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CURRENT ITEMS

World Conference on Population to be held in 1954

The Economic and Social Council at its fourteenth session adopted a resolution approving the holding of a World Population Conference in 1954, under the auspices of the United Nations, in close collaboration with the International Union for the Scientific Study of Population, and interested specialized agencies. The purpose of the conference will be a scientific discussion of population problems. The Council requested the Secretary-General to negotiate the financing of the conference with interested specialized agencies, non-governmental organizations, and any interested host governments.

The Council authorized the Secretary-General, in close collaboration with the International Union for the Scientific Study of Population and interested specialized agencies, to establish a small preparatory committee to be composed of their representatives and a small number of internationally recognized population experts, this committee to assist the Secretary-General in formulating an agenda and in making the necessary arrangements for the conference. The first meeting of the Preparatory Committee took place in Geneva on 17 to 19 November 1952.

World conferences on population have been held under the auspices of private organizations in 1927, 1931, 1935, and 1937. The decision to hold such a conference in 1954 under the auspices of the United Nations was the result of long deliberations on the part of the Economic and Social Council and the Population Commission. The Population Commission received at its third session (1948) a statement from the representative of UNESCO suggesting that the United Nations should convene a conference on world population problems. It was found, at that time, that it would be inappropriate to hold a conference until the main results of the various censuses to be taken in and around 1950 were available, and it was thought that 1954 would be about the earliest suitable year.

A new proposal by the International Union for the Scientific Study of Population, that a World Population Conference be called by the United Nations, was placed before the Population Commission at its sixth session (1951). The Commission noted that the first results of the censuses taken in or around 1950 were being released and that many of the results could be expected by the end of 1952. It also observed that, since the last world conference on population was held, there had been important changes in the structure and evolution of population. Among the population problems which the Commission thought worthy of consideration in a new international conference were: the probable future growth of population as a basis for estimating the requirements for the adequate support of the world's peoples; the demographic and social problems of intercontinental and intracontinental migration; and the problems posed by the increasing proportion of middle-aged and older people in the population.

Accordingly, the Population Commission recommended that the Secretary-General should address inquiries to Member States, specialized agencies, and interested non-governmental organizations, in order to ascertain their views regarding certain questions, including the desirability of holding a world conference on population, the timing of such a conference, the auspices under which it might be held, and the topics which might be discussed. This recommendation of the Commission was endorsed by the Economic and Social Council at its thirteenth session (1951). When the Council took up the question at its fourteenth session (1952), the Secretary-General presented a report on the results of the inquiries, which indicated that the interested specialized agencies and the great majority of the Member States which had replied to the inquiries were in favour of the holding of a world conference on population in 1953 or 1954.

Population Commission to meet in January 1953

The Population Commission is holding its seventh session at United Nations Headquarters, New York, from 19 to 30 January 1953. This is the first session since May 1951. The preliminary agenda for the seventh session includes, *inter alia,* the following items for discussion:

World Conference on Population: Report of the Preparatory Committee.

Studies of relationships between population trends and economic and social factors:

Major gaps in knowledge in this field, and types of studies needed.

Population censuses taken in and around 1950: Achievements of the census programme; Needs for analytical studies based on the results of the censuses and on other data.

Fertility and mortality: Programme of work for 1953 and 1954.

Migration: Report on results of studies and research activities relating to international migration, undertaken by the United Nations and specialized agencies since 1946; Revision of 1949 draft recommendations for the improvement of international migration statistics; Programme of work for 1953 and 1954 on demographic aspects of migration.

Demographic seminars and training courses: Programme of work for 1953 and 1954.

The States to be represented at this session of the Commission are: Australia, Belgium, Brazil, China, France, Indonesia, Iran, Mexico, Peru, Sweden, Ukrainian Soviet Socialist Republic, Union of Soviet Socialist Republics, United Kingdom, United States, and Yugoslavia.

Population studies in India

The Government of India has undertaken, with the assistance of the World Health Organization, an experiment in certain localities in that country to ascertain the acceptability and effectiveness of the safe period method of family planning. In order that the results may be interpreted correctly, the government has asked the United Nations for technical assistance in the statistical evaluation of the effect of the experiment on the birth rate in one of the experimental areas—Ramanagaram (near Bangalore). Professor S. Wahlund, of Sweden, is being sent by the United Nations to India, to assist the government in this study.

This project forms a part of a larger programme relating to population questions which has been launched by the Indian Government with the assistance of the United Nations. Another part of the programme is a study on the interrelationships of demographic, economic and social factors, which is being carried out in certain parts of the state of Mysore. Three types of questionnaires have been used in the inquiry, namely, (*a*) a household schedule to provide data on the demographic, social and occupational characteristics of the population, (*b*) a fertility schedule to obtain a detailed pregnancy history for married women and information on any attempts at family limitation, and (*c*) a village schedule containing questions on the various economic and social activities in the villages. The field work was completed in August 1952 and the tabulations are in process.

New United Nations publications relating to population

The following works in the field of population have recently been published, or are to be published in the near future, by the United Nations:

Causes and consequences of population changes. A summary of findings of studies on the relationships between population trends and economic and social factors. (To be published in 1953.) This volume contains a résumé of present knowledge and hypotheses concerning the determinants and the effects of population changes, based on an international survey of the existing literature. Among the topics covered are: history of world population growth and evolution of population theories; factors affecting mortality, fertility, migration, population growth, and population structure; determinants of population distribution; effects of population characteristics and changes upon labour supply, employment, consumption, productivity, and standards of living; world population in relation to resources; implications of population changes in under-developed and more-developed countries; effects of major migratory movements in modern times.

Application of international standards to census data on the economically active population (Population Studies, No. 9. Published in 1952). This report, issued jointly by the Population Division and the Statistical Office of the United Nations, brings together and explains the recent recommendations of international agencies on the subject of collecting, classifying, and tabulating data on economic activities.

Manuals on methods of estimating population. Manual I. Methods of estimating total population for current dates (In press, 1952). The methods used for making current population estimates in various countries and territories of the world have been surveyed and summarized in this Manual. The suitability of different methods to given amounts of statistical information is discussed, and suggestions are made for the improvement of existing estimates.

The population of Ruanda-Urundi (In press, 1952). This report presents the available information on the trends and characteristics of the population of the Trust Territory, and an analysis of this information in relation to the problems of economic development and social advancement. It is the third in a series of studies of the population of the United Nations Trust Territories; the first, entitled *The Popu-*

lation of Western Samoa, was published in 1948 (Population Studies, No. 1).

Sex and age of international migrants: statistics for 1918-47. (Population Studies, No. 11. To be published in 1953). This volume presents statistics of international migrants classified by sex and age for some seventy-five countries and territories. Such data for 1948 and following years are published in the United Nations *Democratic Yearbook.*

Economic characteristics of international migrants: statistics for selected countries, 1918-1950. (Population Studies, No. 12. To be published in 1953). This volume contains statistics of international migrants classified by occupation, industry, status, and other economic characteristics on which data are available, for thirty-five selected countries and territories.

Survey of demographic legislation (Population Studies, No. 13. In press, 1952). This reference book presents, in summary form, the laws relating to marriage and divorce, contraception, sterilization, abortion, immigration and emigration, and economic measures in favour of the family, which are in force in twenty-five selected countries. It also includes a survey of provisions, relevant to population, of international instruments and national constitutions which have been adopted in recent years. It was prepared for the United Nations by MM. Henri Bunle, Jean Daric, Jacques Doublet, Alfred Sauvy, and others.

Demographic Yearbook, 1952 (December, 1952). This is the fourth issue of the *Yearbook,* which is published annually by the Statistical Office of the United Nations and contains a compilation of basic demographic statistics for all countries of the world. This issue gives special attention to population totals for countries, provinces and cities and figures on urban-rural population distribution from the recent 1950-1951 national population censuses.

An analysis of infant mortality

Contributed by J. BOURGEOIS-PICHAT, *Institut national d'études démographiques, Paris, France*

Translated from French

The serious extent of infant mortality no longer requires demonstration. In the under-developed countries, where one out of five, sometimes even one out of four infants, dies before its first birthday, the waste of human life is particularly glaring. In these countries it is only at a very advanced age—about eighty—that a human being again faces risks comparable with those incurred in the first year of life. But even in countries which have the best health conditions in the world for infants, the first year remains the most dangerous period in life before the advent of old age; in Norway, for example, only age-groups higher than seventy have a mortality rate greater than the rate of infant mortality. This alone would suffice to justify a special study of infant mortality; but this is not all. Adults, and even adolescents, are partly responsible for their own fate, whereas the infant is helpless by itself, and if it dies, its death is almost certainly due to a deficiency in its environment. Thus, if the first year is one of the periods of life in which mortality is highest, it is also the period in which great improvements should be possible. When infants under one year of age die, the reason is that society has not done everything that was necessary to save them. Hence the rate of infant mortality should provide a reliable index of what may be called a country's condition of health.

Two types of infant mortality

The standard definition of the infant mortality rate is familiar: the proportion of live-born infants who die before their first birthday. It is not proposed to go into details here regarding the actual calculation of this rate; methods for taking into account, in particular, fluctuations in births are described in all the demographic treatises, to which the reader may refer, and all the figures to be used below will be presumed to have been correctly calculated. However, is there any justification for this system of placing all deaths taking place in the first year of life in the same category? Even on superficial examination, it becomes obvious at once that deaths of this type should be divided into two categories. The first comprises those cases in which the child bears within itself, from birth, the cause resulting in its death, whether that cause was inherited from its parents at conception or acquired from its mother during gestation or delivery. These deaths constitute as a class what is here called endogenous infant mortality. The second category comprises those cases in which the infant picks up the factor which causes its death in the environment in which it lives. This is exogenous infant mortality, which may be regarded as accidental, in the broadest sense of the term; and clearly it is particularly for this second type of mortality that society must hold itself responsible. Furthermore, this second category should be readily amenable to action, since all that has to be done is to prevent the child's encountering the lethal factor—in short, to take simple precautions—whereas to deal with the first category direct medical intervention is essential.

How can these two types of mortality be differentiated? The statistics of causes of death, which would appear to be the very thing, are very soon found to be difficult to use. In the first place, in many countries they are still very inaccurate. Secondly, while the death of an infant from measles may be classified as exogenous, or the death of a deformed infant as endogenous, without fear of challenge, there are many cases, such as the deaths of feeble or prematurely-born infants, in which the distinction is much more difficult to make.

Proceeding from the fact that endogenous deaths occur particularly in the initial period of life, while exogenous deaths extend throughout the first year, we have devised a method which enables these difficulties to be overcome.[1] To avoid the need for circumlocution in the following pages, this method is here referred to as the "biometric measure of infant mortality". It is based on the following principle:

[1] Jean Bourgeois, "De la mesure de la mortalité infantile", *Population* (January-March 1946), pp. 53 *et seq.* following.

Jean Bourgeois-Pichat, "Analyse de la mortalité infantile", *Revue de l'Institut international de statistique* (1950, No. 1/2), pp. 45 *et seq.*

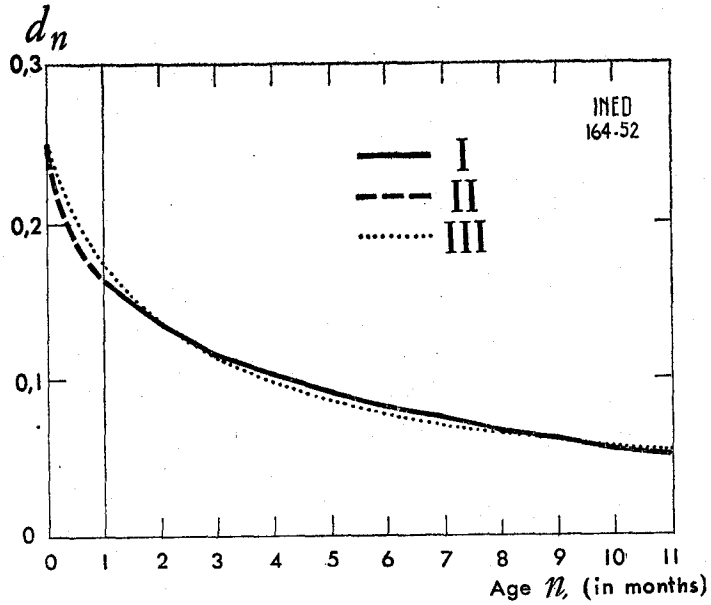
Jean Bourgeois-Pichat, "La mesure de la mortalité infantile", *Population* (April-June 1951), pp. 233 *et seq.*; *Population* (July-September 1951), pp. 459 *et seq.*

Biometric measure of infant mortality

We proceed from the following postulate, which the reader is asked to accept for the time being as a working hypothesis. It is assumed that deaths taking place in the last eleven months of the first year are *all* exogenous. (In any event, observation shows that the age-distribution of deaths from one to eleven months of age is almost invariable both in time and in space, i.e., is independent of the level of infant mortality.)

If $d_1, d_2 \ldots . d_{11}$ represent the ratios of deaths in the second, third . . . . . and twelfth months to the total number of deaths in the 2nd to the 12th month, inclusive, these quantities will be the same, whatever the rate of mortality. According to our hypothesis, that is a characteristic of exogenous infant mortality; one which has been verified for the ages of one to eleven months, and may therefore be assumed to apply equally to the first month of life. If d_0 represents the ratio of exogenous deaths in the first month to the total number of deaths in the last eleven months, it may be assumed that d_0 is also independent of the level of mortality. $d_1, d_2 \ldots . d_{11}$ are known, but d_0 is not known. It can be determined either by graphic extrapolation (figure 1) or by analytic extrapolation.[2] Using both methods, the value to be assumed for d_0 has been found to be 0.25.

FIGURE 1. DISTRIBUTION OF DEATHS IN MONTHS ONE TO ELEVEN IN THE FRENCH MORTALITY TABLE FOR 1933-38



I. Observed distribution.

II. Graphic extrapolation.

III. Analytical adjustment.

To sum up, the hypotheses we have adopted lead to the conclusion that exogenous deaths in the first month represent 25 per cent of deaths from the second to twelfth months inclusive. This being so, the two kinds of mortality, endogenous and exogenous, can easily be separated, as may be demonstrated by a practical example:

In 1949, the conventional infant mortality rate per thousand live births in England and Wales was 32.4. The rate of mortality during the last eleven months was 13.1 per thousand live births. Raising this by 25 per cent we obtain a figure of 16.4, the rate of exogenous infant mortality. The difference between 32.4 and 16.4, which is 16, is the rate of endogenous infant mortality.

TABLE I. ENGLAND AND WALES. EXOGENOUS INFANT MORTALITY PER 1,000 LIVE BIRTHS

Year	Exogenous infant mortality		Deviation	
	Biometric method	Statistics of causes of death	Absolute	As a percentage of the rate obtained by the biometric method
1920	60.7	50.0	10.7	17.6
1921	56.4	46.1	10.3	18.3
1922	50.1	41.3	8.8	17.6
1923	45.8	37.4	8.4	18.3
1924	50.6	41.1	9.5	18.8
1925	51.8	42.1	9.7	18.7
1926	46.6	38.1	8.5	18.2
1927	44.5	36.6	7.9	17.8
1928	42.0	34.1	7.9	18.8
1929	50.4	41.1	9.3	18.5
1930	36.0	29.1	6.9	19.2
1931	42.0	34.1	7.9	18.8
1932	40.5	32.6	7.9	19.5
1933	37.5	30.3	7.2	19.2
1934	34.2	27.3	6.9	20.2
1935	32.6	26.0	6.6	20.3
1936	35.0	27.6	7.4	21.1
1937	34.4	26.6	7.8	22.7
1938	30.1	23.5	6.6	21.9
1939	27.4	21.6	5.8	21.2
1940	33.4	26.7	6.7	20.1
1941	38.0	30.1	7.9	20.8
1942	28.6	22.5	6.1	21.3
1943	29.1	23.3	5.8	19.9
1944	26.4	20.8	5.6	21.2
1945	27.0	21.2	5.8	21.5
1946	23.9	18.6	5.3	22.2
1947	23.4	19.0	4.4	18.8
1948	17.9	13.9	4.0	22.3
1949	16.4	12.8	3.6	22.0

[2] After a number of different analytical formulations had been attempted, it was finally found that very good agreement was obtained by taking:

$$d_n = \frac{\text{Log.}^3[30.5\ (n+1)+1] - \text{Log.}^3[30.5\ n+1]}{\text{Log.}^3 366 - \text{Log.}^3 31.5}$$

It has been explained in a previous article how this algebraical formula could be related to such physiological characteristics as the infant's weight development during the first year of life. See the author's article in the *Revue de l'Institut international de statistique.*

Comparison between the biometric method and the method based on statistics of causes of death

We must now compare the results obtained by the biometric method with those obtainable from the statistics of causes of death. Such a comparison can be made only for countries where such statistics are accurately compiled. Let us take the figures for England and Wales. Table I shows that there are fairly considerable differences between the results obtained by the two methods: the endogenous rates computed from the statistics of causes of death are always higher than the biometric endogenous rates. If, however, these differences are carefully examined, it will be seen that they always represent approximately the same proportion of the exogenous rate (last column of table I). The word approximately is used because it will be observed that the proportion slowly increases as time goes on—a circumstance which we shall revert to shortly but which the reader is asked provisionally to ignore. In other words, we can isolate in the endogenous mortality rate computed from the statistics of causes of death a quantity which varies in direct ratio to exogenous mortality. It can only be concluded that that quantity represents a false endogenous mortality, and in fact corresponds to exogenous mortality. This reveals an error in the classification of exogenous deaths. If E represents true exogenous infant mortality, the exogenous mortality indicated by the statistics of causes of deaths is λE, λ being a coefficient less than unity, the magnitude of which depends upon medical practice in the country under consideration with regard to the declaration of causes of deaths, and on the methods of classification of causes of death used for the compilation of the statistics.

Return to basic hypothesis

It has been assumed up to this point—in fact, it has been our fundamental hypothesis—that deaths in the last eleven months of the first year of life are all exogenous. In reality, however, there is also endogenous mortality during this period of life. But it is not very considerable, and so long as total infant mortality is fairly high, it has little effect on the age-distribution of mortality in the last eleven months. Hence we may assume that the law of stability we have discovered applies to exogenous mortality *alone*.

Let e_0 and e_1, therefore, represent endogenous mortality in the first month and endogenous mortality in the last eleven months of the first year, respectively, e being the total endogenous mortality. Similarly, let E_0, E_1 and E respectively represent exogenous mortality in the first month, the last eleven months and the whole twelve months. Accordingly:

$$e_0 + e_1 = e$$
$$E_0 + E_1 = E$$

E_0 represents 25 per cent of E_1, and the second equation may be written as follows:

$$1.25\ E_1 = E \quad (1).$$

Let us now see what results we obtain with these equations when we apply our two methods of determining exogenous mortality: the biometric method and the method using statistics on causes of death. In the biometric method, exogenous mortality is assumed to be equal to mortality in the last eleven months augmented by 25 per cent. This is quantity:

$$x = 1.25\ (e_1 + E_1) \quad (2).$$

It has therefore been augmented by the quantity $1.25\ e_1$.

In the causes of death method, exogenous mortality is equal to the true exogenous mortality multiplied by λ. This is quantity:

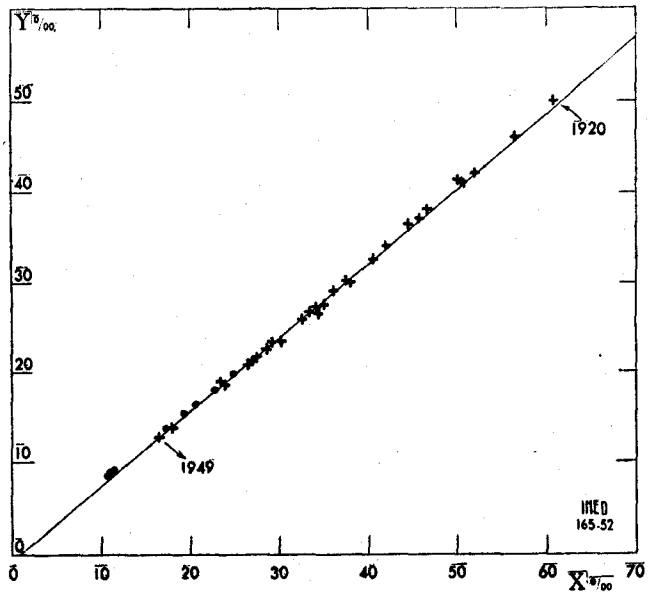
$$y = 1.25\ E_1\ \lambda \quad (3).$$

It has thus been *diminished* by the quantity $(1 - \lambda)\ 1.25\ E_1$. Eliminating E_1 from equations (2) and (3), we obtain the following:

$$y = \lambda\ [x - 1.25\ e_1] \quad (4).$$

Endogenous mortality is, by its very nature, little subject to change. Consequently, it may be assumed that the quantity e_1 remains virtually constant. Let us, therefore, consider either the same population for a number of different years or different populations for the same period, and let x, i.e., the biometric exogenous mortality, be the axis of abscissas and y, i.e., exogenous mortality as derived from statistics on causes of death, the axis of ordinates. Equation (4) shows that the points obtained will be on a straight line intersecting the axis of abscissas at the point $x_0 = 1.25\ e_1$. Figure 2 shows, in the case of England and Wales, that this is in fact true both in time and space. $1.25\ e_1$ is seen to be equal to 1.1 per thousand live births, and hence $e_1 = 0.88$ per thousand. Endogenous mortality during the last eleven months is therefore very low. The fact that the points in graph 2 lie close to the line shows that it has not changed since 1920, and that it is identical in the various parts of England and Wales. It can now be seen why the proportion calculated in column 5 of table I increased as exogenous mortality diminished. To enable the proportion to remain invariable, e_1 would have had to be zero. Furthermore, endogenous mor-

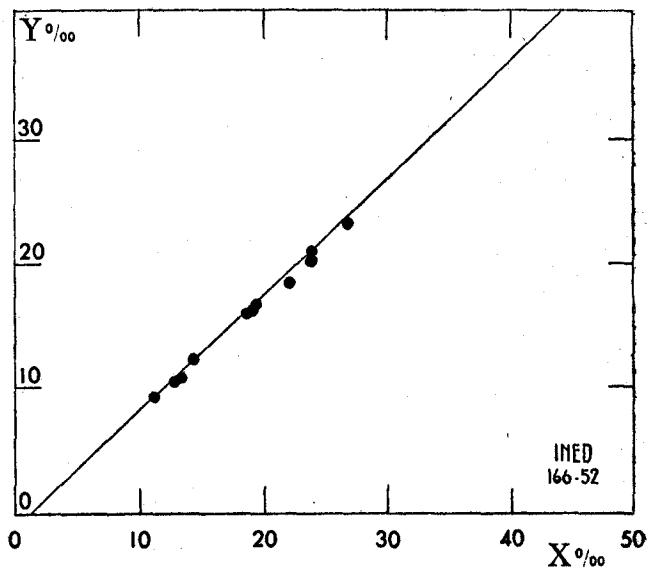
FIGURE 2. ENGLAND AND WALES. RELATION BETWEEN THE BIOMETRIC EXOGENOUS INFANT MORTALITY (x) AND THE EXOGENOUS INFANT MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.816\ (x - 0.9)$

Each cross represents a year (1920 to 1949). Each dot represents a region in 1949 (standard regions used by the Registrar-General)

FIGURE 3. ENGLAND AND WALES. RELATION BETWEEN THE MORTALITY IN MONTHS ONE TO ELEVEN (x) AND THE EXOGENOUS MORTALITY OF MONTHS ONE TO ELEVEN COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.93\ (x - 1.2)$

Each dot represents a region in 1947 (standard regions used by the Registrar-General)

tality during the last eleven months can be determined by another method, the accuracy of which is beyond dispute. Exogenous mortality during the last eleven months as computed from the statistics of causes of death is equal to:

$$Y = E_1 \mu \qquad (5).$$

The coefficient μ, it will be recalled, corresponds to errors in the classification of exogenous deaths. These errors are not necessarily the same before and after the first month, and it is for this reason that a coefficient μ differing from λ is given here.

Total mortality in the last eleven months is as follows:

$$X = e_1 + E_1 \qquad (6).$$

Eliminating E_1 (between 5 and 6) we obtain:

$$Y = \mu\,[X - e_1] \qquad (7).$$

If, therefore, we draw a graph making mortality in months one to eleven our axis of abscissas and exogenous mortality as indicated by the statistics of causes of death our axis of ordinates, the points will be found along a straight line intersecting the axis of abscissas at $x = e_1$. In other words, using equation (7) we isolate from mortality in months one to eleven the proportion which does not vary in direct ratio to exogenous mortality during months one to eleven; i.e., we isolate endogenous mortality. The validity of equation (7) is shown by figure 3, drawn for the various areas of England and Wales in 1947. It will be observed that the coefficients λ and μ in figures 2 and 3 are different: $\lambda = 0.816$ and $\mu = 0.930$. As might be expected, errors of classification are more numerous before the age of one month than after.

To draw figure 3 we have to know the causes of death by age, or at any rate the distribution of causes of death before and after the age of one month, during the first year of life; and for figure 2 we have to know the causes of death for the first year. But in many cases the causes of death during the first year are not known, particularly for the separate territorial divisions constituting the country under consideration. The only information that will then be available will be the number of endogenous deaths among children of all ages. However, endogenous causes continue to operate after the first year—a fact reflected with particular emphasis in the statistics of declared causes of death. If the rate of *declared* endogenous mortality after the first year[3] is repre-

[3] We shall continue to express this rate as a proportion of every thousand live births. The methods to be employed for the correct calculation of e′ in a period in which the birth rate is very variable will readily suggest themselves.

sented by e′, the rate of exogenous infant mortality as obtained from the statistics of causes of death will be equal to:

$$Y' = 1.25\ E_1 - e'$$

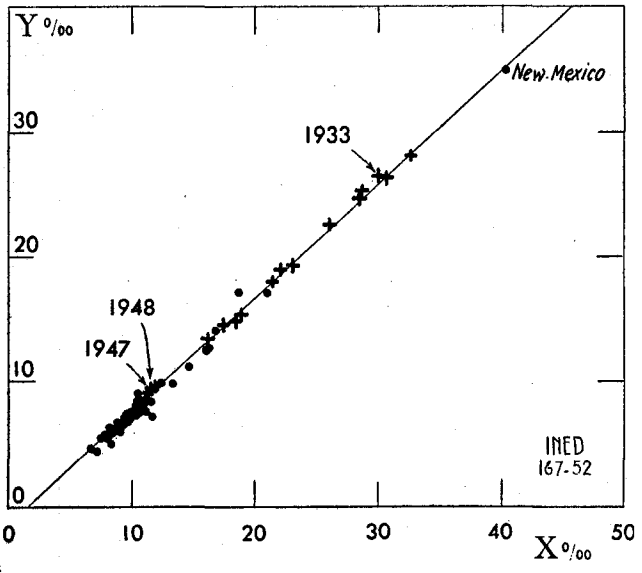
and this may be expressed as above:

$$Y' = \lambda x - 1.25\ \lambda\ e_1 - e' \qquad (8).$$

If e′ is relatively stable, the points obtained on a graph in which x′ is the axis of abscissas and y′ the axis of ordinates will be along a straight line intersecting the axis of abscissas at the point $x' = 1.25\ e_1\ \lambda + e'$. It must be repeated that e′ represents *declared* endogenous mortality in the statistics of causes of death after the age of one. Since the factors involved are declared causes, and not a biological datum, it is not certain that this quantity will remain invariable in time or will be identical for all the regions within a country's territory. It may be noted that it varies according to country: at the present time the rate per 1,000 live births is 0.4 in Spain, 1.31 in Switzerland, 1.41 in Portugal, 1.8 in England and Wales, and 1.0 in the United States.

It is therefore only to be expected that graphs drawn on the basis of equation (8) will give less satisfactory alignments than graphs drawn on equations (4) and (7).

FIGURE 4. UNITED STATES. RELATION BETWEEN THE BIOMETRIC EXOGENOUS INFANT MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$$y = 0.915\ (x - 1.6)$$

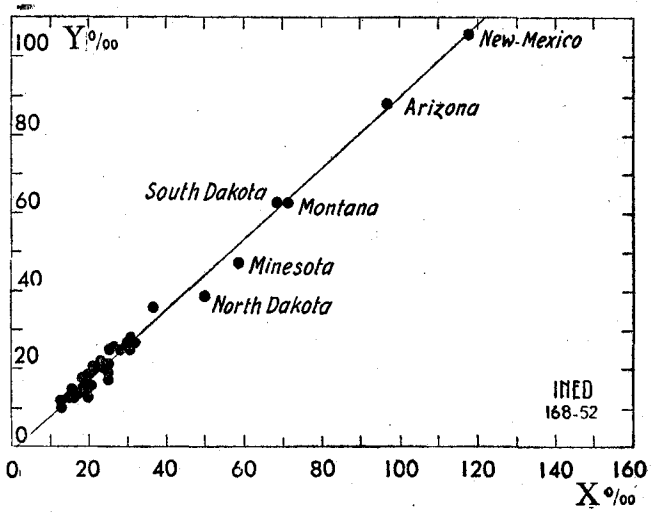
Each cross represents a year (total white and non-white population). Each dot represents a state during the period 1946-1948 (white population only)

We shall now demonstrate that England and Wales are not an exceptional case, and that similar results are obtained for other countries.

Infant mortality in the United States

Figures 4 and 5, which are identical with figure 2 for England and Wales, lead to the same conclusions. The time series begins in 1933, the first year in which the registration of deaths and births extended to cover the entire territory of the United States. For the space distribution, the white population is dealt with separately on figure 4 and the non-white population on figure 5. The coefficient λ is 0.915 for both population groups. Thus, 8.5 per cent of exogenous deaths are erroneously classified as endogenous; a percentage appreciably lower than that obtained in England and Wales, where we found the figure to be 18.5. Incidentally, this difference shows how deceptive it would be to compare these two countries' statistics of causes of death among children. Endogenous mortality in the last eleven months of the first year is 1.4 per thousand live births, which is rather higher than in England and Wales, where the rate was 0.88 per thousand. For the non-white population, the fit is not quite so good, but in evaluating it we must bear in mind the fact that in some states there are very few non-whites and that in these cases the rates are based on small quantities, which are subject

FIGURE 5. UNITED STATES, NON-WHITE POPULATION (1946-1948). RELATION BETWEEN THE BIOMETRIC EXOGENOUS INFANT MORTALITY (x) AND THE EXOGENOUS INFANT MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$$y = 0.915\ (x - 1.6)$$

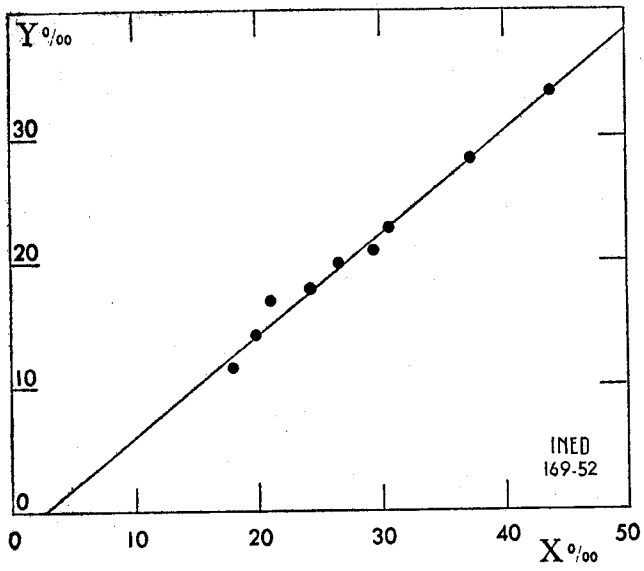
Each dot represents a state

to purely random variations, and also the fact that in the non-white deaths we encounter a rather higher proportion of undeclared or inadequately defined causes than we find among the whites. Such undeclared or inadequately defined causes have in each case been distributed proportionately to the correctly stated causes, which is possibly not the most suitable solution.

Infant mortality in Canada

Figure 6 relates to the territorial distribution of exogenous mortality in Canada. It will be noted that the coefficient λ is 0.815, which is substantially the same as in England and Wales, and that the rate of endogenous mortality in the last eleven months of the first year is 2.2 per thousand, which is considerably higher than the rates that have so far been encountered. Figure 7, which is comparable to figure 3, confirms this result. It should be remembered that on such a graph the axis of abscissas represents mortality during the last eleven months and the axis of ordinates declared exogenous mortality during the last eleven months. On the basis of the alignment obtained we can isolate from mortality during the last eleven months the part which does not vary directly with exogenous mortality; in other words, we can isolate endogenous mortality. Figure 8 gives this mortality as 2.2 per thousand, the same rate as we obtain from figure 7.

FIGURE 6. CANADA. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.815\ (x - 2.7)$

Each dot represents a province (1944-1947)

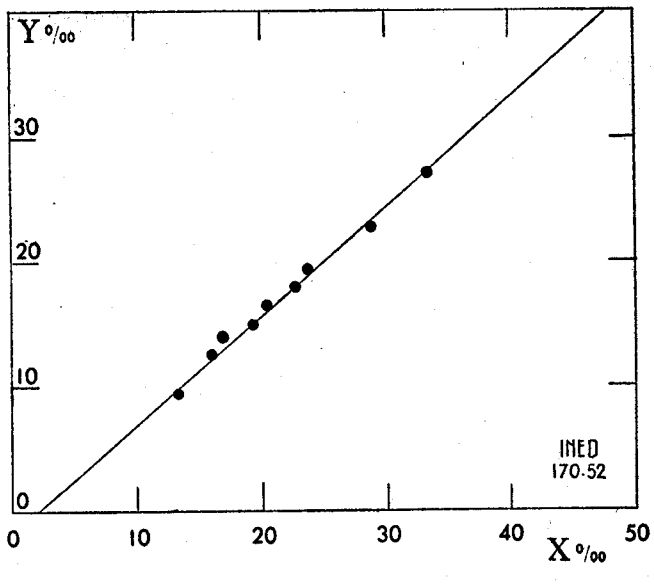
This feature observed in the case of Canada enables us to point out, and to resolve, a difficulty which we sometimes encounter in the practical application of the biometric method. The age-distribution of deaths in months one to eleven sometimes deviates from the stable pattern of distribution indicated in the first part of this study. This fact may be represented graphically as follows: if a represents the biometric endogenous mortality, the rate of mortality before age n may be expressed as $a + bk\ (n)$ where $k\ (n)$ is a function of age identical for all countries and all periods and b a coefficient proportional to the biometric exogenous mortality.[4]

In other words, if we draw a graph with the axis of abscissas representing the quantities of $k\ (n)$ and the axis of ordinates representing the rates of mortality before age n, the points obtained will be in a straight line which will intersect the axis of ordinates at point a, indicating the biometric endogenous mortality. In the case

[4] The analytical adjustment referred to on page 2 gives k (n) = Log.^{3}[30.5 n + 1] where n is the age *in months*, and exogenous mortality equals a b Log.^{3}366. The following are the values of k (n):

n	1	2	3	4	5	6
k (n)	0.199	0.341	0.451	0.541	0.620	0.689
7	8	9	10	11	12	
0.751	0.809	0.862	0.911	0.957	1.000	

FIGURE 7. CANADA. RELATION BETWEEN THE MORTALITY IN MONTHS ONE TO ELEVEN (x) AND THE EXOGENOUS MORTALITY OF MONTHS ONE TO ELEVEN COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.88\ (x - 2.2)$

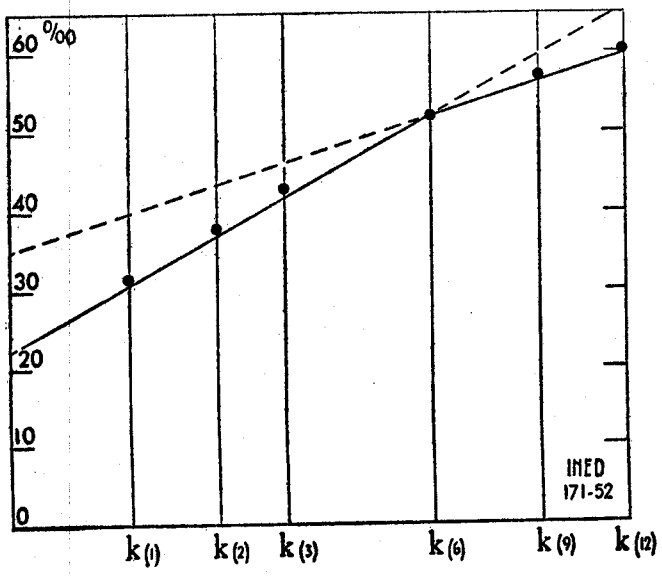
Each dot represents a province (1944-1947)

of populations in which the age-distribution of deaths in the last eleven months of the first year deviates from the normal, the points obtained on such a graph will no longer be in alignment. There are two possibilities: the curve obtained may bend upwards or downwards. Ignoring for the moment the first case, which will be reverted to later, let us examine the second.

Canada provides us with a particularly clear example, in the case of the province of Quebec (figure 8). How is biometric endogenous mortality to be determined in this case? Should the line be adjusted to accord with the last months of the first year, or, on the contrary, to accord with the first months? In the first case a biometric endogenous mortality rate of 35 per thousand would be indicated, and in the second a rate of 22 per thousand. It will be seen that the degree of error is quite large. In passing, it may be pointed out that the numerical calculation method of augmenting mortality in the last eleven months by 25 per cent to obtain the exogenous mortality would give an endogenous mortality rate of 26 per thousand, which is intermediate between the above two values.

For the purposes of figure 6 the adjustment was made on the basis of the first months of the first year. If we had used an adjustment based on the last months, all the points in the graph would have been displaced towards the left, and as a result the endogenous mortality rate for the last eleven months would have been appreciably lower. But figure 7, which is not affected by the above considerations, showed that the endogenous mortality rate was comparatively high. Thus the adjustment based on the first months is the correct one. It should be pointed out that this conclusion differs to some extent from that reached by the author in a previous article.

FIGURE 8. PROVINCE OF QUEBEC (1944-1947). INFANT MORTALITY BY AGE (PER THOUSAND LIVE BIRTHS)



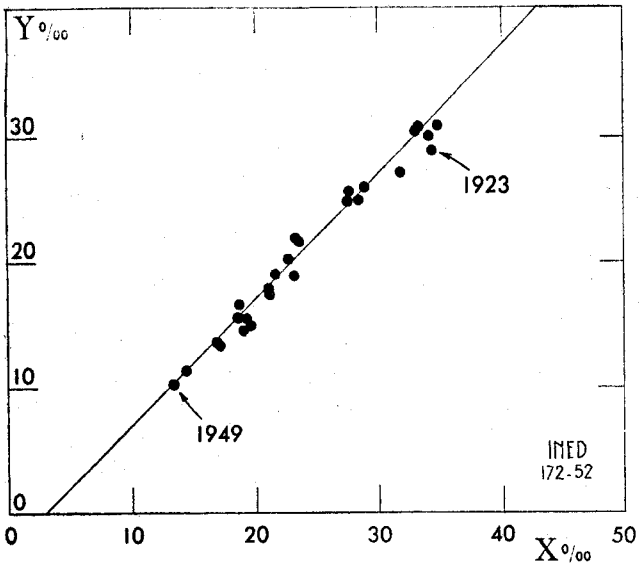
Infant mortality in Switzerland

Figure 9 shows the trend of exogenous mortality in Switzerland from 1923 to 1949. Figure 10 shows the territorial distribution by cantons for the period 1946-1948. The choice of 1923 as a starting point calls for some explanation, which will provide an opportunity for clarifying the process by which certain exogenous deaths are erroneously classified. Up to this point, endogenous mortality as recorded in the statistics of causes of death has been regarded as a single unit. Actually, the nomenclature divides this type of mortality into four main categories, namely:

Congenital debility;
Prematurity;
Malformations;
Diseases of early infancy.

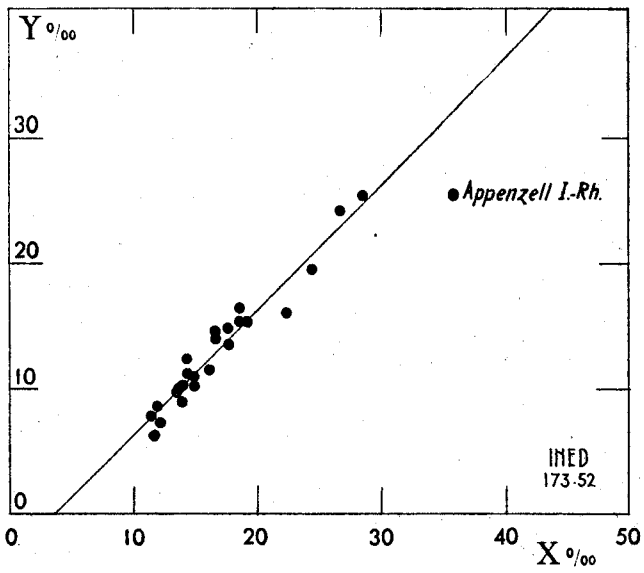
The correlation with exogenous mortality exists principally in connexion with deaths declared under the second heading; the error of classification, therefore, relates to prematurity. This is held responsible for deaths which are really due to the environment in which the infant lives, prematurity being only an additional cause which makes infants more sensitive to environmental deficiencies. Realizing that the heading "prematurity" had very little actual meaning, the Swiss decided in 1923 to delete it from their nomenclature, in order to compel medical practitioners to state the true causes of death. After some years of vacillation this result was achieved and the error of classification which exists in other countries has been eliminated from Swiss statistics, the λ coefficients in figures 9 and 10 being equal to unity. Figure 9 gives endogenous mortality in the last eleven months of the first year as $e = 2.4$. That is rather a high rate of mortality compared with what has so far been encountered. So far as concerns figure 10, the causes of death in infancy are not tabulated in Switzerland by canton. All that can be done, therefore, is to take the total endogenous infant mortality, which goes beyond the first year. It has already been pointed out that the fits obtained in these circumstances are likely to be more defective; and this is confirmed by figure 10. Lastly, the abscissa at the starting point in this case equals $1.25\ e_1 + e'$, which, taking the value for e_1 indicated by figure 9, gives $e' = 1.8$. The endogenous mortality de-

FIGURE 9. SWITZERLAND. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



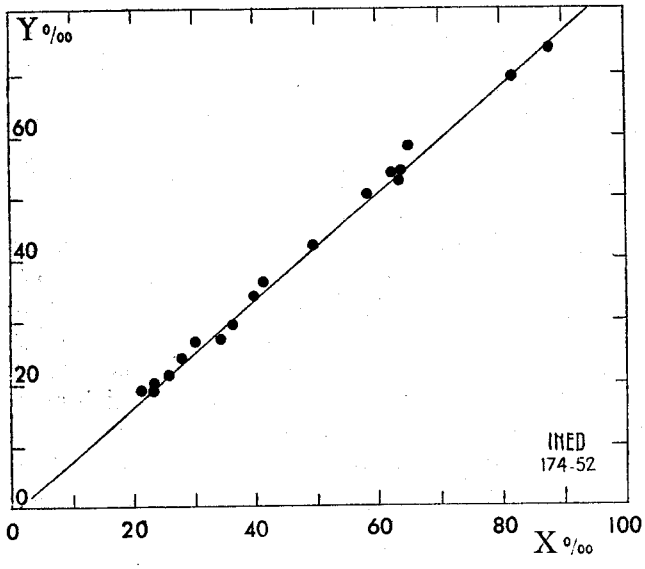
$y = x - 3$
Each dot represents a year

FIGURE 10. SWITZERLAND. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



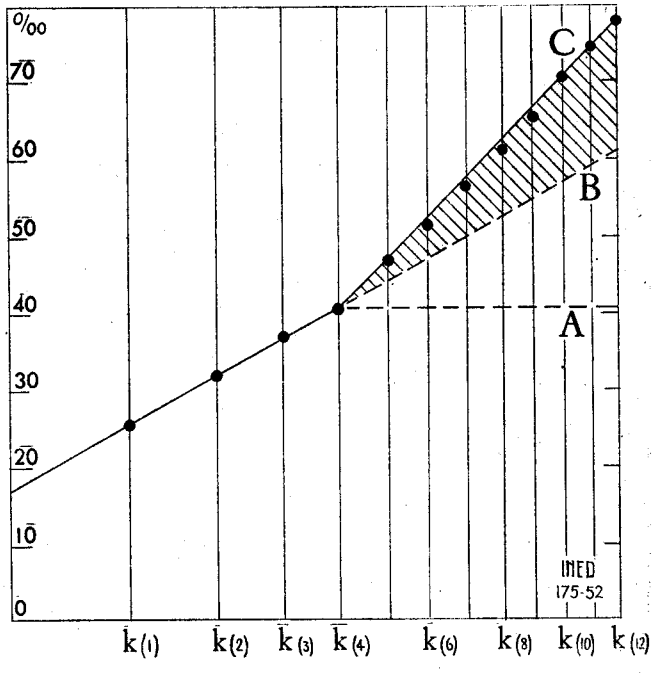
$y = x - 3.8$
Each dot represents a canton (1945-1948)

FIGURE 11. ITALY. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.864\ (x - 1.0)$
Each dot represents a region (1948)

FIGURE 12. SARDINIA IN 1948. INFANT MORTALITY BY AGE (PER THOUSAND LIVE BIRTHS)



The shaded area shows the excess mortality after the fourth month

cared in the statistics of causes of death after the age of one year for the whole of Switzerland is in fact 1.8. It may be pointed out in conclusion that on figure 10 the canton of Appenzell i. Rh. lies away from the line; but this canton is a very special case, since it is entirely surrounded by the canton of Appenzell a. Rh., and there may possibly be some transfers between the statistics for the two cantons. More detailed statistics would be needed to explain the reasons for this peculiarity.

