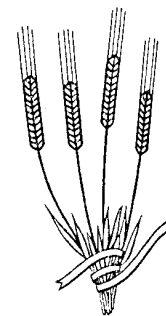


EDITED BY THEODORE W. SCHULTZ

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The purpose of the foundation shall be the promotion of a better understanding on the part of American citizens of the other peoples of the world, thus establishing a basis for improved international relations and a more enlightened world-order. The aim shall always be to give accurate information, not to propagate opinion.

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PART II
POPULATION

* * *

POPULATION—THE LONG VIEW

By FRANK W. NOTESTEIN¹

PERHAPS the greatest hazard in the way of forecasting population trends has been the disposition, both of the makers and of the users of predictions, to treat population growth as an independent variable; to view growth as a dynamic response to laws of nature moving irresistibly toward an inevitable goal. From such trends economic and political conclusions of great weight are readily drawn. It is no less true that population growth itself is a dependent variable, to be affected in large degree by the technological, social, economic, and political developments of the future. The nature of population growth will affect, and in turn be affected by, coming events. We too often fail to consider the response of population growth to the changing setting.

Of course, there are elements that give great inertia to growth. Under favorable peacetime conditions the average length of life is approaching sixty-five years. The maximum limit of the population that will be over age sixty in the year 2000 has already been set. All of that group is now living. Even the number of children to be born between now and 1965 has been directly affected by past events. The maximum limits of the parental stocks of 1960 have already been determined. Furthermore, human mortality and fertility move in response to rather well-known factors, some of which are in a measure predictable. Clearly, growth processes contain many predictable elements.

The difficulty is that the predictable elements tend to attract

¹ Director, Office of Population Research, School of Public and International Affairs, Princeton University.

This paper draws on materials developed for the Division of Geography and Cartography of the Department of State and on materials developed with the financial assistance of the Milbank Memorial Fund and the Carnegie Corporation of New York; however, none of these agencies is to be understood as approving the statements made or views expressed in it. In all matters of fact or interpretation the author alone is responsible.

our attention to the exclusion of the less predictable ones. We tend to assume the existing technological, social, and political setting as the background. The overwhelming temptation is to project the future within the general framework of the present. All things considered, this temptation is probably fortunate. Judgments as to the future of population growth must be made explicitly, or implicitly, in terms of social policy. The predictions are better made on the basis of a general setting that we know, or at which we can reasonably guess, than in terms of a setting concerning which we can only hope or dream. The difficulty, then, is not that of making predictions in terms of the present, or a reasonably anticipated, setting. Rather, it is that of taking the predictions too seriously once they are made. Having introduced assumptions concerning the governing conditions, we must constantly keep in mind the fact that they are assumptions and that a different course of events would lead to different answers.

With this warning in mind, we shall consider, first, the course of past developments and something of the processes of past change; next, examine in greater detail three types of population change; and, finally, present some hypothetical population trends for the future, on the basis of which we can discuss the actual prospects for population change.

PAST TRENDS AND PROCESSES OF CHANGE

The world's population has increased fourfold since the middle of the seventeenth century. It has more than doubled since 1800 and even now continues its rapid growth. These trends may be seen from Figure 1, which presents the data for the world and its major geographic areas on a logarithmic scale.² This scale permits the comparison of rates of change but sharply distorts the amounts of change.³ Obviously, the values are estimates even at the most recent dates. In the cases of Asia, Africa, and Central and South America they are little better than informed guesses. For China, opinions concerning the size of the present population differ by

² Values for the years 1650-1900 are from A. M. Carr-Saunders, *World Population* (Oxford: Clarendon Press, 1936), p. 42. Much of the following discussion is based on this valuable work.

³ E.g., between 1850 and 1940 the line for Oceania rises about three times as far as that for the world. This indicates that its rate of growth was about three times as fast as that of the world. In absolute numbers the sharp rise for Oceania represents a gain of less than 9 million people, while the small rise for the world represents nearly 900 million people.

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more than the total population of the United States. Nevertheless, the chart gives a description of the course of population growth sufficiently accurate for our purposes.

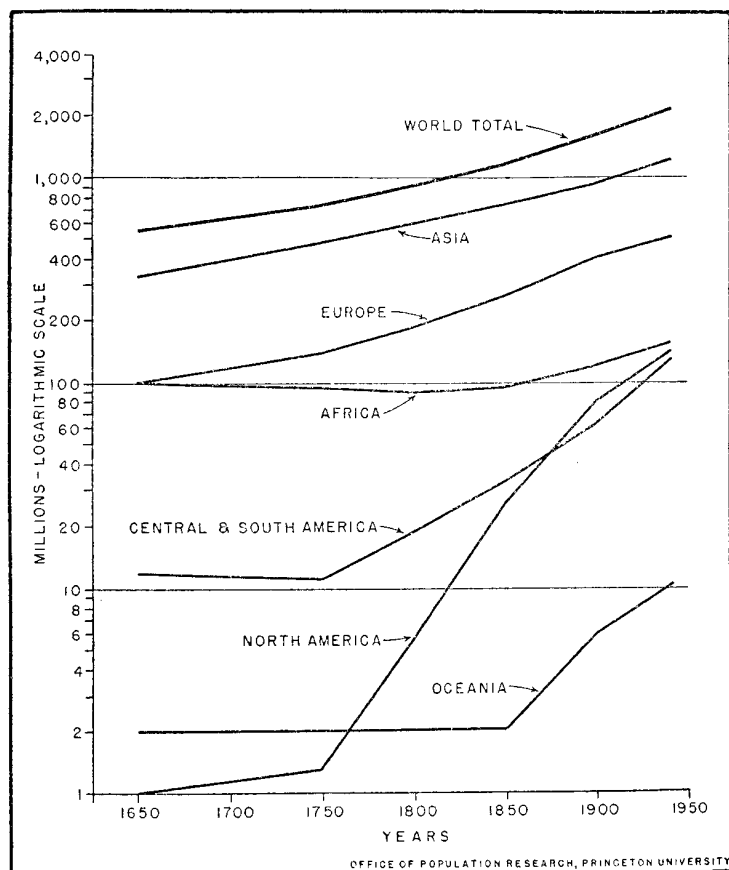


FIG. 1.—Growth of population by continents, 1650-1940 (data for 1650-1900 from Carr-Saunders, *World Population*, p. 42).

