

Population Estimates and Projections

U.S. Department of Commerce
BUREAU OF THE CENSUS

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Population and Per Capita Money Income Estimates for Local Areas: Detailed Methodology and Evaluation

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Detailed Methodology
and Evaluation**



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Chapter 1. Introduction

This report presents a detailed description and evaluation of the Administrative Records methodology used by the Bureau of the Census to prepare postcensal estimates of population and per capita money income (PCI) for approximately 36,000 subcounty areas. The method is also used in conjunction with other methods to produce population estimates for counties and States, and the PCI estimating methodology develops county and State totals to which the local area data are controlled.

The methodological description is illustrated by referring to the July 1, 1975 population estimates and the PCI estimates for 1974, but the methodology is essentially the same for all estimate dates. Improvements in both methods and data have been introduced as dictated by on-going research and evaluation, but the basic design remains unchanged.

The areas covered by the estimates are all States (including the District of Columbia), counties (or county equivalents such as census divisions in Alaska, parishes in Louisiana, and independent cities in Georgia, Maryland, Missouri, Nevada, and Virginia), incorporated places, and active minor civil divisions (MCD's)—commonly towns in New England, New York, and Wisconsin, or townships in other parts of the United States.¹ The most current PCI estimates for local areas are published by State in Current Population Reports, Series P-25, Nos. 740 through 789, and in Nos. 814 through 863 for population.² In addition, this report describes the results of evaluation studies of both the population and per capita income estimates. Chapters 2 and 3 deal with population and chapters 4 and 5 cover per capita income. A technical appendix outlines the methodology in detailed formulas.

UTILIZATION OF THE ESTIMATES

Population estimates, such as those discussed here, are used for a wide variety of Federal, State, and local governmental purposes, as well as by many private organizations. For example, the Library of Congress Congressional Research Service reports that there are over 100 Federal programs that use population as a factor in allocating funds.³ Federal agencies which make the greatest use of these estimates

¹ In some midwestern States (Illinois, Kansas, Minnesota, Missouri, Nebraska, and the Dakotas), selected counties contain active minor civil divisions while others do not.

² The reports are numbered alphabetically by State.

³ For a further discussion of the use of population in the distribution of Federal Funds and a description of each of the programs which utilize population in their allocation formulas, see 95th Congress, 2nd Session, Committee Print No. 95-16, "The Use of Population Data in Federal Assistance Programs," a report compiled by the Congressional Research Service of the Library of Congress for the use of the Subcommittee on Census and Population of the Committee on Post Office and Civil Service, U.S. House of Representatives, December 29, 1978.

include the Office of Revenue Sharing of the U.S. Department of Treasury, the U.S. Department of Labor's Employment and Training Administration (ETA), and the U.S. Department of Housing and Urban Development (HUD). Some of the major programs administered by these agencies are described below.

State and Local Fiscal Assistance Act of 1972

The distribution of funds made by the Office of Revenue Sharing under the State and Local Fiscal Assistance Act of 1972 (Public Law 92-512), is commonly referred to as Federal general revenue sharing. Distribution of Federal funds under this Act are generally made on the basis of three factors: population, per capita income, and tax effort (plus intergovernmental transfers for areas below the State level). The first two of these data elements are derived from the estimates presented in the Series P-25 reports, whereas the information on tax effort and intergovernmental transfers is obtained directly by the Governments Division of the Bureau of the Census in its annual survey of governments.

Comprehensive Employment and Training Act of 1972

Under the Comprehensive Employment and Training Act of 1972 (Public Law 93-203), Federal funds are distributed by the Employment and Training Administration to prime sponsors for establishing and carrying out programs concentrating on comprehensive training for employment. In order to qualify as a prime sponsor, an area must contain at least 100,000 persons. In January of each year, the Bureau of the Census provides a listing of areas to ETA that have either exceeded the 100,000 population threshold or dropped below, according to the most recent estimates. This list is used to determine prime sponsorship under Title I (Comprehensive Manpower Services) of this Act. In addition, each year the Bureau also provides ETA with a list of areas which have crossed a 50,000 population threshold. This list is used to determine prime sponsorship under Title II (Public Employment Programs).

Housing and Urban Development Act of 1972

The U.S. Department of Housing and Urban Development, in administering the Housing and Community Development Act of 1972 (Public Law 93-383), uses current population estimates both in determining areas eligible to receive community development funds and in distributing such funds. Areas with populations of 50,000 or more qualify for funds under this Act. Every year, the Bureau of the Census indicates to HUD those areas whose population has exceeded or dropped below the 50,000 population cutoff according to the estimates.

Chapter 2. Population Estimates Methodology

SUBCOUNTY POPULATION ESTIMATES METHODOLOGY

The Administrative Records method is used to make estimates of the population below the county level. The method is also used in conjunction with other procedures to produce estimates for States and counties or county equivalents.

In general, the Administrative Records method estimates are developed using a component technique in which each of the components of population change—births, deaths, and migration—are estimated separately. For the period April 1, 1970 to the estimate date, resident births and deaths are taken from recorded information or are estimated. Immigration from abroad is developed from data provided by the Immigration and Naturalization Service and other sources. Internal net migration is estimated by developing a net migration rate from exemptions on matched individual Federal income tax returns for successive periods between the base date and the estimate date. This rate is multiplied by a household population base to yield net migrants in households for the entire period. Change in special groups (populations in institutions, colleges, and military barracks) between the base date and the estimate date is added separately because it is not reflected adequately in the net internal migration rate. The final estimate of the resident population is obtained by adding natural change (births minus deaths), immigration from abroad, net internal migration, and change in special population groups to the 1970 census count. Estimates for subsequent years begin with the last estimate as a base point.

A description of the estimation technique for each of the components of population change follows.

Natural Change

Natural change is the difference between resident births and deaths for an area during the estimate period (the period of time between the base date and the estimate date). Wherever possible, reported data on resident births and deaths are used to estimate natural change. Sources of these data are the individual State departments of health and the U.S. Department of Health, Education, and Welfare, National Center for Health Statistics (NCHS). Both the individual State health departments and NCHS compile birth and death statistics by place of residence and both include births and deaths which occur to State residents in out-of-State areas. For resident births, the place of residence of the mother is used to classify the place of residence of the child,

whereas in the case of deaths, the place of residence of the decedent is used.

Birth and death statistics are available for all counties, and for approximately 18,000 places below the county level. For other subcounty areas, neither the State departments of health nor NCHS compile resident birth and death statistics. For these areas, the Bureau of the Census estimates births and deaths using 1970 census data and estimated birth and death rates. Occasionally, the reported data for some subcounty areas are found to be unreasonable and are replaced with estimated figures. This occurs in approximately 10 percent of the areas for which reported births are available and in 5 percent of the areas with reported deaths.

In the procedure used to estimate resident births, the cohort of females 15 through 39 years old is estimated annually. Age-specific fertility rates are estimated for the cohort in 1970 based upon the population under age 1 at the time of the census. This group serves as a surrogate for the actual number of births occurring in a locality. The estimated number of births is obtained by applying the locality's fertility rates to the estimated number of women 15 to 39 years of age on the estimate date and prorating all figures to add to the county total.

In areas where data on resident deaths are not available, a process similar to that used to estimate births is followed. Because of the impact of population characteristics on a locality's death rate, the 1970 reported county-level deaths are distributed to places on the basis of age and racial proportions. This distribution provides the numerator for the development of age-race-specific death rates which are applied to the population to produce the estimated number of deaths for the localities. These death figures are prorated in order to adjust to the reported county total. The same steps are then repeated for each consecutive year.

Migration rates specific to the population over and under age 65 provide the basis for the population cohort change during the estimation periods. In addition, because the majority of deaths occur to persons aged 65 and over, this age category is reduced throughout the estimating procedure by the annual number of deaths. This prevents a disproportionate inflation of this age group.

Despite the fact that the estimates correspond to a July date, calendar year birth and death statistics are used as a surrogate for the July to July periods. Since it is the absolute difference between births and deaths that accounts for natural change, the bias introduced through the use of calendar year data is minimal.

Immigration from Abroad

Immigrant aliens are persons who come to the United States from other countries with the intention of establishing residence. Data on place of intended residence for these resident aliens is tabulated for States and for places with 1970 populations of 100,000 or more, by the U.S. Department of Immigration and Naturalization. For areas within a State which had a total population of less than 100,000 persons in 1970, estimates of the number of immigrants from abroad were made on the basis of the number of persons of foreign birth as reported in the 1970 census. Although aliens not intending to remain permanently (i.e. those persons of foreign citizenship who are visiting this country on a student, business, diplomatic, or other visa) and illegal immigrants are counted as part of the resident population, no acceptable method of counting or estimating change in these special groups exists at this time. Consequently, the number of such persons is implicitly assumed to remain constant during the estimate period.

Net Migration

Net migration is the difference between the number of persons moving into and out of an area during the estimation period. This component is estimated by applying net migration rates for each place derived from individual Federal income tax returns to the appropriate net migration base.

In developing the net migration rate, the residential address shown on individual Federal income tax returns filed for two different years are compared in order to determine movers and nonmovers.¹ Prior to matching the two addresses, the files obtained from the Internal Revenue Service were passed through a series of edits in order to eliminate problem records. Records with invalid Social Security numbers as well as duplicate records caused by the filing of amended returns were removed from the files. The loss of these records represents less than three-tenths of 1 percent of the total income tax returns on the files.

The 1972 income tax return (Forms 1040 and 1040A), included several questions regarding detailed place of residence of the filer (figure 1). These questions asked for State and county of residence, as well as incorporated place if the filer lived within the boundaries of such an area, and the township of residence if applicable (questions 33 (a) to 33(d) and question 34 of the 1972 Individual Income Tax Return, Form 1040. Complete responses to these questions were received on over 70 percent of the returns filed for 1972. The responses obtained on these returns formed the basis for a geographic coding guide which was used to assign geographic codes from mailing addresses on returns for 1969, 1972, and 1974. Geographic data on detailed place of residence beyond the filer's mailing address were again

¹For the July 1, 1975 population estimates, the procedure is carried out in two stages. The first stage matches the 1969 income tax year file (tax returns filed in 1970) and the 1972 income tax year file (tax returns filed in 1973). The second stage matches the 1972 income tax year file and the 1974 income tax year file (tax returns filed in 1975).

obtained on returns for income year 1975. An updated coding guide has been constructed from the 1975 returns for use in subsequent estimates. In developing the 1972 coding guide, the information from the residence question (State, county, minor civil division, and place) was cross referenced with information in the mailing address (State, zip code, post office name, and address type). The resultant coding guide was used to assign geographic codes on a probability basis to the 1969, 1972, and 1974 IRS tax returns.

After files for two different years (e.g., 1972 and 1974) are assigned geographic codes, the returns for the two years are matched by Social Security number as the next step in obtaining a net migration rate for that time period. The pairs of matched returns are then examined to determine whether the filer had moved during the time period in question. If the mailing addresses on the two returns are different, and the assigned geographic codes are also different, the filer is designated as a mover. The geographic classification on the earlier year's return designates the place from which the person or persons migrated, while the geographic classification on the later year's return designates the area to which the person or persons migrated.

Identification of inmigrants, outmigrants, and nonmovers is made, and individual net migration rates for all 39,000 revenue sharing areas are calculated by dividing the difference between exemptions on returns coded as inmigrants and exemptions on returns coded as outmigrants by the sum of exemptions on returns coded as outmigrants and exemptions on returns coded as nonmovers.

$$NMIGRT = \frac{INMIG - OUTMIG}{NONMOV + OUTMIG}$$

Where: NMIGRT = Net migration rate,
 INMIG = exemptions for the period coded as inmigrants
 OUTMIG = exemptions for the period coded as outmigrants, and
 NONMOV = exemptions for the period coded as nonmovers.

For most of the areas, the net migration rates developed from exemptions on individual Federal income tax returns appeared to be reasonable in the light of other available information. However, for a small number of areas (mostly with population under 20,000) there was a wide and unreasonable divergence in the migration rates over time. Further examination revealed that the coverage rate (the ratio of exemptions on matched individual Federal income tax returns to population) for these areas was significantly different from the coverage rate at the county level. The difference in coverage rates often results from post office consolidations or new incorporations. To ameliorate the problem systematically, a procedure was developed to modify or replace certain rates.

A tolerance interval was defined around the county coverage rate as a control in the subcounty estimates. This tolerance interval ranged from 66 2/3 percent to 150 percent of the county coverage rate. Any area within a county that had

Figure 1. IRS Individual Income Tax Return Form 1040 for 1972

(Extract from pages 1 and 2)

Form 1040 **US** Department of the Treasury / Internal Revenue Service **Individual Income Tax Return** **1972**

For the year January 1–December 31, 1972, or other taxable year beginning _____, 1972, ending _____, 19

Place label on form you file. Correct name, etc., if necessary. Enter social security number(s) only if incorrect or not shown on label.	Name (If joint return, give first names and initials of both)	Last name	Your social security number (Husband's, if joint return)
	Present home address (Number and street, including apartment number, or rural route)		Wife's number, if joint return
	City, town or post office, State and ZIP code		Occupation Yours Wife's

Attach Copy B of Form W-2 here

Filing Status —check only one: 1 <input type="checkbox"/> Single 2 <input type="checkbox"/> Married filing joint return (even if only one had income) 3 <input type="checkbox"/> Married filing separately. If wife (husband) is also filing give her (his) social security number and first name here. 4 <input type="checkbox"/> Unmarried Head of Household 5 <input type="checkbox"/> Widow(er) with dependent child (Enter year of death of husband (wife) ▶ 19)	Exemptions Regular / 65 or over / Blind 6 Yourself <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Enter number of boxes checked 7 Wife (husband) <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 8 First names of your dependent children who lived with you _____ 9 Number of other dependents (from line 32) <input type="checkbox"/> Enter number 10 Total exemptions claimed <input type="checkbox"/>
11 Wages, salaries, tips, and other employee compensation. (Attach Form W-2 to front. If unavailable, attach explanation)	11
12a Dividends (see pages 6 and 13 of instr.) \$ _____ (If gross dividends and other _____)	

	(a) NAME	(b) Relationship	(c) Months lived in your home. If born or died during year, write B or D.	(d) Did dependent have income of \$750 or more?	(e) Amount YOU furnished for dependent's support. If 100% write ALL.	(f) Amount furnished by OTHERS including dependent.
Other Dependents					\$ _____	\$ _____
	32 Total number of dependents listed in column (a). Enter here and on line 9 ▶					
Revenue Sharing	33 Print or type the location of your principal place of residence at end of year (not necessarily the same as your post office address).					
	(a) State	(b) County	(c) Locality. If you lived inside the boundaries of an incorporated city, town, etc., enter its name; if not, check here <input type="checkbox"/>	(d) Township (see instructions on page 8)		
	34 Enter the number of persons included on line 10 who (1) are filing a return of their own; or, (2) did not live at your principal place of residence at the end of the year ▶			For IRS use only—Leave blank		

PART I.—Income other than Wages, Dividends, and Interest

35 Business income (or loss) (attach Schedule C)	35	
36 Net gain (or loss) from sale or exchange of capital assets (attach Schedule D)	36	
37 Net gain (or loss) from Supplemental Schedule of Gains and Losses (attach Form 4797)	37	
38 Pensions and annuities, rents and royalties, estates or trusts, etc. (attach Schedule E)	38	
39 Farm income (or loss)	39	
40 Fully taxable income (after adjustments on page 8)	40	
41	41	

a population of less than 20,000 and a coverage rate outside of the county tolerance interval was singled out for potential migration rate replacement. After all such areas within a county were examined, a replacement migration rate was developed by calculating an overall net migration rate for all areas in the county which passed the tolerance interval test. This rate was used for areas which failed the tolerance interval test unless it differed from the total county migration rate by more than 10 percent. In this case, the county net migration rate became the replacement net migration rate. However, if the difference between the original net migration rate and the replacement net migration rate was less than 5 percent, or if the difference in net migrants was less than 10 persons, the original rate was used.

Net Migration Rate

Only the net migration rate is derived from Federal income tax returns. For each local area, the estimated number of net migrants is calculated by applying the net migration rate to an appropriate base population. For the Administrative Records estimates, the base population is the household population² plus one-half of the births and immigration during the estimate period, less one-half of the deaths. The rationale for including one-half of these components in the base population is that these groups are, on the average, exposed to the possibility of migration during one-half of the estimate period. Persons residing in group quarters were excluded from the net migration base because their migration patterns often do not resemble those of the household population. They often do not file individual Federal income tax returns and they are a group for which other types of information can be used to measure change. Thus, the household population migration base is calculated as follows:

$$\text{HHBAS} = \text{RESPOP}_0 - \text{SPECPOP}_0 + .5 \times (\text{IMMIG} + \text{B} - \text{D})$$

Where:

HHBAS	= household population migration base,
RESPOP ₀	= resident population on the base date,
SPECPOP ₀	= special populations on the base date,
IMMIG	= immigration from abroad for the period,
B	= births for the period, and
D	= deaths for the period

Applying the net migration rate (described above) to the household population migration base yields the number of net migrants in households:

$$\text{HHMIG} = \text{NMGRT} \times \text{HHBAS}$$

² The household population, as constituted for the Administrative Records method estimates, is the resident population less inmates of institutions, college students, and military personnel living in barracks. This household population differs somewhat from the concept used in the decennial census in that persons in homes for the aged, rooming houses, and miscellaneous other group living situations are included with the household population for estimating purposes, while some college students not living in group quarters are excluded. See the section on Special Populations.

Where:

HHMIG	= net migrants in households for the period,
NMGRT	= net migration rate, and
HHBAS	= household population migration base.

Special Populations

Special populations include inmates of prisons and long-term hospitals, members of the Armed Forces living in military barracks, and college students enrolled in full-time programs of study. Such persons are included in the population count at the residence associated with their special status. The population change of these special groups is estimated separately, because it is not always adequately accounted for in the other symptomatic data series (i.e., resident births and deaths and individual Federal income tax returns).

For the special population groups, information is gathered on an annual basis by the State agencies participating with the Bureau of the Census in the Federal-State Cooperative Program for Local Population Estimates. For special population groups other than those living in military barracks, the State agencies were asked to keep, at a minimum, an annual time series on group quarters populations where such populations comprised at least 500 persons and at least 2 percent of the total population of the area. Some State agencies are able to keep track of more than the minimum group quarters, while other States have decided to continue with the original criteria. In the case of military barracks populations, the State agencies were asked to obtain this information for each military installation in their respective States, provided such places had military barracks populations of 100 or more.

Inmates of prisons. Inmates of prisons are those persons held in Federal and State prisons, work camps, and work farms for terms of 1 year or more. Included in these counts are persons on work release programs. Persons detained in county and city jails and those in other penal institutions where the period of incarceration is 1 year or less are excluded from the count.

Figures on inmates of prisons usually are the result of the daily census for July 1 of each year or the average results of daily censuses conducted over the period of 1 year and centered on July 1.

Inmates of long-term hospitals. Inmates of long-term hospitals include persons in tuberculosis hospitals, hospitals for the mentally ill, hospitals for terminal cancer patients, long-term health care and domiciliary care at Veterans Administration hospitals, and persons in other health care facilities where the average stay extends for 6 months or more. However, persons residing in nursing and convalescent hospitals or homes are usually excluded from these figures.³

³ This varies somewhat from the standard usage in the decennial census where residents of nursing and convalescent hospitals or homes are considered part of the institutional population.

As with prison inmates, figures relate to July 1 of each year and are usually the result of a daily census or an average of results of daily censuses conducted over the period of 1 year.

College students enrolled in full-time programs. College students enrolled in full-time programs are used as surrogates for college students living in dormitories (including fraternity and sorority houses). Many colleges and universities do not keep an accurate count of the number of students residing in dormitories. However, for funding and other legislative compliances, most institutions do keep reasonably current and accurate records of students by full-time or part-time status. Since the vast majority of students living in dormitories are enrolled in a full-time program of study, the figures on the number of full-time students are used to estimate the change in dormitory populations. In addition to the criteria for inclusion mentioned above, a college, university, or post-high school vocational school qualified for a special population adjustment only if it had dormitories. Community colleges are not included in the special population adjustments since students enrolled at such schools are usually included in the other symptomatic indicators. Data on full-time students related to fall enrollment in the year preceding the estimate year.

Members of the Armed Forces living in military barracks. Members of the Armed Forces living in military barracks include those persons living in barracks structures and those living in bachelor officer quarters (BOQ's). Also included are navy personnel on ships, either afloat or temporarily ashore. Excluded from these figures are members of the Armed Forces not living on base and those military personnel living on base in family quarters. These persons are assumed to be included in the other symptomatic data. Also excluded from these figures are members of the Armed Forces serving overseas on permanent or long-term tours of duty.

The data on military personnel residing in barracks are for July 1 of each year. For some installations, these data are not available for all years. In such cases, the number of military personnel residing in barracks is estimated by calculating the ratio of military personnel counted in the census as living in barracks to total military station strength on April 1, 1970, and multiplying this ratio by station strength figures for July 1 of each year. Data on military station strength are obtained annually from the U.S. Department of Defense and from the individual branches of the Armed Forces.

Miscellaneous special populations. Miscellaneous special populations include persons in Job Corps centers and persons in Vietnamese refugee camps. The Job Corps centers were originally set up under the Economic Opportunity Act of 1964 and were administered by the Office of Economic Opportunity. The Comprehensive Employment and Training Act of 1972 transferred responsibility for the Job Corps program to the Employment and Training Administration of the U.S. Department of Labor. For the purpose of making

population estimates, persons in Job Corps centers are treated as special populations. The Job Corps centers are located in six States—Indiana, Kentucky, Oklahoma, Oregon, Texas, and Utah.

At the end of the Vietnam conflict, many citizens of Vietnam fled that country and took up residence in the United States. Upon entering the United States, these refugees were placed in four camps located across the country in Arkansas, California, Florida, and Pennsylvania. These persons were residing in such camps on July 1, 1975, and consequently, are included in the July 1, 1975, population estimates for those areas. By 1976, these refugee centers were disbanded and the population contained in them disbursed throughout the country. Therefore, an adjustment for this population subgroup is not made to estimates produced for years subsequent to July 1, 1975.

