Chapter I

CENSUS DATA ON INTERNAL MIGRATION

PLACE OF BIRTH

Cost considerations often make it desirable to keep the number of questions on a census schedule to a minimum. Among the questions which have a direct bearing on migration, that on place of birth is perhaps the most widely used. The question is among those given first priority in the United Nations' recommendations for the 1960 and 1970 rounds of censuses; and in fact, about 100 countries did obtain information on birth-place in censuses taken in or around 1960. Most of those lacking such information are newly independent countries which have only recently taken their first census. Such data are obtained by asking a simple question, such as "where was this person born?" for all persons enumerated in the census. The answer to this question may be recorded in a number of ways depending on the degree of detail (with respect to areal units) desired in the migration data. The place of birth may be recorded as the village, town or district in which the person was born, or perhaps a larger unit such as a state, province or governorate. Those born in other countries, separately recorded, can then be singled out as international migrants, not to be included in the study of internal migration.

Lifetime migrants

On the basis of the answer to the place-of-birth question, it is possible to classify the population enumerated into two groups:

1. *Migrants*, defined as persons who were enumerated in a place different from the place where they were born;

2. *Non-migrants*, defined as persons who were enumerated in the place where they were born.

The migrant category may then be subdivided into migration streams on the basis of specific birth-places and specific places of residence. An illustrative compilation of birth-place data is given in table 1, where the population enumerated in each governorate of the United Arab Republic in 1960 is cross-classified by governorate of birth. Column 2 shows that Cairo governorate had in 1960 a total of 1,194,266 lifetime in-migrants (the sum of column 2 minus the figure in the diagonal, that is, 3,273,700 − 2,079,434) of whom 47,220 were born in Alexandria governorate, 9,464 in Port-Said, 216,764 in Menoufia governorate etc. Similarly, the first row of the table shows that Cairo governorate had a total of 241,603 lifetime out-migrants (2,321,037 − 2,079,434) of whom 31,049 were living in Alexandria governorate, 5,293 in Port-Said governorate, 7,038 in Menoufia governorate etc. The diagonal cells of the table give the number of lifetime non-migrants for each governorate.

The streams of lifetime migrants are more conveniently shown in table 2, which gives for the Cairo governorate the numbers of in- and out-migrants, the amount of net migration, the origin and destination of each stream of migration to and from Cairo governorate, and the net balance for each pair of streams.

The number of lifetime in-migrants to Cairo exceeds the number of lifetime out-migrants by 952,663. This difference measures lifetime net migration to Cairo governorate and it can be split up into net streams (i.e., gains and losses resulting from migratory exchanges with each of the other governorates). For example, Cairo had a lifetime net gain of 209,726 persons from Menoufia, a loss of 23,959 to Giza etc.

Cartographic methods are useful for presentation of migration balances or streams, but may not be feasible if the number of areal units is very large. Data for India (with boundaries as of 1931) are shown graphically in map 1, where the direction and magnitude of the major net streams is represented by an arrow whose width is proportional to the size of the balance.

As has been noted about internal migration in general, the sum total of lifetime in-migrants for all the areal units in a country is equal to the sum total of lifetime out-migrants, for each in-migrant to an area is an out-migrant from some other area. The sum of the net balances for all areas is, therefore, necessarily zero. The sum of lifetime in-migrants or lifetime out-migrants gives the number of persons who were enumerated away from their birth-place; that is, the number of lifetime migrants for the country. This total may be obtained from table 1 by subtracting the numbers in the diagonal cells from the corner grand total. Thus, for the United Arab Republic, lifetime migrants numbered 2,697,309, and were 10.5 per cent of the total population. The sum of net lifetime gains (or the sum of net losses) is a measure of redistribution due to lifetime migration for the country as a whole. It is obtained from table 1, by subtracting the horizontal totals from the vertical totals and summing the differences with like sign. For the United Arab Republic, the amount of lifetime redistribution in 1960 was 1,558,452 or 6.0 per cent of the total population.

Estimation of intercensal migration

If place-of-birth statistics are available for the same set of areal units at two consecutive censuses, these data can be used to make an indirect estimate of period, or intercensal net migration for each unit. Thus, if

TABLE 1. POPULATION CLASSIFIED BY GOVERNORATE OF BIRTH AND GOVERNORATE OF ENUMERATION, UNITED ARAB REPUBLIC, 1960

Governorate of birth (1)	*Governorate of enumeration*											
	Cairo (2)	*Alexandria* (3)	*Port-Said* (4)	*Ismailia* (5)	*Kalyubia* (6)	*Gharbia* (7)	*Menoufia* (8)	*Giza* (9)	*Assyiut* (10)	*Souhag* (11)	*All others* (12)	*Total* (13)
Cairo	2,079,434	31,049	5,293	9,813	23,837	10,034	7,038	88,543	4,951	2,569	58,476	2,321,037
Alexandria	47,220	1,085,602	2,641	2,625	2,135	4,921	1,505	6,910	1,355	1,467	29,534	1,185,915
Port-Said	9,464	2,562	168,046	6,461	496	817	323	1,505	326	454	11,184	201,638
Ismailia	9,518	1,395	3,490	171,297	718	910	306	1,593	319	263	10,269	200,078
Kalyubia	90,668	4,730	758	3,182	886,464	3,727	3,523	10,279	340	128	18,076	1,021,875
Gharbia	99,179	39,953	1,742	3,347	7,870	1,604,851	6,313	14,529	848	491	64,140	1,843,263
Menoufia	216,764	46,781	1,640	3,338	2,918	29,580	1,308,283	30,915	567	401	47,843	1,689,030
Giza	64,584	4,899	513	2,013	2,887	1,503	2,161	1,040,179	540	433	13,518	1,133,230
Assyiut	100,305	25,497	1,738	2,522	122	2,245	636	13,153	1,290,255	5,955	35,157	1,477,585
Souhag	100,100	63,712	12,087	9,436	295	2,791	1,095	17,958	11,608	1,540,020	53,224	1,812,326
All others	456,464	177,476	43,898	66,973	49,816	47,315	12,179	94,577	14,690	22,375	11,900,302	12,886,065
TOTAL	3,273,700	1,483,656	241,846	281,007	977,558	1,708,694	1,343,362	1,320,141	1,325,799	1,574,556	12,241,723	25,772,042

SOURCE: United Arab Republic, Department of Statistics and Census, *1960 Census of Population* (Cairo, July 1963), vol. II, General tables, table 14, p. 50.

TABLE 2. LIFETIME IN-MIGRANTS BY GOVERNORATE OF ORIGIN, OUT-MIGRANTS BY GOVERNORATE OF DESTINATION AND NET LIFETIME STREAMS OF MIGRATION, CAIRO GOVERNORATE, 1960

Governorate of origin and destination	*Lifetime in-migrants*	*Lifetime out-migrants*	*Net lifetime migration*
Alexandria	47,220	31,049	+16,171
Port Said.....	9,464	5,293	+4,171
Ismailia	9,518	9,813	−295
Kalyubia	90,668	23,837	+66,831
Gharbia	99,179	10,034	+89,145
Menoufia	216,764	7,038	+209,726
Giza.....	64,584	88,543	−23,959
Assyiut	100,305	4,951	+95,354
Souhag	100,100	2,569	+97,531
Other governorates	456,464	58,476	+397,988
TOTAL	1,194,266	241,603	+952,663

SOURCE: Derived from table 1.

I_t and I_{t+n} are the numbers of lifetime in-migrants in a particular area at two censuses at times 't' and '$t+n$' respectively and if O_t and O_{t+n} are the corresponding lifetime out-migrants, then an estimate of intercensal net migration for that area is given by:

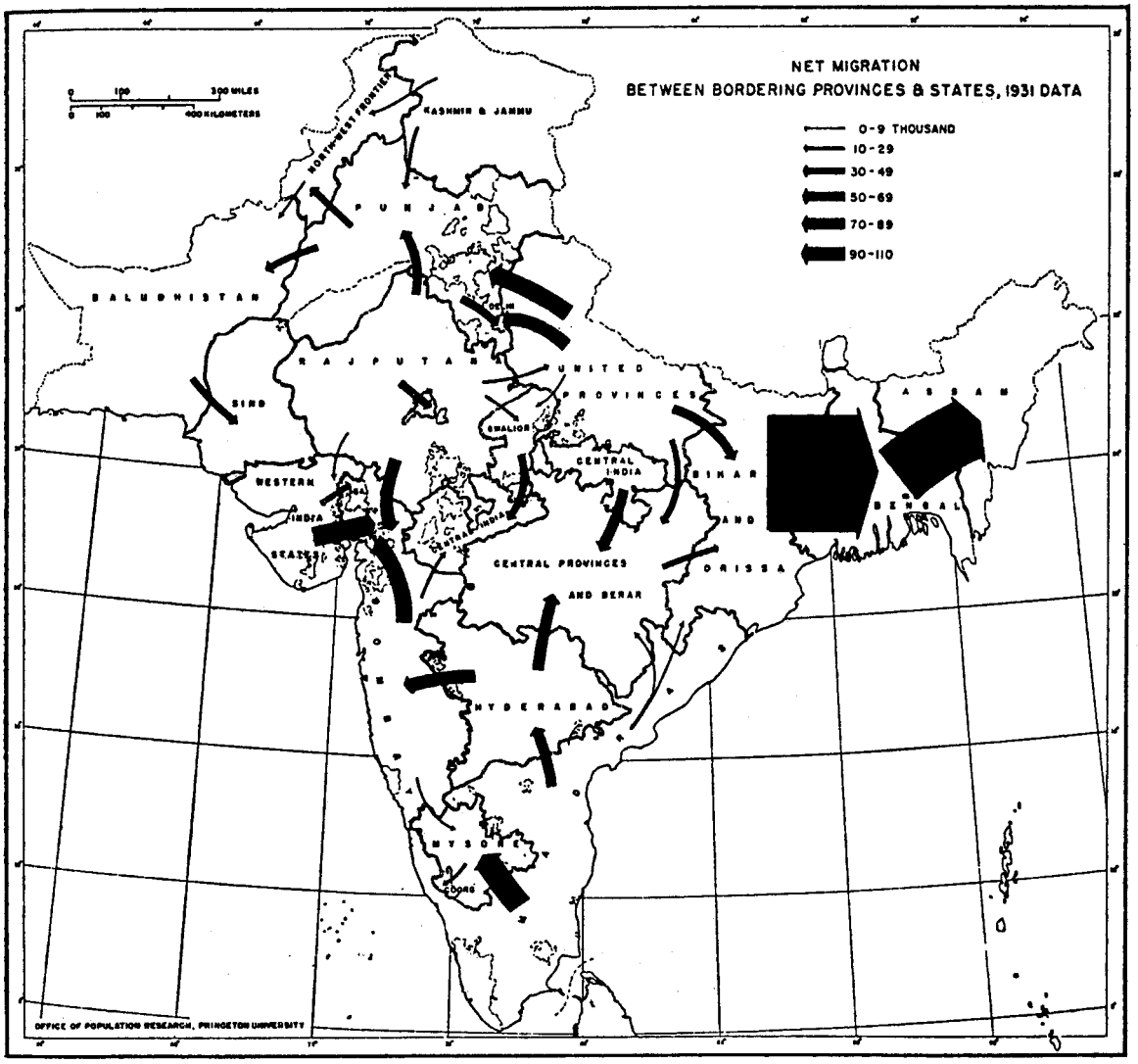
$$\text{Net } M = (I_{t+n} - O_{t+n}) - (S_I I_t - S_o O_t) \qquad (1)$$

where S_I and S_O are the intercensal survival ratios giving the proportions of I_t and O_t that will survive the intercensal period.

