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Prospective Population. Computing Methods

In this paper the authors start from the requirements of our country and, consequently, a few methods of computation are suggested, recent information in the problem being used.

It is needless to prove the present-day interest in determining the number of the population in the near future — which corresponds to the "short term" notion of planning — and in a more distant future, corresponding to the notion of "medium term" or "long term". Economic planning demands this insistently for its multiple requirements. The fact that this problem is less known in our country compels us to sometimes resort to didactic presentations whose only justification is the intention of making intelligible the concepts we use to the widest categories of economists, planners and statisticians. Moreover, the material hereunder has rather the character of methodologic considerations.

In the last few years, the methods used for planning the number and structure of the prospective population have undergone noticeable progress, as also evidenced, among other facts, in the methodologic works elaborated by the U.N. experts, synthesizing the experience of many countries having a tradition in effecting such computations.

In developed countries demographic planning over rather long periods has become a tradition of current work. Moreover, computations are also undertaken regarding the evolution of population by groups of countries, such as those for the countries members of the O.E.C.E. [9].

Countries in course of development also effect prospective computations, mostly with the technical assistance of the U.N. The elaboration of economic, social and cultural development programmes, for a short or a long term, is unconceivable without demographic planning carried out with the help of scientific methods.

The necessity of demographic planning in the socialist countries, where current and prospective planning of national economy is based on such data, is all the greater. Therefore, in our country — like also in the other socialist countries — computations of this kind are carried out systematically by the Central Department of Statistics.

The computations methods and the hypotheses used in the planning of the prospective population are most varied and, consequently, the results also differ. This is the very reason for which the use of as many methods of computation and of as many hypotheses as possible is advisable.

The computations should be done over as often as phenomena occur, whose appearance was unpredictable, or when changes are observed in the trend of the demographic phenomena.

In general, two methods have stood out for the planning of population: the method of global computation and the method of components [1].

The method of global computation is based, essentially, on the evaluation of the population by using the mean rate of growth and the curves of growth (parabolas of various degrees, logistic curve, etc.).

The evaluation based on the logistic curve [2] has been widely used, being a method for the extrapolation of the number of the population, by using closer or more distant data from the past. The logistic growth curve, discovered by the Belgian mathematician P. F. Verhulst, (1838) and later by the American demographers R. Pearl and L. J. Reed (1920), takes into account a long period (about 100 years) cycle of growth.

At present, however, computations regarding the evolution of total population on basis of a growth "law" of the population as in the case of the logistic curve are only of limited interest, being carried out in view of evaluating the number of the population in the past.

The requirements of social programmes demand not only accurate, but also very detailed computations.

The mathematical methods for global planning of the number of the population cannot be applied when the structure of the population by age groups presents evident changes. Likewise, they cannot be applied when essential changes can be visualized in the economic and social domain, liable to influence the dynamics of the population.

Demographic planning does not refer only to the determination of the total population number; they also take into consideration the structure of the population according to various characteristics and in the first place that of its structure by sex and age. The analytic method or method of componence satisfies these requirements.

The method of components is preferable to the mathematical methods previously mentioned because it assumes a distinct analysis of the evolution of each component element of the population.

The following are necessary in view of effecting the computations:

A. Starting base: number of the population by sex and age at the latest census, brought back to the 1st of January, with the necessary corrections;

B. Determination of the number of the population for every 1st January in the prospective period, by sex and age, by means of the survival coefficients, deduced from the most recent table of mortality;

C. Determination of the number of births in the prospective period, for every year, by using several hypotheses. Thus, for instance, one may use the method of the specific fertility coefficients, which consists in multiplying the fertile female population (15—49 years of age) by the specific fertilities. One can also use the number of marriages and their fertility, provided the required data be at hand. Global measurements could also be used: the gross and the net coefficients of population reproduction.

The essential consists in the choice of as truthful as possible a hypothesis regarding the law of mortality and the law of fertility — either of the fertile female population, or of marriages.

With regard to migration, at the level of the country, external migration should be taken into consideration; in the framework of the country, demographic planning by regions makes it necessary to take internal migration into consideration.

