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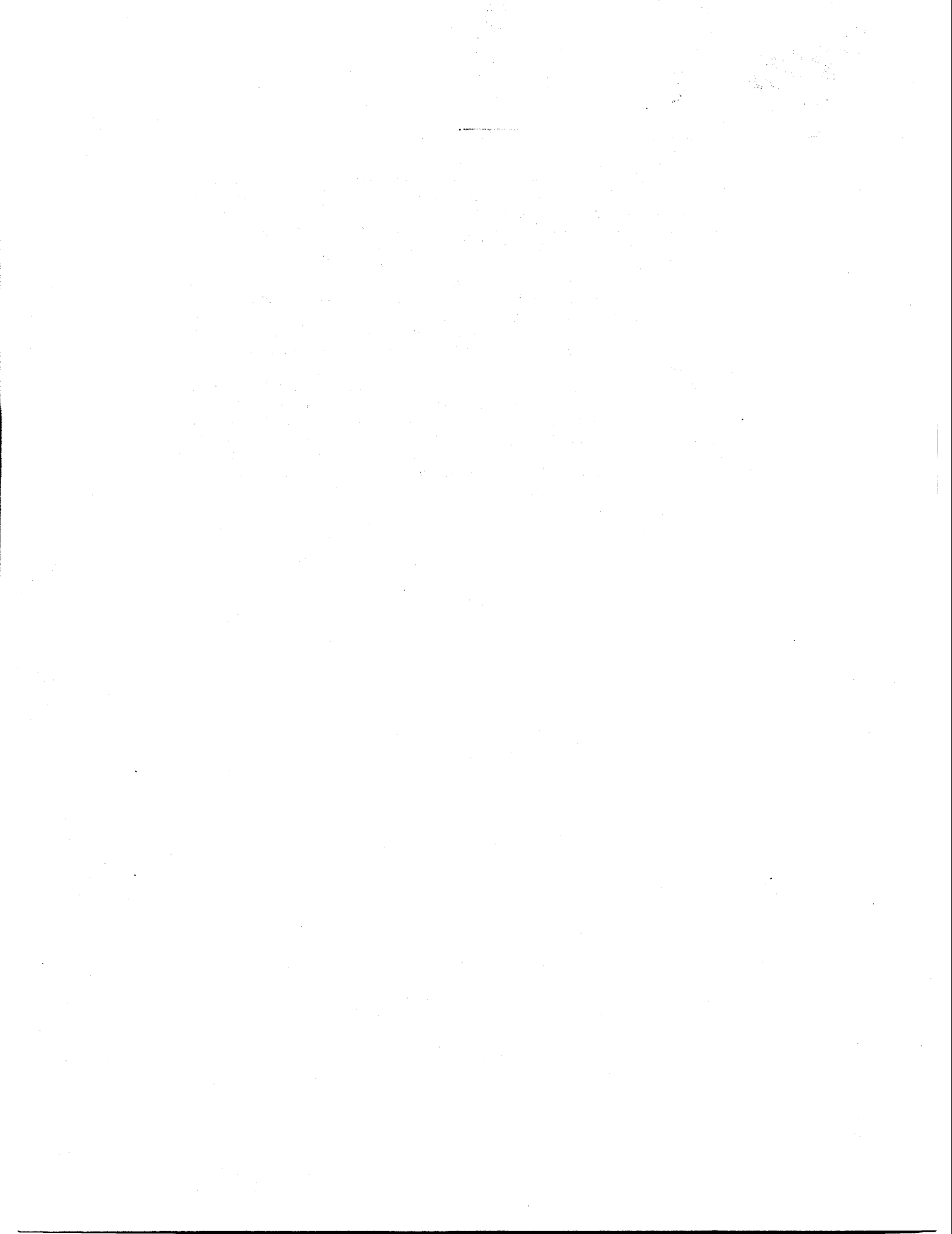
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PREFACE

The *Population Bulletin of the United Nations* presents brief articles relating to population which, by their nature, do not require separate publication. Material for the *Bulletin* is selected in the light of the interests and needs of Governments, international organizations, research institutions and individuals engaged in social and economic research, as well as the public interested in population.

The first seven issues of the *Population Bulletin* were prepared by the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat between 1951 and 1963. In accordance with the endorsement and recommendation of the Population Commission at its eighteenth session, the *Bulletin* was reinstated as a United Nations publication, beginning with the publication of *Bulletin* No. 8 in 1977. As in the past, the *Bulletin* is prepared by the Population Division.