The figure brings out three facts pertinent to this discussion.

1. The world's population has been growing at a rapid and accelerating pace during the last three centuries. Since the middle of the seventeenth century it has grown at an average annual rate of about 5 per thousand. Since 1900 the annual increase has averaged 8 per thousand. Such prolonged and rapid increase cannot have occurred frequently in the history of the race; and, obviously,

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increases of this magnitude have never occurred before. For example, if the average rate of increase obtaining since 1650 had been in force since the beginning of the Christian Era, an initial population of only 10 million would now amount to more than fifty times the present world population. The modern epoch of growth has been unique.

2. All sections of the world have participated in this growth, but it has been particularly marked in Europe and Europe overseas, especially prior to 1900.

3. Since 1900 the rate of growth has tended to decline in Europe, North America, and Oceania; but in Africa, Asia, and Central and South America there apparently has been some acceleration of the rate of increase.

It will assist the discussion of future trends to examine briefly the processes by which this growth has occurred. The essentials of the story are simple enough. Growth came from the decline of mortality. This decline arose from different sources and occurred in different degrees in various parts of the world. In Europe an era of peace and domestic order began to restore the ravaged continent during the seventeenth century. Then shortly afterward there followed a series of agricultural innovations that greatly increased the food supply, which was further augmented by the vast resources of the New World. Industrial innovations began to bring spectacular increases in product. Finally, sanitary and medical advances brought control over the ravaging diseases of childhood and young adult life. In short, the whole process of modernization in Europe and Europe overseas brought rising levels of living, new controls over disease, and reduced mortality.

Meanwhile, fertility was much less responsive to the processes of modernization. So far as we can tell from available evidence, no substantial part of the modern population growth has come from a rise in fertility. On the other hand, neither did fertility decline with mortality. The reasons why fertility failed to decline with mortality are clear enough in general terms. Any society having to face the heavy mortality characteristic of the premodern era must have high fertility to survive. All such societies are therefore ingeniously arranged to obtain the required births. Their religious doctrines, moral codes, laws, education, community customs, marriage habits, and family organizations are all focused toward maintaining high fertility. These change only gradually and in response to the strongest stimu-

lation. Therefore, mortality declined, but a fertility high enough to permit survival in an earlier period began producing rapid growth.

Eventually fertility also began to decline, the trend in Europe starting in the northwest in the latter part of the nineteenth century. From this focus it moved east and south across the continent, meanwhile having become well established in North America, Australia, and New Zealand.⁴

It is important to understand something of the causes of this trend for, so far as the record goes, these are the only populations that have controlled their fertility sufficiently to bring birth rates into balance with the low death rates that modern conditions permit. They are the only populations that have thus far shown a way by which growth can be checked other than through death, the only ones that have attained high efficiency in the maintenance of the stream of life.

There is abundant evidence that the decline came about primarily through rational control, largely by means of contraceptive practices. It does not follow that contraception can be viewed as the cause of the declining birth rate in any profound sense. Relatively effective methods of contraception were widely known for centuries before they were generally used. Birth rates were reduced largely by means of contraception, but in response to drastic changes in the social and economic setting that radically altered the motives and aims of people with respect to family size.⁵

The catalogue of such changes is large and can be only suggested here. Most of them center around the growing individualism and rising levels of popular aspiration developed in urban industrial living. With the growth of huge and mobile city populations, the individual came to depend less and less on the status of his family for his place among his fellows. The station to which he was born gave place to his accomplishments and possessions as the measure of his importance. Meanwhile, the family lost many of its functions to the factory, the school, and commercial enterprises. All these developments made large families a progressively difficult and expensive undertaking; expensive and difficult for a population increasingly freed

⁴ The decline in birth rates began earlier in France and the United States, and perhaps in Scandinavia. In France the secularizing influence of the French Revolution was undoubtedly important. In the United States the birth rate has been dropping since the beginning of the nineteenth century, but the rates have moved down from the exceptionally high levels which characterized a frontier society that was unusually favorable to high fertility.

⁵ See Norman E. Himes, *Medical History of Contraception* (Baltimore: Williams & Wilkins Co., 1936); and Regine K. Stix and Frank W. Notestein, *Controlled Fertility* (Baltimore: Williams & Wilkins Co., 1940), chap. xv.

from older taboos and increasingly willing to solve its problems rather than to accept them. In short, under the impact of urban life, the social aim of perpetuating the family gave way progressively to that of promoting the health, education, and material welfare of the individual child; family limitation became widespread; and the end of the period of growth came in sight. However, during that period the population of European extraction had increased nearly seven fold throughout the world.

The more rapid response of mortality than of fertility to the forces of modernization is probably inevitable. The reduction of mortality is a universally acceptable goal and faces no substantial social obstacles. But the reduction of fertility requires a shift in social goals from those directed toward the survival of the group to those directed toward the welfare and development of the individual. This change, both of goals and of the social equipment by which they are achieved, is at best a slow process. As a result, the period of modernization is virtually certain to yield rapid population increase.

By the end of the interwar period, in nearly all the countries of northwestern and central Europe, fertility had fallen substantially below the level required for the permanent maintenance of a stationary population at existing levels of mortality. In the United States, since 1930, it has been at or below the level required for replacement except for the war flurry of the last few years. Australia and New Zealand are in a similar position. In all of these countries growth continues only because of the favorable age distribution of the population, which time will alter. Populations in which fertility has fallen below the replacement level or those in which it is near and rapidly approaching that level may be characterized as those of "incipient decline," our first demographic type.

Other populations are in an earlier stage of demographic evolution. Among them birth and death rates are still high and growth is rapid, but the decline of the birth rate is well established. These we may characterize as in the stage of "transitional growth," the second type. Still other populations have scarcely begun their demographic transition. Mortality is high and variable and is the chief determinant of growth, while fertility is high and thus far has shown no evidence of a downward trend. In these populations rapid growth is to be expected just as soon as technical developments make possible a decline in mortality. We may characterize this type as that of "high growth potential." Our most realistic view of the prospect for future

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population change can be made by considering the position of each of these demographic types.

TYPE I. INCIPIENT DECLINE

The populations of northwestern, southern, and central Europe, North America, Australia, and New Zealand may all be characterized as those of incipient decline. In the interwar period their fertility was low and declining. In all of them only immigration or the reversal of recent trends in fertility can prevent the virtual termination of growth within a generation. In most of them fertility would have to rise substantially to forestall decline, and such reversals will not be easily obtained, short of drastic governmental policies of an essentially totalitarian kind.

