Appendix C. Source and Accuracy of Estimates

SOURCE OF DATA

Most estimates in this report come from data obtained in November of years 1964 through 1992 in the Current Population Survey (CPS). The Bureau of the Census conducts the survey every month, although this report uses mostly November data for its estimates. The November survey uses two sets of questions, the basic CPS and the supplement.

Basic CPS. The basic CPS collects primarily labor force data about the civilian noninstitutional population. Interviewers ask questions concerning labor force participation about each member 15 years old and over in every sample household.

The present CPS sample was selected from the 1980 Decennial Census files with coverage in all 50 states and the District of Columbia. The sample is continually updated to account for new residential construction. It is located in 729 areas comprising 1,973 counties, independent cities, and minor civil divisions. About 60,000 occupied housing units are eligible for interview every month. Interviewers are unable to obtain interviews at about 2,600 of these units because the occupants are not home after repeated calls or are unavailable for some other reason.

Since the introduction of the CPS, the Bureau of the Census has redesigned the CPS sample several times to improve the quality and reliability of the data and to satisfy changing data needs. The most recent changes were completely implemented in July 1985.

The following table summarizes changes in the CPS designs for the years for which data appear in this report.

Description of the November Current Population Survey

Time period	Number of sample areas	Housing Units Eligible	
		Interviewed	Not Interviewed
1990 to 1992	729	57,400	2,600
1988	729	53,600	2,500
1986	729	57,000	2,500
1982 to 1984	629	59,000	2,500
1980	629	65,500	3,000
1978	614	55,000	3,000
1974 to 1976	461	46,500	2,500
1972	449	45,000	2,000
1968 to 1970	449	48,000	2,000
1964 to 1966	357	33,500	1,500

November 1992 supplement. In addition to the basic CPS questions, interviewers asked supplementary questions in November 1992 about voting and registration.

Estimation procedure. This survey's estimation procedure inflates weighted sample results to independent estimates of the civilian noninstitutional population of the United States by age, sex, race and Hispanic origin. The independent estimates were based on statistics from decennial censuses of population; statistics on births, deaths, immigration and emigration; and statistics on the size of the Armed Forces. The independent population estimates used for 1981 (1980 for income estimates) to present were based on updates to controls established by the 1980 Decennial Census. Data previous to 1981 were based on independent population estimates from the most recent decennial census. For more details on the change in independent estimates, see the section entitled "Introduction of 1980 Census Population Controls" in an earlier report (Series P-60, No. 133).

The estimates in this report for 1985 and later also employ a revised survey weighting procedure for persons of Hispanic origin. In previous years, weighted sample results were inflated to independent estimates of the noninstitutional population by age, sex, and race. There was no specific control of the survey estimates for the Hispanic population. Since then, the Bureau of the Census developed independent population controls for the Hispanic population by sex and detailed age groups. Revised weighting procedures incorporate these new controls. The independent population estimates include some, but not all, undocumented immigrants.

ACCURACY OF THE ESTIMATES

Since the CPS estimates come from a sample, they may differ from figures from a complete census using the same questionnaires, instructions, and enumerators. A sample survey estimate has two possible types of error: sampling and nonsampling. The accuracy of an estimate depends on both types of error, but the full extent of the nonsampling error is unknown. Consequently, one should be particularly careful when interpreting results based on a relatively small number of cases or on small differences between estimates. The standard errors for CPS estimates primarily indicate the

magnitude of sampling error. They also partially measure the effect of some nonsampling errors in responses and enumeration, but do not measure systematic biases in the data. (Bias is the average over all possible samples of the differences between the sample estimates and the desired value.)

Nonsampling variability. Nonsampling errors can be attributed to many sources. These sources include the inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, respondents' inability or unwillingness to provide correct information or to recall information, errors made in data collection such as in recording or coding the data, errors made in processing the data, errors made in estimating values for missing data, and failure to represent all units with the sample (undercoverage).

CPS undercoverage results from missed housing units and missed persons within sample households. Compared to the level of the 1980 Decennial Census, overall CPS undercoverage is about 7 percent. CPS undercoverage varies with age, sex, and race. Generally, undercoverage is larger for males than for females and larger for Blacks and other races combined than for Whites. As described previously, ratio estimation to independent age-sex race-Hispanic population controls partially corrects for the bias due to undercoverage. However, biases exist in the estimates to the extent that missed persons in missed households or missed persons in interviewed households have different characteristics from those of interviewed persons in the same age-sex-race-Hispanic group. Furthermore, the independent population controls have not been adjusted for undercoverage in the 1980 census.

