



August 27, 2008

MEMORANDUM FOR: Cheryl R. Landman  
Chief, Demographic Surveys Division

From: Ruth Ann Killion  
Chief, Demographic Statistical Methods Division



Subject: Source and Accuracy Statement for the October 2007 CPS  
Microdata File on School Enrollment

Attached is the statement on the source of the data and accuracy of the estimates for the October 2007 CPS Microdata File on School Enrollment.

If you have any questions or need additional information, please contact Mike White of the Demographic Statistical Methods Division via email at [dsmd.source.and.accuracy@census.gov](mailto:dsmd.source.and.accuracy@census.gov).

Attachment

cc:

email:

L. Clement (DSD)  
G. Weyland  
K. Woods  
B. Kominski (HHES)  
K. Bauman  
J. Davis  
H. Shin  
J. Clark (ACSD)  
A. Shields

P. Flanagan (DSMD)  
J. Scott  
S. Adeshiyan  
X. Liu  
B. Tran  
T. Moore  
HSSB (9)

# Source of the Data and Accuracy of the Estimates for the October 2007 CPS Microdata File on School Enrollment

## Table of Contents

<b>SOURCE OF THE DATA.....</b>	<b>1</b>
Basic CPS.....	1
October 2007 Supplement.....	2
Estimation Procedure.....	2
<b>ACCURACY OF THE ESTIMATES .....</b>	<b>3</b>
Sampling Error.....	3
Nonsampling Error.....	3
Nonresponse.....	3
Coverage .....	4
Comparability of Data.....	5
A Nonsampling Error Warning.....	6
Standard Errors and Their Use.....	6
Estimating Standard Errors .....	6
Generalized Variance Parameters .....	7
Standard Errors of Estimated Numbers .....	8
Standard Errors of Estimated School Enrollment Numbers .....	9
Standard Errors of Estimated Percentages.....	11
Standard Errors of Estimated Differences .....	12
Standard Errors of Quarterly or Yearly Averages .....	12
Technical Assistance.....	12
<b>REFERENCES.....</b>	<b>17</b>

## Tables

Table 1. CPS Coverage Ratios: October 2007.....	4
Table 2. Estimation Groups of Interest and Generalized Variance Parameters .....	8
Table 3. Population Controls for School Enrollment Age Groups: October 2007 .....	10
Table 4. Parameters for Computation of Standard Errors for Labor Force Characteristics: October 2007 .....	13
Table 5. Parameters for Computation of Standard Errors for School Enrollment Characteristics: October 2007.....	14
Table 6. Year Factors for Non-School Enrollment Characteristics .....	15
Table 7. Year Factors for School Enrollment Characteristics .....	16
Table 8. Factors for Regional Standard Errors and Parameters.....	16

## Source of the Data and Accuracy of the Estimates for the October 2007 CPS Microdata File on School Enrollment

### SOURCE OF THE DATA

The data in this microdata file are from the October 2007 Current Population Survey (CPS). The Census Bureau conducts the CPS every month, although this file has only October data. The October survey uses two sets of questions, the basic CPS and a set of supplemental questions. The CPS, sponsored jointly by the Census Bureau and the U.S. Bureau of Labor Statistics, is the country's primary source of labor force statistics for the entire population. The Census Bureau and the National Center for Education Statistics also jointly sponsor the supplemental questions for October.

**Basic CPS.** The monthly CPS collects primarily labor force data about the civilian noninstitutional population living in the United States. The institutionalized population, which is excluded from the population universe, is composed primarily of the population in correctional institutions and nursing homes (91 percent of the 4.1 million institutionalized people in Census 2000). Interviewers ask questions concerning labor force participation about each member 15 years old and over in sample households. Typically, the week containing the nineteenth of the month is the interview week. The week containing the twelfth is the reference week (i.e., the week about which the labor force questions are asked).

The CPS uses a multistage probability sample based on the results of the decennial census, with coverage in all 50 states and the District of Columbia. The sample is continually updated to account for new residential construction. When files from the most recent decennial census become available, the Census Bureau gradually introduces a new sample design for the CPS.<sup>1</sup>

In April 2004, the Census Bureau began phasing out the 1990 sample and replacing it with the 2000 sample, creating a mixed sampling frame. Two simultaneous changes occurred during this phase-in period. First, primary sampling units (PSUs)<sup>2</sup> selected for only the 2000 design gradually replaced those selected for the 1990 design. This involved 10 percent of the sample. Second, within PSUs selected for both the 1990 and 2000 designs, sample households from the 2000 design gradually replaced sample households from the 1990 design. This involved about 90 percent of the sample. The new sample design was completely implemented by July 2005.

