APPENDIX

DEFINITIONS AND EXPLANATIONS

Population coverage. The figures in this report for March 1975 are sample survey data and relate to the noninstitutional population of the 50 States and the District of Columbia. Members of the Armed Forces living off post or with their families on post are included, but all other members of the Armed Forces are excluded.

Age. The age classification is based on the age of the person at last birthday.

Race. The population is divided into three groups on the basis of race: White, Negro, or Black and "other races." The last category includes Indians, Japanese, Chinese, and any other race except White and Negro.

Persons of Spanish origin are persons who reported themselves as Mexican-American, Chicano, Mexican, Mexicano, Puerto Rican, Cuban, Central or South American, or other Spanish origin. However, all persons who reported themselves as Mexican-American, Chicano, Mexican, or Mexicano were combined into the one category: Mexican. Persons of Spanish origin may be of any race.

Years of school completed. Data in this report on years of school completed were derived from the combination of answers to two questions: (a) "What is the highest grade of school he has ever attended?" and (b) "Did he finish this grade?"

The questions on educational attainment apply only to progress in "regular" schools. Such schools include graded public, private, and parochial elementary and high schools (both junior and senior high), colleges, universities, and professional schools, whether day schools or night schools. Thus, regular schooling is that which may advance a person toward an elementary school certificate or high school diploma, or a college, university, or professional school degree. Schooling in other than regular schools was counted only if the credits obtained were regarded as transferable to a school in the regular school system.

The median years of school completed is defined as the value which divides the population into two equal parts: One-half having completed more schooling and one-half having completed less schooling than the median. This median was computed after the statistics on years of school completed had been converted to a continuous series of numbers (e.g., completion of the first year of high school was treated as completion of the 9th year and the completion of the first year of college as completion of the 13th year). The persons completing a given school year were assumed to be distributed evenly within the interval from .0 to .9 of the year (for example, persons completing the 12th year were assumed to be distributed evenly between 12.0 and 12.9). In fact, at the time of the March survey, most of the enrolled persons had completed about three-fourths of a school year beyond the highest grade completed, whereas a large majority of persons who were not enrolled had not attended any part of a grade beyond the highest one completed. The effect of the assumption is to place the median for younger persons slightly below, and for older persons slightly above, the true median. Because of the inexact assumption as to the distribution within an interval, this median is more appropriately used for comparing groups and the same group at different dates than as an absolute measure of educational attainment.

Assignment of educational attainment for those not reporting. When information on either the highest grade attended or completion of the grade was not reported in the March survey, entries for the items were assigned using an edit in the computer. The general procedure was to assign an entry for a person that was consistent with entries for other persons with similar characteristics. The specific technique used in the March survey was as follows:

1. The computer stored reported data on highest grade attended by race (White and all other) and age, and on completion of the grade by age and highest grade attended, for persons 14 years old and over in the population.

2. Each stored value was retained in the computer only until a succeeding person having the same characteristics (e.g., same race and age in the case of assignments for highest grade attended) and having the item reported, was processed through the computer. Then the reported data for the succeeding person were stored in place of the one previously stored.

3. When one or both of the education items for a person 14 years old and over was not reported, the entry assigned to this person was that stored for the last person who had the same characteristics.

Metropolitan-nonmetropolitan residence. The population residing in standard metropolitan statistical areas (SMSA's) constitutes the metropolitan population. Except in New England, an SMSA is a county or group of contiguous counties which contains at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. In addition to the county or counties containing such a city or cities, contiguous counties are included in an SMSA if, according to certain criteria, they are essentially metropolitan in character and are socially and economically integrated with the central county. In New England, SMSA's consist of towns and cities rather than counties. The metropolitan population in this report is based on SMSA's as defined in the 1970 census and does not include any subsequent additions or changes.