Most of the articles published in the *Bulletin* are prepared by the United Nations Secretariat in pursuance of the programme of work recommended by the Economic and Social Council and the Population Commission. Studies by consultants and reports of meetings organized by the United Nations, or excerpts from such studies and reports, may also be included. In addition, contributions are solicited from the specialized agencies of the United Nations, the secretariats of the regional commissions and scholars.



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Explanatory notes

The following symbols have been used in the tables throughout the report:

Three dots (...) indicate that data are not available or are not separately reported.

A dash (—) indicates that the amount is nil or negligible.

A blank in a table indicates that the item is not applicable.

A minus sign (–) indicates a deficit or decrease, except as indicated.

A full stop (.) is used to indicate decimals.

A slash (/) indicates a crop year or financial year, e.g., 1970/71.

Use of a hyphen (-) between dates representing years, e.g., 1971-1973, signifies the full period involved, including the beginning and end years.

Reference to "tons" indicates metric tons, and to "dollars" (\$) United States dollars, unless otherwise stated.

Annual rates of growth or change, unless otherwise stated, refer to annual compound rates.

Details and percentages in tables do not necessarily add to totals, because of rounding.

SOCIO-ECONOMIC DETERMINANTS OF MORTALITY IN LATIN AMERICA

*Hugo Behm**

SUMMARY

Although at the individual level disease and death are biological phenomena, at the collective level both have an important social determination. Factors affecting mortality in Latin America should be analysed in the context of a transition process from pre-capitalistic modes of production to the development of capitalistic and dependent economies. There is extensive evidence showing that mortality is higher in the working class and is associated with lower levels of education and income. Mortality is also higher in rural populations and in certain indigenous groups. Socio-economic differentials of mortality are more marked in Latin America than in the developed countries. The level of educational attainment of the mother is the variable most significantly associated with infant and child mortality. Populations exposed to higher risks of death numerically constitute a major part of the national populations, so explaining the persistence of a still high mortality at the national level.

The prospect of reducing the present levels of mortality depends mainly upon the implementation of policies aimed at a more egalitarian distribution of the benefits of socio-economic development among the population. In this context, it is also important that effective implementation of health programmes should reach all the population and should make use of the available technology to prevent disease and death, particularly in infancy and early childhood.

Mortality in Latin America has undergone a marked decline in recent decades, but it still shows clear excesses over the levels reached in more developed regions. The relationship between death and socio-economic conditions is well known, although the way in which the various factors come into play, and their relative weight, are not entirely clear. In the present article, an analysis is made of the characteristics and sources of socio-economic differentials of mortality in Latin America, in so far as they are known at this stage, in order to clarify the current situation and its perspectives.

SYNTHESIS OF THE SOCIAL AND ECONOMIC SITUATION IN LATIN AMERICA

The economic and social situation in Latin America was analysed for the period 1950-1975 in a report by the Economic Commission for Latin America (ECLA).¹

*Latin American Demographic Centre (CELADE). This paper was presented to the United Nations/World Health Organization Meeting on Socio-economic Determinants and Consequences of Mortality, held at Mexico City from 19 to 25 June 1979. The author is solely responsible for the opinions in this paper which are not necessarily those of CELADE. The author is especially indebted to Domingo Primante and José Miguel Guzmán for their help in compiling and processing the information.

¹ "Tendencias y proyecciones a largo plazo del desarrollo económico de América Latina" (E/CEPAL/1027), dated 3 March 1977.

This report calls attention to the fact that development in the region has given the lie to the expectation prevailing in the 1950s that "a continuous progress based on industrialization, associated with certain socio-economic reforms, would bring about a social transformation with more egalitarian goals". The economic progress achieved has been important. The growth rates of the per capita domestic product, in spite of the population increase, were 2.6 per cent and they accelerated to 3.7 per cent during the period 1966-1973. The industrial sector has shown itself to be the most dynamic, its product having increased five-fold during those 25 years, while the agricultural sector lags far behind. The most important agents in this process have been the State and the transnational corporations, the latter having abandoned the primary sector for commerce and industry. External financing has made these countries concerned—mainly the large ones—heavily dependent on the international financing market. The total cost of servicing the foreign debt that the region nowadays has to face jeopardizes a large part of the present resources of the region.