Total Resident Population Estimate

Once each of the components of population has been estimated separately, they are combined into an estimate of the total resident population for each area. The total resident population estimate is developed by adding the number of estimated net migrants in households, natural change, immigrants from abroad during the estimation period, and special group quarters populations as of the estimate date to the household population on the base date.

$$\text{RESPOP} = \text{HHPOP} + \text{HHMIG} + \text{B} - \text{D} + \text{IMMIG} + \text{SPECPOP}$$

Where:

RESPOP	=	resident population on the estimate date,
HHPOP	=	household population on the base date,
HHMIG	=	net migrants in households for the period,
B	=	births for the period,
D	=	deaths for the period,
IMMIG	=	immigrants from abroad for the period, and
SPECPOP	=	special populations on the estimate date.

The total resident population estimates for all areas within a county are controlled to independent estimates of the population at the county level. Tests of other estimating methods show that the use of such controls increases the accuracy of the estimates.⁴

The July 1, 1973, population estimates utilize the resident population as reported in the 1970 census for the base date figures. In turn, the resulting July 1, 1973, estimates

⁴See Current Population Reports, Series P-26, No. 21, "Federal-State Cooperative Program for Local Population Estimates—Test Results April 1, 1970," April 1973.

are used as base numbers in computing the July 1, 1975, population estimates; 1975 serves as the base for 1976, and 1976 figures are the base for 1977.

It should be noted that the 1970 census population counts used as a starting point reflect all corrections made after publication of the official counts. Furthermore, these counts have also been updated to take into account major annexations and boundary changes which have occurred since 1970.

Use of State-Prepared Local Estimates

Tests of methods have indicated that averaging estimates using independent methodology tends to increase the accuracy of the estimates.⁵ For six States (California, Florida, New Jersey, Oregon, Washington, and Wisconsin) where (1) the State agencies participating in the Federal-State Cooperative Program prepare estimates for all geographic areas of the State, and where (2) these estimates are prepared using methodologies which have undergone extensive testing and are universally applicable across all subcounty areas, and (3) the methodology is objectively defensible, the State-prepared local estimates are averaged with estimates based on the Administrative Records Method for all areas within the State. In some States, the locally prepared estimates relate to an estimate date other than July 1 of each year (e.g., in California and Wisconsin, State-prepared local population estimates are prepared as of January 1 of each year, and in Washington, the State-prepared population estimates are for April 1 of each year). In such cases, the locally prepared estimates are adjusted to the July 1 date. Also, the State-prepared local estimates are controlled to the independent county estimates prior to averaging.

In California, Florida, New Jersey, Oregon, and Washington, the State-prepared local estimates are based on a housing unit method. In this method, estimates of the number of occupied housing units are first developed as of the estimate date. The number of occupied units is multiplied by the average number of persons per household to yield an estimate of the population in households. An estimate of special populations not in housing units is added to obtain an estimate of the total resident population in the area. The estimates below the county level in Oregon and Washington are controlled to independent estimates of the population at the county level. These are based on an average of Component Method II and the Regression Method.⁶ In California, the State-prepared local estimates are controlled to county estimates based on an average of four methods: Component Method II, the Regression Method, the Driver License Address Change Composite Migration Estimating Method (DLAC), and the Administrative Records Method.⁷

⁵ *Ibid.*, pp. 2-4.

⁶ See the next section of this report on County Estimates for a description of these methods.

⁷ For a detailed description of the DLAC methodology, see Nelson Rasmussen, "The Use of Driver License Address Change Records for Estimating Interstate and Intercounty Migration," a paper presented at the Small Area Statistics Conference, St. Louis, Missouri, August 1974. A copy of this paper can be obtained by writing Chief, Population Research Unit, California Department of Finance, 1025 P Street, Sacramento, California 95814.

State-prepared local estimates in Florida are not subjected to independent county controls.

In Wisconsin, ratio difference estimates based on three different variables—registered automobiles, State income tax returns, and exemptions on State income tax returns—are averaged to yield estimates for each area.⁸ These estimates are controlled to independent estimates at the county level which are based on the ratio-difference procedure. The county level ratio-difference estimates incorporate a fourth variable—the Federal-State Cooperative Program county estimates—in the average of estimates.

COUNTY ESTIMATES

Estimates of the population of counties are made independently of the estimates developed for areas below the county level. The county estimates for the most part are published in Current Population Reports, Series P-26. Timing requirements for use of the data in Federal allocation programs make it necessary to use some provisional data in the estimation procedure. As a result, some differences appear between the county numbers published as P-25 and those published as P-26 (using final data). Generally, these differences are fairly small.

For most counties and county equivalents, the revised estimates are based on an average of estimates developed from Component Method II, the Regression (ratio-correlation) Method, and the Administrative Records Method.

Component Method II employs vital statistics to measure natural increase and school enrollment to measure net migration. The estimates made by the Census Bureau's Component Method II are specific to the civilian population under 65 years old. To this population is added an estimate of the population 65 years old and over based on Medicare statistics and an estimate of the resident military population based on station strength statistics.⁹

In the *Regression (ratio-correlation) Method*, a multiple regression equation is used to relate changes in a number of different data series to change in the population distribution.¹⁰ The data series used to estimate population by this method vary from State to State.¹¹

County Modifications to the Administrative Records Method.

In developing the Administrative Records Method estimates for counties, several modifications are introduced to take into account information available for counties, but not available for areas below the county level. The population 65 years old and over is estimated using the change in Medi-

⁸ For a detailed description of the ratio-difference procedure employed in Wisconsin, see C. Palit et. al., "Making Population Estimates and Projections for State Tax Sharing in Wisconsin," Center for Demography and Ecology, University of Wisconsin-Madison, Working Paper No. 73-30, October 1973.

⁹ For a detailed description of Component Method II, See Current Population Reports, Series P-25, Nos. 520 and 640.

¹⁰ *Ibid.*

¹¹ For a list of the symptomatic variables used in the regression equations for each State, see Current Population Reports, Series P-25, No. 620, "Estimates of the Population of Counties: July 1, 1973 and 1974," February 1976, Appendix B, or individual State reports in Series P-26, Nos. 77-1 through 77-50.

care enrollee data between the base date and the estimate date, and the Administrative Records Method is used to estimate the population under 65 years.

Deaths are estimated by calculating a factor for each county to divide total deaths into two parts, those under 65 years of age, and those 65 and over. The factor is obtained by computing the size in 1970 of the cohorts for these two age categories on the estimate date, by race. These estimated cohort sizes are multiplied by national death rates, by race. Summing for all races provides an estimate of deaths for the two age categories, and the desired factor is the proportion of the under 65 group to the total. This factor is multiplied by total registered deaths for the county to estimate deaths for the population under 65 years of age.

In order to estimate migration for the population under 65 years for counties, the procedure for obtaining the base population is modified. The size of the cohort under 65 on the estimate date is calculated for the base date by its age on the base date. (For the July 1, 1975, estimates with a base date of July 1, 1973, the cohort is under 63 years of age on the base date.) The initial calculation is for the resident population. From this is subtracted inmates of prisons and long-term hospitals, college students enrolled in full-time programs of study, and Armed Forces members residing in military barracks.¹² To this initial household population migration base is added one-half of the sum of (1) natural change (2) immigrants from abroad, and (3) net movement from the military population overseas to the resident civilian population during the period of estimation to obtain the final net migration base.¹³

On individual Federal income tax returns, additional exemptions are allowed for persons 65 years old and over as well as for persons who are legally blind. Although the exemptions for age are not distinguishable from those for blindness on the file, those persons claiming exemptions for blindness are a relatively small proportion of the total number of exemptions for age and blindness combined. At the county level, only exemptions on returns without exemptions for age or blindness were used to develop migration rates. Consequently, the resultant migration rates are specific to the population under 65 years old.

Applying the migration rates for the population under 65 years old to the under 65 year old net migration base yielded estimates of household population migrants under 65 years old in the county during the estimate period. Adding these migrants to the household population on the base date and further adding the sum of natural change,¹⁴ immigrants from abroad, and net movement from the military population overseas to the resident civilian population during the period of estimation plus special populations

¹² The assumption is made that these special populations are included in the under 65 year old cohort. For a detailed description of the special categories see the section, Special Populations.

¹³ Net movement from the resident military population to the resident civilian population is not included here because this movement does not affect the net migration base.

¹⁴ Natural change, as used in the county estimates, refers to the cumulative resident births minus the cumulative resident deaths to the cohort of the population under 65 years old.

results in an estimate of the resident population under 65 years old on the estimate date.

Estimates of the population 65 years old and over at the county level are developed by adding the change in Medicare enrollees between April 1, 1970, and the estimate date to the count of the population 65 years old and over in the 1970 census. Since Medicare statistics published by the Health Care Finance Administration for counties are specific to July 1 of each year, interpolations of the July 1, 1969, and July 1, 1970, Medicare statistics to April 1, 1970, were made.

The estimates of the resident population under 65 years old are then combined with the estimates of the resident population 65 years old and over to obtain estimates of the total resident population for the county. These estimates are subsequently adjusted to agree with independent estimates of State populations. (The procedures used to estimate State populations will be discussed later in this report.)

The July 1, 1975, county estimates used to control the estimates for areas below the county level were developed by adding the average change in Component Method II and Administrative Records Method estimates to the July 1, 1974, county estimates published in Current Population Reports, Series P-26 and Series P-25.¹⁵ There are some exceptions to this procedure:

- In four States—Kansas, Missouri, Nebraska, and Washington—the average change between 1974 and 1975 estimates based on Component Method II, the Administrative Records Method, and the Regression (ratio-correlation) Method were added to the 1974 estimates. The addition of the Regression Method has been extended to additional States in subsequent years.
- In California, the average change in estimates between 1974 and 1975 based on four methods was added to the 1974 estimates. The four methods are: Component Method II, the Administrative Records Method, the Regression (ratio-correlation) Method, and the Driver License Address Change Composite Migration Estimating Method (DLAC).
- The average difference between 1974 and 1975 county estimates for Florida based on Component Method II, the Administrative Records Method, and the Housing Unit Method were added to the 1974 estimate to develop the July 1, 1975, county estimates.
- Estimates for Wisconsin counties with 1970 populations of less than 25,000 were developed by averaging estimates based on the Regression Method, the Administrative Records Method, and the Composite Method. In the Composite Method, estimates of various age groups are derived separately and then summed to secure a total for all ages. Death statistics are used to estimate the popu-

¹⁵ July 1, 1974, and provisional July 1, 1975, county estimates for Alaska, Maryland, Massachusetts, New York, Texas, and Washington were published in Series P-25, Nos. 638, 629, 633, 631, 637, and 624, respectively. Corresponding county estimates for the remainder of the States were published in Series P-26, Nos. 75-1, 75-3 through 75-19, 75-22 through 75-31, 75-33 through 75-42, 75-44 through 75-46, and 75-48 through 75-50.

lation at ages 45 and over, birth statistics are used to estimate the population 18 to 44 years old, and a variation of Component Method II is used to estimate the population under 18 years old. In the case of birth and death statistics, an arithmetic average of 2 years of data is used for both the base year and the estimate year. The 2-year average is used to smooth out random fluctuations in the data which distort the estimates.¹⁶

The estimates of the population for Wisconsin counties with 1970 populations of 25,000 or more were developed by averaging estimates based on Component Method II, the Regression Method, the Administrative Records Method, and the Composite Method.

STATE ESTIMATES

The State estimates are used as independent controls for the corresponding county estimates. They are developed by averaging estimates based on Component Method II, the Regression (ratio-correlation) Method, and the Administrative Records Method. The Administrative Records methodology is comparable to that used at the county level. The other two methods are also as described in the county section.¹⁷ The July 1, 1975, State estimates used to control the 1975 county estimates are published in Current Population Reports, Series P-25, No. 642.

Use of Special Censuses

Wherever possible, the results of special censuses conducted by the Bureau of the Census are taken into account in the development of the population estimates. The interpolated or extrapolated results of special censuses conducted close to the estimate dates are used in lieu of any estimating technique. If the date of a special census is not close to the estimate date, a proportion of the difference between the special census results and an estimate made close to the census date is applied to the current estimate.

In addition, special censuses conducted or supervised by State agencies participating in the Federal-State Cooperative Program for Local Population Estimates also are used. These include special censuses conducted in California, Florida, Michigan, Oregon, and Washington. Special censuses conducted by these agencies were used in a similar manner as Federal special censuses since they employ essentially the same enumeration techniques, population definition, and

¹⁶ For a detailed description of the Composite Method, see Current Population Reports, Series P-25, No. 427.

¹⁷ See also Current Population Reports, Series P-25, Nos. 520 and 640.

quality control procedures as special censuses conducted by the Census Bureau. In addition, the State census conducted by the Commonwealth of Massachusetts on March 1, 1975, was also used in lieu of any estimates.

State/County Adjustment for Special Censuses

In instances in which special censuses are accepted in place of estimates for areas below the county level, the sum of the estimates for subcounty areas no longer agrees with the independent county estimates. There are two adjustment procedures which can be used. The first is to distribute proportionately the sum of the differences between the adjusted special census results and the Administrative Records Method estimates over all areas in the county which did not have their estimates replaced by adjusted special census results. However, if the sum of the differences is large relative to the county's population, the proportionate adjustment would also be relatively large for the county sub-areas. The second procedure is to add the sum of such differences directly to the county control, thereby avoiding the problems raised by direct proportionate adjustment. Since both adjustment procedures contain advantages and disadvantages, three criteria were established to determine for each county which procedure would be used. These three criteria are:

1. If the sum of the 1970 populations for areas within a county which had the Administrative Records Method estimates replaced with adjusted special census results was one-third or more of the 1970 census count for the entire county, the second procedure was used.
2. If the sum of the 1970 populations for areas within a county which had the Administrative Records Method estimates replaced with adjusted special census results was less than one-third of the 1970 census count for the entire county, but the sum of the differences between the adjusted special census results and the Administrative Records Method estimates which were replaced was 3 percent or more of the county's estimated total population, the second procedure was also used.
3. If criteria 1 and 2 failed, the first adjustment procedure was applied.

The impact on the State control estimates of the changes in the county totals when the second procedure was used is shown in table A. The percentage difference is usually very small, never reaching 1 percent.

Table A. Comparison of State Population Estimates Used in Federal General Revenue Sharing and Those Published in Current Population Reports, Series P-25, No. 642: July 1, 1975

State	July 1, 1975		Difference	Percent difference	State	July 1, 1975		Difference	Percent difference
	Used in Federal General Revenue Sharing	Published in Current Population Reports, Series P-25, No. 642				Used in Federal General Revenue Sharing	Published in Current Population Reports, Series P-25, No. 642		
Alabama.....	3,615,907	3,615,065	+842	0.02	Missouri.....	4,769,816	4,767,122	+2,694	0.06
Alaska.....	364,487	364,686	-199	-0.05	Montana.....	746,244	745,996	+248	0.03
Arizona.....	2,225,077	2,211,825	+13,252	0.60	Nebraska.....	1,543,678	1,543,559	+119	0.01
Arkansas.....	2,106,793	2,109,944	-3,151	-0.15	Nevada.....	590,268	590,268	-	-
California.....	21,202,559	21,197,823	+4,736	0.02	New Hampshire.....	811,804	811,804	-	-
Colorado.....	2,541,311	2,541,312	-1	(Z)	New Jersey.....	7,332,965	7,332,965	-	-
Connecticut.....	3,100,188	3,100,188	-	-	New Mexico.....	1,143,827	1,143,826	+1	(Z)
Delaware.....	579,405	579,405	-	-	New York.....	18,075,487	18,075,966	-479	(Z)
District of Columbia.....	(X)	711,518	(X)	(X)	North Carolina.....	5,441,366	5,441,366	-	-
Florida.....	8,283,074	8,277,319	+5,755	0.07	North Dakota.....	642,888	636,932	+5,956	0.94
Georgia.....	4,931,083	4,931,083	-	-	Ohio.....	10,735,280	10,735,280	-	-
Hawaii.....	868,396	868,396	-	-	Oklahoma.....	2,711,263	2,714,589	-3,326	-0.12
Idaho.....	813,765	813,281	484	0.06	Oregon.....	2,284,335	2,284,264	+71	(Z)
Illinois.....	11,206,393	11,197,486	+8,907	0.08	Pennsylvania.....	11,863,710	11,859,674	+4,036	0.03
Indiana.....	5,309,197	5,312,864	-3,667	-0.07	Rhode Island.....	931,208	931,208	-	-
Iowa.....	2,860,686	2,860,682	+4	(Z)	South Carolina.....	2,815,762	2,815,563	+199	0.01
Kansas.....	2,279,899	2,279,899	-	-	South Dakota.....	682,744	680,806	+1,938	0.28
Kentucky.....	3,387,860	3,387,122	+738	0.02	Tennessee.....	4,174,100	4,172,725	+1,375	0.03
Louisiana.....	3,803,937	3,805,575	-1,638	-0.04	Texas.....	12,244,678	12,237,985	+6,693	0.05
Maine.....	1,057,955	1,057,955	-	-	Utah.....	1,202,672	1,202,672	-	-
Maryland.....	4,121,603	4,121,603	-	-	Vermont.....	472,073	472,073	-	-
Massachusetts.....	5,812,489	5,814,191	-1,702	-0.03	Virginia.....	4,980,570	4,980,570	-	-
Michigan.....	9,116,699	9,111,238	+5,461	0.06	Washington.....	3,553,231	3,559,002	-5,771	-0.16
Minnesota.....	3,916,105	3,921,447	-5,342	-0.14	West Virginia.....	1,799,349	1,799,349	-	-
Mississippi.....	2,342,592	2,340,583	+2,009	0.09	Wisconsin.....	4,577,343	4,588,577	-11,234	-0.24
					Wyoming.....	376,309	375,715	+594	0.16

- Represents zero.
X Not applicable.
Z Less than 0.005 percent.

Chapter 3. Evaluation of the Population Estimates

All population estimating techniques have some degree of estimation error associated with them. Errors of estimation vary by estimating technique as well as by geographic level and size of area. The accuracy of a particular estimating technique can best be determined by a comparison of estimates with censuses (both decennial and special). In the absence of census data, a closely related alternative means for evaluating an estimating technique is to compare the estimates with estimates which have been previously tested against benchmarks. In evaluating estimates developed through use of the Administrative Records Method, both of the above-outlined procedures were used. The primary focus, however, is on the evaluation of 1975 estimates for localities against the results of special censuses conducted near the July 1975 date.

EVALUATION OF STATE ESTIMATES

Tests of the accuracy of State estimates based on Component Method II and the Regression Method have been completed for some time.¹ The tests were developed by basing the estimates on the 1960 census, making the estimates specific to April 1, 1970, and comparing the estimates with the results of the 1970 census. These test results revealed that estimates based on Component Method II alone had an average absolute percent deviation of 1.4 percent from the 1970 census, while Regression Method estimates deviated by 1.7 percent. When the estimates produced by each method were averaged, the resulting average absolute percent deviation was reduced to 1.2 percent. This reinforces the conclusion reached from other tests of methods—that averaging estimates produced by two or more independent estimating techniques improves the accuracy of the estimates.

Because of the manner in which Administrative Records Method estimates are developed, and since the individual Federal income tax return files were not available for years going back to 1960, a similar comparison of the Administrative Records Method for States to the 1970 census results is not possible. However, a comparison can be made between Administrative Records Method estimates at the State level and State estimates obtained by averaging estimates based on Component Method II and the Regression Method.

Comparing the July 1, 1975, Administrative Records Method estimates for States with the comparable estimates based on an average of Component Method II and the Regression Method estimates reveals that the Administrative

Records Method estimates compare favorably with the average of estimates based on the other two methods. For all States, the average difference between the Administrative Records Method and the average of the other two methods was only 1 percent, with the vast majority of the States having differences of less than 2 percent (table B). In addition, little, if any directional bias is found in the Administrative Records Method.

The larger the State, the closer the Administrative Records Method estimates are to the other estimates. For States with 1970 populations of 4 million or more, the average difference was one-half of 1 percent, and no State had a difference greater than 2 percent. On the other hand, for smaller States (those with 1970 census populations of less than 1.5 million), the average percent difference increased to 1.5 percent, with seven States having differences of from 1 to 2 percent and four States having a difference of more than 2 percent. However, although most of the patterns for each of the four regions closely approximate the pattern for all States, there are marked differences from the national norm as far as directional bias is concerned. States in the Northeast and North Central Region exhibited a strong negative bias (i.e., the Administrative Records Method is most often lower than the comparative figure) when comparing the Administrative Records estimates with the average of estimates based on the other two methods (table C). This was most pronounced in the North Central Region, where 10 States had lower Administrative Records estimates compared to only 2 States where they were higher. In the South the opposite was true, with almost twice as many States having higher Administrative Records estimates. The West had about the same number of States in each category. No firm conclusions can be drawn about these regional differences, however, since they could be attributable to either set of estimates. Only a test against the 1980 census will be able to determine which set is the more accurate.

EVALUATION OF COUNTY ESTIMATES

At the county level, both types of evaluation procedures are available: (1) a comparison similar to that just used for States (estimates developed through the Federal-State Cooperative Program for Local Population Estimates), and (2) comparison of both the Administrative Records Method estimates and the Federal-State Cooperative Program (FSCP) estimates with the results of county-wide special censuses.

The most extensive and comprehensive test of estimating techniques at the county level was conducted in late 1971

¹ Current Population Reports, Series P-25, No. 520, p. 16.