The population inside SMSA's is further classified as "in central cities" and "outside central cities." With a few exceptions, central cities are determined according to the following criteria:

1. The largest city in an SMSA is always a central city.

2. One or two additional cities may be secondary central cities on the basis and in the order of the following criteria:

a. The additional city or cities has at least 250,000 inhabitants.

b. The additional city or cities has a population of one-third or more of that of the largest city and a minimum population of 25,000.

Farm-nonfarm residence. The farm population refers to rural residents living on farms. The method of determining farm-nonfarm residence in the Current Population Surveys since March 1960 is the same as that used in the 1960 census but differs from that used in earlier censuses.

The nonfarm population, as the term is used here, comprises persons living in urban areas and all rural persons not on farms.

According to the current definition, the farm population consists of all persons living in rural territory on places of less than 10 acres yielding agricultural products which sold for $250 or more in the previous year, or on places of 10 acres or more yielding agricultural products which sold for $50 or more in the previous year. Rural persons in institutions, motels, and tourist camps, and those living on rented places where no land is used for farming are not classified as farm population.

Geographic regions. The four major regions of the United States, for which data are presented in this report, represent groups of States, as follows:

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

North Central: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

The North as used in this report includes the combined Northeast and North Central regions.

Employed. Employed persons comprise those civilians who, during the survey week, were either (1) "at work"—those who did any work for pay or profit, or worked without pay for 15 hours or more on a family farm or business; or (2) "with a job but not at work"—those who did not work and were not looking for work but had a job or business from which they were temporarily absent because of vacation, illness, labor-management dispute, bad weather, or because they were taking the week off for various other reasons.

Occupation. Data on occupation are shown for the employed and relate to the job held during the survey week. Persons employed at two jobs or more were reported in the job at which they worked the greatest number of hours during the week. The major groups used here are generally the major groups used in the 1970 Census of Population. The composition of these groups is shown in 1970 Census of Population, Vol. I **Characteristics of the Population, U.S. Summary.**

Four occupation divisions. The major groups are arranged in four divisions as follows:

White collar. Professional, technical, and kindred workers; managers and administrators, except farm; sales workers; and clerical and kindred workers.

Blue collar. Crafts and kindred workers; operatives, except transport; transport equipment operatives; and laborers, except farm.

Farm workers. Farmers and farm managers, farm laborers, and farm supervisors.

Service workers. Service workers including private household.

The sequence in which these four divisions appear is not intended to imply that any division has a higher social or skill level than another.

Income. For each person in the sample 14 years old and over, questions were asked on the amount of money income received in 1974 from (1) money wages or salary, (2) net income from self-employment, and (3) other income. Wage or salary income in 1974 is defined as the total money earnings received for work performed as an employee during the calendar year 1974. It includes wages, salary, Armed Forces pay, commissions, tips, piece-rate payments, and cash bonuses earned before deductions were made for taxes, bonds, pensions, union dues, etc. Net income from self-employment is defined as net money income (gross receipts minus operating expenses) from a business, partnership, professional enterprise, or farm in which

the person was engaged in his own account. Other money income includes money income received from the following sources: (1) Social Security, veterans payments, or other government or private pensions; (2) interest (on bonds or savings), dividends, and income from annuities, estates, or trust; (3) net income from boarders or lodgers, or from renting property to others; and (4) all other sources such as unemployment benefits, public assistance, and alimony.

The amounts received represent income before deductions for personal taxes, Social Security, bonds, etc. It should be noted that although the income statistics refer to receipts during 1974 the characteristics of the person, such as age, labor force status, and occupation, and the characteristics and composition of the family refer to March 1975. Income of farm persons does not include income "in kind" such as the value of farm produce consumed at home or rental value of the home they own. Furthermore, the cost of living is generally higher in urban areas, requiring higher incomes to maintain a similar level of living.

Rounding of estimates. Individual figures are rounded to the nearest thousand without being adjusted to group totals, which are independently rounded. Percentages are based on the unrounded absolute numbers.