Infant mortality in Italy

Figure 11 is analogous to the preceding one, and shows the territorial distribution by provinces in 1948. It calls for no comment. It gives $\lambda = 0.81$ and $e_1 = 0.88$, i.e., substantially the same figures as for England. However, in Italy the age-distribution of mortality in months one to eleven deviates from the normal in the opposite direction from that noted in the case of Canada. Figure 12, relating to Sardinia in 1948, shows how the figures are distributed. X-axis represents the quantities of k (n) and the Y-axis mortality rates before age n. The points obtained deviate, from the fifth month onward, from the line drawn through the points for the first four months, thus disclosing excess mortality in the last two-thirds of the first year.[5] The mortality rate predictable for the last eight months by extrapolation from the rates observed in the first four months—a method which can be applied for most populations—was AB = 22 per thousand in 1948. Actually the rate was AC = 37 per thousand, which represents an excess mortality of 68 per cent. The maps in figure 13 give the percentage of excess mortality by province in the pre-war period and for 1948. A considerable decrease in excess mortality will be noted between the two periods. Whereas before the First World War this excess mortality was a permanent feature throughout Southern Italy, and even, though to a lesser extent, in the North, it is now yielding ground, everywhere, and in some years disappears completely. In 1947, for example, there was no such excess mortality in

[5] The same phenomenon may be observed for the non-white population of the United States in the following four states: Idaho, Montana, Wyoming, Arizona.

FIGURE 13. ITALY, 1934-1938. PERCENTAGE OF EXCESS INFANT MORTALITY DURING THE LAST EIGHT MONTHS OF THE FIRST YEAR OF LIFE

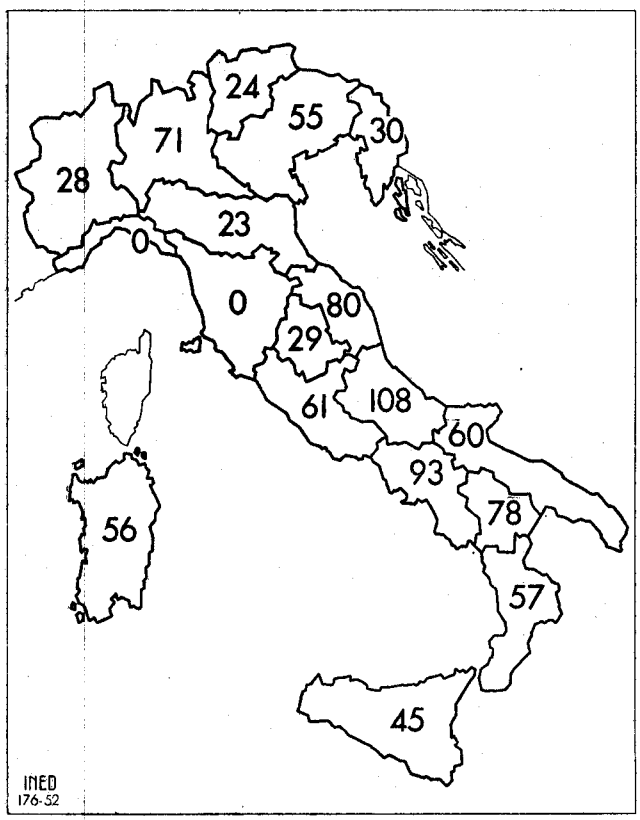
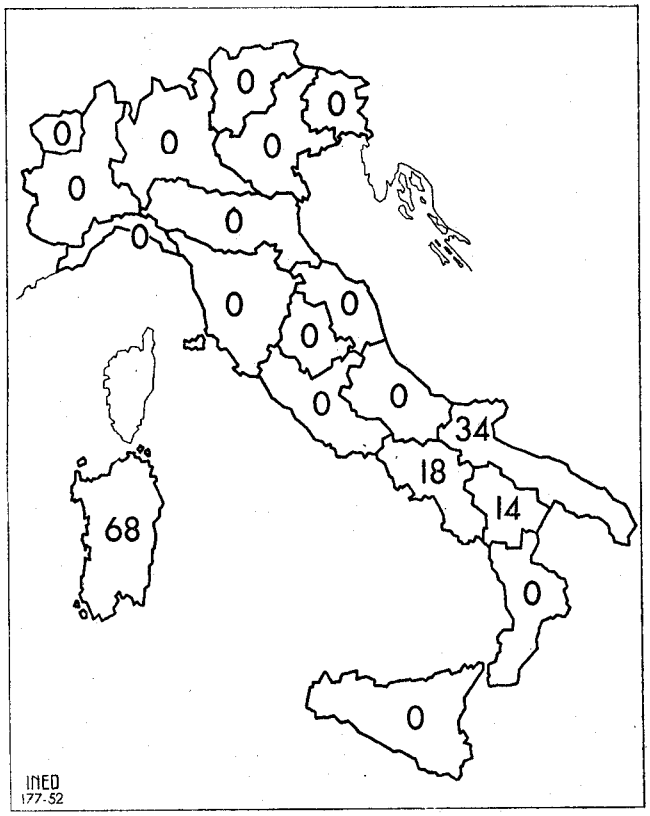


FIGURE 13. ITALY, 1948. PERCENTAGE OF EXCESS INFANT MORTALITY DURING THE LAST EIGHT MONTHS OF THE FIRST YEAR OF LIFE

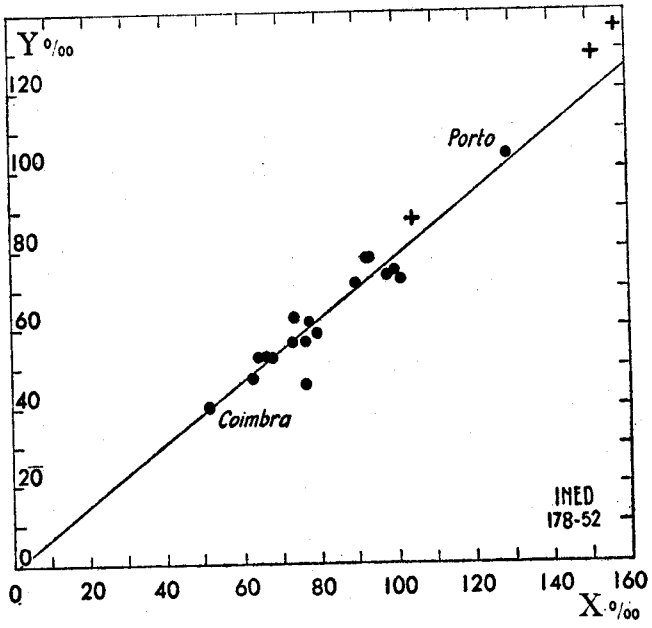


Sardinia. A detailed study of the causes of exogenous deaths would be necessary before the nature of this excess mortality could be elucidated; but even a cursory inspection of the statistics shows that it is probably due to nutritional factors. The period of the first year at which the excess-mortality occurs—immediately after weaning—confirms this interpretation.

Mortality in Spain and Portugal

Figures 14, 15 and 16 show the territorial distribution for the period 1946-1948. For Portugal, $\lambda = 0.87$ and for Spain,[6] $\lambda = 0.85$. The same difficulties arise in connexion with these two countries as we encountered in the case of Switzerland: the endogenous infant mortality in the various territorial divisions is not known. As a result the fits obtained are not so good as in previous cases; and this is aggravated by the fact that in these countries—particularly Portugal—we find a significant proportion of undeclared or inadequately defined causes of death. Hence figures 14 to 16 do not provide an accurate index of endogenous mortality in the last eleven months of the first year. All that can be said is that such excess mortality is very slight—less than one per thousand—and rather greater in Portugal than in Spain. It should also be pointed out that figure 15, and more particularly figure 16, seem to show that in Spain almost the whole of Andalusía and part of the southern plateau (Submeseta Sur) lie away from the line. The statistics at present available do not provide any explanation of this peculiarity. Lastly, these two countries display the same excess mortality after the age of six months as was observed in Italy. Figure 16 shows the territorial distribution of such excess mortality for the period 1946-1948.

FIGURE 14. PORTUGAL. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



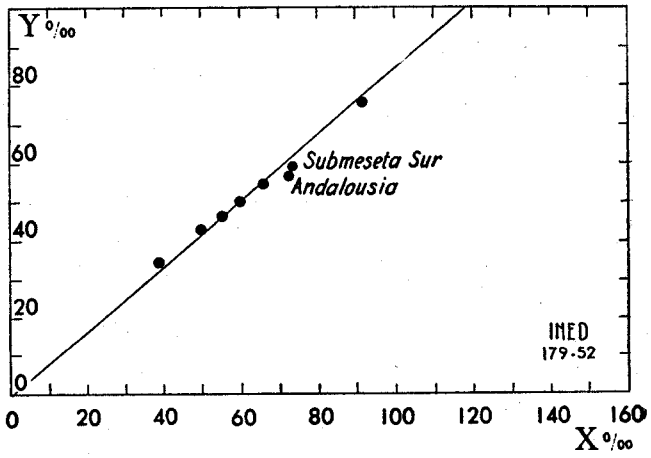
$y = 0.80\ (x - 1.2)$

Each dot represents a province (1946-1948). The adjacent islands are represented by crosses

Infant mortality in France

In the case of France, we will confine our attention to the graph of the chronological development of exogenous mortality. Since there are some *départements* in which the proportion of undeclared or inadequately defined causes of death is as high as 40 per cent—and sometimes higher—and certain regions where a considerable amount of non-medical diagnosis takes place, any graph based on the territorial distribution of mortality rates would be quite illusory. This question deserves special comment. In spite of the lack of precision of the French statistics, however, the graph of chronological development gives acceptable results (figure 18), and displays

FIGURE 15. SPAIN. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)

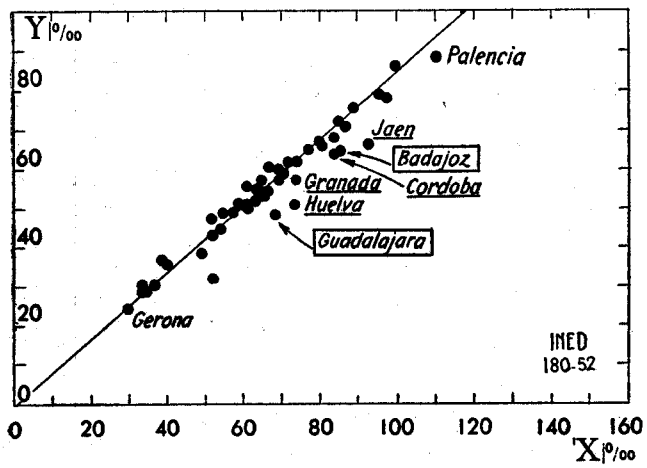


$y = 0.85\ (x - 0.4)$

Each dot represents a natural region (1946-1948)

[6] A very detailed application of the biometric method was carried out in Spain by Dr. Jésus Villar Salinas, who described the results obtained in an article entitled "*La mortalidad infantil contemporanea de las provincias españolas disociada en sus dos grandes causas*" in the *Revista de Sanidad e Higiene Publica* (October, November 1950, pages 592-637).

FIGURE 16. SPAIN. RELATION BETWEEN THE BIOMETRIC EXOGENOUS MORTALITY (x) AND THE EXOGENOUS MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.85\ (x - 0.4)$

Each dot represents a province (1946-1948)

Of the provinces lying away from the line, those that are underlined are in Andalusia, and those that are enclosed form part of the southern plateau (Submeseta Sur)

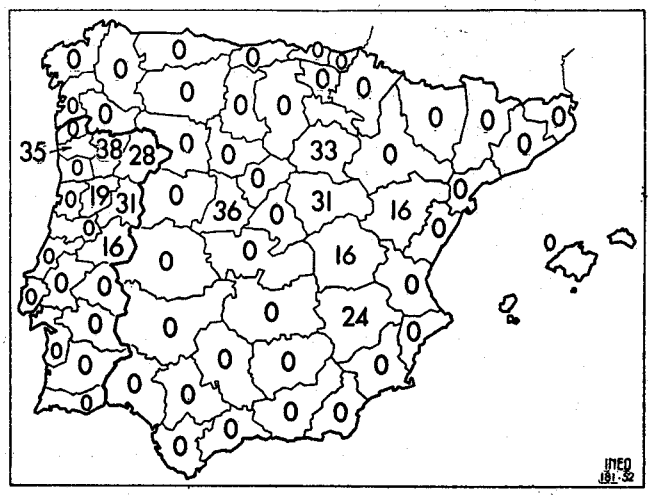
substantially the same characteristics as we noted in the case of England, $\lambda = 0.82$ and $e_1 = 0.80$.

Our examples of the application of the biometric method will be confined to these eight countries. The results obtained establish the validity of the method. The value of the curves obtained, and the fact that the λ coefficients vary from country to country,[7] show beyond doubt that the factor involved is an error in the classification of exogenous deaths. The deceptiveness of all comparisons between gross statistics of causes of death of infants is thus obvious. Such statistics underestimate exogenous infant mortality in varying proportions, according to country, and comparison between regions is therefore impossible. The biometric method slightly overestimates exogenous mortality, but the quantity involved is small, 1.25 e_1 (of the order of one to two per thousand), and varies only slightly from country to country.

By the use of this method valid comparisons can be made. Its advantages are therefore obvious. Where statistics of causes of death which do not include a high proportion of undeclared and inadequately defined causes are available, the methods are complementary, and the examples that have been given show that a very clear distinction between the two kinds of mortality, endogenous and exogenous, is then obtained.

[7] In the eight countries considered, λ varies from 1 to 0.815. Smaller values for λ can be found. From the Swedish statistics a value of $\lambda = 0.7$ is obtained.

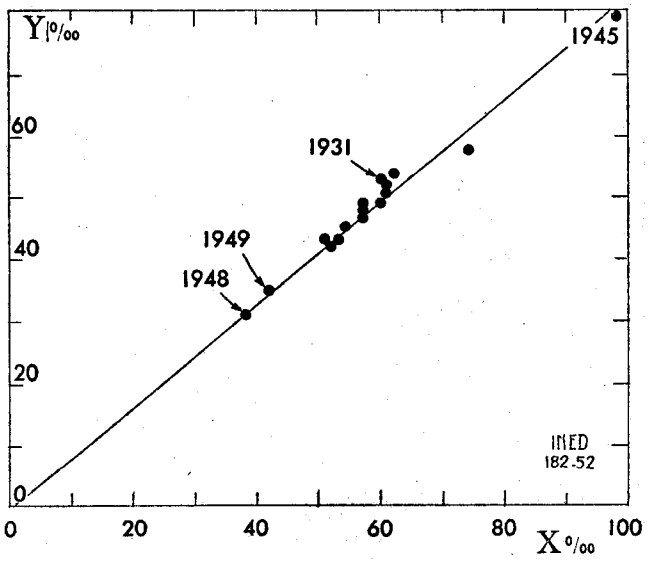
FIGURE 17. PERCENTAGE OF EXCESS INFANT MORTALITY DURING THE LAST EIGHT MONTHS OF THE FIRST YEAR OF LIFE (1946-1948)



We can thus proceed to make significant comparisons for the countries studied in this paper. Figures 19-21 offer materials for such a comparison so far as concerns exogenous infant mortality.

A similar map could be drawn for endogenous mortality; but here we encounter a new difficulty,

FIGURE 18. FRANCE. RELATION BETWEEN THE BIOMETRIC EXOGENOUS INFANT MORTALITY (x) AND THE EXOGENOUS INFANT MORTALITY COMPUTED FROM THE STATISTICS OF CAUSES OF DEATH (y)



$y = 0.828\ (x - 0.6)$

Each dot represents a year

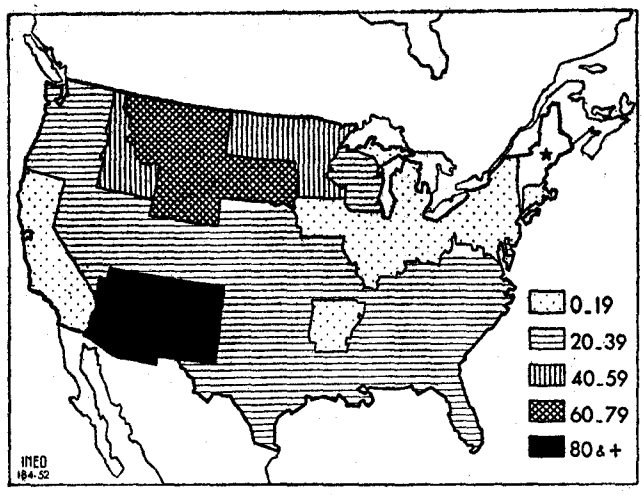


FIGURE 19. EXOGENOUS MORTALITY OF THE NON-WHITE POPULATION OF THE UNITED STATES ABOUT 1948 (PER THOUSAND LIVE BIRTHS)

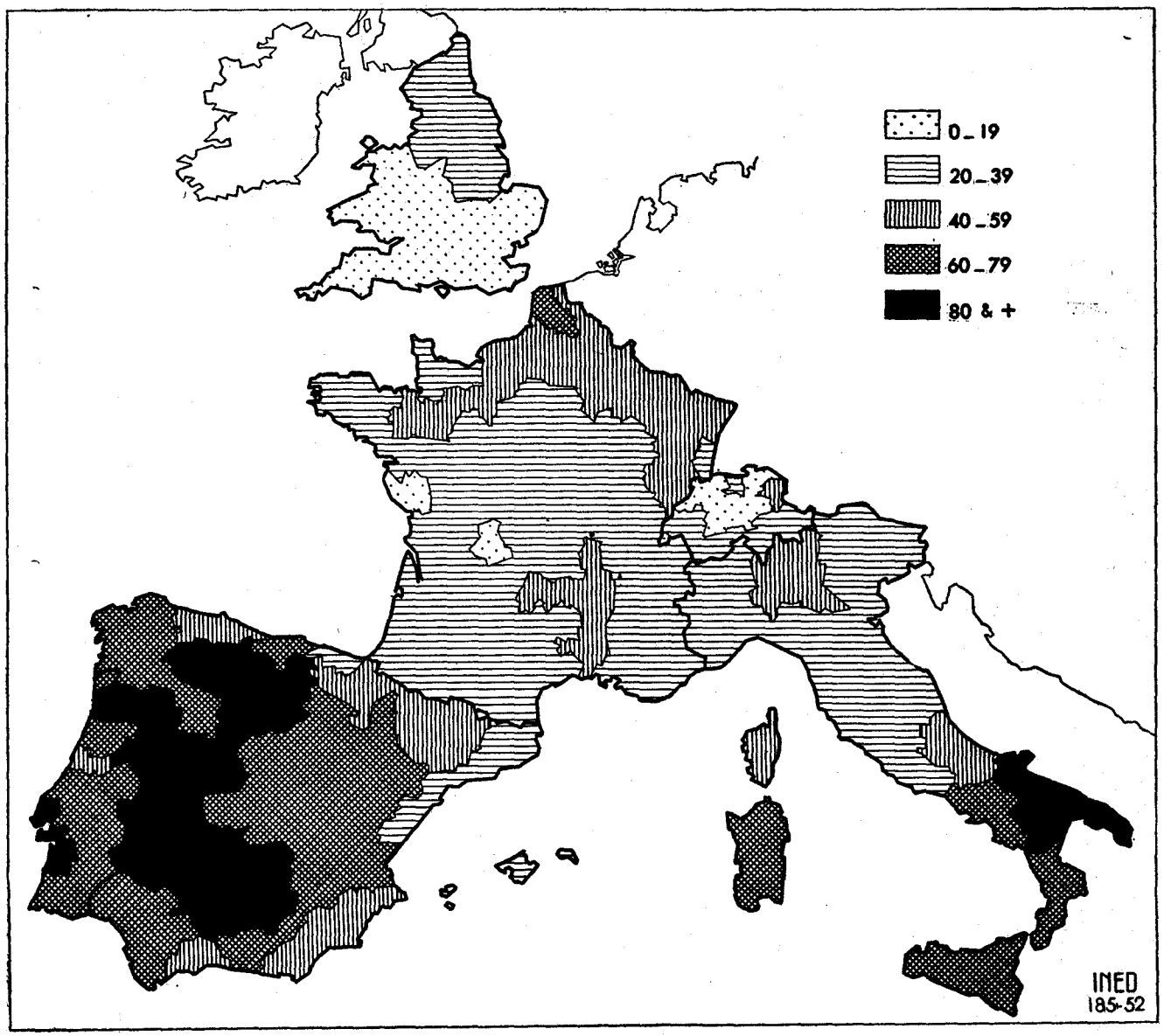
* Information not available

which necessitates a definition of what is understood by perinatal mortality.

Perinatal mortality

In many countries, legal necessities have induced the legislator to consider that an infant which is born alive but dies before the declaration of its birth may be registered as stillborn; whereas logically such a case should be classified as a live birth and a death within the first year.

FIGURE 20. EXOGENOUS INFANT MORTALITY ABOUT 1948 (PER THOUSAND LIVE BIRTHS)



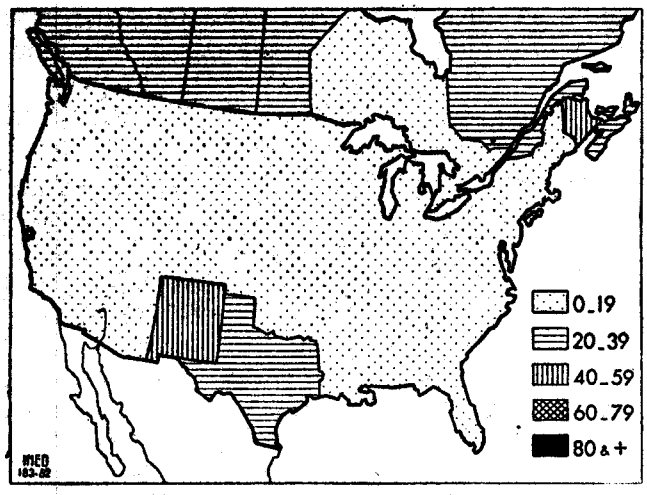
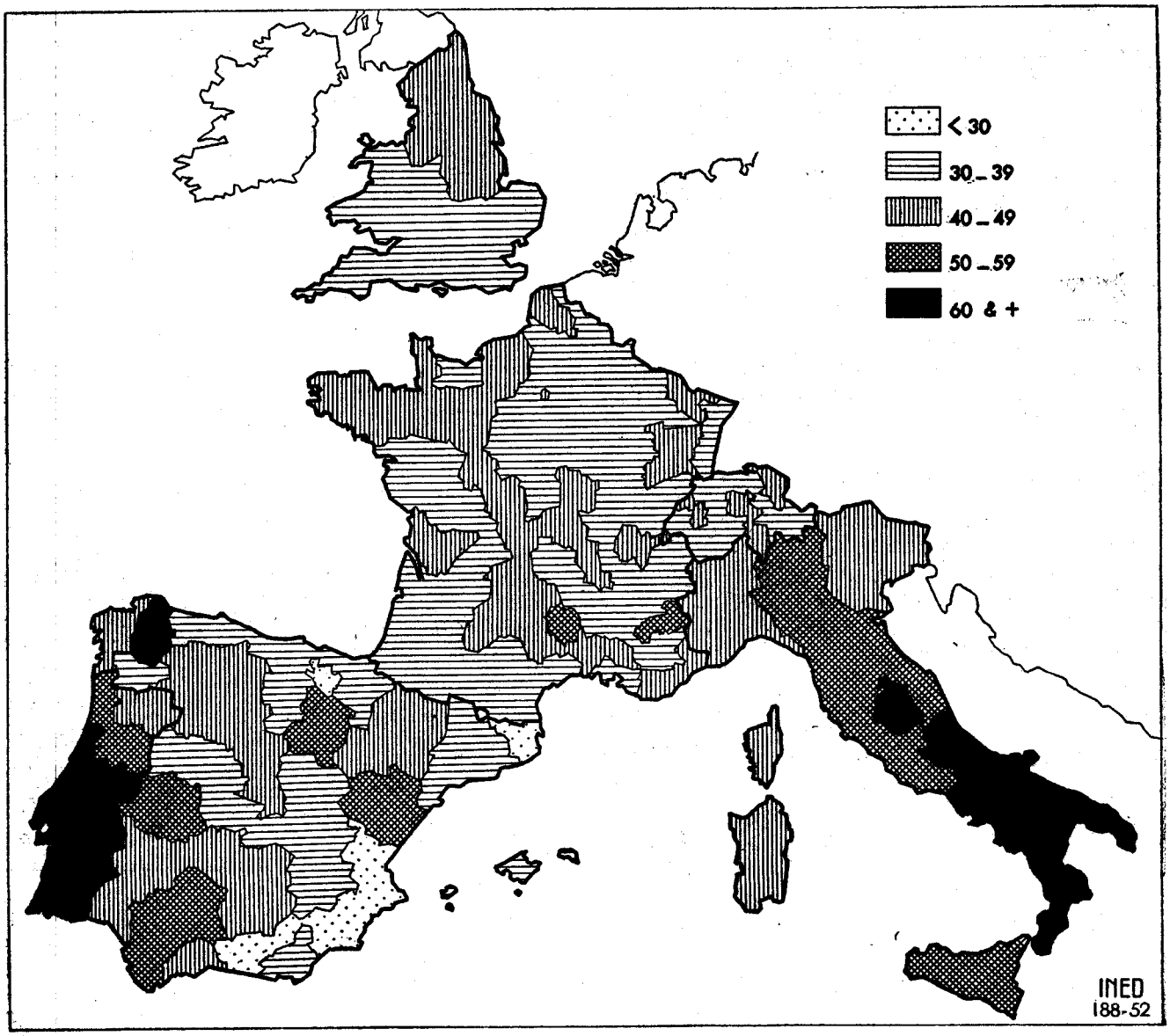


FIGURE 21. EXOGENOUS INFANT MORTALITY ABOUT 1948 IN CANADA AND THE UNITED STATES, WHITE POPULATION (PER THOUSAND LIVE BIRTHS)

But causes of death of infants who die before their births are declared are for the most part endogenous. In the statistics, therefore, some endogenous deaths are classified as stillbirths. Since this occurs in proportions varying from country to country, comparisons of endogenous mortality are of small value. Fortunately there is no great biological difference between the death of an infant from an endogenous cause some days after its birth and the death of an infant in its mother's womb some days before delivery; in other words, stillbirths and endogenous deaths

FIGURE 22. PERINATAL MORTALITY ABOUT 1948 (PER THOUSAND LIVE BIRTHS)



are akin. There is therefore some justification for classifying them together, in a group which may be designated "perinatal mortality", i.e., mortality occurring near birth, whether shortly before or shortly after. Such perinatal mortality is independent of the statistical variations to which attention was drawn a moment ago, and inter-regional comparison is therefore possible. Figures 22-24 show the territorial distribution of perinatal mortality in the eight countries under review. In the European countries considered in this study there are considerable regional differences in exogenous mortality, differences so great, indeed, that the scale of shading adopted for the preparation of the map cannot usefully be applied to the white population of the United States. In that country, with the exception of seven States, the rates of exogenous infant mortality today all fall between 7 and 12 per thousand live births (average 1946-1948).

The following are the seven exceptional States, with the exogenous rates for the period 1946-1948: Maine (15), Colorado (16), West Virginia (16), Kentucky (17), Arizona (19), Texas (21) and New Mexico (40).

In Canada, exogenous mortality is distinctly higher than that noted for the white population of the United States, but is still very much below the rates generally encountered in France, Italy or the Iberian Peninsula. The provinces of Quebec and New Brunswick, with rates for the period 1944-1947 of 34 per thousand and 40 per thousand, are high mortality areas in Canada—in Mediterranean Europe, they would be among the low mortality regions.

Our scale of shadings becomes usable again for the exogenous mortality of the non-white population of the United States. It will be noted, however, that there are some fifteen States where the rate of such mortality is lower than the lowest rates observed in France.

So far as endogenous mortality is concerned, regional differences are much less considerable. France, England and Wales, Switzerland, Northern Italy, a large part of Spain, the white population of the United States and Canada all have very similar rates. On the other hand, Portugal, Southern Italy and the non-white population of the United States represent marked peaks. In the United States, in particular, where the problems of the reduction of exogenous mortality seem to have been solved, perinatal mortality among Negroes is abnormally high. It would appear difficult to explain the regional differences noted, in respect both of endogenous and exogenous mortality, on the basis of the statistics at present available. Before compiling new statistics, however, it is essential to ascertain precisely what has to be measured. That has been the author's object in this paper.

FIGURE 23. PERINATAL MORTALITY OF THE WHITE POPULATION OF THE UNITED STATES AND CANADA ABOUT 1948 (PER THOUSAND LIVE BIRTHS)

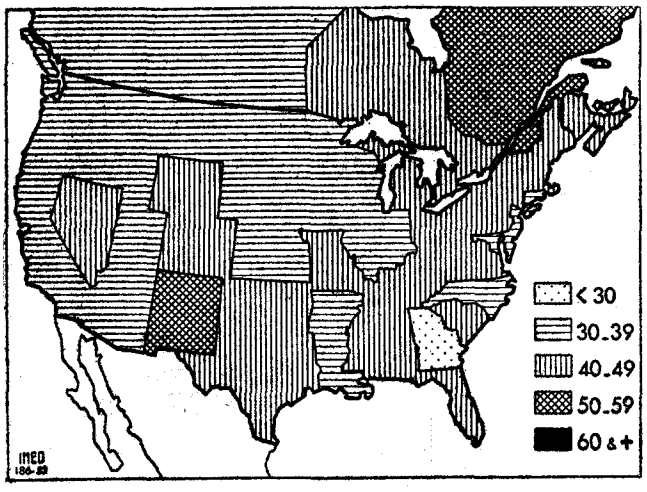
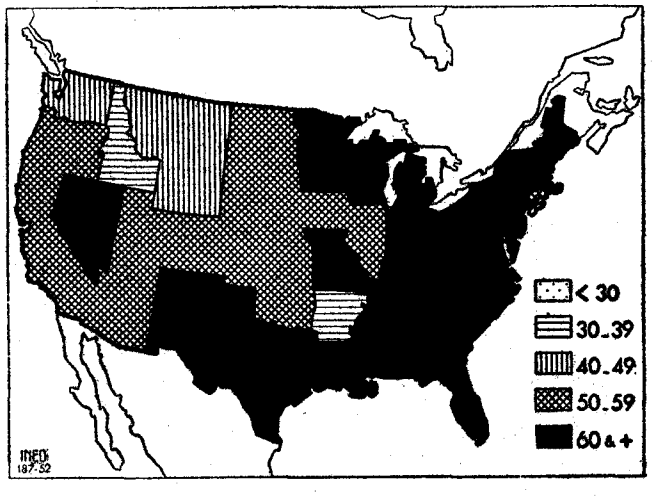


FIGURE 24. PERINATAL MORTALITY OF THE NON-WHITE POPULATION OF THE UNITED STATES ABOUT 1948 (PER THOUSAND LIVE BIRTHS)



Assimilation of the expellees in the Federal Republic of Germany: Demographic and social aspects

Contributed by PAUL F. MEYERS *and* W. PARKER MAULDIN,
United States Bureau of the Census

The Second World War and its aftermath witnessed one of the largest and swiftest migrations in European history. In October 1946, approximately 7 million migrants[1] had moved from other lands into the territory of the Western zones of occupation,[2] and by the end of September 1951, in the Federal Republic of Germany, the migrants, and their children, numbered about 9.8 million, or 20 per cent of the total population of 48.2 million.[3]

These migrants may be divided into two broad groups—refugees and expellees. The refugees are those persons who lived in Berlin or the Soviet zone of Germany in 1939. Expellees are all other persons of Germanic stock and German mother-tongue who, in 1939, lived in territory east of the Oder-Neisse rivers—land now under Polish administration or under control of the USSR—or in Poland, Czechoslovakia, Hungary, Romania, Yugoslavia, and other southern and eastern European countries. The expellee group does not include those West Germans who left Germany after the Second World War began, intending to colonize the conquered territories, but who later returned to the Federal Republic. Unfortunately, most data collected by the Statistical Office of the Federal Republic do not differentiate between the natives[4] and the refugees. Therefore, for the most part, the presentation of data about migrants must of necessity be restricted to the expellees. The expellees make up the bulk of the migrants. In October 1946 they numbered almost 6 million[5] and in September 1951 about 8.1 million persons.[6]

The immensity of the problems involved in the assimilation of the newcomers into the cultural and economic life of Western Germany is difficult to grasp. In any circumstance it would have been difficult enough to absorb such a large number—one refugee or expellee to four natives—within the span of seven years. The difficulties were magnified by the fact that one in every five dwellings in the Federal Republic had been destroyed during the war and that the newcomers were nearly all destitute when they arrived.

[1] *Wirtschaft und Statistik*, Vol. 1, No. 6, September 1949, p. 397.
[2] The Western zones of occupation refer to the present area of the Federal Republic of Germany except for minor border adjustments that have occurred since 1946.
[3] *Statistische Berichte*, VIII/20/4, 21 January 1952.
[4] "Native" or "indigenous" population as used in this paper refers to all persons, including aliens, living in the area of the Federal Republic of Germany in 1939, and their descendants.
[5] *Wirtschaft und Statistik*, Vol. 1, No. 6, September 1949, p. 397.
[6] *Statistische Berichte*, VIII/20/4, 21 January 1952.

FACTORS TENDING TO RETARD ASSIMILATION

Distribution

The very volume and speed of the immigration of the expellees and refugees militated against their assimilation. Assuming that the seven million present in the Western occupation zones in October 1946 had arrived evenly over the two year period, October 1944-October 1946, between 9,000-10,000 would have arrived each day for 720 consecutive days; 290,000 would have arrived each month for twenty-four consecutive months. Such an evenly spaced arrival would have been easier to cope with than was the great influx that occurred over a shorter interval of time. The peak of the arrival rate probably ran as high as 26,000 per day.[7]

This tremendous influx coupled with the housing shortage made it impossible for the *Länder* governments to direct the settlement of expellees to areas of better employment possibilities. In the vast majority of cases, the newcomers had to be distributed according to available housing space and foodstocks. Since destruction of housing occurred primarily in large cities, these people were directed largely to rural areas and to the small cities.

The distribution of migrants by residence as of September 1950 is shown in figure 1 and table 1. These data show that the migrants were heavily concentrated in Schleswig-Holstein, Lower Saxony, and Bavaria. Migrants in these *Länder* made up 38, 33, and 24 per cent of the total population, respectively. The *Länder* with the largest absolute number of expellees and refugees were: Lower Saxony, 2,221,000; Bavaria, 2,155,000; and North-Rhine—Westphalia, 1,711,000. As a result of the settlement patterns of the various sub-groups of migrants shown in table 1, out of each twenty persons in Schleswig-Holstein and Lower Saxony in September 1950, more than four were from the German territory east of the Oder

[7] James Stanley, "The German Expellees: An International Problem", *American Perspective*, Vol. IV:2, Spring 1950, pp. 208-214.

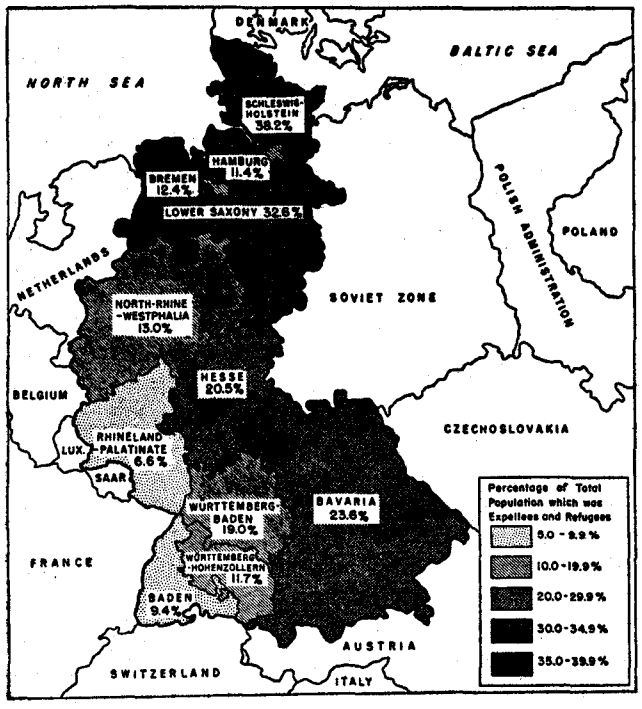
TABLE 1. POPULATION OF THE FEDERAL REPUBLIC OF GERMANY ON 13 SEPTEMBER 1950 BY PLACE OF RESIDENCE ON 1 SEPTEMBER 1939

Residence in the Federal Republic on 13 September 1950	Total population	Residence on 1 September 1939: In the Federal Republic[a]	Outside the Federal Republic: Total	In Berlin and Soviet zone	In other German territory	In foreign countries: Czechoslovakia	In foreign countries: Other
			Per cent distribution				
Total	100.0	80.2	19.8	3.3	9.4	4.0	3.1
Schleswig-Holstein	100.0	61.8	38.2	5.2	26.5	0.5	6.0
Hamburg	100.0	88.6	11.4	4.2	5.4	0.4	1.4
Lower Saxony	100.0	67.4	32.6	5.4	21.3	0.9	5.0
North-Rhine—Westphalia	100.0	87.0	13.0	2.8	8.0	0.6	1.6
Bremen	100.0	87.6	12.4	3.9	6.4	0.4	1.7
Hesse	100.0	79.5	20.5	3.9	5.1	9.1	2.4
Württemberg-Baden	100.0	81.0	19.0	2.4	3.2	7.7	5.7
Bavaria	100.0	76.4	23.6	2.5	6.6	11.2	3.3
Rhineland-Palatinate	100.0	93.4	6.6	1.6	3.1	0.5	1.4
Baden	100.0	90.6	9.4	2.1	4.2	0.7	2.4
Württemberg-Hohenzollern	100.0	88.3	11.7	1.9	5.2	1.0	3.6
			Number (thousands)				
Total	47,696	38,265	9,431	1,555	4,469	1,912	1,495
Schleswig-Holstein	2,595	1,604	991	134	689	13	155
Hamburg	1,606	1,422	184	68	87	6	23
Lower Saxony	6,797	4,576	2,221	369	1,446	58	347
North-Rhine—Westphalia	13,196	11,485	1,711	379	1,049	74	209
Bremen	559	489	70	21	36	2	10
Hesse	4,324	3,437	886	165	222	395	104
Württemberg-Baden	3,908	3,164	744	95	126	301	223
Bavaria	9,126	6,971	2,155	226	599	1,025	305
Rhineland-Palatinate	3,005	2,807	199	47	96	16	41
Baden	1,339	1,212	127	28	56	10	32
Württemberg-Hohenzollern	1,242	1,097	145	24	65	12	45

[a] Includes 43,000 persons whose places of residence in 1939 were unknown, and 182,000 aliens with non-German mother tongues who had entered the country since 1939.

Source: *Statistische Berichte*, VIII/8/12, February 1952.

FIGURE 1. EXPELLEES AND REFUGEES AS A PERCENTAGE OF THE TOTAL POPULATION OF THE FEDERAL REPUBLIC OF GERMANY BY LAND: SEPTEMBER 1950



and Neisse rivers and the Saar, one was from Berlin or the Soviet Zone, and one was from a foreign country other than Czechoslovakia. More than one of each ten persons in Bavaria was expelled from Czechoslovakia while one other of each ten persons was either an expellee from another area or a refugee from Berlin or the Soviet occupation zone.

The rural nature of the distribution of expellees within the eight States of the British and American occupation zones in October 1946 is shown in table 2.

TABLE 2. DISTRIBUTION OF THE EXPELLEE AND OTHER POPULATION BY RESIDENCE IN STADTKREISE AND LANDKREISE; BRITISH AND AMERICAN OCCUPATION ZONES: OCTOBER 1946

Länder	Percentage of population living in: Stadtkreise: Expellee	Stadtkreise: Other	Landkreise: Expellee	Landkreise: Other
Bizonia	15.1	39.4	84.9	60.6
Schleswig-Holstein	15.4	27.4	84.6	72.6
Hamburg	100.0	100.0	—	—
Lower Saxony	12.6	24.4	87.4	75.6
North-Rhine—Westphalia	23.2	48.2	76.8	51.8
Bremen	100.0	100.0	—	—
Hesse	9.8	28.5	90.2	71.5
Württemberg-Baden	11.3	32.9	88.7	67.1
Bavaria	12.6	31.7	87.4	68.3

Source: *Statistische Berichte*, VIII/0/4, 25 March 1950.

This table classifies the expellee and the remaining population by residence in what may be roughly considered as urban counties (*Stadtkreise*) and as rural counties (*Landkreise*). At that time, 85 per cent of the expellees as compared with 61 per cent of the remaining population were living in *Landkreise*. Except for the city-States of Hamburg and Bremen, the proportions of expellees in *Landkreise* varied between 77 per cent in North-Rhine—Westphalia and 90 per cent in Hesse.

Another indication of the rural character of the living arrangements of the expellee and refugee groups is given by the number living on farms in May 1949. At that time, almost 35 per cent of all migrants, as compared to 19 per cent of the indigenous population, were living on farms. Thus, on a proportionate basis, almost twice as many migrants as natives were settled on farms. The expellee and refugee group formed 28 per cent of the total farm population and nearly 15 per cent of the total non-farm population. Farms on which migrants were settled did not provide employment for them to the same degree as for the native population. Although expellees and refugees formed 28 per cent of the total farm population, they formed but 6 per cent of the gainfully employed in agriculture and forestry.[8]

Housing conditions

Aerial bombardment and land fighting during the Second World War destroyed about 2.2 million dwelling units in the Federal Republic of Germany.[9] Those destroyed amounted to 21 per cent of the 10.6 million dwelling units available to the 39.3 million persons living in the area of the Federal Republic in 1939. The number of new dwellings completed and old dwellings rebuilt, up to September 1950, amounted to about one million, so that, at that time, the country still had 1.2 million dwelling units less than in 1939.[10] A population increase of nearly 8.4 million persons from May 1939 to September 1950 along with this decrease in dwelling units resulted in a change from 3.7 to 5.0 persons per dwelling unit, or an increase of 35 per cent. In addition, it is probable that the dwelling units themselves were generally smaller in 1950 because of conversions necessary for the accommodation of the migrant population. As may be expected, there is a strong positive relationship between the percentage that migrants were of the total population and the number of persons per dwelling unit in the various *Länder*. For example, in 1950, there was an average of 5.7 persons per dwelling unit in Schleswig-Holstein, where 38 per cent of the population were migrants; an average of 4.4 persons occupied one dwelling unit in Rhineland-Palatinate, where 7 per cent of the population were migrants.

In addition to the 9.4 million normal dwelling units in the Federal area, there were 537,000 emergency dwellings in September 1950. This type of dwelling includes barracks, board huts, Nissen huts, and porches, vans, cellars, and buildings that had been virtually destroyed or badly damaged. The vast majority of these sub-standard dwellings are occupied by the expellee population.

Another type of sub-standard housing currently being used by the expellee and refugee population is the mass dwelling. This type of dwelling is defined as a room housing more than one refugee family. Some of the types are: air raid shelters, wings of factories, beer and dance halls, and other public buildings. Families partition off cubicles for their privacy with a few boards and old blankets and carpets. Cooking and bathing facilities are usually completely inadequate. This type of housing was provided for temporary accommodations, but the lack of more suitable dwellings and the continued influx of expellees have made necessary its use on a more or less permanent basis. It is estimated that these shelters were being used by about 180,000 persons during 1949.[11]

On 1 July, 1951, there were 324,000 expellees in camps in the Federal Republic.[12] These camps generally consist of isolated huts or barracks, originally used as military outposts or to house migrant agricultural labour. The housing is in bad repair and does not afford adequate protection against the extremes of the climate. There is no separate space for each family. Compared with the other types of sub-standard housing, camp dwelling is probably the most detrimental to the eventual assimilation of the inmates.

A certain proportion of expellees and refugees made their own housing arrangements. Some moved in with friends or relatives who preferred to share their houses with persons they knew than with unselected strangers. Others, who had secured employment, were able to make their own rental arrangements. Most of the independent

[8] *Wirtschaft und Statistik*, Vol. 2, No. 6, September 1950, pp. 217-220.

[9] The Federal Ministry for the Marshall Plan, *Report of the German Federal Government on the Progress of the Marshall Plan, General Survey, 1 October 1949 to 31 March 1951*, Bonn, 1951, p. 72.

[10] *Wirtschaft und Statistik*, Vol. 3, No. 6, June 1951, pp. 227-230.

[11] United States. Report of a special subcommittee of the Committee on the Judiciary, House of Representatives, 81st Congress, 2nd Session, "Expellees and Refugees of German Ethnic Origin", *House Report No. 1841*, U. S. Government Printing Office, Washington, D.C., 1950, p. 33.