The economic growth has gone hand in hand with an uneven distribution of its benefits, because ownership of the means of production, as well as technical progress and modernization, now tend to be concentrated in certain areas. Around 1970, the sectors considered as

being "modern" (mainly manufacturing and mining) produced 50 per cent of the products but only accounted for 12 per cent of the work-force. On the other hand, the "primitive" sector of production absorbed a third of the work-force and only contributed 5 per cent of the product. The latter sector had a working population with low productivity and very low income. The uneven income distribution did not change between 1960 and 1970: the poorest 50 per cent of the population received 14 per cent of the total income, while the better-off 15 per cent received 74 per cent. The productive system was clearly not up to the task of generating employment. According to estimates by the International Labour Organisation (ILO),² drawn up for countries that comprise 75 per cent of the region's population, 28 per cent of the labour-force is not used in the productive process (open unemployment and underemployment). According to the same source, 43 per cent of the population (approximately 110 million people) lived in "serious conditions of poverty, and about 35 per cent had no income level which could provide a minimum balanced diet".

Faced with this situation, countries tend, as a palliative measure, to increase the social services, of which education and health are the most successful. Nevertheless, "if one considers the indicators according to social groups, it is clear that the most impressive improvements of some social strata (medium groups) leave the marginal groups in an even worse situation (especially the rural poor)". Up to here, this summarizes the main relevant points of the ECLA report.

The life expectancy at birth in Latin America was 61.4 years in the period 1970-1975, ranging in the various countries from 46.8 to 69.8 years.³ As compared with the period 1950-1955, mortality was greatly improved, the corresponding values at that time being 52.1, 36.9 and 66.3 years. The question to be asked is, how does the mortality situation in the region relate to the socio-economic context that has just been summarized?

CONCEPTUAL FRAME OF THE ANALYSIS

Mortality in a population is a function of the frequency of illness (incidence) and the probability of dying of the sick person (lethality). Health and disease are two stages in the same dynamic process. Death, as an individual phenomenon, has biological determinants, whose mechanisms are the aetiopathogenesis of the disease. But this biological concept does not, by itself, explain mortality considered at the collective level. The multicausal approach of epidemiology has made it possible to describe the distribution and course of diseases in the population. According to the epidemiological

concept, health-disease is a process depending on the balance between man, various external pathogenic factors and the physical, biological and social environment. Several studies have shown the relation of disease and death to such variables as income, diet, sanitation, education, medical care etc. It has also been shown that all these factors, in turn, are closely correlated. In fact, however, the non-egalitarian distribution of all these components of the level of living in the population are but the visible expression, the measurable link, of a causal chain which is generated in the social, economic and political organization.

Laurell,⁴ among others, has contributed to the elaboration of a more comprehensive causal concept of the health-disease phenomenon at a collective level. In sum, according to this hypothesis, at the collective level, the phenomenon has a social determination and should be studied within the context of a social theory. The root of the process lies in the way in which man transforms natural resources and establishes relations with other men in order to produce and appropriate the resulting product. This process is fundamentally a social one, and expresses itself on a given socio-economic formation as a combination of different modes of production, one of which is dominant. In Latin American countries, for example, more or less advanced capitalist sectors coexist with subsistence economies or economies at a simple mercantile stage. In this context, the degree of development of the productive forces, which determine, among other things, the efficiency with which man transforms nature on behalf of his own benefit, is also important. In this way, the technological progress of man and the improvement of the working tools he has created have enabled him to eliminate the risk of hunger and epidemics in many countries. Lastly, the relative weight of the various groups of pressure in a given society influences the proportion that each of them obtains from the total goods and services produced. An organized working class, for instance, can obtain better salaries and the implementation of more egalitarian social policies. These, and other factors, produce differences in the level of living of the various social sectors of a country, which, at the same time, influence the occurrence of sickness and death. The whole process is historical and dynamic, in the sense that, in each society, social relations of production change and generate themselves consecutively.

This explanation does not in any way deny the existence of biological determinants in the health-disease-death process. The idea is to articulate biological factors within a social context, based on the reasoning that social causes can bring about and transform biological determinants. For example, the higher infant mortality of children born of women of extreme ages and the higher risk of children of a high birth order have a biological explanation. On the other hand, the social determinants of fertility explain that women in low

² "El problema del empleo en América Latina y el Caribe: situación, perspectivas y políticas" (study No. 90/1, produced in November 1975 by the Programa Regional del Empleo para América Latina y el Caribe (PREALC)).

