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POPULATION PROJECTIONS FOR PLANNING PURPOSES

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POPULATION PROJECTIONS[1] FOR PLANNING PURPOSES

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1/ The views expressed in this document are not necessarily those of United Nations organs or Member countries.

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INTRODUCTION

Demographic phenomena are of considerable importance in economic development: while some authors are primarily interested in aggregates such as the volume of production or the volume of consumption, notions such as production or consumption per capita - taking into account the factor "total number of population" - are in practice of undoubted interest.

Hence it would seem desirable to begin any economic and social planning by a sound population analysis, extended by projections (population forecasts) : these basic elements will enable various consequences to be foreseen, relating in particular to various needs of the population in the future, personal needs such as food, or household needs such as housing.

The following report is divided in accordance with these preliminary comments into three parts:

(a) Basic population forecasts, in which strictly demographic projections are made;

(b) Effects on the evolution of future incomes, which will make it possible to describe very roughly what levels of living may be attained in future;

(c) Effects on the probable evolution of various needs, both personal and household ones.

Note: Most of the numerical examples will be taken from French statistics which are the most easily accessible to the author. It seemed preferable to do this for reasons of convenience, although many of the developing countries already have a sufficient quantity of population statistics to supply examples.

A. BASIC POPULATION FORECASTS

The basic population forecasts are those concerning the total number, the sex and age distribution, the geographical distribution and the family size.

The principal methods used for working them out will be described below, after a brief introduction concerning fertility (or birth) rates and death rates.

A 1 THE FERTILITY (AND BIRTH) RATE

A 1.1 The age-specific fertility rate measures approximately the probability that a woman of a given age will have a child during the year.

It is calculated as an observed frequency of births. For example if, in a given population, 1,000 women aged between 30 and 31 gave birth in 1960 to 180 children of either sex, the fertility rate of that population for the year 1960 is 180%: it is supposed that a woman of 30 has a probability equal to 180% of having a child in the year.

A 1.2 At a given period, the age-specific fertility rate varies as a function of the women's age according to a certain curve shown below (see page , figure 1).

The shape of this curve is a general one:

Before the age of 15 (puberty), the fertility rate is practically zero;

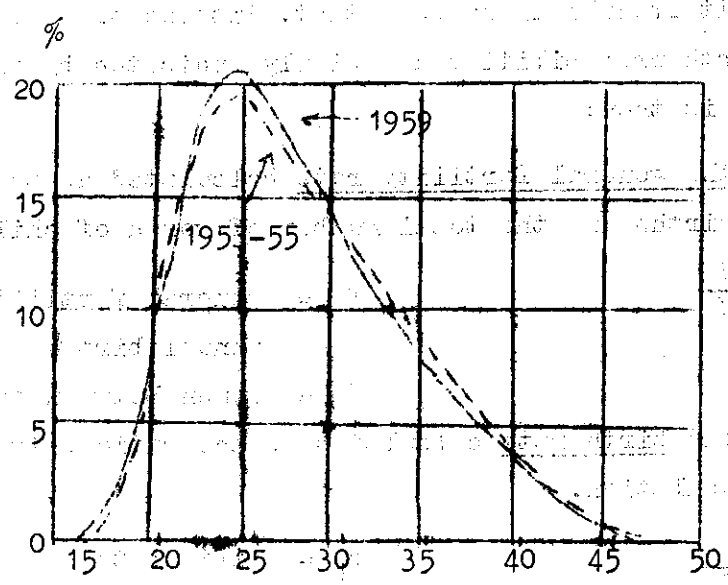
After 45-50 (menopause) the fertility rate is also zero;

The fertility rate passes through its maximum around 25 year of age.

This rate also varies, for a given country, in relation to the mother's legal status (legitimate fertility rate considerably higher than illegitimate fertility rate).

Fig. 1. Age-specific birth probabilities (Number of live-born children per 100 women of each age-group) (France)

Source : INSEE
(Institut National de la Statistique et des Etudes Economiques)



A 1.3 The age-specific fertility rate varies over time: it can generally be accepted that, as a country develops, its fertility rate at the various ages decreases.

However, this is not an absolute law and there are many exceptions. (Fig.1: in France there has been a recovery of fertility since the second world war).

A 1.4 It frequently happens that, instead of showing the curve in Figure 1, birth probabilities are simply indicated by one figure: the concept used is then:

either the general fertility rate calculated as the ratio between annual births and the total number of women of child-bearing age

(1) $$f = \frac{B}{W}$$

f = general fertility rate
B = annual births
W = women between 15 and 45 years of age

or the birth rate calculated as the ratio between births and total population.

(2) $$r_b = \frac{B}{P}$$

r_b = birth rate
B = annual births
P = total population

The birth rate is about a quarter of the general fertility rate, since the number of women aged between 15 and 45 represents about one-quarter of the total population.

I. General fertility rates and birth rates

Country	General fertility rate (1)	Birth rate (2)	Ratio $\frac{(2)}{(1)}$
Non-Moslem Algeria 1954	76	19	0.25
France 1954	79	19	0.24
Moslem Algeria 1948	200	45	0.23

A1.5 Just as, in a given population, the age-specific fertility rate tends to decrease over time, the general fertility rate and the birth rate diminish fairly regularly over time.

Thus, for France, the birth rate which was about 4 per cent in the middle of the 18th century (physiological birth rate) decreased steadily and reached a figure slightly below 2 per cent around 1930-1940. (See page 10 Figure 2).

It can be seen from Figure 2 that after the second world war the French birth rate was slightly higher than before the war.

A2 THE DEATH RATE

A2.1 The death rate measures approximately the probability that a person of a certain age (and a given sex) has of dying during the year.

Just as for the age-specific fertility rate, the probability is assimilated to the recorded frequency: thus, if 1,000 men aged 50 only numbered 980 at the end of a year, it can be said that the male death rate at 50 is 20/1,000 = 2 per cent.

A2.2 The death rate varies from one age to another, and also in relation to sex. The curves representing death rate are shown below for France (see page Figure 3). It will be noted that:

The death rate is very high for the age periods of infancy (very high infant mortality),
it is also very high above 50-60 years of age,
lastly, between the ages of 5 and 20, the death rate passes through a very low minimum.

As Figure 3 shows, the age-specific death rate curve for men is always above that for women; that is to say, at the same age the male death rate is always higher than the female death rate (excess male mortality).

Fig. 2. Evolution of birth and death rates since 1801 (France)