The number and structure of the population, known from the data of the latest census, have a high degree of accuracy. However, the labile character of the computations appears when determining trends in the evolution of mortality and, particularly, of fertility.

Various hypotheses may be set as a basis for the computation. In the last instance its results are dependent on them.

For example, here are the hypotheses taken into consideration in planning France's population until 1980 [3].

1. — constant fertility;
   — constant mortality;
2. — increasing fertility;
   — decreasing mortality.

Both variants have been computed, in the first place taking into account the exclusive action of the natural growth of the population and, in the second place, also taking into account the migratory movement. In England, the Commission for the Population used 11 variants, a fact which should not prove astonishing, taking into account that plannings are, actually, "conditional forecasts".

It is significant that the U.N. experts make use of numerous hypotheses which they quite frequently correct, as a function of the various changes in trends [4], [5].

For our country, since external migration is relatively low, only the birth rate and mortality of the population are important. It should be stressed that the highest errors may be caused by the hypotheses regarding the birth rate. The hypotheses on the evolution of mortality exert a smaller influence. Indeed, while the birth rate in the world ranges between 15 and 50 per 1000 inhabitants, the amplitude of mortality is considerably lower, varying between 8—15 per 1000 inhabitants.

In our country a much more variable character is evidenced for the birth rate from one period to another, in comparison with mortality. It therefore clearly appears that an error in estimating the level of the birth rate is amplified and, along the years, it may generate negative effects on demographic planning.

The determination of general and specific mortality trends, as well as that of the birth rate trend preceed demographic planning.

Such determinations of the trends — established by means of extrapolations using analytical adjustments — are only a first approximation, requiring further precision by an analysis of the incidence of the various factors whose influence is predictable.

The determination of the trend in the mortality of the population raises fewer problems. Its evolution should be investigated under a threefold aspect:

— as general mortality;

— as infant mortality, having in view provisions for its decrease, particularly with regard to the decrease of exogeneous mortality;

— as specific mortality at other ages.

Besides the above, the trend of mortality by sex, that of masculine excess mortality, that of a change in proportion between sexes, should be taken into account.

The statistical analysis of the evolution of general mortality makes the fact stand out that, in our country, it shows a systematic decrease. Here are the levels: 19 per 1000 inhabitants in 1938; 12.4 in 1950; 9.7 in 1955; 8.7 in 1960 and 8.6 in 1965. The decrease of general mortality was determined in the first place by the decrease of infant mortality, however, the change in structure by age groups of the population should not be ignored. The level reached is, however, among the lowest in the world: the increase to be achieved in the future by the reduction in infant mortality will be counteracted by the increase in the number of deaths at advanced ages, since a change in the structure of the population by age groups may be noticed, in favour of advanced ages. In other words, the population of our country — as it can be seen by means of specific indices — shows symptoms of demographic aging and namely, at its base, this corresponds to a decrease of fertility [6], [13].

An adjustment of the data regarding general mortality, by means of a hyperbola, in the period 1955—1964, indicates a level of approximately 8.4 per 1000 inhabitants for the next few years. Taking into account the path covered by other countries, as well as the effect of the change in age structure, the trend in the evolution of general mortality is the following (in $^0/_{00}$):

1955	11.54
1960	8.76
1965	8.52
1966	8.47
1967	8.45
1968	8.44
1969	8.42
1970	8.40

The adjustment according to a hyperbola assumes certain restrictions; mortality — in the most favourable hypothesis — should tend asymptotically towards zero, were it only for the fact that man is not immortal.

A specific mortality should be followed in its evolution by means of the death probabilities in the tables of mortality.

Using the specific mortality coefficients (m_x) instead of the death probabilities (q_x), the situation does not change essentially; however, the use of the probabilities confers more reliability.

As an example the evolution of these probabilities will be shown, according to the tables of mortality for 1956 and 1963.

