AGGREGATE INCOME AND INCOME SIZE DISTRIBUTION ESTIMATES FOR SELECTED STANDARD METROPOLITAN STATISTICAL AREAS

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The United States Decennial Population Census provides income data once every 10 years for areas such as counties and Standard Metropolitan Statistical Areas (SMSA's). There has been a steadily growing demand for current income data (Census basis) for these areas. Accordingly, a research program has been initiated to develop estimates of aggregate income and income size distribution using available Administrative Record sources, such as Internal Revenue Service (IRS) tax base information. Preliminary research findings are included in this paper which consists of three parts. The first part analyzes estimation procedures used to obtain aggregate income levels for 17 SMSA's. The second part describes a technique using lognormal probability graph paper to derive income size distribution data. The third part outlines directions for further research.

Derivation of Aggregate Income Estimates

Table I presents estimates of aggregate income (Census basis) for 17 large SMSA's for income years 1963 and 1965, respectively. These SMSA's were limited to areas which do not cross State boundaries and which had no changes in area definition since 1959. Two methods, designated I and II, were used to develop alternative estimates. These procedures are outlined in the Methodological Appendix. In essence, method I relates SMSA Census data with IRS published adjusted gross income (AGI) information and personal income data published by the Office of Business Economics. Method II relates SMSA Census data with personal income data only. Moreover, method II implicitly assumes a constant SMSA/State per capita income ratio over time.

For 1963 and 1965, respectively, 10 and 11 of the 17 SMSA estimates developed by using the two alternative methods showed a net percentage difference of less than 5 percent. In 1965, the following SMSA's had net percentage differences of greater than 5 percent: Atlanta, Georgia; Baltimore, Maryland; Miami, Florida; Newark, New Jersey; Pittsburgh, Pennsylvania; and San Diego, California. An analysis of these differences revealed that in all of these areas, the SMSA/State ratio of per capita AGI indicated decreases (from 6 percent in Newark SMSA to 16 percent in Baltimore SMSA) from 1959 to 1965 (see table II). These net percentage differences are related directly to the assumed consistency over time of the SMSA/State per capita income ratio.1/

As a check on the estimate, aggregate income totals from the Current Population Survey (CPS) for three SMSA's were computed for 1963 and 1965. It should be noted that CPS and Census data are not strictly comparable since the former covers the noninstitutional population only (see the Methodological Appendix for detailed definition). As shown in table III of the six estimates developed by method I for 1963 and 1965, five showed net percentage differences of less than 10 percent (between CPS data and method I estimates).

Derivation of SMSA Income Size Distribution

This procedure uses lognormal probability graph paper. In essence, this method attempts to capitalize on three empirical findings: (1) for larger population areas, income size distribution usually does not change rapidly over time, (2) State and SMSA income size distributions are generally similar and (3) income size distributions of joint tax returns and family units are fairly uniform. Essentially, the following steps are involved in this graphic technique:

1. IRS published information shows biennially AGI distribution by all returns and joint returns for SMSA's. As noted above, joint returns are assumed to follow distribution of families. Individual returns are obtained by subtracting joint returns from all returns. Individual returns are assumed to follow the distribution of unrelated individuals.

2. For income year 1959 the income size distributions of families and joint returns for the State are plotted on lognormal probability paper. The 1959 family income distribution for the SMSA is also plotted. For income year 1965, the income size distribution of joint returns for the State is plotted. These plotted distributions are examined for uniform curve types (including position and shape). The same procedure is followed for SMSA data. (For 1959, SMSA joint returns distribution is not published but 1961 data may be used.)

3. The general consistency of these plotted distributions for the State and for the SMSA, covering income years 1959, 1961, and 1965 are examined. If these distributions show similar curve types, then it is assumed that the 1965 joint return distribution can be used to estimate 1965 family distribution. An analysis is made to determine whether the SMSA and State joint return distributions have shifted proportionately over time. The percentage increases in median income for joint returns between 1961 and 1965 for the SMSA and for the State are obtained. If these rates of change are similar then the percentage increase in the median income of joint returns for the State between 1959 and 1965 are applied to the 1959 SMSA median family income to obtain an extrapolated SMSA median family income for 1965. Based upon this extrapolated median figure, 1965 family distribution data for the SMSA are plotted following that of the joint return distribution for the SMSA.