Number of births and deaths per 1,000

Source: INSEE

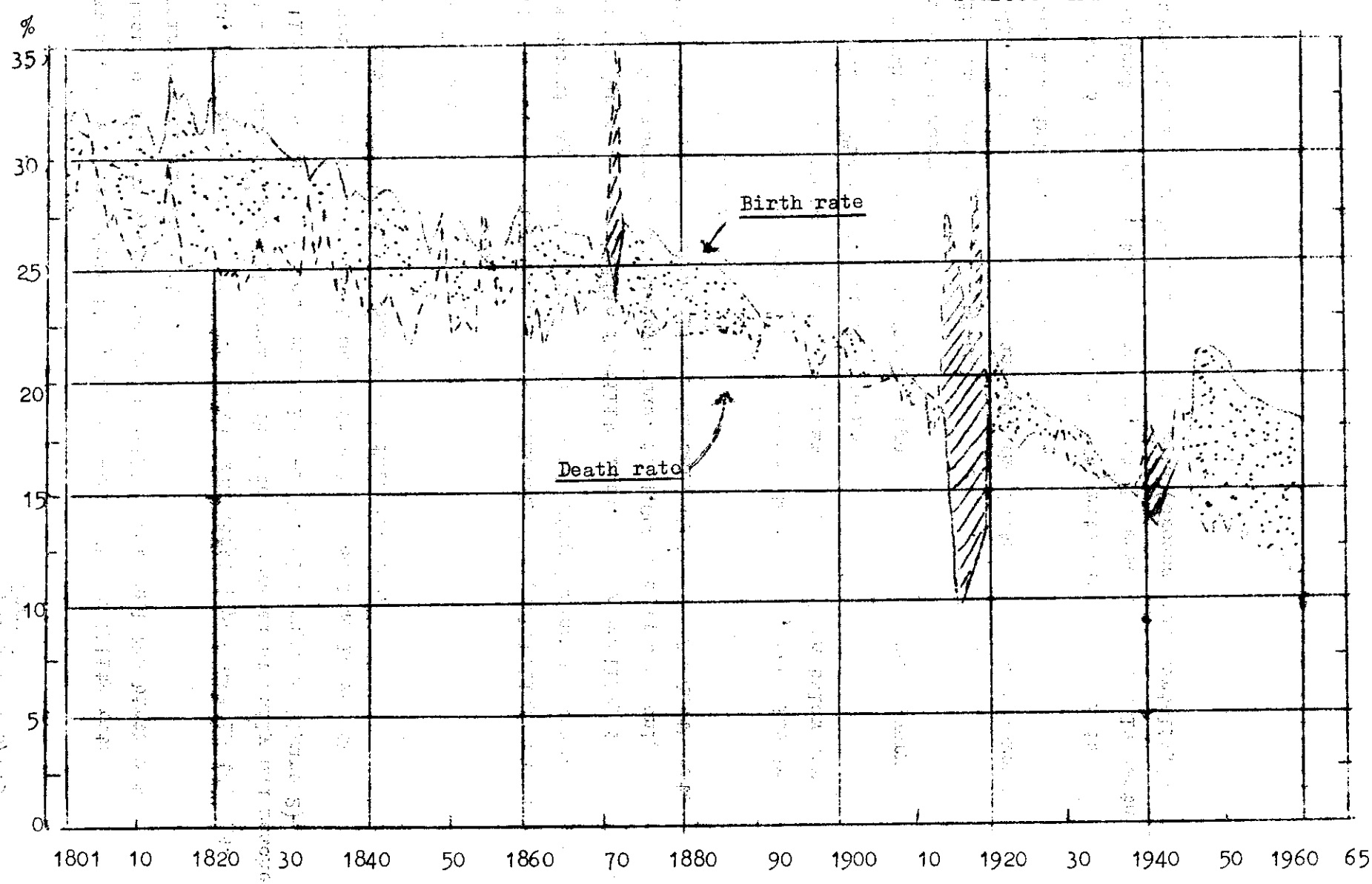
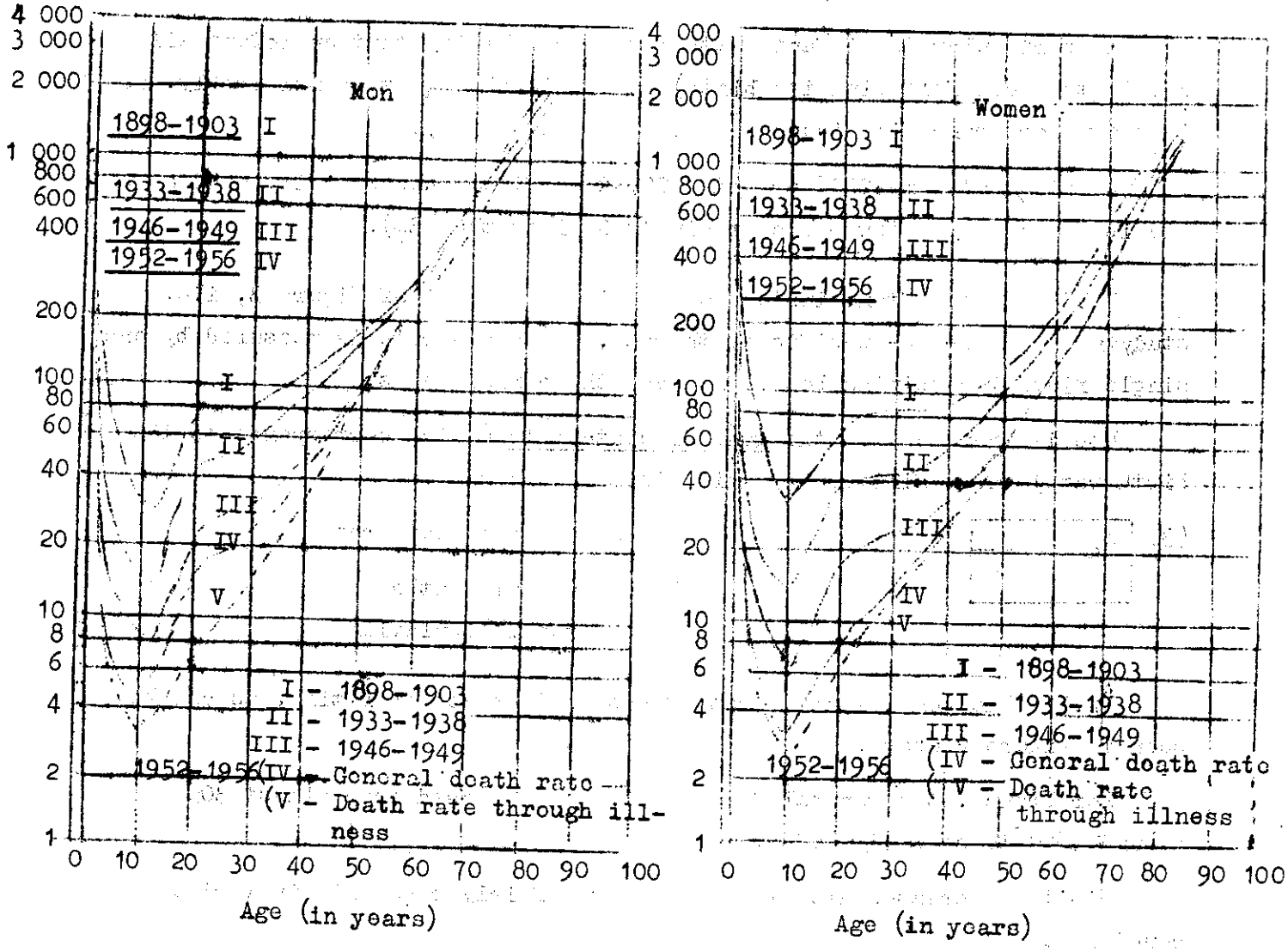


Fig. 3. Age-specific probabilities of death at different periods (France)
Number of death between ages a and a + 1 per 10,000 survivors at age a.

Source: INSEE



A 2.3 The age-specific death rate varies over time (cf. Fig. 3): it can be seen that it decreases steadily over time as the country develops, owing to a number of effects: stricter hygiene, curative medicine, preventive care etc.

In particular the infant death rate (probability that an infant will die in the year following its birth) has diminished quite considerably, as is shown for France in Figure 4 below (see page).

Starting at some 200‰ around 1800, this figure has steadily decreased and is today only a few per cent (in 1960: less than 3‰).

A 2.4 Quite often, instead of keeping the curve of Figure 3, i.e. studying the sex-age-specific death rate, the death rate is measured by one single figure, combining both sexes and the various ages.

Use is then made of the general death rate (which corresponds to the birth rate) the definition of which is as follows:

(3) $$r_d = \frac{D}{P}$$

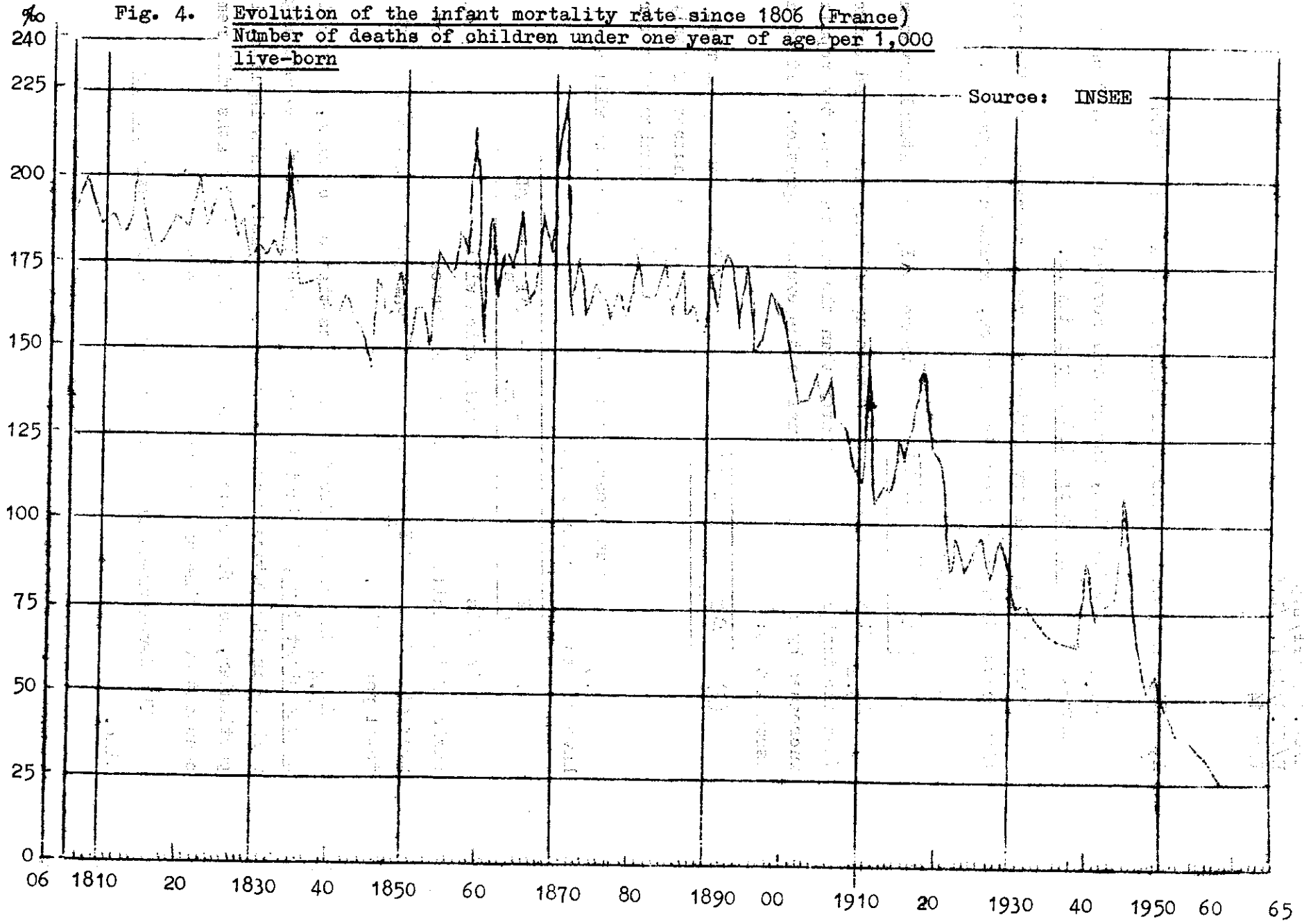
r_d = general death rate
D = annual deaths
P = total population

A 2.5 The general death rate tends to decrease over time, as can be seen in Figure 2 above.

For France, the general death rate has decreased from almost 30‰ around 1800 to some 10‰ today.

Similar decreases are also to be noted fairly regularly in various countries.

Fig. 4. Evolution of the infant mortality rate since 1806 (France)
Number of deaths of children under one year of age per 1,000 live-born



A_3 NATURAL MOVEMENT AND DEVELOPMENT OF TOTAL POPULATION

$A_{3.1}$ By definition, the natural movement of a population is measured by the excess of births over deaths.

Hence the natural movement of a given year represents the population growth during the year in question, excluding migration.

Let us assume:

(4) $\boxed{\Delta P_n = B - D}$ where ΔP_n = natural movement

$A_{3.2}$ Migratory movement is made up of immigrations and emigrations. When the immigrations are greater than the emigrations, the population increases by a net balance equal to the excess migration. It is again assumed that:

(5) $\boxed{\Delta P_m = I - E}$

ΔP_m = excess migration
I = number of immigrants
E = number of emigrants

$A_{3.3}$ During any year, present, past or future, we will always have the following equality:

(6) $\boxed{P_{31\ Dec.} = P_{1\ Jan.} + \Delta P_n + \Delta P_m}$

It is this recurrence formula which will make it possible, on the basis of the initial situation and of forecasts of the future development of ΔP_n and ΔP_m, to work out demographic projections of the total population.

