.8	3.08	235	21.3	2.89	0.4	0.27	1.9
South	260	32.4	2.95	314	32.8	3.28	-0.4	0.39	-1.2
West	231	20.2	0.00	257	20.2	0.00	#	0.00	#
Home tenure									
Own	693	70.6	0.70	794	70.1	0.79	0.5	0.24	0.7
Rent/other	238	29.4	0.70	271	29.9	0.79	-0.5	0.24	-1.7
Household size									
1 person	245	9.4	0.67	278	9.6	0.65	-0.2	0.34	-2.1
More than 1 person	686	90.6	0.67	787	90.4	0.65	0.2	0.34	0.2
Marital status									
Never married	217	24.5	1.43	249	24.2	1.42	0.3	0.48	1.2
Currently married	468	56.5	2.00	531	55.9	2.06	0.6	0.66	1.1
Other	246	19.0	1.77	285	20.0	1.69	-1.0	0.45	-5.0

See notes at end of table.

**Table 8-3. Estimates of nonresponse bias for various characteristics from the Adult Education for Work-Related Reasons (AEWR) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Reduced treatment AEWR respondents			Full treatment AEWR respondents			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Household income									
Less than \$15,000	154	10.5	0.62	194	10.6	0.54	-0.1	0.17	-0.9
\$15,001 to \$30,000	173	16.0	1.33	212	16.1	1.24	-0.1	0.23	-0.6
\$30,001 to \$50,000	171	22.2	1.56	188	23.1	1.59	-0.9	0.49	-3.9
More than \$50,000	433	51.4	1.36	471	50.3	1.30	1.1	0.53	2.2
Language spoken most at home									
English	876	93.1	1.44	999	92.4	1.60	0.7	0.29	0.8
Spanish	33	4.5	1.00	39	4.7	1.08	-0.3	0.17	-6.4
Other language	15	1.8	0.81	18	2.1	0.89	-0.3	0.18	-14.3
English and Spanish equally	7	0.6	0.31	8	0.7	0.31	#	0.03	#
English and other language equally	#	#	#	‡	‡	‡	‡	‡	‡
Employment status									
Employed	551	61.2	2.04	627	61.2	1.93	#	0.50	#
Unemployed but looking for work	36	4.6	1.46	44	5.0	1.28	-0.4	0.54	-8.0
Not in the labor force	344	34.2	1.47	394	33.8	1.35	0.4	0.56	1.2

# Rounds to zero.

! Interpret with caution.

‡ Reporting standards not met.

<sup>1</sup> Bias is estimated as the difference between the reduced treatment AEWR respondent estimate and the full treatment AEWR respondent estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the full treatment AEWR respondent estimate, and is expressed as a percentage.

<sup>3</sup> Any four or more of the following: Received on-the-job demonstrations of equipment, techniques, or procedures by a supervisor or coworker; received other supervised training or mentoring on the job; self-paced study using books, procedures manuals, audio tapes, or videos; self-paced study using computer-based software tutorials; attended “brown-bag” or informal presentations; attended conferences, trade shows, or conventions related to the adult’s work or profession; and read professional journals, trade publications, or work-related magazines.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program, 2007.

It should be noted that because these results are based on estimates from the full effort (with overall unit response rates of 54.0 percent, 51.4 percent, and 41.0 percent for the School Readiness (SR), Parent and Family Involvement in Education (PFI), and Adult Education for Work-Related Reasons (AEWR) surveys, respectively), this examination of nonresponse bias can only account for bias that would be evident as unit response is increased through the field effort; this comparison does not account for bias due to the proportion that failed to respond to the Screener or the extended interview survey even after the field effort. The results shown here give no indication that those who respond to the field effort but not to the telephone data collection effort are different from those who respond to the telephone attempts.

Section 4.2 included discussions of two data collection instruments that were used in the field effort but are not part of the standard data collection effort: the Interviewer Observation Form (IOF) and the Maximum Call postcard. Field interviewers were instructed to complete the IOF on the first visit to the household, before approaching the household, and to not change any responses based on information gleaned later. For the 5,122 cases sent to the field for in-person attempts,<sup>46</sup> a total of 4,600 IOFs were returned. As noted in section 4.2, of the 635 maximum call Screener cases and maximum call postcards distributed, 222 maximum call postcards, or 35 percent, were returned. These instruments provide data that can be used to extend the nonresponse bias analysis beyond the respondents who were interviewed in the field. Tables 8-4, 8-5, and 8-6 provide the results from the analysis of this remaining nonresponse. Since the tables include estimates for field nonrespondents, this analysis was done using base weighted estimates rather than fully weighted estimates.

Table 8-4 contains the frequency distributions of the IOF items; separate distributions are given for field respondents and for field nonrespondents to evaluate the potential bias due to not obtaining a 100 percent response rate in the field. The field respondents and field nonrespondents differ in socioeconomic classification, evidence of children, and the appearance of signs for private security services. Interviewers classified the household as working class or poor for 40 percent of the field respondents compared to 34 percent of the field nonrespondents. The percentage of addresses for which the field interviewer indicated evidence of children was higher for field respondents than for field nonrespondents (23 percent versus 12 percent). Also, the percentage of cases for which the field interviewer indicated finding no houses/apartments on the block with signs for private security services was higher for field respondents than for field nonrespondents (64 percent versus 54 percent).

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<sup>46</sup> This includes the 18 Bias Study cases completed during TRC efforts that were verified as having a correct address-telephone matched in the field.

**Table 8-4. Distributions of characteristics collected in the Interviewer Observation Form (IOF), for field respondents and field nonrespondents separately: NHES:2007 Bias Study**

Characteristic	Bias Study Screener field respondents			Bias Study Screener field nonrespondents		
	Sample size	Percent	Standard Error	Sample size	Percent	Standard Error
Household characteristics						
Socioeconomic classification						
Affluent or upper middle class	211	7.8	1.42	214	9.7	1.67
Middle-middle class	1,303	51.0	3.09	1,117	53.8	2.53
Working class or poor	1,003	39.9	3.12	670	33.8	2.68
Missing	33	1.2	0.34	49	2.6	0.74
Evidence of children						
Yes	590	22.6	1.09	255	12.0	1.05
No	1,913	75.6	1.10	1,717	83.9	1.31
Missing	47	1.8	0.39	78	4.1	0.77
Bars or gratings on doors or windows						
Yes	193	7.8	2.23	186	9.3	2.64
No	2,323	90.9	2.41	1,794	86.9	2.65
Missing	34	1.3	0.31	70	3.8	0.84
Signs for private security services						
Yes	272	10.4	1.04	268	12.7	1.29
No	2,237	88.1	1.32	1,705	83.1	1.63
Missing	41	1.5	0.40	77	4.1	0.75
Block characteristics						
Urbanicity						
Urban	788	32.2	5.43	670	34.4	5.90
Suburban	1,384	54.0	5.01	1,157	54.8	5.41
Rural	351	12.7	2.62	193	9.3	1.80
Missing	27	1.1	0.29	30	1.5	0.60
Traffic flow						
Light	1,757	67.9	1.59	1,373	65.3	3.83
Moderate	569	22.9	1.65	470	23.4	2.61
Heavy	204	8.4	1.11	183	10.1	1.77
Missing	20	0.7	0.21	24	1.2	0.57

See notes at end of table.

