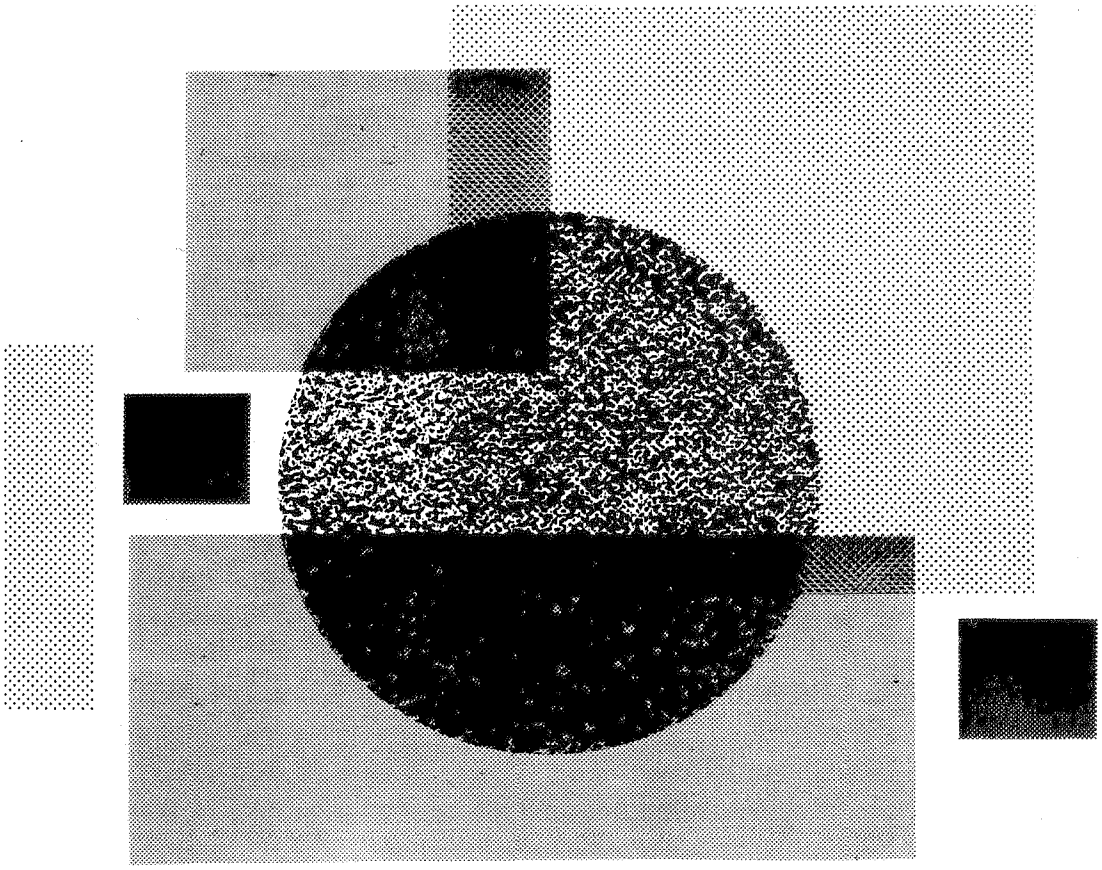
CURRENT POPULATION REPORTS

Population Estimates and Projections

Series P-25, No. 963

Evaluation of 1980 Subcounty Population Estimates

David Galdi



Department of Commerce
BUREAU OF THE CENSUS

Acknowledgments

This report was prepared in Population Division under the general direction of **Frederick J. Cavanaugh**, Chief, Local Area Population Estimates Branch. Computer programming was provided by **Diana Smith**; statistical assistance was provided by **Sandra Miller**, and **Helen Cater** prepared the manuscript. **Rosa B. Taylor** provided interdivisional text coordination. Overall direction was provided by **Richard A. Engels**, Assistant Division Chief. The report was edited, planned, and produced in Publications Services Division.

CURRENT POPULATION REPORTS

Population Estimates and Projections

Series P-25, No. 963
Issued February 1985

Evaluation of 1980 Subcounty Population Estimates

David Galdi

U.S. Department of Commerce
Malcolm Baldrige, Secretary
Clarence J. Brown, Deputy Secretary
Sidney Jones, Under Secretary for Economic Affairs

BUREAU OF THE CENSUS
John G. Keane, Director

BUREAU OF THE CENSUS
John G. Keane, Director
C.L. Kincannon, Deputy Director
William P. Butz, Associate Director
for Demographic Fields

POPULATION DIVISION
Roger A. Herriot, Chief

SUGGESTED CITATION

U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 963, *Evaluation of 1980 Subcounty Population Estimates*, U.S. Government Printing Office, Washington, D.C., 1985.

For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Contents

	Page
Background	1
Methodology	1
Accuracy of 1980 estimates	2
Geographic differences	5
Use of estimates versus decennial census counts	6
Revisions to the methodology	6
Conclusions	8

CHARTS

Figure

1. Average absolute percent error, by size class . . . 3
2. Distribution of areas, by 1970 population size . . . 3
3. Distribution of average percent error, by size class . . . 4
4. Average absolute percent error, by rate of growth . . . 4
5. Direction of error, by rate of growth . . . 5
6. Accuracy of 1980 estimates versus 1970 census as alternative . . . 7

DETAILED TABLES

1. Selected measures of the accuracy of subcounty population estimates: April 1, 1980 . . . 9
2. Average absoulate percent error for 1980 subcounty population estimates, by size of area and rate of growth . . . 9
3. Distribution of places, by percent error and rate of growth . . . 10
4. Subcounty population estimate evaluation: ORS estimates . . . 10
5. Average absolute percent error for 1980 estimates, by size and type of error . . . 11
6. Accuracy of 1980 subcounty population estimates versus 1970 census population as an alternative . . . 11

Evaluation of 1980 Subcounty Population Estimates

BACKGROUND

This report presents an evaluation of estimates of total population for approximately 36,000 subcounty areas. These subcounty areas consist of both incorporated places, such as cities, boroughs, and villages, and minor civil divisions, such as towns and townships. Estimates for these areas were first produced during the early 1970's in response to the State and Local Fiscal Assistance Act of 1972 (Public Law 92-512), which brought the Federal general revenue sharing program into existence. In addition to general revenue sharing, the estimates are now used to allocate funds and determine program eligibility for numerous other programs at the Federal, State, and local levels.[1]

The population estimates program represents an effort to provide more current population figures for the years following the decennial census. The estimation methodology is designed to update the decennial census counts by producing an estimate of change in population since the last available census counts. The first such set of estimates for all subcounty areas was produced for a July 1, 1973, estimate date. The next set of estimates was for July 1, 1975. The 1975 estimates were produced by estimating the change between 1973 and 1975 and adding it to the 1973 estimates. The 1976, 1977, and 1978 estimates were produced in a similar manner. In addition, a set of April 1, 1980, estimates was produced for evaluation purposes, using the July 1, 1978, estimates as a base. The comparison of the 1980 estimates to the April 1, 1980, decennial census counts forms the basis for this report. Although the 1980 test estimates utilized the same methodology as for earlier years, they did not undergo the normal rigorous professional review or review by local officials that is the practice for the estimates that are published and used in fund allocation programs. However, these review programs generally changed a relatively small proportion of the 36,000 estimates, so the effect should be only a slight increase in the average error of the estimates.