The same formula may be rewritten as:

$$\text{Net } M = (I_{t+n} - S_I I_t) + (S_o O_t - O_{t+n}) = M_1 + M_2 \qquad (2)$$

Thus, birth-place data at two censuses not only provide a means of estimating the balance of intercensal migration but they also help to analyse that net balance into two components, namely, net migration among persons born outside the area (M_1) and that among persons born inside the area (M_2).



Map 1. Net lifetime migration streams across state and provincial boundaries, India, 1931

SOURCE: Kingsley Davis, *The Population of India and Pakistan* (Princeton, Princeton University Press, 1951), p. 109.

In practice, the major difficulty in the application of the method is the estimation of S_I and S_O. A considerable amount of data and computations are needed in order to derive accurate estimates of S_I and S_O; such data are not generally available. Several procedures are possible, some elaborate and more accurate, and some simple but approximate. A few of these are discussed below, starting with the simplest and proceeding to more elaborate ones.

Procedure 1

If data on the age distribution of out-born persons are not available, it is virtually impossible to estimate the survival ratios accurately. In this situation, it is recommended that S_I and S_O be both taken as equal to the over-all census survival ratio (ratio of persons aged n years and over in the country at the second census to persons of all ages in the first census, i.e., $P_{n+,t+n}/P_t$) or the over-all life table survival ratio (T_n/T_O) if an appropriate life table covering the entire period is available. These ratios may not measure the probability of survival very accurately, and there will be some error in the migration estimate; but it is certain that an estimate of net migration obtained by using even a roughly approximate survival ratio will be more accurate than one that ignores the mortality factor entirely. If the effect of mortality is ignored, the formula for net migration is reduced to:

$$\text{Net } M' = (I_{t+n} - I_t) + (O_t - O_{t+n}) = M_1' + M_2' \qquad (3)$$

Comparing Net M' and Net M, it is readily seen that if the effect of mortality is ignored, net intercensal migration among out-born and in-born persons will be underestimated by the number of deaths among I_t and O_t during the intercensal period. This can be a serious error for the ordinary intercensal interval of ten years; the population involved is a cohort of lifetime migrants who may have migrated at any time before the first census and who may, therefore, lose substantial numbers through deaths during the period. However, this error will be more serious in the components, M_1' and M_2' than in Net M'. There is some cancellation of error in the estimate of net migration because I_t and O_t have opposite signs in the equation. Nevertheless, the effect of not taking mortality into account is almost certain to be an underestimation of net migration, since the larger of the two components I_t and O_t is likely to lose more through mortality than is the smaller.

A numerical illustration of the application of procedure 1 is given in table 3 using data for the Indian sub-continent, 1921-1931. In this example, the survival ratio is assumed to be the same for the out-born and the in-born; it is estimated from the over-all ten-year census survival ratio, which was approximately 81 per cent. The calculations indicate that the state of Assam had a net gain of 205,000, which was composed of a net inward movement of 211,000 among persons born outside the state and a net outward movement of 6,000 among persons born within the state. The movement to Assam seems to have been virtually a one-way movement. Bombay, on the other hand, shows a net in-migration of 96,000 persons born elsewhere and a net out-migration of 42,000 persons born in Bombay.

TABLE 3. ESTIMATE OF NET MIGRATION FROM BIRTH-PLACE DATA, SELECTED STATES IN THE INDIAN SUB-CONTINENT, MALES, 1921-1931: PROCEDURE 1

State	*Lifetime in-migrants*		*Lifetime out-migrants*		*Net intercensal migration, 1921-1931*		
	1921	*1931*	*1921*	*1931*	*Among out-born*	*Among in-born*	*Total*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Assam	671,195	754,821	44,136	41,785	+211,153	−6,035	+205,118
Madras	97,107	119,621	580,136	723,755	+40,966	−253,845	−212,879
Mysore	187,000	204,260	45,349	54,410	+53,790	−17,677	+35,113
Bombay	474,553	480,557	197,593	202,197	+96,169	−42,147	+54,022

SOURCE: K. C. Zachariah, *A Historical Study of Internal Migration in the Indian Sub-Continent* (Bombay, Asia Publishing House, 1964); derived from table 3.6, pp. 60, 67 and 69.

Note: It is assumed that the ten-year survival ratio of out-born persons is equal to that of in-born persons and that both equal 0.81 column (6) = Col. (3) − 0.81 × col. (2); column (7) = col. (4) × 0.81 − col. (5); column (8) = col. (6) + col. (7).

Procedure 2

If the cross-classification of the population by place of birth and place of residence is available by age in the later of two censuses, but not in both, an over-all survival ratio may be calculated separately for persons born in each of the areal units. Table 4 illustrates the calculation of such area-specific survival ratios for the nine geographic divisions of the United States of America, and table 5 describes and illustrates the steps for estimating net migration among in-born and out-born persons separately for the New England division.

The figures in table 5 for each division were obtained by adding together the numbers of persons born in that division and enumerated in each of the divisions of the country. Ratios of this type are acceptable as survival ratios only if the population native to each area is reasonably "closed", that is, is unaffected by external migration —one of the conditions for the applicability of survival ratio methods. (See chapter II.)

In table 5, these ratios are applied to the 1950 resident population of New England which has been classified by division of birth. The resultant expected numbers (that is, the numbers that would be expected in 1960 in the

TABLE 4. OVER-ALL SURVIVAL RATIOS OF NATIVE WHITE MALES BY GEOGRAPHIC DIVISION OF BIRTH, UNITED STATES OF AMERICA, 1950-1960: PROCEDURE 2

Division of birth	*Native white males born in the division and enumerated anywhere in the United States, 1950*	*Native white males 10 years old and over born in the division and enumerated anywhere in the United States, 1960*	*Ten-year survival ratio, 1950-1960*
(1)	(2)	(3)	(4) = (3)/(2)
New England	4,018,516	3,696,112	0,919770
Middle Atlantic	12,526,609	11,505,221	0.918463
East North Central	13,070,675	11,914,402	0.911537
West North Central ...	7,882,937	7,145,528	0.906455
South Atlantic	7,373,563	6,766,652	0.917691
East South Central	5,183,050	4,677,577	0.902476
West South Central ...	6,015,384	5,640,579	0.937692
Mountain	1,980,217	1,894,899	0.956915
Pacific	3,186,973	3,074,806	0,964805
All divisions	61,237,924	56,315,776	0.919623

SOURCE: For columns (2) and (3), see Hope T. Eldridge, *Net Intercensal Migration for States and Geographic Divisions of the United States, 1950-1960; Methodological and Substantive Aspects.* Analytical and Technical Report No. 5 (Population, Studies Center, University of Pennsylvania, Philadelphia, 1965), table D, pp. 183-191.

absence of change due to migration) are then subtracted from the 1960 enumerated population ten years old and over to estimate net changes due to the migration of each segment of the resident population. The figures in column (5) indicate that during 1950-1960, the New England division experienced a net loss of 65,964 due to the migration of males aged ten years and over in 1960. This net loss is the algebraic sum of a greater net loss of 187,046 due to the migration of males born in New England and a net gain of 121,082 due to the migration of males born in other divisions of the United States of America. The in-migration of 121,082 for males born in other divisions was composed of a gain of 49,781 born in the Middle Atlantic, 21,239 born in the East North Central etc.

Net migration for persons under ten years of age can be obtained directly from the second census, since these were all born during the intercensal period, and any of them living outside their division of birth in 1960 are necessarily intercensal migrants.

Procedure 3

If place-of-birth statistics are tabulated by age for all the areal units of birth and residence separately (that is,

TABLE 5. ESTIMATED NET MIGRATION TO NEW ENGLAND BY GEOGRAPHIC DIVSION OF BIRTH, NATIVE WHITE MALES, 1950-1960: PROCEDURE 2 *(continued)*

Division of birth	*Native white males enumerated in New England in 1950*	*Native white males 10 years old and over in 1960*		*Net change due to migration 1950-1960*
		Expected	*Enumerated*	
(1)	(2)	(3)	(4)	(5)
New England	3,448,223	3,171,572	2,984,526	−187,046
Middle Atlantic	223,158	204,962	264,743	+59,781
East North Central	46,661	42,533	63,772	+21,239
West North Central	20,915	18,959	28,311	+9,352
South Atlantic	34,110	31,302	45,401	+14,099
East South Central	10,759	9,710	15,270	+5,560
West South Central	10,293	9,652	15,132	+5,480
Mountain	6,083	5,821	7,856	+2,035
Pacific	10,833	10,452	13,988	+3,536
TOTAL	3,811,035	3,504,963	3,438,999	−65,964

SOURCE: Columns (2) and (4), tables 8 and 10. Column (3) = column (2) multiplied by the survival ratios given in column (4) of table 4; column (5) = column (4) − column (3).

for each lifetime stream) and at both the censuses, more accurate estimates of period net migration can be obtained and these estimates can be made in considerable detail —by age, and for in-born and out-born persons separately, with further detail for the out-born by area of birth. The procedure is similar to that described above, but computations are done separately for each age cohort. This procedure is a special application of the Census Survival Ratio Method, the problems and procedures of which are discussed in more detail in chapter II. The steps involved in the calculations are given below, with illustrative materials drawn from data for the United States of America.