**Table 8-4. Distributions of characteristics collected in the Interviewer Observation Form (IOF), for field respondents and field nonrespondents separately: NHES:2007 Bias Study—Continued**

Characteristic	Bias Study Screener field respondents			Bias Study Screener field nonrespondents		
	Sample size	Percent	Standard Error	Sample size	Percent	Standard Error
Block characteristics—continued						
Abandoned cars						
None	2,171	84.7	1.83	1,793	87.6	2.35
Very few (roughly 1-2 cars)	301	12.4	1.63	205	9.9	1.91
Some (roughly 3-4 cars)	53	2.0	0.40	22	1.0	0.30
Many (roughly 5 or more cars)	7	0.3	0.19	2	0.1	0.05
Missing	18	0.6	0.14	28	1.4	0.63
Trash or junk						
None	1,704	66.9	3.40	1,465	71.0	2.88
Very little	582	22.6	2.42	399	19.6	2.01
Some	208	8.3	1.21	138	6.7	1.12
A lot	43	1.8	0.74	20	1.1	0.42
Missing	13	0.4	0.12	28	1.5	0.69
Land use						
Primarily residential	2,198	86.2	1.62	1,768	85.6	1.45
Primarily commercial	31	1.2	0.38	24	1.1	0.33
Primarily industrial	3	0.1	0.05	1	0.0	0.04
Primarily vacant lots or undeveloped space	49	1.7	0.21	31	1.2	0.28
Mixed residential and commercial	125	5.2	1.04	103	5.7	1.32
Mixed residential and industrial	10	0.4	0.23	15	0.7	0.34
Mixed residential and vacant lots	102	3.9	0.90	57	2.9	0.92
Other	21	0.8	0.32	25	1.3	0.29
Missing	11	0.4	0.12	26	1.3	0.60
Houses/apartments with window/door bars or gratings						
None	1,956	76.3	4.48	1,449	70.7	6.09
Very few	335	13.2	1.92	299	13.7	2.85
Some	167	6.9	2.09	177	9.4	2.46
Most	65	2.6	1.20	86	4.1	1.56
All	8	0.3	0.20	9	0.5	0.32
Missing	19	0.7	0.10	30	1.6	0.60

See notes at end of table.

**Table 8-4. Distributions of characteristics collected in the Interviewer Observation Form (IOF), for field respondents and field nonrespondents separately: NHES:2007 Bias Study—Continued**

Characteristic	Bias Study Screener field respondents			Bias Study Screener field nonrespondents		
	Sample size	Percent	Standard Error	Sample size	Percent	Standard Error
Block characteristics—continued						
Houses/apartments with signs for private security services						
None	1,642	64.7	2.30	1,109	55.2	3.14
Very few	568	22.0	1.71	543	25.0	1.95
Some	245	9.5	0.97	284	13.9	1.47
Most	59	2.4	0.68	65	3.2	0.75
All	17	0.7	0.68	18	1.1	0.69
Missing	19	0.7	0.15	31	1.6	0.63
Signs for neighborhood watch						
Yes	309	12.2	2.89	272	12.8	2.72
No	2,210	86.7	2.86	1,736	85.1	2.99
Missing	31	1.2	0.24	42	2.1	0.65
Children						
Yes	893	34.3	2.54	690	33.5	4.08
No	1,628	64.6	2.56	1,322	64.6	4.40
Missing	29	1.1	0.25	38	1.9	0.57
Interviewer heard non-English language spoken in neighborhood						
Yes	246	10.0	2.16	290	15.0	3.67
No	1,149	44.0	4.84	827	39.3	4.70
No people around or did not hear any language	1,134	45.3	5.09	904	44.2	5.28
Missing	21	0.7	0.21	29	1.5	0.58

NOTE: Shading indicates a significant difference of 5 percentage points or more. Estimates were produced using base weights.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Surveys Program (NHES), 2007.

In addition to the interviewer-reported characteristics in the IOF, ZIP code-level characteristics were obtained from the Census 2000 Summary Files (SFs), and distributions of these ZIP code characteristics are given for field respondents and field nonrespondents (separately) in table 8-5. The characteristics given in table 8-5 were selected for consideration because they are available at the ZIP code-level from the Census 2000 SFs and are also available on the sampling frame used to select the RDD sample. There are some substantive differences between ZIP code-level characteristics of field

respondents and field nonrespondents. A higher percentage of field respondents than nonrespondents live in ZIP codes with lower median home values (74 percent versus 63 percent in the first through seventh deciles) and lower median income deciles (35 percent versus 28 percent in the first through third deciles).

**Table 8-5. Distributions of ZIP code-level characteristics, for field respondents and field nonrespondents separately: NHES:2007 Bias Study**

Characteristic	Bias Study Screener field respondents			Bias Study Screener field nonrespondents		
	Sample size	Percent	Standard Error	Sample size	Percent	Standard Error
<b>Census region</b>						
Northeast	557	20.7	3.09	485	22.9	3.90
Midwest	486	19.4	3.00	333	15.4	2.77
South	906	35.0	1.77	696	34.0	2.63
West	601	24.9	1.77	536	27.8	2.10
<b>Metro status</b>						
In an MSA	2,405	94.7	0.33	1,950	95.5	0.48
Not in an MSA	145	5.3	0.33	100	4.5	0.48
<b>Median home value</b>						
1st through 7th deciles	1,902	74.4	4.67	1,292	62.7	5.96
8th through 10th deciles	648	25.6	4.67	758	37.3	5.96
<b>Median income</b>						
1st through 3rd deciles	891	35.3	4.96	546	27.7	4.29
4th through 10th deciles	1,659	64.7	4.96	1,504	72.3	4.29
<b>Percent college graduates</b>						
Less than 20 percent	854	33.6	5.15	556	27.8	5.23
20 to 29 percent	658	25.8	3.87	574	27.6	3.63
30 to 39 percent	497	19.5	2.96	403	19.4	2.76
40 to 59 percent	484	18.7	2.78	449	21.6	3.16
60 percent or more	57	2.4	0.89	68	3.7	1.46
<b>Percent White</b>						
Less than 30 percent	182	7.5	2.77	255	12.9	5.19
30 to 49 percent	302	12.4	3.19	206	10.9	3.10
50 to 69 percent	363	14.8	4.18	336	17.3	4.06
70 to 89 percent	656	26.3	3.40	474	23.1	3.81
90 percent or more	1,047	39.1	6.74	779	35.8	5.48

See notes at end of table.

