



## The Amazing Decline of Mortality in Underdeveloped Areas

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# THE POPULATION SPECTER: RAPIDLY DECLINING DEATH RATE IN DENSELY POPULATED COUNTRIES

## THE AMAZING DECLINE OF MORTALITY IN UNDERDEVELOPED AREAS

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Only a short time ago the fundamental cause of declining death rates was considered to be economic development. The history of the West pointed to a direct influence of economic change on health; namely, the better diets arising from the gains in agriculture, transportation, and commerce during the eighteenth and nineteenth centuries. In addition, there were indirect influences brought by the general rise in real income per capita, to which the revolution in methods of manufacture contributed substantially. This rise in real income made possible the growth of public sanitation, medical science, and more healthful living conditions. "It is no disparagement of medical science and practice," says Thompson, "to recognize that the great decline in the death rate that has taken place during the last two centuries in the West is due, basically, to improvement in production and economic conditions."<sup>1</sup>

This view, so long as it is an interpretation of Western history, seems essentially correct. It is perhaps correct in any long view. But when it is applied to contemporary underdeveloped areas, it is wrong; for the truth is that these areas do not need to become economically developed to reduce their death rates drastically. The failure to realize this fact has led to erroneous prediction. In 1931, for example, Bowen predicted that "the rate of proliferation of these [backward] peoples will fall off sharply." (*Op. cit.*, page 213; also, page 221.) Nearly all forecasts of the future population of underdeveloped areas—forecasts made in the thirties and forties—have proved to be too low, mainly because the trend of mortality was not foreseen. In an interesting account of the fight against tropical diseases in various parts of the British Empire, an account published in 1949, Stephen Taylor and Phyllis Gadsden reiterate that a rise in the general standard of living is necessary if public health work is to accomplish much (*Shadows in the Sun*, Geo. G. Harrap, 1949).

The view that declining death rates in underdeveloped areas depend on general economic progress in those areas arises in part from a care-

<sup>1</sup> Warren S. Thompson, *Population Problems* (McGraw-Hill, 4th ed., 1953), p. 77. This author provides, pp. 77-82, a convincing argument for this point of view. A similar position, less fully presented, was taken by Ezra Bowen, *An Hypothesis of Population Growth* (Columbia University Press, 1931), especially p. 201; and by Burnham N. Dell and George F. Luthringer, *Population, Resources and Trade* (Little, Brown, 1938), p. 62.

less application of principles taken from Western history. It also perhaps derives from the grip which Malthus' "means of subsistence" has had on thought about population. In the last analysis, Malthus tended to reduce all positive checks on population growth to lack of means of subsistence. He paid little attention to disease as a cause of mortality and certainly very little attention to disease as a factor independent of lack of subsistence.<sup>2</sup> If all causes of death were a function of the means of subsistence, then obviously a reduction in mortality would depend directly on economic development; but such is not the case. The failure to give adequate attention to causes of death has led, at least in population theory, to a rather sterile overemphasis on the matter of food supply.

Still another reason for economic determinism with respect to mortality trends has been the underestimation of the role of cultural diffusion across international borders. Often the effect of foreign influence on the population of a particular country has been thought of in terms of international trade. Although the importance of such trade is undeniable, it nevertheless remains true that scientific communication and medical co-operation among nations have played a large role in the reduction of mortality especially in recent times. Such communication and co-operation do not depend upon a rise in the level of living or in international trade of the country benefiting from them. It depends, rather, on the economic means of the more advanced countries which offer this kind of help.

Finally, there has been a tendency to overestimate the costs and difficulties of public health programs in underdeveloped areas. Since medical services are costly in advanced countries, especially on the therapeutic side, it has been assumed that they will necessarily be too dear for underdeveloped economies. But recent history has shown that with ingenuity and newer developments in medical technology, the practice of preventive and curative medicine on a mass basis can be carried out at relatively low per capita cost.

In any case, expert opinion failed to foresee the recent trend in the death rate in underdeveloped areas. This trend has been revolutionary, and it has occurred without commensurate economic development.

