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ILLUSTRATIVE PROCEDURE OF THE CENSUS BUREAU'S COMPONENT METHOD II

Section A.--Steps in the Application of Component Method II to Middlesex County, New Jersey: July 1, 1963

Section B.--Review and Evaluation of Basic Data, and Discussion of Underlying Assumptions

Section C.--Computer Programming

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CONTENTS

	Page
Introduction	1
Section A.--Steps in the application of Component Method II to Middlesex County, New Jersey: July 1, 1963	2
The basic arithmetic	2
Summary of components	2
Item-by-item procedure	2
Section B.--Review and evaluation of basic data, and discussion of underlying assumptions	6
List of topics discussed and relation to section A items	6
Review and evaluation, by topic	6
Limitations of Component Method II	12
Section C.--Computer programming	13
Exhibit I.--Identification of variables	14
Exhibit II.--Method II FORTRAN Program	15

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ILLUSTRATIVE PROCEDURE OF THE CENSUS BUREAU'S COMPONENT METHOD II

INTRODUCTION

This report is the first in a planned series of reports detailing methodology of preparing population estimates for geographic areas, such as cities, counties, and States. Each report will present a detailed step-by-step application of a specific method, as well as an exposition on sources of data, review and evaluation of basic data, and discussion of the underlying assumptions. The methods to be illustrated are those now (or formerly) used by the Bureau of the Census in preparing current population estimates of counties in its regular program of metropolitan-area population estimates. These methods are (a) the Census Bureau's Component Method II, which employs vital statistics to measure natural increase, and school enrollment (or school census data) as a basis for measuring net migration; (b) a composite method, in which separate estimates are prepared for different segments of the population using different types of current data for each group (separate estimates are prepared for the population under 5 years, 5 to 17, 18 to 44, and 45 years and over); (c) the Vital Rates method, which employs data on births and deaths as indicators of total population change; and (d) a housing unit method, in which estimated changes in the number of occupied housing units are used as the basis for estimating changes in population.

The illustrative procedure of the Census Bureau's Component Method II detailed here represents an updating of earlier reports of this nature. Component Method II had been illustrated previously in Current Population Reports, Series P-25, No. 133 and No. 20. For a long time, Component Method II was the single method used by the Bureau of the Census in preparing estimates of State population and was recommended for use as the single, preferred method for preparing local population estimates. Recent research suggests, however, that the averaging together of several estimates tends to improve the overall results, provided that the methods use symptomatic data which are largely independent of one another.[1]

Thus, at the State level, estimates based on Component Method II are now averaged together with estimates derived by a regression method (ratio-correlation), whereby a multiple regression equation is used to relate changes in a number of different data series to changes in population distribution. For counties, the average of the results of several methods, including Component Method II, is used to derive current population estimates.[2]

The illustrative step-by-step procedures of the other methods of estimating current population indicated above, will be issued individually, as completed. After all of the reports have been completed, it is planned to combine them into a single Handbook of Methods. Included in the Handbook (and here) will be a section devoted to the adaptability of the methods to electronic computers. Then the Handbook will serve both individuals interested in developing estimates for only one or two counties and those concerned with a large number of areas (perhaps all counties and cities in a State), where computer processing becomes practical.

This report is divided into three sections as follows: Section A--Step-by-step application of method to Middlesex County, New Jersey; Section B--Review and evaluation of basic data, and discussion of underlying assumptions; and Section C--Computer programming.

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[1] Meyer Zitter and Henry S. Shryock, Jr., "Accuracy of Methods of Preparing Postcensal Population Estimates For States and Local Areas," Demography, Vol. 1, No. 1, 1964.

[2] For discussions of various methods used by the Bureau of the Census in preparing State and county population estimates, see Current Population Reports, Series P-25, Nos. 330, 324, and 298.

SECTION A.–STEPS IN THE APPLICATION OF COMPONENT METHOD II TO MIDDLESEX COUNTY, NEW JERSEY: JULY 1, 1963

THE BASIC ARITHMETIC

Civilian resident population, July 1, 1963 = Civilian resident population, April 1, 1960
+ Natural increase, April 1, 1960, to July 1, 1963
+ Net civilian migration, April 1, 1960, to July 1, 1963
+ Net movement between civilian and military population, April 1, 1960, to July 1, 1963.

Total resident population, July 1, 1963 = Civilian resident population, July 1, 1963
+ Armed Forces residing in area on July 1, 1963.

SUMMARY OF COMPONENTS

Population base--civilian resident population on April 1, 1960 (Items 1 to 3)	433,134
Natural increase, April 1, 1960, to July 1, 1963 (Items 4 to 8)	22,471
Estimated net civilian migration, April 1, 1960, to July 1, 1963 (Items 9 to 23)	+13,958
Net movement between civilian and military population, April 1, 1960, to July 1, 1963 (Items 24 to 28).	[3]-352
Estimated civilian resident population on July 1, 1963 (Items 29 to 33)	469,211
Armed Forces residing in the county on July 1, 1963 (Item 34)	431
Estimated total resident population July 1, 1963 (Item 35)	469,642

ITEM-BY-ITEM PROCEDURE

Items 1 to 3--Population Base, April 1, 1960

1. Total resident population of Middlesex County on April 1, 1960 433,856

   Source: U.S. Bureau of the Census, 1960 Census of Population, Vol. I, Characteristics of the Population, Part 32, New Jersey, table 6.

*2. Military personnel residing in the county on April 1, 1960 722

   Source: Local base commanders, or the individual military services, or the Statistical Services Center of the Department of Defense for station strength statistics. See also 1960 Census counts of Armed Forces in the area.

3. Civilian resident population on April 1, 1960: (Item 1)-(Item 2) 433,134

Items 4 to 8--Natural Increase, April 1, 1960, to July 1, 1963

*4. Registered births, by residence, April 1, 1960, to July 1, 1963 33,459

   Source: Division of Vital Statistics, Public Health Service, Vital Statistics of the United States, published annually.

Year	Registered births
1960	10,308
1961	10,518
1962	10,072
1963	10,276

(4/1/60 to 7/1/63 = .75 x 1960 + 1961 + 1962 + .5 x 1963)

*5. Estimated percent completeness of birth registration in Middlesex County in 1960-63 ..... 100.0

   For large metropolitan counties, it is safe to assume for present purposes that births (and deaths) are completely registered.

*6. Births, by residence, adjusted for underregistration, April 1, 1960, to July 1, 1963: (Item 4)/(Item 5) 33,459

*7. Deaths, by residence, April 1, 1960, to July 1, 1963 10,988

   Source: Same as for Item 4.

Year	Registered deaths
1960	3,282
1961	3,339
1962	3,429
1963	3,516

(4/1/60 to 7/1/63 = .75 x 1960 + 1961 + 1962 + .5 x 1963)

8. Natural increase, April 1, 1960, to July 1, 1963 (births minus deaths): (Item 6)-(Item 7) 22,471

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*See Section B for further discussion of this item.

[3] Minus sign (-) denotes net loss of civilian population to Armed Forces.