**Table 8-5. Distributions of ZIP code-level characteristics, for field respondents and field nonrespondents separately: NHES:2007 Bias Study—Continued**

Characteristic	Bias Study Screener field respondents			Bias Study Screener field nonrespondents		
	Sample size	Percent	Standard Error	Sample size	Percent	Standard Error
<b>Percent Black</b>						
Less than 50 percent	2,394	93.6	1.66	1,931	94.0	1.27
50 to 59 percent	106	4.5	1.92	62	3.2	1.35
60 percent or more	50	1.9	1.00	57	2.9	1.57
<b>Percent Hispanic</b>						
Less than 20 percent	1,865	72.2	6.75	1,364	65.0	7.37
20 to 39 percent	394	15.8	4.35	365	18.7	4.82
40 to 59 percent	164	6.6	2.39	132	6.5	2.26
60 percent or more	127	5.4	2.22	189	9.8	4.11
<b>Percent renters</b>						
Less than 30 percent	864	32.3	4.75	692	32.2	4.76
30 to 59 percent	1,389	55.2	4.84	1,060	51.9	4.57
60 percent or more	297	12.5	4.16	298	15.9	4.36
<b>Percent owners</b>						
Less than 40 percent	140	5.5	2.20	171	9.0	3.00
40 to 69 percent	834	34.6	3.40	667	33.8	3.70
70 percent or more	1,576	59.9	4.23	1,212	57.3	5.07

NOTE: Shading indicates a significant difference of 5 percentage points or more. Estimates were produced using base weights.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Surveys Program (NHES), 2007.

Table 8-6 gives the distributions of characteristics that were collected in the Maximum Call postcard. For the Bias Study respondents (whether they responded to the telephone effort or responded as a result of the field follow-up), these items were collected in the Screener. For the field nonrespondents, these items were obtained from the postcard. Although two additional items—household size and highest education—were also asked on the postcard, the distributions of those two items are not presented here because, for respondents, these items are available only if at least one extended interview was completed in the household.

**Table 8-6. Distributions of characteristics collected in the Maximum Call postcard: NHES:2007 Bias Study**

Household characteristic	Bias study respondents			Bias Study TRC respondents			Bias Study field respondents			Bias Study field nonrespondents with MC postcard		
	Sample size	Percent	Standard error	Sample size	Percent	Standard error	Sample size	Percent	Standard error	Sample size	Percent	Standard error
Number of children under 18												
None	3,120	63.4	1.10	1,644	70.1	1.21	1,476	59.0	1.42	127	71.0	2.66
1	751	15.8	0.61	287	12.2	0.68	464	18.1	0.81	26	14.5	2.57
2-3	916	18.5	0.90	382	16.3	1.08	534	20.0	1.05	28	13.7	2.13
4+	107	2.3	0.25	31	1.3	0.32	76	2.9	0.36	2	‡	‡
Home ownership												
Own	3,570	69.0	1.53	2,024	86.3	0.96	1,546	57.8	1.98	129	64.9	3.99
Rent/other	1,324	31.0	1.53	320	13.7	0.96	1,004	42.2	1.98	54	35.1	3.99

‡ Reporting standards not met.

NOTE: Estimates were produced using base weights.

SOURCE: U.S. Department of Education, National Center for Education Statistics, National Household Education Surveys Program (NHES), 2007.

As shown in table 8-6, a larger percentage of telephone respondents than field respondents have no children under 18 (70 percent versus 59 percent). These results appear to be anomalous, in that all other evidence (in both the Bias Study and the NHES RDD surveys) has indicated that a higher percentage of households with children respond to the telephone Screener than households without children. However, the field respondents include cases with no matching telephone number or a mismatched number, not just TRC nonrespondents. Considering all Bias Study respondents (in both the TRC and the field), 63 percent have no children under 18, compared to 71 percent among field nonrespondents who returned the Maximum Call postcard. In terms of home tenure, a larger percentage of Bias Study telephone respondents than field respondents own their homes (86 percent versus 58 percent), and 65 percent of field nonrespondents own their homes.

## **8.2 An Examination of Noncoverage Bias**

Because the Bias Study sample is based on a sample of addresses, it includes persons residing in both telephone and nontelephone households. For this section, nontelephone households are defined as those without a landline so that the noncoverage bias associated with standard RDD surveys that do not include cell phones can be estimated. The NHES:2007 Bias Study survey instruments included a series of questions to capture the presence and number of telephone numbers in the household, so nontelephone households can be identified through the responses to these questions.

In order to examine noncoverage bias in NHES:2007 estimates, fully weighted estimates from the full Bias Study sample (completed extended interviews from FT/RT and FTO cells of figure 4-1) were compared to estimates from the Bias Study sample restricted to telephone households (telephone household field respondents cell of figure 4-1). The weights for the telephone households were separately raked to population totals, since estimates of noncoverage bias in the Bias Study telephone household estimates are intended to provide an indication of noncoverage bias in the final RDD estimates, which included the raking adjustment. The estimates are tabulated for a set of characteristics in tables 8-7, 8-8, and 8-9, for the SR, PFI, and AEWB surveys, respectively.

**Table 8-7. Estimates of noncoverage bias for various characteristics from the School Readiness (SR) Survey: NHES:2007 Bias Study**

Characteristic	Full treatment SR respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Participation in center-based care	177	51.1	2.29	159	53.4	2.11	2.4	0.96	4.5
Specific skills									
Recognizes all colors	249	85.6	2.34	212	84.4	3.93	-1.2	2.21	-1.4
Counts to 20 or higher	198	68.4	2.27	170	67.2	3.22	-1.2	2.57	-1.8
Recognizes all letters	93	29.4	2.89	80	28.9	2.78	-0.5	1.87	-1.7
Writes first name	193	60.4	3.08	171	62.9	3.88	2.5	2.20	4.1
Holds a pencil	252	86.7	1.90	212	85.6	2.18	-1.2	1.65	-1.3
Speech is often understandable to a stranger	249	87.3	2.17	210	87.0	1.95	-0.3	1.39	-0.3
Reads or pretends to read storybooks	289	99.2	0.45	243	99.0	0.56	-0.2	0.14	-0.2
Parents believe it is essential to do certain things to prepare child for kindergarten									
Teach child the alphabet	171	57.7	2.72	149	61.3	2.73	3.6	1.54	6.2
Teach child about sharing	177	57.8	2.97	155	61.4	4.14	3.6	2.49	6.2
Teach child to read	139	48.0	3.47	119	50.1	4.64	2.1	2.70	4.4
Teach child numbers	155	51.7	2.64	136	56.3	3.00	4.6	2.52	8.9
Show child how to hold a pencil	121	37.9	2.88	106	40.3	3.56	2.4	2.56	6.3
Family member read to child everyday in the past week	169	56.9	4.02	142	54.9	5.56	-2.1	3.15	-3.5
Parents report usually doing certain reading-related activity with child									
Ask child what is in a picture	159	52.9	4.00	134	52.8	4.40	-0.1	3.00	-0.2
Stop reading and point out letters	95	31.9	4.14	85	34.5	4.22	2.5	3.42	8.2
Ask child to read with parent	84	29.7	3.05	71	27.0	3.50	-2.7	3.17	-9.1
Talk about the story and what happened	165	60.3	3.18	137	58.0	4.02	-2.3	2.41	-3.8
Parents did home activities with child in the past week <sup>3</sup>	123	41.7	3.23	101	38.9	3.39	-2.8	2.01	-6.7
Parents took 3 or more outings with child in the past month <sup>4</sup>	138	46.0	3.71	114	44.4	4.08	-1.7	2.55	-3.5

See notes at end of table.