In the first stage of the sampling process, PSUs are selected for sample. The United States is divided into 2,025 PSUs. The PSUs were redefined for this design to correspond to the Office of Management and Budget definitions of Core-Based Statistical Area definitions and to improve efficiency in field operations. These PSUs are grouped into 824 strata. Within each stratum, a single PSU is chosen for the sample, with its probability of selection proportional to its population as of the most recent decennial census. This PSU represents the entire stratum from which it was selected. In the case of strata consisting of only one PSU, the PSU is chosen with certainty.

---

<sup>1</sup> For detailed information on the 1990 sample redesign, please see reference [1].

<sup>2</sup> The PSUs correspond to substate areas (i.e., counties or groups of counties) that are geographically contiguous.

Approximately 72,000 housing units were selected for sample from the sampling frame in October. Based on eligibility criteria, 11 percent of these housing units were sent directly to computer-assisted telephone interviewing (CATI). The remaining units were assigned to interviewers for computer-assisted personal interviewing (CAPI).<sup>3</sup> Of all housing units in sample, about 60,000 were determined to be eligible for interview. Interviewers obtained interviews at about 55,000 of these units. Noninterviews occur when the occupants are not found at home after repeated calls or are unavailable for some other reason.

**October Supplement.** In October 2007, in addition to the basic CPS questions, interviewers asked supplementary questions of household members three years old and over on school enrollment.

**Estimation Procedure.** This survey's estimation procedure adjusts weighted sample results to agree with independently derived population estimates of the civilian noninstitutional population of the United States and each state (including the District of Columbia). These population estimates, used as controls for the CPS, are prepared monthly to agree with the most current set of population estimates that are released as part of the Census Bureau's population estimates and projections program.

The population controls for the nation are distributed by demographic characteristics in two ways:

- Age, sex, and race (White alone, Black alone, and all other groups combined).
- Age, sex, and Hispanic origin.

The population controls for the states are distributed by race (Black alone and all other race groups combined), age (0-15, 16-44, and 45 and over), and sex.

The independent estimates by age, sex, race, and Hispanic origin, and for states by selected age groups and broad race categories, are developed using the basic demographic accounting formula whereby the population from the latest decennial data is updated using data on the components of population change (births, deaths, and net international migration) with net internal migration as an additional component in the state population estimates.

The net international migration component in the population estimates includes a combination of the following:

- Legal migration to the United States.
- Emigration of foreign-born and native people from the United States.
- Net movement between the United States and Puerto Rico.
- Estimates of temporary migration.
- Estimates of net residual foreign-born population, which include unauthorized migration.

---

<sup>3</sup> For further information on CATI and CAPI and the eligibility criteria, please see reference [2].

Because the latest available information on these components lags the survey date, it is necessary to make short-term projections of these components to develop the estimate for the survey date.

## **ACCURACY OF THE ESTIMATES**

A sample survey estimate has two types of error: sampling and nonsampling. The accuracy of an estimate depends on both types of error. The nature of the sampling error is known given the survey design; the full extent of the nonsampling error is unknown.

**Sampling Error.** Since the CPS estimates come from a sample, they may differ from figures from an enumeration of the entire population using the same questionnaires, instructions, and enumerators. For a given estimator, the difference between an estimate based on a sample and the estimate that would result if the sample were to include the entire population is known as sampling error. Standard errors, as calculated by methods described in “Standard Errors and Their Use,” are primarily measures of the magnitude of sampling error. However, they may include some nonsampling error.

**Nonsampling Error.** For a given estimator, the difference between the estimate that would result if the sample were to include the entire population and the true population value being estimated is known as nonsampling error. There are several sources of nonsampling error, which may occur during the development or execution of the survey. It can occur because of circumstances created by the interviewer, the respondent, the survey instrument, or the way the data are collected and processed. For example, errors could occur because:

- The interviewer records the wrong answer, the respondent provides incorrect information, the respondent estimates the requested information, or an unclear survey question is misunderstood by the respondent (measurement error).
- Some individuals or businesses which should have been included in the survey frame were missed (coverage error).
- Responses are not collected from all those in the sample or the respondent is unwilling to provide information (nonresponse error).
- Values are estimated imprecisely for missing data (imputation error).
- Forms may be lost, data may be incorrectly keyed, coded, or recoded, etc. (processing error).

The Census Bureau employs quality control procedures throughout the production process including the overall design of surveys, the wording of questions, the review of the work of interviewers and coders, and the statistical review of reports to minimize these errors.

Two types of nonsampling error that can be examined to a limited extent are nonresponse and undercoverage.

**Nonresponse.** The effect of nonresponse cannot be measured directly, but one indication of its potential effect is the nonresponse rate. For the October 2007 basic CPS, the household-level nonresponse rate was 8.0 percent. The person-level nonresponse rate for the School Enrollment supplement was an additional 5.9 percent.