$A_{3.4}$ One of the first assumptions that can be made, particularly in the short term, is that the natural increase and the excess migration will be in the future what they were in the past. This implies, in particular, for the natural excess that births and deaths will remain constant over time or will vary by the same amounts.

The development of the population then follows a linear law over time.

$A_{3.5}$ Another way of operating is to note that the growth of total population can be expressed in the form:

$$P_{31\ Dec.} = P_{1\ Jan.} + \left(\frac{\Delta P_n}{P_{1\ Jan.}} + \frac{\Delta P_m}{P_{1\ Jan.}} \right) \times P_{1\ Jan.}$$

that is:

$$(7) \quad \boxed{P_{31\ Dec.} = P_{1\ Jan.} \times \left(1 + \frac{\Delta P_n}{P} + \frac{\Delta P_m}{P}\right)}$$

The first term $\frac{\Delta P_n}{P}$ represents the <u>crude rate of natural increase</u> of the population and is simply the difference between the birth rate and the general death rate:

$$\frac{\Delta P_n}{P} = \frac{B - D}{P} = \frac{B}{P} - \frac{D}{P} = r_b - r_d$$

The second term $\frac{\Delta P_m}{P}$ represents the <u>rate of increase by migration</u> of the population. It measures the difference between the rate of immigration $\frac{I}{P}$ and the rate of emigration $\frac{E}{P}$:

$$\frac{\Delta P_m}{P} = \frac{I - E}{P} = \frac{I}{P} - \frac{E}{P}$$

Assuming that the crude rate of natural increase and the rate of increase by migration are constant over time[1/], the development of the total population can be represented in the form of a rational geometric progression:

$$1 + \frac{\Delta P_n}{P} + \frac{P_m}{P}$$

The population development is then an <u>exponential</u> function of time.

1/ This assumption with regard to the crude rate of natural increase - difference between birth rate and death rate - implies that both the birth and the death rate develop in the same way over time (the two rates must either remain constant or diminish by the same number of points).

A_4 SEX AND AGE STRUCTURE AND THEIR DEVELOPMENT

$A_{4.1}$ It frequently happens that either the two assumptions made above do not apply or it is necessary to know the sex and age structures in the future.

It is then necessary to make a slightly less rough calculation than previously by using the development of the population pyramid.

$A_{4.2}$ The population pyramid at a given time (1 January 1960 for example) represents an instantaneous photograph of the population at that time.

For example, Figure 5 describes the structure of the French population at 1 January 1960 (see page , Figure 5).

The numbers of males are shown on the left of the vertical axis giving the ages, and the numbers of females are shown on the right.

The pyramid broadens out more or less at the base according to whether the population is more or less young demographically.

$A_{4.3}$ If we can pass from the pyramid of 1 January 1960 to that of 1 January 1961, it is clear that the reasoning could be extended to pass from that of 1961 to that of 1962, and so on: there is a récurrence, which will make it possible to draw all the pyramids of the future.

It is therefore sufficient to see how we can pass for example from the pyramid of 1 January 1962 to the pyramid of 1 January 1963.

$A_{4.4}$ Between these two dates, the change in shape of the pyramid arises from three main causes, assuming there are no external exchanges of population:

There is a general ageing of the population: everybody ages by one year. For example, those who were 30 years and 2 months old at 1 January 1962 will be 31 years and 2 months old at 1 January 1963,

Fig. 5 : Age and sex distribution of the population in 1960

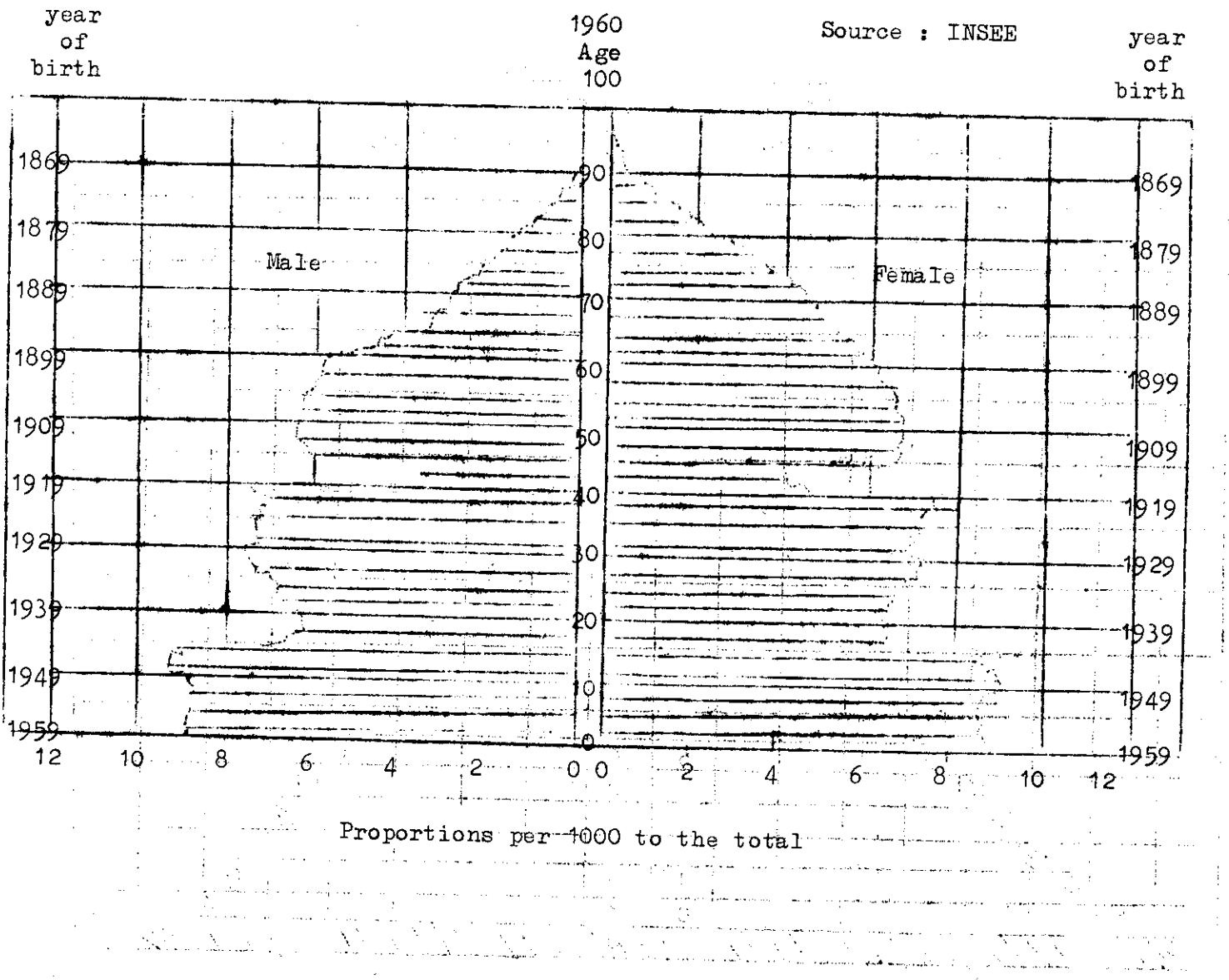
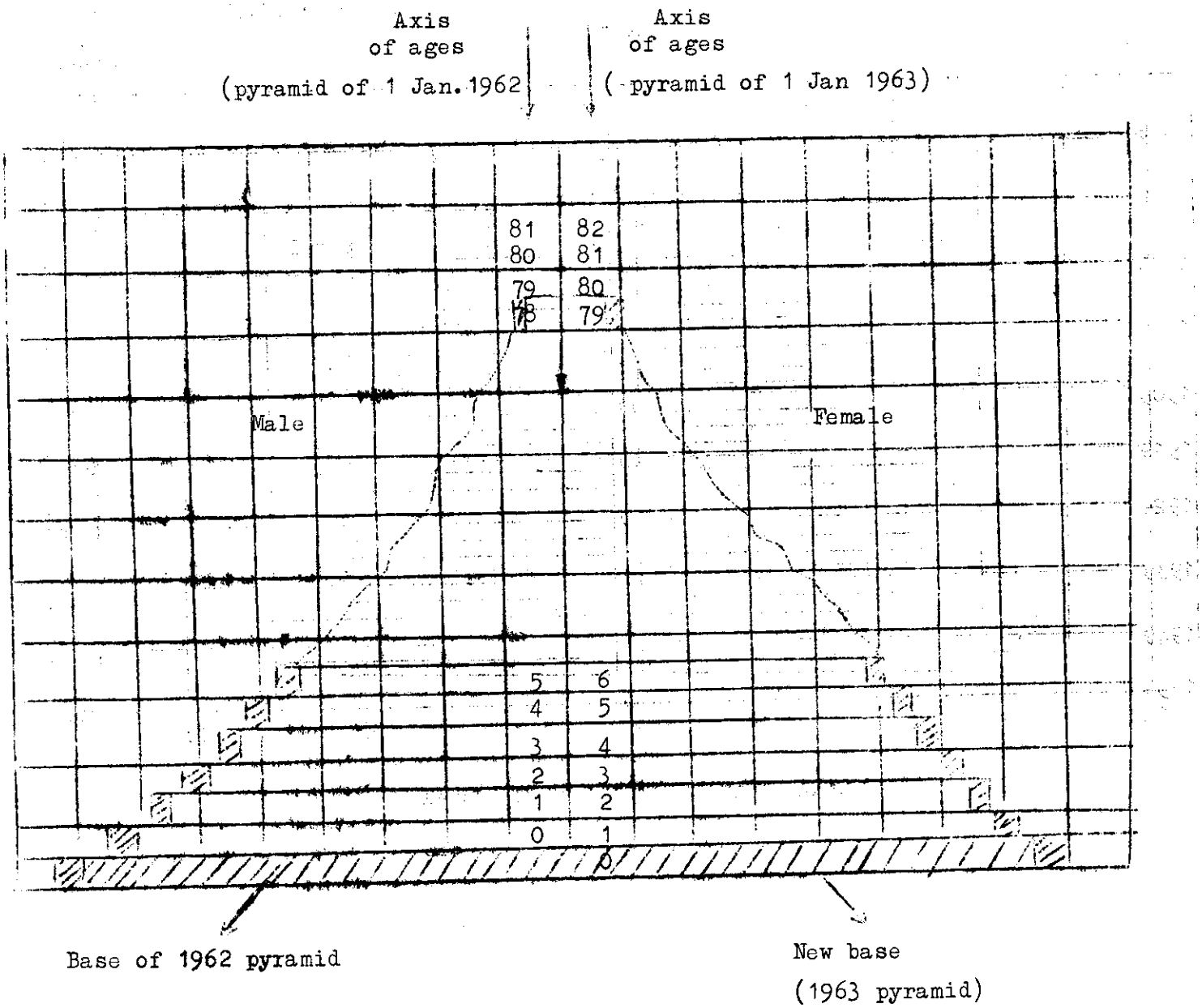


Fig. 6 : Passage from the pyramid of 1 January 1962 to the pyramid of 1 January 1963



new persons appear, their numbers corresponding to the births in 1962. These births are derived from the women of child-bearing age, i.e. aged between 15 and 45-50, and are distributed between the sexes according to the masculinity ratio at birth, that is, roughly in the proportion of 105 boys to 100 girls;

a certain number of persons disappear through death.