SOURCE AND RELIABILITY OF THE ESTIMATES

Source of data. The estimates in this report for the years 1970 and 1975 are based on data collected in March of 1970 and 1975 in the Current Population Survey (CPS) of the Bureau of the Census. Estimates for 1950 and 1960 are based on data obtained from the decennial census of of population for those years. Brief descriptions of these sources and procedures of data collection are presented below.

Current population survey (CPS). The following table provides a description of some aspects of the Current Population Survey design.

The estimating procedure used for CPS data involves the inflation of weighted sample results to independent estimates of the civilian noninstitutional population of the United States by age, race, and sex. For 1972 through 1975 these independent estimates were based on statistics from the 1970 Census of Population; statistics on births, deaths, immigration, and emigration; and statistics on the strength of the Armed Forces. For data collected in the Current Population Surveys in the years 1960 through 1971, the independent estimates used were based on statistics from the 1960 Census of Population.

Decennial census of population. Decennial census data in this report are based on complete counts or on the samples associated with the census. Description of the 3 1/3-percent sample of the 1950 census and the 5-percent sample of the 1960 census can be found in the appropriate census publications.

Reliability of the estimates. Since the CPS estimates in this report are based on a sample, they may differ somewhat from the figures that would have been obtained if a complete census had been taken using the same schedules, instructions, and enumerators. There are two types of errors possible in an estimate based on a sample survey—sampling and nonsampling. For estimates in this report indications of the magnitude of sampling error are provided but the extent of nonsampling error is unknown. Consequently, particular care should be exercised in the interpretation of figures based on a relatively small number of cases or on small differences between estimates.

Nonsampling variability. As in any survey work, the results are subject to errors of response and nonreporting in addition to sampling variability. Nonsampling errors can be attributed to many sources, e.g., inability to obtain information about all cases in the sample, definitional difficulties, differences in the interpretation of questions, inability or unwillingness to provide correct information on the part of respondents, inability

Description of the Current Population Survey

Time period	Number of sample areas	Number of counties	Households eligible		Households visited, not interviewed[1]
			Interviewed	Not interviewed	
March 1975.....	461	[2]923	45,000	2,000	8,000
March 1970.....	449	[2]863	48,000	2,000	8,500

[1]These are households which were visited, but were found to be vacant or otherwise not interviewed.

[2]These are the number of counties and independent cities that are included in the sample areas. These areas were chosen to provide coverage in each State and the District of Columbia.

to recall information, mistakes made in collection such as in recording or coding the data, mistakes made in processing the data and mistakes made in estimating values for missing data. To date, emphasis has been placed on identification and control of nonsampling errors and not on providing estimates of magnitude of such errors in the data.

Sampling variability. The reliability of an estimate is described in terms of standard errors which are primarily measures of sampling variability, that is, the variations that occur by chance because a sample rather than the whole of the population is surveyed. As calculated for this report, the standard error also partially measures the effect of certain response and enumeration errors, but it does not measure, as such, any systematic biases in the data. The chances are about 68 out of 100 that an estimate from the sample would differ from a complete census figure by less than the standard error. The chances are about 90 out of 100 that this difference would be less than 1.6 times the standard error, and the chances are about 95 out of 100 that the difference would be less than twice the standard error.

All statements of comparison involving Bureau of the Census data appearing in the text are significant at a 1.6 standard error level or better and most are significant at a level of more than 2.0 standard errors. This means that for most differences cited in the text, the estimated difference is greater than twice the standard error of the difference. Statements of comparison qualified in some way (e.g., by the use of the phrase, "some evidence") have a level of significance between 1.6 and 2.0 standard errors.

Note when using small estimates. Percent distributions are shown in the report only when the base of the percentage is greater than 75,000. Because of the large standard errors involved, there is little chance that percentages would reveal useful information when computed on a smaller base. Estimated totals are shown, however, even though the relative standard errors of these totals are larger than those for the corresponding percentages. These smaller estimates are provided primarily to permit such combinations of the categories as serve each user's needs.

Reliability of an estimated percentage. The reliability of an estimated percentage, computed by using sample data for both numerator and denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. 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.