Evolution of death probability (1000 q_x) in 1963 in comparison with 1956

(both sexes)

Age	1956	1963	Decrease (in ‰)
0 years	80.8	54.73	32
1 year	10.78	5.50	49
2 years	5.00	2.26	55
3 years	2.86	1.38	52
4 years	2.05	1.03	50
5 years	1.66	0.90	46
10 years	0.87	0.56	36
20 years	1.55	1.16	25
30 years	2.02	1.56	23
40 years	3.35	2.67	20
50 years	7.10	6.06	14
60 years	17.38	15.52	11
70 years	49.74	39.06	21
80 years	119.53	96.15	20
90 years	291.26	138.18	53
100 years	565.54	167.28	70

Unequal decrease is found: at the age of 0 years, it is almost the same as that of infant mortality taken as such, and it is of approximately 32 per cent. In contrast, at the ages of 1 year and 2 years the percentage of decrease increases; later it decreases, reaching its minimum for 60 years. The importance of these decreases is only to be appreciated in relation with the number of population affected. In the prospective determination of the death rate the planning of the evolution of infant mortality is of particular importance for two reasons:

— the absolute number of deaths below 1 year of age is still large in our country;

— the rate of decrease shows great possibilities.

In 1950 the absolute number of infant deaths was 49,795 or 116.7 per 1000 infants born alive; in 1965 the number of deaths under 1 year of age decreased to 12,264 or 44.1 per 1000 infants born alive, thus showing a decrease of about 61 per cent.

What do a few adjustments carried out on the data for the last few years show us?

Adjustment by means of the straight line $y = 88.6 - 3.5x$ leads to the following data with respect to the evolution of infant mortality:

1955.....85.1	1960.....66.6	1965.....48.1
1956.....81.6	1961.....63.1	1966.....44.6
1957.....78.1	1962.....59.6	1967.....41.1
1958.....74.6	1963.....55.1	1968.....37.6
1959.....70.1	1964.....51.6	1969.....34.1
		1970.....30.6

The yearly decrease is $3.5^0/_{00}$, similar to that of other countries. Under these conditions, the level of infant mortality of $30.6^0/_{00}$ in 1970, will be equal to the one reached in some developed countries of western Europe in the years 1960—1964.

The following conclusion stands out herefrom: for the number of deceases under 1 year of age in 1964, which was of about 14,000 such a decrease represents 49 cases yearly. For a larger number this rate of decrease would have had a larger effect. In contrast, the decrease in the death probability for the ages 0—4 years contributes noticeably to the decrease in general mortality and should be taken into account when formulating a hypothesis for the decrease of the death rate and not for the maintenance of its level.

Another adjustment [8], this time to the parabolic curve, shows that the level of infant mortality in 1970 would be $41.07^0/_{00}$ (according to a straight line, the level in 1970 would be $32.7^0/_{00}$).

Before presenting an example of computation for Romania's population we should like to refer to the experience of demographic planning in France [3], [7], and in the U.S.A [10].

In France, for the 1960 planning, hypotheses were adopted brought down to the following: natural evolution with constant death rate, decreasing death rate — with a migration excess, — as well as combinations of hypotheses (4 variants). On the occasion of the resuming of computations in 1963 by the I.N.S.E.E. in connection with the preparation of Plan V, new computations and hypotheses were resorted to. The starting point was the data on the number of the population by sex and age on 1st January 1963, established on basis of the 7 March 1962 population census.

The hypothesis on the death rate was formulated in two variants: decreasing death rate, as a main variant, and constant death rate. The first variant was achieved by extrapolating the data in the tables of mortality of every generation up to 1985, the idea being adopted of a death rate decrease for every age. The hypothesis is expressed in the evolution of the mean life duration: for men, in 1985, the mean life duration is 5.8 years longer than in 1963, and for women 3.8 years longer.

However, when determining the prospective number of births several hypotheses and variants were used. Legitimate and illegitimate births were computed separately. In view of planning the number of legitimate births

it was necessary to determine prospective marriages and the mean progeny of the couples married every year. It is interesting to note that in these plannings an abatement was made from the usual method, namely that of determining the number of births on basis of a fertility law for women, by age, i.e. by multiplying the number of women in the fertile group by the specific fertility of every age. The reasons given for this are extremely interesting: "...the fertility law of marriages — say the authors — according to their duration, has proved much more stable in the after-war years, than the fertility law of women by age, the latter being influenced by the eventual discrepancies in nuptiality by ages" [7]. The adoption of this method was made easier by the fact that since 1943 the Institut National de Statistique et Etudes Economiques (INSEE), of France, has available series of data on the yearly number of births resulting from the couples married every year. These data point to a certain stability in the fertility of married couples as a function of the duration of the marriages. It was therefore appreciated that one may adopt the behaviour observed in the last 20 years and hence the hypothesis of constant fertility has been considered as being the central variant. In this hypothesis the final mean number of children per marriage is 2.4. Complementary hypotheses were: decreasing fertility (2 children per marriage) and increasing fertility (2.8 children per marriage). The computations were completed with hypotheses on external migration.