Since the basic CPS nonresponse rate is a household-level rate and the School Enrollment supplement nonresponse rate is a person-level rate, we cannot combine these rates to derive an overall nonresponse rate. Since it is unlikely the nonresponding households to the basic CPS have the same number of persons as the households successfully interviewed, combining these rates would result in an overestimate of the “true” person-level overall nonresponse rate for the School Enrollment supplement.

**Coverage.** The concept of coverage in the survey sampling process is the extent to which the total population that could be selected for sample “covers” the survey’s target population. Missed housing units and missed people within sample households create undercoverage in the CPS. Overall CPS undercoverage for October 2007 is estimated to be about 13 percent. CPS coverage varies with age, sex, and race. Generally, coverage is larger for females than for males and larger for non-Blacks than for Blacks. This differential coverage is a general problem for most household-based surveys.

The CPS weighting procedure partially corrects for bias from undercoverage, but biases may still be present when people who are missed by the survey differ from those interviewed in ways other than age, race, sex, Hispanic origin, and state of residence. How this weighting procedure affects other variables in the survey is not precisely known. All of these considerations affect comparisons across different surveys or data sources.

A common measure of survey coverage is the coverage ratio, calculated as the estimated population before poststratification divided by the independent population control. Table 1 shows October 2007 CPS coverage ratios by age and sex for certain race and Hispanic groups. The CPS coverage ratios can exhibit some variability from month to month.

Age group	All people	Total		White only		Black only		Residual race		Hispanic	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0-15	0.88	0.88	0.88	0.89	0.88	0.80	0.82	0.90	0.95	0.89	0.86
16-19	0.85	0.87	0.84	0.87	0.86	0.84	0.79	0.91	0.77	0.90	0.91
20-24	0.78	0.75	0.80	0.77	0.80	0.58	0.79	0.84	0.83	0.76	0.88
25-34	0.82	0.79	0.84	0.81	0.85	0.66	0.81	0.80	0.87	0.78	0.83
35-44	0.87	0.84	0.89	0.86	0.91	0.73	0.81	0.85	0.83	0.76	0.90
45-54	0.89	0.87	0.90	0.89	0.91	0.80	0.86	0.81	0.80	0.80	0.87
55-64	0.91	0.90	0.92	0.91	0.93	0.74	0.86	0.91	0.95	0.88	0.94
65+	0.94	0.95	0.93	0.95	0.93	0.97	0.94	0.86	0.86	0.81	0.89
15+	0.87	0.86	0.88	0.87	0.89	0.75	0.84	0.84	0.85	0.80	0.88
0+	0.87	0.86	0.88	0.88	0.89	0.76	0.83	0.86	0.87	0.83	0.88

- Notes: (1) The Residual race group includes cases indicating a single race other than White or Black, and cases indicating two or more races.  
 (2) Hispanics may be any race. For a more detailed discussion on the use of parameters for race and ethnicity, please see the “Generalized Variance Parameters” section.

**Comparability of Data.** Data obtained from the CPS and other sources are not entirely comparable. This results from differences in interviewer training and experience and in differing survey processes. This is an example of nonsampling variability not reflected in the standard errors. Therefore, caution should be used when comparing results from different sources.

Data users should be careful when comparing the data from this microdata file, which reflects Census 2000-based controls, with microdata files from March 1994 through December 2002, which reflect 1990 census-based controls. Ideally, the same population controls should be used when comparing any estimates. In reality, the use of same population controls is not practical when comparing trend data over a period of 10 to 20 years. Thus, when it is necessary to combine or compare data based on different controls or different designs, data users should be aware that changes in weighting controls or weighting procedures can create small differences between estimates. See the discussion following for information on comparing estimates derived from different controls or different sample designs.

Microdata files from previous years reflect the latest available census-based controls. Although the most recent change in population controls had relatively little impact on summary measures such as averages, medians, and percentage distributions, it did have a significant impact on levels. For example, use of Census 2000-based controls results in about a one percent increase from the 1990 census-based controls in the civilian noninstitutional population and in the number of families and households. Thus, estimates of levels for data collected in 2003 and later years will differ from those for earlier years by more than what could be attributed to actual changes in the population. These differences could be disproportionately greater for certain population subgroups than for the total population.

Note that certain microdata files from 2002, namely June, October, November, and the 2002 ASEC, contain both Census 2000-based estimates and 1990 census-based estimates and are subject to the comparability issues discussed previously. All other microdata files from 2002 reflect the 1990 census-based controls.