[12] *Statistische Berichte*, VIII/20/4, 21 January 1952. These camps consisted of temporary collection camps, mass camps and residential camps.

housing arrangements, however, were those of expellees and refugees who moved into emergency dwellings. Housing secured by authorities included mass dwellings, camps, and billets with private families. The billeting arrangement was made by local authorities and was usually based on the rule that dwellings were under-occupied if they had less than 1.5 persons per room. There was, naturally, an antipathy of the resident to the invasion of his home and in some cases billeting had to be enforced by the aid of the police. In Bavaria, refusal to accept newcomers was made punishable with a fine of 10,000 Reichsmarks and imprisonment up to five years.[13] The problem for both the resident and the billeted expellee or refugee was, in many cases, aggravated by the arrival of family members or relatives who had become separated in the mass evacuations during the war or who had been prisoners of war. The difficulties were increased by the fact that the migrants had almost no personal belongings. By and large it was necessary to use the household utensils and, of course, the furniture of the family with whom the migrant was billeted. One official report noted: ". . . with several families trying to cook in the same kitchen, take turns in the same bathroom, and raise children of assorted age and social backgrounds under the same roof, irritations and aggravating incidents are bound to occur. It is not pleasant for anyone. It is particularly difficult for the refugee who recognizes himself as an unwanted intruder."[14]

Conditions in Schleswig-Holstein in January 1949 may be cited as an extreme example of the difficult housing situation of the migrants. At that time, 322,000 of the expellee and refugee households were lodged in normal dwellings and the remaining 110,000 (25.5 per cent) were lodged in emergency dwellings, mass dwellings, and camps. The larger the household unit, the higher was the proportion housed in non-normal dwellings. This proportion ranged from 13 per cent for two-person households to 31 per cent for households of eight or more persons. Of the 322,000 households lodged in normal dwellings, 83 per cent lived in one room and 15 per cent lived in two rooms. Over-all, the average was 2.2 persons per room.[15] Although no comparable data are available for the indigenous population, sample surveys in rural counties throughout the Federal area suggest that the migrants are about twice as crowded in their living accommodations as are the natives.[16]

The only aspect of the migrants' housing situation that would tend to speed assimilation is that they are almost completely mixed with the native population, village by village, house by house. Aside from this aspect, however, the housing condition of both the natives and the migrants is a strong factor in the retardation of assimilation of the migrant group.

Subjective factors

The irredentism and the psychological inhibitions of the expellees and the resistance of the natives are other factors which tend to retard assimilation. The expellees were shocked by the sudden catastrophe that confronted them. Shock resulted in a lethargy, a nostalgia, and an inability to accept the situation in which they found themselves. Regional differences between them and the majority group resulted in rebuffs and a withdrawal from community life to the association of others in their same situation. Economic downgrading and a shortage of money, clothing, and possessions caused a hurt sense of pride. A "camp mentality", or work-shyness, resulted from these inhibitions, from mass living, and from the dole. The natives were resistant to the invasion because of prevailing poverty and dislocations due to the war. Being hospitable was a threat to their meagre existence. As a result of the loss of the war, a sense of betrayal by their society, and a social situation which demanded individual efforts for subsistence, a chaotic individualism caused the natives to be callous to the plight of the expellees.[17] As has been noted in one official source,[18] "the stigma attached to being a refugee, the social and economic disadvantages of their status, are becoming so detrimental that many refugees avoid identifying themselves as such".

FACTORS TENDING TO SPEED ASSIMILATION

Some factors tending to speed the process of assimilation are that the expellees and natives have: (1) the same language; (2) the same ethnic origin; (3) highly similar cultural backgrounds; (4) the same political and legal rights; (5) similar age, sex, marital, and religious composition; and (6) about the same school enrolment rates.

[13] Committee Against Mass Expulsion, *The Land of the Dead, Study of the Deportations from Eastern Germany*, New York, 1947.

[14] United States. Report of a special subcommittee of the Committee on the Judiciary, House of Representatives, 81st Congress, 2nd Session, *op. cit.*, p. 34.

[15] *Statistische Berichte*, VIII/0/6, 29 June 1950, pp. 14-15

[16] Julius Isaac, "Problem of Cultural Assimilation Arising from Population Transfers in Western Germany", in *Cultural Assimilation of Immigrants*, Cambridge University Press, p. 28.

[17] P. J. Bouman, G. Beijer, J. J. Oudegeest, translated by H. A. Marx, *The Refugee Problem in Western Germany*, Martinus Nijhoff, The Hague, 1950, Chapter I.

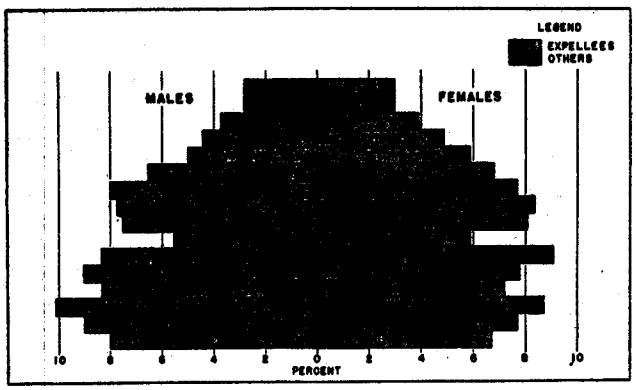
[18] United States, Report of a special subcommittee of the Committee on the Judiciary, House of Representatives, 81st Congress, 2nd Session, *op. cit.*, p. 47.

Also, the expellees have a wide range of occupational skills. In addition, steps have been taken to redistribute the expellees to the less-crowded *Länder*, on the one hand, and to the more urban and industrialized areas, on the other hand. Some of these factors are discussed in detail in this section.

Age and sex

One of the characteristics of the expellee group which has a large influence on the assimilation process is their age-sex distribution. This distribution may be noted in figure 2. Perhaps the most striking feature of the age pyramid for both the expellee and the remaining population is the small proportion of both sexes in the age-group 30-34. This is in part the result of losses in the Second World War, but is also a reflection of reduced fertility during the First World War. An

FIGURE 2. PERCENTAGE DISTRIBUTION BY AGE AND SEX OF THE EXPELLEE AND THE OTHER POPULATION OF THE FEDERAL REPUBLIC OF GERMANY: SEPTEMBER 1950



Source: Data furnished by the Statistical Office of the Federal Republic of Germany.

examination of the pyramid also indicates a smaller number of males than females in the reproductive ages as well as in the older ages, and also a relatively small number of children under 10 years of age.

The expellee population had about the same deficiency of males as had the remaining population. There were 89 males per 100 females in the expellee population and 88 males per 100 females in the remainder of the population. The slight excess of males for ages under 20 years in both populations was normal. From 25 to 39 years, in which age groups occurred the vast majority of war losses to the male population, the expellee population had a more favourable balance between the sexes—82 males per 100 females as compared with 74 males per 100 females of the native and refugee population. For ages past 45 years, the expellee population contributed to the imbalance of the sexes in the Federal Republic. There were four fewer males per 100 females between 45 and 64 years of age, and 15 fewer males per 100 females past 65 years in the expellee population than in the remaining population. This imbalance was probably due to the combination of a high mortality rate among male expellees in the older ages and a selective migration to the Federal Republic.

The expellee population was younger than the remaining population. The median age for the expellee males was 28.4 years; for the remaining males it was 32.8 years. For expellee females, the median age was 32.5 years, for the remaining females, 36.0 years. It may be seen in figure 2 that the proportion of persons in each five-year age-group up to 40 years was higher in the expellee than in the remaining population, whereas the proportion in each age-group 40 years and over was lower in the expellee population. Although, overall, the expellees were younger, the proportions of the two populations in specific five-year age-groups did not differ greatly. The expellees supplemented the population of the Federal Republic of Germany, but contributed only slightly to the normalization of its age and sex structure.

Marital status

A comparison of the marital status of the expellee and the other population 15 years and older, in September 1950, is shown in table 3. For both the expellee males and females of these ages a higher proportion was single and a lower proportion was married than was the case for the remaining population. A slightly lower proportion of expellee males, however, was widowed, divorced, or separated, whereas a higher proportion of female expellees was in this category, as compared with the remaining population.

TABLE 3. MARITAL STATUS OF THE EXPELLEE AND THE OTHER POPULATION OF THE FEDERAL REPUBLIC OF GERMANY, 15 YEARS OF AGE AND OVER: SEPTEMBER 1950

Sex and population group	*Number*	*Per cent*			
		Total	*Single*	*Married*	*Other*
Male					
Expellee	2,705,000	100.0	32.9	61.5	5.6
Other	13,908,000	100.0	29.0	65.1	5.9
Female					
Expellee	3,205,000	100.0	28.1	52.5	19.4
Other	16,641,000	100.0	26.9	56.3	16.8

Source: Data furnished by the Statistical Office of the Federal Republic of Germany.

A comparison of the percentages of single persons in the two populations by age-groups indicates no large differences. The higher proportion

of single persons among the expellee males and females than among the non-expellees was due, in large measure, to the fact that the expellee population had a higher proportion in the younger age-groups in which there is a preponderance of single persons, and a smaller proportion in the older age-groups in which there are relatively few single persons. If the male and female expellees had had the same age structure as had the remaining population, with no change in the age-specific marital rates, 29.0 per cent of the males and 26.2 per cent of the females 15 years or older would have been single. This figure for males is identical with that for the remaining population and the figure for females differs by less than one percentage point from that for the remaining population.

Females outnumbered males in each category of marital status, both among expellees and non-expellees 15 years of age and above. The excess of one-half million females 15 years and over in the expellee population, and the excess of more than two and three-quarter million females 15 years and over in the other population, were distributed by marital status as shown in table 4.

TABLE 4. EXCESS OF FEMALES 15 YEARS OF AGE AND OVER IN THE EXPELLEE AND THE OTHER POPULATION OF THE FEDERAL REPUBLIC OF GERMANY BY MARITAL STATUS: SEPTEMBER 1950

Marital Status	Expellees		Others	
	Number	Per cent	Number	Per cent
Total	500,000	100.0	2,733,000	100.0
Single	10,000	2.1	438,000	16.0
Married	18,000	3.6	312,000	11.4
Other	472,000	94.3	1,983,000	72.6

Source: Data furnished by the Statistical Office of the Federal Republic of Germany.

Overall, there were 10,000 more single female than single male expellees. In the age-group 20-34 years, in which most marriages occur, there was an excess of 70,000 single male expellees. From this age on, however, there was an excess of single female expellees in each age-group. The excess of married women, for both populations, was due principally to the wives of prisoners of war and missing persons who still counted themselves as married. The excess of expellee females was much more strongly concentrated among the widowed, divorced, or separated than was the case in the remaining population.

Religious composition

Both the expellee and the native population in September 1950 had about the same religious composition. The expellees had a slightly higher proportion of Protestants, and slightly lower proportions of Roman Catholics and of persons in the "other" religious category, i.e., those who belonged to other church groups, who did not belong to any church, or whose religious affiliations were unknown. The 1.6 million refugees from the Soviet occupation zone and Berlin, however, differed widely in their religious composition from either the expellee or the native population. The refugees had significantly higher proportions of Protestants and persons in the "other" religious category, and a significantly lower proportion of Roman Catholics, than did the natives or expellees.

The percentage distributions by religion of the expellee and refugee population and the native population of the *Länder* in 1950 are presented in table 5. The over-all structure of the two populations was not too dissimilar. There were, however, striking differences between the two groups in certain *Länder*. Because the expellees were arriving in large numbers, the German refugee administration could not give much consideration to religious preference when distributing them into the various *Länder*. As a consequence, in 1950, the majority religious group among migrants was the minority religious group among the natives in North-Rhine—Westphalia, Hesse, Württemberg-Baden, Rhineland-Palatinate, Baden, and Württemberg-Hohenzollern.

TABLE 5. RELIGIOUS COMPOSITION OF THE MIGRANT AND NATIVE POPULATION OF THE FEDERAL REPUBLIC OF GERMANY BY LÄNDER: SEPTEMBER 1950

Länder	Percentage population that was:					
	Protestant		Roman Catholic		Other	
	Migrant	Native	Migrant	Native	Migrant	Native
Total	56.8	49.7	40.4	46.4	2.8	3.9
Schleswig-Holstein	86.3	89.0	10.4	3.3	3.3	7.7
Hamburg	78.2	78.9	13.8	5.5	8.0	15.6
Lower Saxony	73.4	79.0	23.6	16.4	3.0	4.6
North-Rhine—Westphalia	62.2	37.9	34.7	57.8	3.1	4.3
Bremen	77.7	85.9	17.3	7.7	5.0	6.4
Hesse	42.4	69.7	54.5	26.5	3.1	3.8
Württemberg-Baden	35.3	64.9	62.4	32.0	2.3	3.1
Bavaria	32.1	24.8	66.1	73.6	1.8	1.6
Rhineland-Palatinate	56.6	39.6	41.3	58.9	2.1	1.5
Baden	57.4	25.3	40.0	73.0	2.6	1.7
Württemberg-Hohenzollern	61.4	43.4	36.7	55.4	1.9	1.2

Source: *Statistische Berichte*, VIII/8/11, 18 January 1952.

The over-all effect of the distribution of the migrants was to increase the proportion of the Roman Catholic minority groups among the population in Schleswig-Holstein, Hamburg, Lower Saxony, Bremen, Hesse, and Württemberg-Baden, and to increase the Protestant minority group in the other *Länder*.

The real importance of the religious composition of the new population is at the community level. Assimilation is certainly retarded if the migrants and natives are of different religious groups. This is particularly true in small rural communities where, as has been seen, the bulk of the expellees and refugees is concentrated. Cases have been cited in which communities of almost totally Protestant or totally Catholic population have had an influx of newcomers predominantly of the other faith. The results of this situation are psychological tensions, and difficulties with respect to schools, churches, cemeteries, etc.

School Enrolment

Children are extremely adaptable, and they should be more easily absorbed than their parents. It has been noted that the second generation of newcomers show far less psychological resistance to life among the natives than do their parents.[19] One factor in this absorption potential is the migrants' enrolment in the public schools of the Federal Republic. Expellee children made up over 22 per cent of all children attending the elementary, intermediate, and higher schools in May 1950. The enrolment rates for persons between 6 and 19 years of age attending these types of schools were 69 per cent for expellees and 66 per cent for the remaining population.[20] These rates indicate that expellees had slightly more than their share of children enrolled in these schools.

The enrolment of expellees in technical colleges and universities in the Federal area during the winter semester 1950-1951, however, was below their share of the population. Assuming that the 13,000 expellees and 79,000 other students[21] were between 20 and 32 years of age,[22] the enrolment rates for persons in this age-group were 0.76 per cent for expellees and 1.11 per cent for the remaining population. Thus, the remaining population had an enrolment rate almost one-half again as high as the expellee population. This difference may well have been due to differences in the proportions of the two populations eligible for entrance to these schools. In any case, it indicates that the enrolment of expellees was significantly lower than for the remaining population.

Occupational skills

Although data are not available in the form desired to give one a complete picture of the skills of the expellees, some data are available that throw light on the general problem. An attempt has been made to reconstruct the industrial structure of the economically active population among the Germans living east of the Oder and Neisse rivers and for the Sudeten region as of 1939.[23] This estimate indicates that 38.6 per cent of the economically active persons were in agriculture, 32.2 per cent in industry and mining, 19.3 per cent in commerce and transport, and 9.9 per cent in service industries. In the area of the Federal Republic the corresponding figures for 1939 were 26.2 per cent in agriculture, 40.5 per cent in industry and mining, 16.6 per cent in commerce and transport, and 16.7 per cent in service industries. This comparison shows that a significantly larger percentage of the expellees than of the population of the Federal area, had followed agricultural pursuits. Also, smaller proportions of expellees than of native Western Germans had worked in industry, mining, and the service industries. However, the total number of expellees with experience in industry, mining, commerce, transport, and the service industries appears to be large.

According to the census of 29 October, 1946, the composition of the economically active expellees in the British and American occupation zones (Bizonia) by broad industry group almost mirrored that of the entire economically active population in the three Western occupation zones:

Industry group	*Total in 3 occupation zones*	*Expellees in Bizonia*
Agriculture and forestry ...	30.0	27.4
Industry and mining	35.4	35.2
Commerce and transport	13.6	11.1
Service industries	18.6	19.9
Unknown	2.4	6.4

Source: Total: *Wirtschaft und Statistik*, Vol. 3, No. 3, March 1951, p. 270. Expellees: *Statistische Berichte*, VIII/0/4, 25 March 1950.

The expellees in Bizonia were engaged in service industries and in industry and mining to about the same extent as the remainder of the population in the three Western zones of occupation. The expellees were, however, engaged in agriculture, and in commerce and transport to a slightly

[19] Dolf Sternberger, *Research in Germany on Pressing Social Problems*, Library of Congress, Reference Department, European Affairs Division, 1951.

[20] School enrolment figures were taken from *Statistische Berichte*, VIII/9/5, 27 May 1951.

[21] *Statistische Berichte*, VIII/20/4, 21 January 1952.

[22] In the winter semester 1949-1950, 2.6 per cent of the college and university students were 19.5 years of age or younger and 6.8 per cent were 31.5 years of age or older (*Statistische Berichte*, VIII/4/7, 15 February 1951).

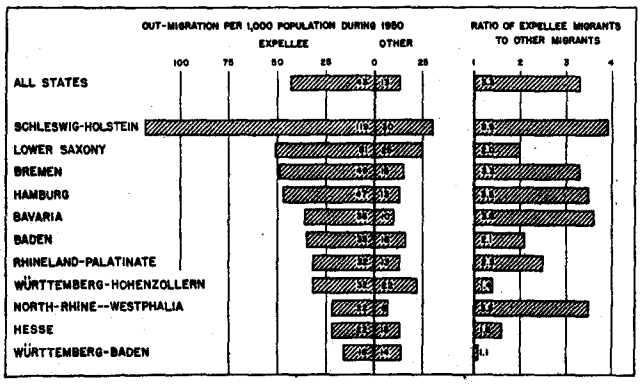
[23] *Wirtschaft und Statistik*, Vol 1, No. 10, January 1950, p. 303.

smaller extent than was the remainder of the population. To be sure, the above data do not indicate the level of skills of expellees within the various industry groups. Further, the jobs held by the expellees may not be a reliable indicator of the skills they possess. As a matter of fact, the similarity of the industrial structure of the expellees to that of the total population shows clearly that the job held by the expellee was primarily determined not by industrial knowledge brought along from the old homeland but by the economic structure of the territory of reception. None the less, the crude indices cited point to the fact that the expellees possess a wide range of skills, although they have a heavier concentration of experience in agriculture than does the native population.

Redistribution

The first internal migration statistics compiled since the war are for the year 1950. During that year, expellees migrated at more than three times the rate of the remaining population. Forty-three out of each thousand expellees changed their *Land* of residence as compared to thirteen out of each thousand of the remainder of the population. These data by *Länder* of origin of the migrants are shown in figure 3.

FIGURE 3. OUT-MIGRATION OF THE EXPELLEE AND THE OTHER POPULATION OF THE FEDERAL REPUBLIC OF GERMANY, BY LAND, DURING 1950



Source: Migration; *Statistische Berichte*, VIII/12/6, 5 November 1951. Total population; *Wirtschaft und Statistik*, Vol. 3, No. 11, November 1951, p. 1103. Expellee population; *Statistische Berichte*, VIII/8/12, February 1952.

Essentially, there are two types of reasons for the greater volume of internal migration among expellees. One type of reason is personal—the desire to get a job, to improve housing conditions, or to reunite a family. Although these factors operate for migrants generally, they are particularly effective in causing movement of expellees since this group suffers from a high rate of unemployment and inferior housing as compared to the remainder of the population. In addition, expellee families, having been settled mostly in rural areas, are separated from the bread-winner working in industry to a greater degree than are those of the native population. The second type of reason for the relatively large internal movement among expellees is the refugee resettlement programme. Of the 342,000 expellee migrants in 1950, 126,000, or 37 per cent, changed their *Land* of residence under the auspices of the Government. Under this programme, the *Länder* of origin of organized migrations were to be the three *Länder* most overburdened with refugees—Schleswig-Holstein, Lower Saxony, and Bavaria. The principal *Länder* of reception were to be the three *Länder* of the French occupation zone—Rhineland-Palatinate, Baden, and Württemberg-Hohenzollern. As a result of individual migration as well as organized transfers, the three *Länder* of origin of organized transfers accounted for 266,000 out-migrants, or 78 per cent of the total expellee migration. The three *Länder* receiving the largest numbers of expellees moving from other *Länder* of the Federal Republic were Rhineland-Palatinate (88,000), North-Rhine—Westphalia (67,000), and Baden (33,000).[24] In general, the direction of such migration has resulted in improved job opportunities for the expellees, and to a certain extent in less-crowded housing conditions. Thus, a high expellee rate of internal migration should speed up the process of assimilation.

STATUS OF ASSIMILATION

This paper, up to this point, has consisted essentially of a discussion of some of the factors that may be classified roughly as tending to speed or retard assimilation. These factors of themselves do not indicate directly the process of assimilation or the degree to which assimilation has taken place up to this time. For example, the high rate of school enrolment among expellees is generally regarded as favourable to assimilation; however, the influx of large numbers of expellee school children has created additional strains on the school system. This overburdening of the schools may well have strengthened the resentment of the natives toward migrants, thus tending to retard assimilation.

The best data available dealing directly with the degree of assimilation are those concerned with the expellees' economic integration, their political activities, and their intermarriage.

Economic integration

The entire economy of the Federal Republic of Germany has been greatly affected by the influx

[24] *Statistische Berichte*, VIII/12/6, 5 November 1951.

of the migrants. The economic absorption of so large a number of persons has been a tremendous undertaking. As is to be expected, the migrants are unemployed to a larger degree than the indigenous population. A comparison of the economic status, in September 1950, of the natives with that of the migrants shows that 46.3 per cent of the former and 42.7 per cent of the latter were economically active. The unemployed made up 4.5 per cent of the economically active native population as compared with 14.5 per cent of the economically active migrants.

The contrast between the figures for the total native and migrant population by sex is equally striking:

Sex and migration status	*Percentage of population economically active*	*Percentage of unemployed among the economically active*
Males		
Natives	63.5	4.2
Migrants	62.2	14.4
Females		
Natives	30.9	5.0
Migrants	24.6	14.6

Source: *Wirtschaft und Statistik*, Vol. 3, No. 2, February 1951, p. 130.

The above figures, however, do not adequately show the difference in economic activity between the two groups. In 1950, the expellees, who formed 82 per cent of the total migrant group, were somewhat younger than the remaining population, and had a slightly higher percentage of population in the "working years" of life. Moreover, many of the migrants who have been unemployed for month after month and who feel that job opportunities are virtually non-existent, no longer take the trouble to register as unemployed. It is probable that some of these migrants would be economically active if job opportunities were less limited. This withdrawal from the labour force also implies that the unemployment figures for migrants are somewhat understated.

The expellees comprise about 17 per cent of the total population of the Federal Republic but almost one-third of the unemployed wage and salary workers. This disproportion in the number of unemployed has existed since at least the currency reform in June 1948, and has shown little sign of diminution (table 6). In general, the higher the proportion of expellee population in an area, the higher the percentage of expellees among the unemployed. In Schleswig-Holstein as of September 1951, for example, the expellees made up 31 per cent of the population and 53 per cent of the unemployed wage and salary workers; in Hamburg, at the same time, expellees made up 8 per cent of the population and only 3 per cent of the unemployed. The high proportion of expellees among the unemployed in Baden and Württemberg-Hohenzollern, which are the exceptions to this relationship, may not be particularly significant in view of the relatively low level of unemployment in these *Länder*, on the one hand, and because of the recent arrival of sizable numbers of expellees, on the other hand.

TABLE 6. EMPLOYMENT STATUS OF WAGE AND SALARY WORKERS IN THE FEDERAL REPUBLIC OF GERMANY: 1948 TO 1951

Date	*Wage and salary workers*[a]							
			Unemployed					
			Total		*Expellees*			
	Total number	*Employed*	*Number*	*Percent of workers*	*Number*	*Percent of unemployed*	*Expellees as percentage of total population*	*Total population*[b]
1951:								
September 30	16,119,640	14,884,661	1,234,979	7.7	338,621	31.5	16.8	48,195,000
June 30	16,046,316	14,720,569	1,325,747	8.3	428,272	32.3	16.7	48,092,000
March 31	15,813,239	14,246,495	1,566,744	9.9	522,834	33.4	16.7	47,961,000
1950, monthly average	15,488,038	13,902,811	1,585,227	10.2	526,830[c]	33.6[c]	16.5	47,462,000
December 31	15,853,064	14,163,075	1,689,989	10.7	537,562	31.8	16.6	47,862,000
September 30	15,567,421	14,295,574	1,271,847	8.2	434,095	34.1	16.5	47,728,000
June 30	15,383,655	13,845,589	1,538,066	10.0	512,717	33.3	16.5	47,512,000
March 31	15,159,223	13,307,344	1,851,879	12.2	617,941[c]	34.7[c]	16.4	47,264,000
1949, monthly average	14,787,136	13,524,140	1,262,996	8.5	...	...	15.9	46,729,000
1948, monthly average	14,063,586	13,459,727	603,859	4.3	...	...	15.2	45,796,000

[a] Includes wage, salary, government, and public relief workers; excludes self-employed and family workers.
[b] Series based on the final results of the September 1950 census; excludes displaced persons in International Refugee Organization camps.
[c] Excluding Rhineland-Palatinate from January to March 1950.
Source: *Wirtschaft und Statistik*, Vol. 2, No. 8; Vol. 3, Nos. 4, 5, 6, 11 and 12; Vol. 4, No. 2.

Inspection of the data on the number of unemployed by detailed occupational group for expellees and for the remaining population as of 30 June, 1951 indicates a substantial reservoir of unused skills among the expellees.[25] In every occupational group, the expellees constituted from

[25] Data furnished by the Statistical Office of the Federal Republic of Germany.

one-fifth to slightly more than one-half of the unemployed. There was some concentration of expellees among occupations found in agriculture, and among glass-makers; however, with these exceptions, the expellees constituted from about one-fifth to two-fifths of the unemployed in each occupational group. Thus, the problem is one of general unemployment rather than unemployment concentrated in a few industries or occupations.

In addition to the problem of unemployment, there is evidence that even those who did find employment frequently had little or no opportunity to use their highest skills, and suffered a strong degree of occupational down-grading. No data are available as to the "class of worker" of the economically active expellees before the war. Inasmuch as they lived in more rural areas than did the population of the Federal Republic, it may be presumed that they had a higher proportion who were self-employed and unpaid family workers (in agriculture) than had the Western German population. Even if the expellees had had lower proportions in these two categories, the differences would have been far less than those reflected in the figures for 1946:

Class of worker	*Percentage of economically active*	
	Expellees	*Others*
Self-employed	3.3	17.7
Unpaid family workers	1.3	15.7
Officials: civil service	1.6	3.4
Salaried employees and wage earners	93.8	63.2

Source: *Wirtschaft und Statistik*, Vol. 1, No. 10, January 1950, p. 304.

The expellees had a much smaller percentage of self-employed and unpaid family workers, and a much larger proportion who were wage-earners than had the remainder of the population. The very small proportions of expellees that were self-employed and unpaid family workers were due principally to the fact that an estimated 400,000 formerly independent craftsmen and farmers had not been able to re-establish themselves in their former professions.[26] These persons swelled the numbers of expellees who were wage-earners.

The economic integration of expellees has been unsuccessful to date as evidenced by their disproportionately high rate of unemployment, their relatively low proportion in the labour force, and their occupational down-grading, e.g., working outside their field of training, or working at jobs which do not utilize their highest skills. Some of the causes of such unsuccessful integration are:

1. That the majority must still live in rural areas because of the acute housing shortage, whereas labour demand is concentrated in industrial, urbanized areas;

2. That they are usually the last to be hired and the first to be fired;

3. That many are employed in marginal industries which cannot withstand market fluctuations;

4. That a high proportion are working in seasonal occupations;

5. That many have developed a "camp psychology" and have withdrawn from the labour market, as a result of shock, mass living, and the knowledge that jobs are just not available;

6. That former independent farmers were not resettled on land of their own;

7. That other independent members of the labour force, such as craftsmen and those in the professions, were not integrated because of a shortage of credits and because of the stringent licensing system.

Political activity

There have been some indications in the political sphere of a definite separation between the expellee and the native population. In Bavaria, a political party has had considerable success with a programme directed against expellees.[27] In addition, an out-and-out expellee party—"Bloc of Expellees and Victims of Injustice"—scored successes in elections to the State Legislatures of Schleswig-Holstein in July 1950 and in Lower Saxony in May 1951.[28] In the local elections in Hesse on 4 May, 1952, the "refugee" party polled 209,000 votes, or 10.8 per cent of the votes cast.[29] There is some indication that political organizations of expellees as such are aimed not only at demands of a material nature, but also that they are expressions of the rejection of the goal of assimilation by the expellees themselves. The available data, however, merely indicate that there is some antipathy between expellees and the native population, and are not adequate to indicate the degree or the trend of such antipathies.

Intermarriage

Perhaps the best index of assimilation is the amount of intermarriage between two population groups. Only limited data are available on this subject for the expellees in the Federal Republic of Germany; however, for the year 1951, data on intermarriages between the expellees and non-

[26] *Wirtschaft und Statistik*, Vol. 1, No. 10, January 1950, pp. 303-306.

[27] *Heirs of Potsdam (The Tragedy of Expelled Germans)*, Royal Institute of International Affairs, October 1948.

[28] Office of the U. S. High Commissioner for Germany, *7th Quarterly Report on Germany, 1 April-30 June 1951*, p. 26.

[29] *The New York Times*, 6 May 1952.

expellees for all *Länder* but Bavaria are as follows:

	Females		
Males	*Expellee*	*Other*	*Total*
Expellee	34,994	47,007	82,001
Other	40,529	282,701	323,230
Total	75,523	329,708	405,231

Source: Letter from Dr. Sperling of the Statistical Office of the Federal Republic of Germany, dated 27 March 1952.

Of the expellee males marrying in 1951, 57 per cent married non-expellees. Since the sex ratio in the age-groups in which marriage rates are highest is more favourable among expellees than among non-expellees, some little intermarriage between expellee males and non-expellee females would be expected. Perhaps this difference in the sex structure is not of great significance because even among the expellees in the marriageable ages there is an excess of females. Also, more than half, 54 per cent, of the expellee females marrying in 1951 married non-expellee males. Such high rates of intermarriage are not due to the mere imbalance between the numbers of males and females.

It is difficult to place a "limit" on what is a low intermarriage rate. Various indices to measure the extent of intermarriage have been suggested by different writers. For example, Bachi[30] suggests the "attraction" index; Savorgnan,[31] the "homogamy" index. K. V. Müller, in writing on this problem in the Federal Republic of Germany,[32] uses what he calls the "connubial" index, which is simply the percentage that actual intermarriages are of the expected number of intermarriages based on chance alone. Thus, an index of 100 means that intermarriage between two groups is neither greater nor less than one would expect, basing one's expectations on the mathematical probability of such an occurrence. An index of less than 100 means that there is less marriage between two groups than one would expect on the basis of chance. Intermarriage between expellees and the remaining population in the Federal Republic in 1951 gives a "connubial" index value of 69. That is to say, there were 69 per cent as many marriages between expellees and non-expellees as would be expected on the basis of chance.

[30] Roberto Bachi, "Statistical Research on Immigrants in the State of Israel", *Cultural Assimilation of Immigrants*, Cambridge University Press, p. 51.

[31] Franco Savorgnan, "Matrimonial Selection and the Amalgamation of Heterogenous Groups", *Cultural Assimilation of Immigrants*, Cambridge University Press, p. 61.

[32] K. V. Müller, "Die Verschwägerung (Konnubium) als soziologischer Masstab für die Einwurzelung der Heimatvertriebenen Bevölkerungsgruppen", *Institute for Empirical Sociology of Hanover*, Academy for Regional Study.

The mathematical model for this calculation is as follows:

	Wives		
Husbands	*Expellee*	*Other*	*Total*
Expellee	a	b	a + b
Other	c	d	c + d
Total	a + c	b + d	N

$$\text{Connubial index} = \frac{100\,(b+c)}{\frac{(a+b)\,(b+d)}{N} + \frac{(a+c)\,(c+d)}{N}}$$

or:

$$= \frac{100\,(b+c)\,N}{(a+b)\,(b+d) + (a+c)\,(c+d)}$$

Thus, this index takes into account the differing proportions that expellees are of the total population of an area. For example, in an area where expellees make up 10 per cent of the total population, and assuming that both population groups have equal propensities for marriage, one would expect, by chance alone, 18 per cent of the marriages to be intermarriages, one per cent to be a marriage between two expellees, and 81 per cent to be marriages between two natives. In terms of the model:

	Wives		
Husbands	*Expellee*	*Other*	*Total*
Expellee	1	9	10
Other	9	81	90
Total	10	90	100

Evaluation of the equation results in a connubial index of 100. Varying any number in the 2 x 2 table and holding constant the stub and column totals, of course, results in an index of greater or less than 100.

This index value of 69 may be compared to intermarriage in Boston between native whites and foreign-born persons during the period 1905-1909. During this period, which witnessed a relatively large immigrant movement, the value of this index was slightly lower than that calculated on the basis of marriages between native whites and persons born in England (71) or France (75), higher than that calculated on the basis of marriages with persons born in Germany (58), Austria (49), and Denmark (45), and exceedingly high as compared to that calculated on the basis of marriages with persons born in Greece (20), Russia (10), and Italy (8).[33] Also, the value of the index for intermarriages between Catholics and non-Catholics in the United States during 1950 was less than 30, even if one assumes that half of the marriages involving Catholics were with non-Catholics. If one assumes that only 26

[33] Since the connubial index is merely the complement of Savorgnan's "homogamy" index in percentage, the numbers used here are the complements of the index values given in: Savorgnan, *op. cit.*, p. 63.

per cent[34] of marriages involving a Catholic were with a non-Catholic spouse, the value of the index drops to about 15.

One cannot determine the "trend" in the value of this index for the Federal Republic of Germany inasmuch as data for all of the country are not available for earlier years. However, in Bavaria, the index rose from 60 in 1948 to 64 in 1949, and to 67 in 1950.[35] These data suggest that there has been considerable intermarriage between expellees and non-expellees ever since the migrants arrived in the Federal area, and that the amount of intermarriage may be increasing.

The variation from *Land* to *Land* in the extent of intermarriage, as measured by this index, has been relatively large. During 1950, the values of this index for eight of the eleven *Länder* of the Federal Republic were as follows:[36]

Länder	*Connubial index*
Württemberg-Baden	58
Bavaria	67
Schleswig-Holstein	69
Lower Saxony	71
Rhineland-Palatinate	74
Hesse	75
Hamburg	77
Bremen	80

The cause of this variation has not been established. Müller points out only that variations of the index from one *Land* to another was not related to: differences in the religious composition of the two population groups; the density of the total population; the density of the expellee population, i.e., the hypothesis that frequency of expellee intermarriages decreases with increased expellee density has not been substantiated. In addition, the value of the index apparently was not associated with the proportion of the total population living in cities of 20,000 persons or more. Fragmentary data, however, suggest that intermarriages were most likely to occur between: non-expellees who were widowed and divorced and expellees who were single; non-expellees who were older than the expellee marriage partners; non-expellees and expellees of the "lower" social classes (i.e., unskilled labourers without property).

The differences between the connubial indices for *Stadtkreise* and *Landkreise* were not large. During 1950 the variation from *Stadtkreise* to *Landkreise* was 4 points or less for Schleswig-Holstein, Lower Saxony and Baden. The index was 5 points higher in *Stadtkreise* than in *Landkreise* in Hesse, and the largest difference was observed in Württemberg-Baden where the index was 70 in *Stadtkreise* and only 56 in *Landkreise* (table 7). These data suggest that intermarriage is more likely to occur in urban than in rural places. Müller points out that this differential is probably accounted for by the fact that only a selected group of especially able, industrious, and marriageable young expellees could move to the cities. However, even in rural areas the extent of intermarriage between expellees and the remainder of the population was rather high.

TABLE 7. CONNUBIAL INDEX OF INTERMARRIAGE OF EXPELLEES AND NON-EXPELLEES IN STADTKREISE AND LANDKREISE FOR SELECTED LÄNDER OF THE FEDERAL REPUBLIC OF GERMANY: 1950

Länder	*Stadtkreise*	*Landkreise*
Schleswig-Holstein[a]	69.6	70.3
Lower Saxony	72.6	71.3
Hesse	79.3	74.3
Württemberg-Baden	69.7	56.1
Baden	67.0	63.0

[a] February 1950-January 1951.

Source: K. V. Müller, "Die Verschwägerung (Konnubium) als soziologischer Masstab für die Einwurzelung der Heimatvertriebenen Bevölkerungsgruppen", *Institute for Empirical Sociology of Hanover*, Academy for Regional Study.

Perhaps this is not surprising inasmuch as the two groups have the same ethnic origin, the same cultural traditions, and the same language. Moreover, their living quarters have been described as being completely mixed with those of the native population, village by village and house by house. Regardless of the circumstances under which these two groups live, however, the relatively high indices of intermarriage suggest that social prejudice between the two groups is not very great.

In conclusion, the available data suggest that for the most part the expellees are being assimilated, particularly the younger generation. They are discriminated against with reference to getting jobs and to the kinds of jobs that they do get. Both the expellees and the remainder of the population are strongly motivated to bring about the unification of Germany and the return of the territory east of the Oder and Neisse rivers, and if this should be effected, undoubtedly many migrants would return to their former homes. Others, however, would likely remain in the Federal Republic. Unquestionably many conflicts arise in the day to day relations between these two groups, but much of the underlying tension would be relieved if adequate housing were available and if unemployment could be reduced to minor proportions.

[34] *The Official Catholic Directory, 1950* (P. J. Kenedy and Sons, New York) reports that 26 per cent of all marriages within the Roman Catholic Church involved a non-Catholic. This is a minimum figure, however, since converts before marriage are considered as Catholics, and marriages of Catholics outside the Catholic Church are not included.

[35] K. V. Müller, *op. cit.*, p. 4.

[36] K. V. Müller, "Die Heiraten Zwischen Heimatvertriebenen und Einheimischen als Kennzeichen für die Einwurzelung der Flüchtlingsbevölkerung in Niedersachsen", Sonderdruch aus den Veröffenlichungen des Niedersachsen Amtes für Landesplanung und Statistik.

International migrations in the Far East during recent times — The countries of immigration

A. Introduction

The main immigration countries of the Far East during modern times have been Malaya, Indonesia, Ceylon, Burma, Thailand, Vietnam, Laos and Cambodia, British Borneo, the Philippines and Manchuria in China. In most of these countries the Chinese and Indians have formed the bulk of the immigrant population. In order to avoid repetition of the history of migration of these peoples, which has been dealt with at some length in "International Migrations in the Far East during Recent Times—The Countries of Emigration", *Population Bulletin No. 1*, and in view of the fact that most of the relevant series of statistics for these immigration countries have become available only recently, the emphasis of the discussion in this article is placed on the most recent decades.

The immigration of Europeans to the Far East lies outside the scope of this study, which is intended to deal only with the movements of the peoples of the region. In fact, the number of European immigrants to all the Far Eastern countries has been relatively insignificant. Nevertheless, since they have had an important role in the economic development of the immigration countries, it seems pertinent to note briefly the magnitude of the influx of Europeans before proceeding to discuss the immigration of foreign Asians to each of the receiving countries.

Persons of European origin (including Americans, etc.)[1] in the Far Eastern countries are a very small minority. Recent data on their numbers range from a few hundred in British Borneo, as of 1931, to 200,000 in Indonesia as of 1930.[2] The highest proportion of Europeans in the total population was found in Indonesia before the Second World War, where they amounted to 0.3 per cent. The Europeans in these countries have been for the most part only temporary residents, with the exception of those in Indonesia, where a substantial proportion of them, prior to the war, were born and permanently settled in the country. The Europeans have been a dominant force in introducing modern commercial and industrial methods, basic protective measures in the interest of public health through improved sanitation and the control of epidemics and diseases, and certain types of educational institutions such as mission schools.

The Europeans have been mostly technicians, managerial personnel, workers in public service and the liberal professions, and skilled labourers. Their economic activities in the major immigration countries have been roughly identified with large plantations, mines and certain other extractive enterprises, export trades, and public utilities.

In the post-war period, many of the countries in south-east Asia have attained independence. The tendency in these countries for the native people to take larger responsibilities in the management of their economic affairs has necessitated a readjustment of the role of the Europeans. As a result, a voluntary reduction in the size of the European communities through emigration from some of these countries is under way. Indonesia and Ceylon are examples.

B. Malaya

1. *Major immigrant stocks in Malaya*

Malaya has been an important immigration country. Prior to the First World War, a substantial proportion of its population was of Asian immigrant stock. There were, for example, 1,184,000 Chinese and Indians in Malaya in 1911, forming 44 per cent of the total population.[3] Figures for the last three decades indicate that over half of the population of Malaya was of foreign origin, practically all being of Asian stock. The total foreign Asian population numbered nearly 1.7 million in 1921, 2.7 million in 1931 and 3.6 million in 1947. It was composed of a large majority of Chinese and Indians, and a a small proportion of Indonesians[4] and other Asians. (See table 1).

[1] In the statistics of some countries, Japanese immigrants have been clasified under the heading of "Europeans".

[2] There were 2,000 Europeans in Thailand in 1937; 5,000 in Ceylon in 1946; 12,000 in Burma in 1931; 19,000 in Malaya in 1947; 25,000 in Vietnam, Laos and Cambodia in 1946; 90,000 in China in 1934-1935, and 120,000 in India and Pakistan in 1931.

[3] British Malaya, *Malayan Statistics*, 1928, p. 5.

[4] No separate figure is available for Indonesians for the year 1921. The number of Indonesians for that year was included in the figure for the Malay population.

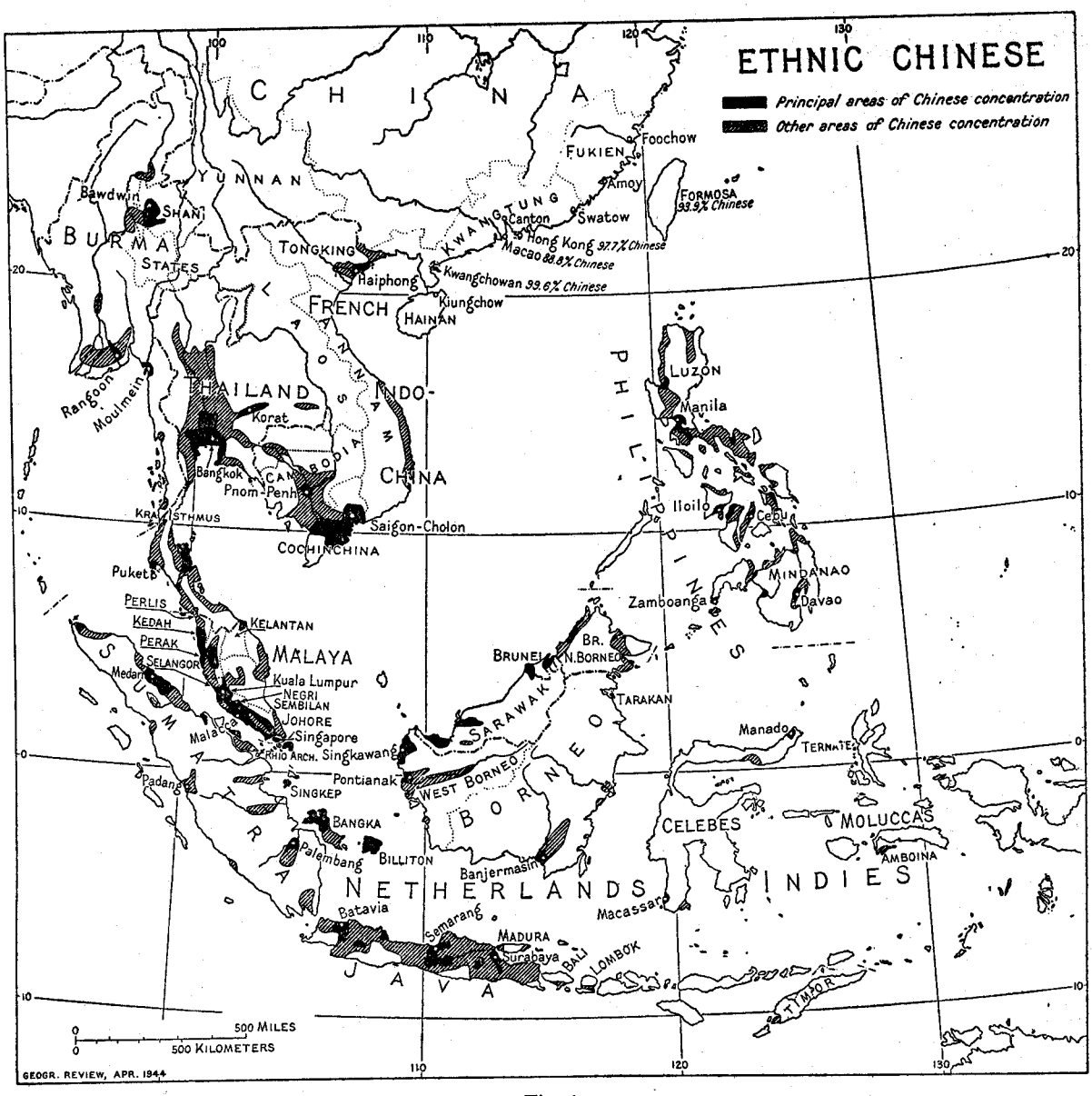


Fig. 1

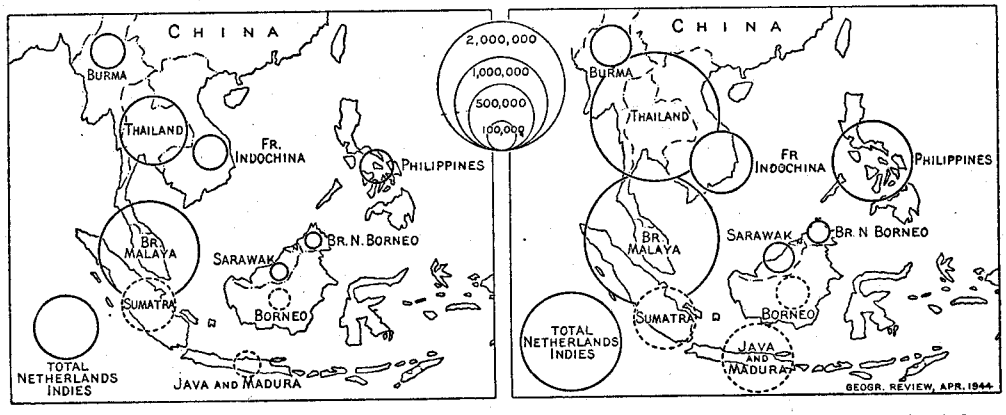


Fig. 2—Cartograms illustrating the distribution of Chinese in Southeast Asia: on the left, citizens of China; on the right, ethnic Chinese.