For additional information on nonsampling error, including the possible impact on CPS data when known, refer to the "Evaluation of the Accuracy of the Data" section of this report, Statistical Policy Working Paper 3, *An Error Profile: Employment as Measured by the Current Population Survey,* Office of Federal Statistical Policy and Standards, U.S. Department of Commerce, 1978 and Technical Paper 40, *The Current Population Survey: Design and Methodology*, Bureau of the Census, U.S. Department of Commerce.

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. Use caution when comparing results from different sources.

Caution should also be used when comparing estimates in this report, which reflect 1980 census-based population controls, with estimates for 1980 and earlier years, which reflect 1970 census-based population controls. This change in population controls had relatively little impact on summary measures such as means, medians, and percentage distributions, but did have a significant impact on levels. For example, use of 1980 based population controls results in about a 2-percent increase in the civilian noninstitutional population and in the number of families and households. Thus, estimates of levels for data collected in 1981 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 subpopulation groups than for the total population. For more details see the "Effects of population controls" subsection on page 24 in the "Studies in the Measurement of Voter Turnout" report (Series P-23, No. 168).

Since no independent population control totals for persons of Hispanic origin were used before 1985, compare Hispanic estimates over time cautiously.

Note when using small estimates. Summary measures (such as medians and percentage distributions) are shown only when the base is 75,000 or greater. Because of the large standard errors involved, summary measures would probably not reveal useful information when computed on a smaller base. However, estimated numbers are shown even though the relative standard errors of these numbers are larger than those for corresponding percentages. These smaller estimates permit combinations of the categories to suit data users' needs. Take care in the interpretation of small differences. For instance, even a small amount of nonsampling error can cause a borderline difference to appear significant or not, thus distorting a seemingly valid hypothesis test.

Sampling variability. Sampling variability is variation that occurred by chance because a sample was surveyed rather than the entire population. Standard errors, as calculated by methods described next in "Standard Errors and Their Use." are primarily measures of sampling variability, although they may include some nonsampling error.

Standard errors and their use. A number of approximations are required to derive, at a moderate cost, standard errors applicable to all the estimates in this report. Instead of providing an individual standard error for each estimate, generalized sets of standard errors are provided for various types of characteristics. Thus, the tables show levels of magnitude of standard errors rather than the precise standard errors.

The sample estimate and its standard error enable one to construct a confidence interval, 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.

Table C-1. **Standard Errors of Estimated Numbers of Persons**

(Numbers in thousands)

Estimate	Total or White	Black	His-panic	Asian
25	9	10	14	10
50	12	15	19	15
75	15	18	24	18
100	17	21	27	21
250	27	33	43	33
500	39	46	60	45
750	47	57	73	54
1,000	55	65	83	61
2,500	86	100	123	83
5,000	121	134	154	76
7,500	147	154	159	(X)
10,000	169	166	142	(X)
20,000	231	148	(X)	(X)
25,000	254	80	(X)	(X)
50,000	329	(X)	(X)	(X)
75,000	361	(X)	(X)	(X)
100,000	362	(X)	(X)	(X)
125,000	333	(X)	(X)	(X)
150,000	263	(X)	(X)	(X)
175,000	79	(X)	(X)	(X)

(X) Not applicable.

NOTE: For a particular characteristic, see tables C-5 through C-7 for the factor to apply to the above standard errors.

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.

Some statements in the report may contain estimates followed by a number in parentheses. This number can be added to and subtracted from the estimate to calculate upper and lower bounds of the 90-percent confidence interval. For example, if a statement contains the phrase "grew by 1.7 percent (±1.0)," the 90-percent confidence interval for the estimate, 1.7 percent, is 0.7 percent to 2.7 percent.

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 appearing in this report is that the population parameters are different. An example of this would be comparing the voting turnout rates of 1990 and 1992.

Tests may be performed at various levels of significance, where a significance level is the probability of concluding that the characteristics are different when, in fact, they are the same. All statements of comparison in the text have passed a hypothesis test at the 0.10 level of significance or better. This means that the absolute value of the estimated difference between characteristics is greater than or equal to 1.645 times the standard error of the difference.

Standard errors of estimated numbers. There are two ways to compute the approximate standard error, s_x, of an estimated number shown in this report. The first uses the formula

$$s_x = fs \qquad (1)$$

where f is a factor from Tables C-5 through C-7, and s is the standard error of the estimate obtained by interpolation from Table C-1. The second method uses formula (2), from which the standard errors in Table C-1 were calculated. This formula will provide more accurate results than formula (1).