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Table I.--COMPARISON OF 1963 AND 1965 TOTAL MONEY INCOME (CENSUS BASIS) FOR SELECTED SMSA'S--METHODS I AND II

SMSA	1963			1965		
	Method I (million dollars) (1)	Method II (million dollars) (2)	Net percent difference Col. (1) / Col. (2)	Method I (million dollars) (1)	Method II (million dollars) (2)	Net percent difference Col. (1) / Col. (2)
Atlanta, Ga.	2,536.4	2,587.5	-2.0	2,981.5	3,227.5	-7.6
Baltimore, Md.	3,800.7	4,225.1	-10.0	4,303.1	5,144.9	-16.4
Buffalo, N.Y.	2,759.1	2,984.1	-7.5	3,176.5	3,277.3	-3.1
Chicago, Ill.	17,611.7	18,156.7	-3.0	19,872.6	20,708.2	-4.0
Dallas, Texas	2,860.4	2,912.7	-1.8	3,391.5	3,413.2	-0.6
Denver, Colo.	2,558.8	2,635.3	-2.9	2,801.4	2,870.0	-2.4
Detroit, Mich.	9,179.2	9,612.9	-4.5	11,428.3	11,861.0	-3.6
Miami, Fla.	2,103.0	2,338.9	-10.1	2,393.1	2,709.4	-11.7
Minn.-St. Paul, Minn.	4,108.6	4,059.6	+1.2	4,529.7	4,661.2	-2.8
New York, N.Y.	31,106.2	30,327.9	+2.6	34,295.8	33,833.3	+1.4
Newark, N.J.	5,076.8	5,081.9	-0.1	5,381.5	5,754.4	-6.5
Paterson-Clifton-Passaic, N.J.	3,828.6	3,550.7	+7.8	3,988.4	4,049.7	-1.5
Pittsburgh, Pa.	4,843.6	5,104.5	-5.1	4,945.0	5,745.2	-13.9
San Bernardino-Riverside-Ontario, Calif.	2,096.5	2,085.7	+0.5	2,397.7	2,405.3	-0.3
San Diego, Calif.	2,282.9	2,784.8	-18.0	2,658.3	3,068.9	-13.4
Seattle-Everett, Wash.	3,326.0	3,095.6	+7.4	3,452.8	3,471.1	-0.5
Tampa-St. Petersburg, Fla.	1,673.8	1,670.1	+0.2	1,912.0	1,942.4	-1.6

Table II.--RELATIONSHIP OF TOTAL INCOME--NET PERCENT DIFFERENCES TO SMSA/STATE PER CAPITA AGI RATIO

SMSA		Aggregate income: Net percent difference between Methods I and II (1)	SMSA per capita AGI (2)	State per capita AGI (3)	Ratio SMSA/State per capita AGI Col.(2) / Col.(3) (4)	Net percent difference 1965/1959 Col.(4) (5)
Atlanta, Ga.	1959		1,708	1,145	1.49	
	1965	-7.6	2,348	1,703	1.38	-7.4
Baltimore, Md.	1959		1,915	1,982	0.96	
	1965	-16.4	2,134	2,638	0.81	-15.6
Buffalo, N.Y.	1959		1,997	2,207	0.91	
	1965	-3.1	2,328	2,689	0.87	-4.4
Chicago, Ill.	1959		2,349	2,076	1.13	
	1965	-4.0	2,883	2,656	1.09	-3.5
Dallas, Tex.	1959		1,879	1,402	1.34	
	1965	-0.6	2,361	1,772	1.33	-0.7
Denver, Colo.	1959		1,978	1,692	1.17	
	1965	-2.4	2,450	2,148	1.14	-2.6
Detroit, Mich.	1959		2,044	1,817	1.12	
	1965	-3.6	2,699	2,486	1.09	-2.7
Miami, Fla.	1959		1,768	1,424	1.24	
	1965	-11.7	2,072	1,894	1.09	-12.1
Minn.-St. Paul, Minn.	1959		1,989	1,558	1.28	
	1965	-2.8	2,590	2,087	1.24	-3.1
New York, N.Y.	1959		2,423	2,207	1.10	
	1965	+1.4	2,996	2,089	1.11	+0.9
Newark, N.J.	1959		2,370	2,121	1.12	
	1965	-6.5	2,839	2,716	1.05	-6.2
Paterson-Clifton-Passaic, N.J.	1959		2,192	2,121	1.03	
	1965	-1.5	2,761	2,716	1.02	-1.0
Pittsburgh, Pa.	1959		1,926	1,785	1.08	
	1965	-13.9	2,130	2,300	0.93	-13.9
San Bernardino-Riverside, Calif.	1959		1,603	2,104	0.76	
	1965	-0.3	1,944	2,578	0.75	-1.3
San Diego, Calif.	1959		1,876	2,104	0.89	
	1965	-13.4	2,053	2,578	0.80	-10.1
Seattle-Everett, Wash.	1959		2,072	1,837	1.13	
	1965	-0.5	2,616	2,328	1.12	-0.9
Tampa-St. Petersburg, Fla.	1959		1,405	1,424	0.99	
	1965	-1.6	1,836	1,894	0.97	-2.0