Items 9 to 23--Net Civilian Migration, April 1, 1960, to July 1, 1963

9. General procedure:

As illustrated here, net civilian migration is estimated in the following manner: (1) a net migration rate for children 7.50 to 15.49 years old is developed on the basis of population data from the 1960 Census and on local statistics on school enrollment in the elementary grades 2 to 8; (2) this rate is multiplied by a factor to obtain an estimated migration rate for the population of all ages; (3) this latter rate is applied to a population base consisting of the civilian non-institutional population of all ages in the area in 1960 plus one-half the births since April 1, 1960, minus one-half the deaths, plus one-half the net movement between the civilian and military population, to obtain an estimate of net civilian migration for the period since 1960.

*10. Public school data for Middlesex County:

The following figures on membership in grades 2 to 8 plus unclassified elementary enrollment in the public schools in Middlesex County, as of October 1 of the school year, were obtained from the New Jersey State Department of Public Instruction:

October 1 enrollment	Number
1959	44,920
1960	48,452
1961	51,134
1962	53,966
1963	56,763

*11. Parochial school data for Middlesex County:

The following figures on enrollment in grades 1 to 8 of the parochial schools in Middlesex County as of October 1 of each year were obtained from the Superintendent of Catholic Schools of the Trenton Diocese:

October 1 enrollment	Number
1959	20,201
1960	21,230
1961	21,423
1962	22,305
1963	23,536

Here grade data were not available; consequently, enrollment in the elementary grades 1 to 8 (excluding kindergarten) is used instead of enrollment in grades 2 to 8.

12. Public school enrollment, April 1, 1960 46,686

*See Section B for further discussion of this item.

The figures in Items 12 and 13 are obtained by linear interpolation between October 1, 1959, and 1960 enrollment data, viz: 1/2 1959 + 1/2 1960.

13. Parochial school enrollment, April 1, 1960 20,716

14. Total elementary enrollment, April 1, 1960: (Item 12) + (Item 13) 67,402

15. Public school enrollment, July 1, 1963 56,064

The figures in Items 15 and 16 are obtained by linear interpolation between October 1, 1962, and 1963, viz: 1/4 1962 + 3/4 1963.

16. Parochial school enrollment, July 1, 1963 23,228

17. Total elementary enrollment, July 1, 1963: (Item 15) + (Item 16) 79,292

*18. Estimated population of elementary school age (7.50 to 15.49 years old) on July 1, 1963, including effect of migration:

a. Population 7.25 to 15.24 years old on April 1, 1960: 3/4 (7 years) + (8 to 14 years) + 1/4 (15 years). 66,562

Source: The population of Middlesex County by single years of age for the ages under 21 on April 1, 1960, is presented in table 27 of the 1960 Census of Population, Vol. I, Characteristics of the Population, Part 32, New Jersey, by age, color, and sex.

b. Number enrolled on April 1, 1960: (Item 14) 67,402

c. Ratio: (Item 18a)/(Item 18b) .... .9875

d. Number enrolled on July 1, 1963: (Item 17) 79,292

e. Estimated population 7.50 to 15.49 years old on July 1, 1963: (Item 18c) x (Item 18d) 78,301

*19. Expected population of elementary school age, assuming no migration, July 1, 1963:

a. The expected population of elementary school age, assuming no migration on July 1, 1963, is the survivors 7.50 to 15.49 years old, from the appropriate age group in 1960. This group was 4.25 to 12.24 years old on April 1, 1960.

b. The number of survivors (expected population) on July 1, 1963, of the population 4.25 to 12.24 years old on April 1, 1960, is given in the following table. The population 4.25 to 12.24 years old is derived as follows: 3/4 (4 years) + (5 to 11 years) + 1/4 (12 years).

Color and sex	Population 4.25 to 12.24 years old, April 1, 1960 (cohort) (1)	Survival factor[1] (2)	Survivors 7.50 to 15.49 years old, July 1, 1963 (expected population) (3)=(1) x (2)
White:			
Male.....	37,371	.99836	37,310
Female.....	35,769	.99892	35,730
Nonwhite:			
Male.....	1,658	.99771	1,654
Female.....	1,564	.99840	1,561
Total....	76,362	(X)	76,255

X Not applicable.
[1] Based on U.S. life table, 1959-61.

c. The expected population of elementary school age (7.50 to 15.49 years old) on July 1, 1963, for Middlesex County, assuming no migration, obtained by summing the color-sex groups in column (3) of the table is..... 76,255

20. Net change in population in this cohort due to migration..... +2,046

The difference between the 78,301 persons 7.50 to 15.49 years old estimated to be in Middlesex County on July 1, 1963, in Item 18e above, and the estimated survivors of the same age, in Item 19c, represents a net change of +2,046 persons, or a net gain of population in this age range due to net in-migration.

21. Migration rate for this cohort, April 1, 1960, to July 1, 1963:

a. Net migration for the cohort: (Item 20)..... +2,046

b. Size of the cohort on April 1, 1960..... 76,362

The cohort on April 1, 1960, comprises persons 4.25 to 12.24 years old as shown in column (1) of the table in Item 19b above.

c. The migration rate for the period between April 1, 1960, and July 1, 1963, is equal to: (Item 21a)/(Item 21b)..... +.0268

*22. Migration rate for the population of all ages, April 1, 1960, to July 1, 1963 = (Item 21c) x 1.1775 (migration factor)..... +.0316

The migration factor of 1.1775 represents the ratio of intercounty migrants at all ages to intercounty migrants in school ages, for the April 1, 1960, to July 1, 1963, period. See Section B for the source and derivation of the migration factors.

*23. Estimated total net civilian migration, April 1, 1960, to July 1, 1963:

a. Civilian noninstitutional population of Middlesex County on April 1, 1960: (Item 3) minus institutional population in 1960... 430,645

Source: Inmates of institutions for Middlesex County are presented in table 28 of 1960 Census of Population, Vol. I, Characteristics of the Population, Part 32, New Jersey.

b. One-half births during the period: 1/2 (Item 6)..... 16,730

c. One-half deaths during the period: 1/2 (Item 7)..... 5,494

d. One-half net movement between civilians and Armed Forces for Middlesex County, April 1, 1960, to July 1, 1963: 1/2 (Item 28)..... [4]-176

e. Population base for computing estimate of net migration at all ages: (Item 23a) + (Item 23b)-(Item 23c) + (Item 23d)..... 441,705

f. Net civilian migration at all ages: (Item 23e) x (Item 22)... +13,958

*See Section B for further discussion of this item.
[4] Minus sign (-) denotes net loss of civilian population to Armed Forces.

Items 24 to 28--Net Movement Between the Civilian and Military Population, April 1, 1960, to July 1, 1963

24. Male population 18 to 24 years old for Middlesex County on April 1, 1960.... 14,411

Source: Table 27 of 1960 Census of Population, Vol. I, Characteristics of the Population, Part 32, New Jersey.

25. Male population 18 to 24 years old for New Jersey on April 1, 1960..... 223,180

Source: Table 16 of 1960 Census of Population, Vol. I, Characteristics of the Population, Part 32, New Jersey.