TABLE 1. ETHNIC GROUPS IN MALAYA, 1921, 1931 AND 1947

	Number			Per cent		
	1921	1931	1947	1921	1931	1947
Total	3,326,695	4,347,704	5,847,910	100.0	100.0	100.0
Malays	1,623,014	1,645,516	2,234,185	48.8	37.8	38.2
Indonesians		284,528	309,384		6.6	5.3
Chinese	1,171,740	1,704,452	2,614,667	35.2	39.2	44.7
Indians	471,514	621,847	599,616	14.2	14.3	10.3
Europeans	14,894	17,686	18,958	0.4	0.4	0.3
Eurasians	12,629	15,999	19,171	0.4	0.4	0.3
Others	32,904	57,676	52,929	1.0	1.3	0.9

Source: Malaya: *A report on the 1947 census of population.* London, 1949, p. 40.

Since 1931 there has been a steady increase in the proportion of Chinese in the population of Malaya. They are drawn mainly from the Hokkien, Cantonese, Hakka, Tiechiu, and Hainanese tribes in that order. The Chinese population is concentrated in the chief towns of Malaya, viz., in Singapore and in the many towns of the Federation: Penang, Malacca, and in those of the States of Perak, Selangor, Negri Sembilan, Pahang, Johore, and Kedah.

See figures 1 and 2.

Many of the Indians in Malaya are rubber plantation workers from the south of India. These include mainly the Tamil, Telugu, and Malayali. Other important Indian groups are the Sikh and Punjabi. Southern Indians are most numerous in Selangor, Perak, and to a lesser extent, in Penang, Johore and Kedah, and the Colony of Singapore. The way of life of the Indians who are plantation workers or independent farmers cultivating their own land (e.g., the Tamils) is very different from that of the Indians engaged in stevedoring and the building trades in towns (e.g., the Malayalis).

The Indians, like the Chinese, are mostly urban residents. (Towns and villages with a population of 1,000 or more are classed as urban.) Of the 2 million urban population in Malaya (1.3 million in the Federation and almost 0.8 million in Singapore) in 1947, 80 per cent were Chinese and Indians.

Among the other ethnic groups are the Indonesians and the Thais. The latter experienced a net emigration from Malaya during 1931-1947, leaving only about 20,000 at the end of the period. The Indonesians in Malaya, on the contrary, increased, numbering about 280,000 in 1931 and about 305,000 in 1947. These were mostly Javanese, with a minority of Banjarese, Boyanese, and other Sumatra peoples. These Indonesians lived in Perak, Selangor, Johore, and Singapore. They were more rapidly assimilated into the native Malay population than either the Chinese or the Indians, as they belonged to a Malayan ethnic stock and religion. Agricultural workers represented about 74 per cent of the total gainfully occupied Indonesians, the remainder being more or less equally distributed among the occupations of personal services, manufacturing, transportation and communication, and commerce and finance. During recent decades, the immigration of Indonesians has decreased even more rapidly than that of Chinese and Indians.[5]

2. *The permanence of the immigration*

Most of the people of foreign stock in Malaya are permanent residents. In 1947 nearly two-thirds of the Chinese and one-half of the Indians in this country were Malaya-born. Of those born abroad, one-half in the case of the Indians and a larger proportion in the case of the Chinese had come to Malaya in 1930 or earlier.[6] These data reflect the fact that the volume of immigration since 1930 has been much smaller than it was before, as well as the tendency for the earlier immigrants to take up permanent residence. Those immigrants who had families in Malaya were particularly likely to remain there. According to estimates based on vital statistics and census data for the Chinese stock classified by birthplace, about 90 per cent of the children, born in Malaya after 1931 of Chinese immigrant parents, who survived to 1947 were still in Malaya, presumably with their parents, at the latter date.[6]

This permanence of the earlier immigration has been one of the factors tending to reduce the volume of immigration since 1930. As the second generation of the Chinese and Indian stock comes of working age, the need to rely on an imported labour supply is reduced. Furthermore, in the post-war years there has been a tendency towards

[5] The number of immigrant Indonesians living in Malaya in 1947 who came to that territory in different years fell from 27,000 for those who came in during the decade 1921-1930, to 21,000 for those who came in during the decade 1931-1940, and 10,000 for those who came in during the seven-year period 1941-1947. The actual decline in the immigrant population would be larger than that indicated above since mortality would certainly have depleted the earlier immigrants more heavily than the recent ones. Malaya: *A report on the 1947 census of population*, London, 1949, pp. 344-350.

[6] Malaya: *A report on the 1947 census of population.* London, 1949, pp. 84-89.

greater fluidity in the adaptation of the locally available labour force to different types of work. An increasing number of Chinese and native Malayans are taking up estate employments that were formerly filled largely by immigrant Indian labourers. These developments have encouraged a governmental policy of limiting the influx of unskilled foreign labourers so as to reserve the employment opportunities in plantations, mines, etc., for the people already in Malaya.

The Malayan statistics of immigration show the numbers of Chinese and Indian arrivals classified as men, women, and children for the years 1930 to 1939, and corresponding data for Indians for the years 1922 to 1930 also. These figures indicate that a very large proportion of the immigrants were men. Of the 2,400,000 Chinese arrivals recorded during 1930-1939, over 1,500,000 or 64 per cent were men. The women made up 22 per cent and the children 14 per cent of the total.[7] The classification of the 1,600,000 Indian arrivals during 1922-1939 indicates that 63 per cent of them were men, 14 per cent women, and 23 per cent children.[7] The fact that the proportion of children among the Indians exceeded the proportion of women suggests that some of the Indians classified as children actually came into Malaya for employment.

3. *Demographic importance and characteristics of immigration into Malaya.*

Relation of immigration to population growth and natural increase of the total population of the country.—The major ethnic groups in Malaya, as shown above, are the Malaysians (i.e., Malays and Indonesians), and Chinese and Indians. Taken together, these formed about 98 per cent of the total population in recent decades. During the approximately 25 years between 1921 and 1947, the Chinese in Malaya were the most rapidly growing element. The Malaysians also increased rapidly but at a lower rate than the Chinese. The Indians, having increased fairly rapidly during the decade between 1921 and 1931, declined in number during the intercensal period between 1931 and 1947. The total population of these ethnic groups had increased from 3,266,000 in 1921 to 4,256,000 in 1931 and 5,758,000 in 1947. (See table 2.)

The increase of the major ethnic groups in Malaya between 1921 and 1931 was 990,000 persons, or 30.3 per cent and that between 1931 and 1947, 1,502,000 or 35.3 per cent. Of the intercensal growth during the former period, the increase of the Malaysians formed 31.0 per cent, that of the Chinese, 53.8 per cent and that of the Indians, 15.2 per cent. Of the intercensal growth during the latter period, the increase of the Malaysians formed 40.9 per cent, that of the Chinese, 60.6 per cent, whereas the number of Indians was reduced by 1.5 per cent.

Natural increase has been the main cause of population increase of the Malaysians, as migration from abroad of this group has been small. Natural increase as well as migration were the major factors in the population increase of the Chinese between 1921 and 1931. Of an intercensal increase of 533,000 persons among the Chinese in Malaya between 1921 and 1931, natural increase accounted for slightly more than half, or 275,000, and migration for 258,000.[8]

[7] Great Britain, Colonial Office, *Annual report on the social and economic progress of the people of the Straits Settlements*, 1919 to 1930 issues; Straits Settlements, *Government Gazette*, 1931 to 1940 issues.

[8] The figure for natural increase refers to the increase in the number of Malaya-born Chinese who were living in Malaya between 1921 and 1931. The figure for migration refers to net immigrants between 1921 and 1931 on the basis of foreign-born Chinese data for Malaya at the 1921 and 1931 censuses. The number of the net immigrants was also computed for mortality from the time of their immigration to the time of the census. Source: Malaya, *A report on the 1947 census of population.* London, 1949, pp. 84-85.

TABLE 2. GROWTH OF MAJOR ETHNIC GROUPS IN MALAYA, 1921 TO 1947

	Total	*Malaysians*	*Chinese*	*Indians*	*Total*	*Malaysians*	*Chinese*	*Indians*
	Number				*Per cent*			
1921	3,266,268	1,623,014	1,171,740	471,514	100.0	49.7	35.9	14.4
1931	4,256,343	1,930,044	1,704,452	621,847	100.0	45.4	40.0	14.6
1947	5,757,852	2,543,569	2,614,667	599,616	100.0	44.2	45.4	10.4
	Intercensal population increase							
1921-1931 ...	990,075	307,030	532,712	150,333	100.0	31.0	53.8	15.2
1931-1947 ...	1,501,509	613,525	910,215	−22,231	100.0	40.9	60.6	−1.5
	Ratio of intercensal population increase to the population at the beginning of each period							
1921-1931 ...					30.3	18.9	45.5	31.9
1931-1947 ...					35.3	31.8	53.4	−3.6

Source: Malaya, *A report on the 1947 census of population.* London, 1949, p. 40.

Between 1931 and 1947, however, natural increase among the Chinese became the major factor in the population increase of this stock. It accounted for an increase by 1.1 million of the Malaya-born Chinese in Malaya, or 190,000 above the total intercensal increase between 1931 and 1947, whereas the number of foreign-born Chinese declined by 190,000 between those two dates.[9]

TABLE 3. CHINESE IN MALAYA BY BIRTHPLACE, 1921, 1931 AND 1947

Year	Total Chinese		Malaya-born		Foreign-born	
	Thousands	Per cent	Thousands	Per cent	Thousands	Per cent
1921	1,172	100	258	22	914	78
1931	1,704	100	533	31	1,171	69
1947	2,615	100	1,633	62	981	38

Source: Malaya, *A report on the 1947 census of population*, pp. 40, 84.

TABLE 4. INTERCENSAL INCREASE OF THE CHINESE IN MALAYA, BY NATURAL INCREASE AND MIGRATION DIFFERENCE, 1921-1931 AND 1931-1947.

Period	Intercensal increase		Natural increase[a]		Migration difference[b]	
	Thousands	Per cent	Thousands	Per cent	Thousands	Per cent
1921-1931 ..	533	100[c]	275	52[d]	+258	48[e]
1931-1947 ..	910	100[f]	1,100	120[g]	−190	−20[h]

[a] The figures in this column are secured by subtracting migration difference from intercensal increase.
[b] The sign + is for net immigration and −, for net emigration.
[c] Intercensal increase of Chinese in Malaya amounted to 45 per cent of the number of Chinese there.
[d] Intercensal increase in the number of Malaya-born Chinese living in Malaya amounted to 107 per cent of the number of Malaya-born Chinese living there.
[e] Intercensal net immigration into Malaya added 28 per cent of the number of foreign-born Chinese living in Malaya.
[f] Intercensal increase of Chinese in Malaya amounted to 53 per cent of the number of Chinese there.
[g] Intercensal increase in the number of Malaya-born Chinese living in Malaya amounted to 206 per cent of the number of Malaya-born Chinese living there.
[h] Intercensal net emigration from Malaya and deaths in Malaya removed 16 per cent of the number of foreign-born Chinese in Malaya.
Source: Malaya, *A report on the 1947 census of population*, pp. 40, 84.

Migration and natural increase played varying roles in the growth of the Indian population of Malaya in the period from 1921 to 1947. Between 1921 and 1931 over half, or 78,000, of the 150,000 intercensal increase in the Indian population came from net immigration, and less than half, or 73,000, came from natural increase. On the other hand, natural increase was the major factor in the maintenance of a nearly comparable Indian population in Malaya between 1931 and 1947, for it had brought the number of Malaya-born Indians who remained and were enumerated in Malaya from 131,000 in 1931 up to 300,000 in 1947[10], whereas the net emigration had completely

[9] *Ibid.*, pp. 84-85.
[10] *Ibid.*, pp. 84-85.

TABLE 5. INDIANS IN MALAYA BY BIRTHPLACE, 1921, 1931 AND 1947

Year	Total Indians		Malaya-born		Foreign-born	
	Thousands	Per cent	Thousands	Per cent	Thousands	Per cent
1921	473	100	59	12	414	88
1931	622	100	131	21	490	79
1947	600	100	299	50	301	50

Source: Malaya, *A report on the 1947 census of population*, pp. 40, 85.

TABLE 6. INTERCENSAL INCREASE OF THE INDIANS IN MALAYA, BY NATURAL INCREASE AND MIGRATION DIFFERENCE, 1921-1931 AND 1931-1947.

Period	Intercensal increase		Natural increase[a]		Migration difference[b]	
	Thousands	Per cent	Thousands	Per cent	Thousands	Per cent
1921-1931 ...	149	100[c]	73	49[d]	+ 77	51[e]
1931-1947 ...	−22	100[f]	167	752[g]	−189	852[h]

[a] The figures in this column are secured by subtracting migration difference from intercensal increase.
[b] The sign + is for net immigration and −, for net emigration.
[c] Intercensal increase of Indians in Malaya amounted to 32 per cent of the number of Indians there.
[d] Intercensal increase in the number of Malaya-born Indians living in Malaya amounted to 124 per cent of the number of Malaya-born Indians living there.
[e] Intercensal net immigration into Malaya added 18 per cent of the number of foreign-born Indians living in Malaya.
[f] Intercensal decrease of Indians in Malaya amounted to 4 per cent of the number of Indians there.
[g] Intercensal increase in the number of Malaya-born Indians living in Malaya amounted to 127 per cent of the number of Malaya-born Indians living there.
[h] Intercensal net emigration from Malaya and deaths in Malaya removed 39 per cent of the number of foreign-born Indians in Malaya.
Source: Malaya, *A report on the 1947 census of population*, pp. 40, 85.

offset this gain from natural increase between these two dates.

In summary, the growing importance of natural increase among the two major immigrant stocks in Malaya, the Chinese and Indians, was essentially responsible for their population growth or maintenance in Malaya during recent decades.

Natural increase of the immigrant stocks, fertility, and mortality.—The size, growth, and relative proportions of the immigrant stocks in Malaya have been affected, as always, by natural increase and by the demographic characteristics of the migrant streams. Such data as exist on these matters are to be found in the census reports and the migration statistics. The census data on sex and age, particularly in the earlier censuses, did not have a complete coverage for each major ethnic group in Malaya. Moreover, age data are among the crudest types of data in the census reports. However, they are sufficient to form the basis for certain comparisons.

TABLE 7. CHINESE AND INDIAN ARRIVALS IN MALAYA BY SEX (ADULTS ONLY), 1930-1939[a]

Year	Chinese			Indians		
	Males	Females	Females per 1,000 males	Males	Females	Females per 1,000 males
1930	241,056	55,483	230	54,884	7,262	132
1931	138,146	31,626	229	42,625	4,413	104
1932	98,374	23,472	239	36,433	4,187	115
1933	87,716	21,693	247	36,456	4,300	118
1934	139,263	52,629	378	86,772	17,862	206
1935	177,701	60,010	338	73,465	13,088	178
1936	174,185	69,424	399	56,355	8,088	144
1937	225,209	117,794	523	106,995	24,442	228
1938	130,696	61,968	474	59,380	8,010	135
1939	113,563	26,106	230	45,096	5,402	120

[a] Sources: Great Britain, Colonial Office, *Annual Report on the Social and Economic Progress of the People of the Straits Settlements, for the years 1919 to 1930;* Straits Settlements, *Government Gazette,* January-March issue for each year 1931 to 1940.

The Malayan migration statistics show sex and broad age designations of the Chinese and Indian arrivals. Of a recorded 2.4 million Chinese arrivals in Malaya during 1930-1939, over 1.5 million were men, 520,000 were women, and 328,000 were children, representing 64, 22, and 14 per cent of the total Chinese arrivals respectively.[11] Of the 1.6 million Indian arrivals during 1922-1939, for whom sex and age data are available, nearly 1 million were men, 220,000 were women, and 355,000 were children, representing 63, 14, and 23 per cent of the Indian arrivals respectively.[11]

During the period 1930-1939 the sex ratios of the adult immigrants were as follows: For the Chinese, the ratio of females to males increased from less than 250 per 1,000 in 1930-1933 to an average of 427 in 1934-1938, but declined to the previous level in 1939. The high sex ratio during 1934-1938 was due to the fact that during those years Chinese women were exempt from quota restrictions. Among the Indians, the sex ratio for adults was considerably lower than that for the Chinese, generally fluctuating between 104 and 228 females per 1,000 males. (See table 7.)

For decades past, the proportion of Malay-born among the Chinese and Indian immigrant stocks has been increasing. This is traceable to natural increase, which, in turn, has been influenced by the changing sex ratios in both these groups. Among the Chinese the ratio of females to males rose steadily from 247 per 1,000 in 1911, to 513 in 1931, and 833 in 1947.[12] The ratio for the Indians rose from 308 in 1911, to 482 in 1931, and 637 in 1947.[13] The higher proportion of native-born among the immigrant stocks in turn has a natural reciprocal tendency to even up the sex ratios. One striking aspect of these developments has been the growing proportion of Chinese females among the total female population of Malaya. T. E. Smith has highlighted this point by saying that the most important single factor in the changing ethnic structure of Malaya over the past forty years has been the enormous increase in the numbers of Chinese females in the country and a corresponding decrease in the relative importance of Malaysians among the female half of the population.[14] The most important gain in the female ethnic composition of Malaya was that of the Chinese in the reproductive age-groups of 20-34 and 35-49, in which the proportion of Chinese females to the total female population of major ethnic groups rose by approximately one-fourth between 1931 and 1947. It was this rise which occasioned an almost 50 per cent increase, the highest ratio of increase among the various age-groups, in the proportion of Chinese females under 5 years of age during the same period, mainly through reproductive performance.

It has been shown that the immigration of the Chinese and Indians into Malaya over the years 1922-1939 was preponderantly males. Similar statistics of these stocks emigrating from Malaya during the same period are not available. However, the selection by sex of the emigrants from Malaya can be gauged indirectly. If we assume that the Malaya-born Chinese and Indians have an equitable sex ratio, then the sex ratio of foreign-born Chinese and Indians can be derived. On this basis, it is estimated that the sex ratio of the foreign-born Chinese in Malaya increased from about 360 females per 1,000 males in 1931 to 600 in 1947.[15] The sex ratio for Chinese adult arrivals in Malaya was only about 350 during 1930-1939. As for the Indians in Malaya, the

[11] Great Britain, Colonial Office, *Annual Report on the Social and Economic Progress of the People of the Straits Settlements,* 1919 to 1930 issues; Straits Settlements, *Government Gazette,* 1931 to 1940 issues.

[12] Malaya, *A report on the 1947 census of population,* p. 57.

[13] *Ibid.,* p. 58.

[14] Smith, *Population Growth in Malaya: an analysis of recent trends.* London and New York: Royal Institute of International Affairs. 1952. p. 9.

[15] Malaya, *A report on the 1947 census of population.* pp. 57-58, 84-85.

TABLE 8. PERCENTAGE COMPOSITION OF VARIOUS AGE GROUPS OF THE FEMALE POPULATION OF MALAYA, 1931 AND 1947

Age	1931				1947			
	Total	*Malaysians*	*Chinese*	*Indians*	*Total*	*Malaysians*	*Chinese*	*Indians*
All ages	100.0	54.6	33.6	11.8	100.0	47.0	44.3	8.7
0-4	100.0	57.7	29.2	13.0	100.0	49.1	41.6	9.2
5-19	100.0	55.9	33.2	10.9	100.0	45.7	45.1	9.1
20-34	100.0	52.4	32.1	15.5	100.0	50.1	40.0	9.9
35-49	100.0	50.0	40.2	9.8	100.0	43.0	48.6	8.4
50 & over.....	100.0	59.7	36.1	4.2	100.0	47.4	48.4	4.2

Notes: Figures based on only that section of the population for which age tables were made in the census reports.

Excluding a small percentage of other ethnic groups, which amounted to less than 3 per cent in each age group in 1931, and less than 2 per cent in each age group in 1947.

Based on data given in Smith, *Population Growth in Malaya: an analysis of recent trends.* London: Royal Institute of International Affairs. 1952, p. 11.

estimated sex ratio of the foreign-born Indians remained rather stable at about 350 females per 1,000 males in both 1921 and 1947,[16] whereas that for Indian adult arrivals in Malaya was slightly over 220 during 1922-1939. Evidently emigration of Chinese and Indians from Malaya during recent decades must have removed relatively more males than females to out-balance the preponderant male immigration in order to achieve the observed improvements in sex ratio among these ethnic stocks in Malaya in 1947.[17] These derived different patterns of sex ratios for immigrants and emigrants seem to be reasonable, since women (and children as well) among the immigrant groups usually have a tendency to become permanent members of the country of immigration. The resulting improvement in sex distribution of the immigrant stock in Malaya would, undoubtedly, have accentuated the importance of the natural increase of these stocks there.

Fertility and mortality of the immigrant stocks.—Smith estimated,[18] on the basis of the 1947 census statistics and registration data for the years *circa* 1947, that the gross reproduction rate (according to 1947 experience) for the Chinese in Malaya would not be lower than 3.25, that the rate for the Indians was somewhat comparable to this figure, and that the rate for the Malaysians (according to 1946-1948 experience) was 2.67. The net reproduction rate for the major ethnic groups in Malaya was estimated by the same author as 2.60 (1947 experience) for the Chinese, and 1.72 (1946-1948 experience) for the Malaysians, whereas the approximate age-specific death rates (1947 experience) for Indian females are higher than those of the Chinese but lower than those of the Malaysians. According to registration data, the natural increase of Chinese and Indians in Malaya in 1947 and 1948 exceeded 3 per cent per year, but the net movement of Indians out of Malaya reduced the increase in Indian population to less than 2 per cent.

These differences in rates of population growth from natural increase among the major ethnic groups of Malaya for some of the post-war years suggest that differences in the same direction, if not of similar sizes, probably also existed for some time before the Second World War. Such differences, modified by migration, or vice versa, have been responsible for changing the ethnic composition of Malaya during the recent decades. The proportion of Chinese in the total population of the three major ethnic groups in Malaya increased from 36 per cent in 1921 to 40 per cent in 1931 and 45 per cent in 1947. That of the Malaysians showed a relative reduction from 50 per cent in 1921 to 45 per cent in 1931 and 44 per cent in 1947, as was also the case with the Indians from 14 or 15 per cent in 1921 and 1931 to 10 per cent in 1947.

Sex and age distribution of the immigrants.—The Malayan census reports for recent decades covered sex and age statistics for that part of the Chinese and Indians who had reported their ages fairly accurately. These data were given separately by major administrative divisions of which the present division is the Federation of Malaya and the Colony of Singapore. To the extent that these data are representative of the sex and age characteristics of the Chinese and Indian populations in Malaya, a rough comparison can be made of these statistics for 1931 and 1947. Among the male populations of both Chinese and Indians in Malaya there was a heavy concentration in the ages between 20 and 40 in 1931. This was 46 per cent for Chinese and 59 per cent for Indians in

[16] *Ibid.*, pp. 57-58, 84-85.

[17] Aside from this, a secondary cause of improving the sex ratio of both stocks in Malaya was the excessive mortality among Chinese and Indian adult males during the years of the Second World War when Malaya was under Japanese occupation.

[18] Smith, *Population Growth in Malaya: an analysis of recent trends.* London and New York: Royal Institute of International Affairs, 1952. pp. 48, 59, 61, 73, 80-81, 87-89.

TABLE 9. PERCENTAGE AGE DISTRIBUTION FOR CHINESE AND INDIAN MALE POPULATIONS IN MALAYA, 1931 AND 1947

Age	Federation of Malaya or its corresponding area				Colony of Singapore			
	1931[a]		1947		1931[a]		1947	
	Chinese	Indians[b]	Chinese	Indians	Chinese	Indians[b]	Chinese	Indians
All ages	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0-9	14.2	13.6	25.8	20.0	15.1	5.6	25.0	10.7
10-19	13.2	12.4	21.4	17.6	15.9	11.6	21.5	9.2
20-29	23.1	31.2	11.5	16.7	24.7	40.6	14.9	27.2
30-39	23.0	27.5	13.5	20.4	21.8	26.7	16.1	29.1
40-54	21.8	13.8	19.0	19.9	18.7	13.7	16.8	19.4
55 & Over	4.7	1.5	8.8	5.3	3.8	1.8	5.7	4.3

[a] Including Labuan in both Malaya and Singapore.
[b] The 1931 figures include Burmese and Nepalese; the 1947 figures do not.
Source: Malaya, *A report on the 1947 census of population* (1949), pp. 54-55.

areas corresponding to the present Federation of Malaya, and 47 per cent for Chinese and 67 per cent for Indians in Singapore. By 1947, however, the bulges at the 20-40 age-group have been reduced considerably in both of these male populations, as there were only 25 per cent for Chinese and 37 per cent for Indians in the Federation of Malaya, and 31 per cent for Chinese and 56 per cent for Indians in Singapore. The reductions were due to the increasing proportion of children among these immigrant stocks and to the fact that many of the former immigrants now living in Malaya have moved to the older age-groups.

There has been a similar but less pronounced trend in the age structure of the more "natural"[19] female components of these immigrant stocks. The proportion of the female population in ages between 20 and 40 in 1931 was 35 per cent for Chinese and 45 per cent for Indians in areas corresponding to the present Federation; and 36 per cent for Chinese and 40 per cent for Indians in Singapore. By 1947, the proportion of the female population in ages between 20 and 40 was 27 per cent for Chinese and 34 per cent for Indians in the Federation and 30 per cent for Chinese and 33 per cent for Indians in Singapore.

Among the Chinese and Indian female populations in Malaya in 1931 and 1947, a larger proportion was in the reproductive ages than would be found in a "natural" female population.[20] This was more so in 1931 than in 1947, and more so for the Indians than for the Chinese. The concentration of female population of these stocks in the reproductive ages will enhance their natural increase through its favourable effect on fertility, which in turn will enlarge the relatively small proportion of the immigrant stocks in the very young ages and thus contribute to normalizing the age structure of these stocks. Moreover, an enhanced natural increase among the immigrant stocks in Malaya also tends to normalize sex distribution within each stock, since sex ratio of

[19] "Natural" in this connexion signifies a population not directly affected by migration.

[20] Such as that of the female population of Korea, 1944, for whom 30.7 per cent were in the age-group 0-9, 20.9 per cent in the age-group 10-19, 14.6 per cent in the age-group 20-29, 11.7 per cent in the age-group 30-39, 12.3 per cent in the age-group 40-54, and 9.8 per cent in ages 55 and over. *Demographic Yearbook, 1948*, p. 127.

TABLE 10. PERCENTAGE AGE DISTRIBUTION FOR CHINESE AND INDIAN FEMALE POPULATIONS IN MALAYA, 1931 AND 1947

Age	Federation of Malaya or its corresponding area				Colony of Singapore			
	1931[a]		1947		1931[a]		1947	
	Chinese	Indians[b]	Chinese	Indians	Chinese	Indians[b]	Chinese	Indians
All ages	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0-9	25.1	27.9	28.5	29.1	23.2	28.4	26.2	32.3
10-19	19.4	17.8	22.9	23.8	19.9	18.8	21.6	23.8
20-29	18.7	29.0	13.7	18.3	19.0	24.6	15.0	20.6
30-39	16.5	16.2	13.6	15.7	16.7	15.0	14.9	12.4
40-54	15.2	7.8	14.2	10.3	15.7	10.4	14.8	8.2
55 & Over	5.1	1.3	7.1	2.7	5.5	2.8	7.5	2.6

[a] Including Labuan in both Malaya and Singapore.
[b] The 1931 figures include Burmese and Nepalese; the 1947 figures do not.
Source: Malaya, *A report on the 1947 census of population* (1949), pp. 54-55.

children at birth is always nearly balanced. These normalizing effects, if undisturbed by migration, help to bring closer the sex and age pattern of the immigrant stocks to a "natural" one or to that of the native peoples. This, in turn, will improve the over-all sex and age pattern for the whole population of Malaya.

In summary, heavy immigration from China and India in the past, coupled with the growing importance of natural increase of the immigrant stocks in Malaya in the more recent decades, has made for a larger Chinese population, both in relative and absolute terms, and a sizable Indian minority in that territory. Malayan migration statistics indicate that Chinese and Indian immigrants to the Straits Settlements averaged about 300,000 a year throughout the 1920's and 400,000 a year during the 1930's. A substantial part of the immigrants returned to their homeland during these two periods. Since the war, immigration into Malaya in relation to the total population has ceased to be important. The age structures of these immigrant stocks in Malaya in 1931 and 1947 were favourable to natural increase. For the Chinese stock, natural increase has become the major factor affecting its size. As to the Indian stock, both migration and natural increase may exert considerable influence on its size because of the relatively small population of this stock.

C. Indonesia

1. *Major immigrant stocks in Indonesia*

The early Asian immigrants who went to Indonesia were mostly traders. But during the latter part of the nineteenth century and the early part of the present century the immigrants included many contract labourers to work on plantations and in the mines. These contract labourers came almost exclusively from China. In spite of the fact that Indonesia has a long immigration history, the Asian immigrant population in that country has always been a minority group, forming roughly 2 per cent of the total population between 1905 and 1930, for which data are available. In 1905 the immigrant Asian population in Indonesia numbered about 600,000. These were preponderantly Chinese, with only a small number of Arabs and Indians. By 1920 the foreign Asian population had increased to 876,000, of whom 809,000 were Chinese, and by 1930 to 1,349,000, of whom 1,233,000 were Chinese.[21] For the later years few estimates were made of the immigrant population in Indonesia until quite recently. Purcell estimated that the Chinese population in Indonesia might be in the neighbourhood of 1.9 million by 1947[22], whereas some Chinese sources give an estimate of 1.6 million Chinese in Indonesia for 1948.[23]

The migration statistics of Indonesia cover only those persons coming in with immigration permits; they do not include either the immigrant members of families (i.e., the wives and children) of residents in the country, or contract labourers. Moreover, there are no statistics on emigration from Indonesia. The available migration data show that for the years 1900-1930, a total of 871,000 Chinese were admitted to Indonesia, or an annual average of more than 28,000 persons. The number admitted during the 1920's appears to be higher than the average, as evidenced by the fact that in 1921 immigration permits were issued to more than 43,000, and in 1928 to about 41,000 Chinese. However, without statistics on emigration, the approximate size of net immigration cannot be determined. "Yet it appears from the changed composition of the population that an ever-decreasing part of it is composed of immigrants, and an ever-growing percentage of those descended from the Chinese born in the Netherlands Indies."[24] From the sources based on the recruitment of the Chinese contract labourers, figures for such labourers are available for the period 1912-1931. During 1912-1919 about 99,000 Chinese under contract entered Indonesia, or about 12,000 a year; whereas during 1920-1931, about 125,000 entered, or 10,000 a year.

Of the 125,000 Chinese contract labourers who entered Indonesia during 1920-1931, 65,000 persons (including dependants) remained in Indonesia after the expiration of the labour contract and were provided with immigration permits, a settlement rate of 5,000 a year.[25]

Since 1930, first the economic depression and then the increasingly restrictive legislation on immigration in Indonesia have reduced the immigration and enhanced the emigration of Chinese. The economic depression of the early 1930's led to a great decrease in the number of Chinese workers employed on the plantations and in the tin mines, as thousands were repatriated. Recruitment of Chinese labour in China (at Hong Kong) and in the Malayan states ceased at the end of 1933, and efforts were made by many enterprises, including the tin mines, to replace the comparatively expensive Chinese immigrants by cheaper native labour. The depression was most serious in Indonesia from 1930 to 1935. Nearly all the contract labour then found in the country, some 50,000 persons, had left Indonesia by the end of

[21] Purcell, *The Chinese in Southeast Asia* (1951), p. 443.
[22] *Ibid.*, p. 442.
[23] The China Handbook Editorial Board, *China Handbook 1951*. China Publishing Co., Taiwan, 1951, pp. 29-30.
[24] Cator, *The Economic Position of the Chinese in the Netherlands Indies* (1936), p. 39.
[25] *Ibid.*, pp. 39, 101, 121, 130, 134, 237-245.

this period and a large exodus of Chinese tradesmen occurred as a result of the wide dislocation of Chinese business life.[26] The number of continental alien immigrants admitted to Indonesia dropped from nearly 41,000 a year during 1927-1930 to less than 10,000 a year during the following decade. Altogether, it appears that there was a net exodus of Asian immigrants during the 1930's.[27]

In the years following 1940 the immigration of all aliens, including the Chinese, has been small in view of the war-time disruptions of transportation and the existence of severe quota restrictions.[28] Since liberation, the entry of Chinese has been suspended, except for the admission of Chinese repatriates at a quota of 400 per month.

The immigration of foreign Asians other than the Chinese was not important. Among these the Indian immigrants came essentially from Malaya rather than directly from India. They were mostly traders. Some of them intermarried with the natives—a practice which existed among the Indians only in Indonesia. In 1920, there were about 28,000 Indians in that country.[29] Their number does not seem to be growing during the recent decades. By 1947, an estimate put the number of Indians at virtually the same figure, 30,000.[30]

2. *Demographic importance and characteristics of the Chinese immigrant population*

Assessment of the effect of immigration on the growth of the Chinese population in Indonesia can be made for the decade 1920-1930. During this period the Chinese living in Indonesia increased from 809,000 to 1,233,000. The Chinese in Java increased from 384,000 to 582,000, and those in the outer islands from 425,000 to 651,000. Of the 582,000 Chinese living in Java in 1930, only 117,000, or 20 per cent, were born outside Indonesia. Birthplace data, which are available for about 610,000 of the 651,000 Chinese living in the outer islands, show that 314,000, or slightly over 50 per cent, were born outside Indonesia. Evidently immigration has had more effect on the growth of the Chinese population in the outer islands than in Java since 1920.[31]

The Chinese in Java have a more nearly equal sex ratio than those in the outer islands. In 1930, when the sex ratio for the total Chinese population was 642 females per 1,000 males, that for the Chinese in Java was 821 as against 502 for those in the outer islands. This disequilibrium in the numbers of men and women led to some intermarriage between the Chinese men and native women both in Java and in the outer islands. The proportion of native women who married Chinese men represents about 5 per cent of the total married Chinese women in Java, but a somewhat higher proportion is found in the outer islands.[32]

The unbalanced sex distribution of the immigrant population would be expected to have some adverse effect on its total fertility. On the other hand, it is probable that the mortality of the immigrant population is lower than that for the total population because of possible age selective factors operating in favour of the migrants. In any event, however, migration and natural increase could have changed but little the situation of the immigrant population in Indonesia from what it was in 1930, a small minority in that country.

In 1930, the Chinese in Java were primarily urban residents, about 60 per cent of them living in towns. Large concentrations of Chinese were found in Batavia, Surabaya, Semarang, Bandung, and Surakarta. In the outer islands the reverse

[26] The world depression necessitated government interference in many branches of trade and industry to avoid a general dislocation of the existing economic structure. The restricted production of sugar, with centralized sale under official control, the regulations on exports of tea, rubber, kapok, etc., and those on imports of rice, kedeke, textiles, beer, cement and the like, led to a decrease in agricultural produce within the scope of government measures, and to shrinking trade. The diminished volume of trade and the resumption of barter among the natives had serious effects on Chinese businessmen. The rapid fall of prices of native products brought losses to the Chinese who had advanced large sums of money to the natives in the form of buying-up credit. These helped the dislodgement of many otherwise settled Chinese in Indonesia.

[27] Figures for 1927-1936 and for 1937-1940 are taken from International Labour Office, *Year Book of Labour Statistics*, 1936 and 1947-48 issues respectively. Figures from the two issues for years 1929, 1931, 1935 disagree due to differences in distribution by intercontinental and continental immigration; however, the total immigration figures for those years are unaffected. The number of aliens did not include contract labourers and the immigrant members of the families of residents in Indonesia.

[28] Legal regulations for preventive supervision of admission of immigrants were stipulated in 1915, under which admittance was dealt with for all nationalities and races alike. Under these regulations, immigration permits were granted to *bona fide* immigrants who were able to support themselves and their dependants. The permit entitled the holder to a stay of two years, with the possibility of an extension to ten years. The charge for the permit was raised from fl. 25 in 1915, to fl. 50 in 1922, to fl. 100 in 1924 and to fl. 150 in 1930. In 1934, a quota system was established limiting the total quota for all alien-newcomers to 12,000 persons per year. This total was equally divided among fifteen countries and races, amounting to 800 persons per country or race. However, women and children were exempted from this quota. In 1940 the total quota was reduced to 10,000 or 667 persons per country or race.

[29] Mukerjee, *Le migrazioni Asiatiche* (1936), pp. 32-33, 291.

[30] Purcell, *The Chinese in Southeast Asia* (1951), p. 691.

[31] *The 1930 Census of the Netherlands Indies*, Vol. II, p. 22, Vol. VII, p. 40; Cator, *The Economic Position of the Chinese in the Netherlands Indies* (1936), pp. 27, 99, 101, 130, 134.

[32] *The 1930 Census of Netherlands Indies*, Vol. VII, pp. 93, 289.

was true, about 70 per cent living outside the towns, with large concentrations in areas along the east coast of Sumatra, in Bangka, Billiton, Riau, Palembang, and west and south-eastern Borneo.[33]

In Java, the Chinese were primarily engaged in trade and commerce and industrial pursuits, and thus were dependent mainly on internal trade; those in the outer islands were engaged in agriculture, trade and industry.[34]

In summary, the sketchy statistics indicate that immigration of foreign Asians into Indonesia even in the pre-Great Depression era, when tens of thousands arrived per year, had little effect on the population growth of Indonesia. The foreign Asian population in Indonesia formed only 2 per cent of its total population between 1905 and 1930. Since 1930 migration has played a role of decreasing importance. However limited demographically the effect of the Asian immigrant stock in Indonesia may be, its economic influence upon the natives may well be disproportionately large. The Asian immigrants in Indonesia, like those in many other immigration countries of the Far East, have formed a middle class who, for the purpose of achieving their own economic interests, have often stimulated native production for the markets. This includes not only the cultivation of market crops by the natives, their collection of jungle produce, or their manufacturing of art crafts, but also their wage-earning on the estates. The natives have also been persuaded by the immigrant traders to consume market goods. As a result, a growing number of natives have become used to a money economy and thus have facilitated the continued economic development of the country.[35]

D. Ceylon

1. *Major immigrant stocks in Ceylon*

Ceylon is an important immigration country. It lies very close to the Indian subcontinent, being separated on the northwest only by the Gulf of Manaar and Palk strait. Its immigrants have been preponderantly Indians. From the second decade of the nineteenth century there was a growing stream of Indian labourers coming to Ceylon to work on the plantations, first for the cultivation of coffee and later, from 1880 onwards, for that of tea and rubber. Immigration was said to have reached its peak during the last third of the nineteenth century when tens of thousands came each year to stay in Ceylon and many times more arrived to work for a short period.[36] It was estimated that the number of immigrants living in Ceylon in the indicated years, who had come to that country during the preceding ten years, was 240,000 in 1880, 100,000 in 1890, 340,000 in 1900, 180,000 in 1910, 90,000 in 1920 and 150,000 in 1930. During 1931-1940 there was a net emigration from Ceylon of 100,000 persons, while during 1941-1945 there was a net immigration of 90,000 persons, and for the following four years, a net immigration of 130,000 persons.[37] Since the migrants to and from Ceylon have been preponderantly Indians throughout modern times, these figures refer essentially to Indians.

2. *Demographic importance and characteristics of immigration into Ceylon*

During the seventy-nine years from the beginning of 1871 to the end of 1949, the population of Ceylon increased from 2.4 million to 7.4 million, an increase of 5 million. Of this increase three-fourths, or about 3.8 million, represented the natural increase during that period, while the remaining one-fourth, or 1.2 million, represented net immigration. See the following table:

Population, natural increase and net migration of Ceylon, 1871-1949
(in thousands)

Years	Mean population of the period[a]	Natural increase (Births minus deaths)	Migration difference[b]
1871-1949		3,797	1,220
1871-1880	2,585	120	240
1881-1890	2,888	140	100
1891-1900	3,295	230	340
1901-1910	3,839	360	180
1911-1920	4,311	320	90
1921-1930	4,920	660	150
1931-1940	5,628	750	−100
1941-1945	6,189	530	90
1946	6,630[c]	121	57
1947	6,808[c]	173	22
1948	7,003[c]	194	20
1949	7,217[c]	199	31

[a] The figure for each of the decades from 1871 to 1930 is the mean of the census figures adjusted for the beginning and end of the decennial period; the average for 1931-1940 and 1941-1945 is based on the estimated mid-year population for each year of the decennium and quinquennium, respectively.

[b] The figures in this column (except those after 1930, which are the actual migration differences) are secured by subtracting natural increase from total change.

[c] Estimated population as of the beginning of the year.

Sources: Table adapted from Taeuber, "Ceylon as a demographic laboratory" (1949), p. 300, with supplementary data for the years 1946 through 1949 from Department of Census and Statistics of Ceylon, *Statistical Abstract of Ceylon*, 1950, p. 65.

[33] *Ibid.*, Vol. III, pp. 11, 133-134.

[34] Cator, *The Economic Position of the Chinese in the Netherlands Indies* (1936), pp. 103, 104, 131.

[35] For more details, see, for example, United Nations, *Economy Survey of Asia and the Far East*, 1950, pp. 54-65; Cator, *The Economic Position of the Chinese in the Netherlands Indies* (1936), pp. 68-82, 170-180; Purcell, *The Chinese in Southeast Asia* (1951), chapters XLII, XLIV and XLVII.

[36] Department of Census and Statistics of Ceylon, *The 1946 Census of Ceylon*, Vol. I, Part I, p. 59.

[37] Taeuber, "Ceylon as a demographic laboratory" (1949), p. 300; Department of Census and Statistics of Ceylon, *Statistical Abstract of Ceylon, 1950*, p. 65.

From the time series on migration difference and that on natural increase in the preceding table, it is clear that the importance of migration as a source of population change fluctuated throughout the period. For the thirty years prior to 1900, immigration contributed a relatively larger share than natural increase to the population change. During the next thirty years ending in 1930, immigration accounted for less than one-fourth of the population change. In the following decade 1931-1940, there was an actual net emigration which caused a loss of 100,000 persons from the decennial natural increase of 750,000. During the five years 1941-1945, migration contributed one-seventh to the population increase. In the four post-war years 1946-1949, migration accounted for nearly one-sixth of the population change. Over the seventy-nine years under observation, migration generally played a role of diminishing importance, and is now only a minor factor in the population change of Ceylon.

The demographic characteristics of the Indian immigrant population are discussed below. Of Ceylon's 6.7 million population in 1946, 4.6 million or seven-tenths of the total are indigenous Sinhalese, 1.5 million or nearly one-quarter of the total are Tamils of Indian origin, 0.4 million or a little over one-twentieth of the total are Moors, leaving a small number of others, numbering about 113,000 or less than one-fiftieth.[38]

Of the 1.9 million Tamils and Moors, nearly 1.2 million are Ceylonese descendants of the early immigrants and thus are not connected with recent immigration from abroad. The remaining 703,000 Indian Tamils and Moors are recent immigrants and their descendants, who represent the net balance of migration and natural increase for both peoples.