[1]For a more detailed description of the origin of the subcounty estimates program, see Meyer Zitter and Frederick J. Cavanaugh, "Postcensal Estimates of Population," a paper presented at the Annual Meeting, American Association for the Advancement of Science, San Francisco, California, January 5, 1980. (Copies of this paper can be obtained by writing: Chief, Population Division, U.S. Bureau of the Census, Washington, D.C. 20233.)

METHODOLOGY

To estimate the population of each subcounty area, a component procedure known as the Administrative Records method was used in which each of the components of population change (births, deaths, migration) was estimated separately. The description below pertains to the production of July 1, 1973, estimates which were produced by estimating the 1970-73 change and applying it to the 1970 census population. Estimates for subsequent years were made in a like manner, with the most recent estimate replacing the 1970 census as the "base" population.[2]

The preliminary 1973 Administrative Records estimates were calculated as follows:

1973 estimate = 1970 base population + births—deaths + net migration + immigration from abroad + change in special populations

Each of the components of change reflects the time period covering April 1, 1970, to July 1, 1973. The individual components are described below:

April 1, 1970, base population. The base population was derived by updating the corrected 1970 census counts to reflect annexations for which an official April 1, 1970 population count had been determined from 1970 census records. This determination is done routinely for places with population greater than 5,000 for which the annexed area constituted over 5 percent of the total population. For other areas, it is done by request on a fee-paid basis.

Births and deaths. Reported resident birth and death statistics were used where available. These data were collected from State health departments and supplemented by data prepared and published by the U.S. Department of Health and Human Services, National Center for Health Statistics. Where reported births and deaths were not available, they were estimated using local fertility and mortality rates and demographic data from the 1970 census. The results were controlled to match the reported figures for counties.

[2]For a more detailed description of estimates methodology, see U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 699, *Population and Per Capita Money Income Estimates for Local Areas: Detailed Methodology and Evaluation,* June 1980.

Net migration. Net migration is based on Internal Revenue Service (IRS) tax returns and is determined using the following formula:

Net migration = IRS migration rate x migration base

where

Migration base = 1970 base population—special populations + 1/2(births—deaths + immigrants)

and

$$\text{IRS migration rate} = \frac{\text{IRS inmovers - IRS outmovers}}{\text{IRS nonmovers + IRS outmovers}}$$

IRS inmovers, outmovers, and nonmovers for the 1970-73 time period were determined by use of two IRS tax return files, one filed in 1970 and the other filed in 1973. The two files were matched by Social Security number. For each set of matched returns, the addresses were compared to determine whether the person or persons represented by that return moved between 1970 and 1973. If the addresses were the same, the return was designated a nonmover. If the addresses were different and other criteria are met, the persons on the return were designated as outmovers from their residence in 1970 and inmovers to their residence in 1973. The calculation of inmovers, outmovers, and nonmovers is made using total exemptions, excluding those for age and blindness. The assignment of inmovers, outmovers, and nonmovers to the appropriate subcounty area is contingent on the successful geo-coding of the address on the return. The assignment of geography codes to the returns is based on the State, Zip Code, post office name, and address type (city delivery, rural route, etc.) from the address. The relationship between these address "keys" and the subcounty geography is determined through use of a residence question which appears periodically on IRS tax forms.

Immigration. Legal immigrants from abroad were added based on data from the U.S. Immigration and Naturalization Service (INS). Where data on intended place of residence were not available at the subcounty level, INS data at the State level were allocated within the State based on demographic data from the 1970 census.

Adjustments for special populations. The change in special populations was accounted for separately. For selected institutions, college dormitories, and military barracks, the resident population for both 1970 and 1973 was obtained from the specific institutions. The change between 1970 and 1973 was then treated as an additional component of population change.

Local estimates. In six States (California, Florida, New Jersey, Oregon, Washington, and Wisconsin) subcounty population estimates prepared by a State agency were averaged with the Administrative Records estimates to improve accuracy.

Adjustments to the estimates. The preliminary estimates, calculated according to the steps given above, were adjusted so that the sum of all areas within a county was equal to the official county estimate which is arrived at independently, using a combination of several methods. In addition, for areas which had special censuses near the time of the estimate date, estimates were adjusted to reflect the results of these special censuses. The estimates were then reviewed by Census Bureau personnel and local officials and selected changes were made.

Subsequent estimates. Rather than starting over again from the decennial census, each succeeding set of estimates is built upon the most current estimates available. The primary reason for this procedure is that the migration data are more reliable for short time periods such as 1 or 2 years. Since migration data are obtained by matching two IRS files, longer migration periods will mean a lower match rate between the two files. This would cause a larger portion of the population to be excluded from coverage, because only matched returns are used to calculate the migration rates.

ACCURACY OF 1980 ESTIMATES

Table 1 contains the results of a comparison between the April 1, 1980, test estimates and the April 1, 1980, census counts by 1970 population size. For the purposes of this evaluation, the differences between the estimates and the census counts are assumed to be due to errors in the estimates. Although errors in the census could also account for some of this difference, the effect would be relatively small as compared with the size of subcounty estimation errors.

The average absolute percent error for all areas was 15.2 percent. The average error varied sharply by size of area, from a low of 3.9 percent for areas with a population of 100,000 or greater to a high of 35.1 percent for areas with population less than 100 (figure 1). The relatively high overall average error was partially due to the preponderance of small areas among revenue sharing governments. Of the 35,644 areas, 76.5 percent had less than 2,500 people (figure 2). For areas with population greater than 2,500, the average absolute percent error was 8.0 percent.

Of the 35,644 areas, 23.6 percent had extreme errors of 20 percent or more (figure 3). As expected, most of these extreme errors occurred in small areas. One-third of the 20,123 areas with population less than 1,000 had extreme errors of 20 percent or more, while there were no errors of this magnitude for the 160 areas with population of 100,000 and over.

The degree of error in an estimate was in large part dependent on the area's rate of change in population between 1970 and 1980 (figure 4). Areas that grew by 50 percent or more or declined by 15 percent or more had an average error of 29.2 percent, compared with an average error of 11.6 percent for the remaining areas. The strong relationships of both population size and rate of growth to the error rate is evident in table 2, in which the average error is tabulated by size by

FIGURE 1.