Users should also exercise caution because of changes caused by the phase-in of the Census 2000 files (see “Basic CPS”). During this time period, CPS data are collected from sample designs based on different censuses. Three features of the new CPS design have the potential of affecting published estimates: (1) the temporary disruption of the rotation pattern from August 2004 through June 2005 for a comparatively small portion of the sample, (2) the change in sample areas, and (3) the introduction of the new Core-Based Statistical Areas (formerly called metropolitan areas). Most of the known effect on estimates during and after the sample redesign will be the result of changing from 1990 to 2000 geographic definitions. Research has shown that the national-level estimates of the metropolitan and nonmetropolitan populations should not change appreciably because of the new sample design. However, users should still exercise caution when comparing metropolitan and nonmetropolitan estimates across years with a design change, especially at the state level.

Caution should also be used when comparing Hispanic estimates over time. No independent population control totals for people of Hispanic origin were used before 1985.

**A Nonsampling Error Warning.** Since the full extent of the nonsampling error is unknown, one should be particularly careful when interpreting results based on small differences between estimates. The Census Bureau recommends that data users incorporate information about nonsampling errors into their analyses, as nonsampling error could impact the conclusions drawn from the results. Caution should also be used when interpreting results based on a relatively small number of cases. Summary measures (such as medians and percentage distributions) probably do not reveal useful information when computed on a subpopulation smaller than 75,000.

For additional information on nonsampling error including the possible impact on CPS data when known, refer to references [2] and [3].

**Standard Errors and Their Use.** The sample estimate and its standard error enable one to construct a confidence interval. A confidence interval is a range that would include the average result of all possible samples with a known probability. For example, if all possible samples were surveyed under essentially the same general conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then approximately 90 percent of the intervals from 1.645 standard errors below the estimate to 1.645 standard errors above the estimate would include the average result of all possible samples.

A particular confidence interval may or may not contain the average estimate derived from all possible samples. However, one can say with specified confidence that the interval includes the average estimate calculated from all possible samples.

Standard errors may also be used to perform hypothesis testing, a procedure for distinguishing between population parameters using sample estimates. The most common type of hypothesis is that the population parameters are different. An example of this would be comparing the percentage of men who were part-time workers to the percentage of women who were part-time workers.

Tests may be performed at various levels of significance. A significance level is the probability of concluding that the characteristics are different when, in fact, they are the same. For example, to conclude that two characteristics are different at the 0.10 level of significance, the absolute value of the estimated difference between characteristics must be greater than or equal to 1.645 times the standard error of the difference.

The Census Bureau uses 90-percent confidence intervals and 0.10 levels of significance to determine statistical validity. Consult standard statistical textbooks for alternative criteria.

**Estimating Standard Errors.** The Census Bureau uses replication methods to estimate the standard errors of CPS estimates. These methods primarily measure the magnitude of sampling error. However, they do measure some effects of nonsampling error as well. They do not measure systematic biases in the data associated with nonsampling error. Bias is the average over all possible samples of the differences between the sample estimates and the true value.



**Generalized Variance Parameters.** While it is possible to compute and present an estimate of the standard error based on the survey data for each estimate in a report, there are a number of reasons why this is not done. A presentation of the individual standard errors would be of limited use, since one could not possibly predict all of the combinations of results that may be of interest to data users. Additionally, data users have access to CPS microdata files, and it is impossible to compute in advance the standard error for every estimate one might obtain from those data sets. Moreover, variance estimates are based on sample data and have variances of their own. Therefore, some methods of stabilizing these estimates of variance, for example, by generalizing or averaging over time, may be used to improve their reliability.

Experience has shown that certain groups of estimates have similar relationships between their variances and expected values. Modeling or generalizing may provide more stable variance estimates by taking advantage of these similarities. The generalized variance function is a simple model that expresses the variance as a function of the expected value of the survey estimate. The parameters of the generalized variance function are estimated using direct replicate variances. These generalized variance parameters provide a relatively easy method to obtain approximate standard errors for numerous characteristics. In this source and accuracy statement, Table 4 provides the generalized variance parameters for labor force estimates and Table 5 provides generalized variance parameters for characteristics from the October 2007 supplement. Also, tables are provided that allow the calculation of parameters for prior years and parameters for U.S. states and regions. Tables 6 and 7 provide factors to derive prior year parameters. Table 8 provides factors and populations controls to derive U.S. state and regional parameters.

The basic CPS questionnaire records the race and ethnicity of each respondent. With respect to race, a respondent can be White, Black, Asian, American Indian and Alaskan Native (AIAN), Native Hawaiian and Other Pacific Islander (NHOPI), or combinations of two or more of the preceding. A respondent's ethnicity can be Hispanic or non-Hispanic, regardless of race.

The generalized variance parameters to use in computing standard errors are dependent upon the race/ethnicity group of interest. The following table summarizes the relationship between the race/ethnicity group of interest and the generalized variance parameters to use in standard error calculations.