The Indian Tamils and their descendants, who numbered 666,000 in 1946, account for the bulk of the immigrants in Ceylon. This entire element lives on the estates, mostly in the central and southern parts of Ceylon, and notably in the Central, Uva and Sabaragamuwa provinces. In these provinces, tea, rice, rubber and coconuts are widely cultivated. Tea is grown on the mountain slopes, while the last three items are grown in the lowlands. The estate population of Ceylon, numbering 851,000 in 1946, included the entire population of Indian Tamils, who constituted nearly 80 per cent of the total. In 1946, the sex ratio (females per 1,000 males) for Indian Tamils was 814 as compared with 885 for the total population of Ceylon. This nearly normal sex ratio is attributed to the fact that the migration is that of whole families rather than merely of adult males in quest of employment.[39] Moreover, employment of labourers on the estates is on a familial basis. The use of women and children is generally extensive, more so on tea than on rubber plantations.

Statistics on age for Indian Tamils are not available. But age data for the estate population as a whole are available in three age-groups for 1946. The percentage of the estate population under 15 was 39, that for those aged 15-49, 53, and that for those aged 50 and over, 8. The corresponding figures for the total population of Ceylon were 37, 52, and 11 per cent respectively. The estate population is seen to be composed of slightly more children and persons "in the prime of life", and fewer old people, than the general population.[40]

The minor immigrant group of Indian Moors, who numbered 37,000 in 1946, mainly consisted of traders. Over half of them were found in the Western Province where the capital city of Colombo is located. The highly immigrant character of this ethnic group is revealed by the fact that they had a sex ratio of only 156 females per 1,000 males and that their working-age group comprises nearly 77 per cent of their total population, while the two remaining age-groups, 0-14 and 50 and above, were 14 and 9 per cent respectively.[41]

In 1939, certain government proposals were made for the control of immigration into Ceylon in order to curb the unemployment of natives. This led the Indian Government to prohibit all Indians from leaving India for Ceylon for purposes of unskilled work, unless granted permission by special order. The ban on Indian immigration to Ceylon was, however, subsequently modified to enable those who were in employment in Ceylon on 1 September 1942, to re-enter Ceylon after a visit to India. The Immigrants and Emigrants Act of 1948 and the regulations included thereunder, which came into force on 1 November, 1949, stipulated that (1) the entry into Ceylon of non-citizens of that country was to be limited to those who had already been in Ceylon and were in possession of specific certificates such as passports, emergency certificates, or identity certificates, endorsed by proper Ceylon authorities as valid for returning to Ceylon; (2) Indian estate labourers were allowed, until further notice, to return to Ceylon under the provision that they carry with them the identity certificates issued to them on the estates before they left Ceylon, and (3) other non-citizens must have either a valid national passport with a visa or an

[38] Department of Census and Statistics of Ceylon, *The 1946 Census of Ceylon*, Vol. I, Part I, pp. 150-163.

[39] *Ibid.*, p. 239.
[40] *Ibid.*, p. 240.
[41] *Ibid.*, pp. 147, 160.

endorsement by certain authorized Ceylon officers or a valid permanent or temporary residence permit.

The immigration of Indian labourers into Ceylon has practically ceased since 1939. Between 1941 and 1945, there was a net immigration to Ceylon amounting to about 90,000, and between 1946 and 1949, 130,000. Ceylon statistics of arrivals and departures of aliens, of whom the Indians formed the large majority, indicate that during the five years from 1946 to 1950 there was a decreasing trend in immigration as well as in emigration from over 200,000 persons a year to over 100,000 persons a year.[42] These figures represent mainly the movements of former Indian immigrants in Ceylon travelling back and forth to India. Both the Indian Tamils and Indian Moors generally return to India upon retirement, although they are technically domiciled in Ceylon after a certain length of time for purposes of political franchise.

E. Burma

1. *Major immigrant stocks in Burma*

The important immigrant stocks in Burma are the Indians and the Chinese in that order. Ever since the 1870's streams of immigration carried large numbers of Indian cultivators, harvesters and labourers to Burma for work on the land and for employment in industries and domestic services in towns. They came mainly from south-eastern and north-eastern India, notably from Madras and Bengal. Besides the cultivators and labourers, there were also numerous traders and businessmen among the Indian migrants. It is these latter groups who have, in time, come to occupy a predominant position in the commercial life of the country, especially in industry, transport, trade and money-lending.[43]

The Chinese who came to Burma in the first half of the nineteenth century were caravan traders from Yunnan in China. They exchanged Chinese copper and iron vessels, silk, precious stones, gold and silver thread and lace, vermillion, etc., for Burmese cotton, ivory, skins and horns. Later there were also many Chinese labourers coming to the north-eastern part of Burma by land routes from Yunnan in dry seasons. Many of them worked on the land and in the tin, lead and other mines. During the latter part of the nineteenth century a different stream of Chinese immigration gained force. This stream carried many "Maritime Chinese" from the provinces of Fukien and Kwantung in China to Burma by sea to engage in trade activities or to serve as artisans and workers in metal, leather and carpentry.[44] Most of these "Maritime Chinese" lived in the capital city of Rangoon and its vicinity.

Prior to the First World War, the number of Indian immigrants living in Burma amounted to 500,000 while that of the Chinese was 75,000.[45] Unlike the Chinese in other immigration countries of south-eastern Asia, those in Burma were decidedly second to the Indians in the commercial life of that country.

2. *The permanence of immigration*

Most of the Indians tended to be temporary immigrants. A large majority of them left their kinsfolk in India. Those who intended to settle in Burma for some time brought in their families later. Still a large number of the migrants did not return home. During 1907-1927 more than 6.5 million Indians entered Burma, but over 5 million left her shores, leaving about 1.3 million behind in that country.[46] During the ten years between 1928 and 1937, the recorded arrivals of aliens who were mostly Indians amounted to 3,066,000 whereas the recorded departures amounted to 2,926,000. The two-way movement nearly balanced during this period.[47]

The Chinese in Burma, on the other hand, have a tendency to become a settled group. More than the Chinese immigrants in other receiving countries in the Far East, the Chinese in Burma tended to regard that country as their home, and many intermarried with the Burmese.[48]

There has been considerable friction between the Burmese and the Indians, resulting from the economic competition and the different business methods of the two groups. Anti-Indian agitation in Burma has led to occasional riots since 1930. Anti-Chinese riots also broke out in 1931, but despite these incidents the Burmese generally have had a friendly feeling for that ethnic group.

In 1938, a Passport Law was passed, according to which, passports were required of immigrants to Burma, with the exception of those coming by land. Under this exception, a number of Chinese entered the country from Yunnan province. This exemption was abolished two years later. In July 1941, Indian immigration to Burma was restricted by an agreement between the Govern-

[42] International Labour Office: *Year Book of Labour Statistics*, 1949-50. Geneva, 1951, p. 403.
[43] Risley and Gait, *Census of India, 1901*. Calcutta, 1903. Vol. I, Part I, pp. 90-91.
[44] Purcell, *The Chinese in southeast Asia* (1951), pp. 59-91.
[45] Based on birthplace statistics. Government of India, *Census of India*, 1911. Vol. IX, Part I, pp. 79-81.
[46] Mukerjee, *Le migrazioni asiatiche* (1936), pp. 91-93.
[47] Christian, *Modern Burma* (1942), Appendix VIII.
[48] Purcell. *The Chinese in southeast Asia* (1951), p. 92.

ments of India and Burma in an effort to remove undue economic competition with the Burmese by Indian immigrants who could not identify themselves with the interests of Burma.

At the beginning of the Second World War in 1939, some 130,000 Chinese were employed to construct the Burma Road, but less than half of this number presumably remained in Burma.[49] In 1941 and 1942, about 400,000 refugees, mostly Indians, were evacuated from Burma to India.[50] At that time it appeared that many of the Chinese population settled in Burma had also made their way out of the country.[51]

Burma was liberated in May, 1945, and became a republic on 4 January 1948. During the post-war period, internal social unrest has hindered the country's return to its normal prosperity and contributed to a decreasing influx of immigrants. However, the major discouragement of immigration is the legal restrictions.

Following the end of the Second World War, the general immigration of Chinese was suspended, but an immigration quota of 2,000 per year was provided solely for the re-entry of former Chinese residents in Burma. The entry of Indians into Burma during the post-war years has been governed by administrative arrangements between the two governments by which only evacuees who were other than unskilled labourers were permitted to return to Burma from India. From the time of the liberation of Burma to 1 April, 1947, about 112,000 Indians left Burma, whereas 108,000 entered the country. The latter were mostly Indian evacuees re-entering the country. The Burma Immigration (Emergency Provisions) Act which came into effect on 14 June 1947 affects primarily Indian immigration. The Act prohibits the entry of any person into Burma without either a passport duly visaed by, or on behalf of, the Government of Burma, or an immigration permit issued by the Controller of Immigration.

Indian immigration during the post-war years is of little significance. Less than 3,000 new immigrants were sponsored by the Government of India as compared with the 23,000 per year net immigration of Indians during the period 1933-1937.[52]

[49] Lasker, *Asia on the move* (1945), p. 80.

[50] *International Labour Review*, Vol. XLV, No. 2 (1942), pp. 195-198; Vol. XLVI, No. 6 (1942), pp. 757-758; Vol. XLVII, No. 2 (1943), pp. 252-253; Vol. XLVII, No. 5 (1943), pp. 667-668.

[51] Purcell, *The Chinese in southeast Asia* (1951), p. 57.

[52] *International Labour Review*, Vol. LVI, No. 5 (1947), pp. 472-473.

3. *Demographic importance of immigration into Burma*

The immigrant stocks of Indians and Chinese in Burma[53] numbered 1,018,000 and 194,000 respectively in 1931, representing together a little over 8 per cent of the total population of the country. The number of Indians dropped to 887,000 in 1941 and to 700,000 in 1947 due to a large net return migration especially during the years of the Second World War. The number of Chinese[54] was 178,000 in 1941, or 16,000 fewer than in 1931. Accordingly, the proportion of the Indians and Chinese to the total population of Burma dropped to a little over 6 per cent in 1941. The drop in numbers for the Chinese was perhaps due to their net exodus and also to the successful assimilation of Chinese immigrant stock into the native population, so that they were no longer counted as foreigners. The latter accounts for the fact that an unknown number of female offspring of mixed Chinese and Burmese origin was not classified as Chinese in the census reports. It had been the custom for quite some time for the half-Chinese females to assume the race of their mother and for the half-Chinese males to assume that of their father. These half-Chinese females were counted as Burmese and were included in the Burmese population at the censuses.

Both Indians and Chinese were concentrated in the urban areas of Burma. It was estimated that these elements formed about one-third of the 1.5 million pre-war population in all towns.[55]

As the number of Indians in Burma diminished after the Second World War, that of the Chinese seems also to have had little growth. It appears that the number of Indians and Chinese civilians in that country in 1947 could not be greater, if at all, than 1 million. If so, it would amount to about 5 per cent of the estimated total population which numbered some 18 million in 1947. Immigration into Burma has come to be of little importance to the population growth of the country.

F. THAILAND

1. *Major immigrant stocks in Thailand*

In Thailand the immigrant foreign ethnic groups of numerical importance are the Chinese,

[53] Purcell, *The Chinese in southeast Asia* (1951), pp. 55, 691; Lasker, *Asia on the move* (1945), p. 80.

[54] Post-war estimates on Chinese in Burma are not comparable with these census figures. It should be noted that the 1931 and 1941 census figures on Chinese were based on the number of persons who gave Chinese as their principle spoken language, whereby the assimilated persons of Chinese stock were excluded.

The estimated 360,000 or so Chinese in Burma in 1947 by Chinese authorities (see *China Handbook*, 1951, pp. 29-30) presumably included the assimilated persons.

[55] Furnivall, *Colonial policy and practice: A comparative study of Burma and Netherlands India* (1948), p. 118.

Indians, and the people from Vietnam, Laos and Cambodia.[56] Of these three groups the Chinese constitute the large majority. According to the 1937 census of Thailand, there were 623,000 alien nationals in the country, representing 4 per cent of the total population, of whom 524,000, or 84 per cent, were Chinese. The number of immigrant Indians was about 56,000 and that of the immigrants from Vietnam, Laos and Cambodia, 39,000.[57] The Indians of Thailand are artisans, merchants, and contract labourers, but mostly the former. Estimates for the number of Indians are usually higher for the earlier years, as, for example, 100,000 in 1934.[58] A tendency to a decline in the number of immigrant Indians has appeared since the 1930's. The immigrants from Vietnam, Laos and Cambodia were presumably agrarians from Tonkin, Annam and Cochin-China, where the growing surplus agricultural population has encouraged migration.

Relatively abundant literature has been published on the largest foreign ethnic group, the Chinese, and this permits a discussion of Chinese immigration in some detail. The numbers of immigrant Chinese living in Thailand on each census day were returned as 260,000 in 1919, 445,000 in 1929, and 524,000 in 1937, representing roughly 3 to 4 per cent of the total population for these years. Since the census figures for the immigrant Chinese take no account of those Chinese immigrants in Thailand who died before the current census date, a comparison of the numbers of Chinese immigrants surviving at two census dates, assuming that the census figures are accurate, would give a minimum net immigrational change during the intercensal period. It thus follows on the face of it that the minimum net immigration of Chinese into Thailand during the intercensal period of 1919 to 1929 appears to be 185,000, or an average minimum net immigration of 17,000 per year, and that during 1929 to 1937 it was 79,000, or about 10,000 per year. However, it is known that since the middle 1930's there was considerable illicit immigration of Chinese into Thailand.[59] It is probable that many of the clandestine immigrants would have escaped enumeration at the 1937 census. If so, the figures given above for minimum net immigration of Chinese during 1929-1937 tend to be understatements. Hence, comparisons of the size of Chinese immigration for these two intercensal periods could not be made without involving a large margin of error. Direct migration statistics for Thailand are not complete because no records were kept of movements across the northern, eastern, and part of the southern frontiers.[60] The record of Chinese arrivals and departures at the port of Bangkok, and similar statistics for all races crossing the southern border by railway, showed a surplus of 114,000[61] arrivals during 1929-1937. The minimum net immigration of Chinese during the same period based on the census-statistics for 1929 and 1937 was, however, 79,000.[62]

In 1937-1941 there was a recorded net immigration of 35,000 Chinese at the port of Bangkok and a net influx of 66,000 persons, including the Chinese, across the southern border from Malaya. It appears that during this period the tendency of Chinese immigration was to increase, probably because of the extension of Japanese military operations in China since 1937 which had encouraged the out-movement of Chinese to take refuge in the neighbouring countries.

For the Second World War period 1941-1945, data on Chinese immigration are available only for the port of Bangkok, but they indicate that the immigration of Chinese was numerically unimportant.

In the post-war years revival of large-scale Chinese immigration has not been possible because of the severe quota restrictions.

Not all Chinese who came to Thailand were from China. Many Malaya-born second-generation Chinese came in across the southern and western borders of Thailand after the early 1920's as pioneers, seeking land for the planting of rubber or for fruit gardening by clearing jungle patches along the railways of the peninsula. They gradually became successful agriculturists. The 1937 census gave data on the occupational distribution of the population but did not specify that of the immigrant Chinese. It appears that persons engaged in trade and commerce,

[56] The number of Chinese, Indians and people from Vietnam, Laos and Cambodia returned in the census covered only the immigrants, because all their Thailand-born descendants are Thai, according to the Thai law. It should be noted that for this reason the figures for these peoples in Thailand cannot be compared with those in other countries of this region, including the major immigration countries of Malaya, Ceylon and Indonesia, for in the latter countries these categories include both the immigrants and their native-born descendants.

[57] Those who were classified in the 1937 census of Thailand as of English and French origin are apparently the Indians and the people of Vietnam, Laos and Cambodia, because these peoples were known to be numerous in Thailand and because there were only 2,000 persons who belonged to the white race and could actually be the English and French people.

[58] Thompson; *Thailand: The New Siam.* New York, 1941, pp. 139-140. Cited by Lasker, *op. cit.*, p. 60.

[59] One of the main reasons for the considerable illicit immigration of Chinese into Thailand was to avoid the payment of fees for certificates of residence and for identification papers under the Immigration Amendment Act of 1931/32.

[60] Landon, *The Chinese in Thailand,* London: Oxford University Press, 1941, pp. 119, 199.

[61] Thailand. Central Service of Statistics. *Statistical Year Book, No. 21,* 1939/40 to 1944, pp. 88-91.

[62] This figure ignores the mortality of Chinese immigrants in Thailand during 1929-1937.

manufacturing and machine-work industries, mining and various skilled crafts and trades were preponderantly Chinese. Except in agriculture, Chinese immigrants also served as labourers. In general, they formed the middle class of the country.

2. *The permanence of immigration*

Prior to the second decade of the present century Chinese immigrants to Thailand were practically all men. A large number of them were temporary immigrants staying in Thailand for from several months to several years in order to save some money, after which they would return to China. Those who settled down in the country usually married Thai women, established Thai homes, and brought up their children as Thai. Thus, early Chinese immigrants who settled in Thailand were largely assimilated to Thai and their descendants were absorbed into the Thai population. After 1910, however, the number of Chinese immigrant women increased. These women came either with their husbands or to marry previous Chinese immigrants. They helped to establish and preserve the Chinese families, and made their children culturally and ethnically unassimilable. As a result, many of the Chinese immigrant families established in Thailand during the recent decades for permanent settlement there tended to become an unassimilable group. As such trends persisted, the Thai Government adopted measures to curb the Chinese immigration. The first immigration legislation was the Act of 1927/1928, which stipulated certain general requirements of the immigrants, including the possession of passports or certificates of nationality, and good health. The Minister of the Interior was, however, left to decide when and where to adopt the more specific immigration measures, which were: the minimum amount of money the immigrant, if not under fifteen years of age and accompanied by parents, must have in his possession, and the maximum number of immigrants of any nationality or of any category of such aliens that might be admitted each year. The Ministerial regulations of 1927/28, 1928/29, in pursuance of this Immigration Act, stipulated that the Immigration Officer is authorized to issue identification papers to immigrants who do not have passports, but who have met certain requirements.

The Immigration Amendment Act of 1931/32 stipulated that a fee of 10 baht should be charged for an identification paper and a fee of 30 baht for a certificate of residence. When it was found that the fees were not high enough to retard immigration, the fee for a certificate of residence was first raised to 100 baht, and then to 200 baht. Subsequent amendments also empowered the immigration authorities to prohibit the entry of individuals twelve years of age or more who could not read and write Siamese or their own language. These amendments were intended to check the influx of Chinese peasants and particularly women, who were mostly illiterate. These measures proved partially effective, but illicit immigration tended to increase. To curb this, the Government promulgated the Registration of Aliens Act of 1936/37. No charge was made for the certificate of registration, but the fine for failure to produce it on demand was set at 200 baht. In 1947, a a quota system for immigrants was established, the quota for Chinese being 10,000 a year. Subsequently this quota was reduced to 400 a year. These regulations tend to prevent the number of permanent Chinese immigrants in Thailand from growing by stifling their source of replenishment.

3. *Demographic importance of immigration into Thailand*

The major immigrant population of Thailand, that of Chinese (excluding Thailand-born persons of immigrant parentage), numbered, as shown previously, about a quarter million in 1919, nearly half a million in 1929 and slightly over half a million in 1937. These figures refer to net immigrants from China who were living in Thailand on the various census dates. They do not count therefore, those Chinese immigrants who died after entering Thailand. Probably they also do not count many illicit Chinese immigrants since the middle of the 1930's. These limitations of the data, together with the lack of birth and death statistics of the Chinese immigrants and the fact that the number of Thailand-born Chinese could not be ascertained from the census data because they were counted as Thai citizens according to Thai law, necessarily restrict the following discussions of factors of population change to net immigration alone.

During the period of interwar years for which census data are available, Chinese immigrants living in Thailand constituted relatively a stable proportion at about 3 or 4 per cent of the total population of the country, which total population grew from 9 million in 1919 to 14 million in 1937. The maintenance of a stable proportion of Chinese immigrants over these two decades was due to the effect of net immigration, without which the relative size of Chinese immigrant population in Thailand would have been bound to decline, even if there were no deaths among them, because the growth of the Thai and other ethnic populations would have reduced the relative proportion of Chinese immigrants.

During 1937-1941 there was a recorded net immigration of 35,000 Chinese at the port of

Bangkok and a net influx of 66,000 people, including the Chinese, across the southern border from Malaya. If these figures were accurate, and if it could be assumed that the latter immigrant group were all Chinese, the total number of Chinese immigrants living in Thailand at the end of 1941 could not have been higher than 624,000 (i.e., total Chinese immigrants living in 1937 plus the net immigration of Chinese during 1937-1941), because the Chinese immigrants would have to be subject to depletion by mortality between 1937 and 1941. Even at 624,000, the number of Chinese immigrants living in Thailand in 1941 would constitute only 4 per cent of the estimated total population of the country for the same year.[63]

Although the relative proportion of the Chinese immigrants in Thailand to the total population of the country remained more or less the same during the interwar years, the proportion of Chinese female immigrants to the total Chinese immigrant population rapidly increased. In other words, the female component of the Chinese immigrant population in Thailand was growing larger and larger. In the eleven years between 1919 and 1929, the total enumerated immigrant Chinese population increased by 71 per cent, the Chinese male population increased by 53 per cent and the Chinese female population by 140 per cent. In the eight years between 1929 and 1937 the enumerated increases in the corresponding categories of Chinese immigrant population were 18, 7 and 43 per cent respectively. This indicates a relatively greater rate of influx of Chinese females than males during the periods under review, which resulted in an improvement of the sex ratio among the enumerated immigrant Chinese population from 266 females per 1,000 males in 1919, to 419 in 1929 and 562 in 1937.[64]

Chinese immigration during the Second World War was numerically insignificant. In the postwar years Chinese immigration must necessarily have been small because of the severe quota restrictions. If the present restrictions continue, natural increase will from now on be the major factor affecting the size of the Chinese ethnic stock in Thailand, in so far as that stock does not physically assimilate through interethnic marriages. From the legal point of view, however, the Chinese in Thailand will necessarily diminish as time goes on, since Chinese descendants born in that country will no longer be Chinese citizens and Chinese immigrants remaining in that country will be depleted by deaths by an amount far larger than could be offset by the quota immigrants. In view of these facts and barring future changes in restrictions or a revival of large illicit immigration, the proportion of Chinese immigrants to the total population of Thailand will inevitably decline.

G. Vietnam, Laos and Cambodia

1. *Major immigrant stocks in Vietnam, Laos and Cambodia*

In Vietnam, Laos and Cambodia there were about 432,000 aliens in 1930, forming 2 per cent of the total population of the country. Of these, 385,000 were Chinese, 35,000 French, and 10,000 Indians and Thai (an indigenous group), forming 90, 8 and 2 per cent of the alien population respectively.[65] It should be noted that the said number of Chinese refers only to those members of that ethnic group who have not been claimed as citizens of Vietnam, Laos and Cambodia, that is, it indicates the legal, but not the entire ethnic, Chinese population. The Chinese half-breeds with a Chinese father and a native mother have been treated traditionally as natives ever since 1829.[66] The 1937 census showed a total of 326,000 legal Chinese, i.e., excluding the Chinese half-breeds, who, according to Purcell's estimate, numbered about 141,000 in 1940.[67] If these figures are sufficiently accurate, then the number of ethnic Chinese in that country around 1940 would come to about half a million.[67] In a country where many basic statistics are lacking, this estimate furnished by Purcell is now taken up as a link and is put together with estimates for other years. A series was thus made, which provides estimates of ethnic Chinese from 293,000 for 1921 to 418,000 for 1931, 500,000 for 1940 and 800,000 to 850,000 for 1947-1950; of the last estimate probably 600,000 were legal Chinese.[68] The precise number of the ethnic Chinese in Vietnam, Laos and Cambodia for the years for which estimates are given cannot be ascertained without the basic data from census or registration sources. Hence reliance has

[63] The estimated total population for 1941 was 15,574,000. United Nations, *Demographic Yearbook, 1948*, p. 103.

[64] The basic census data are given in absolute numbers as follows:

Enumerated Chinese immigrants living in Thailand on the census day of 1919, 1929, and 1937 (in thousands)

	Number			Increase since previous census year		
	Total	*Males*	*Females*	*Total*	*Males*	*Females*
1919	260	205	55	—	—	—
1929	445	314	132	185	108[a]	77
1937	524	336	189	79	22	57

[a] The discrepancy is due to rounding.

Source: Landon, *The Chinese in Thailand*, London, Oxford University Press, 1941, pp. 22, 204.

[65] International Labour Office, *World Statistics of Aliens* (1936), pp. 114-125.

[66] Purcell, *The Chinese in southeast Asia* (1951), pp. 103, 221-222.

[67] *Ibid.*, p. 209.

[68] *Ibid.*, p. 209, 215-216; *Chinese Handbook 1951*, pp. 29-30.

to be placed more or less on the economic or other events that occurred in that country and on the recorded migration statistics which shed possible light on the general situation of the ethnic Chinese there. It is believed that the moderate expansion of trade and land cultivation and the construction of railways and roads in Vietnam, Laos and Cambodia in the 1920's caused fairly rapid increases in the Chinese population there. On the other hand, the trade depression which was severest in the early 1930's is thought to have affected the Chinese population adversely, and this probably resulted in some net emigration of the Chinese in those years.[69] These economic developments seem to corroborate the implied trend of growth in the series of estimated ethnic Chinese population during the interwar period. The available migration statistics also support this assessment. The net arrivals of Chinese immigrants averaged 25,000 a year in 1925-1929, but during the business depressions of 1930-1934 there was a small net departure annually. Then the gradual revival of trade and business conditions, followed by the outbreak of the Sino-Japanese war, produced a net immigration of Chinese which averaged 16,000 a year during 1935 and 1936 and 43,000 a year during 1937-1939. During 1940 and 1941, however, there was a net departure of nearly 10,000 a year, which reflected probably the call by the Chinese Government to the Chinese abroad to return for war-work, and the moving of the Japanese war-front to the territory of Vietnam, Laos and Cambodia.[70]

From the years of the Second World War onward, information on both immigration and the estimated ethnic Chinese population in Vietnam, Laos and Cambodia is extremely sketchy. From 1942 to 1945, few international migratory movements involving Vietnam, Laos and Cambodia were recorded. In the post-war period 1946-1948, there was, however, an average net influx of nearly 20,000 persons a year. The bulk of these were presumably Chinese repatriates.[70]

As for the ethnic structure of Vietnam, Laos and Cambodia in recent years, it is perhaps sufficient to say that an estimated 2 per cent of the 27 million estimated total population in that country in 1949 were aliens, mostly legal Chinese.[71] The French civilians in 1949 in that country numbered less than 50,000.[71]

As to the legislation of this country on international migration, the early immigration decrees of 1906 and 1940 were not particularly restrictive. At the close of the Second World War, the entry of Chinese was suspended until the end of 1946, when a new regulation permitted the entry of those Chinese who were (1) former residents of Vietnam, Laos and Cambodia but had returned to China in or after 1939, and (2) former residents of Vietnam, Laos and Cambodia who had returned to China in 1937 for the purpose of war-work and had certificates testifying thereto.

2. *Demographic importance of immigration into Vietnam, Laos and Cambodia*

The alien population in Vietnam, Laos and Cambodia formed only 2 per cent of the total population of that country between 1930 and 1950. Immigration during these two decades thus had little effect on the size of the population. The bulk of the aliens are Chinese, who have been concentrated largely in Cochin-China and Cambodia. They have settled down as an assimilated minority. A good share of the economic activities of the country in recent decades has been in the hands of the immigrant groups, whose influence has greatly surpassed the small proportion which they have represented in the total population. The Chinese were chiefly merchants handling various trades, with some mill-owners, market gardeners, and skilled workers in modern factories.[72] The French were a class of social *élite* until their exodus in recent years. They had helped to achieve certain economic developments, including mining, plantations, and railway transportation.[73]

H. British Borneo and the Philippines

For British Borneo, the available data relevant to immigrant ethnic groups are very limited. The population of North Borneo in 1931 was 270,000 of which 65,000 or about one-fourth of the total were immigrant stock. The majority of this group were Chinese, constituting three-quarters of the alien stock and about 18 per cent of the total population. The other alien ethnic groups such as the immigrant Indonesians, Filipinos, Malays and others were few in numbers. By 1947, the total population of North Borneo had increased to 331,000, of which an estimated 70,000 were Chinese, or about 20 per cent of the total. People engaged in paid employment in the country were predominantly of immigrant stock until the

[69] Purcell, *The Chinese in southeast Asia* (1951), pp. 215-217.

[70] Figures taken from International Labour Office: *Year Book of Labour Statistics 1945-46*, p. 238; 1947-48, p. 282; Service de la Statistique Générale: *Annuaire statistique de l'Indochine 1943-46*, p. 32, 1947-48, pp. 29-30.

[71] Figures taken from Steinberg (ed.), *The Statesman's Year-Book 1950*, p. 1034. Refer also to Purcell, *The Chinese in southeast Asia* (1951), p. 209.

[72] Except in the mines in which the law does not permit them to participate. *Ibid.*, pp. 210-219; Gourou, *L'utilisation du sol en Indochine française* (1940), pp. 7, 9, 426-428.

[73] Purcell, *op. cit.*, pp. 218-219; Lartilleux, *Géographie universelle des transports, géographie des chemins de fer français*, Vol. IV, Paris 1950, pp. 89-162.

post-war years, when in the larger establishments native labour began to exceed imported labour in numbers.[74]

In Sarawak the population was 546,000 in 1947; of these the 396,000 indigenous people represented over 70 per cent. Of the remaining 150,000 non-indigenous people, over 95 per cent were Chinese.[75]

In both North Borneo and Sarawak immigration has been an important factor in the population growth. Because both areas have had a small population base, the immigrant stocks, though small in absolute terms, have formed a considerable proportion of the total population. Intermarriages between Chinese men and native women have occurred in both areas, especially in the rural districts of Sarawak. The progeny of these mixed unions in Sarawak are usually regarded as Chinese. Natural increase and immigration have kept the Chinese population increasing in both areas.[76]

In the Philippines, the importance of Asian, and particularly Chinese, immigration is essentially a historical matter which took place between the sixteenth and nineteenth centuries. Many of the descendants of early Chinese immigrants were assimilated to the native population. As to recent decades, the number of aliens in that country has been small, totalling about 173,000 in 1930, and forming a little over 1 per cent of the total population. Of these 173,000 aliens, 111,000, or 64 per cent, were Chinese, 20,000, or 12 per cent, were Japanese, and the remainder were others, including Americans. In 1939, according to the census returns for the two largest islands, Luzon and Mindanao, the foreign population amounted to 167,000, including 117,000 Chinese, 29,000 Japanese and 9,000 Americans (exclusive of military and naval personnel and their families).[77] At the end of 1947 the number of Chinese in the Philippines was officially estimated by the Bureau of Immigration of the Philippines at 101,000, or about half a per cent of the total population of that year.[78]

The Chinese in the Philippines are primarily tradesmen, store-keepers and peddlers, and have to a great extent been assimilated in the ethnic groups among whom they reside. Many of them are married to native women and have adopted the Catholic religion.

The inward and outward movements in the Philippines have not been large. In 1935-1940 there was an average net inward movement of 4,500 Chinese, 1,800 Americans, and less than 200 Japanese per year. In the post-war years 1946-1949, there was an average net immigration of 2,700 Americans per year, but there was a small net emigration of Chinese until 1949, when a net influx of about 10,000 was observed. The Japanese were repatriated from the Philippines during the early post-war years.

Over the years, the trend of Asian immigration to the Philippines has been, on the whole, decreasing. This has been due to severe legal restrictions in the case of the Chinese, who were the major element in the immigration of former times. Migration has had a rather limited significance in the population growth of that country.

I. MANCHURIA

1. *Major alien immigrant stocks in Manchuria*

Manchuria is one of the few territories left in the Far Eastern area where lands substantially fertile and rich in mineral resources are available for further agricultural and industrial exploitation. The population density of this territory has been low in comparison with that of North Korea, Japan and the north China plains from which large numbers of immigrants came, especially during the latter part of the interwar years.[79]

The first alien Asians to come to Manchuria were the Koreans, who moved illicitly across the northern border of Korea into the Chientao region of Manchuria during the latter part of the nineteenth century. They were chiefly of the peasant class from the northern parts of Korea, where a series of famines had forced them to abandon their homeland temporarily in order to seek a livelihood in the Chientao region. The agricultural activities of these early immigrants proved fruitful. Land was brought into use, cultivation was more rewarding than in the old country, and a slowly growing stream of immigration followed in spite of the legal prohibition against international migration by both China and Korea. The successful settlement of Korean peasants in Chientao also changed the attitude of the Manchurian authorities from one of restriction to one of welcome in the early 1880's, and

[74] The larger establishments refer to estates, industrial or commercial enterprises, or government organizations, each employing more than twenty labourers. Source: Special communication to the United Nations Secretariat from the Government of British Borneo.

[75] From the same source as that given in footnote [74].

[76] Purcell, *The Chinese in southeast Asia* (1951), pp. 25-26, 146-147.

[77] Krieger, "Races and peoples in the Philippines", in *Far Eastern Quarterly*, Vol. IV, No. 2 (1945), pp. 98-99.

[78] Purcell, *The Chinese in southeast Asia* (1951), pp. 572-573.

[79] Manchuria has an area of 1.3 million square kilometres. It had a density of less than 35 persons per square kilometre in 1940. The population density for Japan proper was 191 in 1940, 110 in Korea, and over 150 per square kilometre in the north China provinces of Shantung and Hopei in 1947.

this almost concurred with the abolition by the Korean Government of the ban on emigration in 1883. After that time the influx of Koreans markedly increased.[80]

The immigration of Koreans into Manchuria prior to the present century proceeded through the initiative of the migrants. The movement was not viewed by the Korean Government with any political interest other than that of relieving the distressed peasants in north Korea. However, this was no longer so when Japan took a keen interest in Manchuria. The expansion of Japanese influence over Manchuria advanced through the Sino-Japanese War of 1895 and the Russo-Japanese War of 1905 to the achievement of complete control during 1931-1945. Following their expansion into Manchuria, the Japanese encouraged the immigration of the Koreans in order to strengthen the Japanese hold and to develop Japanese economic programmes. The number of Koreans in Manchuria increased from probably 300,000[81] *circa* 1910 to some 600,000[82] in the late 1920's, a million[82] in 1937 and nearly 1.5 million[83] in 1940. The great influxes of Koreans occurred largely after 1930.

During the period of Japanese dominance in Manchuria (i.e., 1931-1945), the Koreans in Manchuria occupied an economic and social status which was intermediary between the Japanese, who occupied the highest and best paid positions, and the Chinese, who occupied the lowest and poorest paid positions. The proportion of the economically occupied Koreans engaged in agriculture and forestry was 68 per cent, that in manufacturing industry, commerce, and transportation 10 per cent, and that in government service and the professions, less than 5 per cent.

The second major alien group immigrating into Manchuria was the Japanese. Japanese immigration into Manchuria was encouraged by the Government of Japan for political and economic purposes. In spite of this, the volume of Japanese immigration was not large prior to 1930. Prior to 1910 almost fifteen years after the Sino-Japanese war of 1895, the number of Japanese in Manchuria was only about 20,000.[84] From this number the Japanese population grew steadily to about 150,000 in 1920 and 228,000 in 1930. Since 1930 mass immigration of Japanese has swelled the civilian Japanese population in Manchuria to 1,020,000 in 1940.[85]

The relative importance of the colonization of Manchuria during different periods can be judged by comparing it with the immigration of Japanese to the former Japanese dependencies over the same periods. Between 1920 and 1930 the number of Japanese in Korea, Karafuto, and Taiwan combined increased from 640,000 to 1,040,000, that is, by 400,000 or over 60 per cent, whereas that of Manchuria increased from 150,000 to 228,000, or roughly by 80,000 or less than 50 per cent. However, the ratios of increase for Japanese populations in these places were reversed between 1930 and 1940, when the number of Japanese in the three former Japanese dependencies combined increased by only 350,000, or less than 35 per cent of the 1930 figure, whereas the increase in Manchuria was by 790,000 or nearly 350 per cent. The absolute size of these increases on a per year basis may be taken, within limits, to reflect the volume of Japanese immigration to these places. If so, the mass Japanese movement into Manchuria between 1930 and 1940 was continued on

[80] For several years after 1870, a series of severe famines occurred in northern Korea, as a result of which, many Koreans crossed the Yalu River into Manchuria. This marked the beginning of the infiltration of Korean settlers in areas along the northern bank of the Yalu River. Of these early Korean famine-refugees who entered Manchuria many later returned to Korea. Those who remained in Manchuria were apparently not numerous as evidenced by the fact that in the Yenki district of the Sunkiang area of Manchuria, for example, there were only several thousand Korean settlers by 1875 and in the subsequent years. By 1881, however, the Koreans in Manchuria were a recognized minority group and they were put under the rule of local authorities rather than punished or expelled as originally implied in the Prohibition Order by the Chinese Rulers. This reflected a slackening of the control of alien immigration. After the middle of the 1880's, Koreans were welcome to settle in areas along the northern bank of the Tumen River. By 1894, the number of Korean settlers in the Yenki district amounted to over 20,800 persons. Source: Hsu (editor): *Administrative Documents Relating to the Three Eastern Provinces*, 40 vols. and an appendix of a series of ten sets of maps, 1911 (in Chinese). See Vol. 4, under "Border Affairs", the 4th appendix to Yenki, pp. 1-6, the 7th appendix to Yenki, pp. 10-11; Vol. 7, under "Border Affairs, Suifengting", p. 13; Vol. 21, under "Civil Affairs, Fentien", pp. 48-49; and Vol. 32, under "Educational Affairs, Heilungkiang", p. 1.

[81] In five districts along the northern bank of the Yalu River and one district north of the Tumen River, there were 5,107 households or families of Koreans with 22,260 persons, implying an average of 4.4 persons per household or family. In another district north-west of the Tumen River, there were over 60,000 Korean households. The number of persons in these households was not given. Assuming that the average household or family size for other districts is applicable to those in this district, it would have a Korean population of over 260,000 persons.
Sources: *Ibid.*, same references.

[82] The South Manchuria Railway Company, "Koreans in Manchuria" (1940), pp. 51-54; Office of Population Research, "Manchuria as a demographic frontier" (1945), pp. 263-269.

[83] Excluding Kwantung Leased Territory. The 1940 Census of Manchoukuo.

[84] Japan. Bureau of Statistics, *Résumé statistique de l'Empire du Japon.* 1912, p. 30.

[85] Figures for 1920, 1930, and 1940 for Manchuria including Jehol Province and Kwantung Leased Territory. Data from registration of Japanese population. Source: *Population Bulletin No. 1*, December 1951, p. 25.

a level nearly as high during the Second World War period of 1940-1945.[86]

The Japanese civilian immigrants to Manchuria were a highly selected group, as reflected in their occupational pursuits in that area. These migrants, who came from both the urban and rural areas of Japan, almost invariably took up non-agricultural jobs in Manchuria, including public service, professional pursuits, industry, mining, commerce, etc.

The 1940 "Manchoukuo" census offers substantial data on the immigrant populations. According to that census, Manchuria (excluding Jehol Province and Kwantung Leased Territory) had in 1940 a population of 38,650,000, of whom 2,334,000, or 6 per cent of the total, were of alien ethnic stock. The latter consisted of 1,450,000 Koreans, 811,000 Japanese, and 73,000 other aliens (mostly stateless persons), and these represented 62, 35 and 3 per cent of the total aliens respectively.

The majority of the Koreans and Japanese were living in South Manchuria,[87] which accounted for 1,280,000 or 88 per cent of the total Koreans, and 593,000 or 73 per cent of the total Japanese[88] in Manchuria (excluding Jehol Province and Kwantung Leased Territory). The Koreans were concentrated in the provinces of Chientao (616,000), Kirin (168,000), Mutankiang (119,000), Fengtien (116,000) and Tunghua (95,000). The Japanese were found most numerous in the provinces of Fengtien (272,000), Kirin (153,000), Mutankiang (47,000), and Chinchow (36,000). The large majority of the stateless persons, and consequently the other alien group as a whole, were living in North Manchuria, especially in the municipality of Harbin.[89]

[86] For the years after 1940, data on Japanese in Manchuria are not available. However, the post-Second World War repatriation figures imply that the Japanese in Manchuria (including Jehol Province and Kwantung Leased Territory) at the end of the war might have totalled 1,329,000. This implies a 310,000 increase over the number in 1940 according to the registration figure of that year. The repatriation figures on Japanese presumably refer to civilians, for Japanese war prisoners in Manchuria were estimated separately. Source of repatriation figures: *Materials on Population in Recent Years*, by Population Problem Research Institute, Ministry of Welfare, Japan. 5th edition, March 1, 1949, pp. 42-43 (in Japanese).

[87] South Manchuria had about 580,000 square kilometres and covered the provinces of Antung, Ssuping, Fentien, Chinchow, Tunghua, Chientao, Kirin (including the Municipality of Hsinking), Mutankiang, West Hsingan, and South Hsingan. Beal, "The 1940 Census of Manchuria", *The Far Eastern Quarterly*, Vol. IV, No. 3 (1945), pp. 255-262.

[88] "Manchoukuo" had no jurisdiction over Kwantung Leased Territory, and hence the 1940 "Manchoukuo" census did not cover that territory. On the basis of registration data for Manchuria (including Jehol and Kwantung), there were 1,020,000 Japanese in 1940, of whom nearly 800,000 or 80 per cent were living in South Manchuria. There were 198,000 Japanese living in Kwantung in 1940.

2. *Demographic importance and characteristics of immigration of aliens into Manchuria*

Manchuria is an important immigration area for both the immigrant aliens and the Chinese internal migrants themselves. The immigration of both aliens and Chinese has contributed much to the very rapid growth of the total population of Manchuria. During the three decades from *circa* 1910 to 1940 for which data are available, the total population of Manchuria (excluding Jehol Province and Kwantung Leased Territory) which consisted of the Chinese, the Japanese, and the Koreans increased from some 18.3 million to 38.6 million,[90] denoting an increase of over twofold. The Chinese population increased from almost 18 million[91] around 1910 to almost 28 million *circa* 1930[92] and to 36.3 million[93] in 1940, making a twofold increase in three decades.

The Japanese population in Manchuria increased from 20,000 prior to 1910 to 150,465 in 1920, 227,605 in 1930 and to 810,685 in 1940 making a fortyfold increase in slightly over three decades.[94]

The Korean population in Manchuria increased from around 300,000[95] circa 1910 to 600,000[96] in the lates 1920's, one million[96] in 1937 and to

[89] North Manchuria had about 724,000 square kilometres and covered the provinces of Heiho, Sankiang, Tungan, Peian, Lungkiang, Pinkiang (including the Municipality of Harbin), North Hsingan and East Hsingan. *Ibid.*, pp. 255-262.

[90] For the sources of these figures, see table 1 on page 48.

[91] Estimated by Wang Shih-Ta based on the statistical results of the Minchengpu Census of 1909-1911. *The Chinese Year Book 1935-36*. Shanghai: The Commercial Press, Ltd. 1935. p. 119.

[92] Estimated by Wang Shih-Ta based on provincial returns for years *circa* 1930. Wang, "A New Estimate of the Most Recent Population of China"; *The Quarterly Review of Social Sciences*, Vol. VI, No. 2. Cited in Chiao and Chiang, *China's Population and Food Problems*. Shanghai: Chung Hua Book Co., 1937. p. 17 (in Chinese).

[93] Manchoukuo census of 1940.

[94] The geographical coverage of the figure for 1910 was not specified. Figures for 1920 and 1930 refer to Japanese in Manchuria including Jehol Province and Kwantung Leased Territory. The figure for 1940 refers to Japanese in Manchuria excluding Jehol Province and Kwantung Leased Territory. If the registration figure for 1940 (1,020,000), which covered Manchuria including Jehol Province and Kwantung Leased Territory, is used, it implies a fiftyfold increase in slightly over three decades. For the source of these figures, see table 1 on page 48.

[95] Estimated by applying the average size of a Korean household or family in districts reporting numbers of households or families as well as numbers of persons, to one district for which only the number of Korean households was reported. For six districts, 5,107 Korean households or families with 22,260 persons were reported, implying an average of 4.4 persons per household or family. In one district over 60,000 Korean households were returned, but the number of persons left unreported. Hsu (editor): *Administrative Documents Relating to the Three Eastern Provinces*, 40 vols. (For page references, see footnote [80].)

[96] The South Manchuria Railway Company, "Koreans in Manchuria" (1940), pp. 51-54.

1,450,000 in 1940,[97] making a nearly fivefold increase in three decades.

