MIGRATION

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INTRODUCTION

The four components of population change are births, deaths, immigration, and emigration. The difference between births and deaths is called natural increase if the result is positive and natural decrease if the result is negative. The difference between immigration and emigration is called net migration.

In this Note the terms immigration and emigration are reserved for movements across international boundaries. Movements within this country are called inmigration and outmigration. These terms are defined later in this Note.

The consequences of population change in a community are more clearly understood if one knows whether growth or decline is attributed to natural increase or decrease, to net migration, or to a combination of the two. A growing community which has gained population by only natural increase faces a different set of circumstances than a community which has gained population by both components.

Estimates of natural increase and net migration for a community are of direct interest to health planners who need to project the size and composition of the population as part of planning for health services. The migration estimates also serve as indicators for estimating lack of access to medical care. Indirectly, they serve as an indicator of the economic status of an area.

Persons who move differ from persons who do not move and, as a result, may have an impact on the areas of origin and destination.[1] Age, race, educational attainment, and family status usually influence one's likelihood of moving.

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Highest net migration rates are usually found among persons in their twenties. The rates usually reach a peak at ages 20-24.

Migration patterns differ by race as well, with Negroes being slightly more likely to change residence than white persons; however, Negroes tend to move shorter distances than white persons.

Educational attainment also influences the likelihood of migration. College graduates are more likely to move between counties or States than high school graduates, who, in turn, migrate more often than persons with only a grade school education.

The presence and ages of children in a family influence the likelihood of moving. The presence of school-age children acts to reduce the geographic mobility of families.

Net Migration Estimates and Rates, 1960-70

For the United States, natural increase added approximately 20.9 million people in 1960-70,[2] while net migration added approximately 3.2 million people.[3] The population of metropolitan counties grew by 17.0 percent between 1960 and 1970. Natural increase accounted for the greater part of the growth (12.3 percent). The population of nonmetropolitan counties grew by 4.4 percent. A growth of 10.1 percent due to natural increase was offset by a loss of 5.6 percent from outmigration. Therefore all of the growth in nonmetropolitan counties was due to natural increase.[4]

At the regional level (table A), the West Region experienced the largest net gain in population due to migration (2.9 million), and the North Central Region experienced the largest net loss (0.8 million). The West, the only region with inmigration at all ages, had

Table A. Net migration for all ages and percent of 1970 expected population who migrated during 1960-70 by age and geographic region: United States, 1960-70

Age in 1970	All regions	Northeast	North Central	South	West
	Net migration in thousands				
All ages -------------------------------	3,214	344	-764	740	2,893
	Net migration as percent of 1970 expected population				
All ages -------------------------------	1.6	0.7	-1.3	1.2	9.1
0-4 years-------------------------------	0.4	1.4	1.0	-1.0	0.9
5-9 years-------------------------------	1.6	2.2	1.2	-0.6	5.8
10-14 years-----------------------------	2.0	2.2	-1.0	0.9	9.7
15-19 years-----------------------------	1.3	1.6	-2.0	0.3	8.7
20-24 years-----------------------------	-1.7	-3.1	-7.5	-3.3	14.1
25-29 years-----------------------------	3.8	6.7	1.0	-4.6	22.5
30-34 years-----------------------------	6.3	9.2	4.2	0.5	17.2
35-39 years-----------------------------	3.5	3.5	-0.8	2.9	12.0
40-44 years-----------------------------	2.5	1.4	-1.2	3.4	9.1
45-49 years-----------------------------	1.9	0.6	-1.0	2.9	6.8
50-54 years-----------------------------	1.4	-0.2	-1.2	2.9	5.6
55-59 years-----------------------------	1.1	-1.1	-1.4	3.4	4.8
60-64 years-----------------------------	0.9	-3.2	-3.1	6.6	5.4
65-69 years-----------------------------	0.6	-5.9	-5.7	10.1	7.0
70-74 years-----------------------------	0.3	-6.9	-5.0	10.0	7.2
75 years and over-----------------------	0.1	-5.5	-2.5	4.6	7.5