Table B. Percent Difference Between Administrative Records Method Estimates and the Average of Component Method II and the Regression Method Estimates, for States: July 1, 1975

(Base is the average of Component Method II and the Regression Method estimates)

Item	All States	Population size in 1970		
		4 million and over	1.5 to 4 million	Less than 1.5 million ¹
Average percent difference (disregarding sign).....	1.0	0.5	0.9	1.5
Number of States ¹	51	16	18	17
With differences of:				
Less than 1 percent.....	32	14	12	6
1 percent to 2 percent.....	13	2	4	7
2 percent and over.....	6	-	2	4
Where Administrative Records Method estimate was:				
Higher.....	24	7	9	8
Lower.....	27	9	9	9

- Represents zero.

¹Includes the District of Columbia.

Table C. Percent Difference Between Administrative Records Method Estimates and the Average of Component Method II and the Regression Method Estimates, for States by Region: July 1, 1975

(Base is the average of Component Method II and the Regression Method estimates)

Item	Northeast	North Central	South ¹	West
Average percent difference (disregarding sign).....	0.8	1.0	0.8	1.3
Number of States ¹	9	12	17	13
With differences of:				
Less than 1 percent.....	7	6	13	6
1 percent to 2 percent.....	1	5	3	4
2 percent and over.....	1	1	1	3
Where Administrative Records Method estimate was:				
Higher.....	3	2	11	7
Lower.....	6	10	6	6

¹Includes the District of Columbia.

and early 1972.² County estimates based on the 1960 census were developed for April 1, 1970 and compared with the 1970 census counts. The results of this test formed the basis of an annual series of county population estimates by the FSCP. Among the methods included in this test were Component Method II and the Regression Method.

During the period July 1, 1974 through June 30, 1976, special censuses were conducted in 109 counties throughout the country. Adjusting the results of these special censuses to the July 1, 1975, estimate date provides a base for testing the accuracy of not only the Administrative Records Method estimates at the county level, but also for a more recent test of the FSCP county estimates than was conducted in 1970 and a test of the combination of these two sets of estimates. It should be kept in mind, however, that counties which have special censuses conducted are usually atypical of most counties in that they tend to be fast growing counties—one of the most difficult groups of counties to estimate.³

The results of the 1975 comparisons indicate that the absolute average deviation of the Administrative Records estimates from the special censuses was 3.9 percent, somewhat lower than the 4.7 percent average for the FSCP estimates. The average of estimates from the two sources deviated 3.8 percent, only very slightly below the Administrative Records estimates. The general level of error of these comparisons was similar to the results of a more limited evaluation of 13 counties conducted in 1973.

The lower average error of the Administrative Records estimates in 1975 was observed in all size categories under 50,000 population. For the smallest size group, under 1,000 population, the FSCP estimates were at the almost unacceptable level of 9.4 percent. The Administrative Records estimates had an error of 6.8 percent. For areas of over 50,000 population, however, the FSCP estimates had a smaller average error, 2.0 percent as compared to 2.3 percent for Administrative Records. Counties of intermediate size, 1,000 to 25,000 population, were estimated almost equally well by both methods.

Counties in the North and West were more accurately estimated than were those in the South (3.7 percent difference versus 4.4 percent difference when based on an average of the Administrative Records Method and FSCP estimates). However, there were almost seven times as many counties with special censuses in the North and West as in the South. If there had been more special censuses in the South, covering a greater variety of situations, it is possible that the error rates for southern counties would more closely approximate those of the North and West.

Of the 109 counties, the Administrative Records estimates had differences of less than 5 percent for 82 counties, as compared to 79 for the FSCP estimates. The average of the two methods was even better with 86 counties within 5 percent, and only 9 counties with errors of 10 percent and over. The complete distribution by size of error is shown in table D.

The Administrative Records Method estimates had almost no bias, with 54 estimates being higher than the special census, and 55 being lower. Both the FSCP estimates and the average of the estimates were biased on the high side.

Since the number of counties with special censuses is still relatively small when compared to the total number of counties and county equivalents in the Nation, and since these counties are not a representative sample of U.S. counties, the results of these comparisons may not be taken as the findings of a full test for all counties. However, (1) a general indication of the error level of the Administrative Records Method is obtained, (2) the average error of the FSCP estimates is about the same as those produced by the Administrative Records Method. This was true for all size areas except the smallest group and the 25,000 to 49,999 group, where the Administrative Records Method gave considerably better results, and (3) it may be speculated that the results of this evaluation may be less favorable than will be found in a full test, due to the rapid growth of the 109 counties.

It is also possible to compare the Administrative Records Method estimates at the county level with corresponding estimates developed by averaging Component Method II and the Regression Method estimates. The comparison of the Administrative Records Method estimates with the FSCP figures for all 3,143 county areas also shows that the two sets of estimates are fairly close to one another. The Administrative Records estimates differed from the average of the other two methods by only 2.9 percent (table E). For the smallest counties the average difference was 13.0 percent, but for counties of over 50,000, the difference was only 1.7 percent.

Approximately 7 percent of the counties and county equivalents in the West had differences of 10 percent or more, as compared to less than 2 percent for the North Central Region. In the Northeast, no counties had deviations of this magnitude. In all regions, more than one-half of the counties had differences of 3 percent or less and in the Northeast Region, 85 percent were in this range (table F).

Negative differences exceeded positive differences in all regions except in the Northeast. In the North Central and South Regions, the negative bias was pronounced while in the West it was moderate. The positive bias for Northeast counties was also moderate with the Administrative Records estimate being higher for 57 percent of the region's counties.

Combining all county-level evaluations based on figures since the 1970 census, then, it can be concluded that the county estimates based on the Administrative Records Method do compare well with those produced by other methods used in the Federal-State Cooperative Program; that averaging estimates from the two sources tends to increase the accuracy of the estimates; that there is a negative bias in the Administrative Records Method estimates as compared with the FSCP county estimates; that there is some regional bias in the estimates; and that the county-level estimates should be monitored closely during the late 1970's since error levels appear to be running slightly ahead of what should be anticipated from the experience of the 1960's.

² Current Population Reports, Series P-26, No. 21.

³ *Ibid.*

Table D. Comparison of Administrative Records and 1975 FSCP Estimates for Counties With Interpolated or Extrapolated Results of Special Censuses Conducted Between July 1, 1974 and July 1, 1976

(Base is adjusted special census results)

Item	Number of counties	Average percent difference ¹		
		Administrative Records Method estimates	FSCP estimates	Average of Administrative Records Method and FSCP estimates
All counties with special censuses.....	109	3.9	4.7	3.8
SIZE OF COUNTY ²				
Under 5,000.....	45	5.9	7.8	6.2
Under 1,000.....	24	6.8	9.4	7.1
1,000 to 4,999.....	21	5.0	6.1	5.0
5,000 to 49,999.....	21	2.9	3.3	2.7
5,000 to 9,999.....	5	4.3	4.4	3.7
10,000 to 24,999.....	10	2.9	3.2	2.6
25,000 to 49,999.....	6	1.6	2.4	2.1
50,000 and over.....	43	2.3	2.0	1.8
50,000 to 99,999.....	14	3.2	3.0	2.5
100,000 and over.....	29	1.9	1.6	1.5
REGION				
North and West.....	96	3.6	4.4	3.7
South.....	13	6.1	6.6	4.4
SIZE OF DIFFERENCE				
Less than 1 percent.....	(X)	25	24	27
1 percent to 3 percent.....	(X)	39	38	44
3 percent to 5 percent.....	(X)	18	17	15
5 percent to 10 percent.....	(X)	18	17	14
10 percent and more.....	(X)	9	13	9
Where the estimate was:				
Higher.....	(X)	54	62	59
Lower.....	(X)	55	47	50

X Not applicable.

¹Disregarding sign. For size of difference and positive-negative differences, figures refer to number of counties.

²As determined from the 1970 census.

Table E. Percent Difference Between Administrative Records Method Estimates and FSCP Estimates, for Counties: July 1, 1975

(Base is the provisional FSCP county estimates. Size of county based on 1970 census counts)

Item	All counties	Counties with 1,000 or more population					Counties with less than 1,000 population
		Total	50,000 or more	25,000 to 49,999	10,000 to 24,999	1,000 to 9,999	
Average percent difference (absolute value).....	2.9	2.8	1.7	2.4	2.8	3.8	13.0
Number of counties or county equivalents.....	3,143	3,117	679	567	1,017	854	26
With differences of:							
Less than 1 percent.....	863	859	279	160	266	154	4
1 percent to 3 percent.....	1,173	1,173	284	240	379	270	0
3 percent to 5 percent.....	610	608	84	111	219	194	2
5 percent to 10 percent.....	402	394	30	51	130	183	8
10 percent or more.....	95	83	2	5	23	53	12
Where the Administrative Records Method estimate was:							
Higher.....	1,315	1,301	347	234	397	323	14
Lower.....	1,828	1,816	332	333	620	531	12

Table F. Percent Difference Between Administrative Records Method Estimates and the FSCP Estimates, for Counties by Region: July 1, 1975

(Base is the provisional FSCP county estimates)

Item	Northeast	North Central	South	West
Average percent difference (absolute value).....	1.5	2.4	3.1	3.8
Number of counties or county equivalents.....	217	1,056	1,425	445
With differences of:				
Less than 1 percent.....	106	313	343	101
1 percent to 3 percent.....	78	426	535	134
3 percent to 5 percent.....	28	194	289	99
5 percent to 10 percent.....	5	107	209	81
10 percent or more.....	-	16	49	30
Where the Administrative Records Method estimate was:				
Higher.....	123	449	544	199
Lower.....	94	607	881	246

- Represents zero.

Table G. Comparison of Administrative Records Method Estimates With Results of Special Censuses Conducted Between July 1, 1972 and June 30, 1974, for Subcounty Areas With 50 or More Population, by Size and Region: July 1, 1973 (Revised)

Measurement type and region	All areas	Size of area ¹					
		50,000 or more	10,000 to 49,999	5,000 to 9,999	1,000 to 4,999	500 to 999	50 to 499
UNITED STATES							
Number of areas.....	743	6	70	80	252	110	225
Absolute average percent difference..	11.6	2.9	5.0	7.1	8.2	13.2	18.6
Size of difference:							
Less than 1 percent.....	76	-	15	12	26	10	13
1 percent to 3 percent.....	126	5	21	13	50	13	24
3 percent to 5 percent.....	106	-	15	11	41	17	22
5 percent to 10 percent.....	184	1	10	27	66	29	51
10 percent to 25 percent.....	169	-	8	16	55	29	61
25 percent or more.....	82	-	1	1	14	12	54
Where the Administrative Records estimate was: ²							
Higher.....	328	1	50	36	108	44	89
Lower.....	414	5	20	44	144	66	135

- Represents zero.

¹Based on the 1970 census.

²Sum of high and low estimates is less than the total number of areas because of areas with zero difference.

EVALUATION OF SUBCOUNTY ESTIMATES

Below the county level, more special censuses have been conducted against which the estimates may be compared. It should be emphasized in examining such evaluations, however, that most of the special censuses were conducted at the expense of the local area, in the belief that their population had been substantially under-estimated.

Comparisons of special census results with the 1975 Administrative Records Method estimates were made for 1,986 subcounty areas with 50 or more population, and the 1973 estimates were compared to special censuses for 743 such areas.⁴ The 1973 estimates were tested against special censuses conducted either by the Bureau of the Census or the FSCP agencies between July 1, 1972 and June 30, 1974, after either interpolating or extropolating the special census results to the July 1, 1973 estimate date. The absolute average error of the 1973 estimates was 11.6 percent (table G). Estimates for areas in the 50,000 or more category had an average error of only 2.9 percent.

About 41 percent of the areas covered in table G had absolute average differences of less than 5 percent between the estimate and the special census. There were 82 areas (11 percent) with extreme errors of 25 percent or more, of which well over half were in the smallest size group of 50 to 499 population.

⁴ The subcounty areas are chiefly incorporated places, but some of these lie in more than one township or county. In such cases, each part of a place lying in a separate jurisdiction is estimated and evaluated separately. Some of the parts have very small populations. For this reason, areas with less than 50 residents are excluded from consideration in the analytical tables. There were 31 of these very small areas, and the average deviation of the 1973 estimates from the special censuses was 57.9 percent. If all places had been treated as a single unit of analysis, the errors shown in table G would be reduced, perhaps substantially.

The average error varied sharply by size of area, from less than 3 percent for the largest size group up to 18.6 percent for the smallest group. Of the 76 areas with 1970 populations of 10,000 or more, almost three-fourths had average differences of less than 5 percent.

The tendency for the estimates to be biased high or low also varied by size of area. The estimates for areas of 10,000 to 49,999 population had a strong positive bias with 50 out of 70 where the estimate was high. For the largest population size group, on the other hand, 5 out of 6 estimates were low, and all of the groups under 10,000 population also showed a negative bias. Of the 666 areas under 10,000 population, 389, or 58 percent, had estimates lower than the special census count.

During the period July 1, 1974, to July 1, 1976, special censuses were conducted in 1,986 areas for which comparisons could be made with the estimates for 1975. Comparison of the 1975 estimates with the adjusted results of special censuses reveals patterns similar to those observed for the 1973 estimates. The overall average percent deviation from the special censuses results for areas with 50 or more population decreased by nearly 1 percentage point between 1973 and 1975, from 11.6 percent to 10.7 percent (table H). The overall decrease occurred largely because of the low error rate for the greatly increased number of areas with special censuses in the size category 10,000 to 50,000 population. The 1975 estimates had absolute average errors of 4.1 percent for this category as compared to 5.0 percent for the 1973 estimates. The large increase in the number of special censuses (from 70 to 378) for this category brought down the average in spite of increased average errors in the smallest size group (50 to 499) and the group with 1,000 to 4,999 population.

Table H. Comparison of Administrative Records Method Estimates for 1975 With Results of Special Censuses Conducted Between July 1, 1974 and July 1, 1976 for Subcounty Areas With 50 or More Population, by Size and Region

Measurement type and region	All areas	Size of area ¹					
		50,000 or more	10,000 to 49,999	5,000 to 9,999	1,000 to 4,999	500 to 999	50 to 499
UNITED STATES							
Number of areas.....	1,986	100	378	251	636	232	389
Absolute average percent difference..	10.7	3.2	4.1	7.0	9.3	11.5	23.0
Size of difference:							
Less than 1 percent.....	217	19	75	33	60	17	13
1 percent to 3 percent.....	408	47	126	56	116	34	29
3 percent to 5 percent.....	279	16	77	44	88	29	25
5 percent to 10 percent.....	458	14	75	58	178	62	71
10 percent to 25 percent.....	440	4	20	56	148	62	150
25 percent or more.....	184	-	5	4	46	28	101
Where the Administrative Records estimate was: ²							
Higher.....	878	50	184	121	267	100	156
Lower.....	1,104	50	194	130	367	131	232
NORTHEAST							
Number of areas.....	493	24	154	89	166	30	30
Absolute average percent difference..	6.4	3.8	3.9	6.0	7.4	7.7	15.4
Size of difference:							
Less than 1 percent.....	68	-	28	17	22	1	-
10 percent or more.....	91	1	8	18	40	8	16
Where the Administrative Records estimate was: ²							
Higher.....	233	11	78	44	78	13	9
Lower.....	259	13	76	45	87	17	21
NORTH CENTRAL							
Number of areas.....	716	14	71	87	237	103	204
Absolute average percent difference..	14.5	2.9	5.1	8.7	11.6	12.0	25.5
Size of difference:							
Less than 1 percent.....	51	4	13	4	17	7	6
10 percent or more.....	313	1	8	27	93	39	145
Where the Administrative Records estimate was: ²							
Higher.....	307	13	41	39	97	39	78
Lower.....	408	1	30	48	140	64	125
SOUTH							
Number of areas.....	216	5	21	18	61	38	73
Absolute average percent difference..	17.5	2.6	6.0	7.5	12.5	15.8	29.4
Size of difference:							
Less than 1 percent.....	13	2	4	1	1	3	2
10 percent or more.....	110	-	4	5	29	20	52
Where the Administrative Records estimate was: ²							
Higher.....	82	3	10	7	19	13	30
Lower.....	133	2	11	11	42	24	43
WEST							
Number of areas.....	561	57	132	57	172	61	82
Absolute average percent difference..	7.0	3.1	3.5	5.9	6.9	9.9	14.0
Size of difference:							
Less than 1 percent.....	85	13	30	11	20	6	5
10 percent or more.....	110	2	5	10	32	23	38
Where the Administrative Records estimate was: ²							
Higher.....	256	23	55	31	73	35	39
Lower.....	304	34	77	26	98	26	43

- Represents zero.

¹Based on the 1970 census.

²Sum of high and low estimates is less than the total number of areas because of areas with zero difference.

Table I. Distribution of Places by Percent Difference Between Administrative Records Method Estimates for 1975 and Results of Special Censuses Conducted Between July 1, 1974 and July 1, 1976 by Rate of Population Change and Region, for Areas of 50 or More Population

Percent difference and region	Total number of areas	Rate of change, 1970 to 1975					
		-10.0 percent or more	-0.1 to -9.9 percent	0.0 to 4.9 percent	5.0 to 9.9 percent	10.0 to 49.9 percent	50.0 percent or more
UNITED STATES							
All areas.....	1,986	91	291	286	270	847	201
Percent difference ¹							
-25.0 percent or more.....	115	1	-	3	-	24	87
-24.9 to -10.0 percent.....	262	2	7	10	15	177	51
-9.9 to -0.1 percent.....	727	9	65	110	130	375	38
0.0 to 4.9 percent.....	439	9	115	94	68	144	9
5.0 to 9.9 percent.....	196	9	49	34	33	67	4
10.0 to 24.9 percent.....	178	27	44	31	20	48	8
25.0 percent or more.....	69	34	11	4	4	12	4
Absolute average percent difference..	10.7	40.7	6.8	5.7	5.5	8.5	26.1
NORTHEAST							
All areas.....	493	10	93	80	79	206	25
Percent difference ¹							
-25.0 percent or more.....	12	-	-	-	-	4	8
-24.9 to -10.0 percent.....	45	-	-	-	1	37	7
-9.9 to -0.1 percent.....	202	-	22	43	41	91	5
0.0 to 4.9 percent.....	142	2	46	25	23	44	2
5.0 to 9.9 percent.....	58	2	17	9	12	18	-
10.0 to 24.9 percent.....	28	3	7	3	2	10	3
25.0 percent or more.....	6	3	1	-	-	2	-
Absolute average percent difference..	6.4	15.6	4.3	3.8	3.8	7.4	18.5
NORTH CENTRAL							
All areas.....	716	48	95	108	93	288	84
Percent difference ¹							
-25.0 percent or more.....	61	1	-	3	-	13	44
-24.9 to -10.0 percent.....	131	1	3	9	6	93	19
-9.9 to -0.1 percent.....	216	3	19	32	46	103	13
0.0 to 4.9 percent.....	114	4	30	34	17	27	2
5.0 to 9.9 percent.....	73	3	14	15	12	27	2
10.0 to 24.9 percent.....	81	14	23	13	9	20	2
25.0 percent or more.....	40	22	6	2	3	5	2
Absolute average percent difference..	14.5	47.2	9.3	7.6	6.7	10.9	31.2
SOUTH							
All areas.....	216	12	16	21	26	96	45
Percent difference ¹							
-25.0 percent or more.....	27	-	-	-	-	3	24
-24.9 to -10.0 percent.....	48	-	1	-	7	25	15
-9.9 to -0.1 percent.....	58	1	2	7	9	37	2
0.0 to 4.9 percent.....	37	-	5	8	6	17	1
5.0 to 9.9 percent.....	11	-	3	1	1	6	-
10.0 to 24.9 percent.....	21	4	3	3	3	6	2
25.0 percent or more.....	14	7	2	2	-	2	1
Absolute average percent difference..	17.5	74.7	11.5	7.5	8.2	9.7	31.1
WEST							
All areas.....	561	21	87	77	72	257	47
Percent difference ¹							
-25.0 percent or more.....	15	-	-	-	-	4	11
-24.9 to -10.0 percent.....	38	1	3	1	1	22	10
-9.9 to -0.1 percent.....	251	5	22	28	34	144	18
0.0 to 4.9 percent.....	146	3	34	27	22	56	4
5.0 to 9.9 percent.....	54	4	15	9	8	16	2
10.0 to 24.9 percent.....	48	6	11	12	6	12	1
25.0 percent or more.....	9	2	2	-	1	3	1
Absolute average percent difference..	7.0	18.1	5.8	4.8	4.8	6.1	16.3

- Represents zero.

¹A negative difference indicates that the Administrative Records estimate is lower than the special census.

Table J. Percent Difference Between Administrative Records Method Estimates and Results of Special Censuses Conducted Between July 1, 1974 and July 1, 1976, by Rate of Population Change and Size of Area for Areas of 50 or More Population: July 1, 1975

Percent difference and population	Total number of areas	Rate of change, 1970 to 1975					
		-10.0 percent or more	-0.1 to -9.9 percent	0.0 to 4.9 percent	5.0 to 9.9 percent	10.0 to 49.9 percent	50.0 percent or more
SIZE OF AREA¹							
All Population Size Groups							
Number of areas.....	1,986	91	291	286	270	847	201
Absolute average percent difference..	10.7	40.7	6.8	5.7	5.5	8.5	26.1
Administrative Records estimate is: ²							
Higher.....	878	79	219	159	126	270	25
Lower.....	1,104	12	72	123	144	577	176
50,000 or More Population							
Number of areas.....	100	5	35	17	14	28	1
Absolute average percent difference..	3.2	4.4	3.1	4.0	1.9	2.7	22.2
Administrative Records estimate is: ²							
Higher.....	50	4	23	8	6	9	-
Lower.....	50	1	12	9	8	19	1
10,000 to 49,999 Population							
Number of areas.....	378	6	70	74	65	150	13
Absolute average percent difference..	4.1	10.8	3.9	3.1	3.2	4.4	9.1
Administrative Records estimate is: ²							
Higher.....	184	5	52	39	28	58	2
Lower.....	194	1	18	35	37	92	11
5,000 to 9,999 Population							
Number of areas.....	251	4	38	45	38	108	18
Absolute average percent difference..	7.0	11.1	5.8	3.9	5.0	7.1	20.2
Administrative Records estimate is: ²							
Higher.....	121	3	35	25	20	35	3
Lower.....	130	1	3	20	18	73	15
1,000 to 4,999 Population							
Number of areas.....	636	11	82	74	95	298	76
Absolute average percent difference..	9.3	35.4	7.5	5.0	5.9	7.9	21.5
Administrative Records estimate is: ²							
Higher.....	267	11	63	40	44	94	15
Lower.....	367	-	19	32	51	204	61
50 to 999 Population							
Number of areas.....	621	65	66	76	58	263	93
Absolute average percent difference..	18.7	48.9	11.4	10.5	8.7	12.5	33.4
Administrative Records estimate is: ²							
Higher.....	256	56	46	47	28	74	5
Lower.....	363	9	20	27	30	189	88

- Represents zero.