In exchange, in the U.S.A., the hypothesis of women's fertility was used, with 4 variants: A — 3.350 children, B — 3.100 children, C — 2.775 and D — 2.450 [10].

The planning of prospective population in Romania is drawn up for a relatively short time period and we may therefore consider that the level of general and specific mortality in the 1965—1980 interval will be approximately constant.

The data in the mortality tables of 1963 were used to compute the coefficient of survival.

Regarding the number of newborns which is added to the number of survivals for every year, the computations were made on basis of two hypotheses:

— the first hypothesis considered that in the following period fertility will remain constant, at the level recorded in 1965;

— the second hypothesis assumes the recording of a level of specific fertility, equal to the average of the years 1960—1965, i.e. a higher level.

The hypothesis of the increase in fertility for the female population was also justified, as a consequence of the measures lately adopted by our State in view of stimulating natality.

Since not even a year has elapsed from the date these measures were put into application, the data we possess are insufficient to evaluate the probable rate of fertility increase in the course of the subsequent period.

Having in view the above the conclusion seems to be justified, that the most probable hypothesis is the 2nd hypothesis.

The demographic data for 1966, recently published, point to a birth rate level of 14.3‰, this being the lowest level recorded in the last few years. The trend towards a demographic aging of the population also continues. The results of the computations, as well as the intermediate computations, are shown in annexes.

It can be seen that we can expect the population of our country to amount to 20,524,866 inhabitants in 1980, in the hypothesis where the specific fertility level of 1965 is maintained, and 20,884,501 if the specific fertility were at a level corresponding to the average 1960—1965.

The difference in evaluation of the two variants is not great. It should be pointed out that the hypotheses on the evolution of fertility influences the total number of the population only for ages comprised between 0—14, since the hypotheses on the number of infants born alive are applied starting from 1966.

For the other age groups the number evaluated shows a higher degree of accuracy consequently to the relatively constant character of the survival coefficients.

Obviously, the analysis of the evolution of female population fertility should be studied much more thoroughly, both as a function of the world trends [11] and of the long-term trend in Romania [12]. Likewise, longitudinal analysis ("by cohort") of married couples, should be introduced in view of determining the mean number of children per marriage as a function of marriage duration. Finally, the results of the computations carried out by various methods should be compared with one another.

It is also to be noticed that the yearly mean increase of population is, according to the first variant, 102,941 and in the second variant it amounts to 126,916. We mention here that the population increase in 1966 was of 114,000 persons, in comparison with 1965. Likewise, the yearly mean rate of increase is lower than 1 per cent, approximately the same as that recorded in the period 1960—1965. The trend towards demographic aging, measured by the weighted average of the population aged 60 and above persists systematically, which is natural if the hypotheses stated are taken into account.

Having in view the measures adopted by our State to stimulate the birth rate it is imperative for the computations regarding the prospective population to be re-made after a period of at least 1 year has passed. The changes that will occur will, in the first place, be determined by a coefficient of fertility higher than the one used in the present computations.

Annex 1

Computation: Female fertility by age groups in 1956-1965 (per 1,000 women)

Age group	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
15—49	89.9	85.7	81.9	77.1	73.9	68.4	63.5	61.9	59.9	57.3
15—19	52.5	54.3	55.9	59.5	59.1	62.6	58.4	61.5	56.8	52.3
20—24	180.4	180.1	176.8	168.4	164.1	155.4	147.4	144.0	144.0	140.6
25—29	155.9	145.4	136.8	125.9	121.2	110.1	105.0	102.9	102.6	99.8
30—34	103.5	92.8	84.2	73.9	67.6	60.1	54.9	53.2	52.2	53.5
35—39	58.8	54.6	48.2	42.6	39.0	32.4	29.5	28.2	26.2	25.1
40—44	23.8	17.2	14.0	14.4	14.5	13.2	11.4	10.7	9.5	8.9
45—49	2.7	2.2	1.8	1.6	1.4	0.9	0.8	0.7	0.8	0.8