Step 1: Obtain for each area the totals by age of the male (or female) population born in that area and enumerated anywhere in the country. If these data are not directly available in the census, they can be obtained by combining the appropriate figures from the detailed cross-classification. Table 6 illustrates the kind of compilation that is needed for the computation of area-specific survival ratios using data for the nine geographic divisions of the United States. The figures have been adjusted for non-reporting of place of birth on an assumption of proportionality.

Step 2: Calculate a set of survival ratios for each area of birth by dividing the figures for the later census by the corresponding (same area of birth and same age cohort) figures for the earlier census. As in procedure 2, these ratios will be acceptable only if the population native to each area is closed or virtually so. Illustrative survival ratios are worked out in table 7 using the data of table 6.

TABLE 6. NATIVE WHITE MALES BORN IN CONTERMINOUS UNITED STATES OF AMERICA ON OR BEFORE 1 APRIL1950, AND LIVING IN CONTERMINOUS UNITED STATES OF AMERICA AT THE CENSUS DATES, BY AGE, COLOUR AND SEX, FOR GEOGRAPHIC DIVISIONS OF BIRTH, 1950 AND 1960: PROCEDURE 3

Division of birth									
					Age				
1950	*0-4*	*5-9*	*10-19*	*20-29*	*30-39*	*40-49*	*50-59*	*60+*	*Total*
NE.....	465,097	378,265	606,335	687,705	656,641	500,240	361,245	362,988	4,018,516
MA	1,361,035	1,116,416	1,866,222	2,133,202	2,121.819	1,624,536	1,150,382	1,152,977	12,526,609
ENC	1,522,349	1,217,854	1,948,213	2,043,774	1,939,167	1,566,433	1,280,657	1,552,228	13,070,675
WNC	743,217	615,227	1,111,939	1,194,264	1,229,910	1,087,393	915,609	985,378	7,882,937
SA	912,414	760,432	1,210,249	1,201,300	1,096,888	869,187	629,687	693,406	7,373,563
ESC	530,776	469,858	837,610	816,074	766,251	661,524	494,251	606,706	5,183,050
WSC	696,278	602,175	1,035,753	1,039,361	957,277	770,893	490,898	422,749	6,015,384
MT	291,411	229,569	372,067	346,454	321,363	205,783	125,936	87,634	1,980,217
PAC	708,837	496,101	571,444	500,986	384,823	246,108	157,064	121,610	3,186,973
1960	*10-14*	*15-19*	*20-29*	*30-39*	*40-49*	*50-59*	*60-69*	*70+*	*Total 10+*
NE.....	467,291	368,524	567,349	691,055	653,776	473,087	297,874	177,156	3,696,112
MA	1,377,499	1,088,482	1,764,197	2,165,949	2,091,434	1,526,770	935,508	555,382	11,505,221
ENC	1,534,186	1,189,741	1,852,268	2,088,048	1,924,846	1,488,806	1,066,126	770,381	11,914,402
WNC	743,690	596,680	1,029,881	1,207,170	1,222,771	1,038,422	767,234	539,680	7,145,528
SA	923,142	742,731	1,124,207	1,221,939	1,075,475	817,850	510,677	350,631	6,766,652
ESC	538,502	453,481	765,768	825,753	751,273	619,881	411,265	311,654	4,677,577
WSC	709,735	587,237	965,535	1,059,754	940,249	731,675	408,601	237,793	5,640,579
MT	297,089	227,040	347,198	355,396	318,240	194,210	104,212	51,514	1,894,899
PAC	719,251	488,011	543,220	508,297	379,598	235,989	132,074	68,366	3,074,806

SOURCE: As for table 4.

Note: For names of divisions, see table 4. "Conterminous" United States of America excludes the states of Alaska and Hawaii in accordance with official United States census usage.

TABLE 7. CENSUS SURVIVAL RATIOS FOR NATIVE WHITE MALES BY DIVISION OF BIRTH AND AGE, CONTERMINOUS UNITED STATES OF AMERICA, 1950-1960: PROCEDURE 3 *(continued)*

Age in 1950	Division of birth								
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*
10-14	1.00472	1.01210	1.00778	1.00064	1.01176	1.01456	1.01933	1.01948	1.01469
15-19	.97425	.97498	.97692	.96985	.97672	.96514	.97519	.98898	.98369
20-29	.93567	.94484	.95070	.92722	.92889	.91421	.93220	.93315	.95060
30-39	1.00487	1.01535	1.02166	1.01081	1.01718	1.01186	1.01962	1.02581	1.01459
40-49	.99564	.98568	.99262	.99420	.98048	.98045	.98221	.99028	.98642
50-59	.94572	.93982	.95044	.95496	.94094	.93705	.94913	.94376	.95888
60-69	.82458	.81322	.83248	.83795	.81100	.83210	.83235	.82750	.84089
70+	.48805	.48169	.49631	.54769	.50566	.51368	.56249	.58783	.56217

SOURCE: Hope T. Eldridge, op. cit., table E, pp. 192-196. Ratios shown here for cohort 20-29 were revised after publication of the report.

Step 3: Multiply the population of a given area at the first census by the survival ratios to obtain expected numbers of survivors at the second census. The expected numbers are obtained separately by age and area of birth, and the process is repeated for each area (and each sex or other sub-category of the population). Tables 8 and 9 illustrate step 3 for the New England division of the United States. The ratios of table 7 are multiplied by the 1950 population shown in table 8 to obtain the expected numbers shown in table 9. (The calculations for other divisions are not shown.)

Step 4: Subtract the expected survivors from the enumerated population at the second census to obtain estimates of net migration by age and area of birth. Repeat this step for each area of residence. The enumerated population in 1960 for New England is given in table 10 and the estimates of net migration for this division, classified by age and division of birth, are given in table 11. They were obtained by subtracting the figures of table 9 from those of table 10.

In table 11, the sum of the figures in the first column gives net out-migration of the in-born and the sum of

TABLE 8. NATIVE WHITE MALES BORN IN CONTERMINOUS UNITED STATES OF AMERICA AND ENUMERATED IN NEW ENGLAND IN 1950, CLASSIFIED BY AGE AND BY DIVISION OF BIRTH: PROCEDURE 3 *(continued)*

Age in 1950	Division of birth									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Total*
0-4	442,577	7,651	1,831	719	3,451	679	830	533	1,730	460,001
5-9	354,131	10,477	1,966	628	3,735	558	794	352	1,342	373,983
10-19	557,607	27,256	5,488	1,600	3,635	969	949	414	1,494	599,412
20-29	576,161	43,041	13,035	5,647	9,078	3,578	3,507	1,691	2,730	658,468
30-39	540,315	44,449	8,259	4,439	5,734	2,197	2,162	1,487	1,552	610,594
40-49	402,369	35,463	5,980	2,922	3,527	1,130	969	732	934	454,026
50-59	287,577	26,284	4,796	2,479	2,560	873	682	535	535	326,321
60+	287,486	28,537	5,306	2,481	2,390	775	400	339	516	328,230
All ages	3,448,223	223,158	46,661	20,915	34,110	10,759	10,293	6,083	10,833	3,811,035

SOURCE: United States Bureau of the Census, *United States Census of Population: 1950* (Washington, D.C.), vol. IV, *Special Reports*, part 4, chap. A, "State of birth", table 19, pp. 50-55. Persons with place of birth not reported were distributed *pro rata* among those with place of birth reported.

TABLE 9. EXPECTED NUMBERS OF NATIVE WHITE MALES FOR NEW ENGLAND, BY AGE AND DIVISION OF BIRTH, CONTERMINOUS UNITED STATES OF AMERICA, 1960: PROCEDURE 3 *(continued)*

Age in 1950	Division of birth									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Total*
10-14	444,666	7,744	1,845	719	3,492	689	846	543	1,755	462.299
15-19	345,012	10,215	1,921	609	3,648	539	774	348	1,320	364,386
20-29	512,736	25,753	5,217	1,484	3,377	886	885	386	1,420	561,144
30-39	578,967	43,702	13,317	5,708	9,234	3,620	3,576	1,735	2,770	662,629
40-49	537,959	43,812	8,198	4,413	5,622	2,154	2,124	1,473	1,531	607,286
50-59	380,528	33,329	5,684	2,790	3,319	1,059	920	691	896	429,216
60-69	237,130	21,375	3,993	2,077	2,076	726	568	443	450	268,838
70+	140,308	13,746	2,633	1,359	1,209	398	225	199	290	160,367
10+	3,186,306	199,676	42,808	19,159	31,977	10,071	9,918	5,818	10,432	3,516,165

SOURCE: Computed by multiplying the entries of table 7 by the corresponding entries of table 8.

TABLE 10. NATIVE WHITE MALES BORN IN CONTERMINOUS UNITED STATES OF AMERICA AND ENUMERATED IN NEW ENGLAND IN 1960, CLASSIFIED BY AGE AND BY DIVISION OF BIRTH: PROCEDURE 3 *(continued)*

Age in 1960	Division of birth									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Total*
10-14	417,069	17,077	4,376	1,313	5,578	960	1,413	819	2,687	451,292
15-19	314,048	24,133	6,934	2,361	6,160	1,417	1,703	845	2,141	359,742
20-29	448,711	51,282	16,789	7,448	11,480	4,753	4,467	1,997	3,482	550,409
30-39	545,014	50,274	13,122	5,921	9,685	3,878	3,746	1,472	2,345	635,457
40-49	517,564	49,548	9,675	4,745	5,822	2,013	2,131	1,371	1,787	594,656
50-59	373,051	35,502	6,182	2,900	3,326	1,049	974	744	820	424,548
60-69	231,804	22,344	3,953	1,971	1,982	785	495	386	459	264,179
70+	137,265	14,583	2,741	1,652	1,368	415	203	222	267	158,716
10+	2,984,526	264,743	63,772	28,311	45,401	15,270	15,132	7,856	13,998	3,438,999

SOURCE: United States Bureau of the Census, *United States Census of Population: 1960; Subject Reports;* "State of birth" (Washington, D.C.), table 25, pp. 61-62. Persons with place of birth not reported were distributed *pro rata* among those with place of birth reported.