Table III.--COMPARISON OF AGGREGATE TOTAL MONEY INCOME OBTAINED FROM CURRENT POPULATION SURVEY, METHODS I AND II (CENSUS BASIS), AND IRS STATISTICS OF INCOME SELECTED SMSA'S--1963/1965

(In million dollars)

SMSA	CPS aggregate income (1)	Aggregate income Method I (2)	Aggregate income Method II (3)	Adjusted gross income (4)	Net percent difference (2)/(1) (5)	Net percent difference (3)/(1) (6)	Net percent difference (4)/(1) (7)
1963							
Chicago, Ill.....	16,688.3	17,611.7	18,156.7	16,574.6	+5.5	+8.8	-0.7
Detroit, Mich.....	8,646.3	9,179.2	9,612.9	8,782.3	+6.2	+11.2	+1.6
Pittsburgh, Pa.....	5,325.1	4,843.6	5,104.5	4,807.0	-9.0	-4.1	-9.7
1965							
Chicago, Ill.....	18,128.5	19,872.6	20,814.9	19,377.9	+9.6	+14.8	+6.9
Detroit, Mich.....	10,497.2	11,428.3	11,550.9	11,138.4	+8.9	+10.0	+6.1
Pittsburgh, Pa.....	5,609.5	4,945.0	5,718.3	5,064.6	-11.8	+1.9	-9.7

Source: (1) March 1964 and 1966 CPS Consumer Income Tabulations--Families.
(2) Statistics of Income--Individual Income Tax Returns, Internal Revenue Service, 1963 and 1965.

4. The same steps can be followed to obtain estimated 1965 distribution data for unrelated individuals from individual returns. This general procedure was used except for few modifications to obtain data for Denver, Colorado, one of the 11 SMSA's in 1965 which showed a net percentage difference in aggregate income of less than 5 percent using methods I and II. In the graphic analysis for Denver, the 1965 Census family distribution was estimated using the 1965 joint return distribution for Denver after extrapolating the 1959 median Census family income. The rate of increase was based upon changes in median values of joint returns for the State, between 1959 and 1965. This is described in more detail in the Methodological Appendix.

Directions for Further Research

Empirical findings have revealed that distributions of wage and salary income obtained from both IRS and Census data are generally similar. Differences between IRS and Census income size distribution data can be related to three relationships: (1) whether or not the distribution of income types other than wage and salary income changes over time in proportion to distribution of wage and salary income, (2) whether or not the IRS tax return population changes over time in proportion to the Census consumer unit population, and (3) whether or not the area-State data ratio remains consistent or changes over time. A major task is to investigate further the extent of the applicability of these "proportionality" assumptions to areas other than those covered in this paper.

The data presented herewith are considered first estimates. These data are being compared with other available data sources, e.g., published State tax data, in order that the adequacy of these data can be evaluated further.

Other estimation methods are also being developed. For example, under certain conditions, a simple extrapolation of 1959 SMSA Census data using rates of increase developed from AGI data for the SMSA results in similar aggregates obtained from using method I.

The estimation procedure on income size distribution involves a subjective analysis of the position and shape of the curve types. It is planned to formalize these procedures in an estimation model so that information can be analyzed more objectively.2/

Footnotes

1. A detailed explanation of the relationship between methods I and II is shown in Section III of the Methodological Appendix.

2. IRS tends to report fewer low income families than Census in their respective income size distributions. Income tax data normally not cover persons receiving less than $600 annual income and exclude certain transfer payments, e.g., Social Security, unemployment compensation, etc. and "occupational" payments. Consequently, some means must be found to adjust for these differences in coverage. One possible method is to develop mathematical relationships whereby Census data are functionally related to IRS data at decile values.