Annex 2

Computation: Number of infants born alive in the period 1965—1969; 1970—1974; 1975—1979

Age group of mother	Coefficient of specific fertility		Number of infants born alive in the period					
			1965—1969		1970—1974		1975—1979	
	f. 1965	f. 1960—1965	Variant I (f. 1965)	Variant II (f. 1965—1969)	Variant I (f. 1965)	Variant II (f. 1965—1969)	Variant I (f. 1965)	Variant II (f. 1965—1969)
15—19	0.05235	0.05847	212,170	236,160	229,880	256,755	205,165	229,150
20—24	0.14069	0.14927	491,540	521,520	566,255	600,790	615,635	653,180
25—29	0.09979	0.10693	365,810	391,985	347,050	371,880	399,800	428,405
30—34	0.05352	0.05692	210,750	224,140	195,060	207,450	185,055	196,815
35—39	0.02505	0.03007	95,415	114,535	97,915	117,540	90,630	108,790
40—44	0.00894	0.01137	31,565	40,140	33,690	42,850	34,575	43,975
45—49	0.00079	0.00090	2,145	2,445	2,750	3,130	2,935	3,340
Total	—	—	1,409,395	1,530,925	1,472,600	1,600,395	1,533,795	1,663,655

*Computation: Number of persons in 0—4 year group**

Males

PERIOD	Total born		Males born		Deceased between 0—4 years		Surviving between 0—4 years	
	Var. I	Var. II	Var.I	Var. II	Var. I	Var. II	Var. I	Var. II
1965—1969	1,409,395	1,530,925	718,791	781,282	39,350	42,771	679,441	738,511
1970—1974	1,472,600	1,600,395	751,026	816,201	41,115	44,683	709,911	771,518
1975—1979	1,533,795	1,663,655	782,098	848,464	42,814	46,449	739,284	802,015

Females

PERIOD	Total born		Females born		Deceased between 0—4 yeats		Surviving between 0—4 years	
	Var. I	Var. II	Var. I	Var. II	Var. I	Var. II	Var. I	Var. II
1965—1969	1,409,395	1,530,925	690,604	750,643	31,876	34,645	658,728	715,998
1970—1974	1,472,600	1,600,395	721,574	784,194	33,304	36,194	688,270	748,000
1975—1979	1,533,795	1,663,655	751,427	815,191	34,681	37,985	716,746	780,510

* To compute the number of deceased between 1—4 years the death probability in the 1963 mortality tables was used, and for the age 0 years the death probability, computed on basis of the 1965 data regarding infant mortality.

Annex 4

Computation: Female population for the years 1970, 1975 and 1980

Variant I $\begin{matrix} f \\ Sx \end{matrix}$ $\begin{matrix} 1965 \\ 1963 \end{matrix}$

Age group	Female population on 1.I.1965	Survival coefficient Sx	Female population on		
			1.I.1970	1.I.1975	1.I.1980
0—4	712,660	0.98276	658,728	688,270	716,746
5—9	875,301	0.99740	700,374	647,372	676,404
10—14	887,856	0.99750	873,025	698,553	645,689
15—19	729,960	0.99650	885,636	870,842	696,807
20—24	670,114	0.99542	727,405	882,536	867,794
25—29	799,272	0.99423	667,045	724,073	878,494
30—34	780,453	0.99266	794,660	663,196	719,895
35—39	748,868	0.98944	774,724	788,827	658,328
40—44	671,258	0.98556	740,960	766,543	780,497
45—49	424,856	0.97739	661,565	730,261	755,474
50—54	598,820	0.96672	415,250	646,607	713,750
55—59	507,236	0.94542	578,891	401,430	625,088
60—64	421,451	0.91149	479,551	547,295	379,520
65—59	352,586	0.85011	384,148	437,106	498,854
70—74	242,632	0.74634	299,737	326,568	371,588
75 and over	268,294	0.50996	317,905	385,825	440,486
TOTAL	9,691,616	—	9,959,604	10,205,304	10,425,414