SOURCE: Bowles, G.K., Beale, C.L., and Lee, E.S.: Net Migration of the Population, 1960-70, by Age, Sex, and Color: United States, Regions, Divisions, States and Counties. Economic Research Service, U.S. Department of Agriculture; Institute for Behavioral Research, University of Georgia, and Research applied to National Needs, National Science Foundation, Cooperating, Dec. 1975.

the greatest amount of inmigration for ages 25-29. The Northeast and North Central Regions experienced net losses of people aged 65 and over (0.3 million each), while the South and West experienced net gains (0.4 million and 0.2 million, respectively).[3]

During the same decade, 97 of the 203 Health Service Areas (HSA's) lost 5.4 million people due to migration, while the other 106 HSA's had a net gain of 8.7 million. The additional 3.2 million are those who immigrated to the United States from other countries.

Patterns of Population Change Since 1970

Since 1970 there has been a shift in the migration pattern between metropolitan and nonmetropolitan areas. This development represents a reversal of one of the Nation's best established long-term population trends. For many decades before 1970, metropolitan areas typically grew more rapidly than their nonmetropolitan surroundings. However, between 1970 and 1976, the metropolitan population increased by about 5.5 million persons or 4.0 percent. During the same period, the nonmetropolitan population increased by about 5 million persons, or 8.2 percent. Thus the numerical growth of the metropolitan areas since 1970 is still larger than that of the nonmetropolitan areas, but the latter are growing at a considerably faster rate.[5]

A large part of the recent net movement from metropolitan areas represents continued urban development around the fringes of metropolitan areas. During the 1960's employment increased faster than population outside the central cities of metropolitan areas. As jobs increased in these areas, workers could more easily commute from communities just beyond metropolitan boundaries. Future residence changes in and around metropolitan areas are likely to reflect growth policies of

individual municipalities and available means of commuting.[6]

A pronounced shift in the net migration patterns combined with a continuing drop in the fertility rate has caused a significant change in regional population trends since 1970 as compared with previous periods (table B). Over half of the South's 5.1 million population increase between 1970 and 1975 is attributed to the net migration component. Florida had the largest net inmigration (1.4 million persons), but net inmigration to the rest of the region was 1.2 million persons.[7]

The West continues to be a fast-growing region. However, net inmigration to California, which had dominated the regional pattern prior to 1965, has shifted to the remaining 12 States. The sharp increase in net migration to these 12 States has enabled the West as a whole to continue to attract migrants.[7]

The 1975 and 1976 Census estimates reinforce the pattern of population change for the period since 1970. Most Northeastern and North Central States have grown only modestly in the last year (about 150,000 persons), but most of the Southern and Western States are estimated to have had substantial increases in population (over 800,000 persons and about 660,000 persons, respectively).[8]

This report presents the methods used in deriving net migration estimates and rates for 1960-70 for Health Service Areas (HSA's). Separate net migration estimates and rates by age and sex for the white population and the Negro-and-other-races population are given in the data supplement. •

Table B. Population change for 5-year periods with components of change by geographic region: United States, 1950-75

[Periods begin July 1]

Period	Population change				
	All regions	Northeast	North Central	South	West
	Number in thousands				
1950-55	13,201	2,719	3,879	2,877	3,725
1955-60	14,906	2,524	3,204	4,950	4,228
1960-65	13,485	2,649	2,510	4,405	3,921
1965-70	10,350	1,701	2,445	3,441	2,764
1970-75	9,311	309	999	5,093	2,909
	Natural increase				
	Number in millions				
1950-55	12.1	2.3	3.5	4.5	1.9
1955-60	13.2	2.6	3.9	4.7	2.2
1960-65	12.0	2.3	3.3	4.2	2.2
1965-70	8.7	1.6	2.3	3.0	1.7
1970-75	6.8	1.0	1.8	2.5	1.5
	Net migration				
	Number in millions				
1950-55	1.0	0.4	0.4	-1.6	1.9
1955-60	1.7	*	-0.7	0.3	2.0
1960-65	1.5	0.3	-0.8	0.3	1.7
1965-70	1.7	0.1	0.1	0.4	1.1
1970-75	2.5	-0.7	-0.8	2.6	1.4

SOURCE: U.S. Bureau of the Census: Estimates of the population of States with components of change, 1970 to 1975. Current Population Reports. Series P-25, No. 640. Washington. U.S. Government Printing Office, Nov. 1976.