¹Based on the 1970 census.

²Sum of high and low estimates may be less than the total number of areas because of areas with zero difference.

The proportion of areas with extreme differences decreased slightly from that observed for the 1973 estimates. Of the total of 1,986 areas, 184 (9 percent) had errors of 25 percent or more as opposed to 11 percent for the 1973 estimates. The excess of negative differences over positive differences between the estimates and the special census results still existed. However, the proportion of areas with negative differences decreased slightly during the period. In every region, as for the Nation, the average error of the

1975 estimates increased as population size decreased. The Northeast and West Regions had especially low error rates for the population category 10,000 to 49,999 with 3.9 and 3.5 percent respectively.

The negative bias of the 1975 estimates for areas with less than 10,000 population held true for all regions except the West. The overall negative bias for this region is not pronounced, and there is no pattern with respect to population size.

When the average errors of the 1975 estimates are cross-classified by rate of population change from 1970 to 1975, a pronounced "U" shaped distribution is apparent, with much larger average errors for areas experiencing either rapid growth or extreme losses (table I). For the two central groups in the table, areas growing from zero to 5 percent, and 5 to 10 percent, the estimates differed on the average by only 5.7 and 5.5 percent, respectively, from the special censuses. (The national resident population growth rate for the period was 4.8 percent.) From these central values, the errors increase as the growth rate exceeds or falls short of the central groups. At one extreme, the estimates for areas losing 10 percent or more had an average error of 40.7 percent. For the areas gaining population at the rate of 50 percent or more, the average error was 26.1 percent. For every region, the national "U" shaped pattern also can be observed. The lowest average difference is always in the range from zero to 10 percent population change, and localities with extreme rates of change have large average errors in all regions.

When the areas are cross-classified by population size, the "U" shaped distribution is still apparent for every size category (table J). The pattern is especially marked for the smallest size category (population from 50 to 499 in 1970) with an average error of 48.9 percent for localities losing over 10 percent of their 1970 population, and a 33.4 percent error for the most rapidly gaining areas.

CONCLUSION

The bulk of the findings from the evaluation work supports the conclusion that the Administrative Records Method gen-

erally yields acceptable results, particularly for larger areas. At the State and county levels, it does not have significantly different results from the results of other estimating techniques. Comparisons of the estimates developed through the Administrative Records technique to county special census counts indicate that this method has an acceptable error level, even against counties which are not representative of all counties in the country and are relatively more difficult to estimate. For areas below the county level, comparisons of results using the Administrative Records Method to special census counts reveal that the estimates prepared using the Administrative Records Method have the same problems of estimation as those developed using other techniques; i.e., difficulty in estimating very small areas and those that experience extreme growth. For areas with 10,000 or more population, the average errors of the 1975 estimates are about 5 percent or less in all regions of the Nation.

The procedures used to develop estimates by the Administrative Records Method, just as with the other estimating techniques, are subjected to continued ongoing review and evaluation in an effort to find ways of making more accurate estimates. As a result, the error level of the 1975 estimates is roughly comparable to that for the 1973 estimates, even though a higher level could be expected due to the longer estimating period.

In general the evaluation indicates that the subcounty Administrative Records Method estimates are of an acceptable level of accuracy for use in the official programs for which they were developed.

Chapter 4. Methodology for Estimating Per Capita Income

As in the case of the population estimates, updated PCI estimates are developed using 1970 census estimates as the base and rates of change developed from various administrative record sets and compilations, mainly from the Internal Revenue Service (IRS) and the Bureau of Economic Analysis (BEA). The discussion here again focuses on 1974 income figures comparable to the 1975 population estimates for purposes of illustration.

The PCI estimates are based on a money income concept. Total money income is defined by the Bureau of the Census for statistical purposes as the sum of:

1. Wage and salary income,
2. Net nonfarm self-employment income,
3. Net farm self-employment income,
4. Social Security and railroad retirement income,
5. Public assistance income, and
6. All other sources of money income, such as, interest, dividends, veteran's payments, pensions, unemployment insurance, alimony, etc.

The total represents the amount of income received before deductions for personal income taxes, Social Security, bond purchases, union dues, Medicare deductions, etc.

STATE AND COUNTY PER CAPITA INCOME ESTIMATES METHODOLOGY

The updated per capita income estimates are based on the per capita income figures for 1969 from the 1970 census. The State and county estimates are updated by the six types of income reflecting changes between 1969 and 1974 from administrative records sources (i.e., Federal tax returns and BEA's personal income data).

IRS data were tabulated by the Bureau of the Census using an extract of the 1969, 1972, and 1974 IRS Individual Master File. The BEA data are developed from the National Income and Produce Account system. For a detailed explanation of the derivation of the BEA money income estimates see appendix B.

Wages and salaries at both the State and county level are updated using IRS data. For States, the 1970 census aggregate wage and salary amount is increased by the percent change in wages and salaries from 1969 to 1974 computed from tax returns as shown in Formula I.

Formula I (For States)

$$\left[\frac{1974 \text{ CEN}}{\text{W \& S}} \right] = \left[\frac{1974 \text{ IRS W \& S}}{1969 \text{ IRS W \& S}} \right] \times \left[\frac{1969 \text{ CEN W \& S}}{1970 \text{ Sample Pop.}} \times 1970 \text{ Pop.} \right]$$

At the County level, there is a greater possibility of incorrect geographic coding of the tax returns. To minimize the effect of this source of possible bias, the county wage and salary updates are done on a per capita basis. The 1970 census wages and salaries per capita is increased by the percent change in IRS wages and salaries per exemption from 1969 to 1974. This updated 1974 per capita figure is then multiplied by the 1975 population estimate to derive aggregate wages and salaries as shown in Formula II.

Formula II (For Counties)

$$\left[\frac{1974 \text{ CEN}}{\text{W \& S}} \right] = \left[\frac{1974 \text{ IRS (W\&S/EXEMP)}}{1969 \text{ IRS (W\&S/EXEMP)}} \right] \times \left[\frac{1969 \text{ CEN W \& S}}{1970 \text{ Sample Pop.}} \right] \times \left[1975 \text{ Pop.} \right]$$

The remaining types of income identified in the 1970 census (i.e., nonfarm and farm self-employment, Social Security, Public Assistance, and "other" income) are updated for States and counties using the percent change in BEA estimates for these sources.

It is important to note the income adjustments that are done to the BEA data to account for different population bases. The BEA income data are based on a mid-year (July) population figure for each respective year. Since the changes have to apply to a census income figure with a population base as of April of the year following, the BEA aggregates are adjusted forward to reflect the April population base before the rate of change is calculated (see Formula III). It should also be noted that the 1969 census income data are based on a 20-percent sample population base. These are adjusted to reflect the full population count from the 1970 census since this is the population figure carried forward in updated population estimates.

Formula III (For States and Counties)

$$[1974 \text{ CEN INC (I)}] = \left[\frac{\left(\frac{1974 \text{ BEA INC (I)}}{1974 \text{ Pop.}} \times 1975 \text{ Pop.} \right)}{\left(\frac{1969 \text{ BEA INC (I)}}{1969 \text{ Pop.}} \times 1970 \text{ Pop.} \right)} \right] \times \left[\frac{1969 \text{ CEN INC (I)}}{1969 \text{ Sample Pop.}} \times 1970 \text{ Pop.} \right]$$

Where INC (I) = Nonfarm self-employment
 Farm self-employment (See Formula IV for adjustment for county estimates)
 Social Security
 Public Assistance
 "Other Income"

Because of the volatile nature of changes in county farm income relative to other income gains and losses, a "constrained net" farm income estimate is being utilized (see Formula IV). The first step in this procedure is the preparation of a "net" farm income estimate, which is the application of the dollar change, between 1969 and 1974, in BEA farm self-employment income plus land rent to the 1969 farm income figure from the 1970 census. The second step is the preparation of a "gross change" farm income estimate which applies the percent change in BEA farm receipts plus the dollar change in land rent to the 1970 census figure. This gross change estimate is then used to constrain the movement of net income. If the "net" estimate falls between 80 and 120 percent of the "gross change" estimate, the net estimate is used. If it falls below 80 percent of the gross estimate, the "constrained net" estimate is 80 percent of the "gross change" estimate. If it is higher than 120 percent of the "gross change" estimate, the "constrained net" is 120 percent of the "gross change" estimate.

Formula IV (For county farm self-employment income only)

(A)

$$1974 \text{ CEN FSE (net est.)} = [1974 \text{ BEA FSE} + 1974 \text{ BEA LR} - 1969 \text{ BEA FSE} - 1969 \text{ BEA LR}] + \left[\frac{1969 \text{ CEN FSE}}{1970 \text{ Sample Pop.}} \right] \times 1970 \text{ CEN pop.}$$

(B)

$$1974 \text{ CEN FSE (gross change est.)} = \left[\frac{\left(\frac{1974 \text{ BEA FR}}{1974 \text{ Pop.}} \times 1975 \text{ Pop.} \right)}{\left(\frac{1969 \text{ BEA FR}}{1969 \text{ Pop.}} \times 1970 \text{ Pop.} \right)} \right] \times \left[\frac{1969 \text{ CEN FSE(F)}}{1970 \text{ Sample Pop.}} \times 1970 \text{ Pop.} \right] + \left[[1974 \text{ BEA LR} - 1969 \text{ BEA LR}] + \left[\frac{1969 \text{ CEN FSE(NF)}}{1970 \text{ Sample Pop.}} \times 1970 \text{ Pop.} \right] \right]$$

Where:

FR = BEA farm receipts,
 FSE = Farm self-employment income,
 FSE(F) = Farm self-employment income of farmers,
 FSE(NF) = Farm self-employment income of non-farmers, and
 LR = land rent.

(C)

$$1974 \text{ CEN FSE (constrained net est.)} = A \text{ if } .8B \leq A \leq 1.2B \\ = .8B \text{ if } A < .8 \\ = 1.2B \text{ if } A > 1.2$$

Where:

A = 1974 CEN FSE (net est.), and
 B = 1974 CEN FSE (gross change est.).

Total money income for 1974 is the sum of the income types, and the per capita income estimate is the quotient of total money income divided by the April 1975 census population estimate.

For consistency in State and county totals, the county income estimates are controlled to State totals before per capita income is calculated.

The revised estimates for 1972 are derived in the same manner as the 1974 estimates.

SUBCOUNTY PER CAPITA INCOME ESTIMATES METHODOLOGY

The 1974 and revised 1972 per capita income estimates for subcounty governmental units are derived in somewhat the same manner as those for counties. However, there are differences in the income components used in the estimation procedure, and in the sources used to update the components. The basic procedure is the application of the rate of change in IRS adjusted gross income per exemption and BEA county transfer income per capita to estimates of these components developed from the 1970 census. The 1972 estimates for each component are prepared using the rate of change from 1969 to 1972. The 1974 estimates are based on the 1972 estimates, and are updated by an estimate of change from 1972 to 1974. (The 1972 PCI estimates represent revisions to the previously published 1972 PCI estimates.)

The basic update procedure is straightforward. However, due to the diversity of the geographic areas for which estimates are being made, and the data problems that affect the quality and reliability of the data used in developing the estimates, various adjustments and constraints were built into the subcounty model. The presence of these constraints and adjustments in the model may obscure the basic procedure. For our purposes in presenting the methodology here, we have divided the procedure into two parts:

1. The development of a 1969 base per capita income figure, and
2. The estimation and application of the rate of change in per capita income.

Development of a 1969 PCI Base Figure

In preparing the 1970 census per capita income figures for use in the estimation process, four operations were developed to (a) adjust the 1970 census data used in the model to account for annexation and boundary changes since the census, (b) resolve the problem of sampling variability in the census PCI figures for small places, (c) make census level estimates of adjusted gross income and transfer income, which are the income components used in the update procedure, and (d) adjust the 1969 PCI figures to control totals for larger areas.

Adjustment of census data for annexation and boundary changes—To avoid a piecemeal adjustment of census data to reflect annexation and boundary changes, a formula has been built into the income estimation model to adjust the data for these areas before the update process begins. The procedure is to estimate the census data for the annexed portion of the area, add this amount to the area being increased, and subtract the amount from the area being reduced.

The estimate for an annexed area is based on a weighted average for all places in a county which lost population due to annexation or boundary changes. Formula V shows the adjusted procedure.

Formula V. Adjustment to Census and IRS Data for Annexation and Boundary Changes

$$\text{FINAL ITEM}_i = \text{ORIG ITEM}_i + \left[\begin{array}{l} \text{'70 ANNEX POP}_i \times \\ \left[\frac{\sum_{j=1}^n \text{ORIG ITEM}_j}{\sum_{j=1}^n \text{'70 ORIG POP}_j} \right] \end{array} \right]$$

Where:

i = each subcounty unit in county,

j = each subcounty unit reduced by annexation,
and

ITEM = each 1970 census sample item, and each IRS data item for 1969, 1972, and 1974.

Notes: For Census data, original geographic base is 1970.
For IRS data, original geographic base is 1972.

1969 PCI estimate for small areas.—When estimates of 1972 PCI were originally prepared for revenue sharing purposes, it was decided that the census per capita income figures for areas¹ with fewer than 500 persons (weighted sample population) were of insufficient statistical reliability for use

¹ The basic estimate unit is the MCD/place piece in functioning MCD counties and place/balance of county in nonfunctioning MCD counties.

in the estimation process due to the large degree of sampling variability present in these data. Instead, the PCI value for the county or Minor Civil Division (MCD) was used for these areas. For the present round of estimates, it was determined that the updated estimates for these places should be based on a 1969 PCI estimate which would make use of the 1970 census sample PCI for these small areas.

The final 1969 PCI for areas having a weighted sample population estimate of less than 1,000 is a weighted average of the original 1970 census sample value and a regression estimate. The regression estimate utilizes the sample value as the dependent variable and census housing value (not a sample item), county income and housing data, and IRS adjusted gross income per exemption as the independent variables in the regression equation. Separate regressions were run, by State, by population size class (less than 500, and 500 to 1,000).

The weights applied to the sample PCI and the regression estimate reflect a measure of the variance in the sample estimates relative to that in the regression estimates as determined by the fit of the regression estimates to the sample PCI figures. No weighted estimate, however, is allowed to deviate from the sample PCI figure by more than one standard error.

There is a substantial degree of quality control exercised in the development and the use of the weighted estimates. The census and IRS data for the regression estimate are tested for reliability before they are used. If one or more of the independent variable data items are suspect, those variables are dropped from the regression equation. Each estimate is then flagged to indicate which variables were used in the regression estimate, and whether or not the weighted estimate had to be constrained at one standard error from the sample PCI. If no census sample data were available for the development of a weighted estimate, the county or MCD figure is used.

For a more detailed discussion of this procedure see appendix B.

Estimation of 1969 adjusted gross income and transfer income from census money income.—In an effort to use as much subcounty data as possible for updating census money income, specifically, all adjusted gross income from IRS, census money income for 1969 is divided into two parts, adjusted gross income and transfer income. Transfer income from the census is estimated to be the sum of Social Security Public Assistance, and a portion of "Other Income." Formula VI shows the procedure for identifying that portion of other income to be classified as transfer income. To summarize this procedure, the distribution of 1969 BEA other income for counties by type of other income is assumed to be the same as that for 1972. This distribution is then applied to census other income. The transfer income portion is separated and is distributed among the governmental units in the county by the size of special universe populations derived from the 1970 census. These special universe populations are listed in the formula. Adjusted gross income, then, is estimated to be the difference between total income and transfer income.

Formula VI. Estimate of 1969 Census Transfer Income

1969 Census Transfer Income = Social Security Income + Public Assistance Income +

$$\left[\frac{\sum_{i=1}^7 \left[\left['72 \text{ BEA TR INC}_i \right] \times '69 \text{ BEA OTHER INC} \times \left[\frac{'69 \text{ CEN PLACE UNIV}_i}{'69 \text{ CEN COUNTY UNIV}_i} \right] \right]}{\sum_{i=1}^8 \left[\left['72 \text{ BEA OTH INC}_i \right] \times '69 \text{ BEA OTHER INC} \times \left[\frac{'69 \text{ CEN PLACE UNIV}_i}{'69 \text{ CEN COUNTY UNIV}_i} \right] \right]} \right] \times '69 \text{ CEN OTH INC}$$

Where:

'72 BEA OTHER INC_i =

- | | |
|-----|---|
| '72 | 1) Veteran's Educ. Payments |
| BEA | 2) Other Veteran Payments |
| TR | 3) Federal Fellowships |
| INC | 4) Indian Transfer Income |
| | 5) Unemployment Insurance |
| | 6) Workmen's Compensation |
| | 7) Other Transfer Income |
| | 8) Interest, Dividends, Rent and Royalties and Pensions (i.e. Other, non-transfer income) |

'69 CEN UNIV_i

- | |
|--|
| 1) Student veterans with other income |
| 2) Other veterans with other income |
| 3) Graduate students with other income |
| 4) Indians with other income |
| 5) Unemployed with other income |
| 6) Total wage and salary income |
| 7) Sample population |
| 8) Total money income |

Note: TR = Transfer
UNIV = Universe

Adjustment of the 1969 PCI estimates to larger area controls.—One of the single most significant adjustments to the subcounty estimates is controlling the estimates to the estimates of the higher level geographic areas. It insures that the sum of the estimates for all pieces of geography in the area is the same as an independent estimate for that area. This does not, however, put sufficient control on the distribution of values within the control area, especially when allocated values are used. A solution to this limitation was found in a two-way adjustment procedure (Multiple Univariate Rake) which controls not only to higher level geography totals, but also to several size class totals for the entire State. This determination was made when tests showed that, especially for areas with small populations, the average income level of an area in a particular size class (e.g., less than 500) tended to reflect the level for all areas in that class in the State more closely than it reflected the county level.

The first step in the control procedure is to establish the control totals: 1970 census aggregate money income for each county and 1970 census aggregate money income for all places in selected size classes in the State. The 1969 aggregate income figures as developed in the previous section for the individual subcounty areas are then repeatedly adjusted to each of the control totals until the sum of the areas in the county is equal to the county total, and the sum of areas in a size class is within 1 percent of the size class total.

After this adjustment is completed, the final total income figure is divided into adjusted gross income and transfer income and is ready for use in the update procedure.

Estimating and applying the rate of change in per capita income

Estimating and applying the rate of change in per capita income can also be viewed in terms of four procedures: (a) adjustment of IRS data to account for annexation and boundary changes, (b) data replacements and constraints, (c) estimating and applying the income rate of change, and (d) adjusting the updated components to control totals for counties.

Adjustment of IRS data for annexation and boundary changes—The annexation and boundary change adjustment for IRS data is done with the same formula as the census adjustment. The only difference between the two is that census income data have a 1969 geographic base and the IRS data have a 1972 geographic base. All IRS data items for 1969, 1972, and 1974 are adjusted in this operation.

Data replacements and constraints—Due to the potential limitations in the IRS data used at the subcounty level, a series of edits were used to ensure representative data, and a series of data replacements and constraints were developed to control the estimation process.

In cases where no IRS data were available, or the data failed an edit, the rate of change for the county area was used. For example, if the number of IRS tax returns coded to an area was less than 25, the county rate of change was used.

Estimating and applying the income rate of change—As noted earlier, the basic estimation procedure is the application of the rate of change in IRS adjusted gross income per exemption and BEA county transfer income per capita to the 1969 per capita income base. Regardless of whether the base is an adjusted figure or the rate of change in AGI is a fall-back value, the update procedure is that shown in Formula VII. The 1972 estimates are developed first, then the 1974 estimate is built on the 1972 estimate, applying a 1972 to 1974 rate of change.

Formula VII. 1974 Total Money Income Estimate

$$1974 \text{ TMY} = \left[\left[\frac{\begin{matrix} '74 \text{ IRS AGI}(P) \\ '74 \text{ IRS EXEMP}(P) \\ '72 \text{ IRS AGI}(P) \\ '72 \text{ IRS EXEMP}(P) \end{matrix}}{\quad} \right] \times \left[\frac{'72 \text{ CEN AGI EST}(P)}{'73 \text{ CEN POP}(P)} \right] \times '75 \text{ CEN POP}(P) \right] + \left[\left[\frac{\begin{matrix} '74 \text{ BEA TR}(C) \\ '74 \text{ BEA POP}(C) \\ '72 \text{ BEA TR}(C) \\ '72 \text{ BEA POP}(C) \end{matrix}}{\quad} \right] \times \frac{'72 \text{ CEN TR EST}(P)}{'73 \text{ CEN POP}(P)} \right] \times '75 \text{ CEN POP}(P)$$

Where:

AGI = Adjusted Gross Income,
 TR = Transfer payment income,
 C = Data for County Area,
 P = Data for Subcounty Area (Place), and
 TMY = Total Money Income.

Adjusting the updated components to control totals for counties—After the adjusted gross income and transfer income components for 1972 and 1974 are estimated, they are adjusted in a manner similar to the procedures used to adjust the 1969 income base figures. The only differences are that adjusted gross income and transfer income are adjusted separately, and that the State size class control totals are developed by summing the individual estimates in that class and adjusting these size class totals to the State estimate.

After the adjustment procedure is completed, adjusted gross income and transfer income estimates are combined and the sum is divided by the appropriate population estimate for the final per capita income estimate.