It is not possible to predict the actual course of future population change. However, we can illustrate the implications of the underlying situation by showing the sorts of population that would develop in the absence of fundamental change. Thompson and Whelpton have done so for the United States, and my colleagues and I have done so for Europe and the Soviet Union on certain assumptions.⁶ The methods used in the two studies are not entirely comparable, but they are sufficiently so for our purposes. The trends for selected areas are shown in Figure 2, which gives the actual populations from 1900 to 1940 and the projected populations from 1940 to 1970. All of the projections disregard war losses, international migration, and international boundary changes. All of them are based on the general propositions that both fertility and mortality will decline, most rapidly where they are highest and least rapidly where they are lowest, and that the declines will become less rapid as time goes on.

It is apparent from Figure 2 that the population of northwestern and central Europe reaches its maximum by about 1950, even on these assumptions that disregard war losses. The population of the United States, which Thompson and Whelpton have projected on the assumption of a somewhat less rapid decline in fertility than was used for Europe, continues to grow after 1970, but from then on at a very slow rate. The same is true for southern and eastern Europe, but eastern Europe is better characterized as a region of transitional

⁶ Warren S. Thompson and P. K. Whelpton, *Estimates of Future Population of the United States, 1940-2000* (National Resources Planning Board) (Washington: Government Printing Office, 1943); and Notestein, Taeuber, Kirk, Coale, and Kiser, *The Future Population of Europe and the Soviet Union* (Geneva: League of Nations; New York: Columbia University Press, 1944).

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growth than as one of incipient decline. By 1970 the projected growth of southern Europe is negligible. The trend for the Soviet Union, which is in the stage of transitional growth, is also shown, by way of contrast. The projected increase between 1940 and 1970 amounts to 78 million, yielding a total of 251 million by 1970.

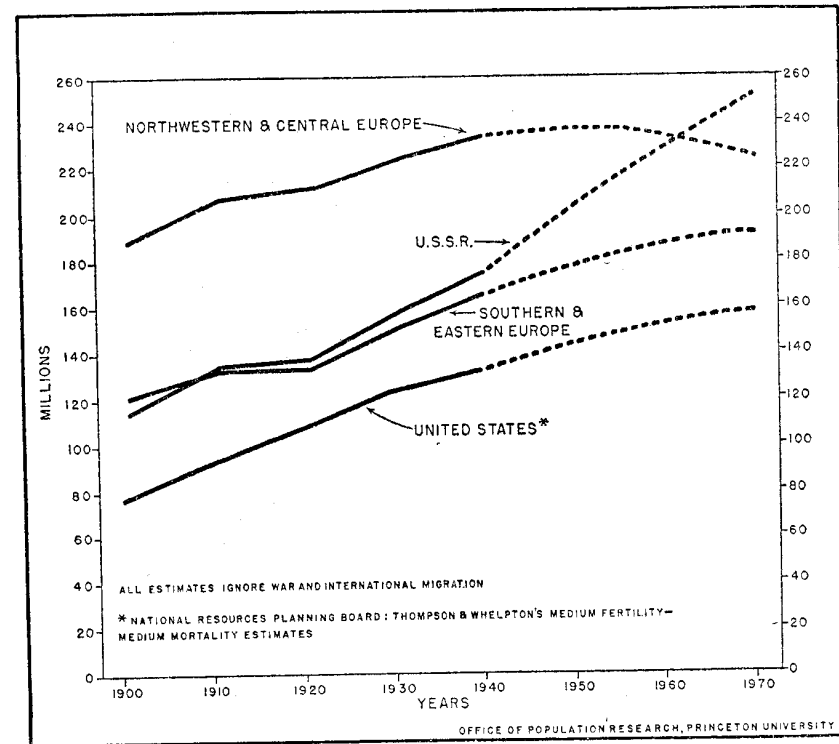


FIG. 2.—Population trends for selected areas, observed 1900-1940, and projected 1940-70 (reprinted from *Population Index*, Vol. X, No. 1 [January, 1944]).

Coming changes in the age distribution of the population will be quite as important as those in total numbers from the point of view of international relations and food requirements. Figure 3 illustrates the types of change that may be expected under the assumptions of our discussion. It permits the comparison of age distributions in 1940 with those projected for 1970 for the United States, northwestern and central Europe, and the Soviet Union, the last being a region of transitional growth. In each of the pyramids males are to the left and females to the right. The length of the bottom bar indicates the