TABLE 11. NET CHANGES DUE TO THE MIGRATION OF NATIVE WHITE MALES, BY AGE AND DIVISION OF BIRTH, FOR NEW ENGLAND, 1950-1960: PROCEDURE 3 *(continued)*

Age in 1960	Division of birth									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Net balance*
10-14	−27,597	+9,333	+2,531	+594	+2,086	+271	+567	+276	+932	−11,007
15-19	−30,964	+13,918	+5,013	+1,752	+2,512	+878	+929	+497	+821	−4,644
20-29	−73,025	+25,529	+11,572	+5,964	+8,103	+3,867	+3,582	+1,611	+2,062	−10,735
30-39	−33,953	+6,572	−195	+213	+451	+258	+170	−263	−425	−27,172
40-49	−20,395	+5,736	+1,477	+332	+200	−141	+7	−102	+256	−12,630
50-59	−7,477	+2,173	+498	+110	+7	−10	+54	+53	−76	−4,668
60-69	−5,326	+969	−40	−106	−94	+59	−73	−57	+9	−4,659
70+	−3,043	+837	+108	+293	+159	+17	−22	+23	−23	−1,651
10+	−201,780	+65,067	+20,964	+9,152	+13,424	+5,199	+5,214	+2,038	+3,556	−77,166

SOURCE: Computed by subtracting table 9 from table 10.

TABLE 12. NET GAINS DUE TO EXCHANGES BETWEEN DIVISIONS, NATIVE WHITE POPULATION 10 YEARS OLD AND OVER IN 1960, GEOGRAPHIC DIVISIONS OF CONTERMINOUS UNITED STATES OF AMERICA, 1950-1960

(Thousands)

Division of gain	Division of loss							
	MT	*SA*	*ENC*	*WSC*	*NE*	*ESC*	*MA*	*WNC*
PAC	145.0	82.2	461.9	270.2	109.8	89.6	270.1	470.6
MT	.	18.1	136.8	79.4	16.3	28.0	60.9	173.0
SA	.	.	126.0	16.2	112.9	199.9	414.4	85.2
ENC	.	.	.	1.9	.	346.0	88.7	48.9
WSC	.	.	.	.	5.7	46.3	33.2	4.3
NE	.	.	7.6	.	.	0.7	52.4	6.1
ESC	.	.	.	.	.	.	5.8	1.2
MA	.	.	.	.	.	.	.	2.7

SOURCE: Eldridge and Kim, op. cit., table 11, p. 61.

the sums of the remaining divisional columns gives net in-migration of the out-born. The sum of the last column gives the net balance of migration for all ages.

Eldridge and Kim were able to evaluate the results obtained from procedure 3 for the United States by adjusting gross data for 1955-1960 in such a way as to make them comparable with the procedure 3 estimates for 1950-1960.[1] They found that net balances were much more accurately estimated by this procedure than were "migration streams". The detail in table 11 both understates the volume of migration streams and causes some distortion of their relative size by area of origin. The last is the result of the attribution of place of origin to place of birth, an attribution that is implicit in procedure 3 or any procedure which attempts to estimate period migration from place-of-birth data. However, when net balances are calculated for all pairs of streams (see table 12 and maps 2 and 3), both the volume and the patterns of net shift are quite accurately estimated.

Problems of accuracy and adequacy

On general principles, it would appear reasonable to expect that a simple question on birth-place would be

[1] Hope T. Eldridge and Yun Kim, *Estimating Intercensal Migration from Birth-Residence Statistics; A Study of Data for the United States, 1950 and 1960*, Analytical and Technical Report No. 7 (Population Studies Center, University of Pennsylvania, Philadelphia, 1967).

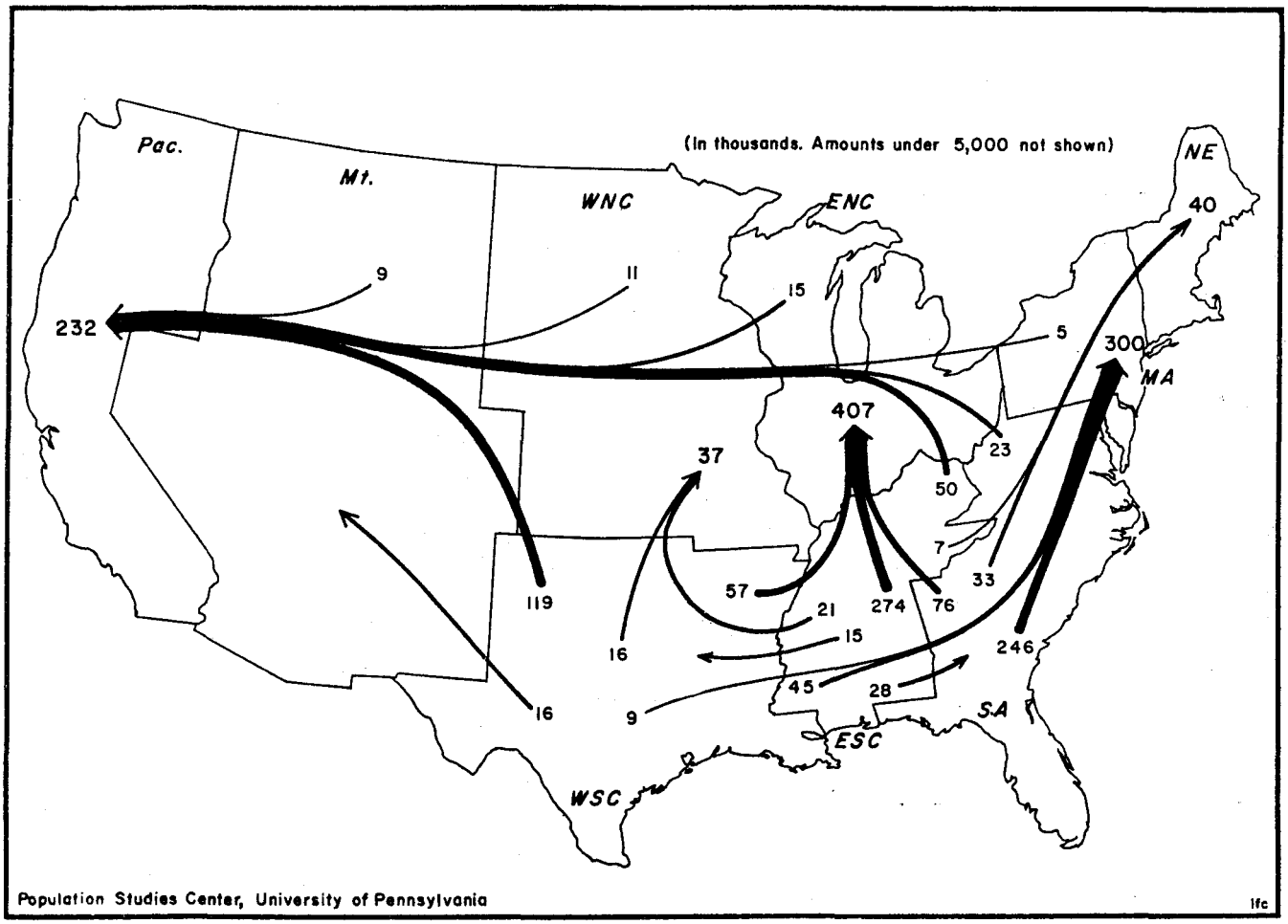
answered with accuracy and completeness. The question is easily understood. Normally, the place where a person was born is fixed in his mind and well known to those close to him. There are, however, possibilities of response error in these data.

The answers to census questions are usually given by one member of the household, ordinarily the head or the housewife, but not always. The respondent may not know the exact birth-place of each person who resides with him or her. If a person has lived in one place for a long time, there may be a tendency to report it as his birth-place. Unintentional mis-statement of place of birth is, therefore, quite possible. There may also be deliberate misreporting of birth-place for political or prestige reasons. The endeavour to identify the area of birth can also introduce a bias in terms of the urban or rural origin of a migrant. A person born in a little-known rural place may prefer to state the name of a better-known nearby town or city, so as to specify his geographic origin more clearly. As a result, many migrants may be reported as having been born in an urban place, though actually they were born in a rural place.

Another factor that can contribute to inaccuracy is associated with boundary changes of geographic units. People are not likely to be aware of such changes, and through ignorance of them may report birth-places incorrectly.

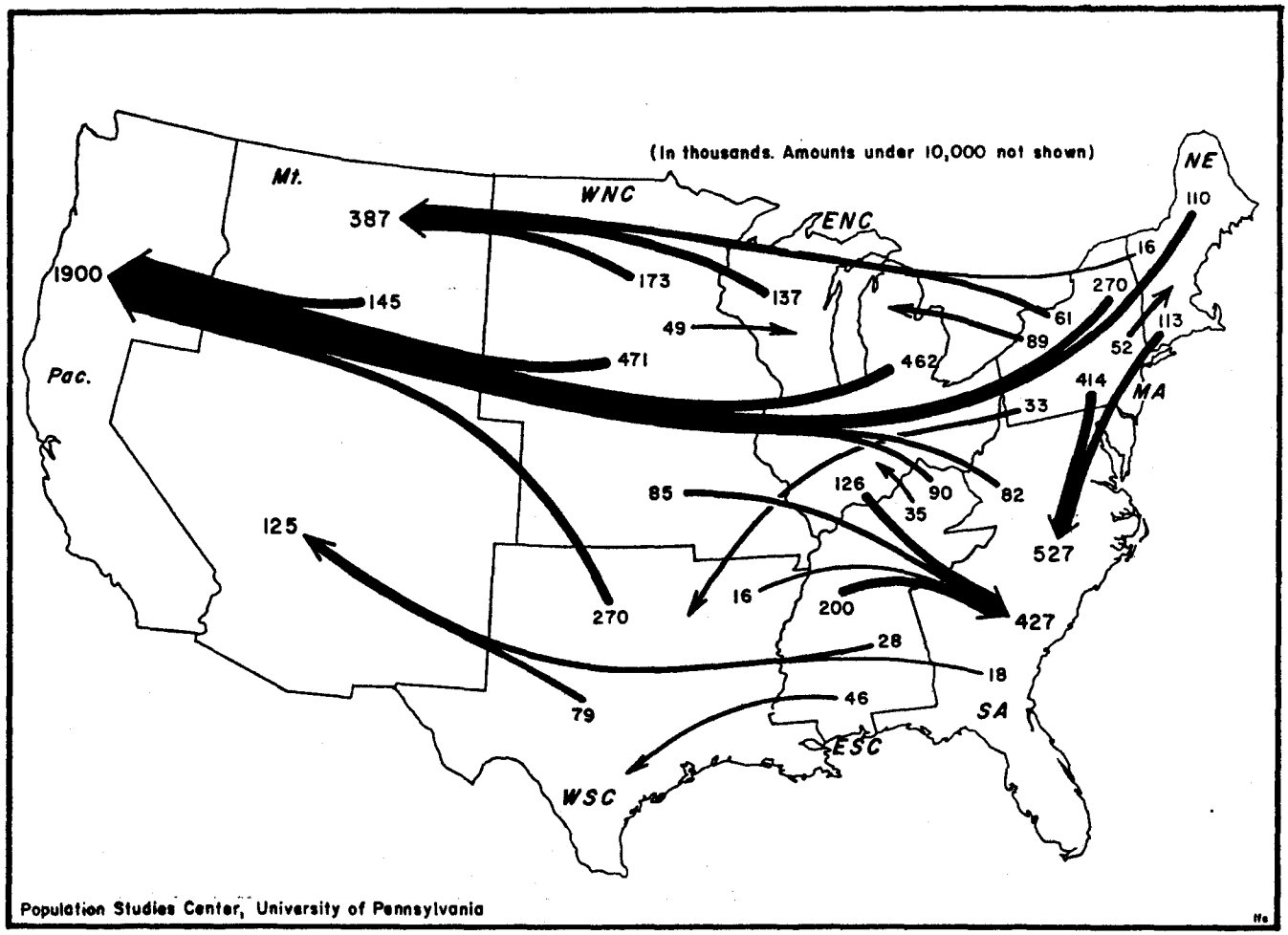
In respect to adequacy, special conditions may render birth-place data unsatisfactory for purposes of migration analysis. In India, for example, it is customary for a woman to return to her father's household to bear the first child and often the second and subsequent children. This custom gives rise to some spurious migration as measured from place-of-birth statistics. It serves to illustrate the desirability, for migration analysis, of identifying the place of birth as the usual place of residence of the parents of a child rather than as the place where the birth actually occurred.