METHODOLOGICAL APPENDIX

I. DEFINITIONS

Standard Metropolitan Statistical Areas.--Except in New England, a Standard Metropolitan Statistical Area is a county or group of contiguous counties which contains at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. In addition to the county, or counties, containing such a city or cities, contiguous counties are included in a SMSA if, according to certain criteria, they are essentially metropolitan in character and are socially and economically integrated with the central city. In New England, SMSA's consist of towns and cities, rather than counties.

Between 1959 and 1965, the range of income years compared in this study, there were amendments to the definition of many SMSA's throughout the United States. These definitional changes were generally additions or deletions of towns and/or counties. A listing of the amended areas is located in Part IV, pages 45-52 in Standard Metropolitan Statistical Areas, 1967, prepared by the Office of Statistical Standards, Bureau of the Budget.

Income Reported in the Census and Current Population Survey (CPS).--In the 1960 Census, total income was the sum of money received by persons 14 years old and over from wages or salaries, net income (or loss) from self-employment, and income other than earnings.

Income from wages or salary was the total money earnings received for work performed as an employee, including wages, salary, pay from Armed Forces, commissions, tips, piece-rate payments, and cash bonuses earned.

Self-employment income was net money income (gross receipts minus operating expenses) obtained from a business, farm, or professional enterprise in which the person was engaged on his own account or as an unincorporated employer. Gross receipts included the value of all goods sold and services rendered. Expenses included the costs of goods purchased, rent, heat, light, power, depreciation charges, wages and salaries paid, business taxes, etc.

Income other than earnings was money income received from sources other than wages or salary and self-employment, such as net income (or loss) from rents or receipts from roomers or boarders; royalties; interest, dividends, and periodic income from estates and trust funds; Social Security benefits; pensions; veterans' payments, military allotments for dependents, unemployment insurance, and public assistance or other

governmental payments; and periodic contributions for support from persons who were not members of the household, alimony, and periodic receipts from insurance policies or annuities.

Receipt from the following sources were not included as income: money received from the sale of property, unless the recipient was engaged in the business of selling such property; the value of income "in kind," such as free living quarters or food produced and consumed in the home; withdrawals of bank deposits; money borrowed; tax refunds; gifts and lump-sum inheritances or insurance benefits. Further information is found in Consumer Income, Series P-60, No. 51, Current Population Reports.

Adjusted Gross Income (Less Adjusted Gross Deficit).--Adjusted gross income was gross income from all sources that are subject to income tax minus (1) ordinary and necessary expenses of operating a trade or business, (2) expense deductions attributable to rents and royalties, (3) expenses of outside salesmen attributable to earning salary or other compensation, (4) expenses of travel, meals, and lodging while away from home overnight paid by an employee with respect to services rendered, (5) transportation cost related to the performance of services as an employee, (6) expenses for education required to maintain salary, status, or present employment, (7) expenses paid or incurred in connection with service as an employee under a reimbursed or other expense allowance arrangement with the employer, (8) exclusion of allowable sick pay if the sick pay was included in gross salary, (9) depreciation and depletion allowed life tenants and income beneficiaries of property held in trust, (10) deductible losses from sales of capital assets, and other property, (11) deduction equal to 50 percent of this excess of net long-term gain over net short-term capital loss, (12) net operating loss deduction, (13) contributions to a retirement fund by the self-employed, (14) reasonable expenses incurred in moving from old residence to new residence at new place of employment, and (15) any other deductions or exclusions from gross income.

Deficits in adjusted gross income occur when deductions allowed for the computation of adjusted gross income, as stated above, exceeded the gross income. See Statistics of Income - 1965, Individual Income Tax Returns, Internal Revenue Service, for further details.

The definition of adjusted gross income is subject to amendment through changes in law. Items 13, 14, and 15 of the 1965 definition were not part of the 1959 definition.

OBE Personal Income.--The personal income totals developed by the Office of Business Economics include, among other items, the following types of nonmoney income which are not included in the Census definition: wages received in kind, the value of food and fuel produced and consumed on farms, the net rental value of owner-occupied homes, the property income received by mutual life insurance companies, and the value of the services of banks and other financial intermediaries rendered to persons without the assessment of specific charges. These items of income in kind account for about 5 percent of total personal income. The Census definition of income, on the other hand, includes such items as regular contributions for support received from persons who do not reside in the same living quarters, income received from roomers and boarders residing in households, and employer contributions for social insurance which are not included in the personal income series. These items, however, represent a much smaller income total than the nonmoney items included in OBE personal income. For further information, see pages 49-65, Personal Income by States Since 1929 prepared by the Office of Business Economics, Department of Commerce.