These three effects have to be taken into account in order to draw the pyramid at 1 January 1963.

$A_{4.5}$ In practice, ageing is reflected in a shifting of the axis of ages by one year: all the persons who were between 30 and 31 old at 1 January 1962 must now be between 31 and 32. Thus, in relation to the pyramid of 1 January 1962, the pyramid of 1 January 1963 will have its base shifted one year lower (see page Figure 6).

$A_{4.6}$ The women of child-bearing age will give rise to a certain number of births. An estimate of the age-specific fertility rate for the year 1962 will make it possible to calculate the number of births in the year according to the formula:

$$B = \sum_{15}^{45} f \times W$$

B = births in 1962

f = age-specific fertility rate forecast for 1962

W = numbers of women of each age appearing in the 1962 pyramid

A distribution between boys and girls in the ratio 105/100 will give the numbers of boys and girls born in the year.

These totals will be inserted in the pyramid (Figure 6) in the one-year interval between the former base (1 January 1962) and the new one (1 January 1963) (lightly shaded part).

$A_{4.7}$ The numbers of the population disappearing through death at every age obviously depend on the sex of the total numbers of that age and on the death rate at that age and for the year 1962. Estimates

of the sex-age-specific death rate for 1962 will make it possible to calculate the deaths for each age group.

These deaths will be withdrawn from the population pyramid in Figure 6 (strongly shaded part).

$A_{4.8}$ The new pyramid at 1 January 1963 can then easily be plotted (and so on for later years).

However, the case where there are large external migration should be forgotten: it is then necessary to make forecasts for future years (and in particular for 1962) regarding the migratory movement in both directions; and to it by sex and age.

For example, if such forecasts were made for 1962, it would be sufficient to delete from, or add to, the numbers shown on the pyramid at 1 January 1963 in Figure 6 (drawn up on the assumption that there were no external exchanges of population), the departures and arrivals of population.

However, a difficulty remains: it concerns the estimates of fertility rates and death rates for subsequent years. The migrants may in fact disturb the development of these rates.

A_5 INTERNAL MIGRATORY MOVEMENT

$A_{5.1}$ Besides the external migration which have just been mentioned, there are a certain number of internal migrations which give rise to population displacement.

The movement can be either permanent or temporary (seasonal and/or daily migration); the latter generally reflects the existence of a different location of residence and work. In what follows we will be mainly concerned with permanent migration.[1/]

1/ Temporary migration being particularly important in the problems of transport between residence and work (necessary infrastructure, means of transport, lost time, etc.).

Moreover, internal migration can be studied either from region to region (for example from a certain province to another province) or from zone to zone, meaning by "zone" a part of the territory which can be fragmented and does not necessarily form one continuous whole (for example, a zone is constituted by a number of towns).

$A_{5.2}$ Permanent migration from region to region is of some importance where the movements are on a large scale: for example the systematic displacements of population towards the coast which is to be observed in some areas in Africa.

But in most cases, at the same time as a change of region occurs, a change of zone is also effected: for example, migrants certainly leave a region to go to another one, but this movement is accompanied by a movement from the country (rural zone) to the town (urban zone).

$A_{5.3}$ The result is that migration from zone to zone must be studied systematically.

The zones to be noted obviously depend on the socio-geographical context and on the problems which it is sought to solve. However, owing to the phenomena of urbanization of populations, a distinction is generally made between urban zones and rural zones.

Thus in France the following zones were selected for certain surveys:

The Parisian agglomeration

other agglomerations of over 50,000 inhabitants

agglomerations of 10,000 to 50,000 inhabitants

agglomerations of 2,000 to 10,000 inhabitants

rural communes with less than 2,000 inhabitants concentrated in the administrative centre.

Thus the French zones were selected according to the agglomeration sizes.

$A_{5.4}$ The problem is to determine for the future the probability of passage from one zone to another.

For this purpose it is first necessary to try to establish for the past the distribution of the natural increase of population in each zone (zone of origin) between the different zones (zone of destination). For example, out of 100 additional persons appearing in zone B, how many stayed in that zone, how many went to zones A, C etc.

Subsequently, with the help of some assumptions taking account of possible changes in structure or behavious, it will be possible to extrapolate the observations of the past to deduce the present possibilities and make forecasts for the future.

$A_{5.5}$ It is very useful to draw up a table showing the different probabilities of passage from zone to zone.

Thus Table II below shows three zones (large towns, other towns and country areas).

TABLE II

PROBABILITY OF PASSAGE FROM ZONE TO ZONE

(concerning the distribution of the natural surplus)

		Zone of origin of the population		
		A (large towns)	B (other towns)	C (country areas)
Zone of destination of the population	A (large towns)	P_{AA}	P_{BA}	P_{CA}
	B (other towns	P_{AB}	P_{BB}	P_{CB}
	C (country areas)	P_{AC}	P_{BC}	P_{CC}

The number P_{AB} represents the probability that an additional person from zone A (corresponding to the natural increase of the population of that area) will go to zone B during the year.

There is an obvious series of relationships, as the additional person must necessarily be located somewhere in the country:

(8)
$$\begin{aligned} P_{AA} + P_{AB} + P_{AC} &= I \\ P_{BA} + P_{BB} + P_{BC} &= I \\ P_{CA} + P_{CB} + P_{CC} &= I \end{aligned}$$

Further, in view of the urbanization trend, which is reflected in transfers of rural population to the towns, the probabilities

$$P_{AB},\ P_{BC} \text{ and especially } P_{AC}$$

are very slight.

Lastly, in the case of countries where there is already a rural over-population, it can be assumed that the probability P_{CC} is virtually zero.

$A_{5.6}$ Table II was presented as if only internal migration existed. Actually an additional line and column should be shown corresponding to an external zone. This zone would comprise the probabilities of passage from (or to) each zone to (or from) outside; probabilities of emigration (or of immigration).

Besides this, in some cases where a greatly accelerated urbanization occurs, entailing a depopulation of the country areas, it can happen that migrations from the country areas are greater than the natural rural increase: in that case (cf. Table II) the sum of the probabilities $P_{CA} + P_{CB}$ will be greater than one, and in order for equation (8) to be satisfied, P_{CC} must be negative. The probability P_{CC} will then represent the relation between the observed decrease in the country areas (hence the minus sign) and the natural increase in those same country areas.

$A_{5.7}$ It would be very interesting to know the probabilities of migration by sex and age, as this effect has important consequences.

It would then be necessary to construct a whole series of Table II for the two sexes and corresponding to different ages. In view of the complications entailed in the plotting of such tables, one is often reduced in practice to making rather rough estimates.

A_6 FUTURE GEOGRAPHICAL DISTRIBUTION

$A_{6.1}$ In many cases it is necessary to know, as will be indicated below, the distribution by zone in the future.

For this, two sets of data are needed:

first, the present distribution of the population by zone, with, for each zone, the various rates enabling the natural increase to be ascertained;

second, and for all the years covered by the projection, the Table II of probabilities of passage from one zone to another.

$A_{6.2}$ The problem of future geographical distribution is resolved by recurrence. To pass from the distribution at 1 January 1962 to the distribution at 1 January 1963, the procedure is as follows:

(a) For each zone of origin A, B, C etc. the natural increase during the year 1962 is established; for example, by multiplying the total population of the zone by the natural rate of increase in the zone.

For zone A: $\Delta P_n (A) = P (A) \cdot \left[r_b (A) - r_d (A) \right]$

(b) For each zone of origin A, B, C etc. the natural surplus will be distributed in proportion to the probabilities of passage in the year 1962 among the different zones of destination.

For example, we will have: immigration from A to B: $P_{AB} \cdot \Delta P_n (A)$

(c) For each destination, the movements will be given and will be added to the numbers at 1 January 1962 to give the total numbers at 1 January 1963.