### *The Rapid Decline of Mortality*

The rapidity with which the death rate has declined in most of the underdeveloped areas, including many areas with a high ratio of popu-

<sup>2</sup> E. F. Penrose, *Population Theories and Their Application* (Stanford: Food Research Institute, 1934), pp. 17-19, 36-43, has analyzed the defectiveness of Malthusian reasoning in this regard. More recently Marston Bates, *The Prevalence of People* (Scribner's, 1955), pp. 68 ff., has pointed out that few species of animals or insects live up to the means of subsistence. Mostly, he says, they are killed off by other animals or insects.

lation to resources, has been unprecedented. It has never been matched at any time in the now advanced countries. The exact trend is difficult to measure in the absence of good statistics, but the evidence is sufficiently abundant and accurate to establish beyond a doubt the general decline.

The best known case is that of Ceylon. There the crude death rate fell by 34 per cent in one year (from 1946 to 1947)! This was no fluke, because the death rate continued to fall. In 1945 the rate was 22.0 per 1,000 population, which was about normal for the country, because during the previous fourteen years it had averaged 22.2. After 1946 the mortality fell precipitously until in 1954 it was down to 10.4 per 1,000, a reduction of 53 per cent in nine years. The United States has no recorded death rate as high as 22.0 during the period of registration since 1900; the highest recorded rate is for 1900, when it was 17.2 per 1,000. Massachusetts had a recorded rate of 21.7 in 1875, but the subsequent decline was exceedingly slow compared to what has happened recently in Ceylon.

The case of Ceylon is interesting, not only because of the rapid drop in mortality, but because the island probably has the best statistics in South Asia. We know the causes involved, as we shall see presently. But the essential point is that this case is not at all an isolated one, for there are other instances of spectacular declines in mortality. During the 1940-50 decade the death rate dropped in Puerto Rico by 46 per cent; in Formosa, by 43 per cent; in Jamaica, by 23 per cent. In order to avoid the effect of spectacular cases, I have taken eighteen underdeveloped areas, chosen not because they had unusual declines in mortality but because they were representative of different areas and had fairly constant boundaries and a relatively continuous series of registered death statistics.<sup>3</sup> When the decline in the death rate from one year to a year five years later was averaged for these eighteen countries, the following results were found:

YEARS COMPARED	PERCENTAGE DECLINE IN CRUDE DEATH RATE
1935 with 1940	8.3
1940 " 1945	5.6
1945 " 1950	24.2
1950 " latest date <sup>4</sup>	14.0

<sup>3</sup> The countries included were as follows: Barbados, Costa Rica, Ceylon, Cyprus, Egypt, El Salvador, Fiji Islands, Jamaica, Malaya, Mauritius, Mexico, Panama, Philippines, Puerto Rico, Surinam, Taiwan, Thailand, Trinidad-Tobago.

<sup>4</sup> In nine cases the latest date was 1954; in six it was 1953; in two it was 1952; and in one it was 1951. In cases where 1954 data were lacking, the percentage decline was raised by assuming that the same rate of change would hold for five years. This was done in order to make the final period comparable with the previous three.

Since 1935, despite depression and war, the drop in mortality has apparently been averaging about 13 per cent for each half decade. Undoubtedly, these areas had long had declining death rates prior to 1935, but the pace of change seems to have accelerated after that date, and the acceleration since 1945, when World War II ended, has been little short of remarkable, as the average decline of 24 per cent between 1945 and 1950 shows.

It seems highly unlikely that these sharp declines in mortality in the eighteen countries chosen are a result of bad statistics. The statistics are certainly bad on the whole, and one has real hesitation about including data from such places as the Philippines, Egypt, and Thailand. But in many of the areas chosen the data are relatively good, and though there may have been some disorganization in vital statistics associated with the depression and the war, one would think that on the whole, especially since 1945, the registration has generally improved and that the statistics would be more likely to minimize the decline than to exaggerate it.