STATE AND COUNTY DATA SUPPLIED BY THE BUREAU OF ECONOMIC ANALYSIS

The Regional Economic Measurement Division of the Bureau of Economic Analysis (BEA) participated with the Bureau of the Census in developing the required data for the State and county estimates of total money income. As detailed in the previous section on the State and county methodology, the BEA-developed conversion of the personal income data series to approximate the Bureau of the Census concept of total money income is critical to the State and county estimates.

Personal income as defined by BEA is the current income received by persons from all sources. It is measured after deduction of personal contributions to social insurance plans, but before deductions of income and other personal taxes. It includes income received from business, government, households, and institutions. It consists of wages and salaries (covering all employee earnings, including executive salaries, bonuses, commissions, payments in kind, incentive payments, and tips), various types of supplementary earnings termed "other labor income" (the largest item being employer contributions to private pension, health, and welfare funds), the net incomes of owners of unincorporated businesses (farm and nonfarm, the latter including the incomes of independent professionals), net rental income, royalties, dividends, interest, and government and business transfer payments (disbursements to persons for which no services are rendered currently—such as Social Security payments, Medicare benefits, retirement pay of government programs, etc.). The term "persons" refers to individuals, nonprofit institutions, and private trust funds.

State and county personal income are converted to the census money income concept by a series of adjustments which include the deletion of some components, or parts of components, of personal income, the shifting of components from one category of type-of-payment to another, and the estimating of income payments which are not part of the personal income definition.

In general, the types of payments that are excluded from personal income are pay in kind, lump-sum payments, imputed income (a form of income in kind), income received by quasi-individuals, and income received but not expendable without restriction. Of the income items included in the census definition but not in the personal income concept (alimony and child support payments, gambling gains, and income from private pensions and annuities), thus far, it has only been possible for BEA to develop direct allocators for income from private pensions and annuities. Because of a lack of data, it has not been possible to prepare estimates of such interpersonal transfers as alimony and child support payments and gambling gains. In many cases these payments are self-cancelling.

A description of the methods used in deriving estimates of money income from personal income at the State and county levels² is contained in appendix B.

INTERNAL REVENUE SERVICE DATA

Data from individual tax returns provided by the Internal Revenue Service (IRS) is critical to making both the population and per capita total money income estimates. The Bureau of the Census was granted permission by IRS to obtain a limited extract of data from the IRS Master Files for 1969, 1972, and 1974. The data obtained were:

- Social Security number of taxpayer
- Address (street address)
- Post Office name
- State of Post Office
- Zip Code
- Number of exemptions
- Number of extra exemptions claimed for age and blindness
- Adjusted Gross Income (AGI)
- Wages and Salaries (W & S)
- Dividend after exclusion
- Interest
- Residence Code (1972 IRS file only)

² For a description of the procedures used by BEA for estimating State and local area personal income, see "Personal Income by States Since 1929," a supplement to the Survey of Current Business (1956) and the more recent special supplement (A National Technical Information Service publication, Accession Number PB2540555), "Local Area Personal Income," 1969-74, Volume 1.

These data were used to develop migration rates and rates of change in AGI per exemption, wages and salaries per exemption, and AGI less wages and salaries per exemption. These data were used in developing the updated population and per capita total money income figures.

The extract the Bureau obtained from IRS was made in late December for the 1969 file, and late August for the 1972 and 1974 IRS files. These extracts were processed by the Bureau in two phases involving two files in each phase, 1969-1972 cycle and 1972-1974 cycle. The processing consists of three major operations.

1. Initial processing of each file
 - a. Edit and range check of each data field.
 - b. Breaking of the file into processing work units defined by Social Security number range.
2. Assignment of residence geography to all records.
3. Matching the two files using Social Security number, and creation of migration and income tallies.

REVISION OF THE 1972 PER CAPITA TOTAL MONEY INCOME

As noted earlier, the 1972 per capita total money income estimates were revised. At the U.S. level this change was an increase of \$9 from an original estimate of \$3,781 to a

Table K. Number and Absolute Average Differences Between Revised 1972 Per Capita Total Money Income Estimates and Revised Estimates for the U.S., States, Counties, and Estimating Units, by 1970 Census Population Size

(The estimating unit is the mutually exclusive piece of geography for which an estimate was made. It would be a place, minor civil division (MCD), MCD balance outside a dependent place or part of a place or village, or part of a place in an MCD)

Estimating unit	Number	Absolute average difference
United States.....	1	\$9
States (including Washington, D.C.).....	51	\$36
Counties (including Washington, D.C.)....	3,143	\$74
Total estimating units.....	36,192	\$301
Estimating units by 1970 census population:		
Over 50,000.....	480	\$57
25,000 to 49,999.....	656	\$80
10,000 to 24,999.....	1,749	\$80
5,000 to 9,999.....	2,200	\$104
2,500 to 4,999.....	3,410	\$118
1,000 to 2,499.....	7,218	\$139
500 to 999.....	6,702	\$222
Under 500.....	13,777	\$547

revised estimate of \$3,790 (table K). At the State level, average absolute change was \$36 with 31 of the States (including Washington, D.C.) increasing and 20 decreasing (table L).

For the counties, the absolute average difference was \$74.

For the 36,192 estimating subcounty units, the absolute

average difference was \$301, with larger estimating units having the smallest differences. When the units are classified by the 1970 census population size, those units with a population over 50,000 had an absolute average difference of \$57 and those units with a population under 500 persons had an absolute average difference of \$547 (table K).

Table L. Comparison of the Revised 1972 Per Capita Total Money Income Estimates With the Original Estimate for the U.S. and States (Including D.C.)

State	Per capita total money income		Dollar difference (revised-original)	State	Per capita total money income		Dollar difference (revised-original)
	Revised 1972	Original 1972			Revised 1972	Original 1972	
Alabama.....	2,974	2,963	11	Missouri.....	3,589	3,564	25
Alaska.....	4,767	4,872	-105	Montana.....	3,400	3,385	15
Arizona.....	3,811	3,760	51	Nebraska.....	3,539	3,441	98
Arkansas.....	2,725	2,685	40	Nevada.....	4,289	4,390	-101
California.....	4,259	4,264	-5	New Hampshire.....	3,648	3,628	20
Colorado.....	4,065	4,006	59	New Jersey.....	4,460	4,477	-17
Connecticut.....	4,480	4,459	21	New Mexico.....	2,963	2,992	-29
Delaware.....	4,014	3,966	48	New York.....	4,210	4,248	-38
District of Columbia.....	4,808	4,901	-93	North Carolina.....	3,210	3,196	14
Florida.....	3,983	3,885	98	North Dakota.....	3,306	3,118	188
Georgia.....	3,375	3,380	-5	Ohio.....	3,773	3,772	1
Hawaii.....	4,184	4,187	-3	Oklahoma.....	3,302	3,315	-13
Idaho.....	3,220	3,242	-22	Oregon.....	3,851	3,840	11
Illinois.....	4,212	4,220	-8	Pennsylvania.....	3,720	3,711	9
Indiana.....	3,686	3,702	-16	Rhode Island.....	3,723	3,752	-29
Iowa.....	3,510	3,476	34	South Carolina.....	2,973	2,925	48
Kansas.....	3,768	3,681	87	South Dakota.....	2,973	2,949	24
Kentucky.....	3,047	3,025	22	Tennessee.....	3,109	3,099	10
Louisiana.....	2,871	2,876	-5	Texas.....	3,409	3,375	34
Maine.....	3,052	3,030	22	Utah.....	3,353	3,341	12
Maryland.....	4,398	4,389	9	Vermont.....	3,337	3,349	-12
Massachusetts.....	4,049	4,052	-3	Virginia.....	3,879	3,883	-4
Michigan.....	3,996	3,984	12	Washington.....	3,896	3,898	-2
Minnesota.....	3,701	3,666	35	West Virginia.....	2,977	2,962	15
Mississippi.....	2,523	2,497	26	Wisconsin.....	3,681	3,669	12
				Wyoming.....	3,589	3,807	-218

Chapter 5. Evaluation of the Income Estimates

EVALUATION OF U.S. ESTIMATES

Evaluation of the per capita total money income estimates is necessarily limited by the lack of independent data for comparison. Comparisons can be made at the U.S. level between the estimates and sample-based estimates from the Current Population Survey (CPS).

As can be seen from table M, the survey-based estimates are reasonably close to the estimates from the Administrative Records system. It should be noted that part of the difference between the census-based estimates and those developed from the CPS is due to the exclusion of institutionalized persons and some Armed Forces members from the CPS.

not a perfect yardstick for measuring the accuracy of the estimates since they are survey-based estimates and as such are subject to sampling and nonsampling error, as well as the difference in population coverage noted above.

EVALUATION OF COUNTY ESTIMATES

There are no independent estimates of total money income for all counties. As a result of special censuses taken in 1973, census per capita total money income estimates are available for only four counties. These 1972 estimated per capita income figures are shown in table P, with the census results.

EVALUATION OF STATE ESTIMATES

At the State level, there is reasonable survey-based per capita income data available from the Current Population Survey for 1972 and 1974 for the larger States. Table N presents the CPS estimate and the Administrative Records estimate for the 20 largest States. The percentage change in the Administrative Records per capita income data compares favorably with the CPS data. The absolute average difference between the 1970 census and the results from the March 1970 CPS is 3.6 percent (table O). The absolute average difference between the Administrative Records estimate for 1972 and the March 1973 CPS is 3.1 percent. The comparable difference between the Administrative Records estimates for 1974 and the March 1975 CPS estimates is 2.9 percent. CPS data are

EVALUATION OF SUBCOUNTY ESTIMATES

At the subcounty level, there were 82 special censuses conducted by the Bureau of the Census in 1973 which collected data on income. These data were collected from all persons 14 years old and over, and consequently, had no sampling error. The absolute average difference between the 1972 estimate and the census value for these places is 14.5 percent, with larger places being less and smaller places being larger (tables Q and R). The difference between the 1972 Administrative Records estimates and the special census per capita income is in part attributable to the sampling error in the 1970 census per capita income figure. For only 7 out of 82 areas was the difference statistically significant (i.e., greater than two times the standard error).

Table M. Comparison of the Per Capita Income Estimates of the Census and Administrative Records Estimates With the Current Population Survey

Year	Census	Administrative Records estimate	CPS	Difference, census or Administrative Records minus CPS	Percent difference (CPS used as base)
1969.....	\$3,119	(NA)	\$3,015	\$104	+3.3
1972.....	(NA)	\$3,790	\$3,752	\$38	+1.0
1974.....	(NA)	\$4,572	\$4,406	\$166	+3.6

NA Not available.

Table N. Comparison of the PCI Growth Rate From 1969 to 1972 and 1974 as Measured by CPS and the Administrative Records From CPS and the 1970 Census

Twenty most populous States in the 1970 census	1969 to 1972			1969 to 1974		
	Percent change		Percentage point difference in the percent change (1) minus (2) (3)	Percent change		Percentage point difference in the percent change (4) minus (5) (6)
	CPS 1970 to CPS 1973 (1)	1970 census to 1972 Administrative Records (2)		CPS 1970 to CPS 1975 (4)	1970 census to 1974 Administrative Records (5)	
1. California.....	20.3	17.8	2.5	40.1	41.5	-1.4
2. New York.....	19.2	16.7	2.5	35.6	35.9	-0.3
3. Pennsylvania.....	23.5	21.3	2.2	52.1	45.1	7.0
4. Texas.....	25.7	22.1	3.6	43.6	50.0	-6.4
5. Illinois.....	26.2	20.5	5.7	49.1	46.1	3.0
6. Ohio.....	21.3	17.9	3.4	45.7	42.6	3.1
7. Michigan.....	25.0	19.0	6.0	50.0	41.5	8.5
8. New Jersey.....	24.2	21.4	2.8	41.3	42.5	-1.2
9. Florida.....	21.8	30.2	-8.4	43.3	57.5	-14.2
10. Massachusetts.....	28.9	18.8	10.1	49.4	39.5	9.9
11. Indiana.....	12.7	20.1	-7.4	39.4	45.2	-5.8
12. North Carolina.....	40.2	29.7	10.5	59.4	56.6	2.8
13. Missouri.....	20.0	21.6	-1.6	44.5	44.1	0.4
14. Virginia.....	41.5	29.5	12.0	62.9	56.9	6.0
15. Georgia.....	43.8	27.8	16.0	62.8	55.0	7.8
16. Wisconsin.....	21.4	21.4	0.0	42.6	47.4	-4.8
17. Tennessee.....	27.0	26.2	0.8	61.1	55.1	6.0
18. Maryland.....	22.7	25.2	-2.5	50.8	50.9	-0.1
19. Minnesota.....	33.0	21.8	11.2	60.0	53.9	6.1
20. Louisiana.....	17.7	23.2	-5.5	47.2	52.1	-4.9
Number of positive differences.	(X)	(X)	15	(X)	(X)	11
Number of negative differences.	(X)	(X)	5	(X)	(X)	9
Average absolute percentage point difference.....	(X)	(X)	5.7	(X)	(X)	5.0

X Not applicable.

Table O. Comparison of Per Capita Total Money Income Estimate for 1969, 1972, and 1974, as Shown by the CPS, Census, and Administrative Records

20 most populous States in the 1970 census	1969			1972			1974		
	March 1970 CPS (1)	1970 census (2)	Percent difference (2) minus (1) (3)	March 1973 CPS (4)	Ad. Rec. 1972 (5)	Percent difference (5) minus (4) (6)	March 1975 CPS (7)	Ad. Rec. 1974 (8)	Percent difference (8) minus (7) (9)
California.....	3,509	3,614	3.0	4,221	4,259	0.9	4,915	5,114	4.0
New York.....	3,502	3,608	3.0	4,173	4,210	0.9	4,748	4,903	3.3
Pennsylvania.....	2,974	3,066	3.1	3,674	3,720	1.3	4,524	4,449	-1.7
Texas.....	2,821	2,792	-1.0	3,547	3,409	-3.9	4,050	4,188	3.4
Illinois.....	3,355	3,495	4.2	4,235	4,212	-0.5	5,002	5,107	2.1
Ohio.....	3,175	3,199	0.8	3,850	3,773	-2.0	4,626	4,561	-1.4
Michigan.....	3,169	3,357	5.9	3,961	3,996	0.9	4,753	4,751	(Z)
New Jersey.....	3,422	3,674	7.4	4,250	4,460	4.9	4,836	5,237	8.3
Florida.....	2,935	3,058	4.2	3,575	3,983	11.4	4,205	4,815	14.5
Massachusetts.....	3,163	3,408	7.6	4,077	4,049	-0.7	4,726	4,755	0.6
Indiana.....	3,173	3,070	-3.2	3,577	3,686	3.0	4,424	4,458	0.8
North Carolina.....	2,384	2,474	3.8	3,343	3,210	-4.0	3,799	3,875	2.0
Missouri.....	2,907	2,952	1.5	3,487	3,589	2.9	4,202	4,254	1.2
Virginia.....	2,838	2,996	5.6	4,016	3,879	-3.4	4,622	4,701	1.7
Georgia.....	2,524	2,640	4.6	3,630	3,375	-7.0	4,108	4,091	-0.4
Wisconsin.....	3,037	3,032	-0.2	3,688	3,681	-0.2	4,330	4,468	3.2
Tennessee.....	2,369	2,464	4.0	3,009	3,109	3.3	3,817	3,821	0.1
Maryland.....	3,507	3,512	0.1	4,303	4,398	2.2	5,290	5,299	0.2
Minnesota.....	2,845	3,038	6.8	3,783	3,701	-2.2	4,553	4,675	2.7
Louisiana.....	2,281	2,330	2.1	2,685	2,871	6.9	3,357	3,545	5.6
Number of positive differences.....	(X)	(X)	17	(X)	(X)	11	(X)	(X)	16
Number of negative differences.....	(X)	(X)	3	(X)	(X)	9	(X)	(X)	4
Average absolute percent difference.....	(X)	(X)	3.6	(X)	(X)	3.1	(X)	(X)	2.9

X Not applicable.

Z Indicates difference of less than .05 percent.

Table P. Comparison of the Per Capita Income Estimates With Special Census Results in 1972 for Four Counties

County	1972 special census	1972 Administrative Records estimates	Difference	
			Dollar	Percent
Cleveland County, Arkansas.....	\$2,163	\$1,932	-\$231	-10.7
Quitman County, Georgia.....	\$1,906	\$1,642	-\$264	-13.9
Towns County, Georgia.....	\$2,102	\$2,180	\$78	3.7
Surry County, Virginia.....	\$2,328	\$2,413	\$85	3.7

No statistical conclusion can be drawn from such a small sample.

Table Q. Comparison of 82 Areas for Which Special Census Values of 1972 Per Capita Total Money Income Are Available

Special census population count	Absolute average percentage difference (base is special census)
All areas.....	14.5
10,000 and over.....	9.7
5,000 to 9,999.....	9.7
2,500 to 4,999.....	11.6
1,000 to 2,499.....	8.8
500 to 999.....	19.7
Less than 500.....	28.0

Table R. Comparison of 82 Special Censuses Taken in 1973 (Collecting 1972 Income Data) With the 1972 Administrative Records Estimates of Per Capita Total Money Income

Area (by population of special census)	Special census population	Per capita income			Estimate minus special census	Percent difference
		1969	1972 special census	1972 estimate		
<u>10,000 and over</u>						
Albany, Ca.....(Alameda Co.)..	14,660	3,962	4,112	4,714	602	14.6
Roselle Park, N.J.....(Union Co.)..	13,886	4,014	4,597	4,833	236	5.1
The Village, Ok.....(Oklahoma Co.)..	12,298	3,628	4,932	4,473	-459	-9.3
<u>5,000 to 9,999</u>						
Westmont, Il.....(DuPage Co.)..	9,680	4,051	4,845	4,853	8	0.2
Limestone Center, Me.....(Aroostook Co.)..	9,655	1,970	3,396	2,520	-876	-25.8
Spring Lake twp., Mi.....(Ottawa Co.)..	8,366	3,698	3,967	4,392	425	10.7
Shenadoah, Pa.....(Schuylkill Co.)..	8,004	2,159	2,568	2,791	223	8.7
Braddock, Pa.....(Allegheny Co.)..	6,952	2,220	2,422	2,874	452	18.7
Cleveland Co., Ar.....(Cleveland Co.)..	6,774	1,558	2,163	1,932	-231	-10.7
Gouverneur, N.Y.....(St. Lawrence Co.)..	6,754	2,730	3,058	3,227	169	5.5
Macedonia twp., Oh.....(Summit Co.)..	6,107	3,520	3,874	4,158	284	7.3
Bolivar, Tn.....(Hardeman Co.)..	5,744	1,951	2,531	2,808	277	10.9
Surry Co., Va.....(Surry Co.)..	5,696	1,887	2,328	2,413	85	3.7
Gunnison, Co.....(Gunnison Co.)..	5,561	2,238	2,720	2,587	-133	-4.9
<u>2,500 to 4,999</u>						
Buchanan, Mi.....(Berrien Co.)..	4,791	3,374	3,593	3,861	268	7.5
Towne Co., Ga.....(Towne Co.)..	4,771	1,759	2,102	2,180	78	3.7
Galen town, N.Y.....(Wayne Co.)..	4,526	2,854	3,215	3,253	38	1.2
Marble town, N.Y.....(Ulster Co.)..	4,515	3,041	3,492	3,664	172	4.9
Mills Co., Tx.....(Mills Co.)..	4,220	2,178	2,837	2,617	-220	-7.8
Masontown, Pa.....(Fayette Co.)..	4,168	2,297	2,808	2,826	18	0.6
Venice, Il.....(Madison Co.)..	4,032	2,148	2,023	2,616	593	29.3
Hamilton, N.Y.....(Madison Co.)..	3,840	2,430	2,558	2,786	228	8.9
Cape May, N.J.....(Cape May Co.)..	3,652	2,727	3,691	3,607	-84	-2.3
Moore Co., Tn.....(Moore Co.)..	3,521	1,976	2,551	2,444	-107	-4.2
Luray, Va. (pt.).....(Page Co.)..	3,505	2,744	3,222	3,663	441	13.7
South Pittsman, Tn.....(Marion Co.)..	3,258	2,222	2,534	2,965	431	17.0
Manitowac Rapids town, Wi.....(Manitowac Co.)..	3,018	2,893	3,009	3,804	795	26.4
Las Animas, Co.....(Bent Co.)..	2,856	1,992	2,578	2,538	-40	-1.6
Shelby, Ms.....(Bolivar Co.)..	2,847	1,353	1,496	1,997	501	33.5
New Madrid, Mo.....(New Madrid Co.)..	2,820	2,193	2,818	2,731	-87	-3.1
Durant, Ms.....(Holmes Co.)..	2,759	1,825	2,173	2,281	108	5.0
East Dublin, Ga.....(Laurens Co.)..	2,566	2,199	2,166	2,702	536	24.7
Montville twp., Oh.....(Medina Co.)..	2,514	4,205	4,332	5,436	1,104	25.5
<u>1,000 to 2,499</u>						
Polk twp., Oh.....(Crawford Co.)..	2,467	3,832	4,090	4,520	430	10.5
Webster, S.D.....(Day Co.)..	2,287	2,549	2,883	2,826	-57	-2.0
Mokena, Il.....(Will Co.)..	2,210	3,343	3,911	4,210	299	7.6
Memphis, Mo.....(Scotland Co.)..	2,161	2,052	2,538	2,364	-174	-6.9
Weave town, N.H.....(Hillsborough Co.)..	2,123	2,643	3,146	3,215	69	2.2
Quitman Co., Ga.....(Quitman Co.)..	2,078	1,149	1,906	1,642	-264	-13.9
Eastport, Me.....(Washington Co.)..	2,074	1,781	2,118	2,158	40	1.9
Union Gap, Wa.....(Yakima Co.)..	2,024	2,784	2,747	3,128	381	13.9
Nineyah twp., In.....(Johnson Co.)..	2,007	3,000	3,486	4,003	517	14.8
Dayton twp., Mi.....(Newaygo Co.)..	1,932	2,633	2,840	2,958	118	4.2
Sugar Creek, Wi.....(Walworth Co.)..	1,920	2,545	3,179	3,007	-172	-5.4
Melville, La.....(St. Landry Parish)..	1,815	1,548	1,710	2,054	344	20.1
Bal Harbour, Fl.....(Dade Co.)..	1,781	11,288	14,842	13,271	-1,571	-10.6
Hartville, Oh.....(Stark Co.)..	1,770	3,978	3,997	4,580	583	14.6
Elk Creek twp., Pa.....(Erie Co.)..	1,598	3,235	2,652	2,957	305	11.5
Salem twp., Oh.....(Shelby Co.)..	1,549	2,495	2,848	2,979	131	4.6
Beulah, N.D.....(Mercer Co.)..	1,388	2,683	3,054	3,545	491	16.1
New Milford, Pa.....(Susquehanna Co.)..	1,376	2,076	2,483	2,197	-286	-11.5
Libson, Ia.....(Linn Co.)..	1,343	2,298	2,990	2,580	-410	-13.7
Kirklin twp., In.....(Clinton Co.)..	1,316	2,788	3,327	3,422	95	2.9