II. POPULATION COVERAGE

Office of Business Economics.--In general, the population data used in computing per capita personal income by States are the midyear (July 1 of income year) estimates published by the Bureau of the Census. These estimates exclude Federal civilian and military personnel stationed outside the continental United States.

Adjusted Gross Income (IRS Returns).--This population universe is composed of all persons reported on all 1965 individual income tax returns and all prior-year delinquent returns for each State and SMSA. The prior-year delinquent returns comprise less than 1 percent of all returns filed.

Population Reported by the Bureau of the Census.--The population data used in the calculation of per capita income in 1959 was the 1960 Census enumeration of total residents in each SMSA and State as of April 1, 1960. This enumeration included all civilian institutional and noninstitutional, as well as the total military population living in the SMSA. For 1963 and 1965, the population of each area was extrapolated for April 1, 1964 and 1966, respectively, from population estimates furnished in the Series P-25 reports. Differences in population coverage between independent Census estimates and CPS totals are explained later in this appendix.

Per Capita Income.--The per capita income is derived by dividing the total income of the SMSA by the population in the SMSA. This description is applicable to both the Census and OBE income series as described above.

III. ESTIMATING METHOD - AGGREGATE INCOME

A. Method I.--This method of SMSA income estimation assumes that a proportional relationship exists in the same period in time and over time between Census income and Internal Revenue Service Adjusted Gross Income (AGI) data. It assumes also that Census per capita income increases over time at the same rate as OBE per capita income. This ratio-estimation method involves a three-stage procedure and is described

in terms of estimating SMSA income for 1965. The first step involves an adjustment of the July 1, 1966 State population estimates to conform with the estimate as of the Census date of April 1, 1966. The second step requires obtaining aggregate income (Census basis) for the State in which the SMSA is located. This is accomplished through multiplication of the 1965 per capita income for the State by the estimated State resident population (as of April 1, 1966). The State 1959 per capita income is extrapolated by a ratio of change calculated from OBE per capita income for 1959 and 1965. The final step involves obtaining the proportion of SMSA income to the State total income (as derived above). A ratio-estimation formula relating 1959 and 1965 Internal Revenue Service Adjusted Gross Income (AGI) data with Census data is employed.

B. Method II.--As in method I, three steps are also required to estimate SMSA income by this method. In the first step, the 1965 midyear SMSA resident population is adjusted as of the "Census" date of April 1, 1966. In the second step, the 1965 per capita income (Census basis) is calculated for the State and SMSA. The SMSA per capita income is derived from use of the relationship between 1959 State and SMSA per capita income. This method of income estimation assumes that the State and SMSA per capita income (Census basis) relationship remains stable over time. It assumes also, as in method I, that State per capita income (Census basis) increases over time at the same rate as State per capita (OBE) personal income. The final step involves the estimation of 1965 SMSA aggregate income. The SMSA resident population estimated as of April 1, 1966 is multiplied by the 1965 SMSA per capita income (Census basis).

The above procedures with appropriate population and income data adjustments were employed also in the estimation of corresponding 1963 aggregates shown in tables I and III.

See illustrations of methods I and II on the following pages.

C. Method I vs. Method II.--The elements of information that are required to perform the calculations by each of these methods are compared in the diagram below. All cells that are marked with an "X" indicate that the particular element is a necessary part of the estimation process.

Element	Method I		Method II	
	State	SMSA	State	SMSA
Per capita personal income (OBE), 1959.....	X		X	
Per capita personal income (OBE), 1965.....	X		X	
Per capita income (Census), 1959.....	X	X		X
Census population, 4/1/60..	X	X		
Census population, 7/1/65..	X	X		X
Census population, 7/1/66..	X	X		X
Adjusted gross income (IRS), 1959.....	X	X		
Adjusted gross income (IRS), 1965.....	X	X		

It is evident from the above scheme that method II estimates can be calculated using data from the Bureau of the Census and the Office of Business Economics. In contrast, method I totals require published data from three governmental sources--Bureau of the Census, Internal Revenue Service (IRS), and the Office of Business Economics (OBE). Moreover, the adjusted gross income data furnished by IRS is only available biennially. This lack of information precludes the possibility of estimating income annually by method I, unless additional techniques such as interpolation are introduced.