Average Absolute Percent Error, by Size Class

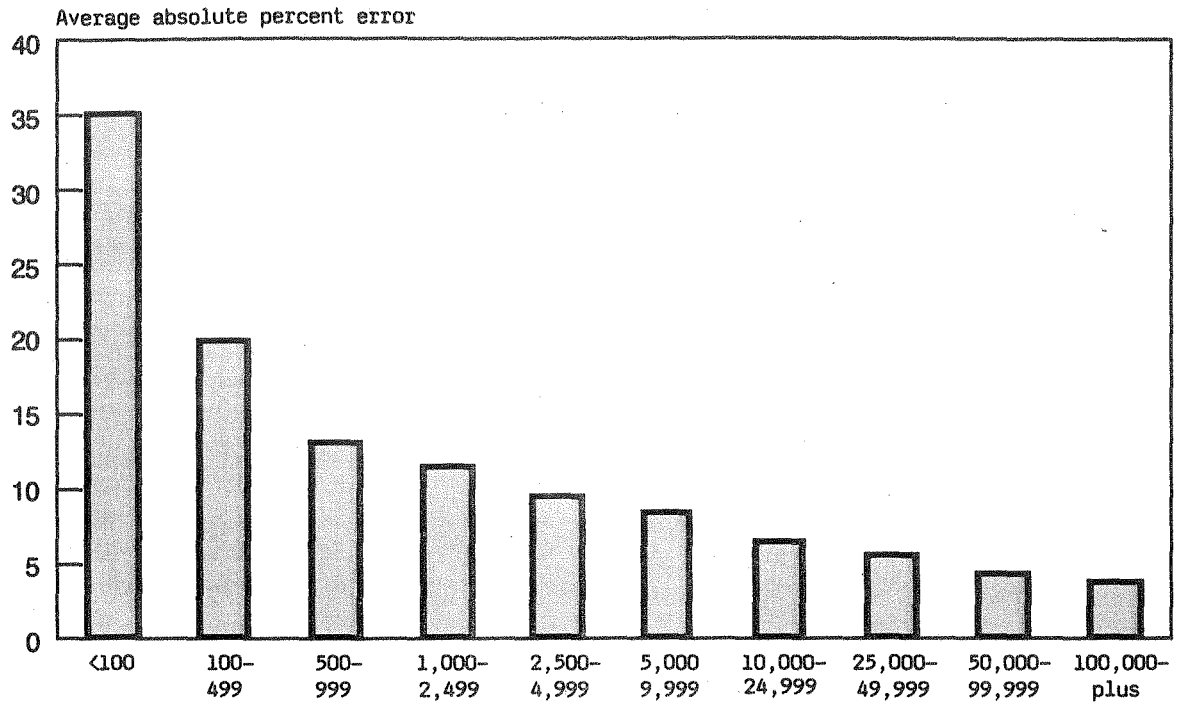


FIGURE 2.

Distribution of Areas, by 1970 Population Size

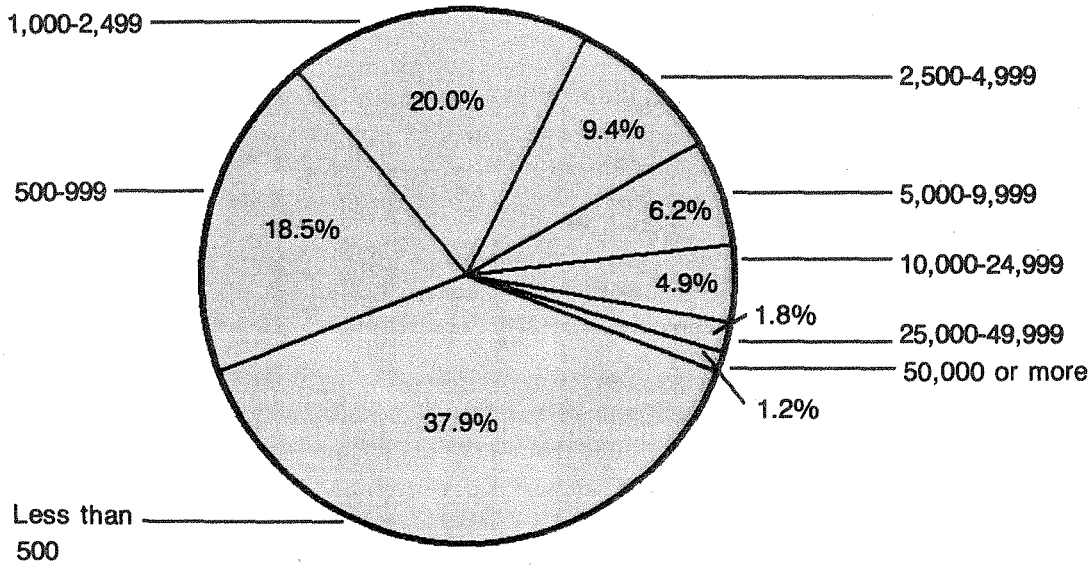


FIGURE 3.

Distribution of Average Percent Errors, by Size Class

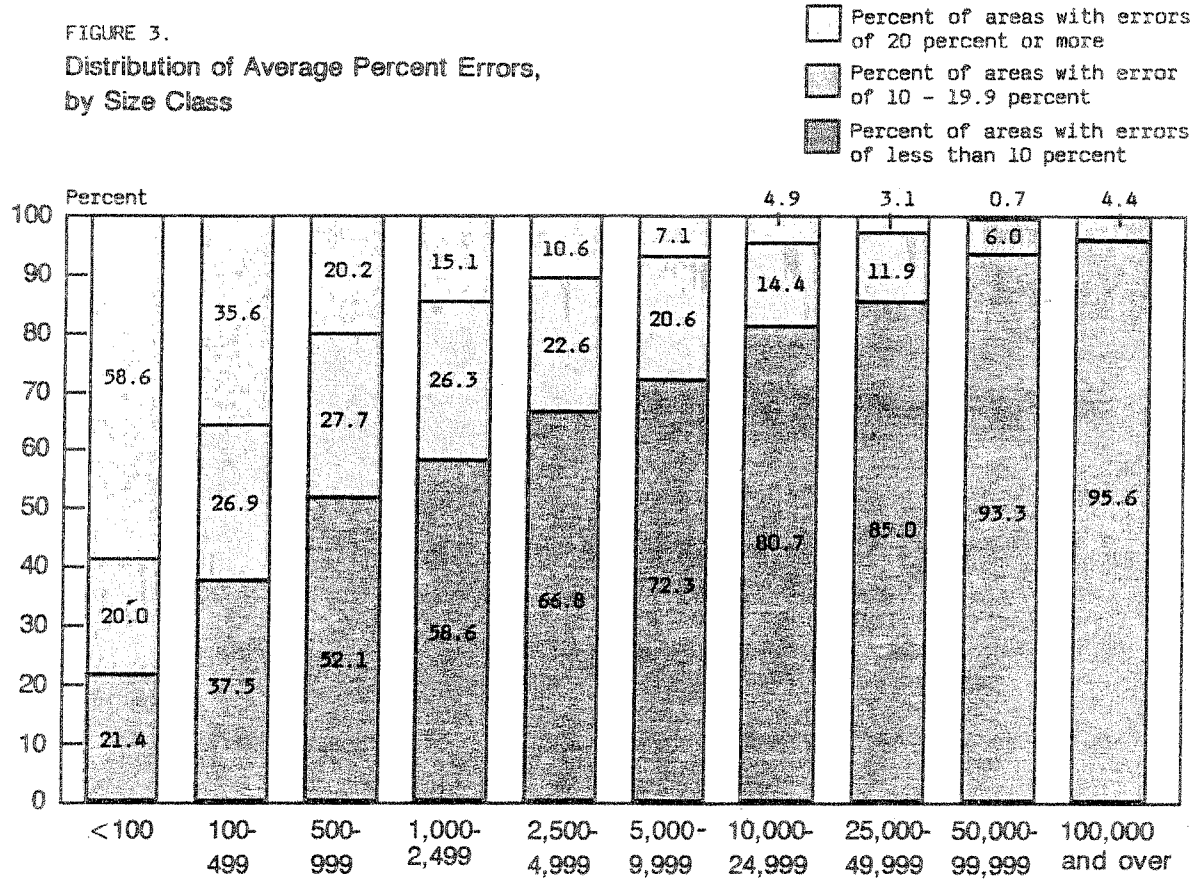
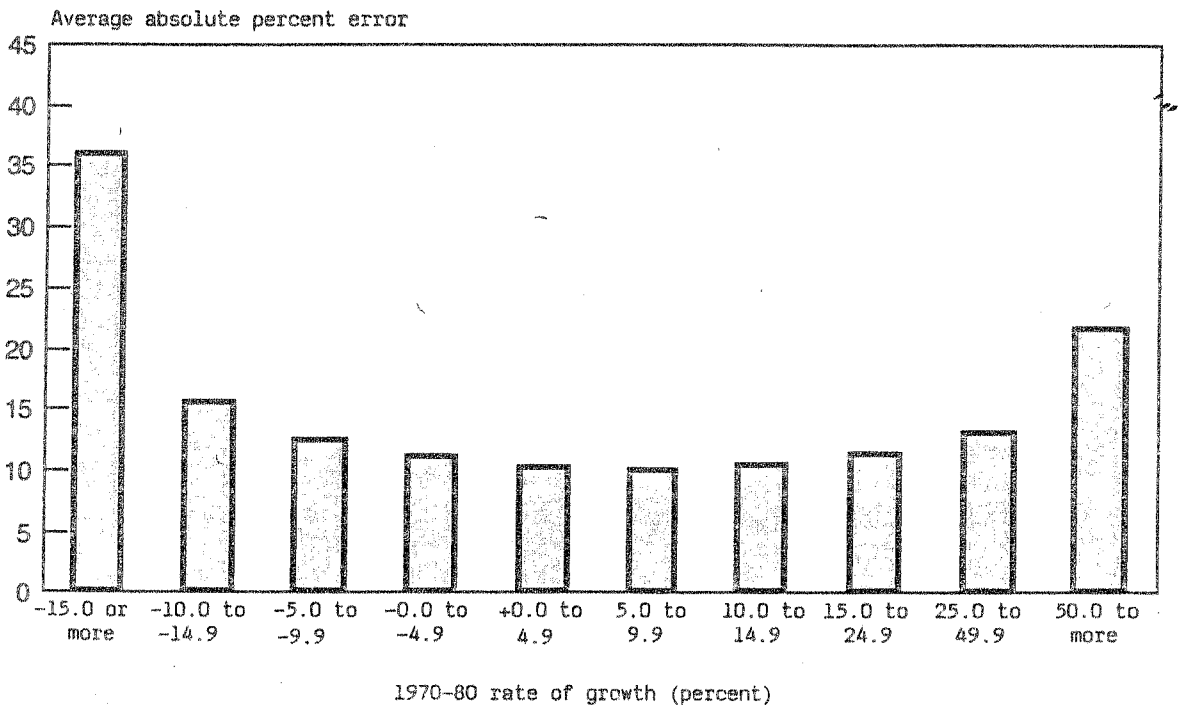