DEFINITIONS

Generally, migration is defined as occurring only once during a time period under study. If a person lives in one area at a given time and in another area at a subsequent time, he is classified as a migrant—out of one area and into another area—even though he may have moved many times either between the same or among several other areas during the time period.

Every move is an outmigration with respect to the area of origin and an inmigration with respect to the area of destination. Thus an inmigrant is a person who enters a migration-defining area by crossing its boundary from some point outside the area but within the same country. An outmigrant is a person who departs from a migration-defining area by crossing its boundary to a point outside it but within the same country.

Net migration for the specified area is the difference between inmigration and outmigration. According to the direction of the balance, the estimate may be characterized as net inmigration or net outmigration. In the data supplement, the net migration estimates and rates represent a net flow in or out as indicated with no sign or with a minus sign, respectively.

METHODOLOGY

The research for the development of the net migration estimates was under the direction of Everett S. Lee, Department of Sociology and Institute of Behavorial Research, University of Georgia. The net migration estimates and rates were developed by Gladys K. Bowles, Economic Research Service, U.S. Department of Agriculture with the advice and counsel of Vera J. Banks and Calvin L. Beale of the same agency.

In brief, the method used to obtain the 1960-70 county net migration estimates and rates was based on the census survival rates forward method, adjusted to the vital-statistics-method net migration estimates by the plus-minus procedure. These procedures are explained in detail below in conjunction with an illustration of how national census survival rates are applied to obtain estimates of net migration by age. This illustration, taken from Census, 1965, focuses on Franklin County, Ohio for the 1950-60 period (table C). The calculations, based on 5 year age groups, have been limited to all sex and race groups for the sake of brevity, although the estimates are often carried out for specific sex and race groups.

Table C. Calculation of net migration estimate and net migration rate by age cohort, for Franklin County, Ohio, by use of national census survival rates, for 1950 to 1960

[Forward survival procedure]

Age in 1950 (or birth date)	Age in 1960	Census population 1950 (age in 1950) (1)	Births (2)	National census survival rates[1] (3)	Expected population, 1960 (age in 1960) (1) or (2) x (3)= (4)	Census population, 1960 (age in 1960) (5)	Net migration Preliminary estimate (5) - (4)= (6)	Net migration Adjusted estimate (7)	Net migration rate [(7) ÷ (4)] x 100= (8)
Total, all ages--------	Total, all ages-----------	503,410	...	...	608,900	682,962	74,062	75,756	12.4
Born April 1, 1955 to 1960----	Under 5 years--------------	...	[2]89,091	[2].947031	84,372	85,464	1,092	1,115	1.3
Born April 1, 1950 to 1955----	5-9 years--------------	...	[2]69,628	[2].939721	65,431	69,635	4,204	4,293	6.6
Under 5 years----	10-14 years---------	52,007	...	1.019725	53,033	58,043	5,010	5,117	9.6
5-9 years--------	15-19 years---------	36,585	...	.987918	36,143	47,602	11,459	11,703	32.4
10-14 years------	20-24 years---------	29,954	...	.963345	28,856	52,454	23,598	24,100	83.5
15-19 years------	25-29 years---------	31,972	...	.989183	31,626	50,587	18,961	19,364	61.2
20-24 years------	30-34 years---------	46,644	...	.999510	46,621	50,959	4,338	4,430	9.5
25-29 years------	35-39 years---------	47,657	...	.992511	47,300	49,523	2,223	2,270	4.8
30-34 years------	40-44 years---------	40,390	...	.986082	39,828	42,132	2,304	2,353	5.9
35-39 years------	45-49 years---------	37,138	...	.948344	35,220	37,007	1,787	1,825	5.2
40-44 years------	50-54 years---------	34,329	...	.925976	31,788	33,201	1,413	1,443	4.5
45-49 years------	55-59 years---------	31,067	...	.916818	28,483	28,849	366	374	1.3
50-54 years------	60-64 years---------	28,138	...	.853888	24,027	23,803	-224	-219	-0.9
55-59 years------	65-69 years---------	24,693	...	.859476	21,223	19,812	-1,411	-1,381	-6.5
60-64 years------	70-74 years---------	20,467	...	.776462	15,892	15,074	-818	-801	-5.0
65-69 years------	75-79 years---------	17,102	...	.608023	10,398	10,084	-314	-307	-3.0
70-74 years------	80-84 years---------	11,629	...	.461477	5,367	5,456	89	91	1.7
75 years and over-----------	85 years and over--------------	13,638	...	.241403	3,292	3,277	-15	-15	-0.5

[1]Based on total population in table 1 of source.
[2]Births adjusted for underregistration or natural census survival rates based on adjusted births.

