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SECTION III

POPULATION GROWTH AND AGRICULTURE

THE POPULATION PROSPECT

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POPULATION growth has been slowing up in most nations of the Western world. This general trend is well known to most agricultural economists, for the relation between the number of people to be fed and a long-time agricultural programme has been receiving much attention of late. What is not so generally understood, however, is the rapidity with which growth has fallen off in the last few years.

Within the past decade several students of population have calculated the future number of inhabitants of various countries according to certain trends of birth-rates, death-rates, and immigration. Published studies include those for Great Britain by Bowley¹ in 1924 and Leybourne² in 1934, for the United States by the author³ in 1928 and 1933, for France by Sauvy⁴ in 1928 and 1929, for Germany by Kahn⁵ in 1930 and Burgdörfer⁶ in 1932, for Belgium by Baudhuin⁷ in 1931, for Italy by Gini⁸ in 1931, and for Denmark by Jensen⁹ in 1931. In most cases the general plan has been to start with the population by five-year age periods as given in the last census, to calculate the

¹ Bowley, A. L., 'Births and Population in Great Britain'. *The Journal of the Royal Economic Society*, vol. xxxiv (1924), pp. 188-92.

² Leybourne, Grace G., 'An Estimate of the Future Population of Great Britain'. *The Sociological Review*, vol. xxvi, no. 2 (April 1934), pp. 130-8.

³ Whelpton, P. K., 'Population in the United States, 1925-1975'. *American Journal of Sociology*, vol. xxxiv, no. 2, pp. 253-70. Whelpton, P. K., and Thompson, Warren S., *Population Trends in the United States*. New York: McGraw-Hill Book Company, 1933.

⁴ Sauvy, Alfred, 'La Population française jusqu'en 1956, Essai de prévision démographique'. *Journal de la Société de Statistique de Paris*, no. 12 (December 1928), pp. 321-7; no. 1 (January 1929), pp. 8-13.

⁵ Kahn, Ernst von, *Der internationale Geburtenstreik*, Frankfurt am Main, Societäts-Verlag, 1930, pp. 81-95.

⁶ Burgdörfer, Friedrich, *Volk ohne Jugend*. Berlin-Grünwald. Kurt Vowinkel Verlag G.M.B.H. 1932.

⁷ Baudhuin, Fernand, 'L'Avenir de la population belge'. Extrait du *Bulletin d'Information et de Documentation de la Banque Nationale de Belgique*, 6ième année, vol. i, no. 11, du 10 Juin 1931.

⁸ Gini, Corrado, *Calcoli sullo Sviluppo Futuro della Popolazione Italiana*. Rome: Istituto Poligrafico Dello Stato, 1931.

⁹ Jensen, Adolph, 'Horoscope of the Population of Denmark'. *Bulletin de l'Institut International de Statistique*, vol. xxv, pt. 3 (1931), pp. 41-9.

number of survivors in each age period at future years according to the most recent life tables, and to compute births since the census by means of recent specific birth-rates. Occasionally an allowance has been made for a gain or loss through migration. In some studies several sets of computations have been made, based on different assumptions as to future trends in specific birth-rates, specific death-rates, and migration. In this paper the endeavour will be to present the results obtained and to show the extent to which the smallest population growth calculated by the least favourable of the assumptions is proving to be too high for most nations.

Great Britain. Bowley's calculation of Great Britain's future population, published in June 1924, was based on the assumptions that the specific death-rates of 1910 to 1912 would continue in effect, that the annual number of births would remain as in 1921 to 1923, and that there would be no migration. Starting with a population of nearly 42,800,000 in 1921, his results showed an increase to a maximum of nearly 48,900,000 in about 1980 with a slight decrease thereafter. At the time this estimate was published it seemed reasonable, but now it is plain that population growth is lagging behind these figures. The 1931 census count of 44,800,000 was almost 600,000 below Bowley's calculation, the major part of his excess being caused by too high an assumption for births, and most of the remainder by not allowing any excess of emigrants over immigrants.