FIGURE 4.

Average Absolute Percent Error, by Rate of Growth



rate of growth. Within individual size classes, there is a clear pattern of larger error rates corresponding to larger absolute rates of change. Similarly, population size is still strongly correlated with percent error within particular categories of change. These patterns of error are consistent with those found in previous evaluations of subcounty estimates against special censuses.[3]

Overall, 48.5 percent of the estimation errors were positive, indicating a slight negative bias. Some of this negative bias may be attributed to the relatively large underestimation of the national population in 1980 (approximately 2.5 percent). The bias was somewhat stronger for certain size classes. In particular, only 37.9 percent of estimation errors for the 100,000 and over size class were positive, and the 1,000-4,999 size class had a substantial negative bias, with only 43.5 percent of the estimates being higher than the census count. The tendency toward bias is most evident when the estimates are examined by rate of growth. As can be seen from table 2, there is a strong relationship between rate of growth and percent positive errors. Estimation errors for areas that increased in population between 1970 and 1980 were biased low, and the degree of bias increased uniformly with the rate of growth. Similarly, areas that declined in population tended to have estimates that were biased high (figure 5).

Table 3 provides further illustration of the relationship between rate of growth and percent error, both with regard to size and direction of error. Areas with large increases in population had a very high percentage of extreme negative errors. Similarly, areas that experienced large declines in population during the 1970's tended to be severely overestimated. The pattern is particularly evident for areas that declined in population: Of the 3,784 areas that declined by 15.0 percent or more between 1970 and 1980, 61.7 percent had estimates that were high by more than 15 percent.

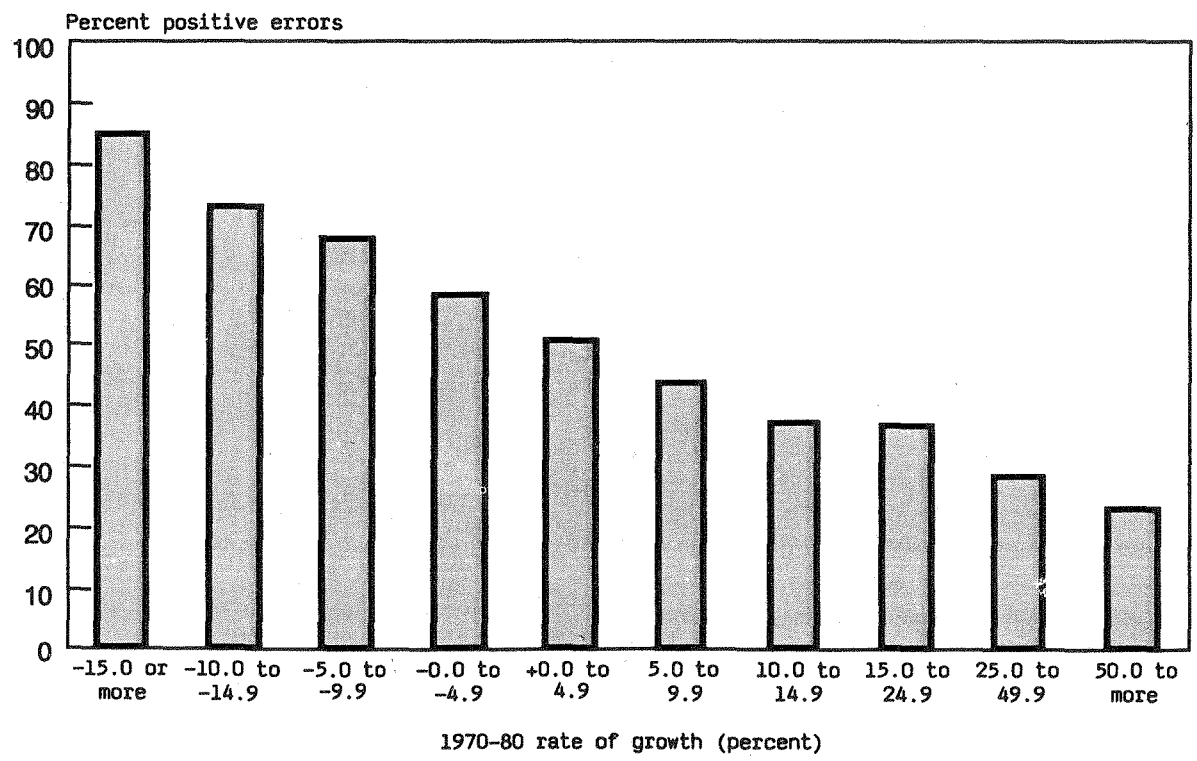
GEOGRAPHIC DIFFERENCES

Table 4 provides a breakdown of estimate accuracy by State. The range of average errors is quite wide, from a low of 5.3 percent for Massachusetts to a high of 29.3 percent for South Dakota. The estimates for the New England area in general were quite accurate with Connecticut, New Hampshire, Massacchusetts, Rhode Island, and Vermont having