SOURCE: U.S. Bureau of the Census: National census survival rates by color and sex, for 1950 to 1960. Current Population Reports, Series P-23, No. 15. Washington. U.S. Government Printing Office, July 12, 1965.

Census Survival Rates
Forward Method

The census survival rates (CSR) method requires population data for the area from two censuses, the number of births to residents of the area during the intervening period, and the national census survival rates. The migration estimates are computed as follows (figure 1):

From the two censuses, obtain the population data by age, sex, and race.

From the vital registration system, obtain the number of births in the intervening years by sex and race.

From the Series P-23 publications of the U.S. Bureau of the Census, obtain the national census survival rates by age, sex, and race.

Calculate the expected population for each sex-race group and age cohort at the time of the second census by multiplying the appropriate population group of the first census by the national census survival rates, and age the respective group by the number of years between the two censuses. For the age groups born between the two censuses, multiply the number of births by the appropriate national census survival rate.

Then, the preliminary net migration estimate is the difference between the enumerated population of the second census and the expected population.

Figure 1. Preliminary net migration estimates by the CSR method

Let P_{50}^i = 1950 Franklin County population by age i, $i=1, \ldots, 16$ where $i=1$ represents the group under 5 years and $i=16$ represents the group 75 years and over

P_{60}^j = 1960 Franklin County population by age j, $j=1, \ldots, 18$ where $j=1$ represents the group under 5 years and $j=18$ represents the group 85 years and over

B^1 = 1955-59 births in Franklin County

B^2 = 1950-54 births in Franklin County

r^k = 1960 National census survival rate by age k, $k=1, \ldots, 18$ where $k=1$ represents the group under 5 years and $k=18$ represents the group 85 years and over.

Then for groups aged 10 years and over, the net migration estimate (NM) derived by the CSR method is given as

$$NM_{CSR}^j = P_{60}^j - \left(r^k \times P_{50}^i\right), \quad \begin{array}{l} i = 1, \ldots, 16 \\ j = 3, \ldots, 18 \\ k = 3, \ldots, 18 \end{array}$$

For group aged 5 to 9 years in 1960, the NM is given as

$$NM_{CSR}^2 = P_{60}^2 - \left(r^2 \times B^2\right)$$

For group under 5 years in 1960, the NM is given as

$$NM_{CSR}^1 = P_{60}^1 - \left(r^1 \times B^1\right)$$

Referring to columns 1, 3, 5, and 6 of table C, for the group aged 20 to 24 years in 1960

$$NM_{CSR}^5 = P_{60}^5 - \left(r^5 \times P_{50}^3\right)$$
$$= 52,454 - [(.963345) \times (29,954)]$$
$$= 23,598$$

Thus the method yields a preliminary estimate of the net inmigration of 23,598 persons.

Figure 2. Independent total net migration estimate by the VS method

Let P_{50} = 1950 Franklin County population

      P_{60} = 1960 Franklin County population

      B .= births in Franklin County during 1950-60

      D = deaths in Franklin County during 1950-60

Then the net migration estimate (NM) by the VS method for Franklin County is

$$NM_{VS} = (P_{60} - P_{50}) - (B - D)$$
$$= (682,962 - 503,410) - (158,719 - 54,923)$$
$$= 75,756$$

NOTE: The data used in the example were published by the U.S. Bureau of the Census in *Current Population Reports,* Series P-23, No. 7, Nov. 1962.

Vital Statistics Method

The vital statistics (VS) method requires population data from two censuses and the number of births and deaths in the area of interest. Net migration is derived by subtracting natural increase (births less deaths) during the intervening years from the total net increase (population at the second census less population at the first census) for the intervening years. Figure 2 illustrates the calculation.