Standard Error Tables and Their Use.

Standard errors for data based on the CPS. Instead of providing individual standard error tables for each characteristic of interest, generalized standard error tables for estimated numbers and estimated percentages, by race, are provided in tables A-1 through A-4.

The figures presented in these tables provide approximations to standard errors of various CPS estimates shown in this report. In all the standard error tables, standard errors for intermediate values not shown may be approximated by interpolation. In order to derive standard errors that would be applicable to a wide variety of items and could be prepared at a moderate cost, a number of approximations were required. In addition, where two or more items have nearly equal standard errors, such as total population and white population, one table is used to represent them. As a result, the tables of standard errors provide an indication of the order of magnitude of the standard errors rather than the precise standard error for any specific item.

Standard errors for data based on the decennial censuses. Sampling errors of all data from the 3 1/3-and 5-percent samples of the decennial censuses shown in this report are small enough to be disregarded. However, the standard errors may be found in the appropriate census volumes.

Illustration of the use of tables of standard errors. Detailed table 1 of this report shows that in March of 1975 there were 1,450,000 White males 20 or 21 years of age who had completed exactly 4 years of high school. Table 1 also shows there were 3,268,000 total White males in that age group. Table A-1 shows the standard error of an estimate of this size to be approximately[1] 37,000. The chances are 68 out of 100 that the estimate would have been a figure differing from a complete census figure by less than 37,000. The chances are 95 out of 100 that the estimate would have been a figure differing from a complete census figure by less than 74,000 (twice the standard error).

Table 6 shows that in March 1975 there were 4,776,000, 25 to 64 year old female service workers in the population. Table C shows that about 52.4 percent of these females had completed 4 years of high school or more. Table A-3 shows the standard error of 52.4 percent to be approximately[1] 1.0. Consequently, chances are 68 out of 100 that the estimated 52.4 percent would be within 1.0 percentage points of a complete census figure. Chances are 95 out of 100 that

[1] Determined by interpolation and rounding to the same accuracy as in the table.

the estimate would be within 2.0 percentage points of a complete census figure, i.e., the 95 percent confidence interval would be from 50.4 to 54.4.

Standard error of a difference. For a difference between two sample estimates, the standard error is approximately equal to the square root of the sum of the squared standard errors of the estimates; the estimates can be of numbers, percents, ratios, medians, etc. This will represent the actual standard error quite accurately for the difference between two estimates of the same characteristic in two different areas, or for the difference between separate and uncorrelated characteristics in the same area. If, however, there is a high positive correlation between the two characteristics, the formula will overestimate the true standard error.

Table A-1 Standard Errors for Estimated Numbers of Persons Enrolled in School Total or White Population

CPS Estimates

(68 chances out of 100. Numbers in thousands)

Estimated number of persons	Total persons in age group									
	100	250	500	1,000	2,500	5,000	10,000	25,000	50,000	100,000
10	4.4	4.6	4.6	4.6	4.6	4.7	4.7	4.7	4.7	4.7
20	5.9	6.3	6.5	6.5	6.6	6.6	6.6	6.6	6.6	6.6
30	6.8	7.6	7.8	7.9	8.0	8.0	8.1	8.1	8.1	8.1
40	7.2	8.5	8.9	9.1	9.2	9.3	9.3	9.3	9.3	9.3
50	7.4	9.3	9.9	10.2	10.3	10.4	10.4	10.4	10.4	10.4
75	6.4	10.7	11.8	12.3	12.6	12.7	12.7	12.7	12.7	12.8
100	-	11.4	13.2	14.0	14.4	14.6	14.7	14.7	14.7	14.7
200	-	9.3	16.1	18.6	20.0	20.4	20.6	20.7	20.8	20.8
300	-	-	16.1	21.3	23.9	24.7	25.1	25.4	25.4	25.5
400	-	-	13.2	22.8	27.0	28.3	28.9	29.2	29.3	29.4
500	-	-	-	23.3	29.5	31.2	32.1	32.6	32.8	32.9
750	-	-	-	20.2	33.8	37.2	38.8	39.7	40.0	40.2
1,000	-	-	-	-	36.1	41.7	44.2	45.6	46.1	46.3
2,000	-	-	-	-	29.5	51.0	58.9	63.2	64.5	65.2
3,000	-	-	-	-	-	51.0	67.5	75.7	78.2	79.5
4,000	-	-	-	-	-	41.7	72.2	85.4	89.4	91.3
5,000	-	-	-	-	-	-	73.7	93.2	98.8	101.5
7,500	-	-	-	-	-	-	63.9	106.7	117.6	122.7
10,000	-	-	-	-	-	-	-	114.1	131.8	139.7
20,000	-	-	-	-	-	-	-	93.2	161.4	186.3
30,000	-	-	-	-	-	-	-	-	161.4	213.5
40,000	-	-	-	-	-	-	-	-	131.8	228.2
50,000	-	-	-	-	-	-	-	-	-	232.9
75,000	-	-	-	-	-	-	-	-	-	201.7
100,000	-	-	-	-	-	-	-	-	-	-