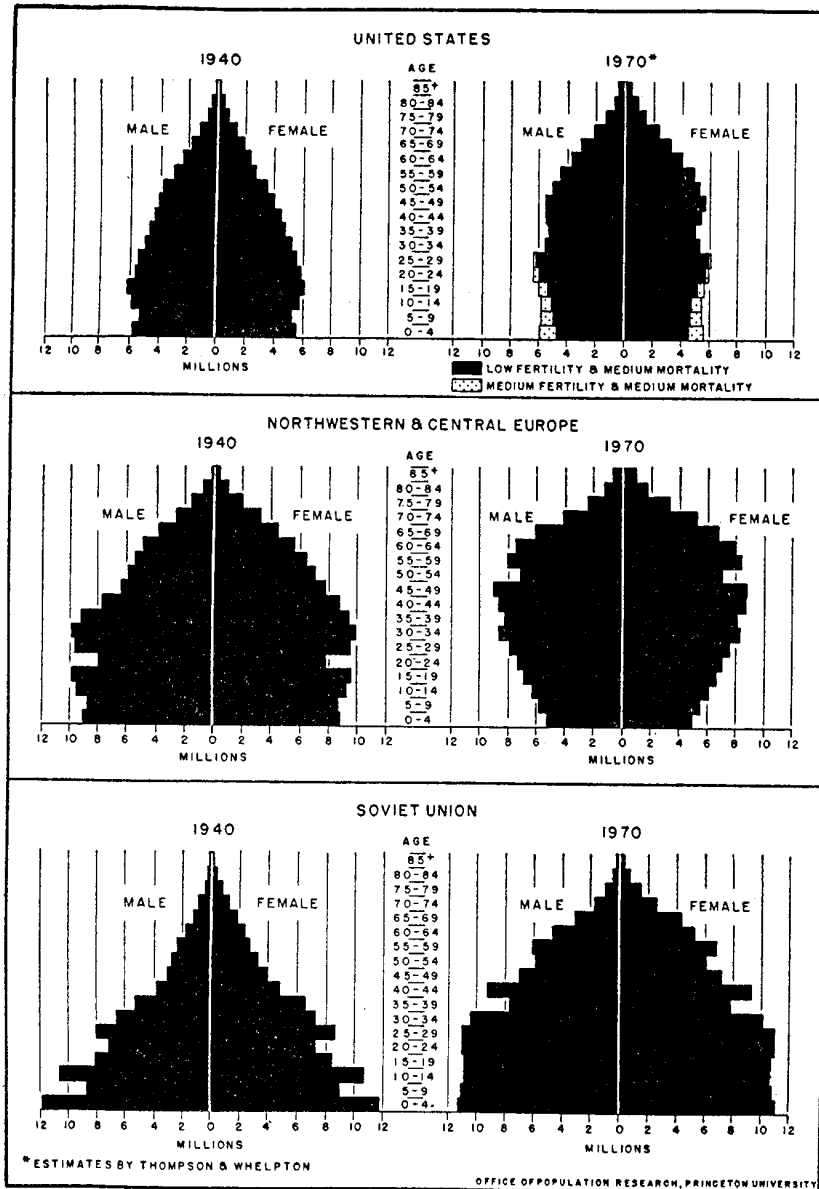


FIG. 3.—Age and sex distribution of the populations of 1940 and of the projected populations of 1970, for the United States, northwestern and central Europe, and the Soviet Union (values for the United States from Thompson and Whelpton, *Estimates of Future Population of the United States, 1940-2000*, pp. 68-69 and 92-94; values for Europe and the Soviet Union from Notestein and Others, *The Future Population of Europe and the Soviet Union*, pp. 242-43, 312-13).

number of persons aged zero to four years; that of the bar next above, the population aged five to nine; and so on to the top bar, which represents the population aged eighty-five years or more.

Much of the demographic history of a population can be read from its pyramid. For example, that for northwestern and central Europe in 1940 is concave on the left at ages forty to fifty-four as a result of the casualties of the first World War. The notches at age twenty to twenty-four are the result of the birth deficits of that war. The maximum age group falls at thirty to thirty-four years. This group was born between 1905 and 1910, the period of the region's maximum number of births. The undercutting of the pyramid at younger ages reflects the shrinking baby crops of subsequent years, a shrinkage that reduced births to their peacetime low in 1930-35. The rise at ages zero to four comes from the larger birth cohort of 1935-39 induced by the pre-war boom and the Nazi pro-natalist policies. This erosion of the pyramid at the younger ages shows clearly why we may expect the death rate to rise and the birth rate to fall in the future. When the relatively large groups now in the childbearing ages move on to swell the deaths at ages of high mortality, they will be replaced in the reproductive ages by the smaller groups now in the years of childhood.

The pyramid to the right shows the type of age distribution that would be expected by 1970 under present assumptions. Losses of the current war and the effects of migration will, of course, alter the details, and governmental efforts to stem the decline in the birth rate may increase the numbers under age twenty. However, unless the pre-war trends are sharply changed, the aging of the population will be very rapid, and in any case a considerable aging is inevitable.

As the pyramid at the top of the chart indicates, the population of the United States in 1940 was further from its maximum. The largest number of births occurred in 1920-24, some fifteen years later than in Europe. The erosion to be anticipated is considerably less severe, although if we accept Thompson and Whelpton's "low" instead of their "medium" assumption on fertility, it is rather marked. In either case, however, the progressive aging and the slowing growth of the population are clear and are characteristic of the type of incipient decline. It is evident that the era of rapid growth is drawing quickly to a close in Europe and North America, except as it may be reinstated by substantial immigration. Australia and New Zealand are in a similar position.

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TYPE II. TRANSITIONAL GROWTH

As noted above, the stage of transitional growth is that in which the decline of both fertility and mortality is well established but in which the decline of mortality precedes that of fertility and produces rapid growth. The populations of eastern Europe are nearing the end of this stage; those of the Soviet Union and Japan and of certain Latin-American countries are in mid-course; while those of Turkey, Palestine, and parts of North Africa appear to be entering it.

The age pyramid for the Soviet Union shown in Figure 3 illustrates the growth capacity of this type. That for 1940 is typical. The narrow top and broad base reflect both the high mortality of past years and the fact that, in spite of this mortality, birth rates have been high enough to yield progressively larger numbers of babies. The gashes of the pyramid result from the terrific losses of the war and revolution, and at ages five to nine the effect of the hard years of 1930-34, plus that of the official abortion policy.⁷

The pyramid for 1970 neglects the effect of the present war and is based on the assumption that both mortality and fertility will decline from the high pre-war levels about as rapidly as they have declined from similar levels in other countries. On these assumptions, during the thirty-year period from 1940 to 1970, the increase alone exceeds the total population of Germany, present or prospective. Of course, war losses will cut the growth; if by 28 million, then the increase would still be 50 million. Moreover, on these assumptions, even by 1970 the parental stocks would not be depleted, so that a very considerable capacity for growth would remain.

The position of Japan is particularly noteworthy. Obviously it is futile to speculate on the future size of its population. Growth in Japan will depend almost entirely on the nature of the war losses and on the economic dispositions of the peace. Its congested population, living in a land deficient in natural resources, is clearly at the mercy of postwar economic arrangements. Japan is interesting, not so much for itself, as for the light it sheds on the processes of population change in the Orient. It is the only Eastern nation that has undergone a substantial period of industrialization and urbanization, hence the only one in which the demographic responses to these changes can be contrasted with those of the West.

⁷ The 1940 age distribution is that estimated by Frank Lorimer. The details of his procedure will appear in his forthcoming book prepared for the Office of Population Research, entitled "The Population of the Soviet Union: History and Prospects."