**Table 2. Estimation Groups of Interest and Generalized Variance Parameters**

Race/ethnicity group of interest	Generalized variance parameters to use in standard error calculations
Total population	Total or White
Total White, White AOIC, or White non-Hispanic population	Total or White
Total Black, Black AOIC, or Black non-Hispanic population	Black
Total Asian, AIAN, NHOPI; Asian, AIAN, NHOPI AOIC; or Asian, AIAN, NHOPI non-Hispanic population	Asian, AIAN, NHOPI
Populations from other race groups	Asian, AIAN, NHOPI
Hispanic population	Hispanic
Two or more races – employment/unemployment and educational attainment characteristics	Black
Two or more races – all other characteristics	Asian, AIAN, NHOPI

- Notes: (1) AIAN, NHOPI are American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, respectively.
- (2) AOIC is an abbreviation for alone or in combination. The AOIC population for a race group of interest includes people reporting only the race group of interest (alone) and people reporting multiple race categories including the race group of interest (in combination).
- (3) Hispanics may be any race.
- (4) Two or more races refers to the group of cases self-classified as having two or more races.

**Standard Errors of Estimated Numbers.** The approximate standard error,  $s_x$ , of an estimated number from this microdata file can be obtained by using the formula:

$$s_x = \sqrt{ax^2 + bx} \quad (1)$$

Here  $x$  is the size of the estimate and  $a$  and  $b$  are the parameters in Table 4 associated with the particular type of characteristic. When calculating standard errors from cross-tabulations involving different characteristics, use the set of parameters for the characteristic that will give the largest standard error.

#### Illustration 1

Suppose there were 3,375,000 unemployed men (ages 16 and up) in the civilian labor force. Use the appropriate parameters from Table 4 and Formula (1) to get

<b>Illustration 1</b>	
Number of unemployed males in the civilian labor force ( $x$ )	3,714,000
a parameter ( $a$ )	-0.000032
b parameter ( $b$ )	2,971
Standard error	103,000
90-percent confidence interval	3,545,000 to 3,883,000

The standard error is calculated as

$$s_x = \sqrt{-0.000032 \times 3,714,000^2 + 2,971 \times 3,714,000} = 103,000$$

The 90-percent confidence interval is calculated as  $3,714,000 \pm 1.645 \times 103,000$ .

A conclusion that the average estimate derived from all possible samples lies within a range computed in this way would be correct for roughly 90 percent of all possible samples.

**Standard Errors of Estimated School Enrollment Numbers.** The approximate standard error,  $s_x$ , of an estimated school enrollment number from this microdata file can be obtained by using the formula:

$$s_x = \sqrt{-\left(\frac{b}{T}\right)x^2 + bx} \quad (2)$$

Here  $x$  is the size of the estimate,  $T$  is the population control in Table 3 for the total number of persons in a specific age group and  $b$  is the parameter in Table 5 associated with the particular type of characteristic. If Table 3 does not contain the age group of interest, use the smallest age group available in the table that does contain the age group of interest. When calculating standard errors for numbers from cross-tabulations involving different characteristics, use the set of parameters for the characteristic that will give the largest standard error.

<b>Table 3. Population Controls for School Enrollment Age Groups: October 2007</b>				
<b>Age group</b>	<b>Total or White</b>	<b>Black</b>	<b>Asian, AIAN, NHOPI</b>	<b>Hispanic</b>
3+	286,354,576	57,381,497	21,120,638	45,642,824
3-4	9,188,689	2,945,600	1,099,408	4,855,825
3-6	18,276,851	5,808,279	2,136,780	9,142,597
3-17	70,678,946	17,443,134	6,152,150	16,909,556
3-24	91,119,187	21,937,481	7,747,725	20,561,994
5-24	81,930,498	18,991,881	6,648,317	15,706,169
6-13	32,933,958	8,526,300	3,080,538	9,072,799
14-17	25,459,825	5,971,234	1,972,204	7,766,959
15+	237,299,236	45,243,459	16,940,692	36,500,227
15-17	21,623,606	5,305,096	1,972,204	7,766,959
15-19	21,623,606	5,305,096	1,972,204	7,766,959
15-24	42,063,847	9,799,443	3,567,779	11,419,397
16-17	17,039,798	3,963,879	1,307,084	2,980,932
16-24	37,480,039	8,458,226	2,902,659	6,633,370
18-19	17,039,798	3,963,879	1,307,084	2,980,932
18-24	37,480,039	8,458,226	2,902,659	6,633,370
20-21	20,440,241	4,494,347	1,595,575	3,652,438
20-24	20,440,241	4,494,347	1,595,575	3,652,438
22-24	20,440,241	4,494,347	1,595,575	3,652,438
25+	195,235,389	35,444,016	13,372,913	25,080,830
25-29	20,751,934	4,550,565	1,747,929	4,183,048
25-34	39,930,744	8,786,354	3,547,873	8,186,132
30-34	19,178,810	4,235,789	1,799,944	4,003,084
35+	155,304,645	26,657,662	9,825,040	16,894,698

- Notes: (1) AIAN, NHOPI are American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, respectively.  
(2) Hispanics may be any race.