Table R. Comparison of 82 Special Censuses Taken in 1973 (Collecting 1972 Income Data) With the 1972 Administrative Records Estimates of Per Capita Total Money Income—Continued

Area (by population of special census)	Special census population	Per capita income				Percent difference
		1969	1972 special census	1972 estimate	Estimate minus special census	
<u>1,000 to 2,499--Continued</u>						
Wakeshma, Mi.....(Kalamazoo Co.)..	1,262	2,916	2,940	3,224	284	9.7
Buffalo, Tx.....(Lean Co.)..	1,260	2,046	2,501	2,376	-125	-5.0
Theresa town, Wi.....(Dodge Co.)..	1,144	2,237	2,905	2,603	-302	-10.4
Roscoe, Pa.....(Washington Co.)..	1,101	2,619	3,483	3,131	-352	-10.1
Gaston, N.C.....(Northampton Co.)..	1,047	1,942	2,557	2,681	124	4.8
Patoka twp., In.....(Crawford Co.)..	1,014	2,030	2,482	2,485	3	0.1
<u>500 to 999</u>						
St. Mary twp., Il.....(Hancock Co.)..	961	2,189	2,607	3,335	728	27.9
Clarence, Ia.....(Cedar Co.)..	950	2,982	3,066	3,551	485	15.8
Manor, Tx.....(Travis Co.)..	886	2,162	2,062	2,607	545	26.4
Young America twp., Mn.....(Carver Co.)..	814	2,272	2,951	2,724	-227	-7.7
Rush twp., Oh.....(Tuscarawas Co.)..	810	2,121	2,241	2,593	352	15.7
Dennison twp., Pa.....(Luzerne Co.)..	769	3,501	3,521	4,230	709	20.1
Carswell Plantation, Me.....(Aroostook Co.)..	731	2,141	1,946	2,680	734	37.7
Gilman twp., Mo.....(Harrison Co.)..	660	1,485	2,224	1,869	-355	-16.0
Bonaparte, Ia.....(Van Buren Co.)..	547	2,561	2,331	3,043	712	30.5
Jeromesville, Oh.....(Ashland Co.)..	538	2,504	3,329	3,105	-224	-6.7
Derby Center, Vt.....(Orleans Co.)..	527	2,087	2,968	2,593	-375	-12.6
<u>Less than 500</u>						
Brookings twp., S.D.....(Brookings Co.)..	390	3,091	3,132	2,830	-302	-9.6
Newington, Ga.....(Screven Co.)..	357	1,612	2,019	2,312	293	14.5
Freeborn, Mn.....(Freeborn Co.)..	310	3,027	2,741	2,898	157	5.7
Dudley, Pa.....(Huntingdon Co.)..	270	1,777	2,446	2,694	248	10.1
Spruce Valley twp., Mn.....(Marshall Co.)..	264	1,577	2,430	2,238	-192	-7.9
McNary, La.....(Rapides Parish)..	249	1,828	2,333	2,358	25	1.1
Benton town, N.H.....(Grafton Co.)..	238	2,317	1,788	3,673	1,885	105.4
Valley twp., S.D.....(Douglass Co.)..	197	1,468	1,574	1,940	366	23.3
Deer Creek, Ok.....(Grant Co.)..	194	1,820	2,451	3,013	562	22.9
Foosland, Il.....(Champaign Co.)..	172	2,008	2,899	3,377	478	16.5
Jacksonville, Mo.....(Randolph Co.)..	136	1,744	2,723	2,697	-26	-1.0
Nora twp., N.D.....(LaMoure Co.)..	124	1,584	1,780	3,527	1,747	98.1
Riga twp., N.D.....(McHenry Co.)..	87	1,895	1,454	2,497	1,043	71.7
Parrish town, Wi.....(Langlade Co.)..	73	4,185	3,567	2,782	-785	-22.0
Thayer, Ne.....(York Co.)..	72	1,688	2,742	3,281	539	19.7
Bryant twp. S.D.....(Faulk Co.)..	62	1,000	2,412	2,857	445	18.4

Appendix A. Derivation of Administrative Records Method Population Estimates

The following presents the derivations of the Administrative Records Method population estimates through a series of mathematical equations. Detailed explanations for the various steps, as well as justifications and data sources can be found earlier in the report. The variables used in the technical appendix are in mnemonic form.

SUBCOUNTY ESTIMATION PROCEDURE

In all of the following equations, let the subscript "ijk" denote the ith place in the jth county of the kth State.

Computation of Net Migration Rates

Given a file of individual Federal income tax returns, matched for two different years, then the net migration rate during the period between x and y ($x < y$) is developed by

$$NMIGRT_{ijk}^{x,y} = \frac{INMIG_{ijk}^y - OUTMIG_{ijk}^x}{NONMOV_{ijk}^{x,y} + OUTMIG_{ijk}^x} \quad (1)$$

where

$NMIGRT_{ijk}^{x,y}$ = the net migration rate;

$INMIG_{ijk}^y$ = exemptions on returns coded as in-migrants;

$OUTMIG_{ijk}^x$ = exemptions on returns coded as outmigrants;

$NONMOV_{ijk}^{x,y}$ = exemptions on returns coded as non-movers;

x = the earlier year of the period (1970 or 1973 in this case); and

y = the later year of the period (1973 or 1975 in this case).

Computation of the July 1, 1973 Estimates

Step 1. Computation of the household population.

The April 1, 1970, household population is derived using the following equation:

$$HHPOP_{ijk}^{70} = RESPOP_{ijk}^{70} - MILBAR_{ijk}^{70} - IC_{ijk}^{70} \quad (2)$$

where

$HHPOP_{ijk}^{70}$ = the household population on April 1, 1970;

$RESPOP_{ijk}^{70}$ = the resident population on April 1, 1970;

$MILBAR_{ijk}^{70}$ = members of the Armed Forces living in military barracks on April 1, 1970; and

IC_{ijk}^{70} = inmates of prisons, long-term hospitals, and college students enrolled in full-time programs on April 1, 1970.

Step 2. Computation of the household net migration base for the 1970-1973 period.

Resident births occurring over the period 1970 to 1973 are developed from calendar year data using the formula

$$CUMBIR_{ijk}^{70,73} = 0.75 \times CYB_{ijk}^{70} + CYB_{ijk}^{71} + CYB_{ijk}^{72} + 0.5 \times CYB_{ijk}^{73} \quad (3a)$$

where

$CUMBIR_{ijk}^{70,73}$ = the resident births occurring between April 1, 1970 and July 1, 1973;

CYB_{ijk}^t = calendar year resident births; and

t = the year.

Similarly, the resident deaths occurring over the same time period are computed from calendar year data using equation 3b.

$$CUMDEA_{ijk}^{70,73} = 0.75 \times CYD_{ijk}^{70} + CYD_{ijk}^{71} + CYD_{ijk}^{72} + 0.5 \times CYD_{ijk}^{73} \quad (3b)$$

where

$CUMDEA_{ijk}^{70,73}$ = the resident deaths occurring between April 1, 1970 and July 1, 1973;

CYD_{ijk}^t = calendar year resident deaths; and

t = the year.

Data on immigrants from abroad are obtained on a July 1 fiscal year basis for places of 100,000 or more in 1970. Immigrants for these areas are developed using equation 3c.

$$\text{CUMIML}_{ijk}^{70,73} = 0.25 \times \text{IMM}_{ijk}^{70} + \sum_{t=71}^{73} \text{IMM}_{ijk}^t \quad (3c)$$

where

$\text{CUMIML}_{ijk}^{70,73}$ = immigrants from abroad between April 1, 1970 and July 1, 1973 to places of 100,000 or more;

IMM_{ijk}^t = immigrants from abroad during the fiscal year for places of 100,000 or more; and

t = fiscal year (July 1).

For places of less than 100,000 in 1970, immigrants from abroad are estimated using 3c'.

$$\text{CUMIMS}_{ijk}^{70,73} = \frac{\text{FB}_{ijk}^{70}}{\text{FB}_{.k}^{70}} \left[0.25 \times \left(\text{IMM}_{.k}^{70} - \sum_{j=1}^M \sum_{i=1}^N \text{IMM}_{ijk}^{70} \right) + \sum_{t=71}^{73} \left(\text{IMM}_{.k}^t - \sum_{j=1}^M \sum_{i=1}^N \text{IMM}_{ijk}^t \right) \right] \quad (3c')$$

where

$\text{CUMIMS}_{ijk}^{70,73}$ = immigrants from abroad between April 1, 1970 and July 1, 1973 to places of less than 100,000;

FB_{ijk}^{70} = number of persons reporting foreign birth in the 1970 census for area i ;

$\text{FB}_{.k}^{70}$ = number of persons reporting foreign birth in the 1970 census for State k ;

$\text{IMM}_{.k}^t$ = fiscal year immigration to State k ;

IMM_{ijk}^t = fiscal year immigration to a place of 100,000 or more population;

t = the year;

M = the number of counties in State k with places of 100,000 or more; and

N = the number of places of 100,000 or more within county j of State k .

Combining the results of equations 2, 3a, 3b, 3c, and 3c', yields the household population net migration base for the 1970-1973 period. The computational form is shown in equation 4.

$$\text{HHBAS}_{ijk}^{70,73} = \text{HHPOP}_{ijk}^{70} + 0.5 \times \left[\text{CUMBIR}_{ijk}^{70,73} - \text{CUMDEA}_{ijk}^{70,73} + \text{CUMIML}_{ijk}^{70,73} \text{ ; or } + \text{CUMINS}_{ijk}^{70,73} \right] \quad (4)$$

where

$\text{HHBAS}_{ijk}^{70,73}$ = the household population net migration base for the 1970-1973 period, and all other variables are shown in equations 2, 3a, 3b, 3c, and 3c'.

Step 3. Household population net migration computation.

The net migration for an area is developed by multiplying the results of equation (4) by the results of equation (1) specific to 1970 and 1973. This calculation is shown below.

$$\text{HHMIG}_{ijk}^{70,73} = \text{NMIGRT}_{ijk}^{70,73} \times \text{HHBAS}_{ijk}^{70,73} \quad (5)$$

where

$\text{HHMIG}_{ijk}^{70,73}$ = household population net migration between 1970 and 1973, and the other variables are as defined in equations (1) and (4).

Step 4. July 1, 1973, total resident population estimate

For areas where data on Armed Forces personnel living in military barracks were not available, these figures were estimated using equation (6).

$$\text{MILBAR}_{ijk}^{73} = \frac{\text{STASTR}_{ijk}^{73}}{\text{STASTR}_{ijk}^{70}} \times \text{MILBAR}_{ijk}^{70} \quad (6)$$

where

MILBAR_{ijk}^t = the number of Armed Forces personnel living in military barracks;

STASTR_{ijk}^t = military station strength; and

t = the date.

The July 1, 1973 total resident population estimate is then computed using the above information.

$$\begin{aligned} \text{RESPOP}_{ijk}^{73} &= \text{HHPOP}_{ijk}^{70} + \text{MILBAR}_{ijk}^{73} + \text{IC}_{ijk}^{73} \\ &+ \text{CUMBIR}_{ijk}^{70,73} - \text{CUMDEA}_{ijk}^{70,73} \\ &+ \text{CUMIML}_{ijk}^{70,73} + \text{HHMIG}_{ijk}^{70,73} \text{ ; or } \quad (7) \\ &+ \text{CMIMS}_{ijk}^{70,73} + \text{HHMIG}_{ijk}^{70,73} \quad (7') \end{aligned}$$

where

\triangle_{ijk}^{73} RESPOP = the July 1, 1973 estimate of the total resident population; and

\triangle_{ijk}^{73} IC = inmates of prisons, long-term hospitals, and college students enrolled in full-time programs.

All other variables are defined in the above equations.

Computation of July 1, 1975 Estimates

Step 1. Computation of the July 1, 1973 household population.

The estimated July 1, 1973 household population is computed by

$$\triangle_{ijk}^{73} \text{ HHPOP} = \triangle_{ijk}^{73} \text{ RESPOP} - \triangle_{ijk}^{73} \text{ MILBAR} - \triangle_{ijk}^{73} \text{ IC} \quad (8)$$

where

\triangle_{ijk}^{73} HHPOP = the estimated household population on July 1, 1973.

Step 2. Computation of the household population net migration base for the 1973-1975 period.

Period births, deaths, and immigration from abroad are developed using the following equations.

$$\triangle_{ijk}^{73,75} \text{ CUMBIR} = 0.5 \times \triangle_{ijk}^{73} \text{ CYB} + 1.5 \times \triangle_{ijk}^{74} \text{ CYB}; \quad (9a)$$

$$\triangle_{ijk}^{73,75} \text{ CUMDEA} = 0.5 \times \triangle_{ijk}^{73} \text{ CYD} + 1.5 \times \triangle_{ijk}^{74} \text{ CYD}; \quad (9b)$$

$$\triangle_{ijk}^{73,75} \text{ CUMIML} = \sum_{t=74}^{75} \text{IMM}_{ijk}^t; \text{ or} \quad (9c)$$

$$\triangle_{ijk}^{73,75} \text{ CUMIMS} = \frac{\text{FB}_{ijk}^{70}}{\text{FB}_{.k}^{70}} \times \sum_{t=74}^{75} \left(\text{IMM}_{.k}^t - \sum_{j=1}^M \sum_{i=1}^N \text{IMM}_{ijk}^t \right) \quad (9c')$$

The estimated household population net migration base is then calculated by

$$\triangle_{ijk}^{73,75} \text{ HHBAS} = \triangle_{ijk}^{73} \text{ HHPOP} + 0.5 \times \left[\triangle_{ijk}^{73,75} \text{ CUMBIR} - \triangle_{ijk}^{73,75} \text{ CUMDEA} + \triangle_{ijk}^{73,75} \text{ CUMIML}, \text{ or} + \triangle_{ijk}^{73,75} \text{ CUMIMS} \right] \quad (10)$$

Step 3. Computation of the estimated household population net migration.

The estimated net migration for the household population is developed by multiplying the results of equation (10) by the results of equation (1) specific to the 1973-1975 period. This calculation is shown below.

$$\triangle_{ijk}^{73,75} \text{ HHMIG} = \triangle_{ijk}^{73,75} \text{ NMIGRT} \times \triangle_{ijk}^{73,75} \text{ HHBAS} \quad (11)$$

Step 4. Estimating the July 1, 1975 total resident population.

The estimates of the July 1, 1975 total resident population were developed using the equation

$$\begin{aligned} \triangle_{ijk}^{75} \text{ RESPOP} = & \triangle_{ijk}^{75} \text{ HHPOP} + \triangle_{ijk}^{75} \text{ MILBAR} + \triangle_{ijk}^{75} \text{ IC} \\ & + \triangle_{ijk}^{73,75} \text{ CUMBIR} - \triangle_{ijk}^{73,75} \text{ CUMDEA} \\ & + \triangle_{ijk}^{73,75} \text{ CUMIML} + \triangle_{ijk}^{73,75} \text{ CUMILS} \\ & + \triangle_{ijk}^{73,75} \text{ HHMIG} \end{aligned} \quad (12)$$

Adjusting To County Totals

After the total resident population estimates for a county are developed, they are controlled to independent estimates of the county population as shown below.

$$\triangle_{ijk}^1 \text{ FRESPOP} = \triangle_{ijk}^1 \text{ RESPOP} \times \frac{\triangle_{jk}^1 \text{ COCNTR}}{\sum_{i=1}^N \triangle_{ijk}^1 \text{ RESPOP}} \quad (13)$$

where

\triangle_{ijk}^t FRESPOP = the final total resident population estimate;

\triangle_{ijk}^t RESPOP = the total resident population estimate developed from equation (7) or (12) above;

\triangle_{jk}^1 COCNTR = the independently derived county control; and

t = the estimate date.

COUNTY AND STATE ESTIMATION PROCEDURE

In developing the estimates for States and counties, the procedures shown above have been modified to take into account additional items of information. The following pro-

cedures detail the county estimates produced using the Administrative Records Method estimates. No attempt is made here to detail either Component Method II or the Regression Method procedures. The formulas shown here pertain to the county, but they are easily adapted to the State level.

July 1, 1973 Estimates

Step 1. Computation of the cohort for the household population.

The cohort of the household population under 65 years old (those under 61.75 years on April 1, 1970) is given by the following equation:

$$\text{CHTU65}_{jk}^{70} = \text{RESU65}_{jk}^{70} - \text{MILBAR}_{jk}^{70} - \text{IC}_{jk}^{70} \quad (14)$$

where

CHTU65_{jk}^{70} = cohort of the household population under 65 years old;

RESU65_{jk}^{70} = cohort of the resident population under 65 years old;

MILBAR_{jk}^{70} = members of the Armed Forces living in military barracks on April 1, 1970¹; and

IC_{jk}^{70} = inmates of prisons, long-term hospitals, and college students enrolled in full-time programs on April 1, 1970.¹

Step 2. Computation of the base for net migration during the period 1970-1973.

The computation of the period resident deaths is very similar to the procedure used for subcounty areas. In the case of counties, the computational form for period resident births is given by

$$\begin{aligned} \text{CUMBIR}_{jk}^{70,73} &= 0.75 \times \text{CYB}_{jk}^{70} + \sum_{t=71}^{72} \text{CYB}_{jk}^t \\ &+ 0.5 \times \text{CYB}_{jk}^t \end{aligned} \quad (15)$$

The definition of the variables is given in equation (3a). However, because the cohort relates only to the population under 65 years old, the deaths must relate to the same age group. Since resident death statistics by age are not available universally by county, a national ratio of deaths under 65 years old to the total deaths was applied to county resident death statistics on an annual basis. The period resident deaths to the population under 65 years old were calculated using equation (16) below.

¹ It is assumed that the age of these special populations falls within the cohort age group.

$$\begin{aligned} \text{CUMDEA}_{jk}^{70,73} &= 0.75 \times \frac{\text{DEAU65}_{jk}^{70}}{\text{DEATHS}_{jk}^{70}} \times \text{CYD}_{jk}^{70} \\ &+ \sum_{t=71}^{72} \frac{\text{DEAU65}_{jk}^t}{\text{DEATHS}_{jk}^t} \times \text{CYD}_{jk}^t \\ &+ 0.5 \times \frac{\text{DEAU65}_{jk}^{73}}{\text{DEATHS}_{jk}^{73}} \times \text{CYD}_{jk}^{73} \end{aligned} \quad (16)$$

where

$\text{CUMDEA}_{jk}^{70,73}$ = resident deaths to the cohort of the population under 65 years old between April 1, 1970 and July 1, 1973;

DEAU65_{jk}^t = total deaths to the population under 65 years old (national data);

DEATHS_{jk}^t = total deaths (national data);

CYD_{jk}^t = total resident deaths; and

t = the year.

The procedures used to calculate the immigrants from abroad is identical with that used for subcounty areas and shown in equations (3c) and (3c'). The county level computations are made using the following:

$$\text{CUMIM}_{jk}^{70,73} = \sum_{i=1}^P \text{CUMIML}_{ijk}^{70,73} + \sum_{i=1}^Q \text{CUMIMS}_{ijk}^{70,73} \quad (17)$$

and where

P = the total number of subcounty areas with 100,000 or more population

Q = the total number of subcounty areas with less than 100,000 population.

At the county level, the measure of net movement between the military and the civilian populations is used. This measure is directly available from Department of Defense records at the State level. However, for counties, the measure is derived by applying the proportion of males 18 to 24 years old in the county to the annual State measure of net movement. Equation (18) details this procedure.

$$\text{NETMOV}_{jk}^{70,73} = \frac{\text{MA1824}_{jk}^{70}}{\text{MA1824}_{jk}^{70}} \times \sum_{t=70}^{73} \text{NETMOV}_{jk}^t \quad (18)$$

where

$\text{NETMOV}_{jk}^{70,73}$ = the net movement between the military and the civilian population from April 1, 1970 to July 1, 1973;

$MA1824_{jk}^{70}$ = males 18 to 24 years old as reported in the 1970 census;

$NETMOV_{.k}^t$ = annual net movement at the State level; and

t = the year.

Combining the results of equations (15), (16), (17), and (18) with the results of equation (14) yields the household under 65 year old net migration base for the period 1970 to 1973.

$$MIGBAS_{jk}^{70,73} = CHTU65_{jk}^{70} + 0.5 \times \left[CUMBIR_{jk}^{70,73} - CUMDEA_{jk}^{70,73} + CUMIM_{jk}^{70,73} + NETMOV_{jk}^{70,73} \right] \quad (19)$$

where $MIGBAS_{jk}^{70,73}$ is the household population under 65 year old net migration base for the 1970-1973 period.