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Figure 4 is informative in this particular. It compares the trend in the birth and death rates for Japan from 1921 to 1941 with those for England and Wales from 1881 to 1939. There is a marked similarity

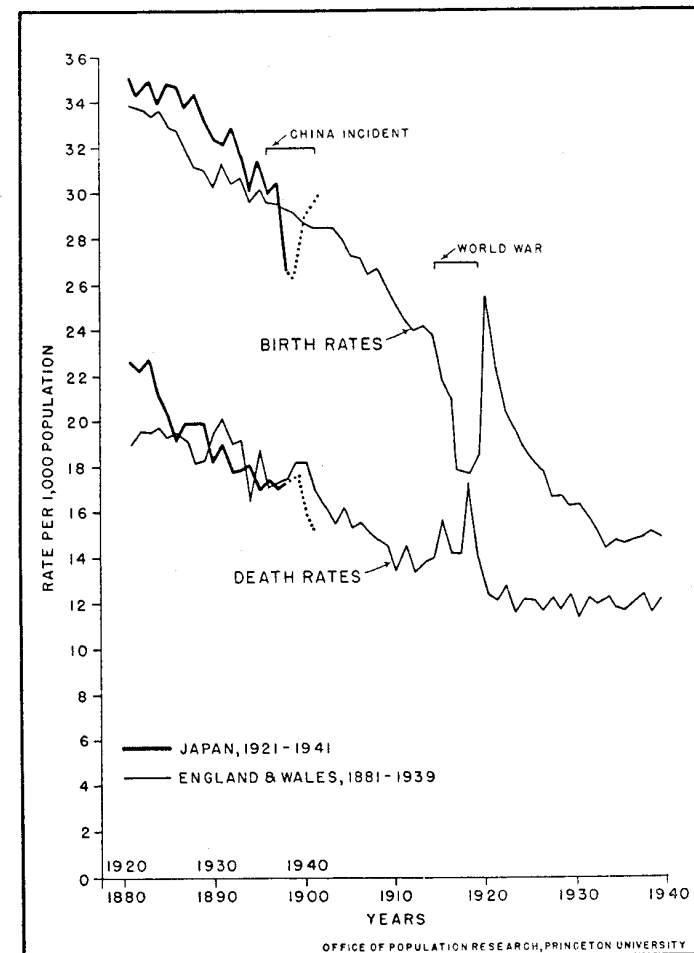


FIG. 4.—Birth and death rates for Japan, 1921-41, and for England and Wales, 1881-1939 (from Kirk, "Population Changes and the Postwar World," *American Sociological Review*, IX, No. 1 [February, 1944], 34).

between developments in Japan during the interwar decades and those in England forty years earlier. Both the birth and the death rates were about the same height, they were declining at about the same rates, and the amount and trend of the natural increase were

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much the same. Figure 5 shows the marked similarity of the age distribution of Japan in 1935 to that of England and Wales fifty-four years earlier. On the surface, at least, it appears that Japan's response to urbanization and industrialization has been much the same as that of England when similar changes in the setting were under way.⁸

Following rather closely a demographic course analogous to that of the West throughout its modern period, Japan's population has risen from approximately 35 million in 1870 to 73 million in 1940. If it were to continue along the general course of European developments without war losses, its population probably would approximate 95 million by 1970. As a prediction, such a figure is worthless. However, it does illustrate the potentialities for population increase inherent in the transitional stage of growth. Modernization and urbanization in Japan have moved rapidly, but population growth has been of the type that implies a tripling of population in a century, and more than half of that increase would come after the birth rate began to fall. In the century lying fifty years earlier (1821-1921) the population of England and Wales, in fact, did triple, despite substantial emigration. More than half of this increase also occurred after birth rates began to decline. Moreover, since 1921, England has experienced more than twenty years of slowing growth. There is no reason that the writer knows for assuming that other regions can achieve their demographic transition without an analogous period of rapid population increase.

TYPE III. HIGH GROWTH POTENTIAL

More than half of the world's population has not begun its period of transitional growth. Death and birth rates remain close to pre-modern standards, and birth rates have scarcely begun to decline. Therefore, they may be classified as populations with high growth potentials. Egypt, central Africa, much of the Near East, virtually all of Asia outside the Soviet Union and Japan, the islands of the Pacific and those of the Caribbean, and much of Central and South America fall in this class.

The past trend and present rate of growth of the members of this group are far from homogeneous. In some regions—central Africa and parts of Central and South America, for example—growth has been slow and populations remain sparse. In these instances fertility, even though probably close to the biological maximum, has been sub-

⁸ Irene B. Taeuber and Edwin G. Beal, "The Dynamics of Population in Japan," *Milbank Memorial Fund Quarterly*, XXIII, No. 3 (July, 1944), 222-55.