**Table 8-7. Estimates of noncoverage bias for various characteristics from the School Readiness (SR) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Full treatment SR respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Child watches 2 or more hours of TV in a typical weekday	179	71.1	2.10	145	67.4	2.50	-3.6	1.87	-5.2
Child has a disability	37	14.1	3.34	32	14.5	4.54	0.4	2.20	2.8
Child's age									
3 years	128	43.9	2.86	102	41.5	3.61	-2.4	2.20	-5.5
4 years	116	37.3	2.64	101	38.2	3.81	0.9	2.05	2.4
5 years and older	48	18.8	3.08	43	20.3	4.48	1.6	2.19	8.0
Child's sex									
Male	169	62.3	2.97	137	60.8	3.78	-1.6	2.16	-2.4
Female	123	37.7	2.97	109	39.2	3.78	1.6	2.16	4.0
Household urbanicity									
Urban	247	80.8	1.62	206	80.6	1.65	-0.2	0.22	-0.2
Rural	45	19.2	1.62	40	19.4	1.65	0.2	0.22	1.0
Home tenure									
Own	201	62.1	0.87	175	62.6	0.62	0.5	1.02	0.8
Rent/other	91	37.9	0.87	71	37.4	0.62	-0.5	1.02	-1.3
Parents' educational attainment									
High school diploma or below	91	34.5	3.80	63	25.3	4.13	-9.2	2.47	-26.7
Beyond high school diploma	201	65.5	3.80	183	74.7	4.13	9.2	2.47	14.0
Parents' language									
Both/only parent(s) speak(s) English	254	88.0	2.48	214	88.9	1.90	0.9	1.74	1.0
One of two parents speaks English	‡	‡	‡	‡	‡	‡	‡	‡	‡
No parent speaks English	29	11.0	2.60	25	10.7	1.80	-0.3	1.82	-2.7

See notes at end of table.

**Table 8-7. Estimates of noncoverage bias for various characteristics from the School Readiness (SR) Survey: NHES:2007 Bias Study — Continued**

Characteristic	Full treatment SR respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
<b>Mothers' employment status</b>									
35 hours or more per week	111	41.6	3.34	94	40.5	3.69	-1.1	2.16	-2.6
Less than 35 hours per week	69	20.4	3.21	62	23.2	3.79	2.8	1.18	13.7
Looking for work	23	10.0	2.49	15	8.2	2.33	-1.7	1.42	-18.0
Not in labor force	83	26.1	2.65	70	25.9	2.78	-0.2	2.35	-0.8
No mother in household	6!	1.9!	1.18!	5!	2.2!	1.04!	0.3!	0.33!	15.8!
<b>Poverty status</b>									
Poor	80	24.5	2.19	63	24.6	3.00	0.1	1.60	0.4
Nonpoor	212	75.5	2.19	183	75.4	3.00	-0.1	1.60	-0.1
<b>Household income</b>									
Less than \$15,000	52	15.3	1.71	41	13.9	2.69	-1.4	1.91	-9.2
\$15,001 to \$30,000	62	17.6	2.39	51	20.5	3.60	2.9	2.54	16.5
\$30,001 to \$50,000	50	17.6	2.77	41	15.6	2.73	-2.0	1.34	-11.4
More than \$50,000	128	49.5	2.92	113	50.0	3.48	0.5	1.15	1.0
<b>Family structure</b>									
Mother and father	219	73.4	4.36	187	72.8	4.20	-0.7	1.96	-0.8
Mother	60	22.4	3.09	48	22.3	3.60	-0.1	2.17	-0.4
Father	6!	1.9!	1.18!	5!	2.2	1.04	0.3	0.33	15.8!
Nonparent guardian(s)	7	2.3	0.96	6	2.8	1.17	0.5	0.77	21.7

See notes at end of table.

! Interpret with caution.

‡ Reporting standards not met.

<sup>1</sup> Bias is estimated as the difference between the “with landline phone” SR respondent estimate and the full treatment SR respondent estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the full treatment SR respondent estimate, and is expressed as a percentage.

<sup>3</sup> Told child a story; taught child letters, words, or numbers; taught child songs or music; did arts and crafts with child; played sports, active games or exercised together; and played board games or did puzzles with child.

<sup>4</sup> Any three or more of the following: Visited a library; visited a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the child was not a player.

NOTE: Shading indicates a significant difference of 5 percentage points or more.

SOURCE: U.S. Department of Education, National Center for Education Statistics, School Readiness (SR) Survey of the National Household Education Surveys Program, 2007.

**Table 8-8. Estimates of noncoverage bias for various characteristics from the Parent and Family Involvement (PFI) Survey: NHES:2007 Bias Study**

Characteristic	Full treatment PFI respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Parents participate in 5 or more activities in the student's school <sup>3</sup>	566	52.1	2.22	500	54.6	2.67	2.6	1.18	4.8
Parents report school provides information very well									
About how student is doing in school	668	58.2	2.20	582	60.8	1.81	2.6	1.34	4.5
About how to help student with his/her homework	525	47.9	2.07	455	49.0	2.39	1.2	1.22	2.3
About why student is placed in particular groups of classes	496	45.6	1.67	432	46.7	2.27	1.0	1.26	2.4
About how to help student plan for college or vocational school	237	38.9	1.65	210	39.1	1.94	0.1	1.06	0.5
About the family's expected role at student's school	539	46.9	1.93	473	48.2	2.34	1.3	1.37	2.8
Parent reports being very satisfied with 4 or more aspects of the student's school <sup>4</sup>	798	73.7	1.87	685	73.2	2.17	-0.4	1.00	-0.7
Parents participated in 5 or more home learning activities <sup>5</sup>	229	42.2	2.28	197	45.3	2.62	3.1	1.62	7.3
Parents took 3 or more outings with student in the past month <sup>6</sup>	559	50.3	2.09	494	52.2	2.25	1.9	1.14	3.8
Parents check to see that student's homework gets done	885	87.9	0.99	754	87.6	1.04	-0.2	0.54	-0.3
Parents received information about free tutoring	465	42.6	2.15	395	43.0	2.55	0.4	1.27	0.9
Parent expects student to earn a college degree or higher	424	67.2	2.87	380	69.7	2.98	2.5	1.79	3.7
Family plans to help pay for student's education after high school	475	83.1	2.19	420	82.1	2.62	-1.0	1.24	-1.2
Student participated in school activities	624	55.8	1.89	550	56.9	2.27	1.1	1.25	2.0
Student has a disability	257	23.0	2.16	213	21.9	1.70	-1.1	1.09	-4.8

See notes at end of table.