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

Here x is the size of the estimate and a and b are the parameters in Tables C-5 through C-7 associated with the particular type of characteristic. When calculating standard errors for numbers from cross-tabulations involving different characteristics, use the factor or set of parameters for the characteristic which will give the largest standard error.

Illustration. Table 1 of the report shows that approximately 113,866,000 people reported voting in 1992. Using formula (1) with f = 1.00 from Table C-5 and s = 346,000, interpolated from Table C-1, the approximate standard error of the number of reported voters is

$$s_x = 1.00 \times 346{,}000 = 346{,}000.$$

Alternatively, using formula (2) with a = -0.000017 and b = 3,011 from Table C-5, the approximate standard error is

$$s_x = \sqrt{-0.000017 \times 113{,}866{,}000^2 + 3{,}011 \times 113{,}866{,}000} = 350{,}000.$$

The 90-percent confidence interval for the number of people that reported voting in 1992 is from 113,290,000 to 114,442,000 i.e., 113,866,000 ± 1.645 x 350,000. Therefore, 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 the size of the percentage and its base. Estimated

Table C-2. **Standard Errors of Estimated Percentages for Total or White Persons**

(Bases in thousands)

Base of estimatge	Estimated Percentage					
	2 or 98	5 or 95	10 or 90	20 or 80	25 or 75	50
25	4.9	7.6	10.4	13.9	15.0	17.4
50	3.4	5.3	7.4	9.8	10.6	12.3
75	2.8	4.4	6.0	8.0	8.7	10.0
100	2.4	3.8	5.2	6.9	7.5	8.7
250	1.5	2.4	3.3	4.4	4.8	5.5
500	1.1	1.7	2.3	3.1	3.4	3.9
750	0.9	1.4	1.9	2.5	2.7	3.2
1,000	0.8	1.2	1.6	2.2	2.4	2.7
2,500	0.5	0.8	1.0	1.4	1.5	1.7
5,000	0.3	0.5	0.7	1.0	1.1	1.2
7,500	0.3	0.4	0.6	0.8	0.9	1.0
10,000	0.2	0.4	0.5	0.7	0.8	0.9
25,000	0.2	0.2	0.3	0.4	0.5	0.5
50,000	0.1	0.2	0.2	0.3	0.3	0.4
75,000	0.1	0.1	0.2	0.3	0.3	0.3
100,000	0.1	0.1	0.2	0.2	0.2	0.3
125,000	0.1	0.1	0.1	0.2	0.2	0.2
150,000	0.1	0.1	0.1	0.2	0.2	0.2
175,000	0.1	0.1	0.1	0.2	0.2	0.2

NOTE: For a particular characteristic, see table C-5 for the factor to apply to the above standard errors.

Table C-3. **Standard Errors of Estimated Percentages for Black and Asian Persons**

(Bases in thousands)

Base of estimate	Estimated Percentage					
	2 or 98	5 or 95	10 or 90	20 or 80	25 or 75	50
25	5.9	9.2	12.6	16.8	18.2	21.0
50	4.2	6.5	8.9	11.9	12.9	14.8
75	3.4	5.3	7.3	9.7	10.5	12.1
100	2.9	4.6	6.3	8.4	9.1	10.5
250	1.9	2.9	4.0	5.3	5.7	6.6
500	1.3	2.0	2.8	3.8	4.1	4.7
750	1.1	1.7	2.3	3.1	3.3	3.8
1,000	0.9	1.4	2.0	2.7	2.9	3.3
2,500	0.6	0.9	1.3	1.7	1.8	2.1
5,000	0.4	0.6	0.9	1.2	1.3	1.5
7,500	0.3	0.5	0.7	1.0	1.0	1.2
10,000	0.3	0.5	0.6	0.8	0.9	1.0
25,000	0.2	0.3	0.4	0.5	0.6	0.7

NOTE: For a particular characteristic, see table C-6 for the factor to apply to the above standard errors.

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 factor or parameter from Tables C-5 through C-7 indicated by the numerator.

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

$$s_{x,p} = fs. \qquad (3)$$

In this formula, f is the appropriate factor from Tables C-5 through C-7, and s is the standard error of the estimate obtained by interpolation from Table C-2, C-3 or C-4.