- Represents zero.

Illustration of the computation of the standard error of a difference between estimated percentages. Table 6 of this report shows that there were 2,793,000, 25 to 64 year old male service workers in the population in March of 1975. Table C shows that 60.4 percent of these males had completed 4 years of high school or more. The apparent difference between the 52.4 percent figure for females of the same occupation and the percentage for males is 8.0 percent. The standard error of 52.4 percent is 1.0 percent, as shown above. Table A-3 shows the standard error of 60.4 percent on a base of 2,793,000 to be approximately[1] 1.3 percent. To get the standard error of the estimated difference use the following formula:

$$\sigma_{(x-y)} = \sqrt{\sigma_x^2 + \sigma_y^2}$$

[1] See footnote 1 on page 64.

Therefore, the standard error of the difference of 8.0 percent is about

$$1.6 \doteq \sqrt{(1.3)^2 + (1.0)^2}$$

This means the chances are 68 out of 100 that the estimated difference based on the sample estimates would vary from the difference derived using complete census figures by less than 1.6 percent. The 68 percent confidence interval around the 8.0 percent difference is from 6.4 to 9.6, i.e., 8.0 ± 1.6. A conclusion that the average estimate of the difference derived from all posible samples of the same size and design lies within a range computed in this way would be correct for roughly 68 percent of all possible samples. The 95 percent confidence interval is 4.8 to 11.2. Thus we can conclude with 95 percent confidence that the percentage of service workers, 25 to 64 years of age having completed 4 or more years of high school, is actually greater for males than for females.

Table A-2 Standard Errors for Estimated Numbers of Persons Enrolled in School Black and Other Races

CPS Estimates

(68 chances out of 100. Numbers in thousands)

Estimated number of persons	Total persons in age group						
	100	250	500	1,000	2,500	5,000	10,000
10	4.8	5.0	5.0	5.0	5.1	5.1	5.1
20	6.4	6.9	7.0	7.1	7.1	7.1	7.2
30	7.3	8.2	8.5	8.6	8.7	8.7	8.8
40	7.8	9.3	9.7	9.9	10.0	10.1	10.1
50	8.0	10.1	10.7	11.0	11.2	11.3	11.3
75	6.9	11.6	12.8	13.3	13.7	13.8	13.8
100	-	12.4	14.3	15.2	15.7	15.8	15.9
200	-	10.1	17.5	20.2	21.7	22.2	22.4
300	-	-	17.5	23.2	26.0	26.9	27.3
400	-	-	14.3	24.8	29.3	30.7	31.4
500	-	-	-	25.3	32.0	34.0	34.9
750	-	-	-	21.9	36.7	40.4	42.2
1,000	-	-	-	-	39.2	45.3	48.0
2,000	-	-	-	-	32.0	55.4	64.0
3,000	-	-	-	-	-	55.4	73.3
4,000	-	-	-	-	-	45.3	78.4
5,000	-	-	-	-	-	-	80.0
7,500	-	-	-	-	-	-	69.3
10,000	-	-	-	-	-	-	-

- Represents zero.