A definite relationship exists between method I and II estimates based on the differences in the rate of growth from 1959 to 1965 of population and AGI estimates between the State and SMSA. Specifically, if:

$$R_I = \frac{\text{SMSA AGI,1965}}{\text{SMSA AGI,1959}} \Big/ \frac{\text{State AGI,1965}}{\text{State AGI,1959}} \quad \text{and}$$

$$R_P = \frac{\text{SMSA population,1966}}{\text{SMSA population,1960}} \Big/ \frac{\text{State population,1966}}{\text{State population,1960}}$$

then the method I estimate equals $\frac{R_I}{R_P}$ multiplied by the method II estimate.

Thus, if both State population and State AGI change over time at the same rates as for the SMSA, method I will equal method II. The relative ease of calculation and the availability of annual Census population estimates lend support to a preference for using method II. However, method I can be modified so that it requires data obtained only from the Bureau of the Census and the Internal Revenue Service. To find a modified method I estimate (designated as method III) multiply the 1959 SMSA aggregate income (Census basis) by the ratio of increase of the SMSA adjusted gross income (AGI) between 1959 and 1965.

Thus: Method III = 1959 SMSA aggregate income (Census basis) $\times$ $\frac{\text{SMSA AGI,1965}}{\text{SMSA AGI,1959}}$

Method III is related to method I by the following relationship:

$$\text{Method I} = \frac{\text{State personal income,1965}}{\text{State personal income,1959}} \times \frac{1}{\frac{\text{State AGI,1965}}{\text{State AGI,1959}}} \times \text{Method III}$$

Method III has the same ease of calculation as method II without having to make the assumption that SMSA income increases at the same rate as the State income.

Current Population Survey (CPS) Aggregate Income.--Income distributions for all families and for all unrelated individuals for selected SMSA's in the United States were tabulated from the March Current Population Survey. Estimates of total money income shown in table III were computed by

ILLUSTRATION OF METHOD I

	State of Colorado	Denver SMSA	SMSA Income / State Income
A. Adjustment of July 1, 1966 State Population Estimates to Conform with Census Base of April 1, 1966			
(1) July 1, 1966	1,955,000		
(2) July 1, 1965	1,949,000		
(a) Difference (Δ)	6,000		
(b) .75Δ	4,500		
(3) July 1, 1965	1,949,000		
(4) April 1, 1966 population (est.)	1,953,500		
B. Estimating State Per Capita Income (Census Basis)--1965			
(1) Per capita income (Census basis)--1959	1,889		
(2) Per capita personal income--1959	2,196		
(3) Per capita personal income--1965	2,706		
(4) Rate of change in per capita personal income--1965/1959	1.2322		
(5) Per capita income (Census basis) estimate--1965 (B1 X B4) (1,889 X 1.2322)	2,328		
C. Estimating Aggregate State Income--1965			
(1) Population (est.) April 1, 1966	1,953,500		
(2) Per capita income (Census basis) (est.)--1965	2,328		
(3) Aggregate income (Census basis) (est.)--1965 ($000)	4,547,748		
D. Estimating SMSA Aggregate Income			
(1) Per capita income (Census basis)--1959	1,889	2,167	
(2) Population, April 1, 1960	1,753,947	929,383	
(3) Aggregate income (Census basis)--1959 ($000)	3,313,206	2,013,973	.608
(4) IRS Adjusted Gross Income--1959 ($000)	2,967,757	1,838,082	.619
(5) IRS Adjusted Gross Income--1965 ($000)	4,196,165	2,632,842	.627
(6) Aggregate income (Census basis) (est.)--1965 ($000)	4,547,748		
(7) SMSA share based on 1959/1965, State/SMSA proportional relationship			.616[1/]
(8) Denver SMSA aggregate income (Census basis)--1965 ($000)		2,801,413	

1/ $\frac{619}{627} = \frac{.608}{X}$

$X = .616$

ILLUSTRATION OF METHOD II

	Denver SMSA	State of Colorado	SMSA Income State Income
A. Adjustment of July 1, 1965 SMSA Population Estimates[1] to Conform with Census Base of April 1, 1966			
(1) July 1, 1965	1,073,000		
(2) July 1, 1964	1,071,000		
(a) Difference (Δ)	2,000		
(b) 1.75 Δ	3,500		
(3) July 1, 1964	1,071,000		
(4) April 1, 1966 population (est.)	1,074,500		
B. Estimating State and SMSA Per Capita Income (Census Basis)			
(1) SMSA/State per capita income ratio--1959	2,167	1,889	1.1472
(2) Per capita personal income--1959		2,196	
(3) Per capita personal income--1965		2,706	
(4) Rate of change in per capita personal income--1965/1959		1.2322	
(5) Per capita income (Census basis) (est.)--1965 (1,889 X 1.2322)		2,328	
(6) Per capita income (Census basis) (est.)--1965 (2,328 X 1.1472)	2,671		
C. Estimating SMSA Aggregate Income (Census Basis)			
(1) Per capita income (Census basis)--1965	2,671		
(2) Population, April 1, 1966	1,074,500		
(3) Denver SMSA aggregate income--1965 [C(1) X C(2)] ($000)	2,869,990		