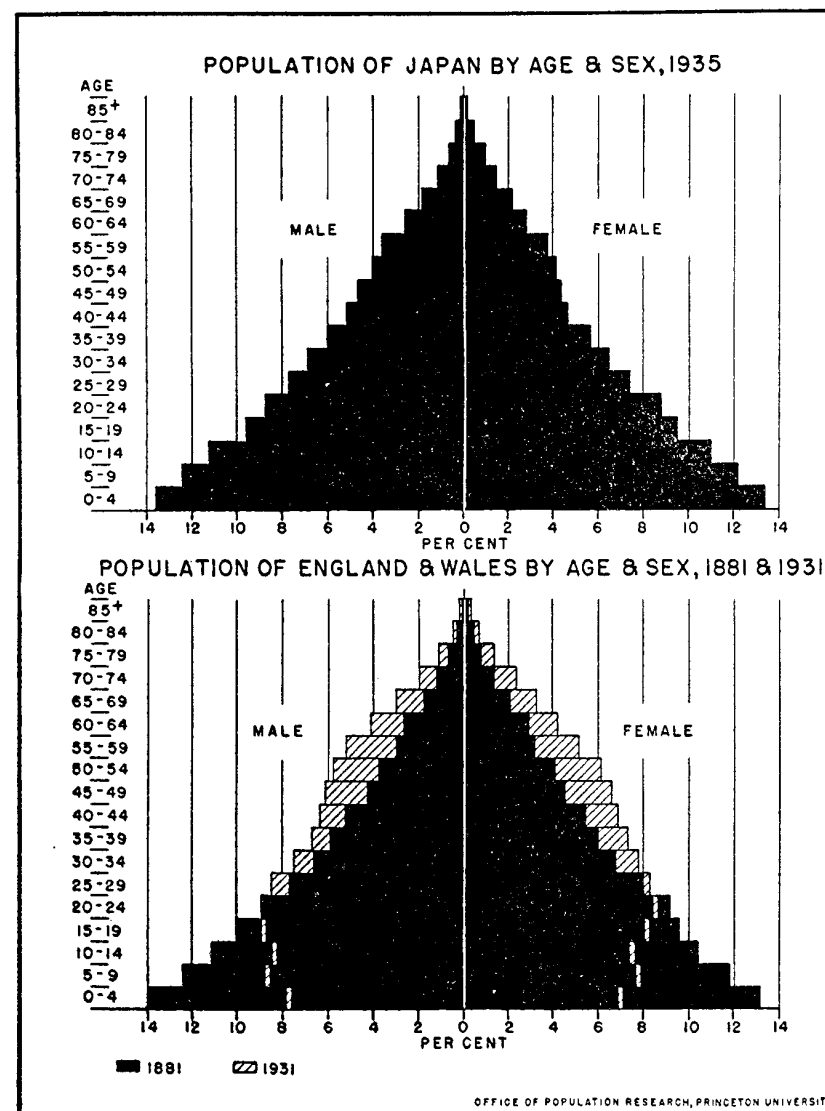


FIG. 5.—Age and sex distribution of the population of Japan, 1935, and of England and Wales, 1881 and 1931.

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stantially canceled by extraordinarily high mortality.⁹ Such areas of relatively light population and slow growth will become regions of rapid population increase just as soon as mortality is brought under a measure of control. For the immediate future, however, they present no serious problem of population pressure. They are already sparsely peopled, and the same measures that would reduce mortality would greatly increase their carrying capacity.

From the point of view of immediate problems, the situation of the relatively dense populations of this type is vastly more critical. These include such areas as India, Java, Formosa, Korea, China, Egypt, and the Caribbean, all regions with rather highly developed economies of the colonial type. In all of them populations are relatively dense, fertility is high, and mortality is high and variable. The presence or absence of growth depends on the state of political order, the abundance of food, and the incidence of epidemic disease.

India may serve to illustrate the nature of the situation. Its problems, although in many respects the most difficult, are in principle those of the other areas, and its statistical records are superior to those of other areas. Figure 6 traces the course of its total population from 1872 to 1941. It is apparent that, prior to 1921, decades of slow increase, due to famine and epidemic, alternated with decades of rapid growth. The last check to growth came during the decade of the first World War, when the influenza epidemic alone appears to have caused more than 15 million deaths. Since 1920, and for the first time in recorded history, there have been two successive decades of rapid growth. In twenty years the population increased by 83 million. At present it exceeds 400 million and is about as large as that of all Europe west of the Soviet Union.¹⁰

The factors bringing about this growth are characteristic of this type of demographic situation. Strong government, improved means of communication, increasingly productive agriculture, a little sanitation and epidemic control, have all been essential to the development of the area as a source of specialized raw materials and as markets for manufactured goods. The result has been population growth

⁹ The reader will understand that throughout most of the areas of this type accurate statistical information is almost nonexistent. Statements made categorically cannot be buttressed by direct evidence. They can, nevertheless, be proved by inference from the general nature of the situation and evidence of the demographic consequences of such situations gathered from the scattered materials that are available.

¹⁰ Kingsley Davis, "Demographic Fact and Policy in India," *Milbank Memorial Fund Quarterly*, XXIII, No. 3 (July, 1944), 256-78.

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without substantial increases in the levels of living. Mortality, low enough to permit growth, nevertheless remains high, the expectation of life at birth falling below thirty-five years even in times of relative order and prosperity.

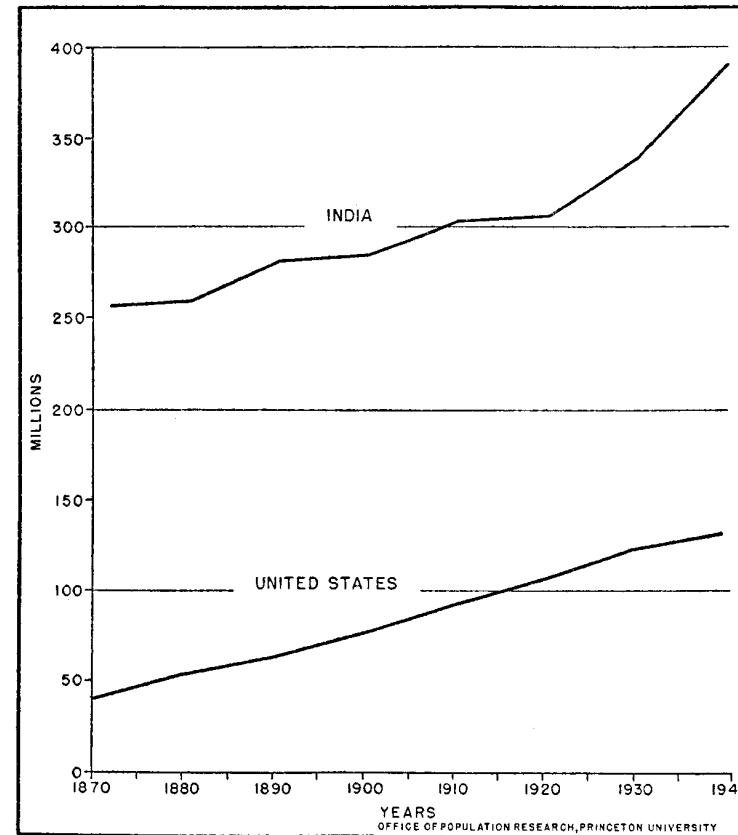


FIG. 6.—The growth of the population of India, 1872-1941, and of the United States, 1870-1940 (from Davis, "Demographic Fact and Policy in India," *Milbank Memorial Fund Quarterly*, XXII, No. 3 [July, 1944], 258).

Meanwhile, the fundamental nature of the agrarian family life, of native customs, religious beliefs, and educational horizons has changed little. The result is that the materials out of which declining fertility grew in the West are not present. In short, the modern nations of the West have imposed on the world's nonindustrial peoples that part of their culture which reduces mortality sufficiently to per-

mit growth, while withholding, or at least failing to foster, those changes in the social setting out of which the reduction of fertility eventually developed in the West. The result is large and congested populations living little above the margin of subsistence.

The future growth of such populations depends almost entirely on events to come. Prolonged periods of political or economic chaos might result in considerable depopulation. On the other hand, a period of peace and order in which there was a rapid advance in production would bring rapid and sustained growth.