[3]Several studies have analyzed patterns in subcounty estimation errors obtained through a comparison to special censuses conducted in the mid-1970's. These include National Research Council Panel on Small Area Estimates of Population and Income, *Estimating Population and Income of Small Areas,* Washington, D.C.: National Academy Press, 1980; Meyer Zitter and Frederick J. Cavanaugh, "Postcensal Estimates of Population," a paper presented at the Annual Meeting, American Association for the Advancement of Science, San Francisco, California, January 5, 1980; and U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 699, *Population and Per Capita Money Income Income Estimates for Local Areas: Detailed Methodology and Evaluation,* June 1980.

FIGURE 5.

Direction of Error, by Rate of Growth



average errors of less than 10 percent. The geographic composition of the New England states is undoubtedly a contributing factor to this low error rate. The minor civil divisions in New England are towns, the boundaries of which are well known and often conform to Zip Code boundaries. This allows a high degree of accuracy in the calculation of migration rates, because tax returns can more readily be assigned to the correct subcounty area. In addition, while small, rapidly growing areas are the hardest to estimate, New England has few small areas, and the growth rates are fairly stable. However, the two States with the largest average errors, North Dakota and South Dakota, have a very high concentration of small areas. Over 95 percent of the areas in each of these States have population less than 1,000. Table 4 also provides an average absolute percent error that is weighted by 1980 population.[4] This measure is not so severely affected by the very small areas which sometimes have extremely high percent errors. For example, North Dakota has a weighted error of only 11.4 percent, while the unweighted error is 29.0 percent. South Dakota, with an unweighted error of 29.3 percent, has a weighted error of only 12.8 percent.

Table 5 shows a breakdown of estimate accuracy by type of geography. The average absolute percent error for minor civil divisions (MCD's) was 15.5 percent, compared with 15.0 percent for places. The slightly higher error rate for MCD's was primarily due to the fact that MCDs tended to be smaller. When examined by size class the estimates for MCDs were more accurate for each category except the areas with population less than 100. The accuracy of the MCD estimates was greatly enhanced by inclusion of the towns in New England, as is evident when the MCD estimates are examined by region. MCDs in the Northeast had an average error of only 10.0 percent, compared with 16.8 percent for MCD's in the Midwest.[5]

USE OF ESTIMATES VERSUS DECENNIAL CENSUS COUNTS

The production of population estimates for all subcounty areas was first undertaken out of concern that it would not be appropriate to allocate revenue sharing funds throughout the 1970s on the basis of the 1970 census population. As the decade progressed, the 1970 counts would become further out-of-date. While the estimates provide a more current measure of population, they do not provide nearly the accuracy attained through a census of the population. Thus, there is a trade-off involved in the use of estimates in lieu of the decennial census counts. Although the estimates are more current, they are also subject to a higher degree of error. One way to analyze the relative value of using estimates instead of the decennial census counts is to consider the 1970 census population as an alternative estimate and compare its accuracy with that of the current estimates. The error resulting from use of the 1970 census will derive almost exclusively from the fact that it is out-of-date. However, the error in the current estimates will derive primarily from the problems in the data inputs and methodology involved in measuring change in the population. The 1970 counts and the 1980 estimates were each compared with the 1980 census population to determine which one provided a better measure of population on April 1, 1980. For each area, a determination was made as to whether the 1980 estimate or the 1970 census was closer to the 1980 census population. The results of this comparison appear in table 6 under the heading "Percent of areas for which estimate is preferable to 1970 census." For each size class, the 1980 estimates were preferable to the 1970 census counts for a majority of cases. This measure ranged from a low of 51.8 percent of the estimates preferable to the 1970 census counts for areas with population less than 250 to 81.3 percent for areas with population 100,000 and over.

Another approach to the comparison between the 1980 estimate and the alternative 1970 census count is to calculate average percent errors for each figure, i.e., average percent differences from the 1980 census count (table 6, figure 6). For all areas, the average absolute percent error resulting from use of the 1970 census counts was 18.0 percent, compared with 15.2 percent for the 1980 estimates. For large areas, the difference in accuracy obtained by use of the estimates instead of the 1970 census counts was striking. The average absolute percent error for areas of 100,000 and over was 11.4 percent when using the 1970 counts, compared with only 3.9 percent for the 1980 estimates. In fact, the 1980 estimates had an error rate of at least 4 percentage points below that of the 1970 census counts for all size classes over 1,000. However, for one size class (under 250), it appears that the 1970 census counts might have been preferable to the 1980 estimates. The average error for the 1980 estimates was 27.2 percent for areas with less than 250 people, compared with 26.2 percent for the 1970 census counts. These findings caused concern over the advisability of making estimates for very small areas during the 1980s. With the 1980 census population available as a benchmark, a program of research and testing was undertaken in an effort to improve the estimation methodology, particlarly for small area estimates.

REVISIONS TO THE METHODOLOGY

The evaluation of the 1980 estimates led to changes in the procedures used to determine several of the components of change. A description of the major revisions follows.

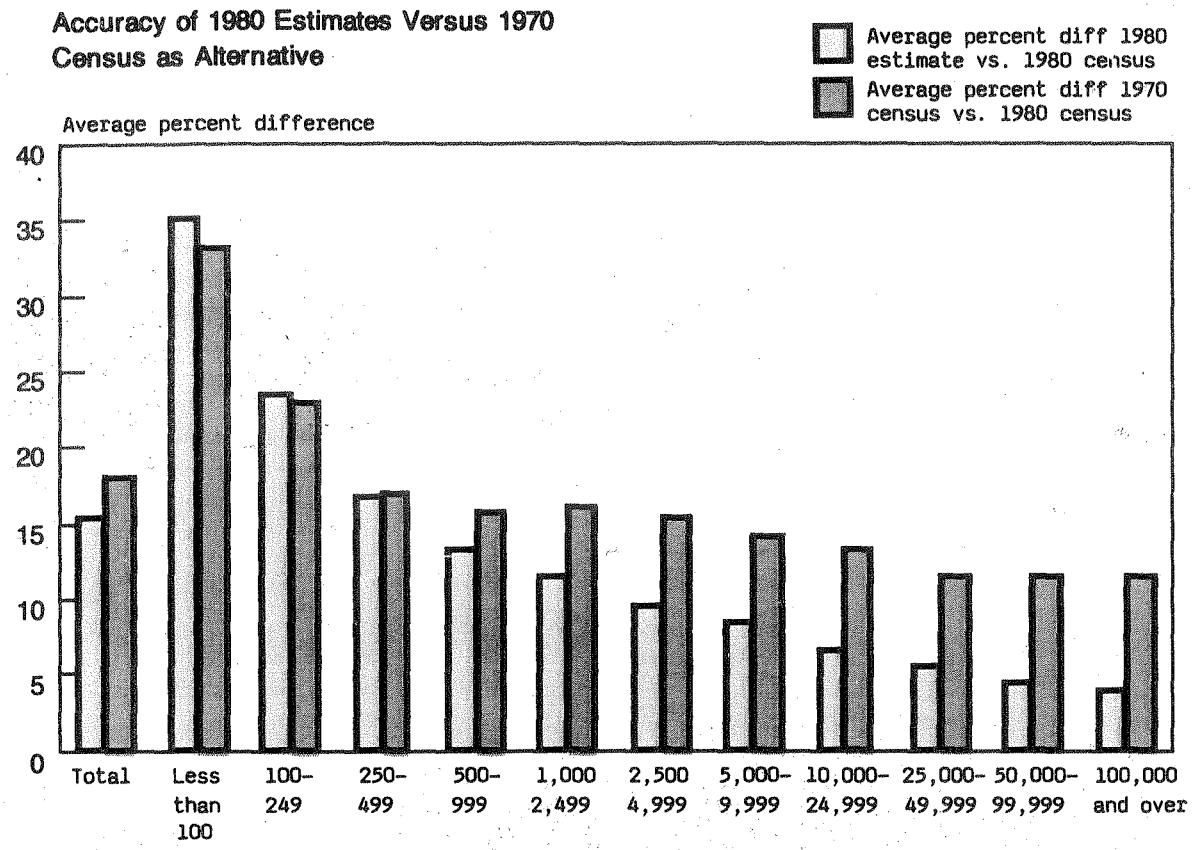
Migration. One of the most serious problems affecting the estimates during the 1970's was the occurrence of spurious migration rates obtained from the IRS tax data. This problem generally took the form of very large positive or negative