³ Jorge L. Somoza, *América Latina: Situación Demográfica alrededor de 1973 y Perspectivas para el Año 2000*. CELADE Series A, No. 128 (1975).

⁴ C. Laurell, "Algunos problemas teóricos y conceptuales de la epidemiología social", *Revista Centroamericana de Ciencias de la Salud*, año 3, No. 6 (enero-abril 1977).

socio-economic groups have an early, high and extended fertility, so a larger proportion of their births occur in groups of greater risk. The relative weight of the biological and social factors will depend on the historical stage in which we find each social structure, as well as the level and structure of the resulting mortality. Socio-economic factors play a more important role in the genesis of mortality in Latin American countries, where a high mortality prevails, especially in the first years of life, linked to preventable causes such as malnutrition, diarrhoea and other infectious diseases.

No doubt a model that has been described concisely requires much fuller elaboration, as indicated by Cordeiro,⁵ among others, in order to explain in different

⁵ H. Cordeiro, *et. al.*, "Los determinantes de la producción y distribución de la enfermedad," *Revista Mexicana de Ciencias Políticas y Sociales*, No. 84 (abril-junio 1976.)

historical contexts the relation of the socio-economic and biologic determinant factors in the genesis of the level and the distribution of mortality in a specific population and at a given moment. Nevertheless, the hypothesis has a greater explanatory value than a simple affirmation that mortality is the result of "poverty" or of the level of economic and social development. The model needs to be verified empirically. Research following this line of thinking is very sparse, among other reasons because the information needed to establish proper analytical categories is not usually collected.

In the following pages, information on the socio-economic differentials of mortality in Latin America is systematically reviewed, with a view to discovering whether those differentials are consistent with the theoretical explanation summarized above.

TABLE 1. PROBABILITY OF DEATH BETWEEN BIRTH AND TWO YEARS OF AGE IN LATIN AMERICAN COUNTRIES AROUND THE PERIOD 1968-1970

Country	Probability of death ^a (per 1,000)	(Estimated) ^b live births		Estimated deaths under two years of age ^c		Excess ^d	
		Thousands	Percentage	Observed	Expected	Number	Percentage
Bolivia 1971-1972	202						
Haiti 1971	176	994	9.5	176 498	20 874	155 624	88.2
Peru 1967-1968	169						
Nicaragua 1966-1977	149						
Guatemala 1968-1969	149						
El Salvador 1966-1967	145	611	5.8	89 261	12 831	76 430	85.6
Honduras 1969-1970	140						
Brazil 1970	133						
Ecuador 1969-1970	127	4 054	38.7	535 596	85 134	450 462	84.1
Dominican Republic 1970-1971	123						
Chile 1965-1966	91						
Colombia 1968-1969	88	3 355	32.1	289 633	70 455	219 178	75.7
Mexico 1970	85						
Costa Rica 1968-1969	81						
Paraguay 1967-1968	75						
Argentina 1965-1966	58	1 451	13.9	81 047	30 471	50 576	62.4
Panama 1970	58						
Venezuela 1971	52						
Cuba 1970	48						
Uruguay 1970	38						
LATIN AMERICA	112	10 465	100.0	1 172 035	219 765	952 270	81.2
United States of America 1970	21						
Sweden 1972	11						

^a Data derived from H. Behm *et al.*, *Mortalidad en los Primeros Años de Vida en Países de América Latina* (various countries), CELADE Series A, Nos. 1024-1032 and 1036-1039 (1976-1978); for Mexico, Panama, the United States of America and Sweden, see *Demographic Yearbook, 1973* (United Nations publication, Sales No. E/F.74.XIII.1) and *Demographic Yearbook, 1974* (United Nations publication, Sales No. E/F.75.XIII.1).

^b Average of 1965-1970 and 1970-1975 estimates; see Jorge L.

Somoza, *Latin America: Demographic Situation around 1973 and Projections for the Year 2000*, CELADE Series A, No. 1020 (1975).

^c Number of observed deaths obtained by applying probability of death (col. (1)) to estimated live births (col. (2)); number of expected deaths obtained by applying probability of death between birth and two years of age in the United States in 1970 (21 per one thousand) to estimated live births (col. (2)).