Standard error of a median. The standard error of an estimated median depends upon the form as well as on the size of the distribution from which the median is determined. An approximate method for measuring the reliability of a median is to determine an interval about the estimated median, such that there is a stated degree of confidence that the median based on a complete census lies within the interval. The following procedure may be used to estimate confidence limits of a median based on sample data:

1. Determine, using table A-3 or A-4, the standard error on a 50 percent characteristic, using the appropriate base.

2. Add to and subtract from 50 percent the standard error determined in step 1.

3. Using the distribution of the characteristic, calculate the confidence interval corresponding to the two points established in step 2.

A two standard error confidence interval may be determined by finding the values corresponding to 50 percent plus and minus twice the standard error determined in step 1.

Illustration of the computation of a confidence interval for a median. Table 3 of this report shows that

the median number of school years completed by Black males, 45 to 64 years of age, in the North Central residence region to be 10.2 years in March of 1975. Table 3 also indicates the size, or base, of the distribution from which this median was determined is 378,000.

1. Table A-4 shows that the standard error of 50 percent on a base of 378,000 is about 4.5 percent.

2. To obtain a two standard error confidence interval on the estimated median, initially add to and subtract from 50 percent twice the standard error found in step 1. This yields percentage limits of 41.0 and 59.0

3. From table 3 it can be seen that 38.9 percent had completed less than 9 years of schooling and 27.3 percent had more than 9 and less than 12 years of schooling. By linear interpolation the lower limit on the estimate is found to be about

$$9 + (12\text{-}9) \left(\frac{41.0 - 38.9}{27.3}\right) = 9.2$$

Similarly, the upper limit may be found by linear interpolation to be about

$$9 + (12\text{-}9) \left(\frac{59.0 - 38.9}{27.3}\right) = 11.2$$

Thus, the 95 percent confidence interval around 10.2 ranges from 9.2 to 11.2.[2]

[2] Confidence intervals for medians are not necessarily symmetrical as in this illustration.

Table A-3 Standard Errors of Estimated Percentages Total or White Population

CPS Estimates

(68 chances out of 100)

Base of percentage (thousands)	Estimated percentage				
	2 or 98	5 or 95	10 or 90	25 or 75	50
100	2.0	3.1	4.3	6.2	7.2
250	1.3	2.0	2.8	4.0	4.5
500	0.9	1.4	1.9	2.8	3.2
1,000	0.6	1.0	1.4	2.0	2.3
2,500	0.4	0.6	0.9	1.2	1.4
5,000	0.3	0.4	0.6	0.9	1.0
10,000	0.2	0.3	0.4	0.6	0.7
25,000	0.1	0.2	0.3	0.4	0.5
50,000	0.1	0.1	0.2	0.3	0.3
100,000	0.1	0.1	0.1	0.2	0.2

Table A-4 Standard Errors of Estimated Percentages Black and Other Races

CPS Estimates

(68 chances out of 100)

Base of percentage (thousands)	Estimated percentage				
	2 or 98	5 or 95	10 or 90	25 or 75	50
50	3.3	5.2	7.1	10.2	11.8
100	2.3	3.6	5.0	7.2	8.4
250	1.5	2.3	3.2	4.6	5.3
500	1.0	1.6	2.2	3.2	3.7
1,000	0.7	1.2	1.6	2.3	2.6
2,500	0.5	0.7	1.0	1.4	1.7
5,000	0.3	0.5	0.7	1.0	1.2
10,000	0.2	0.4	0.5	0.7	0.8