**Table 8-8. Estimates of noncoverage bias for various characteristics from the Parent and Family Involvement (PFI) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Full treatment PFI respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Student's sex									
Male	575	51.8	2.10	484	49.9	2.46	-1.8	1.23	-3.7
Female	548	48.2	2.10	481	50.1	2.46	1.8	1.23	3.9
Household urbanicity									
Urban	933	81.8	0.06	796	81.7	0.11	-0.1	0.06	-0.1
Rural	190	18.2	0.06	169	18.3	0.11	0.1	0.06	0.5
Home tenure									
Own	837	69.7	0.80	743	70.2	0.67	0.5	0.45	0.7
Rent/other	286	30.3	0.80	222	29.8	0.67	-0.5	0.45	-1.7
Parents' educational attainment									
High school diploma or below	326	31.7	2.31	259	29.4	2.38	-2.4	1.05	-7.3
Beyond high school diploma	797	68.3	2.31	706	70.6	2.38	2.4	1.05	3.4
Parents' language									
Both/only parent(s) speak(s) English	1012	90.9	1.29	884	91.8	1.34	0.9	0.74	1.0
One of two parents speaks English	22	2.1	0.61	17	2.1	0.78	#	0.39	#
No parent speaks English	66	7.0	1.17	49	6.0	1.23	-1.0	0.66	-14.3
Mothers' employment status									
35 hours or more per week	521	47.0	2.12	448	47.1	2.33	0.1	1.26	0.2
Less than 35 hours per week	260	21.1	1.68	235	22.8	1.91	1.8	0.91	8.1
Looking for work	45	4.1	0.56	35	3.6	0.69	-0.4	0.54	-12.2
Not in labor force	241	23.4	1.24	200	21.9	2.17	-1.5	1.79	-6.4
No mother in household	56	4.4	0.55	47	4.5	0.64	0.1	0.45	2.3
Poverty status									
Poor	221	19.7	1.05	173	20.5	1.11	0.7	0.59	4.1
Nonpoor	902	80.3	1.05	792	79.5	1.11	-0.7	0.59	-1.0

See notes at end of table.

**Table 8-8. Estimates of noncoverage bias for various characteristics from the Parent and Family Involvement (PFI) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Full treatment PFI respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Household income									
Less than \$15,000	153	12.9	0.64	115	12.0	0.73	-0.9	0.67	-7.0
\$15,001 to \$30,000	179	15.2	1.22	144	16.2	1.30	0.9	1.03	6.6
\$30,001 to \$50,000	171	16.6	2.23	142	15.9	2.49	-0.7	0.54	-4.2
More than \$50,000	620	55.3	2.22	564	55.9	2.50	0.6	0.78	1.1
Family structure									
Mother and father	823	74.1	1.88	723	74.6	2.30	0.6	1.08	0.7
Mother	204	18.6	1.61	164	17.9	2.15	-0.7	1.01	-3.8
Father	54	4.0	0.42	47	4.5	0.64	0.4	0.41	12.5
Nonparent guardian(s)	42	3.3	0.55	31	3.0	0.67	-0.3	0.71	-9.1
School type									
Public	989	89.9	1.65	845	89.0	1.62	-0.9	0.62	-1.0
Private	114	10.1	1.65	103	11.0	1.62	0.9	0.62	8.9
School size									
Under 300	167	14.6	1.51	144	14.4	1.75	-0.2	0.91	-1.4
300-599	321	28.8	2.59	275	29.6	2.49	0.8	1.11	2.8
600-999	286	25.8	1.81	250	26.6	1.56	0.9	0.71	3.1
1,000 or more	323	30.8	1.65	274	29.4	1.86	-1.4	0.76	-4.5

# Rounds to zero.

<sup>1</sup> Bias is estimated as the difference between the “with landline phone” PFI respondent estimate and the full treatment PFI respondent estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the full treatment PFI respondent estimate, and is expressed as a percentage.

<sup>3</sup> Any five or more of the following: Attended a general school meeting; attended a meeting of the parent-teacher organization or association; went to a regularly scheduled parent-teacher conference with the student’s teacher; attended a school or class event because of the student; served as a volunteer in the student’s classroom or elsewhere in the school; participated in fundraising for the school; served on a school committee; and met with a guidance counselor in person.

<sup>4</sup> Any four or more of the following: School student attends this year; teachers student has this year; academic standards of the school; order and discipline at the school; and way that school staff interact with parents.

<sup>5</sup> Any five or more of the following: Told student a story; did arts and crafts with student; played sports, active games or exercised together; worked on projects such as building, making, or fixing something with student not as a chore; talked with student about family history or ethnic heritage; and played board games or did puzzles with student.

<sup>6</sup> Any three or more of the following: Visited a library; a bookstore; went to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo or aquarium; attended an event sponsored by a community, religious, or ethnic group; and attended an athletic or sporting event (outside of school) in which the student was not a player.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Parent and Family Involvement in Education (PFI) Survey of the National Household Education Surveys Program, 2007.

**Table 8-9. Estimates of noncoverage bias for various characteristics from the Adult Education for Work-Related Reasons (AEWR) Survey: NHES:2007 Bias Study**

Characteristic	Full treatment AEWR respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Participates in adult education for work-related reasons	495	39.1	1.76	395	37.1	2.14	-1.9	1.57	-5.4
Participates in employer-supported AEWR	347	70.0	3.57	280	69.5	3.18	-0.5	2.69	-0.7
Participates in distance education	285	60.1	2.98	234	62.1	2.85	2.1	2.28	3.2
Participates in program to earn a college or university degree	124	9.4	0.81	82	8.5	1.04	-1.0	0.80	-10.6
Participates in program to earn a vocational or technical diploma	56	4.2	0.70	46	4.2	1.06	#	0.61	#
Participates in formal apprenticeship program	5!	0.5!	0.33!	3!	0.3!	0.14!	-0.2!	0.31!	-40.0!
Participates in work-related training or courses	416	33.2	1.49	336	31.0	1.89	-2.2	1.41	-7.1
Participates in 4 or more informal work-related learning activities <sup>3</sup>	324	29.2	2.25	275	31.4	2.69	2.2	1.20	7.0
Has any condition that limits ability to work	153	15.2	2.63	126	14.8	2.80	-0.4	1.23	-2.7
Age									
16 to 24 years	104	13.1	1.17	60	12.7	1.61	-0.4	0.85	-3.1
25 to 34 years	168	17.5	1.86	119	17.8	2.55	0.3	1.35	1.7
35 to 44 years	131	16.9	1.31	112	18.4	1.40	1.5	0.91	8.2
45 to 54 years	217	21.4	1.75	184	18.9	1.29	-2.5	1.18	-13.2
55 years and older	445	31.1	1.20	411	32.2	1.15	1.1	0.56	3.4

See notes at end of table.