Step 3. Computation of the net migration component

The computation of the net migration rate for counties is similar to that used for subcounty areas. The only difference is that exemptions on returns where no exemption for age or blindness was claimed were used in the computation of the net migration rate. Equation (20) denotes the computation procedure in general.

$$NMIGRT_{jk}^{x,y} = \frac{INMIG_{jk}^y - OUTMIG_{jk}^x}{NONMOV_{jk}^{x,y} + OUTMIG_{jk}^x} \quad (20)$$

Adapting equation (20) to the 1970-1973 period and multiplying the results by the results of equation (19), yields the net migration of the household population under 65 years old between 1970 and 1973. This computation is shown in equation (21).

$$HHMIG_{jk}^{70,73} = NMIGRT_{jk}^{70,73} \times MIGBAS_{jk}^{70,73} \quad (21)$$

where

$HHMIG_{jk}^{70,73}$ = the net migration of the household population under 65 years old between 1970 and 1973, and the other variables are defined above.

Step 4. Estimated resident population under 65 years old on July 1, 1973

From the above information, the resident population can be developed using equation (22) below.

$$\begin{aligned} \widehat{RESU65}_{jk}^{73} &= CHTU65_{jk}^{70} + CUMBIR_{jk}^{70,73} - CUMDEA_{jk}^{70,73} \\ &\quad + CUMIM_{jk}^{70,73} + NETMOV_{jk}^{70,73} \\ &\quad + HHMIG_{jk}^{70,73} + MILBAR_{jk}^{73} + IC_{jk}^{73} \quad (22) \end{aligned}$$

where $\widehat{RESU65}_{jk}^{73}$ represents the estimated resident population under 65 years old on July 1, 1973; the other variables are defined above.

Step 5. Estimated resident population 65 years old and over on July 1, 1973.

The resident population 65 years old and over is estimated using data on Medicare enrollees. The estimating equation is shown below. It should be noted that Medicare data are compiled as of July 1 each year.

$$\begin{aligned} \widehat{POP65}_{jk}^{73} &= POP65_{jk}^{70} + MEDCAR_{jk}^{73} - \left(0.25 \times MEDCAR_{jk}^{69} \right. \\ &\quad \left. + 0.75 \times MEDCAR_{jk}^{70} \right) \quad (23) \end{aligned}$$

where

$\widehat{POP65}_{jk}^{73}$ = the estimated resident population 65 years old and over on July 1, 1973;

$POP65_{jk}^{70}$ = the resident population 65 years old and over as counted in the 1970 census;

$MEDCAR_{jk}^t$ = July 1 Medicare enrollees; and

t = the year.

Step 6. Estimated total resident population on July 1, 1973

Summing the results of equations (22) and (23) provides estimates of the total resident population for the county on July 1, 1973.

$$\widehat{RESPOP}_{jk}^{73} = \widehat{RESU65}_{jk}^{73} + \widehat{POP65}_{jk}^{73} \quad (24)$$

with $\widehat{RESPOP}_{jk}^{73}$ representing the estimated July 1, 1973 total resident population.

July 1, 1975 Estimates

The procedures used to estimate county populations for July 1, 1975, using the Administrative Records Method closely parallel the procedures used in developing the July 1, 1973, estimates, but begins with the 1973 base.

Step 1. Estimation of the household population under 65 years old on July 1, 1973.

The household population under 65 years old on July 1, 1973, was estimated by using equation (22) and subtracting the appropriate special populations as shown in equation (25).

$$\widehat{HHU65}_{ij}^{73} = \widehat{RESU65}_{ij}^{73} - \widehat{MILBAR}_{ij}^{73} - \widehat{IC}_{ij}^{73} \quad (25)$$

Step 2. Estimation of the cohort for the household population under 65 years old.

The cohort for the household population under 65 years old on July 1, 1973, is given by

$$\widehat{CHTU65}_{ij}^{73} = \widehat{HHU65}_{ij}^{73} - \frac{POP6364^{70}}{POP65^{70}} \times \widehat{POP65}_{jk}^{73} \quad (26)$$

where

$\widehat{CHTU65}_{ij}^{73}$ = the estimate of the cohort for the household population under 65 years old on July 1, 1973;

$\widehat{HHU65}_{ij}^{73}$ = the estimated household population under 65 years old on July 1, 1973;

$POP6364^{70}$ = the 1970 census count of persons 63 and 64 years old in the nation;

$POP65^{70}$ = the 1970 census count of persons 65 years old and over in the nation; and

$\widehat{POP65}_{jk}^{73}$ = estimate of the population 65 years old and over on July 1, 1973.

The multiplicative coefficient of the last term is used to account for those persons 63 and 64 years old on July 1, 1973, who would be 65 years old and over on July 1, 1975.

Step 3. Computation of the household population net migration base for the population under 65 years old for the period 1973-1975.

The estimated household population net migration base for the population under 65 years old for the period 1973 to 1975 is computed in a manner similar to the procedure used to obtain the 1970-1973 base. Period resident births are derived by

$$CUMBIR_{jk}^{73,75} = 0.5 \times CYB_{jk}^{73} + 1.5 \times CYB_{jk}^{74} \quad (27)$$

period resident deaths to the population under 65 years old are calculated similarly to equation 16, using

$$CUMDEA_{jk}^{73,75} = 0.5 \times \frac{DEAU65^{73}}{DEATHS^{73}} \times CYD_{jk}^{73} + 1.5 \times \frac{DEAU65^{74}}{DEATHS^{74}} \times CYD_{jk}^{74} \quad (28)$$

period immigration from abroad for counties is developed similarly to equation (17), using

$$CUMIM_{jk}^{73,75} = \sum_{i=1}^P CUMIML_{ijk}^{73,75} + \sum_{i=1}^Q CUMIMS_{ijk}^{73,75} \quad (29)$$

and period net movement is calculated using

$$NETMOV_{jk}^{73,75} = \frac{MA1824_{jk}^{70}}{MA1824_{.k}^{70}} \times \sum_{t=73}^{75} NETMOV_{.k}^t \quad (30)$$

Using the above information and the results of equation (26) yields the desired net migration base as shown in equation (31.)

$$\widehat{MIGBAS}_{jk}^{73,75} = \widehat{CHTU65}_{jk}^{73} + 0.5 \times \left[CUMBIR_{jk}^{73,75} - CUMDEA_{jk}^{73,75} + CUMIM_{jk}^{73,75} + NETMOV_{jk}^{73,75} \right] \quad (31)$$

Step 4. Computation of net migration of the household population under 65 years old between July 1, 1973, and July 1, 1975.

Making equation (20) specific to the July 1, 1973, to July 1, 1975, period and applying it to the results of equation (31), yields an estimate of the household population under 65 years old net migration $\widehat{HHMIG}_{jk}^{73,75}$ as shown below.

$$\widehat{HHMIG}_{jk}^{73,75} = NMIGRT_{jk}^{73,75} \times \widehat{MIGBAS}_{jk}^{73,75} \quad (32)$$

Step 5. Estimation of the resident population under 65 years old on July 1, 1975.

The resident population under 65 years old is estimated using the following equation:

$$\widehat{RESU65}_{jk}^{75} = \widehat{CHTU65}_{jk}^{73} + CUMBIR_{jk}^{73,75} - CUMDEA_{jk}^{73,75} + CUMIM_{jk}^{73,75} + NETMOV_{jk}^{73,75} + \widehat{HHMIG}_{jk}^{73,75} + \widehat{MILBAR}_{jk}^{75} + \widehat{IC}_{jk}^{75} \quad (33)$$

Step 6. Estimated resident population 65 years old and over on July 1, 1975

The procedure used to estimate the resident population 65 years old and over on July 1, 1975, is similar to the procedure used for the July 1, 1973, estimates. The estimate is calculated by

$$\begin{aligned} \text{POP65}_{jk}^{75} &= \text{POP}_{jk}^{70} + \text{MEDCAR}_{jk}^{75} - \left(0.25 \times \text{MEDCAR}_{jk}^{69} \right. \\ &\quad \left. + 0.75 \times \text{MEDCAR}_{jk}^{70} \right) \end{aligned} \quad (34)$$

Step 7. Estimation of the total resident population on July 1, 1975

The total resident population on July 1, 1975, was estimated by combining the results of equations (33) and (34):

$$\text{RESPOP}_{jk}^{75} = \text{RESU65}_{jk}^{75} + \text{POP65}_{jk}^{75} \quad (35)$$

Adjustment to Independent State Controls

After the estimates are developed for all counties within a State, they are adjusted to agree with independently derived estimates of the State population. This adjustment is made as follows:

$$\text{FRESPOP}_{jk}^t = \text{RESPOP}_{jk}^t \times \left(\frac{\text{STCNTR}_k^t}{\sum_{j=1}^N \text{RESPOP}_{jk}^t} \right) \quad (36)$$

where

FRESPOP_{jk}^t = the final adjusted resident population estimate;

RESPOP_{jk}^t = the total resident population estimate calculated from equation (24) or (35);

STCNTR_{jk}^t = the independent State control; and

t = the estimate date.

1970 Population Counts

It should be noted that the 1970 census population counts shown in tables with the current estimates reflect governmental organization and boundaries at the time of the estimate. Appendix table A-1 gives the relationship of 1970 census publication areas to those shown in the estimate reports. For places incorporated since 1970, the 1970 census counts of the area incorporated were ascertained from the census records. The 1970 census counts used in developing the 1973 estimates reflect all corrections to date which were made after publication of the official counts. These counts have also been updated to take into account major annexations and boundary changes which have occurred since 1970.

Table A-1 Comparison of 1970 Geographic Area and Area Used for Post-1970 Estimates

Postcensal Estimation Area	1970 Census Publication Area
Baton Rouge, Louisiana	Baton Rouge city plus the balance of East Baton Rouge Parish minus the area of Baker and Zachary.
Columbus, Georgia	Muskogee County less the area of Bibb city.
Jacksonville, Florida Atlantic Beach, Florida Baldwin, Florida Jacksonville Beach, Florida Neptune Beach, Florida	Jacksonville, Florida
Indianapolis, Indiana Castleton, Indiana Homecroft, Indiana Cumberland, Indiana (pt) Warren Park, Indiana Crows Nest, Indiana Meridian Hills, Indiana North Crows Nest, Indiana Ravenswood, Indiana Rocky Ripple, Indiana Spring Hills, Indiana Williams Creek, Indiana Wynnedale, Indiana Clermont, Indiana Lynhurst, Indiana	Indianapolis, Ind.
Nashville, Tennessee Belle Meade, Tennessee Berry Hills, Tennessee Forest Hills, Tennessee Goodlettsville, Tennessee (pt) Lakeview, Tennessee Oak Hill, Tennessee Ridgetop, Tennessee (pt)	Nashville, Tennessee

Note: In Hawaii the county is the governmental organization receiving funds; therefore, estimates for the incorporated places are not shown.

Appendix B. Development of Total Money Income From BEA Personal Income: Sources, Methods, and Reconciliation

A complete conversion of personal income data to total money income is difficult, largely because of the conceptual differences in the two series and the methodological differences in the construction of the two data series. This appendix sets out the sources of the major personal income data series to develop total money income. The methodological differences in the two series cannot be resolved due to differences in the basic approach to estimating income: Survey of households versus administrative records. However, more importantly, the conceptual differences have, for the most part, been resolved as detailed below.

Wage and Salary Income¹

Wages and salaries under the census money income concept include not only private nonfarm, farm, and government cash wages and salaries, but some supplementary types of payment—military reserve pay, directors' fees, prisoners' compensation, jury and witness fees, and marriage fees paid to Justices of the Peace (components of Other Labor Income in personal income).

Because money income includes only cash wages and salaries, a major adjustment to wages and salaries in the personal income series is the exclusion of pay in kind. Most of BEA's wage estimates are based on unemployment insurance program (UI) payroll data which do not distinguish between payments in cash and in kind. However, since pay in kind plays the largest role in industries not covered by the UI program, the error introduced by the inability to isolate pay in kind from the UI-based estimates is minimal. For those sectors which are not covered, or are only partially covered, by UI, BEA makes separate estimates of cash wages and pay in kind (where applicable) based on a variety of source materials. Estimates of pay in kind received by military personnel, farm workers, and persons employed in hospitals, private educational services, nonprofit membership organizations, and private households are derived as separate components and have been removed from the personal income series to approximate the money income concept.

With the exception of military reserve pay, the Other Labor Income (OLI) items that are part of the money income definition of wages and salaries need no adjustment for conceptual differences. Military reserve pay, as a component of personal income, includes some pay in kind. The

¹ Although the Bureau of the Census does not make use of BEA's money income version of wages and salaries as it does the other components, a description of the procedures that are necessary in converting wages and salaries to a money income basis is included.

value of supplies and materials provided military reservists is available at the national level from the U.S. Budget. Therefore, State and county estimates of military reserve pay adjusted to exclude pay in kind were derived by allocating the national total less the value of supplies and materials proportionate to the geographic distribution of military reserve pay in the OLI sector of personal income.²

Prior to 1974, an adjustment was necessary to transfer military family allotments ("Q" allotments) out of *wages and salaries* to the residual category *all other income* (see page 42 for the census description of this money income category). In the State and county personal income estimates, the "Q" allotments have been part of the more inclusive component *military allowances and allotments*. To conform to the census money income definition, a national estimate of the "Q" allotments derived from data supplied by the various services was allocated to the States and counties by the distribution of all military allowances and allotments. These derived distributions of "Q" allotments were subsequently subtracted from the personal income estimates of wages and salaries.

The adjustment was discontinued when the family allotment program was terminated at the end of the 1973 fiscal year.

Net Nonfarm Self-Employment Income

Nonfarm proprietors' income in the personal income series differs from the census definition to the extent that it includes: income retained by fiduciaries, an inventory valuation adjustment, the value of homeowner construction, bad debts, and patronage refunds of farmers' co-ops. To convert to the census concept, patronage refunds of farmers' co-ops were transferred out of nonfarm proprietors' income and added to farm proprietors' income. The other four items, by definition, are excluded entirely. At the State level, the nonfarm proprietors' sector of the personal income account includes separate estimates of each of the four nonmoney income items (in SIC two-digit industry detail). Therefore, they were excluded explicitly. County estimates of net nonfarm self-employment income approximating the census concept were made by allocating the State "adjusted" estimates for each two-digit industry proportionate to the

² Under the newly revised concepts (see August 1977 Survey of Current Business), military reserve pay is included in wages and salaries. Supplies and materials will be a subcomponent of military pay in kind.

geographic distribution of its counterpart in the county personal income series.

Net Farm Self-Employment Income

Items included in the personal income estimates of farm proprietors' income that are not in the census definition of net farm self-employment income are farmland rent received by farmers, the imputed value of home consumption of food and fuel, imputed rent for farm dwellings, and an inventory valuation adjustment. The latter item is an offset of the affect of changes in inventory on farm income since net farm income in the personal income definition is a measure of the current year's production in the farm sector.

Farmland rent received by farmers is part of rental income in the census money income concept. It was subtracted from the personal income estimates of farm proprietors' income and added to the census residual category "all other income" (see this page for description). The personal income estimates are based on U.S. Department of Agriculture (USDA) data on rent paid to farm landlords (a residence concept).³ The two nonmoney items, imputed rent and the value of home consumption, are included in the personal income accounts (at their gross value) as components of gross farm income. The related expenses are intermingled with other farm production expenses. In adjusting to a money income concept at the State level, both imputed items were subtracted from farm proprietors' income on a net basis (i.e., reduced by a portion of farm expenses assumed applicable). Imputed rent on farm dwellings was reduced to a net value based on the relationship of USDA data on gross and net rents. The value of home consumption was converted to a net basis using the relationship of production costs to cash receipts from marketing. At the county level, estimates on a net basis were derived by allocating the State net figures of imputed rent and home consumption by their corresponding county distributions of gross value in the personal income series. The change in farm inventory, estimated as a separate component at both the State and county levels of personal income, was an explicit deduction in converting to money income.

State estimates of patronage refunds of farmers' co-ops which were deducted from nonfarm proprietors' income, were added to farm proprietors' income at the State level. The county estimates were derived separately for farm marketing co-ops and farm supply co-ops. Estimates for the farmer were based on distributions of cash receipts from farm marketings. Estimates for the latter were based on the sum of the distributions of farmers' purchases of feed, fertilizer and lime, and gasoline and oil.

An adjustment was also made to breakout and exclude corporate farms from the State and county estimates. Data on corporate farms are included in both USDA and census of agriculture farm and expense series.

³ Under recently revised USDA concepts, the distinction is made between farm operator landlords and nonoperator landlords (an occupational rather than residential dichotomy). Rents received by landlords who live on, but do not operate, their farms are therefore included in rental income in the revised personal income series (August 1977 Survey).

Social Security and Railroad Retirement Income

The census category Social Security and railroad retirement income is equal to the BEA estimates of Old Age, Survivors, and Disability Insurance Benefits and Railroad Retirement Benefits.

Public Assistance Income

The census concept of public assistance income is equal to the sum of the following transfer payment items in the personal income series: Federal refugee assistance payments, State and local government direct relief payments (Aid to Families with Dependent Children and General Assistance), Federal payments under the Supplemental Security Income (SSI) program, and State supplementation payments under SSI.

All Other Income

This residual includes most transfer payments in the personal income series (excluding those already specifically identified in "Social Security and Railroad Retirement Income" and "Public Assistance Income"), such as dividends, interest, rents and royalties, and income from private pensions and annuities.

Transfer payments are further grouped into seven categories for the Census Bureau's subcounty estimates (see formula VI, page 24).

Veterans' Education Payments are the sum of two personal income components, veterans readjustment benefits and educational assistance to wives and widows of veterans. No conceptual adjustments are necessary.

All Other Veterans' Payments include veterans pensions and compensation, payments to paraplegics, to war orphans, to children of disabled veterans, and unemployment insurance payments to veterans. Veterans bonuses, included in personal income, were excluded in the conversion to money income because they are usually lump sum payments.

Federal Fellowship Payments and *Payments to Indians* are separate personal income components that are included in the money income series without need for definitional adjustment.

Unemployment Insurance is the sum of the three transfer payments: State unemployment insurance benefit payments, unemployment compensation for Federal employees, and railroad unemployment benefits plus the OLI component supplementary unemployment benefits.⁴ No adjustments for concept were necessary.

Workmen's Compensation Benefits. The OLI component "compensation for injuries" in the personal income series includes hospital and medical benefits (a form of payment in kind) in addition to cash benefit payments. The OLI component was converted to the census definition of workmen's compensation benefits by excluding the benefits in kind. At the national level, this exclusion was made explicitly since the value of hospital and medical benefits

⁴ In the revised personal income series, supplementary unemployment funds are reflected in the OLI sector in terms of employer contributions rather than benefit payments to parallel the treatment of private pension, health and welfare funds.

received under workmen's compensation programs is reported annually for the United States, by the Social Security Administration. However, the State and local estimates of workmen's compensation benefits were derived by more indirect methods; i.e., the national estimates of compensation for injuries adjusted to exclude benefits in kind were allocated to the States and counties by the geographic distributions of "compensation for injuries" in the State and local personal income series.

Other Transfer Payments includes the remaining transfer payment items in the personal income series adjusted to exclude lump-sum payments, payments to nonprofit institutions, payments not expendable without restriction, and noncash items.

The lump-sum transfer payments consist of business transfers such as cash prizes and payments for injuries to persons other than employees, payments made under the provisions of the Alaska Native Claims Act, as well as portions of benefit payments from the Federal Government Life Insurance Program and from Federal civilian, State, and local government employees' retirement plans. Payments to nonprofit institutions include payments by the Federal, State, and local governments and by corporations. Income payments "not expendable without restriction" are Federal, State and local government medicare payments, Federal, State and local government payments for auto depreciation⁵ (reimbursements to employees using personal cars for official purposes), food stamp payments, Federal Government interest subsidy payments on higher education loans, Basic Education Opportunity grants, and payments made under the Education Exchange Program. The noncash item is the business transfer component, consumer bad debts. All excluded items were explicitly deducted since they are independently estimated components of transfer payments in both the State and county personal income series.

Dividends, Interest, Rents and Royalties. To convert these components from a personal income to a money income definition, a number of adjustments are necessary. At the State level, separate estimates of interest dividends, and rents and royalties conforming to money income concepts were derived by the explicit exclusion of the following components of personal income: Dividends retained by fiduciaries and dividends received by nonprofit institutions; the excess of accrued interest over interest paid on U.S. Savings Bonds, and imputed interest (principally the estimated value of financial services rendered without charge to persons by financial intermediaries); rents and royalty income retained by fiduciaries, rents and royalty income received by nonprofit institutions, and imputed rent (estimated net rental value of owner-occupied nonfarm dwelling units). Personal income estimates of rent were increased by the value of farmland rent received by farmers (as transferred from farm proprietors' income).

County estimates on a money income basis were derived more indirectly since the county personal income estimates of dividends, interest, and rent are made in considerably less

⁵ Under the newly revised concepts (August 1977 Survey of Current Business) these payments have been deleted from personal income, having been reclassified as government purchases.

detail. State estimates of dividends adjusted to the money income definition were allocated among the counties proportionate to dividends in the county personal income series. Similarly, State estimates of interest and of rent, adjusted to the census concept, were allocated proportionate to the county personal income distributions of monetary interest and monetary rent, respectively.

Income from Private Pension and Annuities, the only major component of money income that is not part of the personal income concept, is estimated by BEA to achieve a more complete approximation of total money income. At the State level, the estimates are made in three parts: income from insured private pension plans, income from noninsured private pension plans, and income from individual annuities. U.S. totals for all three are available annually from the "Life Insurance Fact Book." The annual State distributions of "benefit payments from all annuities," also available from the "Life Insurance Fact Book", were used to allocate the national totals for insured private pension plans and for individual annuities. The national totals for noninsured private pension plans were allocated to States proportionate to the distribution of Old Age, Survivors, Disability, and Health Insurance (OASDHI) cash benefit payments received by retired persons.