[4]Weighted average absolute percent error is equal to:

$$\frac{\text{Sum of deviations between estimate and census} \times 100}{\text{Sum of census counts}}$$

[5]The South and West Regions do not have any functioning minor civil divisions.

FIGURE 6.
Accuracy of 1980 Estimates Versus 1970 Census as Alternative



migration rates when in fact little or no migration was occurring. It often led to very large estimation errors when the estimates were compared with the census. A detailed analysis of these areas brought to light the fact that the spurious migration was often the result of postal changes. The designation of a filer as either a mover or nonmover is based in part on the comparison of the addresses on the returns for the two years in question. This determination is made in such a manner that most changes made by the post office, such as changes in Zip Code, post office name, street name, or house number, do not cause a filer to be designated as a mover. However, there was one particular type of postal change that did cause filers to be designated as movers, when in fact they had not moved. This occurred when the post office assigned city delivery addresses to areas that had previously been rural delivery. A modification to the system that is used to determine mover status was devised in order to prevent the spurious migration arising from these postal changes. This change was instituted starting with the 1980-82 migration rates used in the production of the July 1, 1982, estimates.

Immigration from abroad. For the 1970's, immigration from abroad was obtained from the INS for States and large cities. For the remainder of the areas, the total supplied by the INS was allocated based on the total foreign-born population in each area, obtained from the 1970 census. For the 1980's, this procedure has been modified. Rather than total foreign-born population, the allocation is being based on foreign-born population that entered the United States between 1975 and 1980. In addition, the foreign-born population for each area has been divided into 15 categories, each comprising one or more possible countries of origin. The immigration data by country obtained from the INS is similarly separated into these 15 categories and the allocations are done separately, i.e., the immigrants from each group of countries are allocated based on the foreign-born population from that group of countries residing in each subcounty area.

Birth estimation procedure. For areas for which reported births were not available, estimates were made during the 1970's based on demographic information from the 1970 census for each subcounty area. Evaluation of these estimates indicated a problem with birth estimates for very small areas. The birth estimates utilized area-specific fertility rates, calculated using population less than one year old and females aged 15-39 in 1970. For very small areas, these fertility rates proved to be unreliable. Starting with the 1982 estimates, births for areas with less than 500 population will be estimated based on total population, rather than local fertility rates.

Locally conducted counts. Despite improvements in the methodology, it is evident that the best source for small area

estimates is frequently an actual count of the population. For very small areas, such a count is a manageable task and can be done with relative accuracy. However, our estimates are least accurate for small areas. During the estimates review program, guidelines for locally conducted population counts will be made available to officials of governments with populations less than 500. For these small areas that conduct counts according to the guidelines, the estimate will be replaced by the locally conducted count, after adjustment to the appropriate estimate date.

Although production of alternative estimates series could not predict estimate accuracy for the 1980's, these sets of estimates can be used to test the relative accuracy of alternative procedures. The revised birth and death methodology was refined and evaluated through comparisons of alternative sets of estimates to the 1980 census. Test estimates using the revised birth and death methodology had an average error of 16.3 percent, compared with 17.7 percent for a set of test estimates that incorporated birth and deaths based on the old procedures. As expected, the improvement was greatest for small areas. For areas with population less than 250, the average error was reduced from 32.2 percent to 28.9 percent by use of the revised birth and death estimates. Other changes, the effect of which we were not able to measure, should provide a further increase in accuracy.

Although the tests of alternative estimates provided valuable information, they could not all be used in a strictly emperical sense to determine the best methodology. For instance, tests to determine the optimum migration rate allocation and replacement procedures were of necessity based on the existing rates derived using the old methodology. Since the migration rates used in the 1970's included more spurious migration than would be expected using the revised migration rate methodology, the optimum controls determined using the old rates would not necessarily provide the most accurate estimates during the 1980's. Such revisions in the way that the components of change will be calculated, along with the fact that the test estimates were not subjected to individual review, meant that the findings in these tests had to be tempered with consideration for the effect of these factors.

CONCLUSIONS

The estimates are relatively accurate for large areas and provide a clear-cut advantage over use of the decennial census population for estimates with population greater than 1,000. For small areas, the estimates are not as accurate as was hoped for. For areas with population less than 250, there is some doubt, in retrospect, as to whether the estimates were more accurate than continuing to use the latest census count during the 1970's. However, improvements in the methodology should increase accuracy for the 1980's and insure that estimates for even the very small size classes will provide a significantly better measure of current population than use of the decennial census.

The modifications described above, along with minor changes to the death estimation procedures, should provide improved estimates for the 1980's. Ideally, we would like to create a set of test estimates using the new procedures and compare them to the 1980 census in order to determine the improvement in accuracy for the 1980's. Unfortunately, this is not possible for several reasons. First, to recalculate the migration rates using the new methodology would require the reprocessing of six IRS tax files going back to 1970, each containing 80 to 90 million records. Thus any re-creation of the estimates would necessarily have to use the existing migration rates calculated using the old methodology. Second, a key part of the estimates program is a review of the data inputs and the final estimates, both by Census Bureau professionals and local officials. This extensive and time-consuming review, conducted at each intermediate stage in the creation of the existing 1980 estimates (i.e., 1973, 1975, 1976, 1977, and 1978 estimates) is not feasible in the re-creation of alternative estimates for test purposes. Thus it is not possible to create a set of 1980 test estimates that would accurately predict the estimation error to be expected for the 1980's.