Alternatively, formula (4) will provide more accurate results:

$$s_{x,p} = \sqrt{\frac{bp(100 - p)}{x}}. \qquad (4)$$

Here x is the total number of persons, families, households, or unrelated individuals which is the base of the percentage; p is the percentage ($0 \leq p \leq 100$); and b is the parameter in Tables C-5 through C-7 associated with the numerator's characteristic.

Illustration. Table C shows that 57.5 percent of the 65,281,000 persons with a high school education reported voting in 1992. Using formula (3) with f = 1.00 from

Table C-4. Standard Errors of Estimated Percentages for Hispanic Persons

(Bases in thousands)

Base of estimate	Estimated Percentages					
	2 or 98	5 or 95	10 or 90	20 or 80	25 or 75	50
25	7.6	11.9	16.4	21.8	23.6	27.3
50	5.4	8.4	11.6	15.4	16.7	19.3
75	4.4	6.9	9.4	12.6	13.6	15.7
100	3.8	5.9	8.2	10.9	11.8	13.6
250	2.4	3.8	5.2	6.9	7.5	8.6
750	1.4	2.2	3.0	4.0	4.3	5.0
1,000	1.2	1.9	2.6	3.4	3.7	4.3
2,500	0.8	1.2	1.6	2.2	2.4	2.7
5,000	0.5	0.8	1.2	1.5	1.7	1.9
7,500	0.4	0.7	0.9	1.3	1.4	1.6
10,000	0.4	0.6	0.8	1.1	1.2	1.4
20,000	0.3	0.4	0.6	0.8	0.8	1.0

NOTE: For a particular characteristic, see table C-7 for the factor to apply to the above standard errors.

Table C-5. "a" and "b" Parameters for Characteristics of Total or White Persons

Characteristic	a	b	f
Voting, registration, reasons for not voting or registering:			
CPS counts	−0.000017	3,011	1.00
Official counts	(X)	(X)	(X)
Citizenship, household relationship, family heads by presence of children,marital status, duration of residence,tenure, education level, family income of persons and occupation group	−0.000017	3,011	1.00
Characteristics of all persons, Voting and nonvoting:			
Marital status	−0.000026	4,786	1.26
Education of persons	−0.000014	2,532	0.92
Education of family head	−0.000010	1,899	0.79
Employment, not in labor force, occupation	−0.000014	2,485	0.91
Unemployment	−0.000013	2,357	0.88
Persons by family income	−0.000025	4,508	1.22
Duration of residence tenure	−0.000026	4,786	1.26
Household relationships, Voting and nonvoting:			
Head, spouse of head	−0.000010	1,899	0.79
Nonrelative or other relative of head	−0.000026	4,786	1.26

(X) Not applicable. For standard errors of historical data multiply b parameters and f values by:

Standard error	1964	1966	1968-1976	1978-1980	1982-1986	1988	1990
b	1.26	1.97	0.82	0.84	0.94	1.11	1.00
f	1.12	1.40	0.91	0.92	0.97	1.05	1.00

Table C-6. "a" and "b" Parameters for Characteristics of Black Persons

Characteristic	a	b	f
Voting, registration, reasons for not voting or registering:			
CPS counts	-0.000216	4,408	1.00
Official counts	(x)	(x)	
Citizenship, household relationship, family heads by presence of children, marital status, duration of residence, tenure, education level, family income of persons and occupation group	-0.000216	4,408	1.00
Characteristics of all persons, voting and nonvoting:			
Marital status	-0.000337	6,865	1.25
Education of persons	-0.000133	3,425	0.88
Education of family head	-0.000084	1,716	0.62
Employment, not in labor force, occupation	-0.000122	2,485	0.75
Unemployment	-0.000133	2,708	0.78
Persons by family income	-0.000253	5,154	1.08
Duration of residence tenure	-0.000337	6,865	1.25
Household relationships, voting and nonvoting:			
Head, spouse of head	-0.000084	1,716	0.62
Nonrelative or other relative of head	-0.000337	6,865	1.25

(X) Not applicable.
For standard errors of historical data multiply b parameters and f values by:

Standard error	1964	1966	1968-1976	1978-1980	1982-1986	1988	1990
b	1.26	1.91	0.82	0.84	0.94	1.11	1.00
f	1.12	1.40	0.91	0.92	0.97	1.05	1.00