At the county level, the State estimates of income from private pension plans (insured and noninsured) were aggregated and allocated to the counties by the distribution of the dollar amount of OASDHI cash benefit payments received by retired persons. The State estimates for income from individual annuities were allocated to the constituent counties by the distribution of the number of persons 65 years of age and over receiving OASDHI monthly cash benefit payments.

Addendum: Residence adjustment

Census money income is a place-of-residence concept as is total personal income. Most of the wage and other labor income components of personal income (and personal contributions for social insurance), are initially estimated on a place-of-work basis since the data from which they derive are reported by place of work. The two major examples are the administrative records of the Unemployment Insurance and the Social Security programs. The exceptions to this rule are wages and OLI for farms and private households, military reserve pay, and military family allotments which are initially estimated, as reported, on a place-of-residence basis. The other personal income components, farm and nonfarm proprietors' income, dividends, interest, rents and royalties, and transfer payments, are treated as place-of-residence information since the data from which they derive are essentially on a where-received basis.⁶

The residence adjustment factors BEA uses to adjust its place-of-work components are derived from commutation data collected in the Census Bureau's journey to work studies and Internal Revenue Service county distributions of wages and salaries (tabulated from individual income tax returns)

⁶ Proprietors' income is treated as both place of work and place of residence.

for selected years. A detailed description of the residence adjustment procedures used in estimating State and county personal income appears in "Local Area Personal Income, 1969-74," Vol. 1 (see citation in footnote 30 of "State and County Data Supplied by the Bureau of Economic Analysis (BEA)" section.)

The following table illustrates, at the national level, the magnitude of the adjustments in reconciling personal income

to a money income concept. The groupings are by type of payment as designated in the personal income accounts. The related adjustments are also in terms of personal income components. This format differs from the textual description of the conversion of personal income to money income only to the extent that the text describes the reconciliation in terms of census money income categories. The adjustments, of course, are the same in either context.

<u>Type of Payment and Adjustments</u>	<u>Dollars in thousands</u>
Total Personal Income (BEA)	*1,151,721
Wages and Salaries (Personal Income)	757,387
Less:	
1. Pay-in-Kind	2,187
Hospitals	273
Private Educational Services	145
Nonprofit Membership Organizations	430
Private Households	694
Farm	269
Military	376
2. Military Family Allotments ¹	
Plus:	
1. Military Reserve Pay (net of supplies and materials) ²	1,964
2. Directors' Fees ²	686
3. Prisoners' compensation ²	14
4. Jury and Witness Fees ²	136
5. Marriage Fees Paid to Justices of the Peace ²	2
Equals: Wages and Salaries (Money Income-Census Concept)	758,002
Nonfarm Proprietors' Income (Personal Income)	59,500
Less:	
1. Income Retained by Fiduciaries	258
2. Inventory Valuation Adjustment	-3,494
3. Homeowner Construction	450
4. Bad Debts	621
5. Patronage Refunds of Farmers' Co-ops	578
Equals: Nonfarm Proprietors' Income (Money Income-Census Concept)	61,087
Farm Proprietors' Income (Personal Income)	28,154
Less:	
1. Net Value of Home Consumption	248
2. Net Imputed Rent on Farm Dwellings	1,859
3. Change in Inventory	-1,965
4. Farmland Rents Received by Farmers	727
Plus: Patronage Refunds of Farmers' Co-ops	578
Equals: Farm Proprietors' Income (Money Income-Census Concept)	27,862

*After deduction of \$47,791,000 for personal contributions for social insurance.

¹ Discontinued at the end of fiscal year 1973.

² Transferred from Other Labor Income.

<u>Type of Payment and Adjustments</u>	<u>Dollars in thousands</u>
Dividends, Interest, Rents and Royalties (Personal Income)	163,000
Less:	
1. Income Retained by Fiduciaries	3,516
Dividends	732
Interest	1,655
Rents and Royalties	1,129
2. Income Received by Nonprofit Institutions	8,545
Dividends	3,524
Interest and Rents and Royalties	5,021
3. Imputed Income	52,508
Interest	33,603
Rent	18,905
4. Excess of Accrued Interest Over Interest Paid on U.S. Savings Bonds	1,801
Plus: Farmland Rents Received by Farmers	727
Equals: Dividends, Interest, Rents, and Royalties (Money Income-Census Concept)	97,357
Transfer Payments (Personal Income)	140,092
Less:	
1. Lump-Sum Payments	4,945
Federal Government Life Insurance	670
Federal Civilian Pensions	292
Alaska Native Claims Act Payments	71
State and Local Government Retirement	1,464
Veterans Bonuses	90
Other Business Transfer Payments	2,358
2. Payments to Nonprofit Institutions	4,857
Federal Government	2,017
State and Local Governments	1,716
Corporate Gifts	1,124
3. Income Received but Not Expendable Without Restriction	17,018
Federal Medicare Payments	12,505
Federal Food Stamp Payments	3,430
Interest Subsidy Payments on Higher Education Loans	320
Education Exchange Payments	6
Basic Education Opportunity Grants	270
State and Local Government Medicare Payments	199
Federal, State and Local Government Auto Depreciation Payments	288
4. Other Noncash Items	
Business Transfers: Consumer Bad Debts	1,726
Plus: Military Family Allotments	—
Equals: Transfer Payments (Money Income-Census Concept)	111,546
Other Labor Income (Personal Income)	51,378
Less:	
1. Workmen's Compensation Hospital and Medical Benefits	1,622
2. Employer Contributions to Private Pension, Health, and Welfare Funds	43,466
3. Military Reserve Pay (including supplies and materials)	2,001
4. Directors' Fees	686
5. Prisoners' Compensation	14
6. Jury and Witness Fees	136
7. Marriage Fees Paid to Justices of the Peace	2
Equals: Other Labor Income ³ (Money Income-Census Concept)	3,451
Income from Private Pensions and Annuities ⁴ (Money Income-Census Concept)	12,985
Total Money Income: Census Concept	1,072,290

³ Workmen's Compensation (net of hospital and medical benefits) and Supplementary Unemployment Benefits.

⁴ Not included in personal income definition.

Appendix C. Development of the 1969 Per Capita Total Money Income Base for Small Units

The 1970 census collected income data for 1 out of every 5 households. This 20-percent sample was adequate for the Bureau's publication requirements and balanced the need for information with reporting burden of the public. However, with the passage of the Act of 1972 (General Revenue Sha-

ing) the sample data from the 1970 census were tabulated for all functioning governments. In 1970, over 50 percent of the General Revenue Sharing governments were below the 1,000 population level and 76 percent contained less than 2,500 people.

Number of Municipalities and Township Governments by Population Size

Population size class	Total		Municipalities		Township Governments	
	Number	Percent	Number	Percent	Number	Percent
United States	35,508	100.0	18,517	100.0	16,991	100.0
50,000 or more	478	1.3	384	2.1	94	0.6
25,000 to 49,999	638	1.8	453	2.4	185	1.1
10,000 to 24,999	1,755	4.9	1,134	6.1	621	3.7
5,000 to 9,999	2,214	6.2	1,398	7.5	816	4.8
2,500 to 4,999	3,365	9.5	1,911	10.3	1,454	8.6
1,000 to 2,499	7,148	20.1	3,573	19.3	3,575	21.0
Under 1,000	19,910	56.2	9,664	52.2	10,246	60.3

Source: U.S. Bureau of the Census, 1972 Census of Governments, Volume 1, "Governmental Organization," pages 2 and 3.

The sample data for units with a population of less than 500 was felt to lack sufficient statistical reliability for use in the preparation of the 1972 and 1974 per capita income (PCI) estimates for the Office of Revenue Sharing (ORS). Because of the time constraints involved with the task of developing an estimation model, matching data files, and processing the 38,500 1972 PCI estimates, there were no available resources on the sampling variability problem in the initial estimates used by ORS in the first eight payment periods of General Revenue Sharing.

There have been three approaches to providing acceptable PCI estimates for these areas.

1. For the first five entitlement periods, ORS decided to use the 1969 county per capita income figure for all subcounty units with a 1970 census 20-percent sample population of less than 500. The Census Bureau concurred with this decision with the understanding that the problem would be resolved when the next set of estimates was produced.
2. For the 1972 per capita income estimates used for allocation for Entitlement Periods 6, 7, and 8, the Bureau was unable to satisfactorily resolve the problem so it chose a second interim procedure. The PCI estimates for

these governmental units with a 1970 population in the 500 to 999 range were computed by applying the average percent change in PCI for the county, excluding large places (over 10,000 population), to their 1970 census PCI. PCI estimates for these governmental units with a 1970 population of less than 500 were assumed to be equal to the average PCI of the county excluding any large places. The subcounty estimates were adjusted to the county estimates to insure conformity.

3. This procedure, incorporated in the 1974 and revised 1972 PCI estimates, makes use of the 1970 census per capita income to the extent possible, but modifies the 1970 figures through the use of other information which has no sampling variability (value of housing 100 percent 1970 census question or IRS data), or less sampling variability such as the county PCI. The methodology for developing this estimate base is detailed below.

METHODOLOGY

Although there is theoretical justification for using the county PCI amount to stabilize the small subcounty PCI estimates, tests have shown that the use of the county PCI is of limited value and can produce biased results. In addition,

the use of the county PCI for small units does not make use of additional economic data available for these small areas, such as housing value from the 1970 census and income information from tax returns. In theory, a regression estimate using PCI estimates for the small units as the dependent variable and the county PCI value as well as the additional data as independent variables would be preferable. Although the regression estimates are not biased and do make use of additional data for the individual areas, they do not constitute the best estimate because they do not make full use of the information contained in the sample PCI estimates for the small units. A set of estimates with lower overall statistical error can be developed by forming a weighted average of the two estimates.

The regression estimates were prepared using the sample PCI for the subject areas as the dependent variable. The independent variables were the 1970 census value of owner-occupied housing units (a 100-percent item) and IRS Adjusted Gross Income per exemption for the subject area, and the same variables plus 1970 census per capita income for the county area. There is a substantial degree of quality control exercised in the development and the use of the regression estimates. The census and IRS data for the regression estimates are tested for reliability before they are used. If one or more of the independent variable data items are suspect, based on constraints put on the levels of the variables, those variables are dropped from the regression equation. Each estimate is then flagged to indicate which variables were used in the equation.

The weights applied to the two per capita figures are measured by the statistical error present in those figures. The error in the sample estimate is the sampling variability or variance in the estimate. The error in the regression estimate is the variance plus the bias squared. The variance in the regression estimate is never greater than that in the sample estimate, and for small places will typically be substantially less. As a result, the statistical error for the regression estimates has a high probability of being smaller than that for the sample estimates for the subject areas. The weight for each estimate varies inversely to their relative statistical error. For example, if the statistical error in the sample estimate is twice as large as that for the regression estimate, the weight applied to the sample estimate is .33, and that applied to the regression estimate is .66. If the error in both estimates is relatively equal, an equal weight is applied to each estimate.

The weighted estimate is theoretically better than either the sample or the regression estimate because, on the average, the error present will be less. This does not, however, guarantee that the weighted PCI will have less error for any particular estimate. As a result, constraints have been put on the weighted estimates to control the level of the individual estimates. No weighted estimate is allowed to deviate from the sample estimate by more than one standard error.

Empirical Testing of the 1969 Weighted Per Capita Income Estimates

Two tests were designed to determine the accuracy of the 1969 weighted per capita income estimates relative to the

1970 census sample PCI figure and the county PCI plug estimates used for the original round of estimates. The first test can be cited as somewhat the "ideal" type of test where 1972 estimates based on the three PCI amounts are compared to an independent per capita income estimate calculated from a special census in which income was collected on a 100-percent basis. The test is limited by the small number of areas where such censuses were taken: only 24 in the size classes we are dealing with here. The second test, which groups subject areas into groups of 10 to reduce the sampling variability of the 1970 census per capita income estimates, is used to evaluate, for the group, the weighted estimate method and the county value replacement method. This test has the advantage of utilizing all areas of interest in the test, constituting a very substantial comparison of the weighted estimates and the county replacement values. It cannot be used, however, to compare directly the 1970 census PCI for a particular area with the two other estimates.

The approach to the "Special Census Test" is very simple. The 1970 census sample per capita income figure, the 1969 weighted PCI estimates, and the 1970 census county PCI figure are updated to 1972; the absolute percent difference of each figure from the special census figure is calculated, and the average difference for all places in two size classes (1970 census sample population less than 500 and between 500 and 999) is compared. The results are shown in table C-1.

Compared to the special census PCI values in the less than 500 population size class (17 areas), the average absolute percent difference for the updated weighted estimates was 22.0 percent, which is 6.5 less than that for the updated 1970 census sample figures (28.6) and almost 10 percent less than that for the updated county value replacement figures (31.6). In this size class the updated weighted estimate was closer to the special census estimate than the updated census figure in 10 of the 17 cases, and was better than the county value replacement estimates in 13 of the 17 cases. The results for the "500 to 999 size class" (9 areas) are similar. The average absolute difference is smaller for all three PCI figures, but that for the updated weighted estimate, at 15.6 percent, is about 3.5 percent less than the difference in the sample and county figures (19.1 and 19.3 respectively). These results of this test do favor the use of the 1969 weighted PCI estimate over the two other figures, but the reliability of the results must be considered suspect because of the very small number of areas included in the test. There are almost 10,000 places and MCD's in the two size classes.

The "Groups of Ten Test" was designed to expand the evaluation process to include all areas in the subject size classes. In the absence of special census estimates to be used as the comparison base we created a better 1970 census sample figure by grouping the subject areas into blocks of 10 areas each. The sampling variability on the PCI figure for a group of 10 areas is substantially less than that on the PCI figures for each of the 10 areas. The grouping of the areas is a controlled process to avoid diluting the effectiveness of the test. The areas are sorted by level of IRS Adjusted Gross Income per exemption and are then grouped from that sort.

Table C-1. Comparison of Selected 1972 PCI Estimates to 1972 Special Census PCI Values

Special census areas	1972 special census PCI	1972 PCI estimates and percent difference from special census PCI					
		Using 1970 census PCI base		Using 1969 PCI estimate base		Using county or MCD PCI base	
		1972 estimate	Percent difference	1972 estimate	Percent difference	1972 estimate	Percent difference
1970 CENSUS WEIGHTED SAMPLE POPULATION LESS THAN 500							
All areas.....	(X)	(X)	28.6	(X)	22.0	(X)	31.6
Newington, Ga.....	2,019	2,225	10.2	2,302	14.0	2,279	12.9
Fosland Village, Ill.....	2,899	2,771	-4.4	3,199	10.3	3,796	30.9
Bonaparte, Iowa.....	2,331	3,126	34.1	2,942	26.2	2,542	9.1
McNary, La.....	2,333	2,303	-1.3	2,527	8.3	2,908	24.6
Freeborn Village, Minn.....	2,741	3,693	34.7	3,338	21.8	2,922	6.6
Spruce Valley Twp., Minn.....	2,430	1,894	-22.1	1,949	-19.8	2,076	-14.6
Jacksonville, Mo.....	2,723	2,338	-14.1	2,611	-4.1	3,233	18.7
Thayer, Neb.....	2,742	2,245	-18.1	2,870	4.7	3,452	25.9
Benton Town, N. H.....	1,788	2,874	60.7	3,284	78.7	3,570	99.7
Nora Twp., N. D.....	1,780	2,629	47.7	2,754	54.7	3,476	95.3
Riga Twp., N. D.....	1,454	2,749	89.1	2,411	65.8	2,711	86.5
Deer Creek, Okla.....	2,451	2,493	1.7	2,673	9.1	2,762	12.7
Dudley Borough, Pa.....	2,446	2,168	-11.4	2,411	-1.4	2,608	6.6
Brookings Twp., S. D.....	3,132	3,400	8.6	3,309	5.7	2,395	-23.5
Valley Twp., S. D.....	1,574	1,946	23.6	1,972	25.3	2,114	34.3
Bryant Twp., S. D.....	2,412	1,120	-53.6	2,158	-10.5	2,695	11.7
Parrish Town, Wisc.....	3,567	5,399	51.4	4,079	14.4	2,721	-23.7
1970 CENSUS WEIGHTED SAMPLE POPULATION BETWEEN 500 AND 999							
All areas.....	(X)	(X)	19.1	(X)	15.6	(X)	19.3
Caswell Plantation, Me.....	1,946	2,656	36.5	2,490	28.0	2,646	36.0
Sugar Creek Twp., Mo.....	2,224	2,035	-8.5	2,315	4.1	2,018	-9.3
Jeromesville, Ohio.....	3,329	3,081	-7.4	3,418	2.7	3,072	-7.7
Rush Twp., Ohio.....	2,241	2,545	13.6	2,619	16.9	2,546	13.6
Dennison Twp., Pa.....	3,521	4,411	25.3	4,095	16.3	4,430	25.8
Manor, Texas.....	2,062	2,746	33.2	2,765	34.1	2,740	32.9
Derby Center, Vt.....	2,968	2,694	-9.2	2,754	-7.2	2,675	-9.9

X Not applicable.

The areas are sorted by income level because a random grouping would result in a large number of groups with an average 1970 census PCI level which could be reflected by grouped weighted estimates or county estimates where large errors were cancelled out by the grouping itself. When areas with similar income levels, based on data independent of the sample estimates, are grouped together, the potential for homogenizing the groups is reduced.

The areas are sorted by level of IRS Adjusted Gross Income per exemption because these data are independent of the 1970 census sample income data, which, if used as the basis for the sort and then as the object of the comparison, could themselves subject the test to bias by overstating the error in the weighted estimates or the county figures. By using an independent data item to determine this ordering of units, it allows a variation in the sample data to be reflected, and at the same time permits group membership to be determined independent of the estimates derived from this particular sample.

The sorting was done in several stages. In the preparation of the regression estimates, IRS data were not used in the regression equation if the 1969 exemptions per capita ratio was outside the .8 to 1.1 range. This condition occurred in about 60 percent of the cases. Because of this, it was decided

to evaluate separately the estimates where the IRS data were not used to see if this had a large effect on the accuracy of the weighted estimates. In addition, MCD's and places were sorted separately. The results is four different sorts:

1. MCD's where IRS data were used in weighted estimates,
2. Places where IRS data were used in weighted estimates,
3. MCD's where IRS data were not used, and
4. Places where IRS data were not used.

Tables C-2 and C-3 show the results of the "Groups of Ten Test." The data show that, with or without IRS data, for MCD's or for places, the 1969 weighted per capita income estimates for the "Groups of Ten" reflected the 1970 census sample PCI figures far more accurately than did the estimates using the county PCI. For MCD's with weighted estimates using IRS data, the "Groups of Ten" weighted estimates were closer to the 1970 census sample figure 90 percent of the time; for place groupings, they were closer in 73 percent of the cases. The "Groups of Ten" weighted estimates not using IRS data in the formula were closer for 86 percent of the MCD groupings and for 80 percent of the place groupings.

The results of the "Groups of Ten Test" strongly favor the use of the 1969 weighted estimates over the 1969 PCI figures for counties. But they are even more significant than this. There is strong evidence of a large degree of accuracy in the weighted estimates themselves, regardless of their comparison to the county figures. For each of the four groups, 70 percent or more of the grouped weighted estimates are within one standard error of the grouped PCI estimate.

About 90 percent or more are within two standard errors. In addition, the results of this test show there is almost no bias in the weighted estimates when they are grouped together. Thus, based on statistical theory and the results of these tests, there is a strong case for the conclusion that the 1969 weighted estimates for the individual areas would be more reliable than both the county and the sample PCI figures.

Table C-2. Relation of 1969 PCI Estimates and 1969 County PCI Value Replacements to 1970 Census PCI for Groups of Ten

(For places with 1969 IRS exemptions to 1970 census population ratio between .8 and 1.1. Percents may not add to totals due to rounding)

Relation to 1969 sample PCI	MCD's and places				MCD's only				Places only			
	1969 estimate		1969 county value replacements		1969 estimate		1969 county value replacements		1969 estimate		1969 county value replacements	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total groups.....	546	100.0	546	100.0	334	100.0	334	100.0	212	100.0	212	100.0
Within 10% of sample PCI.....	482	88.3	249	45.6	320	95.8	138	41.3	172	81.1	111	52.4
Outside 10% of sample PCI.....	64	11.7	297	54.4	14	4.2	196	58.7	40	18.9	101	47.6
Within one standard error....	411	75.3	146	26.7	287	85.9	77	23.1	149	70.3	61	28.8
Between one and two standard errors.....	92	16.8	144	26.4	44	13.2	74	22.2	28	13.2	60	28.3
Outside two standard errors..	43	7.9	256	46.9	3	0.9	183	54.8	35	16.5	91	42.9
Closer to sample PCI.....	457	83.7	89	16.3	300	89.8	34	10.2	154	72.6	58	27.4

Table C-3. Relation of 1969 PCI Estimates and 1969 County PCI Value Replacements to 1970 Census PCI for Groups of Ten

(For places with 1969 IRS exemptions to 1970 census population ratio outside the .8 to 1.1 range. Percents may not add to column totals due to rounding)

Relation to 1969 sample PCI	MCD's and places				MCD's only				Places only			
	1969 estimate		1969 county value replacements		1969 estimate		1969 county value replacements		1969 estimate		1969 county value replacements	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total groups.....	903	100.0	903	100.0	473	100.0	473	100.0	430	100.0	430	100.0
Within 10% of sample PCI.....	780	86.4	424	47.0	427	90.3	199	42.1	360	83.7	213	49.5
Outside 10% of sample PCI.....	123	13.6	479	53.0	46	9.7	274	57.9	70	16.3	217	50.5
Within one standard error....	676	74.9	282	31.2	375	79.3	138	29.2	306	71.2	143	33.3
Between one and two standard errors.....	155	17.2	249	27.6	84	17.8	115	24.3	82	19.1	127	29.5
Outside two standard errors..	72	8.0	372	41.2	14	3.0	220	46.5	42	9.8	160	37.2
Closer to sample PCI.....	740	81.9	163	18.1	406	85.8	67	14.2	342	79.5	88	20.5