The unprecedented character of these drops in the death rate can be seen by looking at the past history of the now advanced countries. In the United States, for example, the greatest drop in the crude death rate since 1900, taking arbitrary half-decade intervals, occurred between 1910 and 1915, the decline being 10.2 per cent. Sweden had large drops in the more distant past; for instance, the rate for 1805 was 25.3 per cent below that for 1800. But in Sweden in the eighteenth and nineteenth centuries, a sharp fall in the death rate tended to be followed immediately by a sharp rise, so that the secular trend was very slight. This is shown by the fact that from 1750 to 1950 the average loss during any four successive half decades never exceeded 6.9 per cent; and in Switzerland, from 1871 on, it did not exceed 8.6 per cent. These results should be compared to the figures just given for the eighteen underdeveloped countries where the average loss per half decade during the twenty years covered is 13 per cent. It is the persistence of the downward trend, as well as its magnitude, that impresses us in the currently underdeveloped areas.

So far we have considered single-year death rates five years apart. Let us now compare five-year averages. The average percentage declines in successive five-year death rates are given in Table 1 for our eighteen underdeveloped countries. The first thing to notice is that over a period of thirty years there was always a decline from any half decade to the next. Data on the Northwest European countries going back to 1740-44 show that there was no thirty-year period in which a decline always occurred between half decades. A second thing to note is that, over the entire thirty years, the total decline was 47 per cent.

In Northwest European countries the maximum average percentage decline over any thirty-year period since 1740-44 was that between 1890-94 and 1920-24, when the decline was 34 per cent.<sup>5</sup> A third point is that, for our underdeveloped countries, the declines were not sharp in the twenties. The downward course gained momentum in the late thirties and then became a landslide in the forties and fifties. An average drop in the death rate of 20 per cent from 1945-49 to 1950-54 is staggering in view of the preceding long decline. For our Northwest European countries, the biggest decline as between any two successive half decades was 23 per cent, from 1740-44 to 1745-49, but this was followed by fifteen years of rising mortality. We can only conclude

TABLE 1  
AVERAGE PERCENTAGE DECLINE OF CRUDE DEATH AS BETWEEN SPECIFIED PERIODS, IN EIGHTEEN UNDERDEVELOPED COUNTRIES

	Number of Countries*	Average Percentage Decline from Previous Period†
Half Decade Changes		
1920-24.....	—	—
1925-29.....	15	6.0
1930-34.....	16	4.6
1935-39.....	18	6.3
1940-44.....	16	8.5
1945-49.....	16	15.2
1950-54.....	18	20.1
Average.....		10.1
Thirty-Year Change		
1920-24.....	—	—
1950-54.....	15	46.9

\* Eighteen countries were used, but in some cases data were missing for one or the other of the periods compared. The list of eighteen countries is given in footnote 3 in the text.

† The percentage change in average crude death rate was computed for each country. Then the percentages were added and divided by the number of countries involved in each comparison.

that the Northwest European countries never experienced such large persistent declines in mortality as the underdeveloped countries have shown recently. (Mention should be made of the fact that Japan, which is also a latecomer to the scene of declining mortality, showed between 1920-24 and 1950-54 a drop of 59 per cent in her crude death rate.)

Of course, we have been dealing with crude death rates. They are the only index of mortality readily available for a number of backward countries and are more abundantly available up to date. The crude rates, however, should not be misconstrued. In the first place, since deaths are underregistered in most preindustrial areas, the actual rates

<sup>5</sup> The countries in our list were Denmark, Finland, Norway, and Sweden up to 1830-39. In 1840-49, England and Wales were added; in 1850-59, Netherlands was added; and in 1870-79, Switzerland was added.