One of the main problems connected with the use of birth-place statistics for migration analysis is that the timing of migrations is unknown. Inasmuch as birth-place statistics reflect migrations, which may have taken place at any time since birth, the category "migrants" includes those who came to the place of enumeration just a few days before the census date as well as those who came a half-century or more earlier. It is to cope with this problem that the procedures described above have been devised. As an illustration of difference between



Map 2. Net streams between divisions, native whites 10 years old and over, conterminous United States of America, 1950-1960

SOURCE: Hope T. Eldridge and Yun Kim, *Estimating Intercensal Migration from Birth-Residence Statistics*, Analytical and Technical Report No. 7 (Population Studies Center, University of Pennsylvania, Philadelphia, December 1967), p. 62.



Map 3. Net streams between divisions, native non-whites 10 years old and over, conterminous United States of America, 1950-1960

SOURCE: Hope T. Eldridge and Yun Kim, *Estimating Intercensal Migration from Birth-Residence Statistics*, Analytical and Technical Report No. 7 (Population Studies Center, University of Pennsylvania, Philadelphia, December 1967), p. 63.

short-term and lifetime migration, consider the migration between Assam and Bihar states in India during the period just before 1931. The net balance of lifetime migration of females between Assam and Bihar was 187,000 in favour of Assam, but an estimate of net intercensal migration during 1921-1931 indicates a gain of about 5,000 females to Bihar.[2] The latter amount, though relatively small, is in the opposite direction from the former. Thus, the impression one gets from the figures on lifetime migration may be quite misleading so far as the more recent period is concerned.

The birth-place definition of migrants assumes a single movement directly from the area of birth to the area of enumeration. Actually some, perhaps a substantial number, of out-born persons enumerated in an area will have moved to it from places other than their places of birth.

The birth-place approach necessarily counts all persons enumerated in their birth-places as non-migrant, even though some of these will have spent most or part of their lives outside the area, having returned to it before the census date. Exclusion of such return migrants from the category of migrants is a serious drawback of birth-place data, but this exclusion need not materially affect estimates of period net migration. These considerations bring out the importance of supplementing direct measures of lifetime migration with indirect measures of period migration.[3]

DURATION OF RESIDENCE

Another approach to the measurement of migration is made possible by including in the census the single question: "How long have you been living in this place?"

[2] India, Census Commissioner, *Census of India*, 1931, vol. I, *India* (Delhi, 1933), part II, "Imperial tables", table VI, pp. 61-62.

[3] Examples of studies that have utilized birth-place statistics in somewhat different ways are: André Beltramone, "Sur la mesure des migrations intérieures au moyen des données fournies par les recensements", *Population* (Paris), 17 Oct.-Dec. 1962, pp. 703-724; Juan C. Elizaga, "Internal migration in Latin America; some methodological aspects and results", *International Social Science Journal* (Paris), vol. 17, No. 2, 1965, pp. 213-231; D. Friedlander and R. J. Roshier, "A study of internal migration in England and Wales, part I: Geographical patterns of internal migration, 1851-1951", *Population Studies* (London), vol. 19, No. 3, March 1966, pp. 239-279.

Persons who have lived in the place of enumeration all their lives would be treated as non-migrants, others as in-migrants. With this approach, persons who were born in a given area but who subsequently moved out and then returned to it would be treated as in-migrants, the duration of residence being taken as the length of time elapsed since they returned to the place of birth. Thus, migrants by the duration-of-residence definition would include all who had ever migrated: (*a*) those born outside the area of enumeration, and (*b*) those born in the area of enumeration who had at some time lived outside it (return migrants). Their number must therefore be more than, though very rarely it may be equal to, the number of lifetime migrants by the birth-place definition.

Although the duration-of-residence approach can, by counting return migrants, fill a gap inherent in the ordinary birth-place approach, the prevailing practice among countries that have included such a question has been to distinguish migrants from non-migrants on the basis of birth-place rather than on the basis of length of residence. This was the practice, for example, in the 1960 census of Peru, the 1961 census of India, and in most censuses which contained a question on duration of residence.

Migration cohorts

The principal value of data on duration of residence is in another direction, namely, in the information it gives on the timing of the last moves of lifetime migrants. An illustrative tabulation of data on duration of residence is given in table 13, where the population born outside each state of Peru is classified by duration of residence in the state in which they were enumerated in 1960. The figures in the rows show the distribution of in-migrants for each state by duration of residence in that state. In other words, these data furnish a distribution of lifetime in-migrants by time of last arrival, or a classification by migration cohorts. This is the unique contribution of the question on duration of residence. The duration of residence can be expressed in time periods as illustrated schematically for a census taken in April 1960.

Duration of residence	*Period of in-migration*
Less than 1 year	After April 1959
One or more but less than 5 years	April 1955 to April 1959
Five years or more but less than 10 years	April 1950 to April 1955
Ten years or more	Before April 1950

Data of this type furnish useful information about the recent migration history of the area. Thus, for Peru as a whole, nearly 16 per cent of lifetime migrants moved to their destinations during the twelve months prior to the census; 42 per cent moved before 1950 (see total line of table 13). In the state of Amazonas, however, 29 per cent of lifetime migrants moved in during the year before the census, and only 22 per cent before 1950. According to these data, the proportion of recent migrants was higher in Amazonas as compared to the average for the country as a whole.

TABLE 13. MIGRANTS CLASSIFIED BY STATE OF ENUMERATION AND DURATION OF RESIDENCE, PERU, 1960

State	*Total*	*Duration of residence (years)*			
		Less than one year	*1-4*	*5-9*	*10+*
Amazonas	26,643	7,770	9,006	4,049	5,818
Ancash	98,589	17,968	30,165	17,499	32,957
Apurimac	15,348	4,007	4,051	1,705	5,585
Arequipa	119,429	24,461	33,295	18,721	42,952
Ayacucho	30,648	7,171	8,105	3,890	11,482
Cajamarca	87,940	13,862	23,051	16,562	34,465
Prov. Const. Del Callao [a]	104,367	11,036	21,451	17,368	54,512
Cuzco	115,484	26,536	30,669	17,747	40,532
Huancavelica	18,783	4,167	5,091	2,164	7,361
Huanuco	44,818	9,606	12,817	6,838	15,557
Ica	71,472	16,594	18,414	12,398	24,066
Junin	123,628	24,602	36,853	22,037	40,136
La Libertad	120,226	15,632	29,606	21,486	53,502
Lambayeque	75,500	10,255	16,995	12,385	35,865
Lima	881,654	99,995	201,539	165,672	414,448
Loreto	73,456	11,694	19,127	13,308	29,327
Madra De Dios	6,150	2,006	1,774	791	1,579
Moquegua	12,913	3,028	5,049	1,802	3,034
Pasco	31,250	6,425	9,701	6,123	9,001
Piura	98,805	17,123	21,653	15,770	44,259
Puno	57,732	12,970	17,396	8,729	18,637
San Martin	21,294	3,153	4,916	3,096	10,129
Tacna	28,511	7,517	10,941	4,044	6,009
Tumbes	15,084	3,483	5,241	1,949	4,411
TOTAL	2,279,724	361,061	567,906	396,133	945,624

SOURCE: Peru, Dirección Nacional de Estadística y Censos, *VI Censo Nacional de Población, República del Perú* (Lima, 1964), Tomo II, cuadro No. 25, pp. 2-9.

[a] Special district.

Duration-of-residence data for Yugoslavia indicate that the proportion of recent migrants (those who moved in during 1958-1961) increased as the distance of migration increased; namely, from 20 per cent for movers within communes to 24 per cent for those who moved between communes within the same state, and to 26 per cent for those who moved between states. Conversely, the proportion of migrants who moved before 1941 decreased as distance increased (see table 14).

TABLE 14. PERCENTAGE DISTRIBUTION OF IN-MIGRANTS BY PERIOD OF MIGRATION AND TYPE OF MIGRATION, YUGOSLAVIA, 1961

Type of migration	*Period of migration*			
	All periods	*Before 1941*	*1941-1957*	*1958-1961*
Within communes	100	34	46	20
Between communes:				
Within states	100	23	53	24
Between states	100	15	59	26

SOURCE: Yugoslavia, *Ukupno i poljoprivredno stanovništvo prema popisu, 1961*, table 7, p. 56.

In interpreting data of these types, it must be remembered that the in-migrants enumerated in any area are the non-mobile survivors of the actual cohorts that migrated during the indicated periods. The cohorts that arrived at the specified places have been decimated by two factors: further migration and deaths. Because the cohorts of migrants who have lived a longer time in the community have been subjected to more years of attrition from mortality and further migration, one would expect rates computed as annual equivalents (number of migrants in the cohort divided by the number of years times the average population) to decrease with increasing duration even though actual rates may not have decreased. Despite these limitations, the data are capable of yielding useful information on differences between areas in the average level for a given period of time and in the pattern of change with increasing duration. Such differences may give some indication of trends in past migration.