We will thus have:

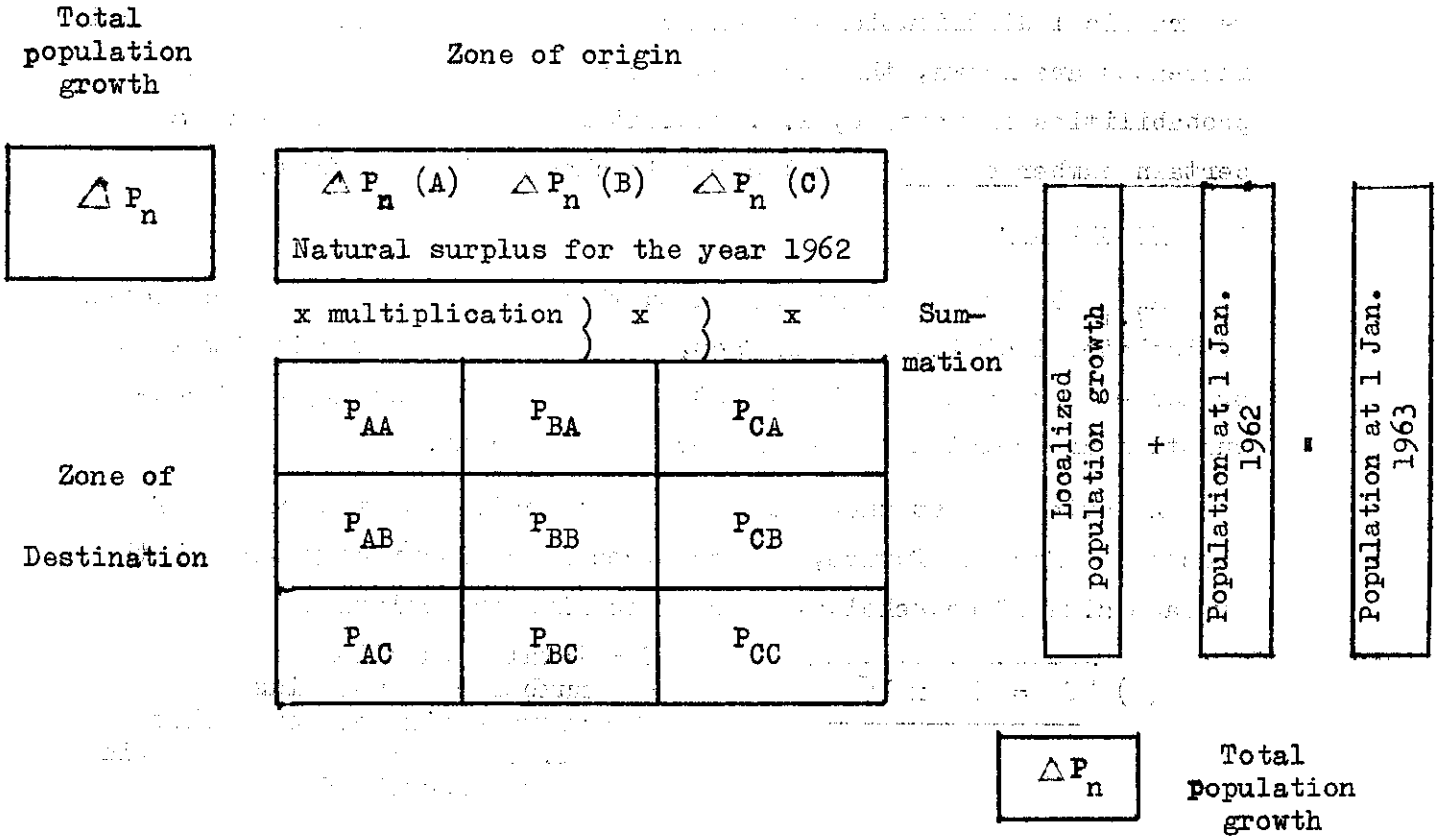
Population of zone B at 1 January 63 = Population of B at 1 January 62 + $\sum_{A} P_{AB} - \triangle P_n$ (A)

$A_{6.3}$ It will be seen by referring to Table II that the above operation consists of multiplying each column by the natural surplus of the zone of origin and then summating line by line to obtain the additional population in each zone of destination.

Table III below shows the simplest way of proceeding:

TABLE III

ASCERTAINING THE FUTURE GEOGRAPHICAL DISTRIBUTION OF THE POPULATION
(passage from the situation at 1 Jan. 1962 to that at 1 Jan. 1963)



$A_{6.4}$ It is sometimes possible to make direct estimates of the population development by zone without going through Table II.

Thus, in some cases it is possible to ascertain the population development in large towns by methods which, though not always quite valid, are simple (electricity consumers, births, registered voters, etc.).

For example, whereas the mean rate of growth of the French population is slightly less than about 1 per cent per annum, it is known that the rate of growth in the Parisian agglomeration is over 2 per cent owing to large migration.

$A_{6.5}$ It also happens that future geographical distribution may be linked with political aims. These may comprise, for example, restricting the growth of certain towns, regarded as too large in relation to their surroundings; or making all the rural surpluses emigrate to the towns as the country areas can not adequately provide subsistence for additional numbers. In that case, it is the future geographical distributions which are partly fixed, and as the natural increases are known, this implies a change in the figure for the probabilities of passage, i.e. ultimately the establishment of a certain number of measures leading to changes in behaviour.

A_7 HOUSEHOLDS

$A_{7.1}$ Up to now we have assumed that the population was composed of isolated individuals. In fact, the individuals live in families or households, and, as will be stated below, certain types of consumption are related to the number of households.

An attempt must therefore be made to calculate the number of households for the future, either directly or indirectly through the average size of households, bearing in mind the relation:

(9) $P = H \times \nu$

P = total population
H = number of households
ν = average size of households (i.e. number of persons living in the household).

$A_{7.2}$ The average size of households varies greatly from one country to another. Thus in some African countries, average sizes of 5 persons per household are observed. In France the average size is very close to 3 persons per household.

Further, it varies over time, usually diminishing. This phenomenon is due to a number of causes, some of which partly stem from urbanization and more generally from the passing from the patriarchal family to the conjugal family. But this decrease over time is fairly slow.

$A_{7.3}$ The size of households varies greatly in relation to geographical location, as is shown by Table IV (1954 census) below, relating to France.

TABLE IV

TOTAL POPULATION, NUMBER OF HOUSEHOLDS AND SIZE OF HOUSEHOLDS BY ZONE OF GEOGRAPHICAL LOCATION (FRANCE 1954)

Type of agglomeration	Total population (in 1000)	Number of households (in 1000)	Size of households
City of Paris	2,764	1,180	2.34
Rest of Paris agglomeration	1,913	695	2.75
Other agglomerations of over 50,000	6,969	2,381	2.92
Agglomerations from 10,000 to 50,000	5,843	1,890	3.09
Agglomerations from 2,000 to 10,000	5,351	1,700	3.14
Rural communes (less than 2,000 concentrated in the administrative centre)	18,268	5,555	3.29
All types	41,108	13,401	3.07

A regular decrease in the size of households is observed depending on the degree of urbanization. This very important result is connected with the fact that urbanization reduces the relative size of the population depending on agriculture, and it is in that sector that the largest household sizes are found.

A 7.4 Table V below (France, 1954 census), in order to highlight this phenomenon, shows the average size of households in relation to the social-status category of the head of the household. It will be noted that, for households the head of which is a farmer, the average size is 4.00, whereas for the households of non-manual workers - the most numerous in the large towns - the average size is 2.94.

TABLE V

SIZE OF HOUSEHOLDS IN RELATION TO THE SOCIAL-STATUS CATEGORY OF THE HEAD OF THE HOUSEHOLD

Category	Average size
Farmers	4.00
Agricultural workers	3.53
Operatives	3.38
Service staff	2.26
Employees in industry and commerce	3.26
Liberal professions and senior higher administrative grades	3.55
Junior administrative grades	3.03
Non-manual workers	2.94
Other economically active persons	3.36
Economically inactive persons	approx. 2.05

Thus the passage from farming to other activities - particularly "white-collar" activities - reduces the average size of households.

$A_{7.5}$ The size of the household also varies in relation to the age of the head of the household, reaching a peak when the children have been born and have not yet left the home.

$A_{7.6}$ Projections of the number of households are usually based on projections of total population by means of assumptions as to the development of the size (relation 9).

In order to make valid estimates, one can:

either operate in the aggregate by extrapolating past trends for the average size (i.e. by slightly reducing the average size of households), or use Tables III and IV simultaneously.

Table III shows the future geographical distribution of the population by zone

Table IV shows the present average size of households by zone (hence to be extrapolated).

The second method, being more analytical, would appear more accurate.

In theory one should allow for the fact that new arrivals in a zone do not immediately have the average behavious of the inhabitants of the zone; in practice, as the deviations are slight, these differences in behavious are not taken into account.

$A_{7.7}$ It would also be extremely important to establish hypotheses on the scatter of the size of households around the mean. In particular for the study of housing needs (cf. below), it would be very useful to know the number of households of 1 person, 2 persons, 3 persons etc. by zone, and if possible, by category of households.

The projections for the future generally do no more than maintain the present patterns, because of ignorance of the causes of the size of households.

B. PROVISIONAL ESTIMATION OF FUTURE INCOMES

The bridge that must be established between the demographic prospects and the estimated needs of the population is that of the revenue to be created by production in the years to come. Indeed, if one merely seeks objective needs, that is to say, needs corresponding to certain standards such as a decent dwelling per household, a school-attendance rate approaching unity, etc., one departs very seriously from reality: objective needs are certainly aims to be attained, but they are often to be attained only in the long run, being far beyond the possibilities of the economy, especially in a developing country.

Thus, in such countries, perhaps even more than in the advanced countries, it is the practical needs that must be considered, that is to say, the needs conforming with the actual possibilities of the economy, both in available income and in production. It is therefore of great importance to measure these possibilities, even very roughly, with a view to avoiding serious errors in assessing the needs to be met.

This part of the report will deal rapidly with methods of estimating future economic activity and its effects on incomes. For this reason, projections will first be made of the economically active population by sector and by social-status category: knowledge of future incomes by category of workers will then make it possible to calculate the income of the various categories of the economically active population, from which will be deduced the income of the various classes of household.

Cross-checks using extrapolation methods will make it possible to verify the compatibility of the results obtained.

The whole of this part is studied in a statistical manner, based essentially on past situations. This means that the only significance to be attached to the results derived from it is that of magnitude.

It is only later in the sector-by-sector examination of the economic development possible and desirable that more useful results on future incomes may be obtained.

B_1 FUTURE SIZE OF THE ECONOMICALLY ACTIVE POPULATION

$B_{1.1}$ The idea of an economically active population, that is to say, a population employed or wishing to employ itself, is in fact a little ambiguous, especially in the developing countries. It is preferable to substitute for it the idea of a "population capable of working", or even a population available for working.

However, at this first stage, the idea of an economically active population will be maintained as it is.