are not necessarily to be taken at face value. They have been used here merely to represent trends, and they are as likely to minimize the trends as to exaggerate them. In the second place, the crude rate, as is well known, reflects the age structure as well as actual mortality. In the case of our underdeveloped countries, the period dealt with is so short and fertility has remained so constant that the age structure has not had much chance to become changed. Consequently, the comparison of the crude rates of one period with those of another, in the case of the underdeveloped countries, is not vitiated by changes in the age structure. In the case of the industrial countries, crude rates may safely be compared as between one time and another, provided the two periods are not widely separated; but one should not compare, for example, the crude rate of Sweden in 1870 with the rate in 1940, because the age structure of the Swedish population was profoundly modified by the latter date. Similarly, one cannot compare the crude rates of industrial and preindustrial countries today. The industrial nations have much older populations, whereas the nonindustrial countries, especially those which have recently lowered their mortality sharply and have maintained a high fertility, have extremely young populations. It follows that the same age-specific death rates will yield a much higher crude death rate in the industrial population than in the other, and the difference tends to become greater as the force of mortality is reduced. Thus the fact that some underdeveloped areas now have crude rates as low or lower than the advanced Western peoples does not mean that their mortality is actually similar. (See the discussion of death rates in relation to age structure in United Nations, *Demographic Yearbook*, 1951, pages 9-12.) For instance, we have compared, in Table 2, the crude death rates in certain industrial countries with those in four underdeveloped countries where deaths are well registered. It can be seen that though the crude death rates of the underdeveloped areas are as low those of the urban-industrial countries, those areas nevertheless have a shorter average length of life.

George J. Stolnitz recently analyzed the mortality trends in advanced and backward countries by means of life tables. ("A Century of International Mortality Trends: I," *Population Studies*, July, 1955, pages 24-55.) Since very few nonindustrial countries have a series of reliable life tables covering different periods, his evidence was necessarily scanty. Nevertheless, his conclusions definitely substantiate those reached here. He points out that in Eastern and Southern Europe the long-term gains in average length of life, leaving aside periods of war, have been "much more rapid" than in Northwestern Europe at a comparable stage of development. Furthermore, he finds that since 1940 survival rates have increased in the countries of Latin America,

Asia, and Africa at such a rate as to narrow substantially the gap between them and the countries of Northwest European culture. He says, in fact: "There are mounting signs that the middle of this century has marked a revolutionary turning point in the life chances of the world's impoverished nations." (*Op. cit.*, page 47.)

*The Causes of the Amazing Decline*

The decline of mortality in the underdeveloped areas has not been equally great in all areas. It has been less in India and Egypt than in Ceylon; it has probably been less in China and Indonesia than in

TABLE 2  
COMPARISONS BASED ON CRUDE DEATH RATES AND ON AVERAGE LENGTH OF LIFE

	CRUDE DEATH RATE		AVERAGE YEARS LIVED AFTER BIRTH (MALES)	
	Date	Rate	Dates	Number
Underdeveloped Countries				
Trinidad and Tobago.....	1954	9.8	1950-52	56.3
Ceylon.....	1954	10.4	1952	57.6
Costa Rica.....	1954	10.6	1949-51	55.7*
Jamaica.....	1953	10.4	1945-47	51.2
Urban-Industrial Countries				
United States.....	1954	9.2	1951	65.9
United Kingdom.....	1954	11.4	1952	67.1
France.....	1954	12.0	1950-51	63.6
Sweden.....	1954	9.6	1946-50	69.0

\* Males and females.

Malaya and Mexico. But significant declines have occurred nearly everywhere, and in many regions their speed has been startling. Let us now summarize what seem to be the main factors.

The main cause of the spectacular decline of mortality in Ceylon is well known. It was the use of D.D.T. as a residual spray in the control of malaria. For centuries this disease was the major cause of death and illness on the island. In 1938, the spleen rate was 21.2 per cent among school children. During the decade 1933-42, the number of deaths specifically reported as due to malaria averaged 1,736 per million inhabitants.<sup>6</sup> But it is known that this was only a fraction of the actual death rate due to this disease, because many malaria deaths were reported as "pyrexia." Furthermore, the weakening effect of malarial infection causes individuals to succumb more easily to other diseases. Doctors on the scene in Ceylon estimate that 100,000 people died from malaria during the months of the great malarial epidemic in 1934-35. (Taylor