Plus-minus Adjustment Procedure

The preliminary estimates of net migration by age obtained from the CSR method are adjusted to an independent, assigned total for all ages obtained by the VS method using the plus-minus adjustment procedure.

The procedure requires the use of two factors one of which is applied to the inmigration estimates and the other to the outmigration estimates. The components of the two factors are the net adjustment required by the distribution and the absolute migration total.

The net adjustment component is the difference between the VS method net migration estimate and the CSR method preliminary net migration estimate. The absolute migration total component is calculated by summing the absolute values for the preliminary net migration estimates as derived by the CSR method.

The factor for adjusting the inmigration estimate is the ratio of the absolute migration total plus the net adjustment to the absolute migration total. The factor for adjusting the outmigration estimate is the ratio of the absolute migration total minus the net adjustment to the absolute migration total. Figure 3 illustrates the calculations.

Calculation of Adjusted Net Migration Estimates

Each of the preliminary estimates by age, sex, and race is multiplied by the appropriate adjustment factor. These results are the adjusted net migration estimates. Figure 4 illustrates the calculation.

Calculation of Net Migration Rates

The net migration rates for this report are calculated by dividing the expected populations at the time of the second census into the adjusted net migration estimates. The rates are then expressed as percents. Figure 5 illustrates the calculation.

Figure 3. Factors for the plus-minus adjustment procedure

Step 1

Let NM_{VS} = the VS method net migration estimate

NM_{CSR} = the total preliminary net migration estimate

Then the net adjustment component is

$$\text{Net adjustment} = NM_{VS} - NM_{CSR}$$
$$= 75{,}756 - 74{,}062$$
$$= 1{,}694$$

Step 2

Let $\left| NM_{CSR}^{i} \right|$ = the absolute value of the preliminary net migration estimate for age group i, $i = 1, \ldots, 18$

Then referring to column 6 of table C, the absolute migration total component is

$$\left| NM_{CSR} \right| = \left| NM_{CSR}^{1} \right| + \left| NM_{CSR}^{2} \right| + \ldots + \left| NM_{CSR}^{17} \right| + \left| NM_{CSR}^{18} \right|$$
$$= 1{,}092 + 4{,}204 + \ldots + 89 + 15$$
$$= 79{,}626$$

NOTE: The absolute value of a number is the numerical value irrespective of sign.

Step 3

The factor for adjusting the inmigration estimate is

$$= \frac{\left| NM_{CSR} \right| + \text{Net adjustment}}{\left| NM_{CSR} \right|}$$
$$= \frac{79{,}626 + 1{,}694}{79{,}626}$$
$$= 1.021274$$

Hence the adjustment factor for the preliminary inmigration estimates is 1.021274.

The factor for adjusting the outmigration estimate is

$$= \frac{\left| NM_{CSR} \right| - \text{Net adjustment}}{\left| NM_{CSR} \right|}$$
$$= \frac{79{,}626 - 1{,}694}{79{,}626}$$
$$= .978726$$

Hence the adjustment factor for the preliminary outmigration estimates is .978726.

Figure 4. Adjusted net migration estimates

Let $\cdot\,NM^{i}_{A}$ = adjusted net migration estimate for age group i, i=1, . . . , 18

NM^{i}_{CSR} = preliminary net migration estimate for age group i, i=1, . . . , 18

Then referring to columns 6 and 7 of table C, the adjusted net migration estimate for an age group that experienced inmigration is

$$NM^{5}_{A} = \text{inmigration adjustment factor} \times NM^{5}_{CSR}$$
$$= (1.021274) \times (23{,}598)$$
$$= 24{,}100$$

Therefore the adjusted net migration estimate for the group aged 20 to 24 years in 1960 is 24,100 persons.

The adjusted net migration estimate for an age group that experienced outmigration is

$$NM^{14}_{A} = \text{outmigration adjustment factor} \times NM^{14}_{CSR}$$
$$= (.978726) \times (-1{,}411)$$
$$= -1{,}381$$

Therefore the adjusted net migration estimate for the group aged 65 to 69 years in 1960 is -1,381 persons.