^d Observed deaths minus expected deaths.

Differentials among Latin American countries

Table 1 shows the mortality rate under two years of age in Latin American countries around the years 1968-1970. This age has been selected because it displays the most sensitivity to the living conditions of the population. According to these estimates, there are 952,000 annual deaths at this age that could have been prevented if Latin America had reached the mortality level at the United States of America in 1970. The region shows considerable heterogeneity with respect to the risk of dying, which varies from 202 per 1,000 births in Bolivia to 38 per 1,000 in Uruguay. It is estimated that more than half of the children born in Latin America are exposed to a mortality rate of over 120 per 1,000, which is 12 times higher than the rate in Sweden.

A study has been made by ECLA of the relationship of the mortality level of Latin America to some aspects of its social development.⁶ A set of four social indicators (hospital beds per 1,000 inhabitants, protein consumption, literacy and houses provided with drinking water) have a high lineal correlation with the life expectancy at birth ($r=0.94$). A study of the mortality of these countries in relation to the characteristics of its socio-economic structure would have greater significance but would exceed the scope of the present paper. A quick analysis of some countries with extreme mortality rates will nevertheless provide food for thought.

One of the countries with a low mortality rate is Argentina, where capitalist development began earlier and has advanced further than in other countries of the region.⁷ The absence of a previous feudal structure made it possible to develop a vast modern export agriculture. The labour-force was helped by heavy European immigration, for the immigrants were able to achieve favourable salary conditions and contributed their own patterns of living and consumption. Life ex-

pectancy at birth in Argentina was 68.2 years in 1970-1975 and the indicators summarized in table 2 are among the best in the region. Costa Rica has a fundamentally agricultural economy and a sound economic growth rate. Following a successful strike in the banana industry in the 1930s, a policy was implemented that considerably extended a number of social benefits, such as education and health. Life expectancy at birth has also reached 68.2 years and the socio-economic indicators are quite favourable.

One of the countries with a high mortality rate is Honduras, whose economy has for a long time been controlled by an agro-(banana)-exporting foreign enterprise, which has distorted the progress of the rest of the country. The life expectancy is only 53.5 years and the socio-economic indicators are extremely unfavourable; income distribution in Honduras is one of the most unequal in the region. In Haiti, the country with the highest mortality rate in Latin America, a subsistence economy and feudal production relations predominate, and development of the capitalist sector is barely beginning.

Regional differences within countries

Geographical mortality differentials within countries are interesting because they are the framework for national policies and can be more easily interpreted in the socio-economic context of each country. Carvalho⁸ describes differences in expectation of life at birth in Brazil in 1960-1970, which ranges from 44.2 years in the backward area of the north-eastern central region to 61.9 years in the south, both ages being related to income, as will be shown further on. Castillo *et al.*,⁹ in Mexico, 1970, using mortality estimates (corrected by omission), find differentials ranging from 124 per 1,000 in Chiapas to 43-44 per 1,000 in the larger industrial centres of the Distrito Federal and Nueva de Leon;

⁶ Economic Commission for Latin America, *Población y desarrollo en América Latina* (Mexico City, Fondo de Cultura Económica, 1975).

⁷ A. Cueva, *El Desarrollo del Capitalismo en la América Latina* (Mexico, Editorio Siglo Veintiuno, 1971).

⁸ J. A. Carvalho, *et al.*, *Renda e Concentração de Mortalidade no Brasil* (Minas Gerais, Universidade Federal de Minas Gerais, Centro de Desenvolvimento y Planjamento Regional, 1977).

⁹ G. Castillo, *et al.*, *Evaluación de la Mortalidad Infantil en la República Mexicana durante el Período 1930-1970: Evaluación y Análisis*, Serie III, No. 1 (1975).