<sup>6</sup>H. Cullumbine, *An Analysis of the Vital Statistics of Ceylon* (a volume of the *Ceylon Journal of Medical Science*, December, 1950), pp. 134-135.



and Gadsden, *op. cit.*, page 53.) This would be a rate of approximately 20,000 per million per year, and would account for nearly half the total deaths on the island during that time. Over many years the disease had been fought by the usual antilarval methods: sluicing of streams, oiling of streams and ponds, training of rivers, etc. Pyrethrum sprays had also been used to kill adult mosquitoes. These measures had some slight effect, but the real control of malaria did not come until 1946 when, with the co-operation of the World Health Organization, residual spraying of D.D.T. "in all the areas where malaria was endemic was commenced." (Cullumbine, *op. cit.*, page 133.) By 1949, this measure had reduced the reported malaria morbidity rate by 77.5 per cent and the mortality rate by 82.5 per cent. The spleen rate of school children had been reduced by 75.5 per cent by 1948 (*ibid.*, pages 134-135). Interestingly, the death rate from other causes also declined sharply. Taking the 1948 rate as a percentage of the average annual rate for 1944-46, we find the following percentage reductions: dysentery, 65.4; influenza and rata, 43.3; pneumonia, 21.4; diarrhoea and enteritis, ages 0-2, 36.3; puerperal causes (maternal mortality), 46.1.<sup>7</sup> A part of these sharp reductions was perhaps due to the fact that D.D.T. killed other insects than mosquitoes (Cullumbine, *op. cit.*, page 137), but a good part of it was also due to the fact that malarial infection leads to general debility which makes people susceptible to other diseases. The control of malaria instituted in 1946 therefore had a much greater effect on the general death rate than the reduction of malaria deaths alone would have had.

The interesting thing about the remarkable control of malaria in Ceylon is that, compared to the older methods of dealing with this disease, it was far less costly than the older and less efficient methods: "In 1937-38 the cost of the Medical Services [on the island] represented 10.5 per cent of the total Government expenditure; in 1949-50, the cost is 9.3 per cent of the total." Although governmental expenditure has risen during the period, the cost of all medical services combined in 1949-50 was only Rs. 10 per head of the population per year (Cullumbine, *op. cit.*, page 256). Since some of the costs of the malaria campaign were met by outside funds—those of WHO—we can see why the revolution in mortality in Ceylon could be accomplished with no great step in economic development on the island.

Malaria has been characterized as "the world's most potent single cause of sickness, invalidism, and death." (Taylor and Gadsden, *op. cit.*, page 43.) What was accomplished in Ceylon can be and is being

<sup>7</sup> Computed from data in *Report on Vital Statistics for the Year 1948* (Colombo: Ceylon Government Press, 1949), pp. 29-33. In the case of maternal mortality, the percentage reduction in 1948 was computed against a 1938-48 average rather than 1944-46.

accomplished in many other underdeveloped areas. In Greece, for example, the introduction of D.D.T. enormously reduced the incidence of malaria—from one or two million to one-twentieth of a million cases annually. (Leland G. Allbaugh, *Crete: A Case Study of an Underdeveloped Area*, Princeton University Press, 1953, page 146.) Similar control measures are successfully being employed in malarial parts of India. (D. K. Viswanathan, *Malaria and Its Control in Bombay State*, 1950.) The cost of this work is insignificant compared to the results obtained. In Bombay Province the cost of protecting a million inhabitants was estimated to be 3 rupees (roughly 90 cents) per house per year, each house containing on an average five persons (*ibid.*, page 94). In countries where high wages and prices prevail, the cost will be higher—about \$6.00 per house per year in Venezuela. (World Health Organization, Technical Report No. 46, *Third Report of Expert Committee on Insecticides*, 1952, page 36.) But the essential thing to note is that the costs are small on a per capita basis, and they can frequently be borne in part by the more advanced countries through international agencies.