26. Ratio: (Item 24)/(Item 25)..... .0646

27. Net movement between the civilian and military population for New Jersey, April 1, 1960, to July 1, 1963..... [5]-5,454

Source: Data are available from Chief, Population Division, U.S. Bureau of the Census, or latest Current Population Reports, Series P-25, presenting State estimates.

*28. Net movement between the civilian and military population for Middlesex County, April 1, 1960, to July 1, 1963: (Item 26) x (Item 27)..... [5]-352

*See Section B for further discussion of this item.

[5] Minus sign (-) denotes net loss of civilian population to Armed Forces.

Items 29 to 33--Civilian Resident Population July 1, 1963

29. Civilian resident population on April 1, 1960: (Item 3)..... 433,134

30. Natural increase, April 1, 1960, to July 1, 1963: (Item 8)..... 22,471

31. Estimated net civilian migration, April 1, 1960, to July 1, 1963: (Item 23)..... +13,958

32. Net movement between the civilian and military population, April 1, 1960, to July 1, 1963: (Item 28)..... [5]-352

33. Estimated civilian resident population on July 1, 1963: (Item 29) + (Item 30) + (Item 31) + (Item 32)..... 469,211

Item 34--Resident Armed Forces on July 1, 1963

*34. Armed Forces residing in Middlesex County on July 1, 1963..... 431

Source: Same as for Item 2.

Item 35--Total Resident Population on July 1, 1963

35. Total resident population of Middlesex County on July 1, 1963: (Item 33) + (Item 34)..... 469,642

SECTION B.–REVIEW AND EVALUATION OF BASIC DATA, AND DISCUSSION OF UNDERLYING ASSUMPTIONS

LIST OF TOPICS DISCUSSED AND RELATION TO SECTION A ITEMS

Topic	Section A item number	Page
Resident military population, 1960 and estimate date	2 and 34	6
Registered births by residence	4	6
Adjustment of births for underregistration	5 and 6	7
Deaths by residence	7	7
Use and evaluation of school enrollment data in developing estimates of net civilian migration	10 and 11	8
Estimated population of elementary school age	18	9
Expected population of elementary school age (survivors of 1960 cohort)	19	10
Migration rate for the population of all ages	22	11
Population base for computing all-ages net migration	23	12
Net movement between civilian and military population	28	12

REVIEW AND EVALUATION, BY TOPIC

Resident Military Population, 1960 and Estimate Date (Items 2 and 34)

Where no appreciable military population is known to be located in the area for which a current estimate is to be prepared, a total resident rather than a civilian resident population can be used as the 1960 population base, and no last-step adding of current military population is necessary.

Where there is a large resident military population in the estimate area, the estimate should be prepared for a civilian resident population. Armed Forces must then be subtracted from the initial census count in 1960 for a civilian resident population base and the current Armed Forces added as a last step to the current civilian resident population estimate.

Since station strength (where the military population is assigned, as reported by the Department of Defense) does not necessarily correspond with the place of residence of the Armed Forces as enumerated in censuses, it is advisable to review 1960 station strength data against the 1960 Census counts of resident Armed Forces to determine the relationship between the two. Where the two series are about the same, station strength statistics can be used to represent the resident statistics of the Armed Forces both in 1960 and on the estimate date. Where there is an appreciable difference between the two series in 1960, however, it will be necessary to work out a special adjustment to convert current station strength data to a residence basis using 1960 relationships of reported station strength to that indicated in the census. Then use with 1960 Census military.

Registered Births by Residence (Item 4)

The number of registered births for each calendar year, 1960 through 1963, shown in Item 4 is based on the residence of the mother at the time of the birth. It is important to distinguish births reported by residence from births reported by place of occurrence.

To obtain births for the period April to December 1960, a satisfactory expedient is to use three-fourths of the number of registered births in 1960. Similarly, for the period January to June 1963, one-half of the number of registered births in 1963 can be used. More refined estimates for 1960 and 1963 using proportions based on published monthly vital statistics for States may be made, if desired.

Figures for counties and for urban places of 10,000 inhabitants or more in 1960 are given in the source reference. Figures for these as well as for additional places commonly are available, by residence, in the records of State Health Departments or in their publications. Both Vital Statistics of the United States and the data compiled by the State Departments of Health should be checked to determine the kind of vital statistics available to the user.

In some cases, where vital statistics by residence are not available for the most recent year, figures may be available on an occurrence basis.[6]

[6] The Monthly Vital Statistics Report, published by the Division of Vital Statistics, contains provisional births and deaths by occurrence for States and five large cities.

These may be converted to a residence basis by the use of the ratio of resident births to births by occurrence that prevailed in the latest year for which both series of births are available.

Where data are not available for the latest year in the time series, it may be expedient to estimate births for the missing year by assuming (a) that they are the same as in the preceding year; or (b) they changed since the preceding year in the same way as national births. Estimating a year's data will have relatively little effect on the eventual population estimate.

Adjustment of Births for Underregistration (Items 5 and 6)

Completeness of registration of births is at such a high level for most places in the United States that there is little reason to attempt an adjustment of births for underregistration. In developing estimates for metropolitan counties, for example, the Bureau of the Census now assumes 100 percent registration completeness for all counties included in this program.

For places where birth registration completeness is believed to be a problem, however, some adjustment for underregistration may be considered necessary. The following source documents may be of use as guides in determining what areas are likely to be deficient in birth registration.

In conjunction with the 1950 Census, the National Office of Vital Statistics (now Division of Vital Statistics, National Center for Health Statistics, Department of Health, Education, and Welfare) conducted a test of birth registration completeness for States and smaller areas. The results of this test are published in National Office of Vital Statistics, Vital Statistics--Special Reports, Vol. 39, No. 2 and No. 4, "Birth Registration Completeness in the United States and Geographic Areas, 1950," Part I, "Data for Each State," and Part II, "Data for Local Areas." Data for States, counties, and urban places of 10,000 inhabitants or more are given in these reports. No comparable test was conducted in conjunction with the 1960 Census.

It is highly probable that improvement in registration completeness has occurred since 1950. Where areas had close to 100 percent completeness of coverage in 1950, it is logical to assume that there is now no problem of birth underregistration. Where an area had less than 90 percent completeness of registration in 1950, however, it may be considered desirable to make some sort of correction to current registered birth totals.

A technique which has been used for correcting current births involves applying separate 1950 registration completeness factors for births occurring in hospitals and outside hospitals.[7] The basic rationale in using the 1950 factors in this manner is that: (1) birth registration tends to be more complete for births occurring in hospitals than for births outside of hospitals; and (2) births have been increasingly concentrated in hospitals since 1950. This should result in improved overall birth registration completeness, despite an assumption of no improvement in registration either in hospitals or outside hospitals.