Annex 5

Computation: Male population for the years 1970, 1975 and 1980

Variant I $\begin{matrix} f \\ Sx \end{matrix}$ $\begin{matrix} 1965 \\ 1963 \end{matrix}$

Age group	Male population on 1.I.1965	Survival coefficient Sx	Male population on		
			1.I.1970	1.I.1975	1.I.1980
0—4	750,779	0.98206	679,441	709,911	739,284
5—9	914,842	0.99644	737,310	667,252	697,175
10—14	923,370	0.99564	911,585	734,685	664,877
15—19	752,685	0.99290	919,344	907,610	731,482
20—24	685,837	0.99176	747,341	912,817	901,166
25—29	784,853	0.99078	680,186	741,183	905,295
30—34	785,051	0.98899	777,617	673,915	734,349
35—39	747,085	0.98529	776,407	769,055	666,495
40—44	600,208	0.98014	736,095	764,986	757,742
45—49	344,512	0.96761	588,288	721,476	749,793
50—54	530,511	0.94887	333,353	569,233	698,107
55—59	472,120	0.91671	503,386	316,309	540,128
60—64	391,458	0.87528	432,797	461,459	289,964
65—69	264,361	0.81046	342,635	378,818	403,906
70—74	171,733	0.70634	214,254	277,692	307,017
75 and over	169,731	0.47259	201,515	246,570	312,672
TOTAL	9,289,136	—	9,581,554	9,852,971	10,099,452

Computation: Female population for the years 1970, 1975 and 1980

Variant II $\begin{matrix} f & 1965 \\ Sx & 1963 \end{matrix}$

Age group	Female population on 1.I.1965	Survival coefficient Sx	Female population on		
			1.I.1970	1.I.1975	1.I.1980
0— 4	712,660	0.98276	715,998	748,000	780,510
5— 9	875,301	0.99740	700,374	703,654	735,104
10—14	887,856	0.99750	873,025	698,553	701,824
15—19	729,960	0.99650	885,636	870,842	696,807
20—24	670,114	0.99542	727,405	882,536	867,794
25—29	799,272	0.99423	667,045	724,073	878,494
30—34	780,453	0.99266	794,660	663,196	719,895
35—39	748,868	0.98944	774,724	788,827	658,328
40—44	671,258	0.98556	740,960	766,543	780,497
45—49	424,856	0.97739	661,565	730,261	755,474
50—54	598,820	0.96672	415,250	646,607	713,750
55—59	507,236	0.94542	578,891	401,430	625,088
60—64	421,451	0.91149	479,551	547,295	379,520
65—69	352,586	0.85011	384,148	437,106	498,854
70—74	242,632	0.74634	299,737	326,568	371,588
75 and over	268,293	0.50996	317,905	385,825	440,486
TOTAL	9,691,616	—	10,016,874	10,321,316	10,604,013

Computation: Population in total and by age

Variant I

Age group	Population on					
	1965			1970		
	Male	Female	Total	Male	Female	Total
0—14	2,588,991	2,475,817	5,064,808	2,328,336	2,232,127	4,560,463
15—59	5,702,862	5,930,837	11,633,699	6,062,017	6,246,136	12,308,153
60 and over	997,283	1,284,962	2,282,245	1,191,201	1,481,341	2,672,542
TOTAL	9,289,136	9,691,616	18,980,752	9,581,554	9,959,604	19,541,158

Variant II

Age group	Population on					
	1965			1970		
	Male	Female	Total	Male	Female	Total
0—14	2,588,991	2,475,817	5,064,808	2,387,406	2,289,397	4,676,803
15—59	5,702,862	5,930,837	11,633,699	6,062,017	6,246,136	12,308,153
60 and over	997,283	1,284,962	2,282,245	1,191,201	1,481,341	2,672,542
TOTAL	9,289,136	9,691,616	18,980,752	9,640,624	10,016,874	19,657,498