Net immigration and its resultant natural increase of new immigrant stock was the major factor in the much more rapid population increase of the Japanese and Korean stocks than of the Chinese in Manchuria during the over-all period noted above; although the relatively small sizes of the populations of Japanese and Koreans at the beginning of the period lent undue emphasis to their population growth in relative terms over the entire period. The effect of immigration and the resultant natural increase of new immigrant stock can be shown more clearly by short period comparisons. Although comprehensive statistics on births and deaths of Japanese, Koreans and Chinese are not available for most districts, a hypothesis can be made to illustrate the point. Had there been no migration either into or from Manchuria, and if a liberal assumption of a 2 per cent per year natural increase is made for the Japanese population in Manchuria at the beginning of each period, this would give the Japanese population an increase of only 4,380 during 1910-20 or less than 4 per cent of the observed increase of 130,000; of only 32,900 during 1920-30 or 42 per cent of the observed increase of 78,000; and of only 49,900 during 1930-40 or less than 9 per cent of the observed increase of 583,000.[98] If the same assumptions were applied to the Koreans, the Korean population in Manchuria at the beginning of each period would have increased through natural increase by 145,800 during 1910-30 or 48 per cent of the observed increase of 300,000; and by 131,400 during 1930-40 or 15 per cent of the observed increase of 849,000. If the same assumptions were applied to the Chinese in Manchuria, the Chinese population at the beginning of each period would have increased through natural increase by 8,750,000 during 1910-30 or 88 per cent of the observed increase of 10 million; and by 6,130,000 during 1930-40 or 74 per cent of the observed increase of 8,300,000. The larger, and in the case of the Japanese and Koreans the much larger, observed population increases than those implied in the assumed 2 per cent per annum natural increase for the respective populations during the various periods reflect the net immigration of these peoples and the natural increase of new migrant stock during the respective periods. As a result of a more rapidly growing immigration relative to size on the part of the Japanese and Korean populations than of the Chinese during the periods under review, the proportion of the former populations in the total population of Manchuria gained as the years went by. The Japanese stock increased from a mere 1 per 1,000 persons in the total population in 1910 to 8 per 1,000 in 1930 and to 21 per 1,000 in 1940. That of the Koreans increased also from 16 per 1,000 persons in the total population in 1910 to 21 per 1,000 in 1930 and to 38 per 1,000 in 1940. The corresponding figures for the Chinese show relative decreases from 982 per 1,000 in 1910 to 971 per 1,000 in 1930 and to 941 per 1,000 in 1940.

[97] The 1940 "Manchoukuo" census. Figures on Koreans for the years *circa* 1910, the late 1920's exclude those in Jehol Province. Figures for 1937 probably include Jehol Province. Figures for 1940 exclude those in Jehol Province and Kwantung Leased Territory.

[98] This figure is based on the 1940 "Manchoukuo" census data which have a smaller geographical coverage for Manchuria. If the registration data for 1940, which have a complete geographical coverage for Manchuria, are used, the estimated natural increase of Japanese population in Manchuria during 1930-1940 would be about 6 per cent of the observed increase of 792,000.

TABLE 1. POPULATION DISTRIBUTION IN MANCHURIA BY MAJOR ETHNIC GROUPS *circa* 1910, 1920, 1930 AND 1940

Year	(Number in thousands) Total	Chinese	Japanese	Koreans	Percentage Total	Chinese	Japanese	Koreans
1910	18,320	18,000[d]	20[a]	300[f]	100.0	98.2	0.1	1.6
1920	...	...	150[b]	...	...	...	...	...
1930	28,828	28,000[e]	228[b]	600[g]	100.0	97.1	0.8	2.1
1940	38,560	36,300[e]	811[c]	1,449[c]	100.0	94.1	2.1	3.8

Figures on Chinese and Koreans for 1910 and 1930 exclude Jehol Province. Figures on Japanese for 1920 and 1930 include Jehol Province and Kwantung Leased Territory. All figures for 1940 refer to Manchuria excluding Jehol Province and Kwantung Leased Territory.

Sources: [a] Japan. Bureau of Statistics. *Résumé statistique de l'Empire du Japon*, 1912, p. 30. [b] Figures refer to civilians based on Japanese population registration data. United Nations: *Population Bulletin No. 1*, December 1951, table IV, p. 25. [c] The 1940 "Manchoukuo" census. [d] Estimated by Wang, Shih-Ta based on the statistical results of the Minchengpu Census of 1909-1911. *The Chinese Year Book 1935-36;* Shanghai: The Commercial Press, Ltd., 1935, p. 119. [e] Estimated by Wang, Shih-Ta based on provincial returns for years *circa* 1930. Wang, "A New Estimate of the Most Recent Population of China," *The Quarterly Review of Social Sciences*, Vol. VI, No. 2. Cited in Chiao and Chiang, *China's Population and Food Problems.* Shanghai: Chung Hua Book Co., 1937, p. 17 (in Chinese). [f] See footnote [81] on page 46. [g] See footnote [82] on page 46.

TABLE 2. INDEX[99] OF POPULATION INCREASE FOR THE CHINESE, JAPANESE AND KOREANS IN MANCHURIA, VARIOUS PERIODS (BASED ON DATA IN TABLE 1)

Period	*Total*	*Chinese*	*Japanese*	*Koreans*
1910-1940	210	202	4,055[a]	483
1910-1930	157	156	1,140	200
1910-1920	...	...	750	...
1920-1930	...	...	152	...
1930-1940	134	130	356[b]	242

[a] See footnote [94] on page 47.
[b] This figure is based on the 1940 "Manchoukuo" census data which have a smaller geographical coverage for Manchuria. If the registration data for 1940, which have a complete geographical coverage for Manchuria, are used, then this index becomes 447.

TABLE 3. AVERAGE ANNUAL POPULATION INCREASE IN ROUND NUMBERS FOR THE CHINESE, JAPANESE AND KOREANS IN MANCHURIA, VARIOUS PERIODS (BASED ON DATA IN TABLE 1)

Period	*Total*	*Chinese*	*Japanese*	*Koreans*
1910-1940	675,000	600,000	26,000[a]	40,000
1910-1930	530,000	500,000	10,000	20,000
1910-1920	...	...	10,000	...
1920-1930	...	...	8,000	...
1930-1940	970,000	830,000	58,000[b]	65,000 to 85,000[c]

[a] This figure is based on the 1940 "Manchoukuo" census data which have a smaller geographical coverage for Manchuria. If the registration data for 1940, which have a complete geographical coverage for Manchuria, are used, then this average annual population increase becomes 33,000.
[b] This figure is based on the 1940 "Manchoukuo" census data which have a smaller geographical coverage for Manchuria. If the registration data for 1940, which have a complete geographical coverage for Manchuria, are used, then this average annual population increase becomes 80,000.
[c] Figures are estimated on the assumption that this period for the Koreans, i.e., from *circa* 1930 to 1940, may cover ten to thirteen years.
Sources: Same as table 1.

As shown in table 3, the peak of Japanese and Korean immigration must have occurred during the decade 1930-1940 when the growth of Japanese and Korean populations was largest, that is, by about 60,000 and 65,000 to 85,000 persons per year respectively as compared with about 10,000 and 20,000 per year respectively for the preceding two decades 1910-1930.

Direct data on births and deaths and migration for entire ethnic groups in Manchuria are not available. Assessments of fertility and mortality made indirectly on the basis of the sex and age data are necessarily crude. Moreover, measures such as the child-woman ratio are often meaningless for populations severely affected by migration such as those in Manchuria. The sex and age data for Manchuria are available for 1940 for Japanese, Koreans, other aliens who were mostly stateless persons, and for the natives, that is, the Chinese. The proportion of persons in the reproductive group to the total population for each ethnic stock may be taken as an indication of group fertility. It should be noted that such an indication precludes the possibility of comparisons of the specific fertility of the separate ethnic groups. According to the 1940 sex and age data for Manchuria (including Jehol but excluding Kwantung Leased Territory), within each ethnic stock there were more males than females in the age-group 15 to 49 and in the age-groups above that. This being so[100], the fertility of each ethnic group would be determined by the number of women in the reproductive ages rather than by either the number of men, or the combined number of men and women, in those ages. For each ethnic group, the proportion of women in the reproductive ages 15-49 to the total population was found to be higher for the alien stocks in Manchuria[101] than for the Chinese, amounting to 29.2 per cent for the other aliens group, 26.8 per cent for the Japanese, 22.6 per cent for the Koreans and 21.6 per cent for the Chinese. Disregarding the problems of differential fertility for the separate ethnic stocks in Manchuria,[101] the alien populations tended to have higher fertility than the Chinese simply because the former had relatively heavier concentrations in the reproductive ages. On the other hand, the proportion of children under 5 and the aged persons of 60 years old and over in the total population of each ethnic stock was lower for the alien stocks than that for the Chinese. It was 14.0 per cent for the Japanese, 16.9 per cent for the other aliens group, 19.3 per cent for the Koreans and 19.4 per cent for the Chinese. Since persons belonging to these ages normally have higher mortality than those in other age-groups, the age distribution of the alien populations tended to produce a lower mortality for them than for the Chinese. Here again, considerations of possible differential mortality for the various stocks are excluded. Within limits[102], the sex and age distribution of the various stocks in Manchuria[103] in 1940 seems to be in the short run more favourable to natural increase for the alien stocks than for the Chinese. This, in turn, implies a changing population composition which would be more favourable to the alien stocks than to the Chinese.

[99] Population at the beginning of each period is taken as the base (100) for the period concerned. Sources: Same as the preceding table.

[100] The need for interracial marriages does not arise here, since such marriages inevitably result in the displacement of adult single men of the same group as that of the would-be brides. The total number of single adult men who cannot find mates will not be affected by interracial marriages.
[101] Including Jehol but excluding Kwantung.
[102] That is, barring future migration and the effects of possible differential fertility and mortality among the various ethnic stocks in Manchuria.
[103] Including Jehol but excluding Kwantung.

An examination of the sex and age distribution of the various ethnic stocks in Manchuria[105] reveals the effects of migration on the sex and age structure. The sex ratio (females per 1,000 males) was the lowest for the Japanese, being 704. It was 808 for the Chinese and 837 for the Koreans. That for the other aliens group was highest, being 1,012. The fairly low sex ratio for the Chinese was, as has been stated previously, due to the fact that the Chinese people themselves were affected by migration. The nearly equitable sex ratio of the other aliens group was probably due to subsequent migrations of this group after it had moved into Manchuria.[104] [105] The sex ratio for Koreans in Manchuria[105] was also markedly lower than the ratio of 1,006 for the Koreans in Korea in 1944.

The sex ratio for the age-group 0-14 was nearly equal for all the ethnic stocks in Manchuria,[105] being 944 for the Chinese, 948 for the Japanese, 956 for the Koreans and 990 for the other aliens group. This was to be expected because children in this age-group are generally little affected by migration or by the sex-selective forces within the migrant families. The sex ratio for the age-groups 15-39 and 40-59 reflects essentially the effects of migration experienced at different periods. As movements of peoples are usually heavily weighted with young adult males, the sex ratio for those in the age-group 15-39 is ordinarily subject to the influence of recent immigration. The sex ratio in this age-group was 638 for the Japanese, 766 for the Koreans, 816 for the Chinese and 1,145 for the other aliens group. The exception offered by the last ethnic stock may be due to reasons discussed in the footnote below.[104] As for the sex ratio for persons in the age group 40-59, the effects of the aging of earlier immigrants and the sex distribution of the older immigrants in recent years are likely to be the essential factors. For this age group, the sex ratio was 536 for the Japanese, 600 for the Chinese, 766 for the Koreans and 959 for the other aliens group. Similar factors also affect the sex ratio for those aged 60 and over, which was 707 for the Chinese, 799 for the other aliens group, 862 for the Koreans, and 1,220 for the Japanese. The high ratio of the Japanese was probably influenced by the relatively small number of old Japanese persons in Manchuria[105] in 1940.

When comparisons of sex ratios for various age-groups are made within each ethnic stock in Manchuria,[106] it is found that the ratios for the age-group 40-59 are generally lower than those for the age-group 15-39. This is probably due either to the fact that earlier immigrants comprised fewer women, or that fewer women were found among the older immigrants moving into Manchuria in recent years, or to a combination of both causes.

TABLE 4. SEX RATIO (FEMALES PER 1,000 MALES) OF THE VARIOUS ETHNIC GROUPS IN MANCHURIA[106], 1940

Age	*Total*	*Chinese*[a]	*Japanese*	*Koreans*[b]	*Other aliens*
All ages[c]	807	808	704	837	1,012
0-14	945	944	948	956	990
15-37	808	816	638	766	1,145
40-59	604	600	536	766	959
60 and over	713	707	1,220	862	799

[a] The Chinese ethnic group includes Chinese, Mongols, Manchus, Moslems, and aborigines.
[b] Including a small number of former Japanese Empire subjects.
[c] Excluding a small number of persons whose age was not reported.
Source: The 1940 "Manchoukuo" census.

The age structure of the various ethnic groups in Manchuria[106] generally shows concentrations in the adult age-groups, with marked deficiency in the age-group 0-14. Concentrations in the age-group 15-39 were heaviest for the Japanese and the Koreans, representing 63.1 and 43.2 per cent respectively of their populations. It was 37.6 per cent for the other aliens group and 39.4 per cent for the Chinese. It should be noted that the last two figures are not considerably higher than what could be found in a "natural" age distribution such as the 35.1 per cent in the Korean population of Korea in 1944 or the 38.8 per cent in the Japanese population of Japan Proper in 1940.[107] As to the age-group 40-59, marked concentration was shown only for the other aliens group (31.6 per cent) and for the Chinese (18.1 per cent). This reflects that in these two ethnic stocks, the population was affected to a much greater extent by earlier immigrations which by 1940 were pushing up the population in the older adult age-groups. As to the Japanese and Korean popula-

[104] The bulk of this group were refugees from Russia or their descendants, who moved to Manchuria in or after the Russian Revolution of 1917. The sex ratio of this group was 990 for those aged 0-14 years old, 1,145 for those aged 15-39, 959 for those aged 40-59, and 799 for those aged sixty and above. The markedly high sex ratio was observed only for the age-group 15-39. The majority of persons in this age-group would have been those who moved into Manchuria in or after 1917 at an age under twenty years. Although selection by sex for persons involved in refugee movements does not necessarily conform to that for persons involved in a migration for economic purposes, yet it does not seem likely that there was considerable selection by sex for Russian refugees under the age of twenty at the time of their movement into Manchuria. Moreover, some Russian refugees moved subsequently from Manchuria to other parts of China.

[105] Including Jehol but excluding Kwantung.

[106] Including Jehol but excluding Kwantung.

[107] *Demographic Yearbook, 1948*, pp. 126-127.

tions in the age-group 40-59, the proportion for the Japanese was considerably lower than that of, say, the Japanese in Japan Proper. It was only 9.6 per cent for those in Manchuria[108] as compared with 17.1 per cent in Japan Proper in 1940. (*Demographic Yearbook, 1948*, p. 126). That for the Koreans in Manchuria[108] was 14.9 per cent and is roughly comparable with that for those in Korea (the latter being 15.4 per cent in 1944. *Ibid.*, p. 127). The great diminution in the proportion of Japanese in this age-group (40-59) reflects the effect of heavy immigration of Japanese into Manchuria since 1930, which has swollen the proportion of the younger adult age-groups and thus reduced relatively the proportion for this age-group (40-59). The reverse is true, however, for the other aliens group because the bulk of their immigration took place earlier in point of time. In the case of the Koreans, the heavy immigration into Manchuria since 1930 must have been characterized by many immigrants bringing their families with them.[109] As a result of this heavy immigration, not only did the Korean proportion who were in the 15-39 age-group swell abruptly, but also a relatively large ratio of children under 15 was maintained. These conditions led to a relative decrease in the proportions for the age-groups of 40-59 and 60 and over, even when they are compared with, say, those of the Koreans in Korea. In the case of the Japanese, the heavy immigration into Manchuria since 1930 had pushed up the proportion in the 15-39 age-group, and thus reduced the proportions for all other age groups. Moreover, the fact that earlier Japanese immigration had always been small in volume, and that the entire history of Japanese immigration has been comparatively recent, also contributed to the small proportion of the Japanese population in the older age-groups of 40-59 and 60 and over. The fact that the proportion of children under 15 was not unduly small in the Japanese population in Manchuria may perhaps be explained as a result of numerous recent Japanese immigrants bringing their families with them.[110]

As for the other aliens group, concentrations were in the age-groups of 40-59 and 60 years and over. This was due to the fact that immigration of this ethnic group took place largely and almost once for all in years following 1917 when the Russian Revolution broke out. The early occurrence of their immigration had resulted in pushing up the proportions in the older age-groups, as the young adults who came in twenty years or so before 1940, were now included in these older age-groups. It is interesting to note that this other aliens group was, relatively speaking, the most aged population among all the ethnic groups in Manchuria. The age structure of the Chinese population in Manchuria[111] was also characterized by concentrations in the adult age-groups at the expense of those under age 15.

The effect of large concentrations in the alien populations in the adult age-groups had, however, little effect on the age distribution of the over-all total population, since the alien populations in Manchuria[112] formed only 5.4 per cent of the total population in 1940. The age distribution of the total population in Manchuria was essentially that of the Chinese who represented 94.6 per cent of the total.

One of the problems of a preponderantly male population in the adult groups was the difficulty the single male persons met in finding mates. This difficulty was more or less present among practically all the ethnic groups in Manchuria, including the Chinese themselves, many of whom were immigrants, with consequently low sex ratios for the adult age-groups. The only exception to this was that of the other aliens group, where there was a small surplus of women,[113] and this would have little effect in easing the general difficulty of unbalanced sex ratios for other ethnic groups. Thus, even if ethnic assimilation were rapidly evolving, intermarriages between different ethnic groups would be of no help. Interethnic marriages could only have resulted in the displacement of the unmarried male adults from one ethnic group to another. The over-all sex ratio of persons in the marriageable ages for the total population as a whole would have been in no way affected.

In summary, migration, both alien and native, has been a very important factor in the population growth of Manchuria during recent times, particularly for the alien ethnic stocks. The rapidly rising immigration of Japanese and Koreans in the decade 1930-1940, together with concentrations in the young adult age-groups, contributes to a rising tendency in their natural increase, although the unequitable sex ratio of these two alien groups tends to partially offset this tendency. However, owing to the relatively

[108] Including Jehol but excluding Kwantung.

[109] This is reflected in a moderate sex ratio of 766 females per 1,000 males for the Koreans in the age-group 15-39.

[110] This is supported by the moderate sex ratio of 638 for those aged 15-39.

[111] Including Jehol but excluding Kwantung.

[112] Including Jehol but excluding Kwantung.

[113] The number by which females surpassed males was 1,851 in the age-group 15-39. But there was a larger number of males than females in the age-group 40-59. It is highly probable that men in the higher age-group would have mates, whether actual or potential, in the younger ages. Hence, the probable number of females in the 15-39 age-group who might have a problem of finding mates was thus reduced to 1,363.

TABLE 5. SEX AND AGE DISTRIBUTION OF THE VARIOUS ETHNIC GROUPS

Num

Age	Total			Chinese[a]		
	Total	*Male*	*Female*	*Total*	*Male*	*Female*
All ages[c]	43,201,329	23,906,957	19,294,372	40,857,137	22,599,325	18,257,812
0-14	15,638,519	8,041,785	7,596,734	14,870,110	7,648,566	7,221,544
15-39	17,251,245	9,540,354	7,710,891	16,079,211	8,856,571	7,222,640
40-59	7,704,151	4,802,499	2,901,652	7,386,609	4,617,290	2,769,319
60 & over	2,607,414	1,522,319	1,085,095	2,521,207	1,476,898	1,044,309
						Perce
All ages[c]	100.0	55.3	44.7	100.0	55.3	44.7
0-14	36.2	18.6	17.6	36.4	18.7	17.7
15-39	39.9	22.1	17.9	39.4	21.7	17.7
40-59	17.8	11.1	6.7	18.1	11.3	6.8
60 & over	6.0	3.5	2.5	6.2	3.6	2.5

[a] Including Mongols, Manchus, Moslems, and aborigines.
[b] Including a small number of former Japanese Empire subjects.

small numbers of the alien stocks in Manchuria, any conditions favourable to their growth would have had only slight effects on the ethnic composition of the total population of which they formed a part. The same is true with regard to the effects of their age distribution on the age structure of the total population.

For the years since 1940, information on Koreans in Manchuria is not available. For the Japanese in Manchuria, available repatriation figures implied a continued heavy Japanese immigration into Manchuria during the period of the Second World War.

Since the end of the war, these Japanese have been repatriated. In the recent years the Russians moved in. There was a considerable population exchange between Manchuria and North Korea. However, statistics on the movements of either Koreans and Chinese are not available. Judged by the similarities in the economic patterns of Manchuria, Soviet Russia and North Korea, it is likely that population movements which have already taken place between these areas may continue.

J. THE CHANGING ROLE OF MIGRATION

The period from the early nineteenth century through the first three decades of the twentieth might well be called the age of the great international migrations. In the world as a whole, both East and West, the numbers of people who migrated across international borders during this period were without precedent in history, and it seems unlikely that either hemisphere will again witness such massive movements in the decades immediately ahead. This was a period of extraordinary activity in the settlement of new lands, the exploitation of newly discovered industrial processes and natural resources, and the building of new centres of commerce and industry in various parts of the Earth. The largest streams of international migrants were those which crossed the Atlantic Ocean from Europe to the rapidly developing countries of America. However, the foregoing history of Oriental migrations has shown that important magnets to immigration developed also in some countries of the Far East, notably Malaya, Burma, and Ceylon, into which workers from India and China poured by the millions. (See figure 3.) Far Eastern emigrants also played a considerable part in the development of certain areas in America, Africa, and Oceania.

The era of large-scale international movements continued for a time in the East after it had ended in the West. The overseas emigration from Europe, which dominated the course of international migrations involving Western peoples, reached its climax before the First World War; it was much less important during the 1920's and nearly insignificant during the 1930's. On the other hand, the movement to the centres of immigration in the Far East continued to grow in volume during the 1920's, and, though it was reduced by the depression of the 1930's, it was of considerable importance during that decade also. As indicated in preceding sections of this article, only the Second World War and its aftermath brought the movement of new migrants in the Far East nearly to a standstill. In the West, the movement revived to some extent during the post-war years, but no such revival appears to have occurred in the Far East.

Many explanations have been offered for the termination of the massive international migra-

IN MANCHURIA (INCLUDING JEHOL BUT EXCLUDING KWANTUNG), 1940

b e r s

Japanese			*Koreans*[b]			*Other Aliens*		
Total	*Male*	*Female*	*Total*	*Male*	*Female*	*Total*	*Male*	*Female*
819,479	480,954	338,525	1,451,841	790,465	661,376	72,872	36,213	36,659
212,246	108,956	103,290	541,191	276,738	264,453	14,972	7,525	7,447
516,972	315,599	201,373	627,697	355,427	272,270	27,365	12,757	14,608
78,567	51,132	27,435	215,925	122,308	93,617	23,050	11,769	11,281
11,694	5,267	6,427	67,028	35,992	31,036	7,485	4,162	3,323
n t a g e s								
100.0	58.7	41.3	100.0	54.5	45.5	100.0	49.7	50.3
25.9	13.3	12.6	37.3	19.1	18.2	20.5	10.3	10.2
63.1	38.5	24.6	43.2	24.5	18.8	37.6	17.5	20.1
9.6	6.2	3.4	14.9	8.4	6.4	31.6	16.2	15.5
1.4	0.6	0.8	4.6	2.5	2.1	10.3	5.7	4.6

[c] Excluding a small number of persons whose age was not reported.
Source: The 1940 "Manchoukuo" census.

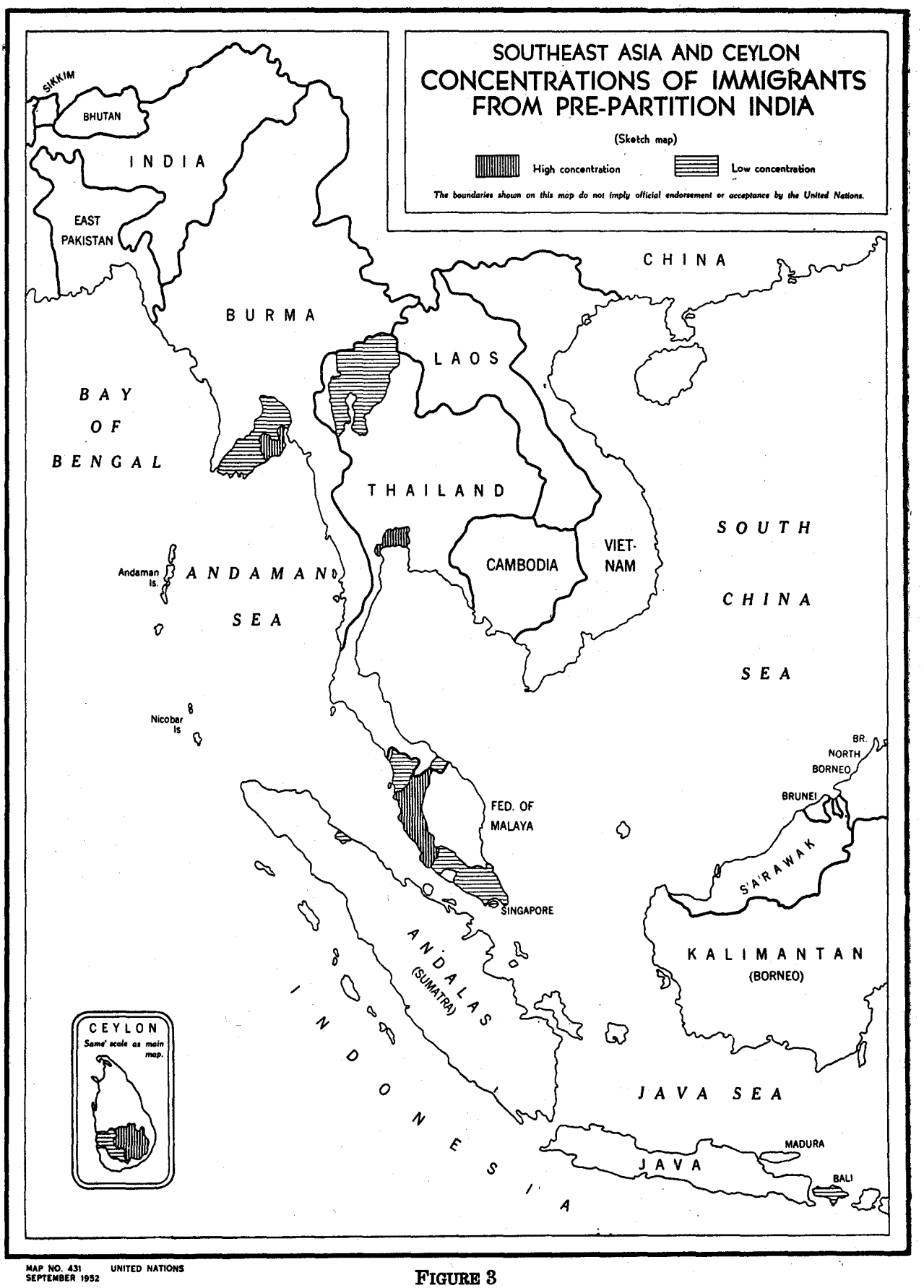
tions in both the East and the West. Increasing legal restrictions on international movements, and especially the barriers erected by the countries of immigration, have evidently been the main immediate cause. The historical summary presented in this study shows clearly the effect of these restrictions upon Far Eastern migration—first closing the outlets of emigration to other regions of the world, and later shutting off the principal avenues of international migration within the Far East. These legal measures, however, are to a large extent symptomatic of other, more fundamental, developments. In the West, the economic, social, and political maturation of the historic countries of immigration has tended to reduce the apparent need for supplementary labour supplies from abroad, while increasing the competition among native workers for the openings formerly filled by immigrants. A somewhat similar development can be seen in the immigration countries of the Far East, where continued economic advances, political independence, and social reforms have enabled the native peoples to take a greater part in enterprises which were formerly dependent primarily on immigrant Asian labour as well as on foreign Western management. Various obstacles to economic development have precluded the more rapid expansion of employment opportunities which would have permitted both immigration and the greater utilization of native labour to proceed on a rising scale. Similar obstacles—notably the shortage of capital—have hindered the development of other countries of potential immigration, both in the East and in the West.

The currents of international migration in the West have also dried up, to a considerable extent, at their sources, because of falling birth rates, rising standards of living, and better employment opportunities in the countries of emigration. In this respect, the factors of international migration in the West differ sharply from those in the Far East. Immense potentials for emigration remain among the impoverished masses of peoples in the principal emigration countries of the latter region. (See figures 4 and 5.) Their high birth rates, accompanied in many cases by falling death rates, accentuate the pressure to emigrate which results from the diversities in population distribution and economic opportunities in the region as a whole.

It is obvious that the Far East needs migration, and needs it on a very large scale, if the full possibilities of industrialization and economic progress in this region are to be realized. Labour supplies must be shifted from the areas where they are redundant to those where new industries can be developed and employment opportunities expanded. If the necessary population shifts cannot be accomplished by international migration, they must be brought about, in so far as possible, by internal movements within the individual countries of the region.

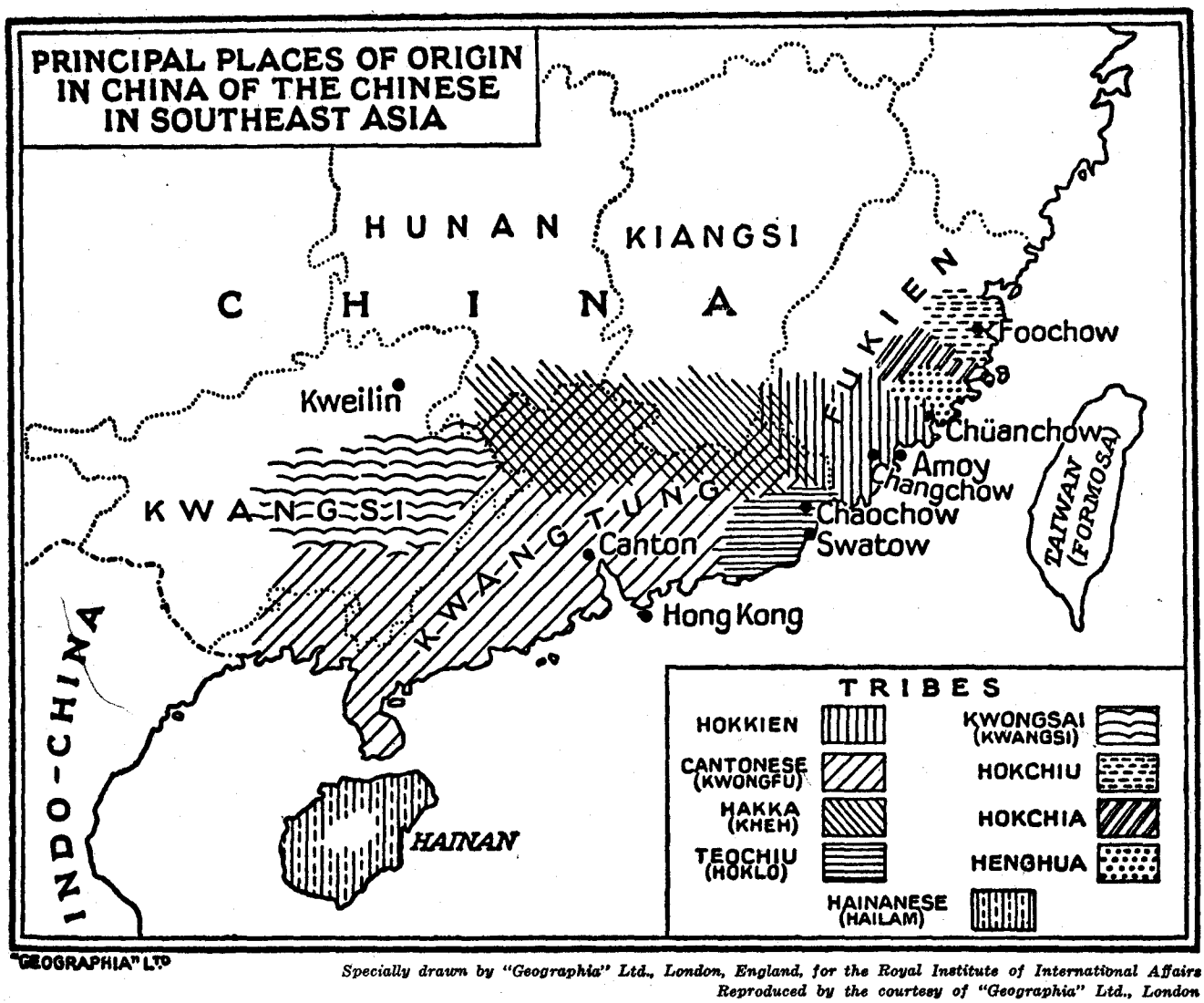
The magnitude of internal migration in the Far Eastern countries has long been far greater than that of migrations across international borders. In Japan, for example, it has been estimated that the urban areas gained 17.5 million persons on the balance of rural-urban migration during the period 1920 to 1940.[114] This gain was more than the increase of the whole population in Japan Proper during this period, and was nearly ten times as great as the net out-migration

[114] Japan, Population Problem Research Institute, *Materials on population* . . . pp. 1, 14-17.



MAP NO. 431 UNITED NATIONS
SEPTEMBER 1952

FIGURE 3



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THE HAKKAS OFTEN INHABIT THE SAME AREAS AS THE CANTONESE, HOKKIEN, AND OTHER TRIBES.

FIGURE 4

of civilians from the country.[115] In India between 1931 and 1941, the net migration from rural to urban areas was of the order of 1 million per year,[116] or ten times the net annual emigration from India during the decade 1921 to 1931, when emigration was at its peak.[117] Massive migrations from rural to urban areas have taken place also in other Far Eastern countries, although they are as yet only in the early stages of industrialization and urbanization. In addition, movements from one region to another within certain Far Eastern countries have occurred on a huge scale. Especially noteworthy has been the movement of Chinese settlers into Manchuria, which involved perhaps 14 million migrants between 1925 and 1943, though a substantial part of this number returned to other parts of China.[118] Such currents of migration differ from the international movements primarily in the absence of an international boundary line in the path of the migrants; that difference by itself is sufficient to give them a far better prospect of continuing on a large scale in the future.

[115] The net emigration of civilians ten years old and over from Japan between 1920 and 1940 has been estimated at 1.7 million. Taeuber, *Migration and the population potential . . .* (1947), pp. 19-20.

[116] From 1931 to 1941 the urban population of India increased by 16.3 million. If the rate of natural increase in the urban areas were the same as that in all India (15 per cent during the decade), this increase would imply a net gain through migration of at least 9.4 million. Madhava, "Possible effects of technological developments . . ." (1949), p. 2.

[117] Davis, *The population of India and Pakistan* (1951), p. 99.

[118] Population Index, "Manchuria as a demographic frontier" (1945), p. 261; United Nations, *Economic Survey of Asia and the Far East* (1947), pp. 40-41.

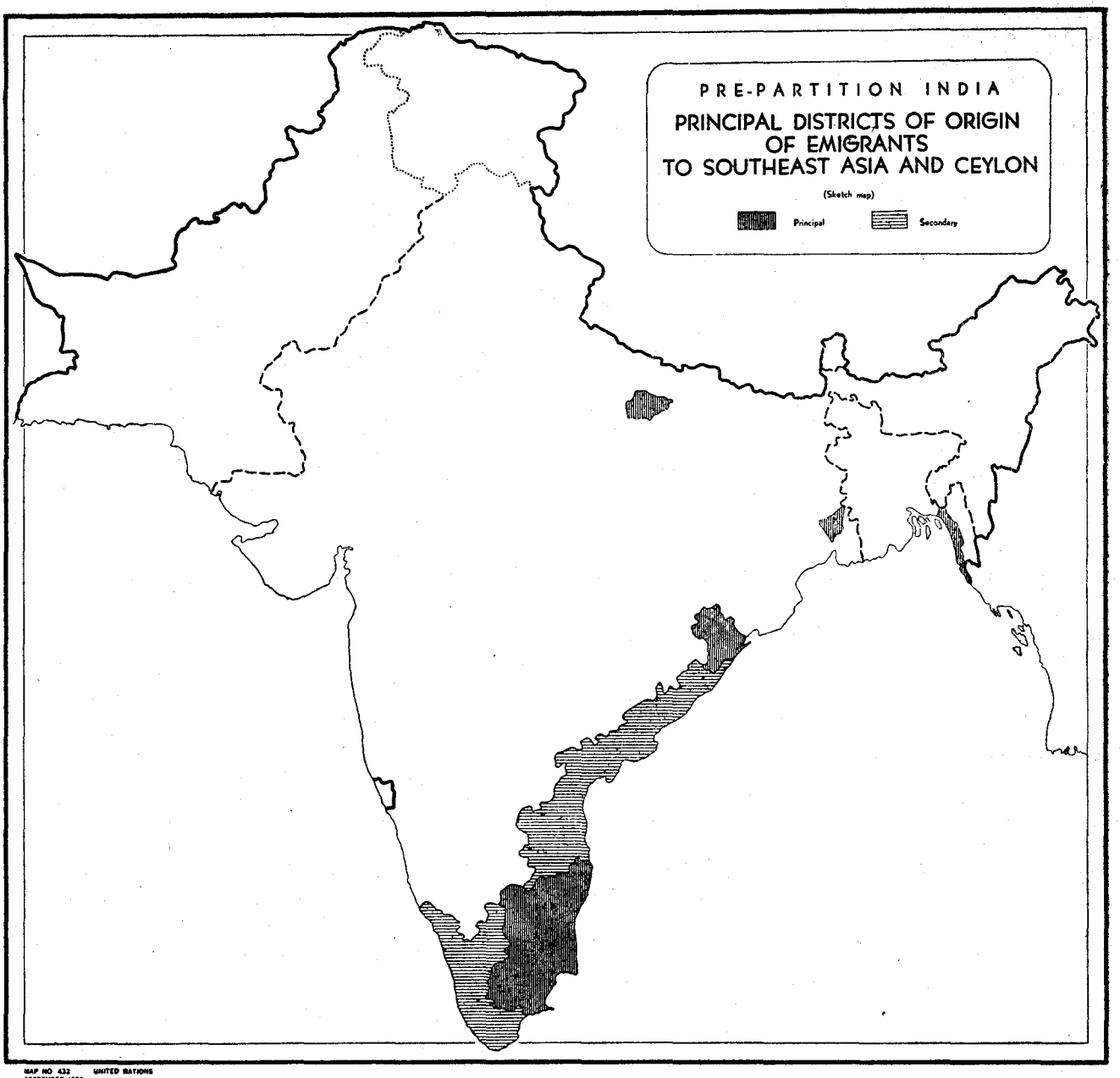

FIGURE 5

Those Asiatic countries which formerly received large numbers of immigrants for work on plantations, in mines, etc., generally possess substantial labour reserves in their less-developed districts which would be adequate, at least numerically, to meet the needs for a large expansion of these industries without further recourse to large-scale immigration, but only provided the necessary adaptation can take place, through occupational training and other appropriate means. In these countries the problem of manpower created by the curtailment of immigration is one of maintaining an adequate flow of internal migration for economic development, and of absorbing the migrant native into expanding industries without undue loss of efficiency or of competitive advantages in the international markets.

As for the historic countries of emigration in the Far East, it has been shown that the volume of emigration from them has never been large enough in modern times to have a very great effect on their demographic or economic situation. Consequently, the cessation of emigration, even though it should prove permanent, could hardly be a major factor in their future economic destiny. However, to the extent that this loss of opportunities for employment abroad does affect

the economic position of the people in labour-surplus areas of these countries, it adds to the need for developing alternative opportunities at home. In these countries also, internal migration on an immense scale is probably essential if they are to achieve a more nearly balanced economy and an adequate living standard. Here again, the shift of population depends on the successful solution of many economic problems, including the provision of necessary capital and the development of the needed technical capacities in the domestic labour force.

It should be emphasized that migration, while it is essential to the economic progress of the Far Eastern peoples, is not in itself sufficient to ensure their future prosperity. Neither international nor internal migration on any scale which can be conceived as feasible would suffice to solve the problem of mounting numbers and inadequate resources in the most heavily populated, agrarian areas of this region. Many students of this problem agree that its solution will require a vigorous simultaneous attack on many fronts, including far-reaching economic and social reforms to promote higher rates of investment, measures tending to limit the natural increase of the population, as well as efforts to attract some of the people to more promising locations.

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Accuracy tests for census age distributions tabulated in five-year and ten-year groups

I. Purpose and method of testing

Errors in reporting which affect the regularity of a census age distribution can be of three types: misstatements of age, incomplete enumeration at particular ages, and failure to report ages.

Misstatements of age are sometimes deliberate. It is commonly held that ages of women are reported less accurately than those of men because women desire to appear younger than they really are. This may be true, but it is far from being the whole truth. If men are less vain in this respect, they may misrepresent their ages in order to escape taxation or military service, to qualify for pensions, to evade restrictions on employment, or for other reasons. Furthermore, in many, perhaps in most cases, the individuals themselves are not to blame for inaccuracy in the statements relating to their ages. In many countries the census is taken by leaving a schedule with each household to be filled out by the household head; in that case husbands commonly report for their wives. In other countries the census information is collected by enumerators in house-to-house interviews; in that case housewives commonly give information for their husbands. In nearly all cases, the ages of children and other dependants in a household, or those of inmates of institutions are reported by other persons.

Misstatements may be due also to complete ignorance or to a reluctance to make the effort of reckoning the age or looking it up in a document. A further source of error is misunderstanding of the census question: in many censuses it is required to report age at the last birthday, but some persons overlook this detail and report age at the nearest birthday which very often is the next birthday.

The error due to omissions from the census enumeration is commonly very serious in the case of infants. In the censuses of most countries, the reported numbers of children at the earliest ages are usually too small, and sometimes very much too small. It is also believed that there is a tendency to omit the most mobile elements in the adult population; it has been found in many censuses that rather fewer young men were reported than might have been expected, either on the basis of prevailing mortality levels or by comparison with the reported numbers of women of the same ages. Under-enumeration of young men may be one part of the explanation, but another part may be that young women tend to to understate their ages while young men tend to overstate them.

For some persons no age is reported. Although persons of unstated ages may be old or young, it is likely that failure to report an age is more frequent at some ages than at others. The effects of this type of error are, in most cases, relatively small.

The amounts of errors due to misstatements of age, under-enumeration, and failure to report ages are much greater in some censuses than in others. Persons using census statistics on this subject need to know to what extent they can rely on the accuracy of the data. The best method of testing their accuracy, of course, is to compare them with other records which are more reliable; this procedure provides not only a test of reliability but also a means of correcting the errors.[1] The users of the statistics, however, are not ordinarily in a position to make tests of this kind. As a rule, they have to be guided by whatever indications of error can be found in the published tabulations of the census itself supplemented in

[1] A method which is sometimes used and which deserves to be used more often as a part of census procedures is to re-enumerate with the greatest possible care a sample of the population, paying special attention to the accuracy of age reports, and to compare the results of this re-enumeration on an individual basis with the original census returns. A still better method was used on the occasion of the 1921 census of New Zealand. The census office of New Zealand then secured the birth records for a sample of individuals identified in the census, and their reported ages were compared to the exact ages according to date of birth. It is unfortunate that the sample was very small and that the attempt has not been repeated. Nevertheless, the New Zealand investigation showed very clearly that there are important tendencies at some ages to understate age and at other ages to overstate it, and that these tendencies must result in a considerable distortion of census results. (See: New Zealand, Census and Statistics Office, *Results of a Census of the Dominion of New Zealand taken for the night of 17th April 1921. General Report.* Wellington, 1925, pp. 93-96.

some cases by vital statistics and migration data. There are various methods of testing census age distributions on this basis, which may indicate the need for caution in using certain data even in cases where they do not give positive evidence of errors.

Several methods have been developed for testing the accuracy of single-year age distributions.[2] Very often, however, single-year data are not readily available or have never been published. Statistics by single years of age, moreover, are not needed for many purposes, and indications of error in single-year distributions do not constitute a very good guide for evaluating the accuracy of grouped data. The present study is concerned with the accuracy of statistics classified in five-year or ten-year age-groups.

One means of testing the accuracy of age distributions in five-year groups is to compare the sex ratios—numbers of males per 100 females—for successive age-groups as recorded in the census. If the distributions are accurate or if the errors for males are as frequent and of the same kind as those for females, sex ratios will change very gradually from one age to another, as a result of sex-differences in mortality and in rates of migration, but cannot vary abruptly or fluctuate violently. The presence of marked fluctuations in these ratios testifies to errors which are not the same for the two sexes.

Another test is provided by "age ratios"—which we shall define as the numbers reported in one age-group per 100 of the mean of numbers reported in the two adjacent age-groups. Because of the possibility of different errors in the figures, it is desirable to compute such age ratios for each sex separately. In general, any considerable fluctuations of the age ratios indicate inaccuracies in age reporting or incomplete enumeration. Some real variations in these age ratios may be expected, however, mainly owing to variations in numbers of births in the past or to variations in past rates of migration, or in an age distribution of migrants. Variations in age ratios due to differences in age-specific mortality rates can be neglected, since almost throughout the entire scale of ages year-to-year changes in mortality rates are gradual and systematic.

A third method is to examine the consistency of age data from successive censuses. Where censuses are taken at fairly brief intervals such as five or ten years, most of the persons enumerated in each census should have been enumerated also in a previous census, when they were a certain number of years younger. If the data are accurate, one should find, after allowing for mortality and for immigration and emigration, approximately the same numbers in a given age group at one census as in a younger group at the previous census. Any substantial difference indicates an error, which may be found in either or both of the censuses.[3] This method gives a precise test only if the age groups tabulated in the censuses can be combined into integral multiples of the time interval between the censuses, and if reliable information is available on mortality and also on migration where that is important. If these conditions are not satisfied, a test may still be possible, but it will give only approximate indications of errors. In any case, whatever inconsistencies are revealed do not necessarily imply errors in the later census, but may be due exclusively to errors in the earlier one; hence the method does not give a clear indication of the reliability of the most recent census.