Such an epoch of growth could be terminated in two ways. If the essentials of the existing agrarian society are maintained, there is every prospect that growth will continue until the potentialities for increased production are exhausted. Then it will be checked by repeated catastrophes and generally increased mortality. In this case, however, large and poverty-stricken populations would be left with the potentiality for a new cycle of growth any time circumstances permitted.

If, on the other hand, a period of peace, order, and rapidly rising production were to be accompanied by a thorough and balanced modernization, we could expect the same or even faster immediate growth but a different termination. If such developments brought urbanization, industrialization, rising levels of living, popular education, and popular participation in political life, the same forces that eventually induced a declining fertility in the West would probably come into play. The population would then undergo transitional growth, perhaps tripling in the process. If events marched swiftly and studied efforts were made to induce declining fertility, perhaps only a doubling of present populations would be involved.

In sober fact each of these alternatives probably will exist in one place or another. Chaotic political and economic conditions probably will check growth in some areas for a considerable time. In other areas rapid growth will probably be terminated by a series of catastrophes, while fertility remains unchecked. In some instances—many, one hopes—wise and vigorous leadership may bring growth to an end through the reduction of fertility. To be achieved, this last alternative will require a tremendous increase in production, an increase that, in spite of rapid growth, can bring rising levels of living and new vistas of health and individual welfare to the world's most poverty-stricken peoples.

PROSPECTS FOR GROWTH

By way of summarizing this discussion of the prospects for population growth, we may now consider the hypothetical future trends shown in Figures 7 and 8. For the years from 1750 to 1940 they present the same materials as Figure 1, except that Figure 8 shows the population on an arithmetic, instead of a logarithmic, scale. The hypothetical values for the years 1940–2000 are not intended to show what will happen. They are intended to show something of the general nature of the changes to be expected if the conditions assumed actually come about.¹¹

For all North America we have assumed that the rates of increase will be those projected by Thompson and Whelpton for the United States on their assumptions of "medium mortality, medium fertility, and no migration."¹² This yielded a maximum value of 176 million for the year 1980. We arbitrarily retained this value for the year 2000 in view of Canada's rather large potentiality for growth. To the writer the figure of 176 million for the year 2000 seems realistic, provided there is no heavy immigration.

In the case of Europe west of the pre-war boundaries of the Soviet Union, we have assumed that the value projected by my colleagues and myself will hold until 1970.¹³ On this projection the population was already declining. However, we have held the values constant from 1970 to 2000 and have made no allowance for war losses, on the assumption that there will be effective governmental policies to forestall any sharp decline in population. Under these conditions the population of Europe west of the pre-war Soviet boundaries would be about 417 million by 2000. For the Soviet Union we have accepted our projection of 251 million by 1970. Beyond that date we have assumed a transition of an essentially European type, to obtain a total of 298 million by the year 2000. This figure makes no allowance for war losses. On the other hand, it assumes that fertility, even when it reaches the low levels of western Europe, will drop as it has in western Europe. Whether this course of events comes about will depend on Soviet policy. All things considered, a population in the neighborhood of 300 million by the year 2000 does not seem unlikely. If it reaches that figure, then the population of Europe and the Soviet

¹¹ The writer is indebted to his colleague, Dr. Ernest Jurkat, for assistance in the construction of these hypothetical populations.

¹² *Op. cit.*, p. 29.

¹³ Notestein and others, *op. cit.*, p. 240.

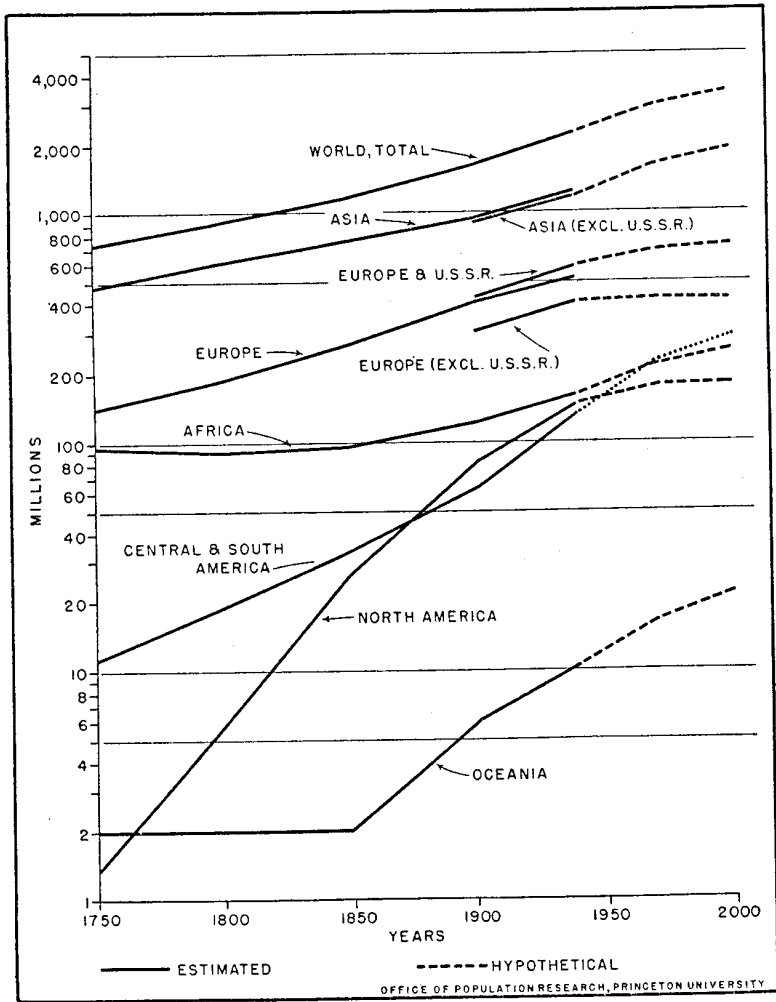


FIG. 7.—Estimated and hypothetical populations of major sections of the world, 1750-2000 (values for 1750-1900 from Carr-Saunders, *World Population*, p. 42; see accompanying text for explanation of hypothetical values).