$B_{1.2}$ An estimate of the future size of the economically active population may be attempted by assigning to the total population of the coming years the same rate of total economic activity (i.e. the ratio economically-active population/total population) as that observed in the past. In France, for example, about 1954, the rate of total economic activity was approximately 44 per cent (taking both sexes together).

This will give:

$$E' = e' \cdot P \qquad (10)$$

E' = economically active population

e' = activity rate

P = total population

This way of working, however, which is hardly better than the direct extrapolation of E, is frequently too crude, for it does not show the modifications of pattern in the population.

$B_{1.3}$ The calculation is therefore often made by introducing activity rates and numbers of people by sex and by age.

The corresponding activity rate can be applied to the numbers in each step of the population pyramid.

This will give:

$$(11) \qquad E'' = \sum_{age} \sum_{sex} \cdot e'' \cdot P$$

E" = economically active population

e = activity rate by age and sex

P = number of the given age and sex

This takes into account the possible modifications in the age structure.

$B_{1.4}$ It would also be perfectly possible to cross-check the foregoing results by estimating the future numbers of the economically active population by zone. For this method, the activity rates by zone would have to be known.

For example, an activity rate in zone B of e'''_B and a total population located in this zone of P_B (in accordance with Table III) would give:

- in zone B an economically active population of $e'''_B \times P_B$
- for the whole country

$$(12) \qquad E''' = \sum_{zone} e'''_B \cdot P_B$$

Knowledge of the distribution of the economically active population by zone is of undoubted interest. It would be possible, by dissociating the two sexes and introducing activity rates by zone for each of them, to estimate the future economically active population by sex for each zone, the total population by zone having itself been classified by sex.

$B_{1.5}$ Some adjustments among E', E", and E"' (especially approximating E"' to E", which is considered more exact) will make it possible to keep a single value for the development of the economically active population E.

B_2 DISTRIBUTION OF THE ECONOMICALLY ACTIVE POPULATION BY SECTOR

$B_{2.1}$ One may seek to know the future distribution of the economically active population by endeavouring to extrapolate past trends.

For example, if the economically active agricultural population has decreased regularly during the past ten years at the rate of 2 per cent per year, the same rate of decrease may be assumed for the future.

These extrapolations, must, however, be so contrived that summation of the various sectors, including a sector for unemployment and inactivity from any other cause, shall give the economically active population E.

$B_{2.2}$ Another way of working is to start with location by zone.

In every zone, the economically active population is classified into the various sectors of activity in an appropriate manner: for example, in the rural zones there is much agriculture; and in the large towns, on the other hand, the amount of agriculture is negligible.

It is enough, then, to know the distribution patterns for each zone of the economically active population among the various sectors of activity, to be able to establish easily, starting with the economically active population of each zone E"', the economically active population per sector.

$B_{2.3}$ In practice, it is necessary to have available a table such as the following table VI, which gives for the future[1/] the pattern by zone (per hundred persons of the total living in the area, both sexes together).

1/ It is possible, for example, if desired, to extrapolate the patterns of the past; but the present patterns can also be used, for they change very slowly with time.

TABLE VI

PATTERN OF THE TOTAL POPULATION BY SECTOR OF ACTIVITY AND BY ZONE

(The absence of unemployment and under-employment is assumed)

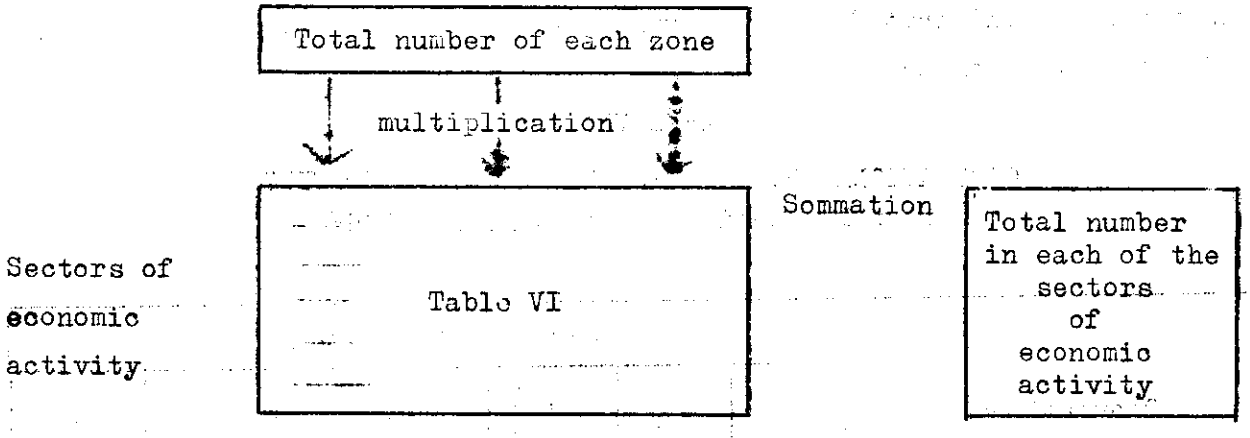
Sector of economic activity	Residence zone		
	A (Large towns)	B (Other towns)	C (Rural districts)
Agriculture	α_A	α_B	α_C
Industries	β_A	β_B	β_C
Non-administrative services	γ_A	γ_B	γ_C
Administration	δ_A	δ_B	δ_C
Economically active population	$100\ e^{-\theta_A}$	$100\ e^{-\theta_B}$	$100\ e^{-\theta_C}$
Inactive population	$100\ (1-e^{-\theta_A})$	$100\ (1-e^{-\theta_B})$	$100\ (1-e^{-\theta_C})$
Total population	100	100	100

It is obvious that for these 100 persons living in zone B, there are $100\ e^{-\theta_B}$ active persons (the mean rate of activity in the zone is equal to $e^{-\theta_B}$); besides, there must be equalities of the form:

$$\alpha_B + \beta_B + \gamma_B + \delta_B = 100\ e^{-\theta_B}$$

which expresses the fact that the total activity is in the sum of the activities per sector.

$B_{2.4}$ Starting from Table VI, each column should be multiplied by the population forecast by location, then the numbers corresponding to each sector of activity should be added together to obtain the numbers employed in each sector, in accordance with the procedure that has already been presented in another case:



$B_{2.5}$ The comparison of the two estimates made by means of exptrapolation and by means of location will permit the establishment of the probable economically active population in each of the sectors, for example Ej for the sector j.

This must obviously give (assuming the existence of a sector for unemployment or inactivity through other causes)

$$(13) \qquad \sum_j E_j = E$$

$B_{2.6}$ The existence of separate calculations for the male and female sectors would make it possible to establish projections of the economically active population by sex, by sector of activity and by zone.

B_3 DISTRIBUTION OF THE ECONOMICALLY ACTIVE POPULATION BY OCCUPATIONAL CATEGORY

$B_{3.1}$ The distribution of the economically active population by sector is extremely useful in itself. In many cases, however, such as problems of training or other problems to be examined further on, one must know the total numbers of the various occupational categories, or social-status categories, of which a partial nomenclature has already been given in Table V.

$B_{3.2}$ For this reason, it is essential to have available a table such as the Table VII that follows, giving the occupational patterns in each of the sectors of economic activity.

TABLE VII

OCCUPATIONAL STRUCTURES BY SECTOR OF ACTIVITY
(per 100 active persons) France 1956

Occupational Categories	Sectors of Activity						
	Agriculture	Industry	Liberal & Administrative Professions	Commerce	Transport	Domestic Services & Health	Together
1. Farmers	78.4	-	-	-	-	-	23.1
2. Agricultural workers	19.6	-	0.2	0.4	-	0.5	5.8
3. Employers in industry & commerce	0.2	15.0	2.2	53.3	3.8	11.1	13.5
4. Liberal professions & higher administrative grades	0.1	2.8	14.2	1.6	3.4	-	3.1
5. Junior administrative grades	0.1	5.8	25.0	4.4	10.3	-	6.3
6. Non-manual workers	0.1	7.8	22.4	21.9	35.2	0.2	10.5
7. Manual workers	1.0	67.6	14.3	14.6	43.1	9.9	30.5
8. Service staff	0.3	1.0	7.9	3.6	4.0	76.6	5.4
9. Persons in other activities	0.2	-	13.8	0.2	0.2	1.7	1.8
All categories	100	100	100	100	100	100	100

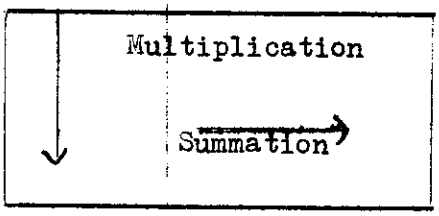
Source: INSEE (National Institute for statistics and economic studies)

Credoc, France 1956.

The total of each column must obviously be 100 (distribution per hundred economically active persons).

$B_{3.3}$ Knowledge of the total numbers employed in each sector of activity will make possible, through simple multiplication of the columns, the determination of the total number (per sector) of each occupational category; and summations by line will then make it possible to forecast the total numbers of each category for the whole of the economy.

The process is always of the type:



B_4 - DISTRIBUTION OF THE TOTAL POPULATION BY THE SOCIAL-STATUS CATEGORY OF THE HEAD OF THE HOUSEHOLD

$B_{4.1}$ One observation is necessary. Consideration has just been given to the occupational category of all economically active persons, namely to the individual occupational categories.

It often happens, though, that the demographer breaks down total population into households and concerns himself above all with the social-status category of the head of the household (cf. below consumption). It is this that shows in the first analysis the manner of living and the income of the household, in short the level of living.

Confusion must on no account be permitted between the two classifications, whose interconnexion is clearly shown in Table VIII :

TABLE VIII

TOTAL POPULATION DISTRIBUTED ACCORDING TO THE SOCIAL-STATUS CATEGORY OF THE HEAD OF THE HOUSEHOLD

	Social-Status category of the head of the household										
	1	2	3	4	5	6	7	8	9	Unoccupied	All categories
1) Economically Active Distributed by individual social-status category 1											
2											
3											
4											
5	Distribution of lower admin. grades among h'holds										Y5
6											
7											
8											
9					Composition of households whose head is of lower administrative grade						
2) Unoccupied (pupils, students, housewives, pensioners, invalids, etc.)											
Total population					X5						
Number of households											

This shows that the economically active population belonging to the category of lower administrative grades (social-status category 5) will be distributed among different households, whose head may belong to different social-status categories. The total numbers in the lower administrative grades will be equal to Y5 and will show in the column at the right.