A single question on duration of residence does not give any indication of the place of origin of the in-migrants to a given area, and consequently no information on out-migration or on net migration can be derived from it. Nor does it distinguish between immigrants and internal migrants. It follows, therefore, that the data are not of much use for the study of these aspects of migration or for the analysis of migration streams, unless the question on duration of residence is accompanied by another on place of origin or place of birth. If, however, duration-of-residence data become available for two censuses, these can be used to estimate the magnitude of remigration; that is, migration among former in-migrants to an area. A procedure for deriving such estimates is shown schematically in table 15.

TABLE 15. DUMMY TABLE SHOWING METHOD OF ESTIMATING OUT-MIGRATION AMONG FORMER IN-MIGRANTS FROM DURATION OF RESIDENCE DATA FOR AN INTERCENSAL INTERVAL OF 10 YEARS

Age at first census	*In-migrants of duration 0-4 years, first census*	*Expected migrants of duration 10-14 years, second census*	*Enumerated migrants of duration 10-14 years, second census*	*Intercensal out-migration among in-migrants of duration 0-4 years at first census*
(1)	(2)	(3)	(4)	(5)
0-4				
5-9				
10-14				
15-19				
20-24				
. .....				
. .....				
. .....				
. .....				

Note: Columns (2) and (4) are obtained from census data on in-migrants by age and duration or residence in the two censuses. Column (3) is obtained by multiplying column (2) by an appropriate set of survival ratios (national survival ratios if more appropriate ones are not available). Column (5) is obtained by the subtraction of column (3) from column (4).

Problems of accuracy and adequacy

As in the case of birth-place data, the accuracy of duration-of-residence data is affected by the fact that the information is sometimes given by a respondent who does not know the duration of residence of all household members. There may, therefore, be a considerable number reported as "duration unknown". In a study of in-migrants to Greater Bombay[4]—based on data from the census of 1961—the proportion of migrants for whom duration of residence was not reported averaged 9 per 1,000 and proportions varied somewhat from one subgroup of migrants to another. It was greater for females than for males; for the urban-born than for the rural-born; for the single than for the married, widowed or divorced; for male non-workers than for male workers; but, conversely, for female workers than for female non-workers; young children than for most adult groups, and so on.

This study also gives evidence of digit preference, for example, the number reporting duration-of-residence

[4] K. C. Zachariah, *Migrants in Greater Bombay* (Bombay, Asia Publishing House, 1968), pp. 72, 74, 76-77.

as ten years was very much greater than single-year estimates for adjacent durations; and the number reporting fifteen years was much greater than the estimates for thirteen or fourteen years. There is no reason to believe that this pattern reflects variations in period migration. It is therefore a reasonable inference that it reflects the same type of preference for certain integers (like 10 and 15) that is almost universally manifested in age reporting.

Cross-classification by place of birth

As mentioned above, it is becoming a more frequent practice in censuses to include questions on both place of birth and duration of residence. An illustration of the cross-classification of these data is given in table 16, where lifetime in-migrants in Greater Bombay in 1961 are cross-classified by state of birth, and length of residence in the city. The spatial and temporal origin and the effect of variation of one on the other can be studied from these figures. For example, it can be seen that 34 per cent of all lifetime migrants have been in the city for more than fifteen years. In general, the numbers of "survivors" of migrants who came to the city in each year decrease as the interval of time between the year of arrival and the census date (duration of residence) increases; but the rate of decrease declines with increase in length of interval. The distribution of migrants by duration of residence is not the same for all lifetime streams. The highest average is for the Gujarat-born migrants, with more than 41 per cent in the duration interval 15+ years; and the lowest is for those born in Kerala, where the proportion of migrants in the duration interval 15+ was only 20 per cent. The spatial origin of the migrants may be studied by considering the percentage distribution

TABLE 16. PERCENTAGE DISTRIBUTION OF MIGRATION STREAMS BY DURATION OF RESIDENCE, AND OF DURATION COHORTS BY STATE OF ORIGIN, GREATER BOMBAY, 1961: BOTH SEXES

States	All	0-1	1-4	5-9	10-14	15+	Not known
	Percentage of total in each duration						
All states	100	7.78	20.17	17.61	19.41	34.14	0.89
Maharashtra	100	7.37	20.13	17.37	16.60	37.64	0.90
Gujarat	100	7.00	15.50	16.26	18.77	41.43	1.04
Mysore	100	7.05	22.29	19.95	17.45	32.54	0.72
Kerala	100	20.01	30.54	21.89	16.92	20.04	0.60
Madras	100	8.21	27.27	23.07	19.65	21.08	0.73
Andhra Pradesh	100	11.61	27.34	19.21	17.25	23.80	0.78
Uttar Pradesh-Bihar	100	10.02	23.94	19.02	18.16	28.01	0.85
West Bengal	100	11.77	25.16	19.88	17.40	24.90	0.87
Rajasthan-Punjab	100	10.92	24.55	20.01	18.97	24.70	0.85
Madhya Pradesh	100	9.47	20.34	18.28	19.32	31.19	1.40
	Percentage of total in each state						
All states	100	100	100	100	100	100	100
Maharashtra	42.11	39.85	42.03	41.53	36.01	46.43	42.93
Gujarat	17.10	15.38	13.14	15.78	16.53	20.75	20.11
Mysore	6.51	5.90	7.20	7.38	5.86	6.21	5.29
Kerala	2.79	3.59	4.23	3.47	2.43	1.64	1.89
Madras	3.24	3.42	4.38	4.24	3.28	2.00	2.65
Andhra Pradesh	3.42	5.10	4.63	3.73	3.04	2.98	3.01
Uttar Pradesh-Bihar	12.37	15.93	14.68	13.36	11.57	10.15	11.81
West Bengal	0.62	0.93	0.77	0.70	0.55	0.45	0.61
Rajasthan-Punjab	3.60	5.06	4.38	4.09	3.52	2.61	3.47
Madhya Pradesh	0.88	1.07	0.89	0.92	0.88	0.81	1.39
Others [a]	7.36	3.77	3.67	4.80	16.33	6.58	6.84

SOURCE: K. C. Zachariah, *Migrants in Greater Bombay*, table 3.13, p. 59, and table 3.12, p. 58.

[a] Including all other states, and also Goa, Pakistan and "place of birth not reported".

by columns. For example, it may be seen that 42 per cent of all migrants were born in Maharashtra, the state in which Greater Bombay is located, and 17 per cent were born in the neighbouring state of Gujarat. Uttar Pradesh-Bihar, though physically far from Bombay, is the third in order of importance. Taken together, these three main origins account for no less than 71 per cent of all migrants in the city. The spatial pattern has undergone some change in the past. The neighbouring areas, on the whole, show decreasing importance. For example, the proportion of Maharashtra-born migrants was 46.4 per cent for duration of residence 15+ years, but was only 39.9 per cent for duration less than one year. For the Gujarat-born, the corresponding proportions are 20.7 for duration 15+ years but only 15.4 for duration less than one year. On the other hand, the share of Uttar Pradesh-Bihar is less for the longer duration (10.1 per cent) than for the shorter (15.9 per cent).

Place of last previous residence

Character of the data

One of the limitations of data on place of birth is that, for persons who have migrated more than once, the place of birth gives no indication of residence at the time of last move. In order to get information on direct moves, it is necessary to ask for place of last residence rather than for birth-place. The data will then permit identification of persons as migrants whenever their place of last residence and place of present residence differ. The category "migrants" will thus include all lifetime migrants plus return migrants; that is, all persons who have migrated at any time or all persons who have ever lived outside the area of birth. Non-migrants will be those who have never lived outside the area of birth.

Data derived from the inquiry on place of last residence can be utilized in the same way that place-of-birth data are utilized for obtaining migration measures. From the cross-classification of place of last residence with place of present residence, the places of origin of the in-migrants to an area, the places of destination of out-migrants from an area, and the amount of net migration between any two areas can be derived. The tabulations required and the methods employed in this approach are identical with those described in connexion with place-of-birth data, except that the place of last residence rather than the place of birth is the point of reference.

Advantages and limitations

These data, like those based on birth-place, suffer from the absence of a definite time reference. Persons who migrated fifty years ago or earlier and persons who moved only a few days ago will be grouped together as migrants. Nevertheless, a very important advantage of the place-of-last-residence approach over the place-of-birth approach is that the former reflects direct movement between places, while the latter ignores intervening moves between departure from the first residence and arrival at the last residence.

As to accuracy, there has been little opportunity as yet to assemble data concerning the validity of responses to the question on place of last residence. It is not known whether the place of birth is more likely to be retained in memory than the place of last residence, but this may be true for people who have moved many times. It is therefore possible that not much improvement will occur in the correctness of reporting if the inquiry on birth-place is replaced by one on place of last residence.

Cross-classification by duration of residence

The question on place of last residence provides much more useful information, as does the question on place of birth, when it is combined with a question on duration of residence, for then migration cohorts and migration streams can be identified and period migration can be studied. The methods appropriate for analysing these combined data are similar to those described above for use with combined data on place of birth and duration of residence.

If information is obtained on both place of birth and place of last residence, as well as on duration of residence of migrants, not only can the approach be varied, as appropriate to particular studies, but a cross-classification of place of birth by place of last residence can provide

TABLE 17. MIGRANTS, BY TYPE OF MOVE, TYPE OF ORIGIN AND TIME OF MIGRATION, YUGOSLAVIA, 31 MARCH 1961

(*Thousands*)

	Total	Time of migration					
		1940 and before	*1941-1945*	*1946-1952*	*1953-1957*	*1958-1961*	*Unknown*
Type of move							
All types	6,884	1,747	536	1,430	1,438	1,556	178
Internal	6,731	1,687	518	1,406	1,428	1,549	144
Same commune	2,111	719	139	392	392	426	43
Other commune of same state	3,297	773	236	704	738	781	65
Other states	1,323	195	143	310	298	342	36
External	112	57	16	22	8	5	4
Unknown	41	3	1	2	2	3	30
Type of origin							
All types	6,884	1,747	536	1,430	1,438	1,556	178
Internal	6,712	1,681	518	1,402	1,425	1,544	142
Rural areas	4,854	1,352	357	998	986	1,067	94
Mixed areas	472	102	38	97	110	116	9
Urban areas	1,386	227	123	307	329	361	39
External	112	57	16	22	8	5	4
Unknown	60	9	2	6	6	7	31

SOURCE: Yugoslavia, Savezni Zavod Za Statistiku, *Statistički Godisnjak SFRJ, 1966*, Thirteenth year (Belgrade, July 1966), pp. 85, 103-105.