TABLE 2. LIFE EXPECTANCY AT BIRTH AND SOME SOCIO-ECONOMIC INDICATORS OF SELECTED LATIN AMERICAN COUNTRIES, 1970

Country	Life expectancy 1970-1975 ^a	Per capita gross domestic product 1970 ^b	Growth rate of per capita gross domestic product 1966-1973 ^c	Percentage of income ^c		Percentage of economically active population ^d		Percentage of population living in extreme poverty ^e	Percentage of illiterate persons in population ^e	Percentage of population with access to drinking water ^e
				Poorest 50 per cent	Wealthiest 50 per cent	Engaged in agriculture	Engaged in manufacturing			
Argentina	68.2	1 208	3.4	23.0	31.0	14.8	19.7	11.0	7.4	64.0
Costa Rica	68.2	656	4.1	19.0	41.0	36.4	11.9	—	11.6	78.0
Honduras	53.5	278	0.4	11.0	50.0	56.8	11.6	49.0	53.0	38.0
Haiti	47.5	112	1.4	—	—	—	—	—	81.2	11.0

^a Jorge L. Somoza, *América Latina: Situación Demográfica alrededor de 1973 y Perspectivas para el Año 2000*, CELADE Series A, No. 128 (1975).

^b *Evolución de la Economía Regional en 1977*, Notas sobre la Economía y el Desarrollo de América Latina No. 274/275 (Santiago, Chile, Economic Commission for Latin America, 1978).

^c "Long-term trends and projections of Latin American economic development" (E/CEPAL/1027).

^d *Yearbook of Labour Statistics, 1975* (Geneva, International Labour Office, 1975).

^e Pan-American Union/Inter-American Statistical Institute, *América en Cifras: Situación Social* (Washington, DC, 1974).

among states the correlation with a socio-economic index is -0.58 . Taucher¹⁰ describes rates of infant mortality in Chile in the period 1973–1975, ranging from 46 per 1,000 in Santiago to 122 per 1,000 in the province of Malleco, an agricultural and underdeveloped region.

Such marked contrasts are examples of the diversity of death risks within each of these countries, but to define the causes requires further analysis.

Urban-rural contrasts in mortality

The dichotomic urban-rural classification used in the census is not adequate to express the variety of socio-economic conditions existing between large cities and the isolated rural communities. A finer classification was made by Behm and Rosero¹¹ for Ecuador, 1969–1970, in a study of mortality in the first two years of life (table 3). Mortality has an inverse non-linear relationship to the degree of urbanization. The mortality risk in rural areas is 48 per cent greater than it is in urban areas. Mortality in big cities is 31 per cent less than in the remaining urban sector. A scattered rural population has a risk 13 per cent greater than the more concentrated population.

TABLE 3. MORTALITY IN CHILDREN UNDER TWO YEARS OF AGE, BY DEGREE OF URBANIZATION, ECUADOR, 1969–1970

Geographical areas	Probability of death (per 1,000 live births)
TOTAL	127
Urban population	98
Large cities	80
Intermediate cities	114
Other urban	117
Rural population	145
Concentrated rural	134
Dispersed rural	151

Sources: H. Behm and L. Rosero, *Mortalidad en los Primeros Años de Vida, Ecuador, 1969–1970*, CELADE Series A, No. 1031 (1977).

Ortega *et al.*¹² describe a higher mortality rate for the rural population in Honduras, 1971–1972; expectation of life at birth is 11.4 years less than it is for the urban population. Excess rural mortality is found at all ages. Absolute differences are particularly marked in the first year of life and at over 65 years of age (table 4).

Behm *et al.*¹³ have studied the risk of death in the first two years of life in the urban and rural populations of 12 Latin American countries, deriving estimates from the census information by way of the Brass method (table

¹⁰ Erica Taucher, *Mortalidad Infantil en Chile: Tendencias, Diferenciales y Causas* (Santiago, Chile, Latin American Demographic Centre, 1978).

¹¹ H. Behm and L. Rosero, *La Mortalidad en los Primeros Años de Vida en Países de América Latina: Ecuador 1969–1970*, CELADE Series A, No. 1031 (1977).

¹² A. Ortega and M. Rincón, *Encuesta Demográfica Nacional de Honduras*, fascículo IV, *Mortalidad*, CELADE Series A, No. 129 (1975).

¹³ H. Behm and D. Primante, *Mortalidad en los Primeros Años de Vida en Países de la América Latina*, Notas de Población No. 16, año VI, CELADE, abril 1978.

5). It should be noted that the method tends to underestimate mortality in some rural areas, so real differences might be greater. In two thirds of these countries the risk for rural populations exceeds that for urban populations by 30–60 per cent. In countries with a higher mortality rate, this means that one out of every five or six children born alive in the rural regions dies before reaching the age of two years. Such differences are particularly significant if one considers the fact that in most of these countries the majority of the population is rural.