This procedure, of course, may underestimate the degree of improvement, however. Registration completeness in hospitals in 1950 was generally at a very high level, and there is little likelihood of much improvement. Registration completeness outside hospitals, however, was frequently quite low and could have improved markedly. An alternate procedure in updating these 1950 factors might be to assume convergence of the outside-hospital underregistration level to the level of hospital underregistration by some specified date, thus allowing for improvement in the current level of underregistration for births occurring outside hospitals.

Deaths by Residence (Item 7)

The registered deaths shown in item 7 for each calendar year, 1960 through 1963, are based on the place of residence of the deceased rather than the place in which the death occurred. The deaths for the periods April to December 1960 and January to June 1963 may be obtained by proration as was the case for births in Item 4.

Theoretically the computations made here should be for a civilian resident population, so that military deaths would be properly excluded in developing a series on civilian deaths (military deaths should be accounted for in the "net movement" component). In fact, however, too few military deaths occur to make worthwhile an adjustment of this type. For the United States as a whole about 3,000 deaths occurred annually to resident military personnel during the period 1960 through 1965, plus about 1,000 deaths to overseas personnel.

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[7] Unpublished underregistration factors for 1950, available separately for births occurring in hospitals and outside hospitals, can be obtained upon request from the Natality Statistics Branch, Division of Vital Statistics, National Center for Health Statistics, Department of Health, Education, and Welfare, Washington, D.C.

Use and Evaluation of School Enrollment Data in Developing Estimates of Net Civilian Migration (Items 10 and 11)

The estimate of net migration for children of elementary school age in the area is derived from a comparison of the reported number of children enrolled in elementary school on the estimate date and the expected number of elementary school children surviving from the appropriate age group in 1960. The reported number of elementary school children is available in terms of grades and the expected number of children in terms of age. Investigation of various possible age-grade combinations at the national level indicates that greatest accuracy of the estimates in the past has usually been obtained by using enrollment in grades 2 to 8 and ages 7.50 to 15.49 years old at the estimate date. If any other grade range is used for a particular area, the age range should be chosen for logical consistency with the grade range. It is possible that in some areas other age-grade relationships are appropriate for deriving population estimates.

Since Method II depends largely on school statistics for the measurement of net migration, serious errors of estimation can result unless the school data are assembled with the main purpose always in mind. School statistics should relate as closely as possible to ages at which enrollment is compulsory and virtually complete, so that differences between expected enrollment and actual enrollment cannot be attributed to changes in enrollment rates. Some types of school data are more appropriate for this purpose than other kinds of series. For example, statistics relating only to children of elementary school age are more useful than those relating to all school children regardless of age. Data on enrollment by age are to be preferred over data on enrollment by grade for the purpose of making population estimates. If data on enrollment by age are not available, however, as is usually the case, grade enrollment figures are next to be preferred over other types of pupil statistics. When such figures are used, they should generally be restricted to the elementary grades, which comprise pupils most of whom are within the ages of compulsory school enrollment. For some areas, however, high school enrollment may be used in addition to elementary enrollment if the enrollment rate for children of high school age runs very high.

Types of public school enrollment statistics available

Annual (or biennial) reports and statistical reports of State Departments of Education or Public Instruction should be reviewed to determine the types of public school enrollment statistics reported by local areas. These reports frequently show data for counties; in some cases data are also shown for cities, where they have independent school systems.

Of the commonly available types of enrollment statistics for public schools for a given area, the most universal is enrollment for the school year (the number of pupils enrolled at the beginning of the school year plus all pupils enrolling during the school year). It fails to exclude any pupils who withdraw from school during the school year, however. Obviously, this type of cumulative enrollment tends to overstate the number of children actually enrolled in an area at a given time.

More and more States are now developing a statistical series on enrollment which reflects membership (number of persons on the rolls) on a specific date. When this type of series is available it is preferred to the cumulative type of enrollment described above, since it presents a snapshot of school enrollment at a given point of time.

Two other types of school statistics are usually available. The first, average daily attendance, should generally be avoided. It is obvious that an increase in average daily attendance may often reflect no increase in enrollment or population but merely improved school administration or better weather during the school year.

The final type of school statistics to be discussed here is the school census. Experience has indicated caution before using such data to estimate population. It is no simple task to enumerate the population of an area with reasonable completeness even when trained enumerators do the job under well-organized administrative controls. Yet, in most instances, school censuses are taken by school teachers, policemen, or unpaid volunteers, often without the geographic and other administrative controls needed to assure reasonably complete enumeration. Sometimes a house-to-house canvass is not even attempted. As a result, school census data frequently vary in accuracy from year to year and lack the consistency required for population estimation purposes. In theory, however, the school census provides a more direct measure of what is wanted than school enrollment, just as enrollment provides a more direct measure than attendance.

Enrollment in nonpublic schools

In many areas, a substantial proportion of the population of elementary school age does not attend public school but receives its education at parochial or other private schools. For such areas, it is very important that the enrollment

figures include parochial as well as public schools. Method II using public school data only in these areas would tend to give low estimates to the extent that there is a shift in recent years away from public schools and to parochial schools. For many areas, the enrollment data need include only the Catholic school data because enrollment in other parochial or private schools is negligible. The latter data should be collected where they are important.

Correspondence with Catholic dioceses will yield enrollment data for areas under their jurisdiction. Although data by grade are generally not available, detail for grades 1 to 8 inclusive (excluding kindergarten) are obtainable. A single data source for individual Catholic schools is The Official Catholic Directory, published annually by the P. J. Kenedy Company. Total elementary school enrollment can be obtained from this source.

State Departments of Education in some cases compile statistics on nonpublic schools which may be published in detail or in summary form in their reports. Since a single source for all school enrollment statistics has obvious advantages, this should be checked out. Caution must be used, however, to determine whether coverage varies appreciably from year to year.

Pitfalls in enrollment statistics

An enrollment series that closely reflects the size of a fixed age group may nevertheless contain a defect from the standpoint of measuring net migration for a given area. One such situation occurs when the area for which the estimate is being prepared is not the same as the area for which the school statistics are compiled. Sometimes data are available for school districts that do not conform to county or city boundaries.

Another problem in the use of school statistics is a concealed inconsistency. Frequently a series of school data appears reasonable, but subsequent investigation reveals an administrative act which renders the figures useless unless an adjustment can be made to obtain consistency. Thus, a change from a 7- to an 8-grade elementary school system may give a sudden, misleading increase in elementary enrollment. Similarly, a change in the minimum age requirements for entrance into the first grade (such as has occurred recently in Arkansas and West Virginia public schools), the abolition of mid-term (February) entries or promotions, or the introduction of public kindergarten pupils into the elementary enrollment statistics will produce a misleading change in a school data series. Sometimes these changes are not noted in the statistical tables.

In general, kindergarten pupils should be excluded from these statistics because attendance of these children is not compulsory and enrollment rates are relatively low. Where statistics for the first grade can be isolated and excluded, the Bureau of the Census has found it appropriate to exclude this grade also, since first grade enrollments are frequently swollen to include children who should be classified as kindergarten pupils. Statistics for schools show a very sharp attrition in enrollment from grade 1 in a given year to grade 2 in the succeeding year, a far heavier attrition than occurs in higher grades.