Note: The total population, in thousands, was 18,549, of which 11,665 were non-migrants.

methodologically useful information for testing the relative advantages of the two questions. Moreover, with such information it is possible to identify persons moving from areas other than the area of birth (secondary migrants) and persons returning to their areas of birth (return migrants). These measures would, of course, still be only partial because they would not take account of the additional moves made between intermediate places of residence.

Some countries have included a question on place of last residence either alone or in combination with duration of residence (notably a number of Latin American countries and Yugoslavia). In the 1961 census of Yugoslavia, a question on place of last residence was followed by another on the date of arrival at the place of enumeration. Some data drawn from that census are presented in table 17. The total number of migrants was about 6,884,000 (or 37 per cent of the total population of the country) of which 4,854,000 (71 per cent of the latter total) originated in rural areas; 472,000 (7 per cent of the total) in mixed settlements; 1,386,000 (20 per cent) in urban areas; and the balance from outside Yugoslavia. The average duration of residence among internal migrants was longest for migrants from rural areas and shortest for those from urban areas, with the migrants from mixed areas occupying an intermediate position. The external migrants were the group with the longest average duration, 50 per cent having migrated before 1941.

Cross-classification of data like these by specific origins and destinations can yield a wealth of information about the patterns and character of internal migration. Obviously, such detail for all durations would involve extensive tabulations. However, it should be noted that origin-destination tabulations for one migration interval (say "duration five years or less") would yield information closely comparable to that obtained from an inquiry on residence at a fixed past date. The duration-by-place-of-last-residence approach would yield a somewhat larger number of migrants for a given interval, because it would count circular migrants whereas the other approach would not. Stream data would also differ somewhat. For multiple movers, the first approach would designate place of last residence as place of origin; the second approach would designate place of residence at the beginning of the interval as place of origin.

Place of residence at a fixed prior date

Type of measure

Responses to a question concerning residence on a specified past date furnish information that is in many ways the most readily manipulable from the analyst's point of view. The migration interval is clear-cut; migration status is determined by a comparison of residence at two definite points in time; and a migrant is defined as a person whose residence at the census date differs from his residence at the specified prior date. This approach relates strictly to persons who were alive at the beginning of the interval and survived to the end of it. It gives a count of surviving migrants for a single fixed period of time. It understates the number of such migrants in that it does not count as migrants those who moved out of an area during the interval and returned to it before the end of the interval. Information on the migration of persons born during the interval can be obtained only if a supplementary question on birth-place is included.

It differs from the last-residence-by-duration approach just discussed in that (*a*) the place of origin is the place or residence at a fixed prior date rather than the place of residence just before the last move and (*b*) moves made before the specified date are disregarded entirely. Data from these two sources have certain elements in common, provided the migration interval can be equated to a duration interval. Thus, if the fixed prior date is five years before the census in the first instance; and if data are compiled for the duration "five years or less" in the second instance, the two measures are closely comparable except as indicated in (*a*) and (*b*) above.

In asking this question in censuses, an important consideration is the length of the interval. The time intervals most commonly selected are five years (e.g., the United States of America, 1960 and 1940; Greece, 1960) and one year (e.g., Japan, 1960; the United States of America, 1950). Both the total number of moves and the total number of movers are understated to degrees that vary according to the length of the interval. The migration interval should therefore be short enough to obtain a significantly large proportion of all moves. On the other hand, the interval should be long enough to permit the accumulation of enough relatively permanent movements so that the analyst can detect prevailing patterns of migration and can depend upon finding numerical frequencies that are reasonably free from chance variations. It is difficult to designate an optimum length of interval that would be suitable from all points of view; but the balance of a number of factors, such as effective recall, consonance with the census age distribution, attrition due to mortality, as well as those just mentioned, suggest that an interval of five years is perhaps the most serviceable.

Advantages and limitations

Because of its simplicity and specificity, this type of question is considered by some demographers to represent a more worthwhile and useful approach than a question on place of birth or place of last residence, especially if these last two are not accompanied by a question on duration of residence. On the other hand, it can be argued that people have difficulty in recalling where they were living at some arbitrary date in the past and that it is easier for them to recall place of last residence or duration of present residence.

Table 18 shows a cross-classification of migrants by place of enumeration and place of residence five years before the census for each geographic division in the United States of America. Column 1 of this table gives the in-migrant streams to the New England division by their divisions of origin (i.e., residence in 1955). About 440,000 migrants came to New England between 1955 and 1960, of whom 182,000 were living in the Middle Atlantic division in 1955, 58,000 in the East North Central division etc. Correspondingly, from row 1 of the

TABLE 18. INTERDIVISIONAL MIGRANTS IN THE UNITED STATES OF AMERICA FOR THE POPULATION 5 YEARS OLD AND OVER, BY DIVISION OF RESIDENCE IN 1955 AND DIVISION OF ENUMERATION IN 1960

Division of residence in 1955	*Division of enumeration in 1960*									*Out-migrants, 1955-1960*
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	
NE	.	132,695	51,036	16,477	146,720	11,797	24,073	19,661	94,228	496,687
MA	181,608	.	219,405	41,532	508,737	43,777	62,873	60,850	224,546	1,343,328
ENC	57,641	173,765	.	223,873	434,153	188,044	135,765	150,950	410,097	1,774,288
WNC	20,315	40,881	236,867	.	97,884	35,626	145,205	189,862	332,146	1,098,786
SA	90,673	315,947	274,337	60,425	.	183,613	124,678	60,109	213,545	1,323,327
ESC	15,283	45,558	300,295	40,703	283,376	.	125,123	27,046	88,054	925,438
WSC	22,263	47,490	123,840	135,113	135,227	103,915	.	159,999	305,077	1,032,924
MT	13,325	24,618	55,600	78,629	45,311	16,226	103,717	.	322,936	660,362
PAC	38,946	71,614	120,134	110,999	139,281	39,283	150,902	239,511	.	910,670
In-migrants, 1955-60	440,054	852,568	1,381,514	707,751	1,790,689	622,281	872,336	907,988	1,990,629	9,565,810

SOURCE: United States Bureau of the Census, *United States Census of Population*, 1960, *Final Report*, Pc (2)-2D, *Lifetime and Recent Migration*, table 3, pp. 8-9.

table it is evident that out-migrants from New England numbered 497,000 persons for the same interval. About 133,000 of these went to the Middle Atlantic division, 51,000 to the East North Central division, etc. As a result of these movements, the New England division had a net loss of 57,000 migrants. At the same time, it had net gains, totalling 63,000, that resulted from migratory exchange with the Middle Atlantic, the East North Central, the West North Central and the East South Central divisions. It had net losses, totalling 119,000, as a result of exchanges with the South Atlantic, the West South Central, the Mountain and the Pacific divisions. The streams of in-migrants, out-migrants and the net balances of migration for the New England division are given more conveniently in the first three columns of table 20. Similar tables could be prepared for the other divisions in the same manner, using data from the appropriate rows and columns of table 18.

These data thus permit the calculation of all the conventional measures of migration: in-, out- and net migration. The period in which the migrations took place is well defined; the areas from which the migrants came or to which they went are known, it being understood that a migrant is defined as a person whose residence at the census date differs from his residence at some fixed prior date.

TABLE 19. DIVISION OF RESIDENCE IN 1960, BY DIVISION OF RESIDENCE IN 1955 AND DIVISION OF BIRTH FOR THE POPULATION 5 YEARS OLD AND OVER, UNITED STATES OF AMERICA, 1960

(*Hundreds: totals are sums of rounded numbers*)

Division of residence in 1955 and 1960	*Born in*									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Total*
NE, 1960	69,114	5,423	1,223	526	1,624	381	338	161	344	79,134
Division of residence in 1955:										
NE	68,103	3,894	712	306	1,071	216	165	88	175	74,730
MA	354	1,263	62	23	69	13	11	6	15	1,816
ENC	102	60	332	22	23	17	10	4	7	577
WNC	36	14	16	111	7	4	8	3	5	204
SA	272	109	41	19	398	28	19	5	17	908
ESC	28	10	7	4	12	85	4	1	2	153
WSC	58	18	13	10	12	7	95	4	6	223
MT	34	14	12	9	8	3	9	38	7	134
PAC	127	41	28	22	24	8	17	12	110	389
MA, 1960	4,863	224,692	4,949	1,606	13,827	2,156	1,136	430	816	254,475
Division of residence in 1955:										
NE	773	408	46	17	49	10	9	5	12	1,329
MA	3,900	221,992	3,739	1,198	11,758	1,708	810	304	539	245,948
ENC	45	519	899	62	97	62	26	9	19	1,738
WNC	9	101	40	205	16	9	13	6	9	408
SA	78	1,001	110	41	1,795	64	34	11	26	3,160
ESC	9	100	21	7	35	268	10	2	4	456
WSC	15	157	26	19	27	18	196	7	10	475
MT	7	107	18	16	11	4	11	63	9	246
PAC	27	307	50	41	39	13	27	23	188	715

TABLE 19 (*continued*)