Miss Leybourne's calculations for Great Britain, published last April, take account of the rapid decline in the birth-rate and the small decline in the death-rate that has occurred since the base period used by Bowley. She assumes that birth-rates will continue to decline until 1944 at about the pace followed from 1924 to 1931, that death-rates will be lowered but slightly from the 1924-32 average, and that emigration will equal immigration, as has been approximately the case recently. On these assumptions Great Britain's population will reach a maximum next year at 45,144,000 and will then decline to 32,713,000 in 1976. This latter figure is about 16 millions below Bowley's result of almost 48,900,000 in 1976, a difference which should be quite significant in connexion with any plans for a British agricultural programme during the next half-century. Leybourne's figures are so much below Bowley's, chiefly because the lower birth-rates she assumes give about 16 million fewer persons under 45 in 1976; for her lower death-rates give 600,000 more persons over 65 than Bowley obtained.

Whether birth-rate trends are likely to change so much between now and 1976 that Bowley's figures will be as nearly correct as

Leybourne's will be discussed later. It is almost certain, however, that Leybourne's result of 44,840,000 in 1941 will be much nearer Great Britain's actual population than Bowley's result of 47,280,000.

Germany. Ernst Kahn's calculation of Germany's population growth published in 1930 was based on the assumptions that infant mortality would decline 70 per cent. in 25 years and specific death-rates at older ages 20 per cent. in 45 years, that the number of children born per married couple would decline from 1.94 in 1929 to 1.50 in 1950-4 and remain at this level, and that there would be no gain or loss through migration. On this basis the German population would increase from 59,177,000 in 1920 to a maximum of about 65,500,000 between 1935 and 1940 and would then decline. By 1975 there would be less than 50 million persons, with the decrease continuing at a diminishing rate.

Burgdörfer's calculations published in 1932 were made on three assumptions as to birth-rates, but in each case the specific death-rates were assumed to remain as in 1927 and no allowance was made for a gain or loss through migration. The most optimistic assumption was that specific birth-rates would remain as in 1927. On this basis Germany's population would increase to over 71 millions in 1965 and would decline slowly thereafter. Nearly as optimistic was the second assumption that the number of births would remain as in 1927. This would give a population of almost 70 millions in 1960 which would become stabilized at 67 millions by the end of the century. Burgdörfer's lowest assumption was a decrease of 25 per cent. in specific birth-rates from 1927 to 1955 with no subsequent decline. The resulting population would reach a maximum of nearly 68 millions in 1945 with a decline thereafter to 57 millions in 1980 and further losses in prospect.

Of the three estimates by Burgdörfer and the one by Kahn, which most nearly approximates the actual population growth? The answer to date may be found by comparing the trend of the birth-rate with the various assumptions made. As Burgdörfer himself has pointed out, the decline in the birth-rate since 1927 (his base year) has been more rapid than his lowest assumption. By 1929 specific birth-rates had declined 6 per cent. from 1927, by 1930 the decline was 9 per cent., by 1931 it was 18 per cent., and by 1932 approximately 22 per cent. I understand the decline to 1933 was about 30 per cent. In 6 years, then, specific birth-rates have dropped more than Burgdörfer's lowest assumption allowed in 28 years, whereas there has been only a slight decrease in the crude death-rate. At the present time, therefore, the results of Burgdörfer's two more optimistic assumptions are far too

high, and even his lowest results, like those of Kahn, appear above rather than below the actual population. Unless the German birth-rate continues at or above the 1933 figure, or unless migration adds appreciably to the population, Germany's agricultural programme should be based on 40 million inhabitants in 1980.

Italy. In 1931 Gini published several calculations of the future population of Italy based on different assumptions as to birth- and death-rates and migration. The largest population growth, from 38,950,000 in 1921 to 63 millions in 1961, resulted from the assumptions that specific birth- and death-rates would remain as in 1928 and that no migration would occur. The smallest growth, to 47,300,000 in 1961, resulted from the assumptions that specific death-rates would remain constant, that the decline in specific birth-rates from 1922 to 1928 would continue until 1948 and that net emigration would amount to 950,000 during 1921-31 and to 400,000 in subsequent decades. In all cases population growth would continue to 1980, though no results were shown after 1961.

Here again Gini's lowest assumptions, although too optimistic, are closest to the actual population growth to date, the 1931 figure of 41,900,000 which they give being only 700,000 above the census of 41,200,000. There has been a decline in death-rates not allowed for by the low assumptions, but the birth-rate has declined more rapidly since 1928 than it did from 1922 to 1928, and the loss by emigration has been larger than assumed. Unless the decline in the birth-rate is soon checked or unless emigration decreases, the population to be provided for in Italy will continue to be less than Gini's lowest figures.