Modern science (developed mainly by the advanced countries and often applied in an underdeveloped region by their experts and with their funds) is being used often now to control some widespread disease on a mass basis and at a low cost. This has been done in the past with smallpox, cholera, plague, kalaazar, diphtheria, etc. (See Kingsley Davis, *Population of India and Pakistan*, Princeton University Press, 1951, pages 45-51.) It is being done now on a bigger and wider scale because of the discovery of the sulfonamides and antibiotics as well as new insecticides and new immunization sera. For example, successful mass control of trachoma is believed possible by the application of aureomycin or terramycin 1 per cent ointment four times daily without interruption for two months (WHO, Expert Committee on Trachoma, *First Report*, Technical Report No. 59, 1952, page 5). It has been demonstrated by a campaign in Bosnia, Yugoslavia, that endemic syphilis can be wiped out by the use of penicillin. In two years the campaign, sponsored by WHO and UNICEF, eliminated the disease as a public-health problem in areas with approximately half a million people. (WHO, Technical Report No. 63, 1953, page 12.) Similar programs on other treponemal diseases such as yaws and bejel have been successfully prosecuted under WHO and UNICEF auspices in Haiti, Indonesia, Iraq, the Philippines, and Thailand. The average cost was something like 41 cents per person examined and \$3.30 per person treated (*Chronicle of World Health Organization*, February-March, 1954, special issue on "Treponematoses: A World Problem," page 63). It is believed that in the future the reduction in the price of penicillin and the improvement of operational procedures will lower the cost to

10 cents per person examined and \$1.00 per person treated (*ibid.*, page 65).

In general, then, it seems clear that the great reduction of mortality in underdeveloped areas since 1940 has been brought about mainly by the discovery of new methods of disease treatment applicable at reasonable cost, by the diffusion of these new methods from the advanced countries to the unadvanced through international organizations and scientific communication, by international financial help furnished through international organizations and governments and private foundations, and by the use of experts and medical personnel furnished primarily by the industrial countries. The reduction could be rapid, because it did not depend on general economic development or social modernization in the underdeveloped areas. It did not depend on training local medical personnel or local research or local prosperity. It was an example of a rapid cultural diffusion of death-control techniques which did not depend on the diffusion of other cultural elements or basic changes in the institutions and customs of the people affected. Though in the literature on public health there is still great lip service paid to the necessity of general economic improvement and community welfare in the control of disease, the truth is that many scourges can be stamped out with none of this, just as diseases in cattle can be eliminated.

#### *The Demographic Consequences of Declining Mortality*

The consequences of rapidly declining mortality in underdeveloped regions can be understood only in conjunction with what is happening to fertility. In this regard, two points seem clear: First, the drop in the death rate has tended to go much farther without a significant decline in the birth rate than was the case in the West. Second, the traditional birth rates in most underdeveloped areas appear to be, and to have been, higher than they ever were in Northwestern Europe.

The first point appears clear from available data. Stolnitz has shown for eleven Western countries the dates when the sharpest increases in life expectancy were made (*op. cit.*, page 32). In eight out of the eleven, the sharpest rise in life expectancy at birth for males was after 1915; and in none did the sharpest rise occur wholly before 1900. (The results are essentially the same for life expectancy at age 0 for females.) An analysis of crude death rates reveals much the same thing. In the case of Sweden, for example, the average percentage decline in the mean death rate as between successive decades was as follows: 1740-99, 3.7; 1800-1849; 3.1; 1850-99, 4.3; 1900-1949, 7.7. In other words, the most rapid decline in mortality in Western countries oc-

curred in the twentieth century. It is known that the birth rate had started its downward course long before this. In Sweden, for example, the crude birth rate definitely turned down around 1860, and more refined analysis suggests that there was some reduction beginning as early as 1801. (See N. B. Ryder, "The Influence of Declining Mortality on Swedish Reproduction," in Milbank Memorial Fund, *Current Research in Human Fertility*, 1955, especially pages 71-72.) By the time the most rapid descent of the death rate occurred, the birth rate was already greatly reduced. In Norway the crude birth rate had dropped to the low twenties, and in Sweden and Switzerland it had fallen to less than twenty.