Still another illustration of essentially the same situation is the omission from the school data series of 7th and 8th grade pupils in junior high schools or pupils in special or ungraded classes. The omission might become a matter of consequence if the school system is in the process of expanding such programs and is assigning more students to the junior high schools or steadily reclassifying its pupils and assigning them into the special or ungraded classes from the regular classes.

In order to avoid the pitfalls noted, the following key factors should be kept in mind:

(a) Assemble a complete annual time series from the estimate date back to the 1958-59 schoolyear;

(b) Compile data by single years of age or by grade;

(c) Relate the data each year to the same time of the school year (i.e., fall, spring, October 1) and use the same type of statistics throughout (i.e., enrollment, membership, attendance) to assure consistency from year to year; and

(d) Compile both public and nonpublic school data.

Estimated Population of Elementary School Age (Item 18)

If population estimates are being prepared for all the counties in the State, it is recommended that the estimates of the school-age population for the counties obtained in Item 18 be adjusted as necessary so that their sum will agree with an independently derived estimate of the school-age population for the State as a whole. Upon request, the Bureau of the Census will provide its estimate of the population 7.50 to 15.49 years old on the estimate date for the State. The Bureau's State figures have already been adjusted to make their sum agree with an independently derived estimate of the population 7.50 to 15.49 years old for the United States on the estimate date. Tests have demonstrated that some gain in

the average accuracy of the population estimates of States is made by adjustments of this kind at this stage of the procedure. However, if any grade and age combination is being used other than grades 2 to 8 and 7.50 to 15.49 years old, the Bureau's State figures for the group 7.50 to 15.49 years old should not be used to adjust the county figures. In such a case, the local estimator's State figure will have to be used in this step.

Expected Population of Elementary School Age: Survivors of 1960 Cohort (Item 19)

Detailed 1960 Census data on age are required to obtain an estimate of the number of children 4.25 to 12.24 years old who were living in Middlesex County on April 1, 1960. The survivors of this group on July 1, 1963, are the expected population 7.50 to 15.49 years old, assuming no migration, in Middlesex County.

The numbers shown in the Item 19 tables were developed as follows:

Column (1): On the assumption of an even distribution of population within both the ages 4 and 12 years, the figures in this column are computed by taking three-fourths of the number 4 years old plus the number 5 to 11 years old plus one-fourth of the number 12 years old. (Adjustments for underenumeration of children under 5 are not suggested for the 1960 Census data. Unlike the 1950 Census, the 1960 Census shows no evidence of appreciably greater net undercount in the number of children under 5 years of age than in the adjacent age groups.)

Columns (2) and (3): The estimated proportion of the population at a given age who will be alive at a given date in the future is called the survival factor. The survival factors in column (2) are derived from the 1959-61 U.S. life table. (Appendix table B of Current Population Reports, Series P-25, No. 133, showed factors based on the 1949-51 life table values for States, which were intended to be used in the computation of estimates for each estimate date, July 1, 1950 to 1959, and April 1, 1960. Survival rates based on national life tables, however, should be adequate for the present decade.)

The 1959-61 U.S. life tables were used to derive current survival rates. These rates were obtained for 1963 by dividing the sum of the L_x values from the life tables for ages 4.25 to 12.24 (the school-age cohort on April 1, 1960) into the comparable value for ages 7.50 to 15.49 (survivors of the cohort on the estimate date). Survival rates for all years of the decade based on 1959-61 life tables are given in table A.

Table A.--UNITED STATES SURVIVAL FACTORS FOR SCHOOL-AGE POPULATION (7.50 TO 15.49), BY COLOR AND SEX: 1961 TO 1970
(Based on 1959-61 U.S. Life Tables)

April 1, 1960, to each estimate date	Age of cohort on April 1, 1960	Age of survivors on estimate date	Survival rates			
			White		Nonwhite	
			Male	Female	Male	Female
July 1, 1961	6.25 to 14.24	7.50 to 15.49	.99936	.99960	.99910	.99942
July 1, 1962	5.25 to 13.24	7.50 to 15.49	.99886	.99927	.99841	.99893
July 1, 1963	4.25 to 12.24	7.50 to 15.49	.99836	.99892	.99771	.99840
July 1, 1964	3.25 to 11.24	7.50 to 15.49	.99782	.99853	.99695	.99780
July 1, 1965	2.25 to 10.24	7.50 to 15.49	.99723	.99810	.99609	.99708
July 1, 1966	1.25 to 9.24	7.50 to 15.49	.99655	.99757	.99499	.99617
July 1, 1967	0.25 to 8.24	7.50 to 15.49	.99546	.99672	.99281	.99431
July 1, 1968	0 to 7.24	8.25 to 15.49	.99468	.99613	.99139	.99316
	Births 4/1/60 to 1/1/61	7.50 to 8.24	.96857	.97593	.94363	.95364
July 1, 1969	0 to 6.24	9.25 to 15.49	.99400	.99563	.99024	.99224
	Births 4/1/60 to 1/1/62	7.50 to 9.24	.96833	.97575	.94330	.95338
April 1, 1970	0 to 5.49	10.00 to 15.49	.99344	.99521	.98926	.99147
	Births 4/1/60 to 10/1/62	7.50 to 9.99	.96816	.97565	.94310	.95322

Comments made above concerning the adjustment of the estimated school-age population to State controls in Item 18 are equally applicable to the expected population of school age. If population estimates are being prepared for all the counties in the State, it is recommended that the estimates of the expected population 7.50 to 15.49 years old for the counties obtained in Item 19 be adjusted

to add to an independently derived estimate of the expected population 7.50 to 15.49 years old for the State as a whole. The Bureau of the Census will also provide, upon request, its State estimate for this group, which estimate has already been adjusted to the national total.

Migration Rate for the Population of All Ages (Item 22)

Evidence regarding the ratio of the migration rate for all ages to the school-age migration rate has been derived by using annual gross migration data by age for the United States as a whole obtained in the Current Population Survey, the Bureau's continuing national sample survey of population. Previous consideration of this material led to an assumption of a ratio of 1.2 to 1 in the estimation of net migration. This was the factor recommended in Series P-25, No. 133, for use in converting the net migration rate of school-age children to the net migration rate for the total population. Further consideration of this question suggested that the same factor was not applicable to each estimate period. Recent research has indicated that, given the specific age pattern of migration rates shown by the Current Population Survey for the last several years, the ratio of the net migration rate of the total population to the net migration rate of the school-age population will tend to decline as the length of the estimating period increases.

The variation in the ratio with the length of the estimating period results from differences in migration rates by age and the variation in the age composition of the school-age group with the length of the estimating period. The decline in the ratio results from the facts that progressively younger children are included in the school-age group as the period lengthens and that migration rates are higher for these younger children than the older ones. For example, for a 1-year period, the group 7.50 to 15.49 years old on the estimate date was 6.50 to 14.49 years old at the start of the period; for a 6-year period, the group 7.50 to 15.49 years old on the estimate date was 1.50 to 9.49 years old at the start of the period. In the first case, only children 6.50 to 15.49 years of age are included at some time during the estimate period; in the second case, children 1.50 to 15.49 are included. Since the annual migration rate for the ages under 6.50 is higher than that for the ages 6.50 to 15.49, the ratio of the net migration rate for the total population to that for the school-age population for a 6-year period is smaller than the corresponding ratio for a 1-year period.