Denmark. In 1932 Jensen published three sets of results regarding the future population of Denmark, varying the assumptions for birth-rates and migration, but in each case assuming specific death-rates of 1921-5 to remain in effect. The largest population, increasing from 3,250,000 in 1921 to over 5,500,000 in 1981, was given by assuming no migration and a continuation of 1921-5 specific birth-rates. Allowing the same net immigration as during 1921-5 and the same specific birth-rates as from 1926 to 1929 resulted in a population of 4,400,000 in 1981, with little subsequent gain. Continuing the 1927-9 number of births instead of the birth-rate for that period gave still lower results, the population reaching a maximum of 4 millions in 1971 and declining slightly thereafter.

Clearly the first assumptions are too high to date for they do not take into account the decline in birth-rates and loss by emigration that has occurred since the 1921 census, not even that known at the time they were made. The results yielded by the other assumptions

were practically identical for 1931, and differed only slightly from the 1931 census. Both the birth-rate and the number of births have declined more rapidly since the base period than these assumptions anticipated, but the loss through emigration has also been smaller than assumed. For the future, there must be no decline in the number of births, or else a decline must be offset by a smaller loss or even a gain through migration, if the population of Denmark is ever to reach the 4 million mark.

France. Figures showing the future population of France were presented in November 1928 by Alfred Sauvy, calculated according to the assumptions that the specific death-rates of 1920-3 and the specific birth-rates of 1927 would continue in effect, and that there would be no gain or loss through migration. On this basis France would continue to have about 39,500,000 inhabitants from 1928 until 1940, after which there would be a slight decline. Sauvy mentioned the possibility that the decline in the birth-rate which had gone on in France for many years prior to 1928 might continue. In this case actual births each year would be under his figures by an amount increasing up to 150,000 annually in 1956, and the population in that year would be some 2 millions below his result of 38 millions computed on a stationary birth-rate.

Unlike the calculations for Great Britain, Germany, Italy, and Denmark, those for France have proved too low. Instead of 41,835,000 as shown by the census for 1931, Sauvy had calculated only 39,540,000, a deficit of almost 2,300,000. The deficit resulted largely from the fact that immigrants exceeded emigrants by almost 2 millions in the intercensal period, while Sauvy assumed no gain from this movement. A small part may also have been due to a decrease in death-rates after 1920-3. On the other hand, the birth-rate during 1928-30 averaged somewhat below that of his base year (1927), and has declined still more since 1930. Estimates of net migration are more hazardous than those of birth-rates, but judging from events of the last five years Sauvy's omission of an allowance for immigration during the next decade or two will more than offset his not allowing for further declines in the birth-rate during this period. In this case, the French population which exceeded his figures by almost 2,300,000 in 1931 should do so by somewhat larger amounts up to 1950 or thereabouts.

Belgium. Like Sauvy's calculations for France those of Baudhuin for Belgium, published in 1931, have proved to be slightly under rather than above the actual population. He assumed specific birth-rates and death-rates would continue about as in 1928 and made no

allowance for a gain or loss through migration. On this basis the population of Belgium would increase from 7,406,000 in 1920 to 8,110,000 in 1940, and then decline to 6,725,000 in 1980. Judging from crude rates his assumption for births and deaths has been followed closely, the 1932 rates being almost identical with those of 1928. Migration added about 164,000 to Belgium's population from 1921 to 1931, which is approximately the difference between the 1930 census of 8,090,000 and that of 7,910,000 computed by Baudhuin. If trends of the last five years continue, immigration will keep Belgium's population from declining quite as fast as Baudhuin's figures indicate.

United States. The first calculations for the United States by the writer, published in 1928, assumed that specific death-rates would continue to decline much as in the past until they would reach in 1975 the New Zealand rates of 1920-2. For specific birth-rates it was assumed that the downward trend would keep on at about the pace from 1905-9 to 1925-6, so that by 1975 these rates would be about 75 per cent. of the 1925-6 figures. Based on immigration reports for 1925-7 an allowance of 200,000 was made for annual net immigration after 1927. On these assumptions the population of the United States would increase from 105,711,000 in 1920 to 175 millions in 1975. The result for 1930 was a little too high, being about 200,000 above the census count of 122,775,000, but since then birth-rates and net immigration have been considerably below the assumptions, making the calculated population too large by an increasing margin.