Division of residence in 1955 and 1960	*Born in*									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Total*
ENC, 1960	1,527	9,836	230,738	10,206	9,760	20,021	5,076	966	1,270	289,400
Division of residence in 1955:										
NE	274	56	120	13	20	11	7	3	6	510
MA	54	1,531	373	48	97	43	24	8	16	2,194
ENC	1,111	7,905	227,380	8,372	7,898	17,145	4,151	732	888	275,582
WNC	13	50	613	1,446	33	79	84	25	26	2,369
SA	34	154	729	67	1,521	163	38	12	26	2,744
ESC	7	32	343	39	93	2,425	47	7	9	3,002
WSC	10	32	337	67	38	80	646	14	15	1,239
MT	6	22	257	55	19	23	25	133	17	557
PAC	18	54	586	99	41	52	54	32	267	1,203
WNC, 1960	375	1,247	7,465	109,122	966	2,230	4,559	1,260	1,082	128,306
Division of residence in 1955:										
NE	85	14	10	38	6	2	5	2	4	166
MA	12	255	30	77	18	7	8	3	5	415
ENC	15	52	1,348	604	37	81	63	17	22	2,239
WNC	226	820	5,813	106,749	612	1,788	3,540	932	748	121,228
SA	11	35	46	209	218	31	30	10	15	605
ESC	3	8	24	81	15	248	21	3	3	406
WSC	8	21	64	378	26	44	764	23	22	1,350
MT	5	15	52	379	12	12	54	232	26	787
PAC	10	27	78	607	22	17	74	38	237	1,110
SA, 1960	3,174	12,705	8,298	2,686	174,955	9,221	2,315	581	1,077	215,012
Division of residence in 1955:										
NE	1,021	158	50	23	151	23	15	6	20	1,467
MA	149	3,843	174	59	698	75	40	15	36	5,089
ENC	51	252	2,778	151	719	276	62	19	34	4,342
WNC	11	40	94	600	114	38	49	14	19	979
SA	1,835	8,108	3,842	1,597	171,912	6,671	1,305	305	528	197,103
ESC	23	71	100	38	582	1,920	67	12	21	2,834
WSC	23	70	80	62	314	109	644	22	29	1,353
MT	11	37	47	43	104	27	34	130	20	453
PAC	50	126	133	113	361	82	99	58	370	1,392
ESC, 1960	244	859	2,534	832	3,937	92,363	2,076	168	265	103,278
Division of residence in 1955:										
NE	70	8	4	3	7	22	3	1	1	119
MA	12	277	20	7	29	79	8	2	4	438
ENC	8	34	677	37	64	1,013	34	6	9	1,882
WNC	2	6	26	179	12	97	25	4	5	356
SA	21	61	68	29	878	710	47	8	14	1,836
ESC	117	435	1,665	510	2,863	89,814	1,438	85	125	97,052
WSC	6	18	34	31	46	413	473	9	10	1,040
MT	2	6	12	12	10	59	15	40	6	162
PAC	6	14	28	24	28	156	33	13	91	393
WSC, 1960	489	1,614	3,366	5,334	2,323	6,096	118,589	1,282	1,240	140,333
Division of residence in 1955:										
NE	142	19	10	7	10	6	40	3	5	242
MA	15	426	25	15	35	15	87	4	7	629
ENC	10	41	736	77	43	87	334	13	15	1,356
WNC	6	21	74	797	25	39	445	25	20	1,452
SA	27	76	67	47	593	107	289	15	25	1,246
ESC	6	20	41	30	57	805	275	8	10	1,252
WSC	263	947	2,284	4,160	1,485	4,952	115,847	896	776	131,610
MT	6	23	54	85	27	35	510	263	34	1,037
PAC	14	41	75	116	48	50	762	55	348	1,509

TABLE 19 (*concluded*)

Division of residence in 1955 and 1960	Born in									
	NE	*MA*	*ENC*	*WNC*	*SA*	*ESC*	*WSC*	*MT*	*PAC*	*Total*
MT, 1960	485	1,698	4,301	8,236	1,045	1,067	4,986	30,733	2,553	55,104
Division of residence in 1955:										
NE	132	19	9	7	6	4	4	13	5	199
MA	18	460	30	18	22	7	12	30	11	608
ENC	11	58	1,094	112	43	58	42	68	24	1,510
WNC	7	20	92	1,462	18	18	93	153	36	1,899
SA	15	55	53	41	279	36	34	64	24	601
ESC	3	8	17	14	16	164	21	21	7	271
WSC	10	28	64	110	35	47	1,118	150	38	1,600
MT	258	968	2,767	6,151	570	686	3,427	29,626	1,568	46,021
PAC	31	82	175	321	56	47	235	608	840	2,395
PAC, 1960	3,161	8,517	16,230	23,243	4,024	4,035	16,472	10,581	76,771	163,034
Division of residence in 1955:										
NE	662	82	39	28	31	11	18	12	58	941
MA	73	1,694	106	60	94	31	38	24	125	2,245
ENC	41	178	2,927	260	127	189	122	53	204	4,101
WNC	17	46	196	2,558	38	42	166	74	185	3,322
SA	90	218	196	137	965	114	115	52	248	2,135
ESC	8	23	48	32	52	598	50	13	56	880
WSC	23	64	119	171	72	93	2,187	77	246	3,052
MT	37	107	239	431	66	53	290	1,516	491	3,230
PAC	2,210	6,105	12,360	19,566	2,579	2,904	13,486	8,760	75,158	143,128

SOURCE: As for table 18.

Cross-classification with place of birth

If data on place of birth and place of residence x years ago are simultaneously available; that is, if place of birth is cross-classified by place of residence x years ago (as in table 19), the analytical potentialities of the data are greatly increased. In the first place, lifetime migration can be compared with fixed-period migration to give some insight into past changes in migration patterns. In table 20, the 1955-1960 streams to and from New England are compared with lifetime streams. The data for streams between New England and the East North Central indicate a net gain of 6,700 for New England between 1955 and 1960 but a net lifetime loss of 30,400. Such contrary patterns are not found in the other pairs of divisions, but the data reveal considerable shift in the relative importance of the various net streams. Thus, New England had a lifetime net gain of 56,000 from the Middle Atlantic and most of the gain occurred during 1955-1960. On the other hand, with respect to the Pacific division, New England had a lifetime net loss of 281,700, but the loss between 1955 and 1960 was only 55,200.

With these data, it is possible to classify 1955-1960 migrants into three meaningful categories:

(1) Primary migrants; that is, those who were living in their division of birth in 1955 and in another division in 1960;

TABLE 20. LIFETIME AND CURRENT MIGRATION STREAMS TO AND FROM NEW ENGLAND AND NET BALANCES FOR ALL PAIRS OF STREAMS

(*Thousands*)

Division of origin or of destination	Recent migration streams, 1955-1960			Lifetime migration streams, 1960		
	To New England	*From New England*	*Net balance*	*To New England*	*From New England*	*Net balance*
MA	181.6	132.9	+48.7	542.3	486.3	+56.0
ENC	57.7	51.0	+6.7	122.3	152.7	−30.4
WNC	20.4	16.6	+3.8	52.6	37.5	+15.1
SA	90.8	146.7	−55.9	162.4	317.4	−155.0
ESC	15.3	11.9	+3.4	38.1	24.4	+13.7
WSC	22.3	24.2	−1.9	33.8	48.9	−15.1
MT	13.4	19.9	−6.5	16.1	48.5	−32.4
PAC	38.9	94.1	−55.2	34.4	316.1	−281.7
TOTAL	440.4	497.3	−56.9	1,002.0	1,431.8	−429.8

SOURCE: Table 19. Totals and balances computed on rounded numbers.

(2) Secondary migrants; that is, those who were living outside the division of birth in 1955 and in a third division in 1960;

(3) Return migrants; that is, those who were living outside the division of birth in 1955 and had returned to it by 1960.

Table 21 gives the figures for these three categories of migrants for the United States (at the national level),

TABLE 21. INTERDIVISIONAL MIGRANTS 5 YEARS OLD AND OVER, BY CATEGORIES OF MIGRATION, UNITED STATES OF AMERICA, 1955-1960
(*Thousands*)

Total migrants	9,556
Primary	5,521
Secondary	1,996
Return	2,049

SOURCE : Hope T. Eldridge and Yun Kim, *Estimating Intercensal Migration from Birth-Residence Statistics*, Analytical and Technical Report, No. 7 (Population Studies Center, University of Pennsylvania, Philadelphia, December 1967), appendix tables 3, 5 and 7.

and table 22 gives such classification of in-migrants and out-migrants for the New England division. The classification of migrants by these types, and an analysis of their differentiating characteristics are important steps in explaining many features of migration in a country. Examples of the analytical uses of these categories can be found in two articles by Hope T. Eldridge.[5]

TABLES 22. IN-MIGRANTS AND OUT-MIGRANTS 5 YEARS OLD AND OVER, BY CATEGORIES OF MIGRATION, NEW ENGLAND, 1955-1960
(*Thousands*)

Types of migration	*In-migrants*	*Out-migrants*
Total	440	497
Primary	243	316
Secondary	96	96
Return	101	85

SOURCE: As for table 21.

SUMMARY APPRAISAL OF THE SEVERAL APPROACHES

In assessing the advantages and disadvantages of alternative approaches, there are two basic considerations: (*a*) the adequacy of the data for migration analysis, and (*b*) the accuracy of the responses. Both these aspects have been touched upon already, but they are drawn together here for an over-all appraisal.

[5] "Primary, secondary and return migration in the United States, 1955-60", *Demography* (Chicago), vol. II, 1965, pp. 444-455 and "Patterns of dominance in internal migration, United States, 1955-1960" (WPC/WP/183), paper presented to the United Nations Word Population Conference, 1965.

The adequacy of data must be evaluated on the basis of a set of standards acceptable from the point of view of migration analysis. A desirable minimum requirement is that the data be available for reasonably small areal units and that they provide statistics of total in-migration, total out-migration, and net migration for each unit. In addition, it should be possible to show for each areal unit how much of the in-migration came from each of the other areal units in the country and how much of the out-migration went to each of the other areal units. From these points of view, the only question which gives satisfactory data is "place of residence x years ago". Place-of-birth data have no definite time reference, though they do give information on migration streams. The same is true of the question on place of last residence. The question on duration has time reference, but it does not give any information on migration streams, unless the place of last residence is also obtained in the census and the results are cross-tabulated. Consequently, it cannot provide estimates of out-migration and net migration. From all these points of view and on the assumption that only one question on previous residence is to be asked, place of residence x years ago probably represents the most satisfactory approach.

There are, however, certain inadequacies also in these data. If the question on residence x years ago is not equated to the intercensal period, it will not be possible to estimate intercensal migration precisely and the data will not be of much use in determining the components of intercensal population growth; that is, migration and natural increase. Nor do these data overcome the problems of multiple moves during the x-year period prior to the census and circular moves, neither of which are counted in the migration category.

The accuracy of response is likely to vary from one question to another. If, as seems likely, it can be assumed that one of the most important causes of errors in response to these questions would derive from lapses of memory, then it would seem *a priori* that data on place of residence x years ago are likely to be less precise than those based on birth-place or place of last residence. To be sure, the place-of-birth question will yield less accurate results if there have been numerous or important changes in area boundaries during the lifetime of an appreciable proportion of the population. But if the address at some prior date is required, especially if this date is not in the very recent past, many respondents may not be able to remember accurately and easily the required information. A question such as "Where were you living five years ago?" may well tax the memory of persons who have moved more than once during this period. Where a population is highly mobile, the resulting inaccuracies of response may be significant.

In assessing the potential value of these different approaches, it should be kept in mind that the desire to confine the inquiry on migration status to a single question should not be allowed to outweigh considerations of quality and usefulness of the results. Of particular value would be two questions, one covering duration of residence and the other place of last residence. Such a combination can yield at least as much information as the question on residence at a fixed prior date.