The data from the Current Population Survey do not directly provide information on how the migration-age ratio changes with the length of the estimating period. This change in the migration ratio was developed as follows. Initially, annual migration by single years of age for each year since 1960 was derived by graphic interpolation of the migration for broad age groups reported in the Current Population Survey. The interpolated values were then converted to rates, the rates were graphically smoothed and applied to a population base to derive adjusted migration estimates by single years of age, which in turn were adjusted to the original migration totals for broad age groups reported in the survey. The resulting number of migrants were cumulated by cohorts as required for each estimating period. For example, the number of children in ages 7.50 to 15.49 on July 1, 1963, who migrated during the period April 1, 1960, to July 1, 1963, was derived as follows:

Migration period	Age at end of period	Migrants
4/1/60 to 4/1/61	5.25 to 13.24	1,607,239
4/1/61 to 4/1/62	6.25 to 14.24	1,517,986
4/1/62 to 4/1/63	7.25 to 15.24	1,677,846
4/1/63 to 7/1/63	7.50 to 15.49	[1]414,011
Total, 1960 to 1963	7.50 to 15.49	5,217,082

[1] Estimated by taking 1/4 of migrants 7.50 to 15.49 in survey year ending 4/1/63.

The number of school-age migrants was then converted into a migration rate for "school-age" children by dividing by the appropriate population in 1960. This migration rate was then divided into the migration rate for all ages to derive the factor for the period April 1, 1960, to July 1, 1963. In a similar manner factors were computed for each of the postcensal periods.

The series of factors developed by this procedure for use in the computation of estimates of net migration are as follows:

April 1, 1960, to estimate date	Migration factor	
	Interstate[1]	Intercounty[2]
July 1, 1961	1.3639	1.3408
July 1, 1962	1.2800	1.2511
July 1, 1963	1.1629	1.1775
July 1, 1964	1.0907	1.1247

[1] Used in current State estimates.
[2] Used in current SMSA county estimates.

Factors for each period during the 1960's will be available from the Bureau of the Census as they are computed at each estimate date.

Population Base for Computing All-Ages Net Migration (Item 23)

This procedure allows for net migration among persons alive on the base date and also among persons born subsequently. It is assumed that births and deaths between the base date and the estimate date were evenly distributed throughout the period and that, on the average, the newly born persons and persons dying were exposed to the probability of migration for only half the period and have therefore experienced net migration at only half the computed rate for the period.

Net Movement Between Civilian and Military Population (Item 28)

In developing Method II components of change for a civilian resident population, allowance must be made for population shifts occurring between it and the military population. (Items 24 to 28 should be bypassed in the computation if Armed Forces are not deducted from the population base in 1960 and added as a last step to the estimate of current civilian resident population.) Theoretically, this component of change in the civilian resident population is developed by: (1) Subtracting inductions into the Armed Forces from the estimate area during the period April 1, 1960, to the estimate date; (2) Adding discharges from the Armed Forces during the period of persons inducted from the estimate area; and (3) Adding deaths occurring during the period to Armed Forces who had entered the military from the estimate area. Statistics of this type are not readily available for areas below the national level, however. The procedure outlined in Section A is intended to provide a reasonable approximation by relating to State estimates for this component which are prepared annually by the Bureau of the Census.

LIMITATIONS OF COMPONENT METHOD II

As stated earlier, Component Method II has been used separately, and in combination with other methods, to prepare population estimates of States and metropolitan areas as part of the Census Bureau's regular program of population estimation. In addition to the problems arising from the consistency and adequacy of the basic input data, i.e., births, deaths, school enrollment, life table survival factors, and 1960 Census base data, the main weakness in Component Method II is in translating the school-age migration rate to the migration rate of all ages. It is to be expected that a fairly accurate and reliable measure of the migration rate of school-age children will result from the above procedure inasmuch as the enrollment data and the method by which the data are manipulated apply specifically to the school-age population. In moving from the school-age migration rate to the migration rate for the total population, however, the same national factors are used for all States. These at best provide approximate guides to the true factors for each State. It is quite likely that this factor varies from State to State due to area variation in age, sex, color, and urban-rural composition of States, as well as in other characteristics related to differential migration.

The tests of accuracy of Component Method II indicated earlier[8] suggest considerable room for improvement in the derivation of net migration by this procedure. Differential migration factors might provide one of the means of achieving such improvement. Migration data for the 1955-60 period available from the 1960 Census is one of the areas worthy of further exploration. Any new information or knowledge developed as the result of research, leading to improved factors of the relationship between school-age migration and migration of all ages would be made readily available and published in our regular reports in this series.

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[8] See footnote 1.

SECTION C.–COMPUTER PROGRAMMING

This section describes the computer program used by the Bureau of the Census to derive Component Method II estimates for counties in its metropolitan area program. It should be recognized that the specifications of the program given here represent only one means of carrying out, via computers, the Method II steps illustrated above. Adjustments, modifications, and simplifications, can be made when the method is programmed for different equipment. The program as well as the basic input data format may also be designed to facilitate future research and experimentation, rather than just to generate the specific steps of the method. Of course, because of the time and effort involved in the basic data compilation for computer input and for program writing, the derivation of the estimates by computers is most efficient where estimates are being prepared for many areas and the operations are repeated periodically.

County population estimates by Component Method II are prepared at the Bureau of the Census on an IBM 1401 computer (12,000 character storage and two 7330 tape units), using programs written in FORTRAN II. Six cards per county are used as input to the main program.

The identification of the variables used in the program as well as the input card layouts are shown below in Exhibit I.

It should be noted that some of the input items are computed separately in advance, rather than in the main program. There are two programs, for example, that are not included here, which are used to compute such input items as, school-age cohort, survivors of the school-age cohort, births for the period, and deaths for the period. This program segmentation has several advantages. First, not all of the required basic data become available at the same time. Running preliminary programs on the more readily available data permits time for review and analysis of these items; it also reduces the amount of input required for the main program; and finally, the limited storage of the 1401 computer puts severe limitations on the permissible length of the main FORTRAN program.

A listing of the main program is given in Exhibit II. The input to the computer is on tape, but, of course, cards could easily be used with slight modification of input statements. Population estimates for SMSA's are obtained by summing the constituent counties. Adjustments to overall totals for larger areas are not included in this program. Such adjustments could be achieved in the program, however, with few additional statements.