### Illustration 2

Suppose there were 4,491,000 three and four year olds enrolled in school and 9,188,689 total children in that age group. Use the appropriate  $b$  parameter from Table 5 and Formula (2) to get

<b>Illustration 2</b>	
Number of three and four year olds enrolled in school ( $x$ )	4,491,000
Total ( $T$ )	9,188,689
$b$ parameter ( $b$ )	2,453
Standard error	75,000
90-percent confidence interval	4,368,000 to 4,614,000

The standard error is calculated as

$$s_x = \sqrt{-\left(\frac{2,453}{9,188,689}\right) \times 4,491,000^2 + 2,453 \times 4,491,000} = 75,000$$

The 90-percent confidence interval is calculated as  $4,491,000 \pm 1.645 \times 75,000$ .

A conclusion that the average estimate derived from all possible samples lies within a range computed in this way would be correct for roughly 90 percent of all possible samples.

**Standard Errors of Estimated Percentages.** The reliability of an estimated percentage, computed using sample data for both numerator and denominator, depends on both the size of the percentage and its base. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentages, particularly if the percentages are 50 percent or more. When the numerator and denominator of the percentage are in different categories, use the parameter from Table 4 or 5 as indicated by the numerator.

The approximate standard error,  $s_{x,p}$ , of an estimated percentage can be obtained by using the formula:

$$s_{x,p} = \sqrt{\frac{b}{x} p(100-p)} \quad (3)$$

Here  $x$  is the total number of people, families, households, or unrelated individuals in the base of the percentage,  $p$  is the percentage ( $0 \leq p \leq 100$ ), and  $b$  is the parameter in Table 4 or 5 associated with the characteristic in the numerator of the percentage.

### Illustration 3

Suppose there were 15,854,000 people aged 18 to 21, and 47.9 percent were enrolled in college. Use the appropriate parameter from Table 5 and Formula (3) to get

<b>Illustration 3</b>	
Percentage of people aged 18-21 enrolled in college ( $p$ )	47.9
Base ( $x$ )	15,854,000
b parameter ( $b$ )	2,131
Standard error	0.58
90-percent confidence interval	47.0 to 48.9

The standard error is calculated as

$$s_{x,p} = \sqrt{\frac{2,131}{15,854,000} \times 47.9 \times (100.0 - 47.9)} = 0.58$$

The 90-percent confidence interval for the estimated percentage of people aged 18 to 21 enrolled in college is from 47.0 to 48.9 percent (i.e.,  $47.9 \pm 1.645 \times 0.58$ ).

**Standard Errors of Estimated Differences.** The standard error of the difference between two sample estimates is approximately equal to

$$s_{x-y} = \sqrt{s_x^2 + s_y^2} \quad (4)$$

where  $s_x$  and  $s_y$  are the standard errors of the estimates,  $x$  and  $y$ . The estimates can be numbers, percentages, ratios, etc. This will result in accurate estimates of the standard error of the same characteristic in two different areas, or for the difference between separate and uncorrelated characteristics in the same area. However, if there is a high positive (negative) correlation between the two characteristics, the formula will overestimate (underestimate) the true standard error.

#### Illustration 4

Suppose that of the 7,338,000 employed men between 20-24 years of age, 24.6 percent were part-time workers, and of the 6,529,000 employed women between 20-24 years of age, 34.2 percent were part-time workers. Use the appropriate parameters from Table 4 and Formulas (3) and (4) to get

<b>Illustration 4</b>			
	Male (x)	Female (y)	Difference
Percentage working part-time ( $p$ )	24.6	34.2	9.6
Number	7,338,000	6,529,000	-
b parameter ( $b$ )	2,971	2,782	-
Standard error	0.87	0.98	1.31
90-percent confidence interval	23.2 to 26.0	32.6 to 35.8	7.5 to 11.8

The standard error of the difference is calculated as

$$s_{x-y} = \sqrt{0.87^2 + 0.98^2} = 1.31$$

The 90-percent confidence interval around the difference is calculated as  $9.6 \pm 1.645 \times 1.31$ . Since this interval does not include zero, we can conclude with 90 percent confidence that the percentage of part-time women workers between 20-24 years of age is greater than the percentage of part-time men workers between 20-24 years of age.