Still another method, which can be used where adequate statistics of births are available, is to compare the numbers of persons of each sex enumerated in each age-group with the numbers of births reported in the appropriate years preceding the census date. Like the third method mentioned above, this requires information on mortality and also on migration where the latter factor is important. It is more useful for testing the accuracy of data on numbers of children than of data for adults.

In evaluating the accuracy of the statistics for a given country, it is advisable to use all tests which can be applied to the data at hand, and to interpret the results in the light of all available information regarding past trends of births, deaths, and migration which may have created peculiarities in the age structure of the population. On the other hand, if the purpose is to compare the data from the censuses of several countries, with regard to their apparent reliability, there is an advantage in using only those tests which can be applied uniformly to the data from all these censuses. If the number of countries is rather large, and if detailed information on the demographic history of all these countries is lacking, there is a further advantage in devising the tests so as to minimize the allowances that must be made for true irregularities in the age structures. The present study deals with the methods which may be appropriate for the latter purpose.

[2] For example Whipple's index of concentration, and Myers' blended method. The Index of Concentration is explained in United States, Bureau of the Census, *Thirteenth Census* . . . Vol. I, p. 291-92. Myers' index is explained in *Transactions of the Actuarial Society of America*, Vol. XLI, Part 2, No. 104, Oct. 1940, pp. 402-407.

[3] This method was applied to age distributions from the censuses of a number of countries, by Durand in his "Adequacy of Existing Census Statistics for Basic Demographic Research", *Population Studies*, Vol. IV, No. 2, Sept. 1950, pp. 179-199.

The methods of analysing the consistency of results of successive censuses and comparing the census data with birth statistics are not very appropriate for this purpose. The kinds of statistics required for these methods of testing are not available for some countries, and the variations in the timing of the censuses, in the age-groups tabulated, and in the quality of information about births, deaths, and migration make it impossible to devise uniform criteria for evaluating the results of the tests. The tests based on sex ratios and age ratios are more suitable, and it is with the application of these on a large scale, to the results of censuses in many countries, that the present study is concerned.

When the sex ratios and age ratios described above have been computed for the various five-year or ten-year age-groups shown in a census tabulation, it is convenient to derive a summary measure of the degree of variability which they exhibit. There are many possible summary measures; the ones chosen here are defined as follows:

(*a*) The mean difference between sex ratios for the successive age groups, averaged irrespective of sign; this will be called the "sex-ratio score".

(*b*) The mean deviation of age ratios from 100 per cent, also irrespective of sign; this will be called the "age-ratio score".

For reasons that will be made clear later, both these scores are calculated from the ratios for all age-groups up to age 70, but not for any older groups.

By means of such scores, the degrees of variability of the sex ratios and age ratios calculated from the results of many censuses can readily be compared. Furthermore, it is possible to determine certain standard values for these scores, representing the variations in the ratios that can normally be expected where data are accurate. Deviations of the scores for a given census age distribution from these standard values constitute rough indications of the degree of inaccuracy in the given distribution, provided that certain factors which disturb the regularity of the sex and age structure of populations are absent.

It is convenient also to derive a joint score which takes account of the variation in both sex ratios and age ratios. The experience gained in a large number of computations has led to the conclusion that, on the whole, more reliance should be placed on the sex-ratio score than on the age-ratio scores for the two sexes, because the latter are more severely affected by irregular population trends. However, the sex-ratio score alone may not be sufficient because the errors in age distributions may, in some instances, be similar for both sexes. It has therefore been decided to arrive at a "joint score" by adding three times the sex-ratio score to the sum of the age-ratio scores for the two sexes.

II. Illustration of the application of sex-ratio and age-ratio tests

The 1910 census of the United States has been selected for the purpose of illustration. The age distributions of native whites and Negroes are treated separately.[4] It may be assumed that in 1910 the age statistics for native whites were fairly, but not highly, accurate. The data for Negroes, on the other hand, were less accurate since in 1910 Negroes were not nearly as well educated as the white population. Ages reported at the 1910 census for each of these segments of the population are shown in table 1.

Table 1. United States, 1910. Ages reported for Native whites and Negroes of each sex, in quinquennial groups

(Numbers in thousands)

Age group (years)	*Native white*		*Negro*	
	Males	*Females*	*Males*	*Females*
0- 4	4,677	4,544	629	634
5- 9	4,135	4,042	619	627
10-14	3,825	3,735	578	577
15-19	3,647	3,647	508	552
20-24	3,247	3,309	482	549
25-29	2,802	2,793	422	459
30-34	2,409	2,353	332	336
35-39	2,212	2,112	320	313
40-44	1,786	1,691	230	226
45-49	1,505	1,409	200	186
50-54	1,390	1,241	179	147
55-59	984	887	115	95
60-64	745	697	101	85
65-69	537	525	68	56
70-74	346	348	41	38
75-79	202	211	23	21
80-84	91	102	12	14
85-89	33	41	5	6
90-94	8	10	2	3
95-99	1	2	1	1
100 and over	0.2	0.3	1.0	1.7
Age not reported	74	34	17	14

Source: United States, Bureau of the Census, *Thirteenth Census of the United States taken in the year 1910*, Vol. I, Washington, D.C., 1913.

For native whites it appears that numbers in successive age-groups for each sex fall off fairly regularly with advancing age. Males are more numerous than females in all age-groups except at 20-24 and at ages above 70. Since the native white population is not affected by immigration, it is to be expected that males would be more

[4] The age distribution of foreign-born whites is discussed in Section IV C, p. 67.

numerous at early ages (owing to greater frequency of male births) but that, with advancing age, they would be eventually overtaken in numbers by females (owing to lower female mortality at all ages). An excess of females at ages 20-24, followed by an excess of males at ages 25-69 can therefore be taken as evidence of the misstatement of ages or under-enumeration of males aged 20-24.[5]

Among the Negro population, numbers fall off with advancing age, but not very regularly. At ages 5-9, numbers are almost as large as at ages 0-4, although infant and early childhood mortality was fairly high and population increase should have given rise to increasing numbers of births. The most plausible explanation for the smallness of the difference in these numbers is that many Negro infants below age 5 were not enumerated at the census. It is also possible that ages of small children were sometimes overstated, causing some depletion of numbers at ages below 5 and a corresponding inflation of numbers at ages over 5. Females appear more numerous than males at ages 0-9, 15-34, and 80 and over. A preponderance of females in childhood is probably explained chiefly by more frequent overstatement of ages of small boys than of girls. Ages 15-34 are attractive, and ages over 35 unattractive, to females from the point of view of their eligibility for marriage; consequently there may have been an understatement of women's ages, which would account for the observed disparities in the numbers of the two sexes at these reported ages. A deficient count of young men would have the same effect.

A first inspection of the figures, therefore, suggests some errors in the data for Native whites and considerable errors in those for Negroes.

A computation of sex ratios and age ratios, however, suggests further errors (see tables 2 and 3). In the case of native whites, the numbers of males per 100 females decrease to ages 20-24, then increase to ages 50-54, and decrease quite rapidly at subsequent ages. In a population not affected by migration and with female mortality lower than male mortality at all ages, one would expect a constant decrease, at first very gradual, but later more rapid, in the sex ratios. A sex ratio of 98.1 at ages 20-24 can hardly be compatible with one of 112.0 at ages 50-54 in a population of this type, and must probably be explained chiefly in terms of age misstatements which differ between the two sexes. The sex ratios of Negroes show, on the one hand, large fluctuations between adjacent age-groups (e.g., a decline by 8.3 points from 10-14 to 15-19, a rise by 7.1 points from 25-29 to 30-34, a rise by 14.8 points from 45-49 to 50-54, and particularly sharp falls when the age limits of 70, 80 and 90 are passed). On the other hand, the Negro sex ratios show trends similar to those of the native white population, with a minimum at ages 20-24 and a maximum at 50-54, but with a much wider amplitude. If, in the case of native whites, a minimum at 20-24 of 98.1 is inconsistent with a maximum at 50-54 of 112.0, the minimum of Negro sex ratios of 87.9 at 20-24 and the maximum of 122.3 at 50-54 clearly points to very frequent gross errors in ages, different for the two sexes. As already indicated, under-enumeration of males in certain age groups could also contribute to this result.

TABLE 2. UNITED STATES, 1910. SEX RATIOS (MALES PER 100 FEMALES) FOR NATIVE WHITES AND NEGROES, IN QUINQUENNIAL AGE GROUPS

Age group (years)	Native white		Negro	
	Sex ratio	Difference from ratio for preceding age group	Sex ratio	Difference from ratio for preceding age group
0- 4	102.9	—	99.3	—
5- 9	102.3	— 0.6	97.8	— 0.6
10-14	102.4	+ 0.1	100.2	+ 1.5
15-19	100.0	— 2.4	91.9	— 8.3
20-24	98.1	— 1.9	87.9	— 4.0
25-29	100.3	+ 2.2	91.8	+ 3.9
30-34	102.4	+ 2.1	98.9	+ 7.1
35-39	104.7	+ 2.3	102.4	+ 3.5
40-44	105.6	+ 0.9	101.7	— 0.7
45-49	106.8	+ 1.2	107.5	+ 5.8
50-54	112.0	+ 5.2	122.3	+14.8
55-59	110.9	— 1.1	121.7	— 0.6
60-64	106.9	— 4.0	118.5	— 3.2
65-69	102.3	— 4.6	122.2	+ 3.7
70-74	99.5	— 2.8	106.1	—16.1
75-79	95.9	— 3.6	106.2	+ 0.1
80-84	89.1	— 6.8	84.2	—22.0
85-89	80.4	— 8.7	86.0	+ 1.8
90-94	75.1	— 5.3	69.3	—16.7
95-99	62.6	—12.5	71.1	+ 1.8
100 and over	73.8	+11.2	60.1	—11.0

Age ratios, on the other hand, show a characteristic fluctuation (see table 3 and diagram). Ratios are high at ages 25-29, 35-39, 50-54, and 60-64, indicating that excessive numbers of persons were reported in these age-groups by comparison with the numbers in the groups just higher and lower. In the case of Negro females, the sawtooth fluctuation in age ratios continues to the most-advanced ages. In general, after age 70, values fall below 100 and become progressively smaller, because at advanced ages numbers dwindle more rapidly with mounting mortality.

[5] It is believed that the statistics for native whites may also be affected somewhat by misreporting as natives of persons born abroad. Because of the peculiar sex ratio of the foreign-born whites, such misreporting would have some effect on the sex ratios of the population classed as native white.

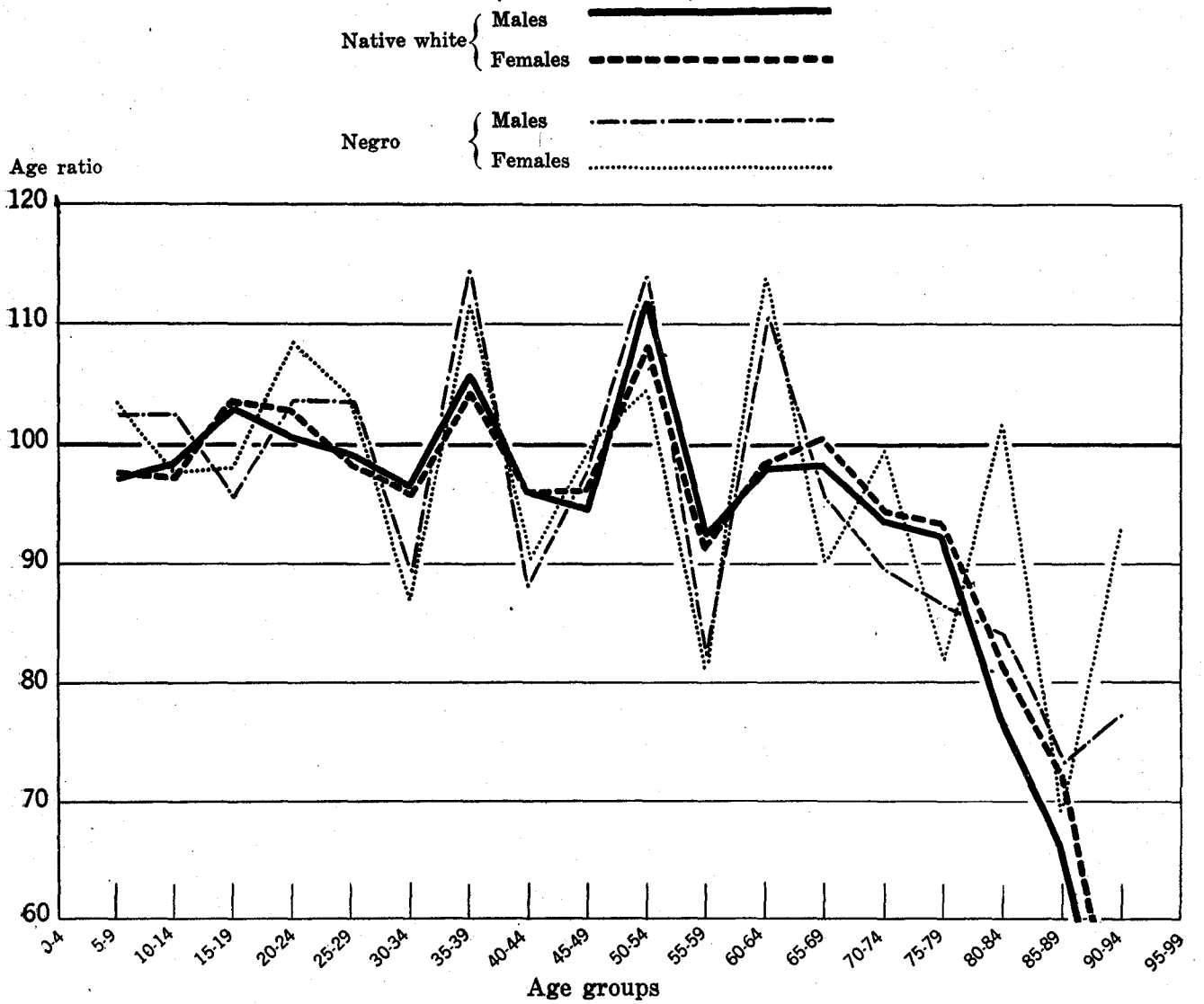
TABLE 3. UNITED STATES, 1910. AGE RATIOS (PERSONS IN EACH AGE GROUP AS PERCENTAGE OF ARITHMETIC MEAN OF TWO ADJACENT AGE GROUPS), FOR NATIVE WHITES AND NEGROES, IN QUINQUENNIAL AGE GROUPS

Age group (years)	Native white		Negro	
	Males	Females	Males	Females
5- 9	97.3	97.6	102.6	103.6
10-14	98.3	97.2	102.6	97.8
15-19	103.2	103.6	95.8	98.1
20-24	100.7	102.8	103.7	108.4
25-29	99.1	98.6	103.6	103.9
30-34	96.1	96.0	89.5	87.0
35-39	105.5	104.4	114.1	111.5
40-44	96.1	96.1	88.3	90.5
45-49	94.8	96.1	97.7	99.9
50-54	111.7	108.0	113.9	104.6
55-59	92.2	91.6	82.1	81.5
60-64	98.0	98.7	110.5	113.7
65-69	98.4	100.4	95.9	90.0
70-74	93.7	94.6	89.6	99.4
75-79	92.4	93.7	86.7	81.9
80-84	77.5	81.3	84.0	101.5
85-89	66.3	72.4	73.3	69.2
90-94	45.8	48.6	77.5	93.0

Sex ratios and age ratios computed from the results of many other censuses classified in five-year age groups usually show similar fluctuations which may be attributable largely to age misstatement and in some cases also to omissions from the enumeration.

Some census publications contain tabulations of ages in decennial groups only; others present quinquennial groups for certain ages and decennial for others. It is therefore of interest to consider the results of applying the above tests to data tabulated in ten-year groups. Tables 4 and 5 show sex ratios and age ratios for United States native whites and Negroes in 1910 in decennial groups. Irregularities in such a wide grouping may, of course, be much more influenced by long-term changes in demographic trends than those in quinquennial groups, making it more difficult to determine which of the irregularities should be attributed to real causes and which to inaccurate reporting. In this case, however, the

UNITED STATES, 1910. AGE RATIOS FOR NATIVE WHITES AND NEGROES, MALES AND FEMALES
(See also table 3)



errors in the data are sufficient to show up in the sex ratios computed for decennial groups. Sex ratios are particularly low at ages 20-29 and particularly high at ages 50-59. This pattern is inconsistent with what is known about the trends of the native white and Negro populations before 1910. For Negro females, the age ratio is particularly high at ages 20-29 and particularly low at ages 50-59. Similar deviations in the age ratios, though less marked, can also be observed in the case of native white females and of both groups of males, age ratios being particularly low at ages 40-49. At advanced ages, age ratios in decennial groups fall off rapidly.

TABLE 4. UNITED STATES, 1910. SEX RATIOS FOR NATIVE WHITES AND NEGROES, IN DECENNIAL AGE GROUPS

Age group (years)	Native white		Negro	
	Sex ratio	Difference from ratio for preceding age group	Sex ratio	Difference from ratio for preceding age group
0- 9	102.6	—	99.0	—
10-19	101.2	− 1.4	96.1	− 2.9
20-29	99.1	− 2.1	89.7	− 6.4
30-39	103.5	+ 4.4	100.6	+10.9
40-49	106.2	+ 2.7	104.3	+ 3.7
50-59	111.5	+ 5.4	122.1	+17.8
60-69	104.9	− 6.7	120.0	− 2.1
70-79	98.1	− 6.8	106.1	−13.9
80-89	86.6	−11.5	84.8	−11.3
90-99	73.2	−13.4	69.8	−15.0

TABLE 5. UNITED STATES, 1910. AGE RATIOS FOR NATIVE WHITES AND NEGROES, IN DECENNIAL AGE GROUPS

Age group (years)	Native white		Negro	
	Males	Females	Males	Females
10-19	100.6	100.5	100.9	99.6
20-29	100.0	103.0	104.0	113.4
30-39	98.9	97.0	97.9	91.4
40-49	94.1	94.0	90.7	92.5
50-59	103.8	98.4	98.4	87.3
60-69	87.7	91.0	94.5	93.7
70-79	78.0	81.9	68.0	74.1
80-89	44.4	50.1	50.6	61.7

The values of the "sex-ratio score", the "age-ratio score", and the "joint score", as defined on p. 61, are as follows:

United States, 1910:	Quinquennial grouping	Decennial grouping
Native whites:		
Sex-ratio score	2.2	3.8
Age-ratio scores:		
Males	3.9	4.0
Females	3.6	3.8
Joint score	14.1	19.2
Negroes:		
Sex-ratio score	4.4	7.3
Age-ratio scores:		
Males	7.8	3.9
Females	7.8	8.2
Joint score	28.8	34.0

The question of standards with which such scores can be compared is taken up in the sections which follow.

III. SEX RATIOS AND AGE RATIOS IN A STATIONARY POPULATION

A perfectly regular age distribution would be found in a population with constant fertility and mortality rates and no immigration or emigration. No such population exists in reality, but it is possible to analyse the characteristics of hypothetical populations of this kind by the use of life tables. The L_x values in a life table represent a stationary population, recruited each year by a constant number of births and depleted by constant death rates at each age level, with no migration. To illustrate what values for sex ratios and age ratios would be obtained under such conditions, an analysis has been made of the stationary populations from two life tables, one representing a low mortality (United States, 1939-1941) and the other a high mortality (Chile, 1920).[6] Tables 6 and 7 show the L_x values, sex ratios, and age ratios for these two stationary populations. The L_x values for males were increased by 5 per cent in calculating the sex ratios, to correspond to the assumption that for every 100 girls born there are 105 male births, an assumption which is close to most actual observations.

In stationary populations, the effects of constant rates of mortality can be studied in isolation. Because the mortality of males is generally higher than that of females, sex ratios decline quite consistently with age (except that under mortality conditions such as those in Chile in 1920 there is a slight rise in sex ratios at early ages). The decline is very slow up to ages 40-44 but grows much more rapid with advancing age thereafter.

Quinquennial age ratios, up to ages 70-74, do not depart greatly from 100. Ratios for ages 5-9 are below 100, owing to the fact that rates of mortality in infancy and early childhood are higher than in later childhood (notably under conditions of high general mortality). For ages from 10 up to about 70, the age ratios are generally slightly in excess of 100, reflecting a very gradual increase in age-specific mortality rates. After about age 70, age ratios fall off rapidly as

[6] United States Bureau of the Census, *United States Life Tables and Actuarial Tables 1939-1941*, by T. N. E. Greville, Washington, D.C., 1946; "Tablas de Vida para Chile: 1920, 1930 y 1940", *Revista Chilena de Higiena y Medicina Preventiva*, Vol. VIII, No. 3, Sept., 1946.
According to these life tables, expectation of life at birth was 61.6 years for males and 65.9 years for females in the United States in 1939-1941, and 30.9 years for males and 32.2 years for females in Chile in 1920.

the numbers of survivors dwindle. In decennial age groups, the age ratios are similar to those for quinquennial groups, though they show larger departures from 100 because wider age-ranges enter the computation. At ages below 70, deviations from 100 of age ratios in decennial groups are roughly three to four times the deviations in quinquennial groups.

TABLE 6. STATIONARY POPULATIONS OF LOW AND HIGH MORTALITY. SEX RATIOS AND AGE RATIOS OF L_x VALUES FROM 1939-1941 LIFE TABLE FOR THE UNITED STATES AND 1920 LIFE TABLE FOR CHILE, IN QUINQUENNIAL AGE GROUPS

Age group (years)	United States life table, 1939–1941			Chilean life table, 1920		
	Sex ratio	Age ratio		Sex ratio	Age ratio	
		Males	Females		Males	Females
0- 4	103.8	—	—	103.3	—	—
5- 9	103.6	99.7	99.7	103.6	95.3	95.3
10-14	103.4	100.1	100.1	103.9	100.3	100.3
15-19	103.2	100.2	100.2	104.0	101.1	100.9
20-24	103.0	100.1	100.1	103.7	100.5	100.4
25-29	102.6	100.1	100.1	103.0	100.0	100.2
30-34	102.3	100.2	100.2	102.6	100.2	100.3
35-39	101.9	100.4	100.2	102.2	100.3	100.1
40-44	101.2	100.6	100.4	101.3	100.3	100.0
45-49	100.0	100.9	100.6	99.6	99.9	99.8
50-54	98.1	101.2	100.8	97.3	100.2	100.3
55-59	95.3	101.4	101.1	94.4	100.5	101.0
60-64	91.6	101.6	101.6	91.5	100.6	101.3
65-69	87.0	101.7	102.3	88.5	100.3	101.1
70-74	81.8	101.3	102.7	84.8	96.6	98.3
75-79	76.0	97.7	100.6	80.4	86.4	88.8
80-84	69.4	88.1	93.0	74.4	75.4	79.7
85-89	62.3	71.7	77.9	68.5	61.9	66.3
90-94	55.5	52.2	57.9	63.2	49.4	52.9
95-99	49.5	35.2	39.2	53.4	36.1	42.5

TABLE 7. STATIONARY POPULATIONS OF LOW AND HIGH MORTALITY. SEX RATIOS AND AGE RATIOS OF L_x VALUES FROM 1939-1941 LIFE TABLE FOR THE UNITED STATES AND 1920 LIFE TABLE FOR CHILE, IN DECENNIAL AGE GROUPS

Age group (years)	United States life table, 1939–1941			Chilean life table, 1920		
	Sex ratio	Age ratio		Sex ratio	Age ratio	
		Males	Females		Males	Females
0- 9	103.7	—	—	103.4	—	—
10-19	103.3	100.4	100.3	103.9	99.8	99.3
20-29	102.8	100.6	100.5	103.4	101.5	101.4
30-39	102.1	101.2	100.8	102.4	100.9	100.6
40-49	100.6	102.9	101.9	100.5	100.6	99.9
50-59	96.8	105.1	104.0	96.0	101.2	102.2
60-69	89.5	106.5	108.0	90.2	100.9	103.9
70-79	79.4	98.0	105.4	83.2	78.2	83.3
80-89	67.2	57.8	67.5	72.8	39.4	44.8
90-99	54.5	18.3	22.6	61.4	15.4	18.2

Similar results would be obtained from the L_x values of any other life table. In some cases, where female mortality at certain ages exceeds that of males, there may be a slight rise in the sex ratio at those ages. Where infant mortality is especially high, the age ratio for the group 5-9 falls markedly below 100. Under conditions of high mortality in adult ages, the decline in age ratios sets in somewhat sooner than under conditions of low mortality. In no case, however, will the results differ greatly from those obtained in the present examples.

It may, therefore, be stated that, in stationary populations, *differences between sex ratios for successive quinquennial age groups and deviations of quinquennial age ratios from 100 are slight for all ages up to age 70.* The same is true for decennial ratios, if somewhat larger differences are allowed for. The amounts of the variations as indicated by the sex-ratio score and age-ratio score for the examples analysed are as follows:

Stationary populations:	*Quinquennial distribution*	*Decennial distribution*
United States, 1939-1941:		
Sex-ratio score	1.3	2.4
Age-ratio scores:		
Males	0.7	2.8
Females	0.6	2.6
Joint score	5.2	12.6
Chile, 1920:		
Sex-ratio score	1.2	2.4
Age-ratio scores:		
Males	0.7	0.9
Females	0.8	1.5
Joint score	5.1	9.6

IV. EFFECTS OF DEMOGRAPHIC CHANGES ON SEX AND AGE RATIOS

A. *Effects of changing mortality*

The foregoing examples relate to populations having constant mortality rates and a constant annual number of births. We shall now consider the variations of sex ratios and age ratios in populations with changing mortality rates, still assuming constant numbers of births.

The life tables upon which the foregoing computations have been carried out are "current life tables", which reflect mortality conditions at a given time. To express the effects of changing rates of mortality to which a given generation has been subjected at various times in their lives, life tables of a different type have sometimes been constructed. The L_x values in such a "generation life table", on the assumption of a constant annual number of births, show regular declines with advancing years similar to those of a "current life table". It is reasonable to conclude that changes in mortality, which are usually rather gradual and systematic over very wide ranges of ages, will not affect the sex ratios and age ratios to any great extent.

Even excessive mortality in years of famine or disease is not likely to affect the regular procession of the ages, since excess mortality, though perhaps greater in some very broad age ranges than in others, is likely to be distributed fairly

regularly among the successive five-year or ten-year age-groups within those ranges. Sex differences in excess mortality, if such exist, are also likely to be evenly distributed within a sufficiently wide range of ages so that differences in the sex ratios from one quinquennial or decennial age-group to the next will not be affected very considerably. Only in cases of excess mortality affecting particular sex-groups and age-groups, such as war casualties, can the effects on sex ratios and age ratios be important. Such cases will be considered later.

B. *Effects of changing numbers of births*

We may now take up the case of a population with changing annual numbers of births. It can be noted in the first place that changing numbers of births will not affect the sex ratios, for the sex ratio at birth is practically constant in populations of substantial size. Survivors to any age will have the sex ratio determined by mortality, regardless of the numbers born. The effect of changes in the number of births upon the age ratios, on the other hand, may be important or not, depending on the type of change which occurs in the number of births.

With a constant mortality and a constant birth rate, population increase or decrease proceeds at a geometric rate, and the annual number of births changes in a constant ratio. Any reasonable geometric rate of change, however, cannot affect greatly the age ratios computed on arithmetic averages of adjacent age groups. This fact can be demonstrated by comparing the age ratios in certain hypothetical stable populations, having rapidly increasing annual numbers of births, with those in the corresponding stationary populations, which have the same mortality but constant annual numbers of births.

Table 8 shows the age ratios, in quinquennial groups, for two hypothetical stable populations, both having sufficiently high birth rates to maintain a fixed rate of population increase at 2 per cent per annum, and the one having the mortality represented by the United States life table of 1929-1931, while the other has the mortality of Chile, 1920. Sex ratios in the stable populations are, of course, practically identical with those in the corresponding stationary populations (shown in table 6). The age ratios in these rapidly increasing populations are in all cases slightly lower than the corresponding ratios in the stationary populations. However, up to age 70, their deviations from 100 are little, if any, greater than those for the stationary populations. The age-ratio scores for the stable populations in table 8 are as follows: 0.5 for males and 0.4 for females under United States mortality; and 1.8 for males and 1.8 for females under Chilean mortality. In the case of the United States these scores are lower, and in the case of Chile somewhat higher than the scores for the stationary population, but the differences are not great.

The conclusion is that a number of births increasing in a fixed proportion will not greatly affect the age ratios, and will tend to give about the same degree of variability in these ratios as a constant number of births. A constantly decreasing number of births may result in somewhat higher age ratios and possibly a somewhat higher age-ratio score, as ratios exceed 100 by slightly larger amounts than they do in the stationary population.

TABLE 8. STABLE POPULATIONS OF LOW AND HIGH MORTALITY. AGE RATIOS DERIVED FROM 1939-1941 LIFE TABLES FOR THE UNITED STATES AND 1920 LIFE TABLES FOR CHILE, ASSUMING, IN EACH CASE, AN ANNUAL INCREASE OF 2 PER CENT

Age group (years)	*United States, 1939-1941*		*Chile, 1920*	
	Males	*Females*	*Males*	*Females*
5- 9	92.2	99.2	94.1	94.1
10-14	99.5	99.5	99.6	99.5
15-19	99.6	99.6	100.2	99.9
20-24	99.5	99.5	99.4	99.3
25-29	99.5	99.5	98.8	99.0
30-34	99.5	99.5	98.9	99.0
35-39	99.6	99.6	98.8	98.7
40-44	99.7	99.6	98.7	98.6
45-49	99.8	99.7	98.1	98.2
50-54	99.9	99.8	98.2	98.5
55-59	99.8	99.9	98.2	98.9
60-64	99.5	100.0	97.7	98.6
65-69	99.0	100.2	96.5	97.6
70-74	97.6	99.6	91.7	93.6
75-79	92.9	96.2	81.0	83.6
80-84	82.4	87.4	69.9	74.1
85-89	66.1	72.1	56.9	61.1
90-94	47.7	53.0	45.1	48.4
95-99	32.0	35.7	32.7	38.6

If the increase of births and population proceeds regularly at an accelerating or decelerating rate instead of a fixed rate, the effect on age ratios will be more important. In all reasonable cases, however, it is unlikely that long-term trends in numbers of births, or long-term trends in population growth under constant mortality, can have any pronounced effects on age ratios.

Fluctuations in annual numbers of births, however, have greater effects. Year-to-year fluctuations, unless extreme, are not very important since, in a period of five or ten years, large and small annual numbers of births often alternate, and an unusual frequency or scarcity of births in a particular year may be, at least partly, compensated by numbers born in the remaining years of a quinquennial or decennial group. Marked effects on age ratios must be expected if changes in numbers of births are abrupt, or cyclical, be-

ing effective within a short number of years. Changes of this type have occurred recently in a number of Western populations where birth rates declined to very low levels in the years following 1930, but rose again in the 1940's. Survivors of groups born at the time when birth rates were lowest consequently are considerably less numerous than the survivors of groups born in the preceding and the following five-year intervals. Some Western populations also experienced large birth deficits during the First World War. In such cases the age-ratio scores may rise quite high, although data are accurate. However, where birth records are kept, the instances of boom or depression in birth rates can be known and their effects can be allowed for in interpreting the age ratios.

C. *Effects of migration*

Sex ratios and age ratios may be affected by immigration and emigration. The extent of distortion depends on the composition and continuity of the prevailing migratory stream, as well as on its size relative to the country's total population. Migrants are often characterized by a prevalence of young men. If emigration or immigration occurs on a relatively large scale for a short time only, this age-sex group in the population is likely to be affected in an important degree. For instance, the effect of large immigration during a few years is likely to be an increase in the sex ratio at ages between about 15 and 35, and a rise in the age ratios for five-year age-groups within this range. If the movement is discontinued or greatly reduced in volume, these effects will be transmitted in subsequent decades to older age-groups of the population.

If immigration or emigration continues over a long period without abrupt changes in its volume, the effects on sex ratios and age ratios will be less noticeable. For instance, a large, continuous immigration consisting chiefly of young men will eventually raise the sex ratios for all age groups from early adulthood onward, but the increases will be more or less uniform, so that these ratios will exhibit a regular pattern of variation from age to age. The age ratios in the age range of young adulthood will be constantly somewhat above the levels that are typical of populations not affected by immigration, but these excesses will be moderate, and their amounts will diminish as age increases.

These effects are illustrated by the sex ratios and age ratios computed for foreign-born whites at the United States census of 1910 (see table 9). The inaccuracies in reporting of ages and omissions from the census enumeration were presumably not very much greater in the case of foreign-born than of native whites.[7] The ratios therefore probably reflect mainly the effects of a large volume of recent immigration following a long period of continuous immigration on a smaller scale. The variations in the sex and age ratios for the total population, due to the addition of the foreign-born whites, were of course much smaller than the variations in the ratios for the foreign-born white population itself. In particular, the foreign-born white group is extremely deficient in children, for only few of their small children were born abroad and those who were born in the United States are of course not counted among the foreign-born white population.

TABLE 9. UNITED STATES, 1910. SEX RATIOS AND AGE RATIOS FOR FOREIGN-BORN WHITES, IN QUINQUENNIAL GROUPS

Age group (years)	*Sex ratio*	*Difference from ratio for preceding age group*	*Age ratio*	
			Males	*Females*
0- 4	102.7	—	—	—
5- 9	101.9	− 0.8	129.2	129.9
10-14	102.4	+ 0.5	72.2	75.4
15-19	109.2	+ 6.8	70.0	82.2
20-24	135.9	+26.7	122.8	122.0
25-29	147.4	+11.5	115.7	109.9
30-34	144.0	− 3.4	98.6	97.3
35-39	136.2	− 7.8	99.0	102.0
40-44	136.2	—	102.4	101.7
45-49	134.0	− 2.2	102.7	103.1
50-54	132.0	− 2.0	101.5	99.3
55-59	121.3	−10.7	88.6	90.3
60-64	112.3	− 9.0	104.5	108.2
65-69	109.6	− 2.7	101.2	101.3
70-74	105.2	− 4.4	95.8	97.8
75-79	102.5	− 2.7	94.5	95.5
80-84	98.5	− 4.0	81.4	83.5
85-89	93.4	− 5.1	66.4	69.3
90-94	86.6	− 6.8	44.5	47.7
95-99	80.2	− 6.4	—	—
100 and over	75.4	− 4.8	—	—

In the circumstances, it is not surprising that the sex-ratio and age-ratio scores are very high for the foreign-born whites. The sex-ratio score works out to 6.5 and the age-ratio scores to 11.7 for males and 10.3 for females. The joint score is 41.5.

Most migrations are selective with respect to age-sex groups. A continuous migratory movement of this kind, however, would have marked effects only on age and sex ratios around the early ages characteristic of recent migrants. Only irregular or discontinuous selective migrations will affect greatly the test ratios at most or all

[7] The possibility of misreporting of foreign-born whites as natives has already been mentioned; it would have greater proportional effects on the data for the foreign-born than on those for the native white population.

ages. The cases in which such migrations have occurred are usually known (e.g., Israel), and the resulting limitations of the testing methods must be borne in mind.

D. *Effects of war*

In some European countries, one or both of the two World Wars have had profound demographic effects. Among the effects of war one may distinguish: war casualties, civilian excess mortality, and a deficit in births. The effects of each of these factors on testing ratios have already been discussed. War casualties affect primarily males of certain age groups; the sex ratios and the age ratios for males are consequently affected, but female age ratios remain largely unaffected. Civilian excess mortality has little, if any, effect on sex ratios and age ratios since the increased risk of dying in times of war affects civilians of both sexes and all ages. A war-time birth deficit affects age ratios of both sexes around the ages of persons born in the war years, but does not affect sex ratios.[8]

The combined effects of war casualties and birth deficits, particularly after two successive wars, can make it very difficult, if not impossible, to test the accuracy of age distributions by the methods discussed here. The number of age-groups affected may be so many that an insufficient number remain on which significant conclusions can be based. The problem can be illustrated by the case of the age distribution of the population of Western Germany at the census of 1946 (see table 10). Previous censuses have shown that Germans are highly accurate in the matter of age reporting. It may therefore be assumed that the irregularities in the ratios are mostly due to real peculiarities in the age structure.[9] Birth deficits are reflected in the female age ratios, which are low for ages 10-19 and 25-29, but high for ages 5-9 and 20-24. Persons aged 25-29, born during 1916-1921, were relatively few owing to the decline in births during the First World War. A recovery in the birth rate in the early 1920's was followed by a decline to low levels during the early 1930's, which is reflected by low age ratios for males and females 10-19 years old. In the later 1930's, the birth rate recovered, but it fell again to a low level during the years of the Second World War—hence the high age ratios for the group 5-9 years old. The effects of military casualties appear in the sex ratios, which may be regarded as "normal" only for ages under 15 and over 60. Unusually low sex ratios for ages 20-34 reflect not only the Second World War casualties but also the fact that in 1946 many men of military ages had not yet returned from captivity; low sex ratios at ages 50-59 are the result of the military losses of the First World War. The combined effects of birth deficits, temporary captivity, and military casualty are such that none of the male age ratios below age 60 can be regarded as "normal".

[8] Some demographers have adduced a certain amount of evidence to support the hypothesis that a higher than usual ratio of male births occurs during or after a major war. Though this may be so, the increase in masculinity of births can only be very slight and can affect sex ratios only to a degree which is negligible if compared to the irregularities in sex ratios arising for different reasons.

[9] It is possible that there were more omissions in the 1946 count than in pre-war enumerations, but their effect on the census age distribution could not have been great.

TABLE 10. WESTERN GERMANY, 1946. SEX RATIOS AND AGE RATIOS IN QUINQUENNIAL AGE GROUPS

Age group (years)	*Population (thousands)*		*Sex ratio*	*Difference from ratio for preceding age group*	*Age ratio*	
	Males	*Females*			*Males*	*Females*
0- 4	1,617	1,550	104.3	—	—	—
5- 9	2,151	2,072	103.8	− 0.5	127.0	127.1
10-14	1,770	1,710	103.5	− 0.3	92.3	90.0
15-19	1,685	1,729	97.5	− 6.0	114.6	94.7
20-24	1,169	1,940	60.3	−37.2	88.8	117.0
25-29	947	1,586	59.7	− 0.6	81.9	84.4
30-34	1,142	1,818	62.8	+ 3.1	95.8	99.7
35-39	1,436	2,061	69.7	+ 6.9	104.4	109.9
40-44	1,609	1,934	83.2	+13.5	111.2	101.7
45-49	1,458	1,741	83.7	+ 0.5	105.5	100.9
50-54	1,154	1,519	76.0	− 7.7	93.3	100.5
55-59	1,016	1,281	79.3	+ 3.3	98.9	98.5
60-64	900	1,080	83.3	+ 4.0	100.7	99.3
65-69	771	894	86.2	+ 2.9	105.2	103.7
70-74	566	643	88.0	+ 1.8	106.2	103.4
75-79	295	350	84.3	− 3.7	85.8	87.3
80-84	122	159	76.7	− 7.6	—	—
85 and over	36	54	66.7	−10.0	—	—

Source: United Nations, *Demographic Yearbook, 1949-50.*

V. Sex ratios and age ratios obtained from highly accurate data

The foregoing considerations lead to the general conclusion that differences between sex ratios for successive quinquennial age groups and deviations of quinquennial age ratios from 100 are likely to be slight for all ages up to age 70 if the statistics are accurate and if the population has not been severely affected by birth cycles, birth deficits, military casualties, and large, discontinuous migrations. This conclusion also holds for populations affected by continuous migration over a long period, except around the ages of early adulthood in which the majority of recent migrants are normally found.

The range of these differences and deviations still needs to be examined by the use of data which are known to be highly accurate. Highly accurate data on ages of the population exist only in a few European countries where civil registers have been established for several generations. The demographic histories of these countries, notably the Scandinavian countries, have been largely similar and do not present a very wide range of different demographic situations. Tables 11 and 12 show sex ratios and age ratios, in quinquennial groups, for the Swedish censuses of 1910, 1920, 1930, 1935, 1940, and 1945.

Table 11. Sweden, 1910-1945. Sex ratios for quinquennial age-groups under 70

Age group (years)	1910	1920	1930	1935	1940	1945
0- 4	104.4	104.4	103.7	104.4	104.2	105.1
5- 9	103.2	103.8	103.9	103.3	104.2	104.0
10-14	103.3	104.2	104.1	103.6	103.3	104.1
15-19	103.3	103.3	104.1	104.0	103.5	103.1
20-24	98.8	102.0	102.2	103.5	103.2	102.8
25-29	96.6	97.2	98.3	102.0	102.9	102.8
30-34	95.7	94.1	96.9	98.6	101.9	102.7
35-39	94.2	94.3	94.3	97.2	98.8	101.6
40-44	90.0	94.7	92.8	94.7	97.2	98.5
45-49	88.2	93.7	93.8	93.1	94.6	96.8
50-54	86.6	89.4	94.2	94.0	92.8	94.1
55-59	87.1	86.7	93.2	93.8	93.1	92.1
60-64	84.8	84.5	87.8	92.5	92.6	91.9
65-69	82.6	83.9	84.4	86.6	90.9	91.3

At the Swedish censuses, ages were reported with precision since they were derived from the population registers with reference to the date of birth; and enumeration was virtually complete. The testing ratios show minor irregularities in these data which, in so far as they cannot be ascribed to any known major causes affecting population trends, must be regarded as chance variations in population trends of the kind to be expected in any population. The high accuracy of the data is confirmed by the general regularity of the ratios and, moreover, by the fact that such minor irregularities as do occur tend to reappear at successive censuses in the corresponding age cohorts, i.e., at ages which are advanced by the number of years of the census intervals. These irregularities result in scores for the ratios of an order of magnitude which cannot be attributed to inaccurate reporting.

Table 12. Sweden, 1910-1945. Age ratios for quinquennial groups under 70

Sex and age-group (years)	1910	1920	1930	1935	1940	1945
Males						
5- 9	99.1	99.0	104.9	95.6	92.0	88.8
10-14	100.6	105.0	100.8	105.4	95.9	92.2
15-19	102.8	101.4	101.9	101.5	105.7	96.1
20-24	99.1	101.4	104.8	101.0	101.1	105.6
25-29	97.4	97.6	98.6	104.7	100.9	101.1
30-34	101.7	99.3	100.2	99.3	104.9	100.9
35-39	100.0	98.4	98.5	100.1	99.5	105.0
40-44	90.0	102.5	100.2	98.6	100.3	99.6
45-49	105.6	100.5	99.1	100.2	98.7	100.4
50-54	102.4	91.5	102.7	99.4	100.3	98.8
55-59	98.6	106.3	101.3	102.8	99.5	100.5
60-64	98.9	102.9	91.9	101.5	103.2	99.9
65-69	—	—	—	—	101.6	103.5
Females						
5- 9	99.8	99.5	104.9	96.2	91.5	89.4
10-14	100.5	104.3	100.8	105.4	96.4	91.8
15-19	100.7	101.3	100.9	101.1	105.4	96.3
20-24	100.7	99.9	104.0	100.4	101.1	105.7
25-29	98.1	98.9	100.1	103.9	100.5	101.1
30-34	101.6	101.2	99.7	100.5	103.9	100.4
35-39	99.0	98.5	99.2	99.8	100.4	103.9
40-44	92.1	101.8	101.6	99.3	100.0	100.6
45-49	105.9	99.1	98.7	101.5	99.3	100.0
50-54	103.7	92.5	102.1	98.9	101.6	99.5
55-59	97.2	106.8	99.4	102.2	99.2	101.8
60-64	99.2	104.1	93.5	99.8	102.7	99.7
65-69	—	—	—	—	100.3	102.9

As expected, sex ratios fall fairly regularly with advancing age because of higher male than female mortality. In a few cases, for accidental reasons, this fall seems to be interrupted. The fall has been more rapid at earlier than at more recent censuses, partly perhaps because of higher mortality in earlier times, but mainly because of past emigration of young men. Greater irregularities appear in the age ratios. For example, birth rates were unusually low in the years 1866-1870, and an unusually small number of male and female survivors born in those years can be traced through subsequent censuses. Again, in the years 1930-1935, the general decline in birth rates, long under way, was accelerated, but after 1935 the rates rose again. As a result, survivors aged 5-9 in 1945 show particularly low age ratios.

Scores resulting from the tests were as follows:

	1910	1920	1930	1935	1940	1945	Mean
Sex-ratio score	1.8	1.7	1.8	1.6	1.1	1.1	1.5
Age-ratio score:							
Males	2.4	2.8	2.4	2.0	2.5	3.2	2.6
Females	2.3	2.6	2.0	1.8	2.3	3.1	2.4

These scores may be compared with those obtained for stationary populations (see p. 65). The mean sex-ratio score for the Swedish census populations is only slightly higher (particularly in earlier years when migration was of more importance) than those computed for the stationary populations. The mean age-ratio scores, for the Swedish populations, are about three to four times as high as those for the stationary populations. The scores were particularly high in 1945, when a major irregularity was registered by the ratio for ages 5-9. The results suggest that a sex-ratio score of approximately 1.5 and age-ratio scores of about 2.5 are to be expected from data which are highly accurate, relating to a population in which demographic trends have, on the whole, been fairly regular. The mean joint score for the Swedish data, 9.4, affords a suitable standard for evaluation of the significance of joint scores obtained from other data.