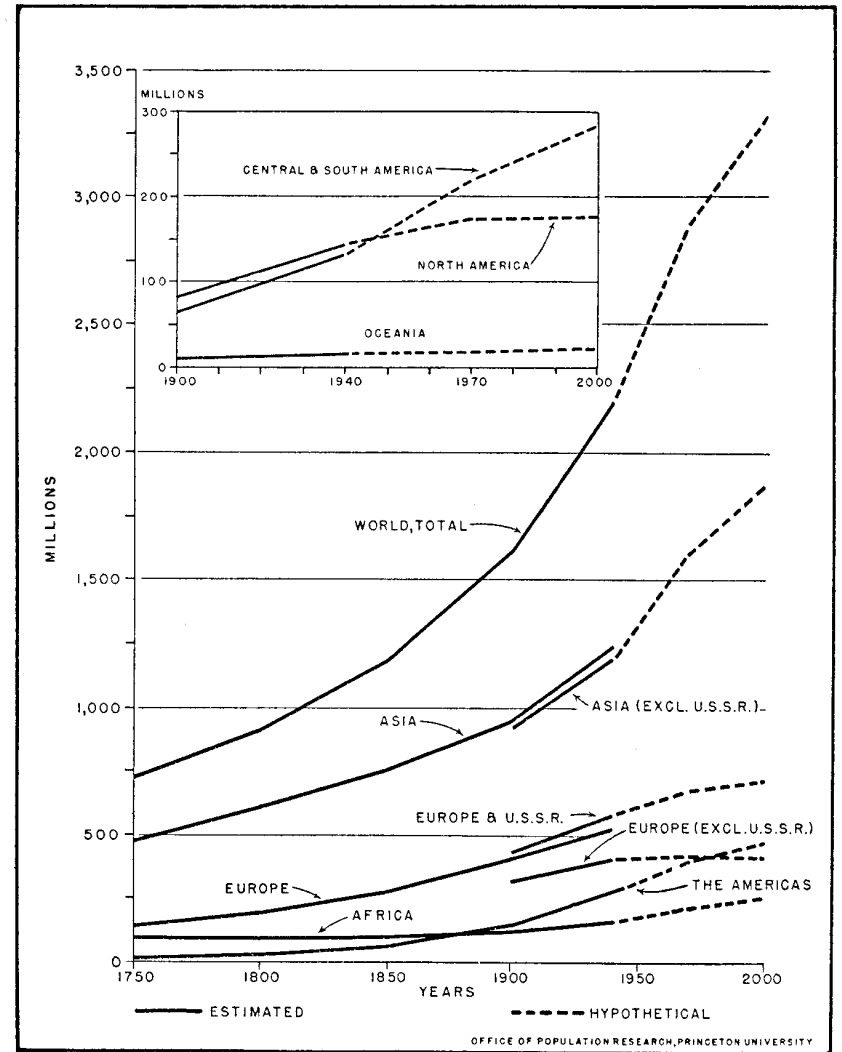


FIG. 8.—Materials of Figure 7 presented on an arithmetic scale

FOOD FOR THE WORLD

Union would amount to something of the order of 700 million. Given an era of peace, this, too, seems reasonable.

Now we approach the difficult sections of the world. Central and South America contain populations of two demographic types, and the information available concerning them, even as to their present populations, is highly defective. Less by way of a prediction than as an illustration of the growth implications in a European type of transition from high to low mortality and fertility, we have assumed an essentially European course of events. Having made our best guess at the present birth rate for all Central and South America, we assumed that those rates would decline along a course midway between the past rates of Italy and Germany and that death rates would be those associated with such birth rates in the average of a wide range of experience. These assumptions result in a population of 283 million by 2000, a number a little more than double that for 1940. In view of the possibilities for immigration, this figure seems to be rather conservative.

In the case of Oceania, the principal part of which is Australia and New Zealand, heavy immigration is probable. It is scarcely likely that in the long run they will remain sparsely settled near a teeming East. Therefore, we have assumed increases that give a population of 21 million by 2000, a figure slightly more than twice that of the present population.

There remain Asia and Africa, the most difficult of all. We have, in fact, assumed annual rates of growth of 1 per cent from 1940 to 1970, and of 0.5 per cent from 1970 to the year 2000. Whether the results are too high or too low depends on the course of events. In both continents the rate of 1 per cent represents a slight increase over the estimated prevailing rates, but one that is consonant with the past acceleration. On the other hand, the rate of 0.5 per cent used from 1970 on is lower than any estimated rate of increase as far back as 1850. To the writer the results seem likely to be too low in the case of Africa, where a population of about 250 million is given for the year 2000.

The hypothetical population of 1.9 billion for Asia in the year 2000 also may be lower than events will justify. Of course, it could be too high, but it probably will not be unless there is widespread and prolonged disorder. This contingency, although not unlikely, is scarcely to be counted upon in constructive planning. If, however, we assume a relatively long period of peace and order, then the hypothetical figures for Asia are best justified on either of two rather sharply con-

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trasting assumptions: (1) that the advance in economic productivity will be insufficient to support a more rapid growth or (2) that the advances in economic productivity will be very large indeed and accompanied by rapid modernization and strong policy directed explicitly toward reducing birth rates. Conceivably, such a course of events could hold populations within the hypothetical figure. On the other hand, a rapid increase in production achieved within a slowly changing social framework would probably yield an Asiatic population well over the 2 billion mark by the year 2000.

Summing the hypothetical figures for the year 2000, we have a world total of 3.3 billion people. On the assumption of general order and the spread of modern techniques of production the figure is probably conservative. It implies a slightly accelerated growth between 1940 and 1970, but a sharp curtailment after that date. Given widespread disorder and catastrophe, the reverse of this sequence might develop, with growth slowing in the coming generation, only to rise still higher in the next. However, it appears to the writer that sensible planning for the future should be based on the assumption that the world will have at least 3 billion people by the year 2000.

Finally, in connection with the problems of world food supply, one important fact should be kept in mind. There is a considerable chance that the world will reach the 3 billion level in two generations, with the capacity for growth of its backward populations still unimpaired. If it is not to do so, if by that time fertility is to fall sufficiently to bring in sight the end of the epoch of growth, then advances in production and social political organization will have to be spectacular indeed. Food production will have to increase much more rapidly than population, and equally swift developments must occur in the fields of industrial production, education, public health, and government. For it is only when rising levels of living, improved health, increasing education, and rising hope for the future give new value and dignity to the individual life that old customs break and fertility comes under control. Without such control the growth of the world's population is limited only by its carrying capacity. In the long run it remains true that the control of mortality without the control of fertility is impossible.