Table C-7. "a" and "b" Parameters for Characteristics of Hispanic Persons

Characteristic	a	b	f
Voting, registration, reasons for not voting or registering:			
CPS counts	-0.000540	7,428	1.00
Official counts	(x)	(x)	
Citizenship, household relationship, family heads by presence of children, marital status, duration of residence, tenure, education level, family income of persons and occupation group	-0.000540	7,428	1.00
Characteristics of all persons, voting and nonvoting:			
Marital status	-0.000841	11,569	1.25
Education of persons	-0.000420	5,772	0.88
Education of family head	-0.000210	2,892	0.62
Employment, not in labor force, occupation	-0.000162	2,234	0.55
Unemployment	-0.000197	2,708	0.60
Persons by family income	-0.000632	8,686	1.08
Duration of residence tenure	-0.000841	11,569	1.25
Household relationships, voting and nonvoting:			
Head, spouse of head	-0.000210	2,892	0.62
Nonrelative or other relative of head	-0.000841	11,569	1.25

(X) Not applicable For standard errors of historical data multiply b parameters and f values by:

Standard error	1972-1976	1978-1980	1982-1984	1986	1988	1990
b	0.98	1.01	1.13	0.94	1.16	1.00
f	0.99	1.00	1.06	0.97	1.08	1.00

Table C-8. **"a" and "b" Parameters for Characteristics of Asian Persons**

Characteristic	a	b	f
Voting, registration, reasons for not voting or registering	−0.000649	4,408	1.00
Citizenship, household relationship, family heads by presence of children, marital status, duration of residence, tenure, education level, family income of persons and occupation group	−0.000649	4,408	1.00
Characteristics of all persons, voting and nonvoting:			
Marital status	−0.001011	6,865	1.25
Education of persons	−0.000505	3,425	0.88
Education of family head	−0.000253	1,716	0.62
Employment, not in labor force, occupation	−0.000366	2,485	0.75
Unemployment	−0.000399	2,708	0.78
Persons by family income	−0.000759	5,154	1.08
Duration of residence tenure	−0.001011	6,865	1.25
Household relationships, voting and nonvoting:			
Head, spouse of head	−0.000253	1,716	0.62
Nonrelative or other relative of head	−0.001011	6,865	1.25

(X) Not applicable.

Table C-5 and s = 0.3, interpolated from Table C-2, the standard error for the percentage of persons with a high school education who reported voting is approximately

$$s_{x,p} = 1.00 \times 0.3 = 0.3.$$

Alternatively, using formula (4) and b = 3,011 from Table C-5 the standard error is approximately

$$s_{x,p} = \sqrt{\frac{3{,}011 \times 57.5 \times (100 - 57.5)}{65{,}281{,}000}} = 0.3.$$

The 90-percent confidence interval for the estimated percentage of persons with a high school education who reported voting in 1992 is from 57.0 percent to 58.0 percent, i.e. 57.5 percent ± 1.645 x 0.3.

Standard error of a difference. The standard error of the difference between two sample estimates is approximately equal to

$$s_{x-y} = \sqrt{s_x^2 + s_y^2} \qquad (5)$$

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 approximates the actual standard error for the difference between estimates of the same characteristic in two different areas, and 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. Table 2 shows 63.9 percent of the 21,039,000 voting age Blacks in the United States registered to vote in 1992. Table 2 also shows 35.0 percent of the 14,688,000 voting age Hispanics in the United States registered to vote in 1992. The apparent difference between the percent of voting age Blacks that registered to vote and the percent of voting age Hispanics that registered to vote is 28.9 percent. Using formula (4) with b = 4,408 from Table C-6, the approximate standard error for the percent of voting age Blacks that registered to vote, s_x, is 0.7. The standard error for the percent of voting age Hispanics that registered to vote, s_y, is 1.1, where b = 7,428 from Table C-7. Using formula (5), the standard error for the estimated difference is

$$s_{x-y} = \sqrt{0.7^2 + 1.1^2} = 1.3.$$

This means that the 90-percent confidence interval around the difference is from 26.8 percent to 31.0 percent, i.e., 28.9 ± 1.645x1.3. Because the interval does *not* contain zero, we can conclude with 90-percent confidence that the percent of voting age Blacks that registered in 1992 is greater than the percent of voting age Hispanics that registered in 1992.

Standard error of a ratio. Certain estimates may be calculated as the ratio of two numbers. The standard error of a ratio, x/y, may be computed using

$$s_{x/y} = \frac{x}{y}\sqrt{\left[\frac{s_x}{x}\right]^2 + \left[\frac{s_y}{y}\right]^2 - 2r\frac{s_x s_y}{xy}}. \qquad (6)$$

The standard error of the numerator, s_x, and that of the denominator, s_y, may be calculated using formulas described earlier. In formula (6) r represents the correlation between the numerator and the denominator of the estimate.