Table 1. Selected Measures of the Accuracy of Subcounty Population Estimates: April 1, 1980

Size of area	Number of areas	Average absolute percent error	Percent positive errors	Percent of estimates preferable to 1970 census	Percent of areas with errors of—		
					Less than 10 percent	10 to 19.9 percent	20 or more percent
Total	35,644	15.2	48.5	59.6	51.9	24.5	23.6
Less than 100	2,425	35.1	55.1	51.9	21.4	20.0	58.6
100 to 499	11,085	19.8	52.8	53.6	37.5	26.9	35.6
500 to 999	6,613	13.2	46.5	58.3	52.2	27.7	20.2
1,000 to 2,499	7,141	11.6	43.9	62.3	58.6	26.3	15.1
2,500 to 4,999	3,348	9.6	43.0	66.9	66.7	22.6	10.6
5,000 to 9,999	2,212	8.3	45.8	67.1	72.3	20.6	7.1
10,000 to 24,999	1,740	6.5	51.7	69.9	80.6	14.4	4.9
25,000 to 49,999	636	5.5	52.7	70.0	84.9	11.9	3.1
50,000 to 99,999	284	4.5	46.5	78.2	93.3	6.0	0.7
100,000 and over	160	3.9	36.9	81.3	95.6	4.4	0.0

Table 2. Average Absolute Percent Error for 1980 Subcounty Population Estimates, by Size of Area and Rate of Growth

Size of area	Total	Percent change in population: 1970-80									
		-15.0 or more	-10.0 to -14.9	-5.0 to -9.9	-0.0 to -4.9	+0.0 to 4.9	5.0 to 9.9	10.0 to 14.9	15.0 to 24.9	25.0 to 49.9	50.0 or more
Total:											
Average percent error	15.2	36.0	15.6	12.3	11.0	10.3	9.9	10.5	11.3	13.3	21.8
Number of areas	35,644	3,789	2,163	2,916	3,624	3,833	3,638	2,983	4,304	4,980	3,414
Percent positive	48.5	84.7	72.9	67.2	58.6	50.7	53.8	37.3	36.7	28.0	22.9
Less than 100:											
Average percent error	35.1	47.4	26.4	20.8	22.2	23.5	20.8	23.7	23.2	24.4	39.8
Number of areas	2,425	979	159	162	194	85	104	92	144	189	317
Percent positive	55.1	82.8	58.5	61.1	48.5	43.5	36.5	35.9	31.3	19.0	16.1
100 to 499:											
Average percent error	19.8	34.3	19.1	16.2	14.4	14.1	13.0	13.7	15.0	15.7	26.4
Number of areas	11,085	1,998	940	999	1,029	912	863	739	1,062	1,391	1,152
Percent positive	52.8	86.8	73.5	67.5	57.9	52.3	46.5	39.6	36.6	27.5	18.5
500 to 999:											
Average percent error	13.2	33.0	14.4	12.6	10.9	10.9	9.8	10.7	10.3	13.3	19.9
Number of areas	6,613	302	323	506	714	811	735	620	930	1,034	638
Percent positive	46.5	87.7	81.1	71.7	62.9	53.3	43.8	34.5	38.5	27.1	20.5
1,000 to 2,499:											
Average percent error	11.6	33.6	11.7	10.3	9.1	9.0	9.3	9.3	10.4	12.5	16.8
Number of areas	7,141	211	218	423	688	886	908	722	1,127	1,289	669
Percent positive	43.9	84.4	80.7	72.8	60.5	51.1	44.7	37.4	34.3	27.9	27.1
2,500 to 4,999:											
Average percent error	9.6	19.2	12.3	9.0	8.0	8.0	7.7	7.9	8.4	11.3	14.5
Number of areas	3,348	90	137	247	312	413	446	392	485	525	301
Percent positive	43.0	84.4	77.4	68.4	59.6	47.5	38.1	33.7	34.2	28.2	30.2
5,000 to 9,999:											
Average percent error	8.3	19.5	9.1	7.2	6.6	6.8	6.9	7.4	8.3	7.9	12.1
Number of areas	2,212	89	124	186	270	313	286	223	285	269	167
Percent positive	45.8	79.8	66.1	60.8	57.4	40.3	42.3	42.6	39.3	30.9	32.3
10,000 to 24,999:											
Average percent error	6.5	11.5	6.6	5.9	5.8	6.2	6.5	5.7	6.3	7.4	7.2
Number of areas	1,740	58	136	203	261	261	189	130	180	189	133
Percent positive	51.7	69.0	64.0	61.6	54.8	54.4	48.7	43.1	50.0	40.2	36.8
25,000 to 49,999:											
Average percent error	5.5	7.2	7.0	5.1	5.9	5.6	4.8	5.8	4.3	5.4	4.9
Number of areas	636	34	63	103	101	91	65	37	61	59	22
Percent positive	52.7	55.9	66.7	61.2	58.4	56.0	52.3	45.9	34.4	37.3	31.8
50,000 to 99,999:											
Average percent error	4.5	5.7	4.0	3.9	4.2	5.0	3.9	4.4	4.1	5.5	6.3
Number of areas	284	14	38	56	33	42	26	21	22	17	15
Percent positive	46.5	57.1	68.4	58.9	54.5	45.2	34.6	9.5	40.9	23.5	26.7
100,000 and over:											
Average percent error	3.9	2.7	4.0	3.3	2.9	4.8	4.2	3.7	4.3	5.7	0.0
Number of areas	160	14	25	31	22	19	16	7	8	18	0
Percent positive	36.9	64.3	48.0	38.7	36.4	47.4	12.5	28.6	25.0	16.7	0.0

Table 3. Distribution of Places, by Percent Error and Rate of Growth

Percent error	Total	Percent change in population: 1970-80									
		-15.0 or more	-10.0 to -14.9	-5.0 to -9.9	-0.0 to -4.9	+0.0 to 4.9	5.0 to 9.9	10.0 to 14.9	15.0 to 24.9	25.0 to 49.9	50.0 or more
Total	35,644	3,789	2,163	2,916	3,624	3,833	3,638	2,983	4,304	4,980	3,414
-25.0 percent or more	2,320	79	29	43	73	72	92	112	226	527	1,067
-24.9 to -15.0 percent	3,083	96	70	97	151	223	276	279	505	863	523
-14.9 to -10.0 percent	2,932	83	70	103	218	307	323	354	498	669	307
-9.9 to -5.0 percent	4,538	138	162	251	424	565	618	531	709	776	364
-4.9 to 0.0 percent	5,495	182	255	463	634	724	734	593	787	751	372
+0.0 to 4.9 percent	5,024	274	328	567	691	704	624	422	617	553	244
5.0 to 9.9 percent	3,468	284	285	401	519	464	366	261	369	336	183
10.0 to 14.9 percent	2,383	313	244	310	318	260	232	164	215	199	128
15.0 to 24.9 percent	2,709	580	329	344	316	284	216	159	206	160	115
25.0 to 49.9 percent	2,493	957	313	278	226	186	129	87	135	105	77
50.0 percent or more	1,199	803	78	59	54	44	28	21	37	41	34