**Standard Errors of Quarterly or Yearly Averages.** For information on calculating standard errors for labor force data from the CPS which involve quarterly or yearly averages, please see the “Explanatory Notes and Estimates of Error: Household Data” section in *Employment and Earnings*, a monthly report published by the U.S. Bureau of Labor Statistics.

**Technical Assistance.** If you require assistance or additional information, please contact the Demographic Statistical Methods Division via e-mail at [dsmd.source.and.accuracy@census.gov](mailto:dsmd.source.and.accuracy@census.gov).

**Table 4. Parameters for Computation of Standard Errors for Labor Force Characteristics: October 2007**

Characteristic	a	b
<b>Total or White</b>		
<i>Civilian labor force, employed</i>	-0.000016	3,068
<i>Not in labor force</i>	-0.000009	1,833
<i>Unemployed</i>	-0.000016	3,096
<i>Civilian labor force, employed, not in labor force, and unemployed</i>		
Men	-0.000032	2,971
Women	-0.000031	2,782
Both sexes, 16 to 19 years	-0.000022	3,096
<b>Black</b>		
<i>Civilian labor force, employed, not in labor force, and unemployed</i>		
Total	-0.000151	3,455
Men	-0.000311	3,357
Women	-0.000252	3,062
Both sexes, 16 to 19 years	-0.001632	3,455
<b>Hispanic</b>		
<i>Civilian labor force, employed, not in labor force, and unemployed</i>		
Total	-0.000141	3,455
Men	-0.000253	3,357
Women	-0.000266	3,062
Both sexes, 16 to 19 years	-0.001528	3,455
<b>Asian, AIAN, NHOPI</b>		
<i>Civilian labor force, employed, not in labor force, and unemployed</i>		
Total	-0.000346	3,198
Men	-0.000729	3,198
Women	-0.000659	3,198
Both sexes, 16 to 19 years	-0.004146	3,198

- Notes: (1) These parameters are to be applied to basic CPS monthly labor force estimates.
- (2) AIAN, NHOPI are American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, respectively.
- (3) Hispanics may be any race. For a more detailed discussion on the use of parameters for race and ethnicity, please see the “Generalized Variance Parameters” section.
- (4) The Total or White, Black, and Asian, AIAN, NHOPI parameters are to be used for both alone and in combination race group estimates.
- (5) For nonmetropolitan characteristics, multiply the *a* and *b* parameters by 1.5. If the characteristic of interest is total state population, not subtotaled by race or ethnicity, the *a* and *b* parameters are zero.
- (6) For foreign-born and noncitizen characteristics for Total and White, the *a* and *b* parameters should be multiplied by 1.3. No adjustment is necessary for foreign-born and noncitizen characteristics for Black, Hispanic, and Asian, AIAN, NHOPI parameters.
- (7) For the groups self-classified as having two or more races, use the Asian, AIAN, NHOPI parameters for all employment characteristics.

**Table 5. Parameters for Computation of Standard Errors for  
School Enrollment Characteristics: October 2007**

Characteristics	b			
	Total or White	Black	Asian, AIAN, NHOPI	Hispanic
<b>PEOPLE</b>				
<i>Persons enrolled in school:</i>				
Total.....	2,131	2,410	2,410	2,744
Children 13 and under.....	2,453	2,775	2,775	3,159
<i>Marital status, household and family characteristics, health insurance</i>				
Some household members.....	4,687	6,733	6,733	11,347
All household members.....	5,695	9,929	9,929	16,733
<b>FAMILIES, HOUSEHOLDS, OR UNRELATED INDIVIDUALS</b>				
<i>Income, earnings.....</i>	2,016	2,201	2,201	3,709
<i>Marital status, household and family characteristics, educational attainment, population by age/sex.....</i>	1,860	1,683	1,683	2,836

- Notes: (1) These parameters are to be applied to the October 2007 School Enrollment Supplement data.
- (2) AIAN, NHOPI are American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, respectively.
- (3) Hispanics may be any race. For a more detailed discussion on the use of parameters for race and ethnicity, please see the “Generalized Variance Parameters” section.
- (4) The Total or White, Black, and Asian, AIAN, NHOPI parameters are to be used for both alone and in combination race group estimates.
- (5) For nonmetropolitan characteristics, multiply the *a* and *b* parameters by 1.5. If the characteristic of interest is total state population, not subtotaed by race or ethnicity, the *a* and *b* parameters are zero.
- (6) For foreign-born and noncitizen characteristics for Total and White, the *a* and *b* parameters should be multiplied by 1.3. No adjustment is necessary for foreign-born and noncitizen characteristics for Black, Asian, AIAN, NHOPI, and Hispanic parameters.
- (7) For the group self-classified as having two or more races, use the Asian, AIAN, NHOPI parameters for all characteristics except employment, unemployment, and educational attainment, in which case use Black parameters.