EXHIBIT I.--IDENTIFICATION OF VARIABLES

A. INPUT ITEMS AND CARD LAYOUTS (CARDS ARE CONVERTED TO 80-CHARACTER TAPE RECORDS)

Item	Variable name used in program	Field columns
CONTROL CARDS (2 cards):		
1. Year of estimate (last digit).....	IYEAR	1
2. Migration ratio[1].....	RAT1	1-6
Migration ratio[1].....	RAT2	7-12
Identification constant ("88").....	ICODE	13-14
Year of estimate (last digit).....	IYR	15
COUNTY CARDS (6 cards for each county):		
1. Name of county (first 6 letters).....	NAME3	1-6
Name of county (second 6 letters)....	NAME4	7-12
Civilian population, 4/1/60.....	PCIV	13-24
Institutional population, 4/1/60.....	PINS	25-36
Resident population, 4/1/60.....	PRES	37-48
Population 7.25 to 15.24 years, 4/1/60.....	SCPOP	49-60
2. Births, 4/1/60 to estimate date.....	BIR	1-12
Deaths, 4/1/60 to estimate date.....	DEA	13-24
3. School enrollment, 4/1/60.....	ENR60	1-12
4. School enrollment, estimate date.....	ENREST	1-12
5. Cohort of population 7.50 to 15.49 on estimate date, 4/1/60.....	COH	1-12
Survivors of school-age cohort, 4/1/60 to estimate date.....	COHSUR	13-24
COUNTY CARDS--Continued		
6. Net loss to Armed Forces, 4/1/60 to estimate date.....	ETOSS	1-12
Resident military deaths, 4/1/60 to estimate date.....	DEMIL	12-24
Armed Forces station strength, estimate date.....	AMIL	25-36
Note: All county cards contain the following information in columns 70-78:		
County identification.....	ICO or ICO1	70
Central county identification ("1"; if not central "0").....	ICE or ICE1	71
Data type identification.....	ITYP	72
Year of data (last digit).....	IYR	73
State identification.....	IST or IST1	75-76
SMSA identification.....	ISMSA	77-78
SMSA CARD (1 card for each SMSA):		
1. Name of SMSA (first 6 letters).....	NAME1	1-6
Name of SMSA (second 6 letters).....	NAME2	7-12
Identification constant ("77").....	ICODE	73-74
SMSA identification.....	ISMA	75-76
Number of counties within SMSA.....	NUM	77-78

[1] Ratio of all ages intercounty migration to migration of 7.50 to 15.49 age group, 4/1/60 to estimate date. The program is set to handle different migration ratios for central and outlying counties, but at this time the same factor is used for all counties.

B. COMPUTATION ITEMS

Item	Variable name used in program
COUNTY ITEMS:	
Ratio, population 7.25 to 15.24 to school enrollment, 4/1/60.....	RATIO
Estimated population 7.50 to 15.49, estimate date.....	EXPOP
Net migration for school-age cohort, 4/1/60 to estimate date.....	SCMIG
Net migration rate for school-age cohort, 4/1/60 to estimate date.....	SCRATE
Net migration rate for all ages population, 4/1/60 to estimate date.....	AMIRAT
Population base for computing all ages net migration, 4/1/60 to estimate date..	BASE
Net civilian migration all ages, 4/1/60 to estimate date.....	AMIG
Estimated civilian resident population, estimate date.....	CEST
Estimated resident population, estimate date.....	REST
Civilian deaths, 4/1/60 to estimate date.....	DEA
Percent change in resident population, 4/1/60 to estimate date.....	CHAN
SMSA ITEMS (Sum of Component Counties):	
Resident population, 4/1/60.....	TOT1
Net civilian migration, 4/1/60 to estimate date.....	TOT2
Births, 4/1/60 to estimate date.....	TOT3
Civilian deaths, 4/1/60 to estimate date.....	TOT4
Net loss to Armed Forces, 4/1/60 to estimate date.....	TOT5
Estimated civilian resident population, estimate date.....	TOT6
Estimated resident population, estimate date.....	TOT7
Percent change in resident population, 4/1/60 to estimate date.....	TOT8
Total number of SMSA's.....	INUM

EXHIBIT II.--METHOD II FORTRAN PROGRAM

```
SEQ    STMNT        FORTRAN STATEMENT

       C            POPULATION ESTIMATES FOR SMSAS AND COMPONENT COUNTIES
       C             BY COMPONENT METHOD II
       C            INPUT ON TAPE 1. TABLE 2 OUTPUT ON TAPE 2.
  1                 REWIND 1
  2                 REWIND 2
       C
       C              SEQUENCE ITEMS 3 THROUGH 18.--EDIT FORMATS ASSOCIATED WITH
       C                INPUT/OUTPUT STATEMENTS.
  3       10        FORMAT%I1¤
  4       20        FORMAT%2A6,60X,3I2¤
  5       30        FORMAT%2A6,4F12.0,9X,4I1,1X,2I2¤
  6       50        FORMAT%2F12.0,45X,4I1,1X,2I2¤
  7       60        FORMAT%F12.0,57X,4I1,1X,2I2¤
  8       70        FORMAT%2F6.5,I2,I1¤
  9       90        FORMAT%1H0,5X,2A6,7F10.0,F10.2,10X,2I1,2X,2I2¤
 10      100        FORMAT%11H0SMSA TOTAL,7X,7F10.0,F10.2,16X,I2¤
 11      110        FORMAT%28H1METHOD II ESTIMATES FOR 196,I1¤
 12      120        FORMAT    %116H0  SMSA    COUNTY   RES POP  MIGRATION   BIRTHS  DE
                  1 ATHS   NET LOSS  CIV EST   RES EST    CHANGE                  CODE ¤
 13      130        FORMAT%1H0,2A6,101X,I2,2X,I2¤
 14      140        FORMAT%3F12.0,33X,4I1,1X,2I2¤
 15      150        FORMAT%2A6,2F12.0,33X,4I1,1X,3I2¤
 16      160        FORMAT%F8.5,61X,4I1,1X,2I2¤
 17      210      0 FORMAT%57H0SMSA  COUNTY        ENROL 60   SCH POP     RATIO  ENROL
                  1 6,I1,60H   EST POP  COH SURV   SCH MIG    COH 60  MIG RATE  MIG BA
                  2 SE¤
 18      220        FORMAT%1H0,4X,2A6,2F10.0,F10.5,5F10.0,F10.5,F10.0¤
       C
       C              SEQUENCE ITEMS 19 THROUGH 21.--SETTING OF CONSTANTS AND
       C                INITIALIZATION OF ACCUMULATOR.
 19                 IK#0
 20                 ITYPE # 5
 21                 INUM #0
       C
       C              SEQUENCE ITEMS 22 THROUGH 53.--READING AND CHECKING OF
       C                INPUT DATA.
 22                 READ INPUT TAPE 1,10,IYEAR
 23                 PRINT 110,IYEAR
 24                 PRINT 120
 25                 READ INPUT TAPE 1,70,RAT1,RAT2,ICODE,IYR
 26                 WRITE OUTPUT TAPE 2,110,IYR
 27                 WRITE OUTPUT TAPE 2,210,IYR
 28                 IF%ICODE-88&IYEAR-IYR¤91,25,91
 29       25        READ INPUT TAPE 1,20, NAME1,NAME2, ICODE, ISMA, NUM
 30                 IF%ICODE-99¤13,101,91
 31       13        IF%ICODE-77¤91,2,91
 32        2        TOT1#0.
 33                 TOT2#0.
 34                 TOT3#0.
 35                 TOT4#0.
 36                 TOT5#0.
```