But the preindustrial birth rate in Northwestern Europe seems never to have been so high in the first place as that of Asia, North Africa, and much of Latin America today. Birth rates of 40 to 60 per 1,000 population are still found in many of the latter areas, whereas in Denmark the highest birth rate recorded in the eighteenth century was 33.6 in 1780; the highest in Sweden in that century was 38.7 in 1751, and the highest in Norway was 37.8 in 1756. (For the eighteenth-century rates, see H. Gille, "The Demographic History of the Northern European Countries in the Eighteenth Century," *Population Studies*, June, 1949, page 63.) In other words, "almost all the underdeveloped areas now have fertility rates well above the corresponding Western European rates before decline set in about 1880-1890." (Norman S. Buchanan and Howard S. Ellis, *Approaches to Economic Development*, Twentieth Century Fund, 1955, page 107.)

Since the death rate in underdeveloped areas is falling precipitously while the birth rate, already extremely high to begin with, is either not falling at all or is doing so very slowly, the rate of natural increase is much faster in these regions than it ever was in the past in the now urban-industrial areas. The extremity of the natural increase can best be grasped by comparing it with what happened in the now industrial countries, as in Table 4. Clearly, the excess of births over deaths in most of our underdeveloped countries has been in recent years four to ten times what it was in Northwestern Europe prior to 1800. It has even been two to three times what it was in Northwestern Europe during the heyday of population growth in the latter region, 1850-99. We cannot fail to conclude, then, that neither preindustrial Europe nor industrial Europe ever had the rate of natural increase that the pre-industrial countries of the world today are showing.

In many of the densely settled underdeveloped countries, indeed, the rate of natural increase is approaching or has achieved something like 30 per 1,000 per year. Thus in 1954 or the latest year available, seven-

TABLE 4  
NATURAL INCREASE FOR DIFFERENT PERIODS, DEVELOPED AND  
UNDERDEVELOPED COUNTRIES

	Average Natural Increase per 1,000 per Year					
	1735-99	1800-49	1850-99	1900-49	1940-49	1950-54†
<b>Industrial Countries</b>						
England and Wales.....	—	10.2*	12.7	6.5		
Denmark.....	2.8	8.5	12.2	10.9		
Norway.....	6.6	9.3	14.0	9.0		
Sweden.....	5.6	8.1	11.5	6.9		
Switzerland.....	—	—	7.9†	7.0		
Average.....	5.0	9.0	11.7	8.1		
<b>Underdeveloped Countries</b>						
Barbados.....					14.7	18.6
Ceylon.....					19.9	27.8
Costa Rica.....					27.6	37.3
Cyprus.....					19.6	20.2
Egypt.....					16.1	26.0
El Salvador.....					25.0	33.2
Fiji.....					27.5	29.6
Jamaica.....					17.4	22.1
Malaya.....					22.6	29.6
Mauritius.....					12.3	33.0
Mexico.....					24.6	28.7
Panama.....					24.9	26.2
Puerto Rico.....					26.0	27.6
Surinam.....					20.6	27.0
Taiwan.....					25.0	35.0
Thailand.....					14.9	18.9
Trinidad and Tobago.....					22.7	26.6
Average.....					21.3	27.5

SOURCES: For 1940 to 1954, UN *Demographic Yearbook*, 1953 and 1954. For earlier years statistical yearbooks of various countries and H. Gille, "Demographic History of the Northern European Countries in the Eighteenth Century," *Population Studies*, June, 1949.

\* For 1841-50 only.

† For 1871-99 only.