Table 4. Subcounty Population Estimates Evaluation: ORS Estimates

State	Number of areas	Average absolute percent error		Percent positive errors	Percent of areas with population less than 1,000	Average absolute growth rate	Percent of estimates preferable to 1970 census
		Weighted	Unweighted				
United States	35,644	6.8	15.2	48.5	56.5	17.9	59.6
Alabama	427	8.5	20.4	38.4	55.7	21.2	60.0
Alaska	139	13.8	18.4	51.8	87.1	26.2	71.2
Arizona	75	9.0	13.3	44.0	16.0	31.8	81.3
Arkansas	471	6.5	16.3	38.0	68.8	20.7	59.0
California	421	4.7	6.3	39.4	5.2	20.7	81.2
Colorado	265	10.1	23.8	65.7	67.2	27.3	62.6
Connecticut	182	4.4	6.2	72.5	3.3	11.8	75.3
Delaware	56	7.4	18.9	48.2	57.1	17.4	44.6
Florida	391	5.6	14.2	49.6	35.8	32.3	79.0
Georgia	532	11.3	20.1	48.9	55.6	16.0	45.1
Idaho	199	10.1	20.7	54.8	67.8	24.4	60.8
Illinois	2,689	5.5	11.0	38.2	51.4	13.9	55.7
Indiana	1,561	7.0	11.5	42.6	38.8	13.1	56.2
Iowa	955	4.6	10.9	35.7	74.1	12.3	52.1
Kansas	2,008	8.7	19.5	54.9	82.0	17.3	50.0
Kentucky	413	9.7	19.3	40.9	52.1	19.7	51.3
Louisiana	300	8.4	16.0	43.7	46.7	16.3	53.0
Maine	497	6.5	12.3	43.5	59.6	22.7	80.1
Maryland	151	10.7	18.2	57.0	45.7	17.3	51.7
Massachusetts	351	3.6	5.3	64.1	13.1	14.3	78.1
Michigan	1,774	7.8	14.8	46.7	38.5	19.2	63.0
Minnesota	2,649	9.5	15.8	56.9	84.4	16.8	54.7
Mississippi	290	8.8	15.2	37.6	51.0	15.9	52.4
Missouri	1,246	8.6	17.4	46.3	71.5	16.2	50.4
Montana	125	10.4	15.3	72.0	54.4	14.3	48.0
Nebraska	1,005	9.9	16.1	48.4	84.4	13.9	47.3
Nevada	16	8.0	8.9	68.8	12.5	19.3	75.0
New Hampshire	234	6.4	9.1	33.8	44.0	27.7	90.2
New Jersey	565	4.6	6.7	55.2	6.4	15.8	79.1
New Mexico	95	7.3	17.8	55.8	49.5	21.8	69.5
New York	1,540	5.5	8.7	53.1	23.2	11.6	62.8
North Carolina	479	10.0	19.6	55.5	52.8	18.8	48.0
North Dakota	1,718	11.4	29.0	60.6	96.0	30.0	54.8
Ohio	2,257	8.3	14.3	46.2	36.1	14.8	55.3
Oklahoma	575	8.1	18.1	46.8	65.6	21.1	59.7
Oregon	240	6.5	15.6	75.4	51.7	23.8	67.5
Pennsylvania	2,566	7.9	11.7	40.3	35.9	16.2	68.9
Rhode Island	39	4.7	6.1	43.6	2.6	17.4	84.6
South Carolina	265	11.5	17.5	47.2	49.4	17.7	50.6
South Dakota	1,313	12.8	29.3	60.8	95.2	25.9	49.0
Tennessee	331	7.1	14.7	37.8	48.0	18.6	63.7
Texas	1,105	7.1	19.1	39.0	45.3	23.2	64.0
Utah	219	9.3	14.5	53.0	58.9	31.2	79.9
Vermont	294	5.3	8.1	39.8	59.2	19.1	82.7
Virginia	188	14.4	23.6	50.0	58.5	18.5	47.9
Washington	265	4.5	7.9	61.9	44.5	16.9	71.7
West Virginia	231	8.3	14.7	51.9	47.6	13.2	54.5
Wisconsin	1,848	5.4	7.9	50.9	65.4	15.1	71.4
Wyoming	89	9.2	21.8	58.4	65.2	29.7	68.5

NOTE: Hawaii contains no functioning subcounty areas.

Table 5. Average Absolute Percent Error for 1980 Estimates, by Size and Type of Area

Size of area	All areas	Incorporated places	Minor civil divisions		
			Total	East	Midwest
Total:					
Average percent error	15.2	15.0	15.5	10.0	16.8
Number of areas	35,644	18,929	16,715	3,207	13,508
Percent positive	48.5	48.2	48.7	39.7	50.9
Less than 100:					
Average percent error	35.1	34.2	35.6	33.2	35.8
Number of areas	2,425	802	1,623	85	1,538
Percent positive	55.1	44.3	60.5	37.6	61.8
100 to 499:					
Average percent error	19.8	19.9	19.8	14.3	20.3
Number of areas	11,085	5,908	5,177	435	4,742
Percent positive	52.8	47.1	59.2	38.9	61.1
500 to 999:					
Average percent error	13.2	14.8	11.6	10.7	11.9
Number of areas	6,613	3,344	3,269	619	2,650
Percent positive	46.5	48.0	45.0	36.2	47.1
1,000 to 2,499:					
Average percent error	11.6	12.6	10.5	9.3	10.9
Number of areas	7,141	3,601	3,540	909	2,631
Percent positive	43.9	50.0	37.7	36.9	37.9
2,500 to 4,999:					
Average percent error	9.6	10.4	8.7	8.7	8.7
Number of areas	3,348	1,900	1,448	485	963
Percent positive	43.0	48.3	36.0	35.5	36.3
5,000 to 9,999:					
Average percent error	8.3	8.4	8.0	6.8	8.8
Number of areas	2,212	1,398	814	303	511
Percent positive	45.8	50.0	38.5	39.3	38.0
10,000 to 24,999:					
Average percent error	6.5	6.8	6.1	5.2	6.9
Number of areas	1,740	1,143	597	280	317
Percent positive	51.7	51.5	52.1	57.9	47.0
25,000 to 49,999:					
Average percent error	5.5	5.7	5.2	3.8	6.1
Number of areas	636	466	170	70	100
Percent positive	52.7	48.9	62.9	68.6	59.0
50,000 to 99,999:					
Average percent error	4.5	4.8	3.1	2.7	3.3
Number of areas	284	229	55	21	34
Percent positive	46.5	45.9	49.1	61.9	41.2
100,000 and over:					
Average percent error	3.9	3.8	4.4	0.0	4.4
Number of areas	160	138	22	0	22
Percent positive	36.9	34.8	50.0	0.0	50.0

Table 6. Accuracy of 1980 Subcounty Population Estimates Versus 1970 Census Population as an Alternative

Size of area	Number of areas	Percent of areas for which estimate is preferable to 1970 census	Average absolute percent difference between 1980 estimate and 1980 census	Average absolute percent difference between 1970 census and 1980 census
Total	35,644	59.6	15.2	17.9
Less than 100	2,425	51.9	35.1	33.0
100 to 249	5,119	51.7	23.4	23.0
250 to 499	5,966	55.2	16.7	17.9
500 to 999	6,613	58.3	13.2	15.8
1,000 to 2,499	7,141	62.3	11.6	15.9
2,500 to 4,999	3,348	66.9	9.6	15.2
5,000 to 9,999	2,212	67.1	8.3	14.2
10,000 to 24,999	1,740	69.9	6.5	13.1
25,000 to 49,999	636	70.0	5.5	11.5
50,000 to 99,999	284	78.2	4.5	11.5
100,000 and over	160	81.3	3.9	11.4