Annex 7

Computation: Male population for the years 1970, 1975 and 1980

Variant II f 1960—1965
Sx 1963

Age group	Male population on 1.I.1965	Survival coefficient Sx	Male population on		
			1.I.1970	1.I.1975	1.I.1980
0— 4	750,779	0.98206	738,511	771,518	802,015
5— 9	914,842	0.99644	737,310	725,262	757,677
10—14	923,370	0.99564	911,585	734,685	722,680
15—19	752,685	0.99290	919,344	907,610	731,482
20—24	685,837	0.99176	747,341	912,817	901,166
25—29	784,853	0.99078	680,186	741,183	905,295
30—34	785,051	0.98899	777,617	673,915	734,349
35—39	747,085	0.98529	776,407	769,055	666,495
40—44	600,208	0.98014	736,095	764,986	757,742
45—49	344,512	0.96761	588,288	721,476	749,793
50—54	530,511	0.94887	333,353	569,233	690,107
55—59	472,120	0.91671	503,386	316,309	540,128
60—64	391,458	0.87528	432,797	461,459	289,964
65—69	264,361	0.81046	342,635	378,818	403,906
70—74	171,733	0.70634	214,254	277,692	307,017
75 and over	169,731	0.47259	201,515	246,570	312,672
TOTAL	9,289,136	—	9,640,624	9,972,588	10,280,488

Annex 8

group in the years 1965, 1970, 1975 and 1980

1st January

1975			1980		
Male	Female	Total	Male	Female	Total
2,111,848	2,034,195	4,146,042	2,101,336	2,038,839	4,140,175
6,376,584	6,474,315	12,850,899	6,684,557	6,696,127	13,380,684
1,364,539	1,696,794	3,061,333	1,313,559	1,690,448	3,004,007
9,852,971	10,205,304	20,058,275	10,099,452	10,425,414	20,524,866

1st January

1975			1980		
Male	Female	Total	Male	Female	Total
2,231,465	2,150,207	4,381,672	2,282,372	2,217,438	4,499,810
6,376,584	6,474,315	12,850,899	6,684,557	6,696,127	13,380,684
1,364,539	1,696,794	3,061,333	1,313,559	1,690,448	3,004,007
9,972,588	10,321,316	20,293,904	10,280,488	10,604,013	20,884,501

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PERSPECTIVES DE LA POPULATION. METHODES DE CALCUL

Les nécessités courantes et de perspective de la planification, ainsi que les études démographiques modernes, réclament la projection du nombre de la population à un niveau très détaillé, en prenant pour base des données adéquates, pour des périodes relativement longues — de 10 à 20 ans.

Le perfectionnement des méthodes de projection est l'une des préoccupations permanentes de la démographie moderne.

Cette étude prend comme point de départ les nécessités de notre pays et on propose, en conséquence, quelques modalités de calcul, en utilisant les informations récentes ayant trait à ce problème. On examine les tendances de la mortalité spécifique à l'aide des tables de mortalité (évolution des probabilités de décès), l'évolution de la fertilité spécifique et la détermination de ses tendances futures. Diverses méthodes d'ajustement analytique et d'extrapolation sont employées, et on formule plusieurs hypothèses se rapportant aux tendances de la mortalité et de la fertilité de la population féminine. En vue d'assurer des bases scientifiques à cette étude, on a également recours à des analogies avec différents pays ayant déjà parcouru certaines étapes de l'évolution démographique.

ПЕРСПЕКТИВНОЕ НАСЕЛЕНИЕ. МЕТОДЫ РАСЧЕТА

Требования текущего и перспективного планирования, современные демографические исследования делют необходимым детальное, соответственно обоснованное планирование численности населения на сравнительно большие периоды, 10—20 лет.

Усовершенствование методов планирования является одной из постоянных задач современной демографии.

В работе авторы исходят из потребностей нашей страны и, в результате, предлагают несколько способов, касающиеся этого вопроса. Исследуются тенденции специфической смертности при помощи таблиц смертности (эволюция возможностей смерти) эволюция специфической рождаемости и определение ее тенденции в будущем. В работе использованы различные методы аналитической подборки и сопоставления. Сформулированы некоторые положения о тенденциях смертности и рождаемости женского населения. Чтобы подвести научную базу проведена аналогия и с различными странами, которые пошли определенные этапы демографического развития.