‡ For 1954 or the latest year available. See footnote 8 in text.

teen underdeveloped countries had an average natural increase of 27.5 per 1,000.<sup>8</sup> These countries were chosen, it must be remembered, not because they showed high growth rates, but because, among the underdeveloped nations, they tended to have better than average birth and death statistics and represented different regions. Their statistics are far from perfect; in many cases the rates of natural increase are probably in error by substantial margins. But there is no reason to think that on the whole the births are any better registered than the deaths. The contrary may be true, which would mean that the rates given would be underestimates of natural increase. Furthermore, the evidence is

<sup>8</sup> The list is the same as that previously used, except that the Philippines was omitted because of gross defectiveness in birth registration. Of the seventeen countries included, data were available for 1954 in nine cases; for 1953 in five cases; for 1952 in two cases; and for 1951 in one case.

overwhelming: all of these countries report extremely high rates of natural increase.

To appreciate the significance of these rates of natural increase, one should remember that a growth of 30 per 1,000 per year will double the population in twenty-three years and quadruple it in forty-six years. The United States, often thought to have established a record in population growth,<sup>9</sup> never had, even in its heyday and with the help of immigration, a faster increase than many of our underdeveloped areas are showing by the sheer excess of births over deaths. Here are the figures for the United States during its greatest population boom:

AVERAGE POPULATION GROWTH PER 1,000 PER YEAR DURING PRIOR DECADE	
1800 .....	30.1
1810 .....	31.0
1820 .....	28.6
1830 .....	28.9
1840 .....	28.2
1850 .....	30.6
1860 .....	30.4

These figures include net immigration and so are higher than the natural increase alone would be. Lack of data on births and deaths prevents our knowing the rates of natural increase in the United States during our period of most rapid growth. Nevertheless, they are apparently equaled by the natural increase of many underdeveloped areas today. This circumstance would not seem strange if the underdeveloped areas were sparsely populated and had rich resources and expanding frontiers; but this is obviously not the case in places like Ceylon, Egypt, Jamaica, El Salvador, Taiwan, and a host of other backward areas. In such places the recent rapid population growth is a totally different matter from what it was in the United States from 1790 to 1860. It is not a response to seemingly unlimited economic opportunity but rather an unfortunate by-product of the importation of scientific death control. There appears to be nothing in the economic future of most underdeveloped countries to suggest that they can achieve substantially higher levels of living with populations that are tending to double every twenty-five to thirty years.

<sup>9</sup> "It is likely that population growth was never more rapid in any nation than among the youthful population of this New World, from the days of colonial settlement to the time of the Civil War. . . ." (National Resources Committee, *The Problems of a Changing Population*, 1938), p. 6.

*Future Possibilities*

No doubt the reduction of mortality in underdeveloped areas can be carried still further, though possibly at slower rates. The life expectancy of these areas is still considerably lower than that of industrial nations. Unless, therefore, their birth rates begin to fall, the rates of natural increase may climb still higher. There is some evidence that fertility is beginning to drop (e.g., in Puerto Rico, Jamaica, Cyprus), but the signs are small as yet and are matched by slight apparent increases elsewhere (e.g., Trinidad, Fiji, Ceylon). Actually, the improvement of health, with no other changes, tends to increase reproduction.

If, as we have seen and contrary to earlier expectations, drastic reductions in mortality can be made without marked economic development in the countries concerned and without much change in the traditional birth rates, does this mean that the death rate is permanently disassociated from economic progress? Can populations continue to grow rapidly without a corresponding economic growth?

The answer is clearly no. The demographic trends of recent decades in underdeveloped areas are of necessity temporary. They result from the brief effect, the shot in the arm, which the conquest of disease by imported techniques can give. But people can die of other things than disease. They can die of starvation or from war, and they can die from a loss of the very disease controls which once saved them. As one analyst of mortality in Ceylon puts it: "What would happen, for example, if a future war prevented the importation of supplies of D.D.T.?" (Cullumbine, *op. cit.*, page 245.) Unless the demographic ledger is balanced by a change in birth rates, it may turn out that the gains in mortality in recent years will prove transitory. Economic development alone cannot be counted on to save a situation over which it has so little control and by which it is itself greatly influenced.