**Table 8-9. Estimates of noncoverage bias for various characteristics from the Adult Education for Work-Related Reasons (AEWR) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Full treatment AEWR respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Census region									
Northeast	259	25.7	4.68	231	25.1	5.33	-0.6	1.35	-2.4
Midwest	235	21.3	2.89	203	21.5	3.06	0.2	0.86	0.9
South	314	32.8	3.28	242	33.2	3.83	0.4	0.97	1.2
West	257	20.2	0.00	210	20.2	#	#	#	#
Home tenure									
Own	794	70.1	0.79	709	71.1	0.66	1.0	0.61	1.4
Rent/other	271	29.9	0.79	177	28.9	0.66	-1.0	0.61	-3.5
Household size									
1 person	278	9.6	0.65	211	9.2	0.88	-0.4	0.64	-4.3
More than 1 person	787	90.4	0.65	675	90.8	0.88	0.4	0.64	0.4
Marital status									
Never married	249	24.2	1.42	162	22.8	2.05	-1.3	1.28	-6.1
Currently married	531	55.9	2.06	481	58.3	2.26	2.4	1.41	4.1
Other	285	20.0	1.69	243	18.9	1.92	-1.1	1.33	-5.8
Household income									
Less than \$15,000	194	10.6	0.54	137	10.5	0.93	-0.1	0.68	-1.0
\$15,001 to \$30,000	212	16.1	1.24	173	16.5	1.78	0.4	1.25	2.4
\$30,001 to \$50,000	188	23.1	1.59	151	20.7	1.79	-2.3	1.44	-11.6
More than \$50,000	471	50.3	1.30	425	52.3	1.26	2.1	1.51	3.8

See notes at end of table.

**Table 8-9. Estimates of noncoverage bias for various characteristics from the Adult Education for Work-Related Reasons (AEWR) Survey: NHES:2007 Bias Study—Continued**

Characteristic	Full treatment AEWR respondents			With landline phone			Bias <sup>1</sup>		Relative bias <sup>2</sup>
	Sample size	Estimate (percent)	Standard error	Sample size	Estimate (percent)	Standard error	Estimate (percent)	Standard error	Estimate (percent)
Language spoken most at home									
English	999	92.4	1.60	837	93.1	1.49	0.7	0.60	0.8
Spanish	39	4.7	1.08	31	4.9	1.22	0.2	0.47	4.1
Other language	18	2.1	0.89	14	1.6	0.68	-0.5	0.45	-31.3
English and Spanish equally	8	0.7	0.31	3!	0.2!	0.17!	-0.4!	0.26!	-57.1!
English and other language equally	‡	‡	‡	‡	‡	‡	‡	‡	‡
Employment status									
Employed	627	61.2	1.93	510	61.1	1.45	-0.1	1.54	-0.2
Unemployed but looking for work	44	5.0	1.28	34	6.1	1.57	1.1	0.66	18.0
Not in the labor force	394	33.8	1.35	342	32.8	1.52	-1.0	1.60	-3.0

# Rounds to zero.

! Interpret with caution.

‡ Reporting standards not met.

<sup>1</sup> Bias is estimated as the difference between the “with landline phone” AEWR respondent estimate and the full treatment AEWR respondent estimate.

<sup>2</sup> Relative bias is estimated as the bias estimate divided by the full treatment AEWR respondent estimate, and is expressed as a percentage.

<sup>3</sup> Any four or more of the following: Received on-the-job demonstrations of equipment, techniques, or procedures by a supervisor or coworker; received other supervised training or mentoring on the job; self-paced study using books, procedures manuals, audio tapes, or videos; self-paced study using computer-based software tutorials; attended “brown-bag” or informal presentations; attended conferences, trade shows, or conventions related to the adult’s work or profession; and read professional journals, trade publications, or work-related magazines.

NOTE: Shading indicates a significant difference of 5 percentage points or more.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Adult Education for Work-Related Reasons Survey of the National Household Education Surveys Program, 2007.

For the SR Survey, table 8-7 shows that the percentage of preschoolers in telephone households whose parents' highest educational attainment is beyond a high school diploma (75 percent) is higher than the overall percentage of preschoolers whose parents' highest educational attainment is beyond a high school diploma (66 percent). The key estimates for the SR survey, however, are comparable for preschoolers in telephone households and the overall sample. Although there are some statistically significant differences between school-age children in telephone households and school-age children overall (table 8-8), as well as between adults in telephone households and adults overall (table 8-9), none of these differences meet the criterion for substantive importance of at least 5 percentage points. As shown in section 7.3, some differences were found between RDD estimates before and after the raking adjustment, indicating potential noncoverage bias in the pre-raked estimates. Based on the analysis in section 7.3 and the analysis in this section, the raking adjustments appear to be effective in reducing noncoverage bias in the final estimates.

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## 9. DISCUSSION

With survey response rates—in particular, random digit dial (RDD) survey response rates—on the decline, the potential for nonresponse bias is an important concern to survey methodologists and data analysts. Response rates are frequently used as a measure of the potential for nonresponse bias. A general perception is that surveys with higher response rates have less potential for nonresponse bias than surveys with lower response rates. Another important attribute is the *face validity* of the survey that is diminished if a high survey response rate is not obtained. In addition, there is increasing concern over noncoverage bias in RDD surveys, as the rate of cell-phone-only households continues to rise.

Several analyses have been conducted to evaluate nonresponse and noncoverage bias in the NHES surveys. As noted in chapter 1, estimates from the NHES:2007 RDD sample and earlier NHES surveys have been compared to other surveys with higher response rates. These comparisons are valuable, but any differences might be due to a variety of causes other than nonresponse and noncoverage. For example, different questionnaire wordings, modes, and context effects could be responsible for differences. The source of the difference is important because remedial actions (such as using frames that cover a higher proportion of the population) might not have any effect on the differences due to these other sources.

Another nonresponse bias approach used a multivariate Chi-Square Automatic Interaction Detection (CHAID) analysis to detect differences in response rates among subgroups (described in chapter 5). These results were evaluated for consistency between years. A limitation of this approach is that it only provides indicators of potential nonresponse bias rather than direct estimates.