For one type of ratio, the denominator is a count of families or households and the numerator is a count of persons in those families or households with a certain

Table C-9. **State Voting Parameters**

State	a	b
Alabama	−0.001107	3,448
Alaska	−0.001201	394
Arizona	−0.001218	3,179
Arkansas	−0.001089	1,997
California	−0.000178	3,765
Colorado	−0.001308	3,178
Connecticut	−0.001416	3,601
Delaware	−0.001385	705
District of Columbia	−0.001479	695
Florida	−0.000271	2,697
Georgia	−0.001116	5,371
Hawaii	−0.001350	1,057
Idaho	−0.001099	785
Illinois	−0.000321	2,795
Indiana	−0.001206	5,126
Iowa	−0.001056	2,278
Kansas	−0.001084	1,999
Kentucky	−0.001142	3,186
Louisiana	−0.001233	3,891
Maine	−0.001186	1,105
Maryland	−0.001271	4,582
Massachusetts	−0.000320	1,472
Michigan	−0.000312	2,210
Minnesota	−0.001200	3,938
Mississippi	−0.001052	2,001
Missouri	−0.001208	4,733
Montana	−0.001107	654
Nebraska	−0.001031	1,229
Nevada	−0.001293	1,090
New Hampshire	−0.001414	1,220
New Jersey	−0.000301	1,824
New Mexico	−0.001134	1,238
New York	−0.000175	2,415
North Carolina	−0.000295	1,478
North Dakota	−0.001049	495
Ohio	−0.000299	2,486
Oklahoma	−0.001109	2,658
Oregon	−0.001350	2,853
Pennsylvania	−0.000286	2,697
Rhode Island	−0.001369	1,062
South Carolina	−0.000933	2,443
South Dakota	−0.000924	483
Tennessee	−0.001019	3,864
Texas	−0.000316	3,787
Utah	−0.001252	1,383
Vermont	−0.001436	613
Virginia	−0.000923	4,189
Washington	−0.001181	4,128
West Virginia	−0.001082	1,558
Wisconsin	−0.001001	3,693
Wyoming	−0.001633	529

characteristic. If there is at least one person with the characteristic in every family or household, use 0.7 as

Table C-10. **Census Division and Region Voting Parameters**

Area	a	b
Divisions:		
New England	−0.000185	1,877
Middle Atlantic	−0.000081	2,367
East North Central	−0.000091	2,927
West North Central	−0.000226	3,030
South Atlantic-	−0.000094	3,089
East South Central	−0.000261	3,028
West South Central	−0.000167	3,246
Mountain	−0.000215	2,086
Pacific	−0.000128	3,561
Regions:		
Northeast	−0.000057	2,241
Midwest	−0.000065	2,957
South	−0.000049	3,126
West	−0.000085	3,183
All except South	−0.000023	2,799

an estimate of r. An example of this type is the mean number of children per family with children.

For all other types of ratios, r is assumed to be zero. If r is actually positive (negative), then this procedure will provide an overestimate (underestimate) of the standard error of the ratio. An example of this type of ratio is given below.

NOTE: For estimates expressed as the ratio of x per 100 y or x per 1,000 y, multiply formula (6) by 100 or 1,000, respectively, to obtain the standard error.

Illustration. Table A shows 63.6 percent of 157,837,000 voting age Whites voted in 1992. Table A also shows 28.9 percent of 14,688,000 voting age Hispanics voted in 1992. The ratio of the percentage of voting age Whites who voted in 1992 ($x = 63.6$) to the percentage of voting age Hispanics who voted in 1992 ($y = 28.9$) is 2.20. Using formula (4) with $b = 3{,}011$ from Table C-5, the approximate standard error for the percentage of Whites who voted is $s_x = 0.2$. Using formula (4) with $b = 7{,}428$ from Table C-7, the approximate standard error for the percentage of Hispanics who voted is $s_y = 1.0$. Using formula (6) with $r = 0$, the estimate of the standard error is

$$s_{x/y} = 2.20 \sqrt{\left[\frac{0.2}{63.6}\right]^2 + \left[\frac{1.0}{28.9}\right]^2} = 0.08$$

The 90-percent confidence interval around the ratio is from 2.07 to 2.33, i.e., $2.20 \pm 1.645 \times 0.08$.