Figure 5. Net migration rates

Let NMR^i = net migration rate for age group i, $i=1, \ldots, 18$

NM_A^i = adjusted net migration estimate for age group i, $i=1, \ldots, 18$

EP_{60}^i = expected population in 1960 for age group i, $i=1, \ldots, 18$ as calculated for the CSR method in figure 1

Then the net migration for age group i, $i=1, \ldots, 18$, is

$$NMR^i = \frac{NM_A^i}{EP_{60}^i} \times 100$$

If $i=5$, then from columns 4 and 7 of table C the net migration rate shown in column 8 of table C for the group aged 20-24 years in 1960 is

$$NMR^5 = \frac{NM_A^5}{EP_{60}^5} \times 100$$

$$= \frac{24,100}{28,856} \times 100$$

$$= 83.5$$

Therefore the adjusted percent difference between the 1960 expected population for the Franklin County group aged 20-24 years and the 1960 enumerated population for this age group is 83.5 percent. The net migration component of population change was almost equal to the expected population for this age group at the second census. This illustration clearly shows the necessity for considering the age distribution of the population when assessing community health needs.

DISCUSSION

Health Planning Implications of Migration

Health planning for HSA's requires some basic assumptions about the future composition of the population to be served. Plans for facilities and resources, especially if construction is involved, must be initiated in advance of the time that they will be utilized. How many people will there be? Will they primarily be elderly people with a need for geriatric services or families with young children requiring pediatric services?

Determining the future population of an area is not a simple task but one that must be done if the appropriate plans are to be made for services. The size and characteristics of the future population of an area depend not only on the area's current birth and death rates and their change over time but also on the differential patterns of migration to and from the area. It is especially difficult to project future populations in small areas of the United States since the American population is highly mobile, moving towards areas which are socially or economically attractive and away from areas which are not. The conditions which make an area attractive to one segment of the population are not necessarily those which attract a different segment. The result is that the composition as well as the size of the population in a small area may be radically changed by migration over a relatively short period of time.

Both inmigration and outmigration influence the size and composition of the population. In addition, inmigrants may have problems in obtaining medical care or may place demands which are different from those of established residents on the health care system. They will not have a regular source of medical care or a continuing relationship with a physician who knows their history. Thus they may be more likely to seek care from other sources, emergency rooms, for example, until they have established a relationship with a regular source of care. They may have more trouble obtaining appointments with physicians than will residents who have obtained a regular source of care. This is especially a problem if no attempt is made to establish the relationship until care is needed. Thus an emergency room may be the only alternative.

The inmigrant will have less knowledge of available community resources. Special outreach efforts may be advisable. The new resident may place special demands on the health care system simply because kinship and friendship networks do not exist. In the case where there is no one to provide care or help out at home, hospitalization or institutionalized home health services may be required.

Finally, migration rates are useful as an indicator of the economic trend in an area. An area with a declining population probably will experience deteriorating social and economic conditions if the outmigration continues over a long period of time. Young, better educated people with income earning skills are the most mobile and most likely to move, leaving behind older people or those with less earning capacity. Thus areas from which there is substantial outmigration may experience an increasing underutilization of health care facilities planned for a younger population, thereby experiencing a demand for other kinds of facilities and health care services.

Limitations of Data

In using national census survival rates, it is assumed that there are no significant differences in mortality levels from area to area for a given sex-race group and age cohort, in completeness of coverage in the 1970 census relative to the 1960 census, and in the degree of consistency of reporting race between 1960 and 1970. Caution should be exercised when interpreting net migration estimates of a local area whose mortality levels differ substantially from the national levels.

The applicability of the net migration estimates and rates derived by the national census survival rates method for the Negro-and-other-races population in the local area depends on the extent to which the racial composition (i.e., the percent of "other races") in the local area differs from the national racial composition. In other words, migration estimates and rates given for the Negro-and-other-races population apply to those areas and only those areas which have a racial composition similar to the national composition.

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Statistical Notes for Health Planners is a cooperative activity of the National Center for Health Statistics, Office of the Assistant Secretary for Health, and the Bureau of Health Planning and Resources Development, Health Resources Administration.

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SYMBOLS

Data not available---	- - -
Category not applicable--------------------------------	. . .
Quantity zero--	-
Quantity more than 0 but less than 0.05------	0.0
Figure does not meet standards of reliability or precision-------------------------------	*

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