EXHIBIT II.--METHOD II FORTRAN PROGRAM--Continued

```
SEQ   STMNT        FORTRAN STATEMENT

 37                TOT6#0.
 38                TOT7#0.
 39                INUM # INUM &1
 40                WRITE OUTPUT TAPE 2,130,NAME1,NAME2,ISMA,NUM
 41                PRINT 130,NAME1,NAME2,ISMA,NUM
 42        1       READ INPUT TAPE 1,30,NAME3,NAME4, PCIV, PINS, PRES, SCPOP,ICO,
               1    ICE,ITYP,IYR,IST,ISMSA
 43                IF%ITYP-8&ISMSA-ISMA¤92,4,92
 44        4       READ INPUT TAPE 1,50,BIR,DEA,ICO1,ICE1,ITYP,IYR,IST1,ISMSA
 45                IF%ITYP-2&ICO-ICO1&ICE-ICE1&IYEAR-IYR&IST-IST1&ISMA-ISMSA¤94,5,94
 46        5       READ INPUT TAPE 1,60,ENR60,ICO1,ICE1,ITYP,IYR,IST1,ISMSA
 47                IF%ITYP-4&ICO-ICO1&ICE-ICE1    &  IYR&IST-IST1&ISMA-ISMSA¤95,6,95
 48        6       READ INPUT TAPE1,60,ENREST,ICO1,ICE1,ITYP,IYR,IST1,ISMSA
 49                IF%ITYP-5&ICO-ICO1&ICE-ICE1&IYEAR-IYR&IST-IST1&ISMA-ISMSA¤96,7,96
 50        7       READ INPUT TAPE 1,50,COH,COHSUR,ICO1,ICE1,ITYP,IYR,IST1,ISMSA
 51                IF%ITYP-6&ICO-ICO1&ICE-ICE1&IYEAR-IYR&IST-IST1&ISMA-ISMSA¤97,8,97
 52        8       READ INPUT TAPE 1,140,ETOSS,DEMIL,AMIL,ICO1,ICE1,ITYP,
               1   IYR,IST,ISMSA
 53                IF%ITYP-7&ICO-ICO1&ICE-ICE1&IYEAR-IYR&IST-IST1&ISMA-ISMSA¤98,9,98
      C
      C              SEQUENCE ITEMS 54 THROUGH 57.--COMPUTATION OF COUNTY SCHOOL-AGE
      C                MIGRATION RATE.
 54        9       RATIO # SCPOP / ENR60
 55                EXPOP#RATIO*ENREST
 56                SCMIG#EXPOP-COHSUR
 57                SCRATE#SCMIG/COH
      C
      C              SEQUENCE ITEMS 58 THROUGH 61.--COMPUTATION OF NET MIGRATION RATE
      C                FOR ALL AGES.
 58                IF%ICE1-1¤44,46,99
 59       46       AMIRAT#SCRATE*RAT1
 60                GO TO 48
 61       44       AMIRAT#SCRATE*RAT2
      C
      C              SEQUENCE ITEMS 62 THROUGH 65.--COMPUTATION OF NET MIGRANTS
      C                FOR ALL AGES.
 62       48       BASE#%.5*%BIR&DEMIL¤¤-%.5*%DEA&ETOSS¤¤&PCIV-PINS
 63                WRITE OUTPUT TAPE 2,220,NAME3,NAME4,ENR60,SCPOP,RATIO,
               1   ENREST,EXPOP,COHSUR,SCMIG,COH,SCRATE,BASE
 64                PUNCH 160,SCRATE,ICO1,ICE1,ITYPE,IYR,IST,ISMSA
 65                AMIG#AMIRAT*BASE
      C
      C              SEQUENCE ITEM 66.--COMPUTATION OF CIVILIAN RESIDENT POPULATION
      C                ON ESTIMATE DATE.
 66                CEST#PCIV&BIR&DEMIL-DEA-ETOSS&AMIG
      C
      C              SEQUENCE ITEM 67.--COMPUTATION OF TOTAL RESIDENT POPULATION
      C                ON ESTIMATE DATE.
 67                REST#CEST&AMIL
      C
      C              SEQUENCE ITEMS 68 TO END.--PRINTING AND PUNCHING OF OUTPUT AND
```

EXHIBIT II.--METHOD II FORTRAN PROGRAM--Continued

```
SEQ    STMNT        FORTRAN STATEMENT

       C                ADDING COMPONENT COUNTY ESTIMATES TO SMSA LEVEL.
 68                 DEA#DEA-DEMIL
 69                 CHAN#%%REST-PRES¤/PRES¤*100.
 70                 ITYP#01
 71                 PUNCH 150,NAME3,NAME4,PRES,REST,ICO1,ICE1,IK,IYR,IST,ISMSA,ITYP
 72                 PRINT 90,NAME3,NAME4,PRES,AMIG,BIR,DEA,ETOSS,CEST,
                  1 REST,CHAN,ICO1,ICE1,IST1,ISMSA
 73                 TOT1#TOT1&PRES
 74                 TOT2#TOT2&AMIG
 75                 TOT3#TOT3&BIR
 76                 TOT4#TOT4&DEA
 77                 TOT5#TOT5&ETOSS
 78                 TOT6#TOT6&CEST
 79                 TOT7#TOT7&REST
 80                 NUM#NUM-1
 81                 IF%NUM¤1,14,1
 82        14       TOT8#%%TOT7-TOT1¤/TOT1¤*100.
 83                 PRINT 100,TOT1,TOT2,TOT3,TOT4,TOT5,TOT6,TOT7,TOT8,ISMSA
 84                 GO TO 25
 85        91       PAUSE
 86        92       PAUSE
 87        94       PAUSE
 88        95       PAUSE
 89        96       PAUSE
 90        97       PAUSE
 91        98       PAUSE
 92        99       PAUSE
 93       101       REWIND 1
 94                 REWIND 2
 95                 PAUSE
 96                 READ INPUT TAPE 2,10,IC
 97                 READ INPUT TAPE 2,10,IC
 98                 PRINT 110,IYEAR
 99                 PRINT 210,IYEAR
100                 DO199 I#1,INUM
101                 READ INPUT TAPE 2,130, NAME1,NAME2,ISMA,NUM
102                 PRINT 130,NAME1,NAME2,ISMA,NUM
103                 DO199 K#1,NUM
104                 READ INPUT TAPE 2,220,NAME3,NAME4,ENR60,SCPOP,RATIO,
                  1 ENREST,EXPOP,COHSUR,SCMIG,COH,SCRATE,BASE
105       199       PRINT 220,NAME3,NAME4,ENR60,SCPOP,RATIO,ENREST,EXPOP,COHSUR,
                  1 SCMIG,COH,SCRATE,BASE
106                 REWIND 2
107                 STOP
108                 END
```