In addition, an extensive evaluation of nonresponse bias was performed for the NHES:2001 (Montaquila et al. 2008). The goal of that research was to investigate nonresponse bias in the estimates if the survey had used different data collection procedures that would have resulted in lower response rates. A limitation of this analysis is that the evaluation was limited to the original set of respondents. Through such studies, researchers are able to examine bias due to excluding hard-to-contact or reluctant respondents, thus informing decisions about how much additional effort might be needed to reduce nonresponse bias. On the other hand, direct assessment of nonresponse bias due to cases that did not complete the survey was not possible.

While each of these methods of analyzing bias has its own limitations, it has been encouraging that none of the efforts has indicated nonresponse bias of substantive importance in the estimates. Many of these approaches essentially used different resources and methodologies, so the collective evaluation provides a more robust estimate of the lack of substantively important bias than any one of them alone could. Nevertheless, the falling response and coverage rates in RDD surveys prompted further research into the potential for bias.

The NHES:2007 Bias Study was developed to provide a more direct assessment of nonresponse bias for cases that did not complete the survey by telephone. This study was the first full-scale NHES effort undertaken to follow up with the nonrespondents in the field. The in-field follow-up was successful in yielding additional completes. Of cases that refused the Screener on the telephone, 42 percent completed the Screener in the field.<sup>47</sup> Similarly, 46 percent of telephone maximum call cases and 45 percent of telephone noncontact cases completed the Screener during the in-field follow-up. This study is still limited because survey estimates for the households that did not respond to either the telephone or in-field effort are not available. However, general characteristics of the cases that failed to respond to the field effort were available from the IOF and decennial census. A higher proportion of field respondents than field nonrespondents were found to live in ZIP codes with lower median home values and lower median income deciles. Also, interviewers classified a higher proportion of field respondents as living in working class or poor households, having evidence of children, and being on blocks where no households had signs for private security, compared to field nonrespondents. For the majority of characteristics examined, however, the field respondents were found to be similar to field nonrespondents.

Results from this study suggest that there is no systematic pattern of bias in key statistics from the NHES:2007. A comparison of the fully weighted RDD estimates to Bias Study estimates showed potential for bias in five estimates. The estimated percentages of preschoolers who count to 20 or higher, whose speech is often understandable to a stranger, and who watch two or more hours of TV in a typical weekday were lower for the RDD survey than the Bias Study. The estimates of the percentage of preschoolers whose mother is not in the labor force, as well the percentage of adults who are currently married, were higher for the RDD survey than the Bias Study. However, the majority of estimates evaluated showed no evidence of bias of substantive importance.

In addition to the evaluation of overall bias in the NHES:2007 estimates, the Bias Study also allowed for the estimation of the nonresponse and noncoverage bias components. The NHES:2007

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<sup>47</sup> The percentage includes nonhostile refusals only. Hostile refusals were not sent to the field.

estimates were produced using weights that were adjusted for nonresponse and calibrated to population totals—adjustments that are expected to reduce nonresponse and noncoverage bias. The results from the NHES:2007 Bias Study, in concert with the previous bias analyses, suggest that despite the falling response rates, there is no bias of substantive importance in the NHES:2007 estimates due to nonresponse. A comparison of estimates before and after the raking adjustments indicated potential noncoverage biases in some unadjusted SR survey outcome estimates, as well as in some demographic estimates, that were reduced through the weighting process (see section 7.3 for a complete list). While the weighting adjustments appear to have reduced noncoverage bias, the Bias Study analysis did provide evidence of the potential for noncoverage bias in the final estimate of the percentage of preschoolers whose parents' highest educational attainment is beyond a high school diploma. Although estimates of noncoverage bias in other final estimates examined in this study are not of substantive importance as defined for this report, noncoverage bias may become more of an issue in the future as more households drop their landline telephone service.

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## REFERENCES

- Aquilino, W.S, and Wright, D.L. (1996). Substance abuse estimates from RDD and area probability samples: Impact of differential screening methods and unit nonresponse. *Public Opinion Quarterly*, 60 (4): 563–573.
- Atrostic, B.K., Bates, N., Burt, G., and Silberstein, A. (2001). Nonresponse in U.S. Government Household Surveys: Consistent Measures, Recent Trends, and New Insights. *Journal of Official Statistics*, 17: 209–226.
- Bethlehem, J. (1988). Reduction of Nonresponse Bias Through Regression Estimation. *Journal of Official Statistics*, 4: 251–260.
- Blenk, D.K., and Stasny, E. (2001). Using Propensity Scores to Control Coverage Bias in Telephone Surveys. *Survey Methodology*, 27: 121–130.
- Blumberg, S.J., Luke J.V. Wireless substitution: Early release of estimates from the National Health Interview Survey, July – December 2007. National Center for Health Statistics. Retrieved August 22, 2008 from <http://www.cdc.gov/nchs/nhis.htm>.
- Blumberg, S.J., Luke, J.V., and Cynamon, M.L. (2006). Telephone Coverage and Health Survey Estimates: Evaluating the Need for Concern about Wireless Substitution. *American Journal of Public Health*, 96(5): 926–931.
- Boyle, F.M., Cook, M.D., Dunne, M.P., Najman, J.M., and Purdie, D.M. (2002). Health and Demographic Characteristics of Respondents in an Australian National Sexuality Survey: Comparison with Population Norms. *Journal of Epidemiology and Community Health*, 56: 748–753.
- Bradburn, N.M. (1983). Response Effects. In P.H. Rossi, J.D. Wright, and A.B. Anderson (Eds.), *Handbook of Survey Research*. Orlando, FL: Academic Press.
- Brick, J.M. (1996). *Undercoverage Bias in Estimates of Characteristics of Adults and 0- to 2-Year-Olds in the 1995 National Household Education Survey (NHES:95)* (NCES 96-29). National Center for Education Statistics Working Paper, U.S. Department of Education. Washington, DC.
- Brick, J.M., Burke, J., and West, J. (1992). *Telephone Undercoverage Bias of 14- to 21-Year-Olds and 3- to 5-Year-Olds* (NCES 92-101). National Center for Education Statistics, U.S. Department of Education. Washington, DC.
- Brick, J.M., and Collins, M. (1997). *An Overview of Response Rates in the National Household Education Survey: 1991, 1993, 1995, and 1996* (NCES 97-948). National Center for Education Statistics, U.S. Department of Education. Washington, DC.
- Brick, J.M., Collins, M., and Chandler, K. (1997). *An experiment in random-digit-dial screening* (NCES 98-255). National Center for Education Statistics, U.S. Department of Education. Washington, DC.