Standard error of a ratio. Table A of this report shows data for the percent change between years. The standard error of a percent change can be obtained from the standard error of a ratio $\frac{x}{y}$. The formula for the standard error of $\frac{x}{y}$ is:

$$\sigma_{\left(\frac{x}{y}\right)} = \sqrt{\left(\frac{x}{y}\right)^2 \left[\left(\frac{\sigma_x}{x}\right)^2 + \left(\frac{\sigma_y}{y}\right)^2 - 2p\left(\frac{\sigma_x}{x}\right)\left(\frac{\sigma_y}{y}\right)\right]} \; .$$

In this formula, the ratio $\frac{x}{y}$ can be a ratio of two standard estimated numbers, a ratio of percents or a ratio of medians. σ_x and σ_y represent the standard errors of x and y. ρ is the correlation coefficient. For the data in this report, ρ may be assumed equal to zero.

Illustration of the computation of the standard error of a percent change. In table A the percent change is calculated by the formula $\frac{x-y}{y}$ where x is the estimate for 1975 and y is the estimate for 1950. The standard error of $\frac{x-y}{y}$ is the same as the standard error of $\frac{x}{y}$. Since y represents the estimate from the 1950 census data, σ_y can be assumed to be zero. The formula for the standard error of the percent change, $\frac{x-y}{y}$, simplifies to:

$$\sigma_{\left(\frac{x-y}{y}\right)} = \left(\frac{1}{y}\right)\sigma_x \; .$$

For example, consider the percent change in the number of black males 25 years old and over who had completed high school from 1950 to 1975. The following table outlines the steps involved in calculating the standard error:

	Percent change	1950 estimate (y)	1975 estimate (x)	1975 estimate of number in population (base)	Standard error of 1975 estimate (σ_x)	Standard error of percent change
Source.....	Table A	Table D	Table 1	Table 1	Table G	$(\frac{1}{y})\sigma_x$
Estimate.....	390.1%	253,000	1,236,000	4,924,000	[1]47,400	.187=18.7%

[1]Determined by interpolation and rounding to the same accuracy as the tables.

Thus an approximate 95 percent confidence interval around 390.1 percent ranges from 352.7 to 427.5 percent.

Standard error of an annual rate change. Table B of this report shows data for the annual rate of change. Letting r represent the annual rate of change, the standard error of r is given in the following formula[3]:

$$\sigma_r = \sqrt{\frac{1}{n^2}(1+r)^2\left[\left(\frac{\sigma_x}{x}\right)^2 + \left(\frac{\sigma_y}{y}\right)^2 - 2p\left(\frac{\sigma_x}{x}\right)\left(\frac{\sigma_y}{y}\right)\right]} \; .$$

Here x might represent the number of persons in some category in the more recent of the two years being observed and y might represent the number of persons in the same category in the earlier year. σ_x and σ_y are the standard errors of the numbers x and y. When y refers to an estimate based on 1950 census data, σ_y may be assumed to be equal to zero. n is the exact number of

[3] For the computation of r, see George W. Barclay, **Techniques of Population Analysis** (New York: John Wiley), 1958, pp. 28-33.

years between x and y. The value of ρ can be assumed to be equal to zero.

Illustration of the computation of the standard error of an annual rate of change. Table B shows the annual rate of change from 1970 to 1975 in the number of White females 25 years old and over who had completed 4 or more years of college was 6.37 percent. The following table summarizes the steps involved in calculating the standard error of this annual rate of change:

	1970 estimate (y)	1975 estimate (x)	Base for 1970 estimate[1]	Base for 1975 estimate[1]	Standard error of 1970 estimate (σ_y)	Standard error of 1975 estimate (σ_x)	Standard error of annual rate of change (σ_r)
Source.....	Table D	Table D	Table D	Table D	Table F	Table F	Formula
Estimate.....	4,408,000	6,002,000	51,506,000	54,806,000	[2]89,600	[2]106,700	.006 = .6%

[1]Base is the estimated number of White women 25 years old or over in the population.
[2]Determined by interpolation and rounding to the same accuracy as in the table.

Note: An approximate 95 percent confidence interval around 6.37 percent ranges from 5.17 to 7.57.