For their part, the households whose head belongs to the lower administrative grades will consist of economically active persons of all the social-status categories and of unoccupied persons (pupils, housewives, young children, old people, etc.): the total population of these households will be equal to X5 (penultimate line).

B4.2 If it is desired to classify the whole population (and not as above, the economically active population) into the various categories of household, attention must be paid to the fact that the composition of a household of a given category may be considered relatively stable in time.

All that is necessary in practice, then, is to determine the X's knowing the Y's and assuming the stability of the patterns of each column.

B4.3 It is most desirable next to locate the different categories of household by zone. This could be outlined by means of cross tabulation of zone against the social-status category of the head of the household, households being classified by zone and by the category of the head of the household.

IX. Distribution of households (in percentage) according to the area of residence and the social-status category of the head of the household
France 1956

	Parisian aggregation	Provincial towns of 100,000 inhabitants & over	Urban communes of 10,000 to 100,000 inhabitants	Urban communes of under ten thousand inhabitants	Rural communes	Together
Farmers	0.3	0.4	1.9	6.3	29.6	13.2
Agricultural workers	0.2	0.2	0.5	2.1	7.3	3.4
Industrialists, large merchants	1.6	1.5	1.5	1.6	0.5	1.1
Craftsmen	2.8	3.8	3.9	4.3	5.0	4.2
Small merchants	4.8	6.5	6.4	7.0	4.0	5.2
Liberal professions, higher admin.grades	6.8	5.1	4.7	3.1	0.5	3.2
Lower admin.grades	9.6	7.5	6.6	4.5	2.8	5.5
Non-manual workers	14.3	11.2	9.6	5.7	2.7	7.4
Supervisory staff	2.2	1.8	1.5	2.6	0.5	1.4
Skilled & semi-skilled workers	25.9	27.7	27.7	28.1	15.4	22.4
Unskilled workers	2.6	4.5	4.6	4.5	2.8	3.5
Domestic servants	2.3	2.0	1.3	1.4	0.6	1.3
Other service staff	3.8	1.8	1.5	0.5	0.5	1.4
Other active persons	2.8	2.4	2.2	1.6	1.3	1.9
Unoccupied	20.0	23.6	26.1	26.7	26.5	24.9
TOGETHER	100	100	100	100	100	100

The domestic product is indeed defined as the sum of the values added in the various sectors. Subject to calculating the net values added (values added without depreciation), and at factor prices (prices without the net indirect addition of subsidies), the domestic product becomes identical with the idea of domestic income (that is to say very approximately with national income), which is itself - save very exceptionally - close enough to the income of households.

Thus, the income of households in France represents 95 per cent of the net domestic product at factor cost.

B6.2 The introduction of unitary values added by sector of activity j, defined as the value added per person employed in the sector j, makes it possible to write the domestic product in the form (net domestic product = NDP)

$$(14) \qquad \boxed{NDP = \sum_{j} \omega' Ej}$$

the value added in the sector for unemployment and inactivity from any other cause being obviously new.

B6.3 The result is that the domestic product for future years will appear in the projection (already carried out) of the total numbers Ej employed in each sector and of the projection (to be made) of the unitary values added j per sector.

The development rates adopted for the latter vary from one sector to another.

Thus, for example, in France the following future developments (rough estimates) have been adopted for the unitary values added:

	Annual rate of growth of the unitary value added j	
agriculture	3.5 per cent	
industry	3.0 per cent	average of the undertakings 3.4 per cent
transport	3.0 per cent	
trade	2.4 per cent	
services other than administration	2.5 per cent	
administration	3.0 per cent	

The development of the NDP is then very easy to determine.

$^{B}6.4$ Calculation of the net domestic product could have been attempted directly:

either by direct extrapolation in time (based on past observations)

or by the relation

$$NDP = \quad x\ E$$

that is to say by making no sectorial distinction and by projecting into the future the average unitary value added .

It does not seem desirable to adopt these two methods if break-down by sector can be used.

$^{B}6.5$ The closeness between household income and domestic product in the future leads to definition of the future value of the relation between these two aggregates, which is close to unity (in France 0.95 per cent), and thus to verification of the agreement between the estimation of household income and net domestic product made by the two different approaches.

$^{B}6.6$ The division of the two aggregates by the total number of the population P gives a parameter of very great practical value: the income per head or domestic product per head, which distinguishes the level of development of the economy, and therefore the level of needs, both in volume and in pattern, that may reasonably be satisfied.

These are the needs whose future development will now be studied.

(c) Between the school-leaving age (about 15 for a moderately developed country) and the age of retirement, people are capable of working.

There are therefore the four following age groups:

less than 6 years old	:	low-age population
from 6 to 15 years old	:	school age population
from 15 to 50-55 years old	:	population capable of working
over 55-60 years old	:	old population

$C_{1.3}$ - The ratio between the population not working and the population capable of working is the number of persons that one adult must support besides himself if he works (dependants on an adult).

The paradox can be observed that it is in the developing countries, where the worker is least productive, that this ratio is highest.

XI. Ratio $\frac{\text{children + old people}}{\text{adults}}$ for some countries

Advanced countries			Developing countries		
United Kingdom	1955	1.68	Turkey	1955	2.13
Norway	1953	1.70	Brazil	1955	2.22
France	1956	1.75	Peru	1955	2.36

It would be equally interesting to calculate the ratio between persons not available for work and persons available for work: this ratio would obviously be higher, since some adults are not available for work, for example housewives.

$C_{1.4}$ - Adults, indeed, make-up the population capable of working, but not the whole of this population is necessarily available for work. The following must be excluded:

- students
- members of the armed forces
- the sick, disabled, etc.
- housewives looking after their own households
- etc.

that is to say all these not taking part in the productive process.

The adult population available for work then remains. It is certain that the pattern and size of this population are closely related to the estimate, based on social habits, that is made of the number of housewives remaining at home.

$C_{1.5}$ - Among old people it is very important to distinguish:

- those who work
- those who are on pension
- those who are dependent on their children
- etc.

with a view, in particular, to establishing an assistance policy for old people (old age pensions, the building of hostels for old people, etc.).

$C_{1.6}$ - The resources in man-power are then equal to the total number of people aged from 15 to 45-50 able in fact to work and old people wishing to continue to work[1/]. They measure the employment needs of the future population. It will be useful to divide them by sex.

The employment possibilities for this man-power are connected with the possibilities of economic development, which cannot be discussed here.

It is difficult, then, to ascertain a priori whether the equilibrium resources = employment can be attained: this equilibrium depends closely on the economic development contemplated.

$C_{1.7}$ - It will be extremely useful to locate by zone, and if necessary by region, the total numbers of school age, resources in man-power, and old people, so as to know the different needs, by zone and by sex, and to ensure equilibria at the lowest level.

C_2 - PROJECTIONS OF CONSUMPTION (general method)

$C_{2.1}$ - Data are generally available, from family-budget surveys (carried out in the country, or available from similar countries), on consumption by households analyzed by category of household.

1/ Where the school-leaving age is low, some people of under of 15 years old will normally be added to these numbers.

Tables like the following table XII have been established for most countries.

XII. Household-consumption expenses

Goods or services used	Social-status category of the head of the households									Averages
	1	2	3	4	5	6	7	8	9	
Food products										
Clothing										
Housing										
Health and hygiene										
Transport										
Culture and leisure										
Total consumption										

To know future consumptions, it is enough to take into account the total numbers of each category of household, or of the total population by category, since the size of the household is known: simple multiplication of the columns of table XII, followed by summation by line, will give the desired result.

It is obviously an aggregate method.

$C_{2.2}$ - A more refined method would be to take into account the domicile of the household. Thus, in France, some family-budget surveys have been analyzed geographically, especially by zone. This has given tables like table XII for each of the zones comprising the territory:

- parisian aggregation
- towns of over 100,000 inhabitants
- towns of 10,000 to 100,000 inhabitants
- towns of 2,000 to 10,000 inhabitants
- rural communes (under 2,000 inhabitants, dependent on to the chief town).

The projection process is the same: it is then enough to know by category of household for each zone the total numbers of households.

$C_{2.3}$ - Another method still more complicated, and therefore difficult of application in the developing countries, would be to draw up table XII not only by zone, but also by type of household, account being taken for each type, of the number, sex, and age of the members of the household[1/]. Thus this would give various households consisting of two adults and two children, households of the zone "towns of 2,000 to 10,000 inhabitants" consisting of one adult and two children, etc.

The great difficulty for the projection of consumption is to be able to estimate future total numbers for each of these types of household: there is, indeed, practically no basis for estimating, unless it be to extrapolate the present situation.

$C_{2.4}$ - The various estimates made above assume unquestioningly that the average income of households by category of household remains constant. Now it is very probable that this income will rise with time, though perhaps only slightly[2/]: the increase must therefore be taken into account.

For this reason, an attempt will be made to prepare tables such as Table XIII reproduced below, showing, for a given social-status category (and possibly for a given locality and/or a given type of household), the household consumption for different income sectors.

1/ A great part of consumption is in effect privileged to age and sex of the consummers.

2/ A rise in the average income of the households may be much greater than that of the average income of each category, since it depends also on the movement of households of the low-income categories towards the high-income categories, as a consequence of urbanization.

XIII. Consumption expenditure of rural households (all localities, every type of household)

Goods or services used	Income of households in thousands of NF						Average
	Under 1	1-2	2-3	3-4	10-15	15 & over	
Food products							
Clothing							
Housing							
Health & hygiene							
Transport							
Culture & leisure							
Total consumption							

If it is allowed that a pattern of future income can be calculated for each category of household, given the pattern (total numbers by sections), the average of present incomes, and the average of future incomes, a multiplication of the consumption units by the income sections will give the consumption of the various categories of household.