In 1932 the future population of the United States was calculated according to several sets of assumptions for birth-rates, death-rates, and migration. The results were published in *Population Trends in the United States* by Warren S. Thompson and the writer early in 1933. The lowest assumptions were a decrease of about one-third from specific birth-rates in 1925-9, a continuation of 1930 specific death-rates, and no immigration. The resulting population increased from 122,800,000 in 1930 to 136,500,000 in 1956 and then declined to 126,500,000 in 1980. At the other extreme were the assumptions of a decline of only about 15 per cent. in specific birth-rates, a decline of about 15 per cent. in specific death-rates, and the net arrival of 200,000 immigrants annually during 1935-9 and 300,000 annually thereafter. Under these conditions the population of the United States would increase for a century or more and would amount to 202 millions in 1980. In this book, Thompson and I stated our belief that population growth probably would follow more closely the results of our so-called medium assumptions than of either our high or low

assumptions, but would more likely be below than above the medium figures. These showed the population increasing to 155 millions in 1980, which is well below the 1975 figure of 175 millions yielded by the 1928 assumptions. As a matter of fact, however, our lowest assumptions give a population on January 1, 1935, of 127,300,000, which will be about 250,000 too high. Instead of immigration equalling emigration during 1930-4, in accordance with our lowest assumption, there has been an excess of departures. In addition, the number of births has declined more rapidly than we thought at all probable, births in 1933 being 11 per cent. fewer than in 1930, and specific birth-rates declining still more. Unless the decline is checked rapidly our low figures of 136,500,000 as a maximum population for the United States will not even be reached. This means future growth will increase the January 1, 1934, population by less than 8 per cent.

In France and Belgium immigration has added enough to population growth to make it run slightly higher than anticipated according to reasonable assumptions for birth- and death-rate trends. On the other hand, in Great Britain, Germany, Italy, Denmark, and the United States the population has grown less than indicated by apparently low assumptions for birth-rates, death-rates, and migration. The net result for these seven countries has been decidedly below expectations. Will this be true during future years? Only a prophet can give a definite answer to such a question. The writer disclaiming any prophetic powers and having but limited time here can only summarize certain facts bearing on the question.

FUTURE DEATH-RATES

Regarding future death-rate trends there is little disagreement among the well informed, and apparently a prospect of only minor errors. Most students of vital statistics realize that it will be difficult, if not impossible, to increase the expectation of life beyond seventy years and that progress towards this goal is likely to become increasingly slower in the future. Their assumptions in recent years have been modest and have been close to actual events. Population growth has not been falling behind the anticipated figures because of failure to achieve the small improvement in mortality rates assumed, nor is it likely to do so in the next few decades.

FUTURE IMMIGRATION

If immigration and emigration were governed chiefly by economic conditions it would be hard enough to indicate the movement likely to occur during the next several years. Adding to the difficulties are

the legislative restrictions which act as the decisive factor in the United States and many other countries, and for which there is little basis of judging trends long in advance. At present the most general belief seems to be that immigration will continue to be limited rather rigidly by the United States and certain other countries which have received many immigrants in the past, while emigration will be discouraged by some countries which formerly sent out large numbers of persons. In most of the assumptions discussed above, little allowance has been made for gains or losses through migration. In France and Belgium, where population growth has run above the calculated figures, the most important cause is the immigration that has taken place. An important number of the immigrants to France came from Italy, where the 1931 population was below the mark set by Gini's lowest calculations primarily because net emigration amounted to nearly 1,800,000 during 1921-31 instead of 950,000 as he assumed. To quite an extent, therefore, the gains by immigration to some of the above countries mean losses by emigration for others and have little effect on the total population of all seven.

Nothing was said earlier in this paper about the probable growth of population in the countries of eastern and south-eastern Europe, in some of which the increase is believed to have been rapid in recent years. Kuczynski¹⁰ has shown, however, that in Czechoslovakia, Latvia, Austria, and Esthonia the net reproduction rate is less than one, which means that present birth- and death-rates will not maintain population growth permanently. Emigration from these countries on a large scale appears quite improbable; if there is such a movement it must come from such countries as Russia with a net reproduction rate of 1.7 in 1929, or the Ukraine, Bulgaria, or Poland with rates of 1.3 to 1.4 at that time. These nations now have a population growth sufficiently large to furnish each year many thousands of immigrants to the countries of western Europe. Whether the transfer occurs will depend largely on economic conditions, and on governmental rules and regulations.