In 1994, we calculated school enrollment parameters directly from the 1994 CPS data. Since that time, the school enrollment parameters have been based on these updated parameters. Therefore, when calculating past school enrollment parameters, a separate set of year factors should be used.

Table 6 shows the prior year factors to apply to the non-school enrollment parameters.

<b>Table 6. Year Factors for Non-School Enrollment Characteristics (1942-2006)</b>					
<b>Time Period</b>	<b>Total or White</b>	<b>Black</b>		<b>Asian, AIAN, NHOPI</b>	<b>Hispanic</b>
	<b>a and b</b>	<b>a</b>	<b>b</b>	<b>a and b</b>	<b>a and b</b>
January 2003 – Present	1.00	1.00	1.00	1.00	1.00
July 2001 – December 2002 (SCHIP)	1.00	1.20	1.00	NA	1.00
January 1996 - June 2001 (Non-SCHIP)	1.11	1.33	1.11	NA	1.11
April 1989 - December 1995	1.03	1.23	1.03	NA	1.03
April 1988 - March 1989	1.14	1.37	1.14	NA	1.20
January 1985 - March 1988	0.96	1.15	0.96	NA	0.96
January 1982 - December 1984	0.96	1.15	0.96	NA	1.35
March 1973 - December 1981	0.86	1.03	0.86	NA	1.20
January 1967 - February 1973	0.86	1.03	0.86	NA	1.20
May 1956 - December 1966	1.29	1.55	1.29	NA	1.81
August 1942 - April 1956	1.93	2.32	1.96	NA	2.71

- Notes: (1) These factors are for use with the 2007 non-School Enrollment *a* and *b* parameters.  
 (2) AIAN, NHOPI are American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander.  
 (3) Hispanics may be any race. For a more detailed discussion on the use of parameters for race and ethnicity, please see the “Generalized Variance Parameters” section.

Table 7 shows prior year factors to apply to school enrollment parameters.

<b>Table 7. Year Factors for School Enrollment Characteristics (1945-2006)</b>					
<b>Time Period</b>	<b>Total or White</b>	<b>Black</b>		<b>AIAN, NHOPI</b>	<b>Hispanic</b>
	<b>a and b</b>	<b>a</b>	<b>b</b>	<b>a and b</b>	<b>a and b</b>
January 2003 – Present	1.00	1.00	1.00	1.00	1.00
July 2001 - December 2002 (SCHIP)	1.00	1.20	1.00	NA	1.00
January 1996 - June 2001 (Non-SCHIP)	1.11	1.33	1.11	NA	1.11
March 1995 - December 1995	1.03	1.23	1.03	NA	1.03
April 1989 - February 1995	1.19	1.70	1.42	NA	2.10
April 1988 - March 1989	1.32	1.89	1.58	NA	2.45
January 1985 - March 1988	1.11	1.60	1.33	NA	1.97
January 1982 - December 1984	1.11	1.60	1.33	NA	2.76
March 1973 - December 1981	0.99	1.43	1.19	NA	2.46
January 1967 - February 1973	0.99	1.43	1.19	NA	2.46
May 1956 - December 1966	1.49	2.14	1.78	NA	3.69
October 1945 - April 1956	2.24	3.21	2.67	NA	5.54

Notes: (1) These factors are for use with the 2007 School Enrollment *a* and *b* parameters.

(2) AIAN, NHOPI are American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander.

(3) Hispanics may be any race. For a more detailed discussion on the use of parameters for race and ethnicity, please see the “Generalized Variance Parameters” section.

Table 8 provides the U.S. regional factors to apply to parameters in order to calculate standard errors for U.S. regional estimates.

<b>Table 8. Regional Factors to Apply To 2007 Parameters</b>	
<b>Type of characteristic</b>	<b>Factor</b>
U. S. totals	1.00
Regions:	
Northeast	1.06
Midwest	1.06
South	1.07
West	1.02

## References

- [1] Bureau of Labor Statistics. 1994. *Employment and Earnings*. Volume 41 Number 5, May 1994. Washington, DC: Government Printing Office.
- [2] U.S. Census Bureau. 2002. *Current Population Survey: Design and Methodology*. Technical Paper 63RV. Washington, DC: Government Printing Office.  
(<http://www.census.gov/prod/2002pubs/tp63rv.pdf>)
- [3] Brooks, C.A. and Bailar, B.A. 1978. *Statistical Policy Working Paper 3 - An Error Profile: Employment as Measured by the Current Population Survey*. Subcommittee on Nonsampling Errors, Federal Committee on Statistical Methodology, U.S. Department of Commerce, Washington, DC. (<http://www.fcsm.gov/working-papers/spp.html>)