This method of estimation, however, appears somewhat laborious.

$C_{2.5}$ - In many cases, a far simpler method is possible, using not consumption by household, but consumption by consumption unit. The consumption unit can be each person of the household taken as a unit, whatever his age and sex: the consumption of the consumption unit will in this case be the consumption of the household related to the number of members of the household.

A method often preferred is to take roughly into account the composition of the household, especially the sex and age of the members: a measuring system must then be adopted.

A system of the following type is generally acceptable, giving a value to the various members of the household:

- head of the household	: 1.0 consumption unit
- other adults	: 0.7 c.u.
- children and old people	: 0.5 c.u.

This procedure, which is valid only for certain types of consumption, makes it possible to calculate the number of consumption units in each household, and consequently to deduce from it the consumption per consumption unit.

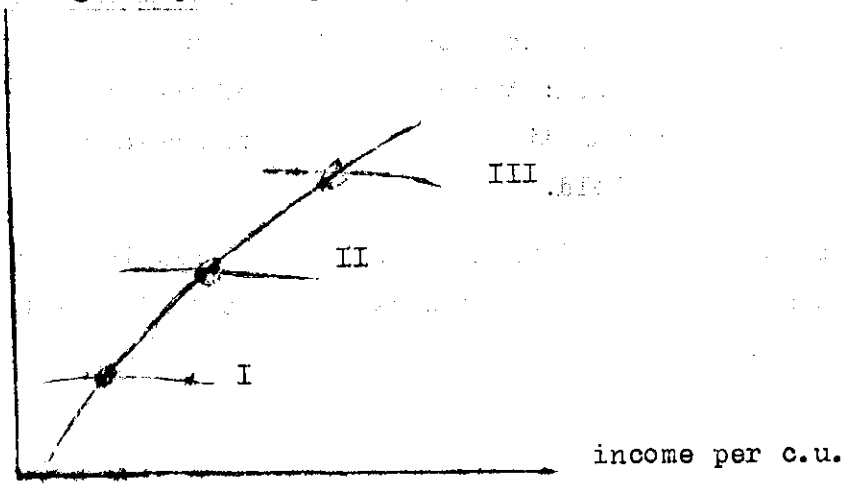
As a knowledge of the population pyramid makes it possible to calculate the future number of consumption units, it would be enough to know the development of the average consumption per c.u. in order to deduce from it an overall projection of consumption.

$C_{2.6}$ - Although in practice the procedure may not be so crude, the spirit of this approach remains: the aim is to establish for each category of household the future consumption per c.u., and this is multiplied by the future numbers of consumption units.

It is therefore necessary to have curves, like those shown in figure 7, setting forth the consumption of a given product:

Fig. 7 -

Consumption of a given product per c.u.



For each category of household (I, II, III representing at the same time a social-status category, a region, a zone and a type, in the above sense), a correlation is established between the consumption of this product per c.u. and the income per c.u.

This then gives a series of curves like I, II and III.

The future numbers of consumption units must then be calculated for each category of household, and they must be distributed in accordance with the income per c.u. Relation 15 can then be applied.

$C_{2.7}$ - One observation must be made. The mid-points of curves I, II and III are generally themselves on a curve, curve C of figure 7. Great care must be taken that the consumption per c.u. be developed by category in accordance with curve I, II and III and not in accordance with curve C, which shows movement from one category of household to another.

$C_{2.8}$ - The methods given may seem to suggest that all future consumption must be estimated in value.

It is obvious that direct calculation in quantity can be carried out in the same way.

C_3 - THE CASE OF HOUSING AND OF CERTAIN DURABLE GOODS

$C_{3.1}$ - The number of dwellings necessary at a given moment is identical with the number of existing households at that time if it is desired that each family be housed. Furthermore, the dwellings must be located in exactly the same place as the households.

$C_{3.2}$ - If it is easy to know the number of dwellings required, it is more difficult to fix their characteristics, which are of two kinds (reduced to the minimum):

- the number of rooms in the dwelling
- the quality of the dwelling (economy, de luxe, etc.)

It might be accepted in theory that the number of rooms per dwelling is related to the size of the household, and that the quality of the dwelling is related to the income of the household. In fact, this is not entirely true.

$C_{3.3}$ - It is very often possible to ascertain by survey the number of rooms desired and the price that the households would be ready to pay regularly for housing. These two elements vary with the category of household (social-status category of the head of the household, location, type) and with the income per household.

The problem, then, consists in making projections into the future, based on methods similar to those described above, and starting with current information and with forecasts of the development of the number of households per category. The main characteristics of the housing desired will be deduced from these projections.

$C_{3.4}$ - Housing available in the future depends on housing existing at present, building to be carried out between the present period and the period under consideration, and demolitions to be carried out between the same periods, in accordance with the relation:

(16) future housing = present housing + building - demolition

an equality true for each type of dwelling.

Knowledge of the present situation and future demolition will make it possible, after calculating requirements in future housing, to calculate the construction of new housing necessary.

$C_{3.5}$ - A number of expenses are related to the characteristics of the housing. The following are worthy of note:

- purchases of furniture
- purchases of household electrical equipment (washing-machines, television sets, radio sets, record-players, heating or cooking equipment, refrigerators, etc.)
- consumption of certain supplies (water, gas, electricity, fuel, cleaning materials, gramophone records, etc.)
- certain domestic services and various rental charges.

Projections can be worked out for each of these items, starting from the numbers of dwellings of each type, and the contents of the various types of dwelling.

C_4 - THE CASE OF EDUCATION AND HEALTH

$C_{4.1}$ - If the organization chart for education and the programme of courses are taken as being known, it still remains to be seen how many pupils or students can benefit from them.

A distinction must therefore be made between general education and occupational training.

$C_{4.2}$ - In the case of primary general education, it can be said that the objective requirements are known: instruction must be given to the whole of the school-age population, that is to say to all children of both sexes aged from 6 to 14 if schooling extends over 8 years.

In fact, to satisfy the objective requirements will nearly always be impossible, because of the cost involved in education and the lack of teachers. Very often, therefore, primary instruction can be given to no more than a fraction of this population of school-age, a fraction that tends towards unity as the income per head (level of development) rises, that is to say as time passes.

$C_{4.3}$ - Secondary and higher general education is directed above all towards training middle and higher administrative grades.

The future requirements in these grades are shown in table VII, reproduced earlier, which provides an estimate of numbers employed by occupational category.

A relation of the type (16) must then be applied to obtain the annual requirements in training:

Future grades = present grades + grades to be trained - grades to be lost.

$C_{4.4}$ Another way of working, though it seems a little too general for forced adaptation in the various countries, would consist in accepting certain standards such as those recommended at the Addis Ababa conference:

- of every hundred children completing primary education, thirty shall proceed to secondary
- of every hundred adolescents completing secondary education, twenty shall proceed to higher.

It would be essential to ascertain whether this method would lead in a given country to the training of sufficient new administrative staff to satisfy future needs.

$C_{4.5}$ With occupational education the same procedure must be followed as with secondary and higher education, that is to say the future needs in qualified staff must be estimated. The problem is, in fact, more complicated; for whereas the greater part of the middle and higher administrative staff, whosform the object of general education, may be considered relatively versatile, the persons trained by occupational education must be far more specialized in accordance with a very large number of relatively homogenous categories.

This would imply a good understanding of future needs in qualified staff, technicians and engineers by occupation: tables would therefore be necessary tabulating industry and occupation in a very detailed way.

The use of such tables is, moreover, inconceivable unless adequate projections of economic development by sector have already been made, whereas for general education one can, without too much risk of error, rely on rough estimates similar to those made earlier in B.

$C_{4.6}$ Starting with the knowledge of the number of pupils or students to be instructed or trained, an attempt can be made to work out:

- the training-instructors, teachers, and professors, needed for teaching and training pupils
- the investment needed for construction of primary and secondary schools, universities, and centres of occupational education
- the educational material (tables, chairs, books, exercise books, apparatus, etc.) needed for teaching.

Projections can be attempted in this sphere through the knowledge of standards such as the number of pupils per class.

$C_{4.7}$ Projections of requirements in hospitals, mental hospitals, homes, etc., including equipment and staff, are often difficult.

The normal practice is simply to use standards that fix arbitrarily for a given level of development the number of hospital beds per person or equivalent factors.

It is easy, through the knowledge of these standards, to project the future needs and deduce from them in accordance with formula (16) the requirements in training and new construction.

CONCLUSION

The various estimates presented here, which must serve as a basis for the determination of the aims of the plan, and must be reviewed in step with the progress of studies and achievements, are deduced one from another through the agency of a series of pattern tables.

These tables must be established for the past and the present from the basis of available statistics, and they must be extrapolated into the future by means of reasoning or foreign experience.

The practical problem that arises is that of having the necessary statistics for the preparation of these tables; the effort to prepare them must, then, be pursued with the greatest urgency.

These are the essential tasks for a demographic statisician and the economic statistician in co-operation with the planner.

ANNEX

XIV. Distribution of the total population in accordance with the social-status category of the head of the household and with the individual occupation - France 1952

Individual social-status category	Social-status category of the head of the household						Total
			Employees				
	Farmers	Individual entrepreneurs	Higher administra-tive grades	Other employees	Other private individuals	Persons living in institutions	
Farmers	1,970	20	-	80	80	-	2,150
Individual entrepreneurs	40	1,860	15	240	85	-	2,240
Agricultural unpaid family workers	3,010	-	-	-	-	-	3,010
Non-agricultural unpaid family workers	-	790	-	-	-	-	790
Higher administrative grades	-	10	440	40	10	-	500
Other employees	430	700	230	10,030	630	20	12,040
Retired persons	1,250	130	35	350	1,885	-	2,650
Other inactive persons	700	1,170	420	4,720	2,140	850	10,000
Children of under 14	1,650	1,220	350	5,500	345	155	9,220
Total	8,050	5,900	1,490	20,960	5,175	1,025	42,600
Number of households	1,970	1,825	425	6,630	2,790	-	13,640
Number of units of consumption	5,860	4,400	1,090	15,440	4,390	820	32,000