But even countries whose population is now growing rapidly may have a large decline in rates of increase in the future. Japan, for example, has experienced a remarkable population growth in recent decades; the number of inhabitants rose from 56 millions in 1920 to 64 millions in 1930, and the crude rate of increase was 14 per 1,000 in 1933. Nevertheless, such an authority as Uyeda¹¹ believes that growth

¹⁰ Kuczynski, Robert R., *The Balance of Births and Deaths* (Washington: The Brookings Institution, 1921), vol. ii, p. 64.

¹¹ Uyeda, Teijiro, 'Future of the Japanese Population'. Preliminary paper prepared

will slow up rapidly in the future. His conclusions are that Japan's population will never reach 100 millions, and probably will not exceed 80 millions, with a declining birth-rate bringing about much of the stoppage of growth. Such a dwindling of the rate of increase seems equally probable in some of the eastern and south-eastern European nations.

FUTURE BIRTH-RATE

As pointed out earlier, it has been primarily because of a rapid decline in the birth-rate that population growth in the United States and the nations of western Europe has lagged behind even the low expectations on the whole. Among the causes to which this decline has been ascribed are biological changes, venereal and other diseases affecting fertility becoming more widespread, the nervous strain of city life becoming more intense, changes in diet, an increasing number of persons being in sedentary occupations instead of leading an active outdoor life, a lowering of the marriage rate among those of a marriageable age, and an increase in the practices of abortion and contraception. The relative importance of each of these factors is of interest here in considering what the trend of the birth-rate will be in the future. Although this will be discussed primarily from the standpoint of the situation in the United States, it is believed that the underlying principles apply fairly well to the countries of western Europe.

That the low birth-rate of to-day is due in part to biological and physiological causes is certain, for the experience of physicians shows that there are a number of couples who have tried to have children but to whom no live births have occurred. Thus Reynolds and Macomber,¹² two leading gynaecologists, estimate that the percentage of married couples in Massachusetts who are infertile is between 10 and 13 per cent., and that most of these are infecund. Unfortunately there is very little evidence in the United States of the extent of sterility, and none as to changes in the situation during past years. There are abundant data showing the increase in the proportion of childless couples which has taken place, but, as will be shown later, the indications are that this is due to other causes than biological changes lowering fecundity.

Several of the other causes are equally difficult to measure. Statistics of venereal diseases are entirely inadequate at present and past trends for the Fifth Biennial Conference of the Institute of Pacific Relations held at Banff, Canada, August 14 to 28, 1933. Tokyo: Japanese Council, Institute of Pacific Relations, 1933.

¹² Reynolds, Edward, and Macomber, D., *Fertility and Sterility in Human Marriages*. Philadelphia and London: W. B. Saunders Co., 1924.

cannot be known. That there is a nervous strain connected with city life, and that it has increased in intensity with greater congestion in cities and the speeding up of the tempo of urban life, seems probable, and it is certain that city birth-rates have declined. It is yet to be proved, however, that there is a causal relationship between these series of events. As far as diet is concerned the importance of vitamin E has been proven, but there seems far too small a change in the vitamin E consumption of the population to cause the decline in the birth-rate that has taken place. As far as a lowering of the marriage rate is concerned, the trend in the United States has been upward, hence in that country there should be a higher rather than a lower birth-rate to women in the child-bearing ages.

Beyond question the practice of abortion is partially responsible for the low birth-rate, but here as with infecundity, current information is meagre and inadequate, while information on trends is practically non-existent. One of the best sources of statistical information is the study of 10,000 women who went to the Birth Control Clinical Research Bureau in New York City from 1925 to 1929.¹³ Prior to their first clinic visit 38,985 pregnancies had occurred to these women, 7,677 or 19.7 per cent. ending in induced abortions. In this group less than 4 per cent. of first pregnancies were terminated by induced abortion while 20 per cent. of second pregnancies and about 30 per cent. of fourth pregnancies were so ended.

Many students of population have long believed, like the writer, that the practice of contraception has been by far the most important cause of the present low birth-rate in the United States and certain western European nations, and of the rapid decline in rate that has occurred in the past. Until recently, however, the direct statistical basis for this belief was not fully adequate, since there was no assurance that it was obtained from unbiased groups. Results of several of the earlier studies were important, nevertheless. For example, Dr. Katharine B. Davis¹⁴ reported in *Factors in the Sex Life of Twenty-Two Hundred Women* that 730 of each 1,000 married women returning questionnaires practised contraception. Among women going to the Birth Control Clinical Research Bureau in New York City, 95 per cent. had made some effort before their first clinic visit to limit their families by the practice of what they believed to be contraception.¹⁵ Comparing the frequency of pregnancy among these

¹³ Kopp, Marie E., *Birth Control in Practice*. New York: Robert M. McBride & Co., 1934.