1/ July 1, 1966 population estimates are currently available for selected SMSA's. For these SMSA's, the resident population is calculated as three-quarters of the difference between July 1, 1966 and July 1, 1965 population totals published in the P-25 series reports (Bureau of the Census).

multiplying the frequencies in each income interval by the corresponding mean estimate and then summing these products. For the upper open-end class interval, the Pareto formula was used. These products were then aggregated into subtotals for families and for unrelated individuals. The two subtotals were combined into a grand total for families and unrelated individuals.

IV. GRAPHICAL ANALYSIS--INCOME SIZE DISTRIBUTION

Chart 1.--Joint Returns vs. Families, Denver SMSA and Colorado State, 1959 and 1965.

Family and joint return income size distribution data for the State in 1959 appears to show a uniform pattern. The shape of the State and SMSA curves also show a uniform pattern. The 1965 distribution was estimated as follows:

A. 1959 median income of joint returns for the State of Colorado was estimated at $5,800. The 1959 median income of families for the State was estimated at $5,800.

B. 1965 median income of joint returns for the State was estimated at $7,400. The net percentage increase between 1959 and 1965 for median income of joint returns was 27.6 percent. This rate of increase was used to extrapolate the 1959 Denver SMSA median family income figure ($6,600) to obtain the estimated 1965 SMSA median family income figure ($8,400). Based upon the 1965 median figure, the 1959 family income distribution curve was shifted upward to obtain the estimated SMSA 1965 family income distribution.

Chart 2.--Individual Returns vs. Unrelated Individuals, Denver SMSA and Colorado State, 1959 and 1965.

State 1959 income distributions of individual returns and unrelated individuals are not uniform. Consequently, the extrapolated 1965 income distribution of unrelated individuals is not as adequate as the family income distribution. It also appears that the relationship between income distributions for Denver SMSA and for the State is not consistent. One method that can be used to obtain preliminary estimates (subject to further review) of income size distribution of unrelated individuals is described below:

A. The rate of increase between 1961 and 1965 of the median income of IRS individual returns in the SMSA was obtained. Using a ratio-estimation formula, the rate of increase (between 1959 and 1965) for median income of individual returns for the SMSA was computed.

B. Using this rate of increase (between 1959 and 1965), the 1959 median income figure of unrelated individuals in the SMSA was extrapolated to 1965. The relationship between the 1959 distribution for unrelated individuals and the 1965 distribution for individual returns was examined. Since the curve types appear generally similar, estimated SMSA 1965 income distribution for unrelated individuals was plotted following the SMSA 1959 distribution for unrelated individuals.

V. LIMITATIONS

The SMSA's examined in this paper are limited to those which do not cross State boundaries. As can be seen in the illustrative computations for methods I and II, the total and per capita income relationships between the SMSA and the State which contains it underly these methods, in addition to the explicit relationship assumed among IRS, Census, and OBE income data.

Differences in Income Concepts and Population Coverages.--In addition to limitations noted previously, consideration must also be given to differences in the income definitions and population coverage employed in the estimation of Census, CPS, IRS, and OBE data in any comparative assessment of totals derived from the various sources. The income concepts used in Census and CPS are basically the same. However, differences do exist in the population coverage. The CPS excludes the institutional population and most members of the Armed Forces living on post. These two groups were included in the Population Census. Secondly, college students are generally enumerated at their own home in the Current Population Survey and classified as family members, but in the Census they were enumerated at their college residence, usually as secondary individuals.

The IRS income data are not directly comparable with those obtained from Census or CPS. Income, as defined for tax purposes, differs from the concept employed by the Bureau of the Census. For example, certain types of receipts such as veterans' payments, Social Security benefits, and relief payments, which constitute the main income source for some families, are excluded from income tax coverage. Moreover, the coverage of income tax statistics is less inclusive because persons receiving less than $600 (less than $1,200, if 65 years old and over) are not required to file returns.