- Brick, J.M., and Kalton, G. (1996). Handling Missing Data in Survey Research. *Statistical Methods in Medical Research*, 5: 215–238.
- Brick, J.M., Montaquila, J., Hagedorn, M.C., Roth, S.B., and Chapman, C. (2005). Implications for RDD Design From an Incentive Experiment. *Journal of Official Statistics*, 21: 571–589.
- Brick, J.M., Tubbs, E., Collins, M.A., Nolin, M.J., Cantor, D., Levin, K., and Carres, Y. (1997). *Telephone Coverage Bias and Recorded Interviews in the 1993 National Household Education Survey (NHES:93)* (NCES 97-02). National Center for Education Statistics, U.S. Department of Education. Washington, DC.
- Cochran, W. (1977). *Sampling Techniques (3rd edition)*. New York: John Wiley & Sons.
- Cohen, G., and Duffy, J.C. (2002). Are Nonrespondents to Health Surveys Less Healthy Than Respondents? *Journal of Official Statistics*, 18: 13–23.
- Colombo, R. (2000). A Model for Diagnosing and Reducing Nonresponse Bias. *Journal of Advertising Research*, 40(1/2): 85–93.
- Curtin, R., Presser, S., and Singer, E. (2005). Changes in Telephone Survey Nonresponse Over the Past Quarter Century. *Public Opinion Quarterly*, 69: 87–98.
- Deming, W.E., and Stephan, F.F. (1940). On a Least Square Adjustment of a Sampled Frequency Table When the Expected Marginal Totals Are Known. *Annals of Mathematical Statistics*, 11: 427–444.
- Deville, C., and Särndal, C. (1992). Calibration Estimators in Survey Sampling. *Journal of the American Statistical Association*, 87: 376–382.
- Garretsen, H.F., Jansen, H.A., Lahaut, V.M., and van de Mheen, D. (2002). Non-Response Bias in a Sample Survey on Alcohol Consumption. *Alcohol & Alcoholism*, 37: 256–260.
- Groves, R.M. (1989). *Survey Errors and Survey Costs*. New York: John Wiley & Sons, Inc.
- Groves, R., Presser, S., and Dipko, S. (2004). The Role of Topic Interest in Survey Participation Decisions. *Public Opinion Quarterly*, 68: 2–31.
- Groves, R.M., Singer, E., and Corning, A.D. (1999). Leverage-saliency Theory of Survey Participation: Description and an Illustration. *Public Opinion Quarterly*, 64: 299–308.
- Hagedorn, M., Montaquila, J., Carver, P., O'Donnell, K., and Chapman, C. (2006). *National Household Education Surveys Program of 2005: Public-Use Data File User's Manual, Volume I, Study Overview and Methodology* (NCES 2006-078). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
- Hagedorn, M., Roth, S.B., O'Donnell, K., Smith, S., and Mulligan, G. (2008). *National Household Education Surveys of 2007: Data File User's Manual, Volume I* (NCES 2009-024). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.

- Hox, J.J., and De Leeuw, E.D. (1994). A comparison of nonresponse in mail, telephone, and face-to-face surveys. *Quality and Quantity*, 28(4): 329–344.
- Kalton, G., and Maligalig, D. (1991). A Comparison of Methods of Weighting Adjustment for Nonresponse. *Proceedings of the U.S. Bureau of the Census 1991 Annual Research Conference*, 409–428.
- Keeter, S., Miller, C., Kohut, A., Groves, R., and Presser, S. (2000). Consequences of Reducing Nonresponse in a Large National Telephone Survey. *Public Opinion Quarterly*, 64: 125–148.
- Leon, J.J., Brown, W.C., Ruch, L.O., Johnson, T.E. (2003). *Survey Research: In-person, Mail, Telephone, and Web Methods*. Honolulu, HI: Streamline Surveys, Inc.
- Little, R. (1986). Survey Nonresponse Adjustments for Estimates of Means. *International Statistical Review*, 54: 139–157.
- Lundstrom, S., and Särndal, C-E. (1999). Calibration as a Standard Method for Treatment of Nonresponse. *Journal of Official Statistics*, 15: 305–327.
- Montaquila, J.M., Brick, M.J., and Brock, S.P. (1997). *Working Paper: Undercoverage Bias in Estimates of Characteristics of Households and Adults in the 1996 National Household Education Survey (NCES 97-39)*. National Center for Education Statistics, U.S. Department of Education. Washington, DC.
- Montaquila, J.M., Brick, J.M., Hagedorn, M.C., Kennedy, C., and Keeter, S. (2008). Aspects of nonresponse bias in RDD telephone surveys. In *Advances in Telephone Survey Methodology* (Lepkowski, J.M., Tucker, C., Brick, J.M., de Leeuw, E.D., Japec, L., Lavrakas, P.J., Link, M.W., and Sangster, R.L., eds.). Hoboken, NJ: John Wiley & Sons, Inc.
- Nolin, M.J., Montaquila, J., Nicchitta, P., Hagedorn, M.C., and Chapman, C. (2004). *National Household Education Surveys Program: 2001: Methodology Report* (NCES 2005-071). National Center for Education Statistics, Institute for Education Sciences, U.S. Department of Education. Washington, DC.
- Nolin, M.J., Montaquila, J., Nicchitta, P., Kim, K., Kleiner, B., Lennon, J., Chapman, C., Creighton, S., and Bielick, S. (2000). *National Household Education Survey of 1999: Methodology Report*. (NCES 2000-078). National Center for Education Statistics, U.S. Department of Education. Washington, DC.
- Office of Management and Budget. (2006). Questions and Answers When Designing Surveys for Information Collection, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C.
- O’Muircheartaigh, C., Eckman, S., and Weiss, C. (2002). Traditional and enhanced field listing for probability sampling. *Proceedings of the Social Statistics Section of the American Statistical Association* (pp. 2563–2567).

- Roth, S.B., Montaquila, J.M., and Chapman, C. (2007). *Nonresponse Bias in the 2005 National Household Education Surveys Program* (NCES 2007-016). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC.
- Seastrom, M.M. (2002). *NCES Statistical Standards* (NCES 2003-601). National Center for Education Statistics, U.S. Department of Education. Washington, DC.
- Smith, P., Hoaglin, D., Rao, J.N.K., Battaglia, M., and Daniels, D. (2004). Evaluation of Adjustments for Partial Non-Response Bias in the US National Immunization Survey. *Journal of the Royal Statistical Society, A*, 167: 141–156.
- Tucker, C., Brick, J.M., Meekins, B., and Morganstein, D. (2004). Household telephone service and usage patterns in the U.S. in 2004. *Proceedings of the Survey Research Methods Section, American Statistical Association* (CD-ROM).
- Tucker, C., Lepkowski, J.M., and Piekarski, L. (2002). The current efficiency of list-assisted telephone sampling designs. *Public Opinion Quarterly*, 66: 321–338.
- Westat (2004). *Field test of the 2005 National Household Education Surveys Program*. Contractor report. Rockville, MD: Westat.
- Wolter, K. (1985). *Introduction to Variance Estimation*, Chapter 4. New York: Springer-Verlag.