¹⁴ Davis, Katharine B., *Factors in the Sex Life of Twenty-two Hundred Women*. New York and London: Harper & Brothers, 1929.

¹⁵ Stix, Regine K., and Notestein, Frank W., 'Effectiveness of Birth Control'. *The Milbank Memorial Fund Quarterly*, vol. xii, no. 1 (Jan. 1934), pp. 57-68.

women with that among those who had not practised contraception indicated that the former lowered the chance of becoming pregnant by 73.6 per cent.

Quite recently the statistical knowledge of the prevalence and effectiveness of contraceptive practices has been greatly enlarged by studies of Dr. Raymond Pearl¹⁶ dealing with nearly 5,000 married women not selected according to their interest in birth control. Among the white women in the study the proportion practising contraception rose from 32.7 among the very poor to 38.8 among the poor, to 50.6 among those in moderate circumstances, and to 78.3 among the well-to-do and rich, and was higher among those who had been pregnant two or more times than among those who had borne their first child shortly before being interviewed. About half of the women were successful in their contraceptive practice, having only desired pregnancies. About one-third were unsuccessful primarily through lack of knowledge about effective practices, while about one-sixth were unsuccessful through carelessness in usage of contraceptive methods and appliances. Among white women in the well-to-do classes, however, nearly 70 per cent. of those who had experienced two or more pregnancies practised contraception so successfully as to have only as many pregnancies as they wanted. Among white women who had not practised contraception the mean pregnancy rate was practically the same in all four economic classes. This is in great contrast to the inverse relation between fertility and economic status found in the general population, and indicates strongly that the latter is due to variations in the practice of contraception rather than to biological, physiological, or environmental causes. Further evidence is furnished by the facts that the mean pregnancy rates were similar among white and negro women not practising contraception, and in each economic class among white women using the same contraceptive practices.¹⁷

This direct evidence on the extent and effectiveness of the practice of contraception fits in well with the indirect evidence built up previously on the basis of certain existing differentials. Over a long period it has been observed that there was an inverse relation between birth-rate and economic status in American cities. The explanation was advanced that among city people those in the upper economic groups would first learn effective practices of contraception and those in the lowest groups would be last in obtaining this knowledge.

¹⁶ Pearl, Raymond, 'Contraception and Fertility in 4945 Married Women. A Second Report on a Study of Family Limitation'. *Human Biology*, vol. vi, no. 2, pp. 355-401.

¹⁷ *Ibid.*, p. 399.

Pearl's study finds this to be the case. Eventually when contraceptive information is equally widespread among all economic groups, birth-rates of the poorest group may fall sufficiently to be slightly under those of the upper groups. This is the situation Edin¹⁸ reports for Stockholm.

As far back as records go in the United States, urban birth-rates have been below rural rates. An explanation suggested was an earlier and wider spread of contraceptive information among urban people. In addition it was believed there was less pressure to practise contraception on farms, for children have been less of an economic burden to rural than urban people in the past. Pearl's study does not throw light on this matter, rural women probably being relatively few in the sample and not tabulated separately. But in view of his results the writer fully expects this hypothesis to be proven.

In the future it is believed that knowledge about contraceptive practises will spread among the lower economic groups in the cities and among rural people until their situation in these respects is similar to that of upper economic city groups. To quote from Pearl's study:

'The general picture is of a state of affairs where a high proportion of the economically most fortunate classes are practising contraception with a relatively high degree of precision and intelligence, producing mainly only as many babies as they want and when they want them. On the other hand the less and particularly the least fortunate economic classes, in this material certainly, are to a much smaller extent making any attempt to practise contraception at all, and of those who are making the attempt the proportion who are doing so intelligently and precisely is also smaller. Our detailed records indicate clearly that *this is due primarily to ignorance of contraceptive methods and technique*, rather than to a desire to have large families. Hundreds and hundreds of the women in this sample who do not practise contraception are pleading for information and instruction so that they may. A more perfect illustration than that afforded by the figures of this report would be hard to find of the element of truth embodied in that plaintive ballad whose refrain states that:

It's the *rich* what 'as the pleasure;

It's the *poor* what gets the blime!