Both the CPS and IRS income totals are based on sample data, and, as such, are subject to sampling variability. For additional information on the CPS sample selection, see Technical Paper No. 7, The Current Population Survey - A Report on Methodology, U.S. Department of Commerce, Bureau of the Census. Comparable background information on the IRS sample of tax returns is available in the Statistics of Income - 1965, Individual Income Tax Returns, Internal Revenue Service.

Chart 1.--JOINT RETURNS VS. FAMILIES

DENVER SMSA AND COLORADO, 1959, 1965

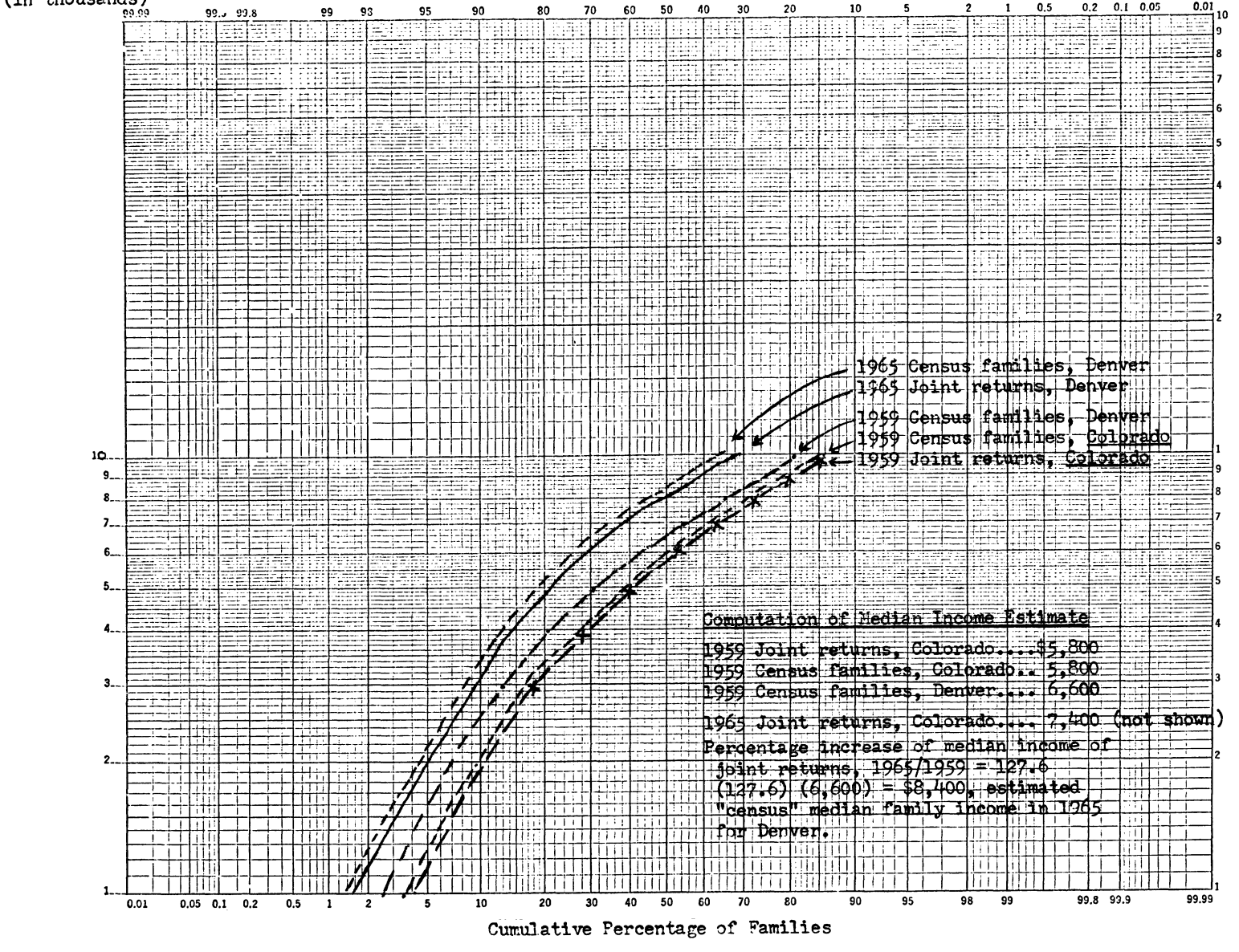

Chart 2.--INDIVIDUAL RETURNS VS. UNRELATED INDIVIDUALS

DENVER SMSA AND COLORADO, 1959, 1965