The scores for the Swedish data are considerably lower than those obtained from the data for Native whites, and much lower than those for Negroes, in the 1910 census of the United States (see p. 64). The excesses of the latter scores over those from the Swedish data may be taken as approximate indications of the extent of inaccuracy in the United States figures.

Age ratios and sex ratios in decennial age-groups have also been computed for the Swedish censuses shown above. The means of scores resulting from the latter computations were as follows: 2.7 as the mean sex-ratio score, 4.8 as the mean score for male age ratios, 4.0 as the mean score for female age ratios, and 16.9 as the mean joint score. It should, however, be noted that the decennial ratios, in the case of Sweden, are powerfully affected by long-term changes in trends, notably in the birth rates.

VI. Sex ratios and age ratios obtained from very inaccurate data

The age distributions shown in the reports of the Indian censuses of 1911, 1921, and 1931 have been selected as representing statistics of low accuracy. Faulty knowledge of ages is to be expected in India, since in that country it is not customary to celebrate birthdays. Also, large sections of the population are illiterate. The difficulties of census taking are such that substantial numbers of people may be omitted from the enumerations.

According to these data (see tables 13 and 14), sex ratios are high at ages 10-14, 35-39, 45-49, 55-59, and 65-69; they are low at ages 0-4, 20-24, and 60-64. It appears that too few females are reported at ages 10-14, and too many at ages 20-24, and that there is a systematic fluctuation in the sex ratio at ages above 30 as a result of more frequent rounding on multiples of 10 in the case of females than in that of males. These fluctuations are considerably smaller in the data for 1931. The sex-ratio scores, 14.0, 12.9, and 5.2, respectively, may be compared with only about 1.5, on the average, in Swedish censuses and indicate very strongly the presence of widespread errors.

Table 13. India, 1911, 1921, and 1931. Sex ratios in quinquennial age-groups

Age group (years)	1911		1921		1931	
	Sex ratio	Difference from ratio for preceding age group	Sex ratio	Difference from ratio for preceding age group	Sex ratio	Difference from ratio for preceding age group
0- 4	97.1	—	96.6	—	97.9	—
5- 9	104.8	+ 7.7	104.1	+ 7.5	109.9	+12.0
10-14	122.5	+17.7	121.7	+17.6	113.6	+ 3.7
15-19	107.6	−14.9	109.2	−12.5	101.1	−12.5
20-24	92.7	−14.9	93.0	−16.2	97.7	− 3.4
25-29	103.3	+10.6	103.3	+10.3	104.8	+ 7.1
30-34	104.1	+ 0.8	104.8	+ 1.5	110.7	+ 5.9
35-39	117.2	+13.1	119.0	+14.2	114.3	+ 3.6
40-44	105.3	−11.9	105.9	−13.1	115.1	+ 0.8
45-49	117.8	+12.5	119.8	+13.9	116.1	+ 1.0
50-54	102.3	−15.5	104.9	−14.9	112.9	− 3.2
55-59	113.1	+10.8	116.2	+11.3	105.9	− 7.0
60-64	88.4	−24.7	94.6	−21.6	101.1	− 4.8
65-69	115.2	+26.8	107.3	+12.7	103.2	+ 2.1
Score		14.0		12.9		5.2

TABLE 14. INDIA, 1911, 1921, AND 1931. AGE RATIOS IN QUINQUENNIAL GROUPS

Age group (years)	1911		1921		1931	
	Males	Females	Males	Females	Males	Females
5-9	111.0	113.8	120.3	124.7	99.1	94.1
10-14	104.4	90.3	107.6	93.6	108.4	101.4
15-19	85.3	85.8	83.4	83.1	84.5	88.7
20-24	94.3	107.1	90.8	103.6	103.6	109.1
25-29	108.6	103.1	108.1	103.4	101.3	99.9
30-34	109.2	113.9	109.9	114.8	105.1	103.2
35-39	85.0	75.9	87.9	77.8	96.1	94.6
40-44	126.5	141.1	120.9	136.3	102.6	102.6
45-49	71.3	63.0	74.2	65.3	96.4	94.8
50-54	155.3	176.5	150.6	170.3	102.2	101.6
55-59	51.2	43.8	52.8	45.7	88.9	91.0
60-64	198.2	254.9	200.8	240.7	114.9	119.5
Score	27.2	37.6	27.4	35.7	6.1	6.2

A comparison of age ratios for the same ages at successive censuses demonstrates the persistence of age biases which are greater than any conceivable irregularities of age structure from real causes; great improvement, however, is evident in 1931. The age-ratio scores are in strong contrast to an average of 2.5 for the Swedish censuses, although the birth-rate trend in Sweden was probably more irregular than in India. The joint scores for India are 107.1 in 1911, 101.8 in 1921, and 27.9 in 1931—all many times higher than the Swedish mean joint score of 9.4.

A great many of the inaccuracies in Indian age statistics find their expression in a quinquennial sawtooth fluctuation. Ratios computed on decennial age-groupings, therefore, show smaller deviations. Decennial sex-ratio scores are 10.1 for 1911, 10.0 for 1921, and 6.6 for 1931. Decennial age-ratio scores are 5.5, 6.5, and 5.0, respectively, for males, and 10.0, 8.0, and 7.3, respectively, for females. Joint scores are 45.8, 44.5, and 32.1. These results may be compared with the decennial sex-ratio scores of 2.5 to 3.0 and decennial age-ratio scores of 4.0 to 5.0, in the case of Sweden, and the Swedish decennial joint score averaging 16.9.

VII. LIMITATIONS OF THE METHOD

Computations similar to those which are discussed above have been made on the basis of a wide assortment of census age distributions for various countries; the results are presented in section VIII. The experience gained in these computations has led to the conclusion that high testing scores reflect to some extent real disturbances in the systematic development of the population (as, e.g., in the examples shown for foreign-born whites in the United States, or for the population of Western Germany after the two World Wars), but usually to a much larger extent the influence of errors in the statistics. However, it cannot always be decided how much of the differences in successive sex ratios and of the deviations of age ratios from 100 should be ascribed to real causes and how much to inaccuracy of data; this fact imposes limitations on the validity of the method.

Another limitation arises from the smallness of some populations. In a small population, relatively great fluctuations of age and sex ratios must be expected since numbers at particular ages are, in part, determined by an element of chance which becomes particularly important where only small numbers are involved.

Finally, some modifications are necessary where an age distribution is not given in quinquennial groups over a wide enough range of ages to permit computation of all quinquennial ratios up to age 70.

A. *Exemption of age-groups affected by irregular demographic trends*

We have already discussed the possible effects of irregular demographic trends on sex ratios and age ratios, and have come to the conclusion that these are important in the cases where a population has been affected in an important measure by birth cycles, birth deficits, military casualties, and migrations, particularly discontinuous migrations.

Where birth cycles, birth deficits, or military casualties have an important effect on the ratios, the tests have to be limited by excluding those age-sex groups which are particularly affected. Sex ratios are independent of the frequency of births but can be affected by military casualties. Female age ratios are generally unaffected by the latter. The effects may, therefore, be such that either certain sex-ratio differences, or certain age-ratio deviations, or both, may have to be eliminated before the average scores are computed. As already pointed out, the cases where

a population has been affected by a birth cycle or by military casualties are generally well known, and the age groups affected can be ascertained at once on the grounds of such knowledge. However, no rule can be laid down as regards the severity of these effects, where sufficiently accurate and detailed vital statistics are not available. The exemption of particular groups from the computation of the score, therefore, must in many cases be left to personal judgment.

Where irregularities in an age distribution have been caused by large migrations, there is often even greater uncertainty as regards the exemption of certain age-sex groups. Knowledge regarding past rates of migration and their fluctuations and regarding the age and sex composition of the migrants is often insufficient to show clearly which age and sex groups should be included in the test and which should be exempted. Populations which have been affected in a large measure by migration, therefore, must be treated with special caution and, if it is uncertain whether the ratios for any group could have been appreciably affected by migration, it is preferable to exempt this group from the scoring.

If too many exemptions of age groups are made, the remaining age groups may be too few to permit the computation of a significant score. As a general rule, where quinquennial data are used, six sex ratios and six age ratios of either sex may be regarded as the minimum for the computation of a significant score. Where so many groups have to be omitted that less than six remain, the applicability of the testing method is doubtful.

The exemption of age-groups from scoring must be more rigorous where accuracy appears to be fairly high than where it is low. This is illustrated by the examples of the age data for Austria in 1939 and for Turkey in 1935 (see tables 15 and 16). When no exemptions are made, a joint score of 26.1 is obtained for Austria and one of 84.9 for Turkey. Both these countries, however, suffered casualties and a birth deficit during the First World War. In the case of Austria, it may be assumed that the sex ratio difference at ages 40-44, male age ratios at ages 15-29 and 35-49, and female age ratios at ages 15-29 are affected to an extent that they should be exempted from scoring. For the same reasons, similar exemptions may be made in the Turkish data. The joint score for the Austrian data is reduced from 26.1 to 11.7 as a result of these exemptions, but the joint score for the Turkish data is not appreciably reduced, because of the great inaccuracies in the data for the remaining age-groups.

TABLE 15. AUSTRIA, 1939, AND TURKEY, 1935. DIFFERENCES IN SUCCESSIVE SEX RATIOS AND DEVIATIONS OF AGE RATIOS FROM 100 FOR QUINQUENNIAL AGE-GROUPS WITHOUT EXEMPTIONS

(Symbols: (1) difference between six ratios for given age-group and for preceding age-group; (2) deviation of male age ratio from 100; (3) deviation of female age ratio from 100)

Age group (years)	Austria, 1939 (1)	(2)	(3)	Turkey, 1935 (1)	(2)	(3)
5- 9	− 0.2	− 4.3	− 4.3	− 2.9	+ 6.2	+10.4
10-14	− 0.1	+ 2.6	+ 3.4	+ 6.4	− 4.1	− 7.5
15-19	+ 1.5	+26.3	+27.2	+ 1.2	−30.1	−29.9
20-24	+ 3.9	−33.7	−36.8	+ 2.0	+26.9	+ 6.1
25-29	− 6.3	+19.5	+20.8	−30.8	− 6.7	+12.5
30-34	− 2.0	+ 1.7	+ 1.6	+ 4.8	+ 5.5	+ 4.3
35-39	− 2.0	+ 8.5	+ 3.4	+ 4.5	+ 7.1	− 8.7
40-44	−11.7	− 3.0	+ 1.6	−27.2	−11.3	+15.0
45-49	− 5.3	− 6.8	− 3.4	+ 8.9	−11.6	−26.6
50-54	+ 0.5	+ 2.1	+ 2.9	−18.5	+11.5	+50.7
55-59	+ 2.0	+ 0.8	− 0.9	+24.4	−19.1	−42.7
60-64	− 0.7	+ 5.8	+ 6.6	−24.1	+33.6	+98.1
65-69	+ 0.7	− 0.1	− 1.2	+36.5	—	—
Score	2.8	8.9	8.8	14.8	14.5	26.0
Joint score		26.1			84.9	

Source: United Nations, *Demographic Yearbook, 1949-50.*

TABLE 16. AUSTRIA, 1939, AND TURKEY, 1935. DIFFERENCES IN SUCCESSIVE SEX RATIOS AND DEVIATIONS OF AGE RATIOS FROM 100 FOR QUINQUENNIAL AGE-GROUPS, WITH EXEMPTIONS

(Symbols: (1) difference between sex ratios for given age-group and for preceding age-group; (2) deviation of male age ratio from 100; (3) deviation of female age ratio from 100)

Age group (years)	Austria, 1939 (1)	(2)	(3)	Turkey, 1935 (1)	(2)	(3)
5- 9	− 0.2	− 4.3	− 4.3	− 2.9	+ 6.2	+10.4
10-14	− 0.1	+ 2.6	+ 3.4	+ 6.4	− 4.1	− 7.5
15-19	+ 1.5	—	—	+ 1.2	—	—
20-24	+ 3.9	—	—	+ 2.0	—	—
25-29	− 6.3	—	—	−30.8	− 6.7	+12.5
30-34	− 2.0	+ 1.7	+ 1.6	+ 4.8	+ 5.5	+ 4.3
35-39	− 2.0	—	+ 3.4	+ 4.5	—	− 8.7
40-44	—	—	+ 1.6	—	—	+15.0
45-49	− 5.3	—	− 3.4	+ 8.9	−11.6	−26.6
50-54	+ 0.5	+ 2.1	+ 2.9	−18.5	+11.5	+50.7
55-59	+ 2.0	+ 0.8	− 0.9	+24.4	−19.1	−42.7
60-64	− 0.7	+ 5.8	+ 6.6	−24.1	+33.6	+98.1
65-69	+ 0.7	− 0.1	− 1.2	+36.5	—	—
Score	2.1	2.5	2.9	13.8	12.3	27.6
Joint score		11.7			81.3	

B. *Limitations due to smallness of the population*

In a very small population the numbers in various sex and age groups are largely a matter of chance, and no great regularity can be expected even if the demographic development were undisturbed and the statistics are exact. The same is

true, to a lesser degree, of somewhat larger populations. Therefore, unless a population is quite large, some allowance must be made in test scores for irregularities arising from chance.

These allowances in test scores deserve special interpretation. The age distribution of a small population, which is largely a result of chance, is not useful for certain statistical computations, such as the calculation of age-specific rates, or of a life table. In a sense, the age distribution of a small population, even if accurate, is of no greater usefulness than that of a large population affected by great inaccuracy in age reporting. If the "usefulness" of the age distribution of a small population is to be determined, no allowance is to be made for test score points due to smallness of the population. If, on the other hand, it is desired to determine whether the accuracy of the statistics for a certain small population is comparable with that of some other population, then a number of points, depending on population size, should be deducted to allow for smallness.

The effect of smallness of the population on test scores can be studied by using quinquennial age data for several counties of varying size in Ontario Province, Canada, given in the reports of the 1941 census of Canada. For the whole of Ontario Province (with a population of 3,787,655), the following scores were obtained: 1.62 for the sex-ratio differences, 2.02 for male age ratios, 1.89 for female age ratios, and a joint score of 8.77. It may be assumed that the enumeration and age reporting in each county were of an accuracy comparable to that of the whole Province. However, the individual counties were undoubtedly subject to great irregularities due to migration from county to county, which had no effect on the age structure of the Province as a whole. The scores for the counties, arranged in descending order of population size, are shown in table 17.

TABLE 17. CANADA, 1941. RESULTS OF AGE-ACCURACY TESTS FOR SELECTED COUNTIES OF ONTARIO PROVINCE WITH VARYING POPULATION SIZE[a]

County	Population	Sex-ratio score	Age-ratio score		Joint score
			Males	Females	
York	951,549	3.31	2.51	2.39	14.83
Carleton	202,520	3.52	3.66	3.48	17.70
Middlesex	127,166	2.68	2.99	3.05	14.08
Waterloo	98,720	4.35	3.84	4.02	20.91
Kent	66,346	5.62	4.41	4.56	25.83
Algoma	52,002	8.39	4.65	2.17	31.99
Leeds	36,042	5.04	3.42	3.17	21.71
Durham	25,215	6.38	7.03	2.91	29.08
Glengarry	18,732	9.67	4.05	5.51	38.57
Dufferin	14,075	9.42	7.75	5.99	42.00
Manitoulin	10,841	10.18	6.90	5.83	43.27
Haliburton	6,695	13.98	5.60	7.53	55.07

[a] Source of data: Canada, Dominion Bureau of Statistics, *Eighth Census of Canada*, 1941, Vol. II, Ottawa, 1946.

If it is true that the accuracy of age reporting in the several counties was comparable—and there is little reason to believe otherwise—it is clear that an increasing number of points must be allowed for smallness of the population, as population size decreases. An attempt has been made to evaluate empirically the manner in which joint scores increase with decreases in population size and a formula for computing the number of score points attributable to smallness of the population has been obtained.[10] With this formula, the joint scores of the counties in the Canadian census (see table 17) can be adjusted as indicated in table 18. The joint scores, after adjustment for smallness, bear no relation to population size. They suggest, but do not prove, that Leeds County had perhaps the most accurate and Algoma County perhaps the least accurate age data.

TABLE 18. CANADA, 1941. JOINT SCORES RESULTING FROM AGE-ACCURACY TESTS FOR SELECTED COUNTIES OF ONTARIO PROVINCE WITH VARYING POPULATION SIZE, WITH ADJUSTMENT FOR SMALLNESS OF THE POPULATION[a]

County	Population	Joint score	
		Without adjustment	With adjustment for smallness
Ontario Prov.	3,787,655	8.77	6.97
York	951,655	14.83	11.24
Carleton	202,520	17.70	9.92
Middlesex	127,166	14.08	4.26
Waterloo	98,720	20.91	9.77
Kent	66,346	25.83	12.24
Algoma	52,002	31.99	16.64
Leeds	36,042	21.71	3.27
Durham	25,215	29.08	7.05
Glengarry	18,732	38.57	13.00
Dufferin	14,075	42.00	12.50
Manitoulin	10,841	43.27	9.65
Haliburton	6,695	55.07	12.30

[a] In order to increase the precision of this comparison, the adjustments have been computed by means of the unmodified formula, and the adjusted scores are those which would obtain if each of these populations were infinitely large. This practice has, however, not been followed in other computations. If adjustments were made by the modified formula, i.e., with no adjustment for populations of one million or more, the adjusted scores for the counties would be increased by 3 points.

Strictly speaking, some allowance, however small, has to be made for populations of any size. Thus, 3.5 points would have to be allowed for a population of one million, one point for a population of 12,250,000, and one-quarter of a point for a population of 196 million. There would be little advantage in applying such small adjustments, since the method of estimating the adjustments is not highly accurate. It has therefore been found convenient to modify the formula in such

[10] See the appendix. Reference is here made to the unmodified formula for populations of any size.

a manner that the influence of population size on score points is disregarded for populations of one million or more, and adjustments by one or more points are applied only to populations of less than one million. There is also an upper limit to the adjustments which can be legitimately applied. The allowances for smallness, computed by the formula, are probably not very reliable for populations of less than 10,000, while for populations of less than 5,000 the method ought to be regarded as inapplicable.

Table 19 shows allowances in joint scores for smallness, according to the modified formula, for populations ranging from one million to less than 5,000. The table has been arranged in the order of the number of points which should be allowed in the scores for populations of given sizes. This table also gives some idea of the sizes of samples required to obtain a representative age distribution at a given level of significance. Thus, if the addition of 20 score points can be tolerated, a sample of the ages of a population should comprise no fewer than 30,000 individuals.

TABLE 19. ESTIMATED ALLOWANCES FOR SMALLNESS IN JOINT SCORES FOR POPULATIONS OF LESS THAN 1,000,000

Points to be allowed in joint score	*Population*	*Points to be allowed in joint score*	*Population*
0	1,000,000 or more	25	15,100–16,199
1	600,000–999,999	26	14,100–15,099
2	400,000–599,999	27	13,200–14,099
3	290,000–399,999	28	12,300–13,199
4	220,000–289,999	29	11,600–12,299
5	170,000–219,999	30	10,900–11,599
6	136,000–169,999	31	10,300–10,899
7	111,000–135,999	32	9,700–10,299
8	93,000–110,999	33	9,200– 9,699
9	78,000– 92,999	34	8,700– 9,199
10	67,000– 77,999	35	8,300– 8,699
11	58,000– 66,999	36	7,900– 8,299
12	51,000– 57,999	37	7,500– 7,899
13	45,000– 50,999	38	7,100– 7,499
14	40,000– 44,999	39	6,800– 7,099
15	36,000– 39,999	40	6,500– 6,799
16	32,000– 35,999	41	6,200– 6,499
17	29,000– 31,999	42	5,900– 6,199
18	26,500– 28,999	43	5,650– 5,899
19	24,000– 26,499	44	5,400– 5,649
20	22,000– 23,999	45	5,200– 5,399
21	20,400– 21,999	46	5,000– 5,199
22	18,800– 20,399	47	4,800– 4,999
23	17,400– 18,799	48	4,600– 4,799
24	16,200– 17,399	49	4,400– 4,599

C. *Decennial and irregular age-groups*

Sometimes, an age-distribution is published in decennial groups only, or in quinquennial groups up to a certain age, followed by decennial groups. It is, therefore, not always possible to compute test scores in quinquennial groups for all ages up to 70, although ratios for some or all of these ages can be computed on a decennial basis.

Quinquennial ratios tend to be influenced more by short-term fluctuations and less by long-term changes in past demographic trends than decennial ratios. The ratios are also differently affected by different types of age errors. Quinquennial ratios are likely to be most strongly affected by accumulations at preferred final digits of age (the phenomenon which is reflected in a quinquennial "saw-tooth" fluctuation). Decennial ratios, on the other hand, are likely to be more strongly influenced by directional biases in age reporting (prevailing tendencies to either overstate or understate age at particular age ranges) and by biases in favour of certain age decennia (e.g., a preference for reporting in the "forties" rather than in the "thirties", or vice versa). Hence, the results of quinquennial and decennial tests are not strictly comparable. Various types of age error are, however, likely to be correlated, and it remains true that irregularities in quinquennial and decennial ratios both point to the same things, namely inaccuracy of data and disturbances of demographic trends.

The correlation of scores derived from quinquennial and decennial groupings can be shown from the examples already used. Quinquennial and decennial age and sex ratios have been computed for native whites, foreign-born whites and Negroes of the United States in 1910, for stationary populations derived from life tables of the United States (1939-1941) and Chile (1920), for Swedish census populations, 1910-1945 (the average of the scores obtained at the several censuses), and for Indian censuses, 1911-1931. The results are compared in table 20.

The difference in degree of accuracy between the statistics for Sweden and those for the native white population of the United States appears to be much greater when it is measured by the quinquennial than by the decennial joint score. In the Indian statistics, likewise, the improvement in accuracy between 1921 and 1931 as indicated by the quinquennial joint score is much greater than that shown by the decennial score. These examples show that in a comparison of the relative accuracy of various age distributions, some in quinquennial and others in decennial groups, the testing ratios might give quite misleading results.

In the applications described below, no decennial age distributions are included, but some distributions composed partly of quinquennial and partly of decennial groups are included. In those cases, the effect of the difference in size of age-groups may not be great enough to seriously upset the comparison; in order to reduce their effect, the ratios computed on the decennial basis

TABLE 20. TESTING SCORES DERIVED FROM VARIOUS AGE DISTRIBUTIONS, IN QUINQUENNIAL AND DECENNIAL GROUPINGS

Age distribution	Sex-ratio score		Age-ratio score				Joint score	
			Males		Females			
	Quinquennial	Decennial	Quinquennial	Decennial	Quinquennial	Decennial	Quinquennial	Decennial
Stationary populations:								
United States, 1939-1941	1.3	2.4	0.7	2.8	0.6	2.6	5.2	12.6
Chile, 1920	1.2	2.4	0.7	0.9	0.8	1.5	5.1	9.6
Sweden, 1910-1945 (average scores)	1.5	2.7	2.6	4.8	2.3	4.0	9.4	16.9
United States, 1910:								
Native whites	2.2	3.8	3.9	4.0	3.6	3.8	14.1	19.2
Negroes	4.4	7.3	7.8	3.9	7.8	8.2	28.8	34.0
Foreign-born whites	6.5	11.8	11.7	22.2	10.3	18.6	41.5	76.2
India:								
1911	14.0	10.1	27.2	5.5	37.9	10.0	107.1	45.8
1921	12.9	10.0	27.4	6.5	35.7	8.0	101.8	44.5
1931	5.2	6.6	6.1	5.0	6.2	7.3	27.9	32.1

were given only one-half the weight assigned to those computed on the quinquennial basis.[11]

VIII. APPLICATION OF THE METHOD IN EVALUATION OF RELATIVE ACCURACY OF CENSUS AGE DISTRIBUTIONS SHOWN IN THE DEMOGRAPHIC YEARBOOK

The method described above has been applied to all census age distributions published in the 1949-50 and 1951 issues of the United Nations *Demographic Yearbook*. In a number of cases, the method was not found applicable, either because irregularities of past demographic development (discontinuous migrations, losses of two wars) made it necessary to omit too many of the ratios, or because the age distribution was presented in decennial or irregular groups. The results are shown in table 21. The table shows also joint scores computed with allowance for smallness (in accordance with table 19) for populations, or samples of a population, smaller than one million.

[11] The tests were applied to such mixed age distributions only if the number of quinquennial ratios plus one-half the number of decennial ratios for ages below 70 was no less than six.

TABLE 21. TEST SCORES OBTAINED FROM CENSUS AGE DISTRIBUTIONS PUBLISHED IN UNITED NATIONS, DEMOGRAPHIC YEARBOOK, 1949-50 AND 1951

[Age distributions indicated with an asterisk (*) have been tested by using all quinquennial groups up to age 70. In all other cases, either not all quinquennial groups were given, or the ratios for some age-groups had to be exempted from scoring in view of irregular demographic development. In the case of age distributions not marked with an asterisk, therefore, the scores are not perfectly comparable.]

Country and year of census	Sex-ratio score	Age-ratio score		Joint score	
		Male	Female	Without adjustment	With adjustment for smallness
AFRICA					
*Algeria (Moslems) 1948	6.3	6.8	6.6	32.3	32.3
Algeria (non-Moslems) 1948	1.9	3.1	2.8	11.6	10.6
Algeria (Moslems) 1936[a]	—	—	—	—	—
Algeria (Europeans) 1936[a]	—	—	—	—	—
*Angola 1940	9.5	12.4	14.3	55.2	55.2
Cape Verde Islands 1940[a]	—	—	—	—	—
*Egypt 1937	11.5	24.6	29.2	88.3	88.3
French Morocco (non-Moroccans) 1947[a]	—	—	—	—	—
*Mauritius 1944	8.2	6.6	10.9	42.1	40.1
Mauritius 1931	3.4	8.2	10.3	28.7	25.7
*Mozambique 1940	12.8	36.2	37.9	112.5	112.5
St. Helena 1946[a]	—	—	—	—	—
São Tome and Principe 1940[a]	—	—	—	—	—
Southern Rhodesia (Europeans) 1946[a]	—	—	—	—	—
South West Africa (Europeans) 1936	4.1	5.2	3.8	21.3	4.3
Tunisia (Moslems) 1946	10.1	7.7	5.2	43.2	43.2
Tunisia (Europeans) 1946	4.1	5.3	5.2	22.8	18.8
*Union of South Africa (non-Europeans) 1946	13.4	6.6	11.1	57.9	57.9
*Union of South Africa (Europeans) 1946	2.1	3.9	3.0	13.2	13.2
AMERICA					
Alaska 1939[a]	—	—	—	—	—
*Argentina 1947	3.6	3.3	3.5	17.6	17.6
*Argentina 1914	6.7	7.0	8.5	35.6	35.6
*Bahamas 1943	6.5	4.8	3.6	27.9	17.9
*Barbados 1946	4.5	5.0	3.9	22.4	17.4

TABLE 21. TEST SCORES OBTAINED FROM CENSUS AGE DISTRIBUTIONS PUBLISHED IN UNITED NATIONS, DEMOGRAPHIC YEARBOOK, 1949-50 AND 1951 (*cont'd*)

Country and year of census	Sex-ratio score	Age-ratio score		Joint score	
		Male	Female	Without adjustment	With adjustment for smallness
AMERICA (*cont'd*)					
*Brazil 1940	3.9	7.0	8.5	27.2	27.2
*British Guiana 1946	4.7	6.0	4.6	24.7	21.7
*British Honduras 1946	4.6	7.0	4.7	25.5	14.5
*Canada 1941	2.5	2.4	1.8	11.7	11.7
*Chile 1940	5.6	4.8	8.5	30.1	30.1
*Colombia 1938	6.3	15.2	17.2	51.3	51.3
*Costa Rica 1927	5.1	7.1	9.9	32.3	30.3
*Cuba 1943	7.8	10.6	8.3	42.3	42.3
*Dominican Republic 1935	7.1	15.7	17.5	54.5	54.5
El Salvador 1930[a]	—	—	—	—	—
*Greenland 1945	4.7	6.1	4.5	24.7	3.7
*Guatemala 1940	6.3	7.9	9.0	35.8	35.8
*Honduras 1945	6.0	8.4	6.6	33.0	33.0
*Jamaica 1943	3.8	8.9	8.8	29.1	29.1
*Leeward Islands 1946	4.4	6.5	4.9	24.6	16.6
*Mexico 1940	3.3	11.7	12.1	33.7	33.7
*Newfoundland 1945	3.6	3.4	4.2	18.4	15.4
*Nicaragua 1940	3.8	5.2	8.7	25.3	24.3
Panama 1940	8.0	6.6	6.8	37.4	35.4
*Peru 1940	5.4	6.9	10.6	33.7	33.7
Puerto Rico 1950[d]	12.4	4.6	6.9	48.7	14.7
Puerto Rico 1940	4.5	6.0	4.3	23.8	23.8
*Trinidad and Tobago 1946	4.9	5.0	6.9	26.6	24.6
*United States 1940	1.9	2.5	2.3	10.5	10.5
*Venezuela 1941	7.9	7.5	11.2	42.4	42.4
*Virgin Islands 1940	6.8	5.7	3.3	29.4	10.4
*Windward Islands 1946	4.0	6.3	5.2	23.5	19.5
ASIA					
Aden Colony 1946	12.8	7.4	7.2	53.0	44.0
British Malaya[a]	—	—	—	—	—
Burma 1931	4.7	6.4	6.1	26.6	26.6
Ceylon 1946	9.6	12.2	11.3	52.3	52.3
Cyprus 1946	3.4	4.4	5.1	19.7	17.7
Federation of Malaya 1947[a]	—	—	—	—	—
Formosa 1940	3.0	3.8	4.2	17.0	17.0
Hong Kong 1931[a]	—	—	—	—	—
India 1931	5.2	6.1	6.2	27.9	27.9
Israel 1931[a]	—	—	—	—	—
Japan 1950[c]	4.5	2.7	2.7	18.9	17.9
Japan 1948	2.0	2.2	3.3	11.5	11.5
*Japan 1940	2.5	2.8	2.8	13.1	13.1
Korea 1944	2.9	3.5	3.2	15.4	15.4
South Korea 1949	2.4	2.6	2.9	12.7	12.7
Palestine 1931[a]	—	—	—	—	—
*Philippines 1939	7.3	15.5	13.4	50.8	50.8
*Portuguese India 1931	9.8	11.6	17.5	58.5	56.5
Portuguese Timor 1936[a]	—	—	—	—	—
Ryukyu Islands 1947	2.8	5.0	3.6	17.0	16.0
Sarawak 1947	7.9	9.2	12.8	45.7	43.7
Singapore 1947[a]	—	—	—	—	—
*Thailand 1947	3.0	4.3	2.4	15.7	15.7
*Thailand 1937	3.8	3.5	3.1	18.0	18.0
Turkey 1945	12.1	13.6	30.6	80.5	80.5
Turkey 1935	14.8	14.5	26.0	84.9	84.9
EUROPE					
Austria 1939	2.1	2.5	2.9	11.7	11.7
Belgium 1947	1.5	3.0	2.8	10.3	10.3
Bulgaria 1934	2.8	4.3	5.0	17.7	17.7
Czechoslovakia 1947[e]	1.5	—	2.1	—	—
Denmark 1945	1.1	2.0	2.3	7.6	7.6
Dodecanese 1947	4.3	5.9	4.5	23.3	16.3
England and Wales 1931	2.2	2.2	1.4	10.2	10.2
Faeroes 1945	8.7	3.5	7.2	36.8	19.8
Finland 1940	2.4	3.3	3.6	14.1	14.1
France 1946	1.3	3.7	2.4	10.0	10.0
Germany 1939[a]	—	—	—	—	—
Germany, Federal Republic 1950[e]	3.1	—	2.3	—	—
Germany, Berlin 1946[e]	2.6	—	3.5	—	—
Germany, Western Germany, 1946[e]	1.9	—	2.0	—	—
Germany, USSR Zone 1946[e]	2.5	—	1.8	—	—
Greece 1940	4.4	4.2	7.4	24.8	24.8
Hungary 1941	2.0	2.8	3.6	12.4	12.4
*Iceland 1940	3.1	3.0	3.0	15.3	8.3
Ireland 1946	1.6	5.3	5.4	15.5	15.5
Italy 1936	1.7	1.4	1.7	8.2	8.2
Luxembourg 1947	3.1	3.4	3.3	16.0	13.0
Luxembourg 1935	2.3	3.5	3.7	14.1	11.1
Malta and Gozo 1948	3.5	6.2	8.5	25.2	22.2
Monaco 1951	5.9	7.3	5.7	30.7	8.7
Netherlands 1947	1.1	1.7	1.6	6.6	6.6
Netherlands 1930	0.9	1.5	1.6	5.8	5.8
Northern Ireland 1937	1.8	3.0	2.7	11.1	11.1
Norway 1946	1.6	2.4	1.8	9.0	9.0
Norway 1930	2.3	2.9	2.4	12.2	12.2
Poland 1949[b]	2.5	4.4	4.4	16.3	16.3
Poland 1931	3.5	2.9	3.5	16.9	16.9
Portugal 1940	2.5	3.4	3.7	14.6	14.6
Romania 1948[a]	—	—	—	—	—
Romania 1930	9.6	10.7	21.9	61.4	61.4
Saar 1946[a]	—	—	—	—	—
Scotland 1931	2.9	2.2	1.5	12.4	12.4
Spain 1940	2.6	3.9	2.8	14.5	14.5
Sweden 1945	1.2	2.1	1.9	7.6	7.6
*Switzerland 1941	1.8	2.7	2.7	10.8	10.8
USSR 1939[a]	—	—	—	—	—
Yugoslavia 1948	3.9	5.0	5.7	22.4	22.4
Yugoslavia 1931	5.3	4.0	8.7	28.6	28.6
OCEANIA					
*American Samoa 1940	8.7	9.3	5.6	41.0	13.0
Australia 1947	2.4	1.7	2.2	11.1	11.1
Australia 1933	1.6	2.4	2.7	9.9	9.9
Cook Islands 1945	13.0	5.6	8.5	53.1	26.1
Gilbert and Ellice Islands 1947	6.5	9.7	12.6	41.8	26.8
Guam 1940	7.6	5.1	4.7	32.6	12.6
Hawaii 1950[a]	—	—	—	—	—
Hawaii 1940[f]	—	2.7	4.4	—	—
New Zealand (excl. Maoris) 1945	3.7	4.0	3.3	18.4	18.4
*New Zealand (Maoris) 1945	7.0	8.3	5.8	35.1	27.1

[a] No significant scores could be obtained.
[b] Based on a sample of 4.4 per cent of the population. The sample exceeds one million.
[c] Based on a sample of 1 per cent of the population.
[d] Based on a sample of 8,700 individuals.
[e] No significant male age-ratio score could be computed.
[f] No significant sex-ratio score could be computed.

Altogether, the age data of 129 censuses were examined. The method of deriving a joint score was found fully applicable in 102 cases, in 43 of which the score could be computed with reference to all quinquennial groups below age 70. (These 43 cases are marked with an asterisk). In the case of six censuses, scoring was found only partially applicable (no significant male age-ratio scores could be derived for recent censuses of Czechoslovakia and Germany, owing to the losses of two wars, and no significant sex-ratio score could be derived for Hawaii, owing to irregular immigration in the past). In 21 cases, the method was inapplicable, because sufficient detail was not published, because too many age-groups were affected by irregular development in the past, or because the population was too small.

In the light of the various limitations of the method, the joint scores should not be considered as a perfect measurement of the degree of inaccuracy of age statistics. The scores measure, more or less approximately, those inaccuracies which find expression in quinquennial groups, though there may be many errors which do not affect the regularity of the quinquennial grouping. To a greater or smaller extent, the scores also reflect irregularities in the age structure which have arisen from real causes, though it cannot be said in the individual case to what precise extent the scores are so affected. Nevertheless, the wide range in the scores which were obtained can very well be used as an approximate scale for purposes of comparison.

In order to summarize the results of these computations, it was decided to establish three classes, with scores of 20 and 40 being the dividing marks. Depending on whether or not allowance is made for the smallness of some populations (and the smallness of samples, if age data were derived from a sample), the number of cases in each class appears as follows:

Classes defined by joint score	*Number of instances*	
	Without allowance for smallness	*With allowance for smallness*
I. Joint score less than 20	43	57
II. Joint score between 20 and 40	34	25
III. Joint score over 40	25	20
Total number of age distributions for which joint scores have been computed	102	102

If we wish to describe the general usefulness, or reliability, of the several age distributions for purposes of statistical manipulation, we shall have to regard the joint scores obtained without adjustment for smallness. In this manner, we may describe 43 age distributions as at least reasonably reliable, 34 as fairly unreliable, and 25 as quite unreliable. If, on the other hand, we merely wish to determine the degree of accuracy with which the ages have been recorded, we must consider the scores which remain after reduction for smallness. We may then class 57 of the age distributions as at least tolerably accurate, 25 as markedly inaccurate, and 20 as greatly in error.

APPENDIX

Score points attributable to smallness of the population

A joint score computed from sex ratios and age ratios may be considered as comprising three components. One part of the score may reflect irregularities of demographic trends. However, by exempting some of the ratios from scoring—as explained in section VII A—this component can be largely eliminated. The other two components arise from the inaccuracy of the data and from the smallness of the population. If we call J the unadjusted joint score, A the component which reflects age accuracy, and S the component arising from the smallness of the population, we may interpret this latter component in such a way that

$$J = A + S$$

For certain theoretical considerations there is reason to believe that the component arising from smallness is a function of the reciprocal of the square root of the population and approximates, at least for a fairly wide range of population sizes, the formula

$$S = \frac{B}{\sqrt{P}}, \text{ so that } J = A + \frac{B}{\sqrt{P}}$$

where P is the size of the population and B is a constant. That this relation holds approximately will appear from the observations presented in the following paragraphs. Assuming this relation to be correct, it is necessary only to determine the constant B from a sufficient number of observations.

The formula

$$J = A + \frac{B}{\sqrt{P}}$$

is really a straight-line regression of J on $\frac{1}{\sqrt{P}}$. The constant B can therefore be determined by the method of least squares, given a

sufficient number of observations of J and P in which A may be regarded as uncorrelated with P. This has been done in three separate experiments.

The unadjusted joint scores for twelve selected counties of Ontario Province[1] have already been shown in table 17 (p. 73). Though age accuracy as well as the regularity of demographic trends may vary among these counties, this variation is probably fairly independent of the population size. If the scores are plotted on a graph, with the scores as the ordinate and the reciprocal of the square root of the population as the abscissa, they appear to follow a linear trend. By the method of least squares, the equation of this straight line was found to be

$$J = 8.99 + \frac{3{,}710}{\sqrt{P}}.$$

The value of 8.99 may then be interpreted as an estimate of the average score of these counties arising from age errors or other irregularities, which would be obtained if the population were infinitely large, while the value 3,710 may be regarded as an estimate of the constant B.

The same experiment was applied to the age data of the 1946 Census of the British West Indies for the eleven islands in the Leeward and Windward groups with populations of more than 5,000. The population and unadjusted score of each island were as follows:

Island	*Population*	*Joint score*
Grenada (including Carriacou)	72,387	33.8
St. Lucia	70,113	35.0
St. Vincent (including the Grenadines)	61,647	30.5
Dominica	47,624	24.4
Antigua	40,778	30.2
St. Kitts	29,818	32.0
Montserrat	14,333	38.4
Nevis	11,388	48.9
Carriacou	6,769	52.7
Tortola	5,421	74.9
Anguilla	5,037	60.8

From these data, the straight-line regression was found to be

$$J = 14.2 + \frac{3{,}516}{\sqrt{P}},$$

with 13.9 as the estimated average score if the population were infinite, and 3,516 as another estimate for the constant B.

Finally, the same experiment was made with the eleven districts of Barbados, using again the data of the 1946 Census of the British West Indies. The population and unadjusted joint score of each district were as follows:

District	*Population*	*Joint score*
Bridgetown and St. Michael	76,437	25.8
Christchurch	24,963	32.7
St. Philip	14,876	34.0
St. George	14,409	37.5
St. James	11,297	43.8
St. John	10,096	54.4
St. Peter	9,127	50.6
St. Thomas	8,486	47.4
St. Lucy	7,816	52.8
St. Joseph	7,712	49.4
St. Andrew	7,581	46.2

and the regression was found to be

$$J = 11.5 + \frac{3{,}437}{\sqrt{P}}.$$

We have therefore three estimates for the constant B, namely 3,710, 3,516, and 3,437. It is obvious that estimates based on the regression of eleven or twelve observations cannot be very accurate. Moreover, the presence of a slight correlation between population size and age accuracy, or population size and regularity of demographic trends, is not altogether impossible. Thus, it might be argued that in some of the remote and less-populous counties of Ontario part of the population is less well-educated and greater difficulties are encountered by enumerators than in the more densely settled counties. Similarly, in some of the smallest West Indian islands employment opportunities are not as diversified as in some of the larger islands, with consequently greater proportions of males in working ages emigrating from smaller islands. Nevertheless, there is some assurance that the true value of B, if that could be found, should be between 3,400 and 3,700.

For the purpose of computing a table of values of score allowances, it is more convenient to employ a multiple of 500, and it has therefore been assumed that the constant B is equal to 3,500. The formula (unmodified) for computing score allowances for populations of any size (including also large populations) has therefore been assumed as

$$S = \frac{3{,}500}{\sqrt{P}}.$$

This formula was employed in adjusting the scores of the Canadian counties (see table 18).

For the sake of greater convenience, it was decided to modify this formula in such a way that the small allowances for populations of one million or more could be disregarded. According to the unmodified formula, the precise score allowance for a population of one million should be 3.5 points. If only integral numbers of score points are considered, 3 points have to be allowed for populations ranging from a million to 1,960,000, and 4 points for populations of 604,938 to one million. If we disregard allowances for populations of a million or more, allowing only

[1] The counties were selected in such a way as to constitute a good assortment of widely varying population sizes.

one point for populations of *circa* 600,000 to 999,999, and more points for smaller populations, the allowance S in the unmodified formula must be reduced by 3, giving the modified formula:

$$T = \frac{3{,}500}{\sqrt{P}} - 3.$$

The population for which a given number of points must be allowed can be computed by transforming this formula to:

$$P = \frac{12{,}250{,}000}{(T + 3)^2}.$$

Table 19 has been computed by this formula. The ranges of population size for each given integral number of score points were determined by substituting $T + \frac{1}{2}$ and $T - \frac{1}{2}$ for each integral value of T. The resulting values were rounded for greater convenience.

Confirmation of the approximate validity of this formula can be found from the following observations (see table 21).

1. For Luxembourg 1935, Luxembourg 1947, Monaco 1951, and France 1946 unadjusted joint scores were 14.1, 16.0, 30.7, and 10.0, respectively. After adjustments for smallness, these scores were reduced to 11.1, 13.0, 8.7, and 10.0, respectively. The latter values are much more nearly uniform, despite great variations in population size (about 20,000 for Monaco and 40 million for France). It is only reasonable to assume that ages had been reported with comparable accuracy.

2. The unadjusted joint score for Iceland (population 121,474) of 15.3 is reduced to 8.3, which is near the scores for large Scandinavian populations (7.6 for Sweden 1945, 7.6 for Denmark 1945, and 9.0 for Norway 1946).

3. The unadjusted score for Puerto Rico 1950 (based on a sample of 8,700 individuals) was 48.7; after adjustment for the smallness of the sample, it was reduced to 14.7. The score for the entire population of Puerto Rico in 1940 amounted to 23.8. It is reasonable to assume that accuracy was greater in the sample of 1950 than in the census of 1940.

4. Unadjusted scores for New Zealand (Maoris) 1945, Gilbert and Ellice Islands 1947 and Cook Islands 1945 were 35.1, 41.8, and 53.1, respectively. After adjustment, these were reduced to 27.1, 26.8, and 26.1, respectively. It is reasonable to assume that accuracy was comparable in the three cases.

5. The score for St. Helena 1946 (population 4,758) is not shown in table 21. The unadjusted score was 60.8 which, after reduction by 48 points, became 12.8, suggesting that the data were fairly accurate, which seems reasonable.

Nevertheless, in the cases of some populations, adjustments for smallness do not give satisfactory results. Thus, the adjusted score for Europeans in South West Africa 1936 amounts to only 4.3, and that for Greenland 1945 to only 3.7, both of which appear too low even if ages had been reported with the greatest accuracy. The adjusted score for the Faeroe Islands 1945, on the other hand, amounts to 19.8, which appears too high if compared with scores for other Scandinavian populations.

It appears, therefore, that adjustments for smallness by the methods outlined give satisfactory results in many, but not in all cases, and that adjusted scores should be regarded with some caution, particularly where the population is very small.

A more adequate investigation of the influence of population size on the significance of age returns is desirable. The results of such an investigation may be of considerable value in determining the size of a sample which would be necessary in a given case to obtain significant age data or, conversely, to ascertain the reliability of age data secured in a sample of given size. The treatment of this problem in the present study is only preliminary.