In view of the facts, little probability is seen of the birth-rate in the United States or in most European countries ceasing to decline, or of present rates being regained in the future. The rapid decrease in the birth-rate during the recent depression is not believed to be a temporary phenomenon, to be followed by an increase when good times

¹⁸ Edin, Karl Arvid, 'The Birth Rate Changes'. *Eugenics Review*, vol. xx, no. 4 (Jan. 1929), pp. 258-66.

return. Instead, it is argued that the depression has intensified the need for families to control their size, and hence has speeded up the spread of contraceptive information and of success in limiting births. Comparatively little of the drop in rates brought about in this manner is expected to be regained as economic conditions improve by the occurrence of births postponed because of hard times. It is believed that the return of many city people to a rural environment which has occurred in the United States as a result of the depression will not check the decline in the birth-rate because of the higher rural rate applying to a larger proportion of the population, but rather that it will speed up the decline by spreading more rapidly city information regarding contraception among country people. There are no exact current data available on this matter, however, since births in the United States are tabulated by place of occurrence of birth rather than place of residence of the mother, the depression has greatly decreased the use of city hospitals by prospective rural mothers, and the size of the urban-rural migration is not known by age groups.

The general tendency of persons who have been studying future population growth has been to underestimate the speed with which contraceptive information would be spread and put into practice, and hence the rapidity with which the birth-rate would be lowered. One result may be that the birth-rate will become stabilized earlier than anticipated, as low rates are attained in the near future. In the meantime, however, the conclusion seems inevitable that population growth in most nations of the western world will be smaller than the figures computed on the basis of the low assumptions published.

CHANGES IN AGE COMPOSITION

Almost all of the studies referred to above point out the important changes that will occur in the age composition of the population as population growth follows the low assumptions. In general these are a rapid decrease in the proportion and some decline in the number of children and youths in the population, a small increase in the proportion of young adults in the best working ages (20-45), a medium increase in the proportion and a rapid increase in the number of adults in the older working ages (45-65), and a large increase in the proportion and a still larger increase in the number of elders, those over 65 and whose working days are about ended. So much has been said of these changes and so little of my time remains that I shall not go into detail regarding them but will only give a few examples. According to Leybourne's calculations Great Britain will have barely 4 million persons under 15 in 1976 compared with nearly 11 millions

in 1931, while the number of persons 65 and over will increase from slightly over 3 millions to almost 6 millions. In Germany, Kahn's computation envisages a decline from almost 15 millions under 15 in 1931 to not quite 5 millions in 1975, and an increase in those 65 and over from 4 millions to almost 11 millions. In Italy, Gini's low assumptions show smaller changes, the population under 15 being 11,700,000 in 1961 compared with 12,200,000 in 1931, and the population 65 and over rising only from 2,600,000 to 3,800,000. In the United States our lowest assumptions show persons under 15 numbering 23 millions in 1980 compared with 36 millions in 1930, and those 65 and over rising from 6,600,000 in 1930 to 17,100,000 in 1980.

Striking as these changes are, it must be remembered that the failure of population growth to come up to the low assumptions for most countries during the next half-century will mean a still greater decline in the number and proportion of children and youths and a still larger increase in the proportion of those too old to work, although the number of the latter will not change from the low assumptions because it is determined by births that have already occurred.

To agriculture, as to other interests, the possibility that the population of north-western Europe and North America will reach a peak within twenty years and then commence to decrease may be quite alarming and seem to call for action. Two courses may be suggested, one dealing with goods and the other with people. Under the first a long-time programme will be developed for increasing the per capita purchasing power of the population, particularly of those large masses who are now little above a mere subsistence level, and for controlling production so that it will be in line with this demand. Under the second the attempt will be to check the decline and even cause an increase in the birth-rate and the population growth by putting into effect economic measures to lighten the burden of child-rearing on the family, and by endeavouring to change social attitudes so that the importance of child-rearing to a well-rounded personal development will be more fully appreciated and individuals brought to feel more responsibility for the perpetuation of the race. It may be that progress can be rapid along the first lines, but my belief is that it will be slow along the second because of the fiscal difficulties of granting worth-while financial benefits for child-rearing, and because of the extent to which short-sighted and self-centred motives dominate individuals and lead them to choose immediate material and personal comforts rather than more distant human and racial ideals.