TABLE 4. MORTALITY IN THE URBAN AND RURAL POPULATIONS, HONDURAS, 1971–1972

Indicator	Population		Ratio rural/urban mortality
	Urban	Rural	
Life expectancy at birth	61.5	50.1	—
Crude rate of mortality ^a	9.0	16.5	1.8
Infant mortality rate ^b	85.6	127.2	1.5
Rates by ages ^a			
1–4	10.5	22.6	2.2
5–14	2.7	4.5	1.7
15–44	2.2	4.8	2.2
45–64	12.2	16.6	1.4
65 and more	39.6	58.2	1.5

Source: A. Ortega and M. Rincón, *Encuesta Demográfica Nacional de Honduras*, fascículo VI, CELADE Series A, No. 129 (1975).

^a Per 1,000 population.

^b Per 1,000 live births.

To what extent do the prevailing social relations of production in Latin American agriculture explain the excessive rate of rural mortality? In a recent analysis of social development in rural areas in Latin America by ECLA and the Food and Agriculture Organization of the United Nations (FAO),¹⁴ it was found that during the period 1950–1975 the problems in that area had not been solved and in many cases had become worse. Problems of food, employment, income and living conditions were not due to an insufficient expansion of production or to the persistence of traditional agricultural structures but seemed to be more related to modalities under which a transformation of the socio-economic structures of agriculture was being brought about. The process tended to intensify the capitalistic nature of the system of agricultural production, with the expansion of a subsector of modern agriculture, composed of a relatively small number of medium-size and large enterprises, linked through commercial, agro-industrial and financing mechanisms with national and international markets. It was pointed out in the report that the expansion of modern agricultural methods, because of the resulting concentration of production, as well as of resources and incomes, with the obvious implications for employment and the standard of living of the rural populations, contributed to the decay of traditional agriculture. The characteristics and problems of agricultural evolution in Latin America were

¹⁴ *El Desarrollo Social en las Áreas Rurales de América Latina*, Notas sobre la Economía y el Desarrollo de América Latina, No. 276 (Santiago, Chile, Economic Commission for Latin America, 1978).

TABLE 5. PROBABILITY OF DEATH BETWEEN BIRTH AND TWO YEARS OF AGE IN URBAN AND RURAL POPULATIONS, SELECTED LATIN AMERICAN COUNTRIES, AROUND 1968-1970

Countries	Probability of death (per 1,000 live births)		Percentage of excess rural mortality	Percentage of rural popu- lation
	Urban	Rural		
Bolivia, 1971-1972	166	224	34.9	62
Chile, 1965-1966	84	112	33.3	25
Colombia, 1968-1969	75	109	45.3	36
Costa Rica, 1968-1969	60	92	53.3	59
Dominican Republic, 1970-1971	115	130	13.0	60
Ecuador, 1969-1970	98	145	48.0	59
El Salvador, 1966-1967	139	148	6.5	60
Guatemala, 1968-1969	119	161	35.3	64
Honduras, 1969-1970	113	150	32.7	69
Nicaragua, 1966-1967	143	152	6.3	65
Paraguay, 1967-1968	69	77	11.6	63
Peru, 1966-1967	132	213	61.4	40

Source: H. Behm *et al.*, *Mortalidad en los Primeros Años de Vida en Países de la América Latina* (various countries), CELADE Series A, Nos. 1024-1032 and 1036-1039 (1976-1978).

factors in the expansion of mercantile production, within which the socio-economic structures of agriculture were reorganized in order to be able to provide food and cheap labour, a function that was essential for the accumulation of capital in the economic system as a whole. In that process, the small producer had remained linked to the salary earners who formed the majority of the low-income rural workers.

The various attempts at reform and the agrarian revolutions that have taken place in Latin America, as mentioned in the report, have been limited in nature and have not been carried through. They have met with opposition from organized fronts of agrarian management, and the peasants have not been able to organize themselves strongly enough to defend their right to work and own land. On the other hand, as a result of the high concentration of resources in the export sector of the agrarian economy, production for internal consumption has not had the expected growth. ECLA and FAO have defined this growth as a prerequisite for solving the population's nutritional problems. Del Canto *et al.*¹⁵ point out that Central American countries have been compelled to import increasingly large quantities of food, with a resulting dependence on markets and on international prices.

The above citations place the high rural mortality rate in Latin American countries in its true social, economic and political setting. They also show that the "explanation" of mortality differentials can be found neither in the analysis of conventional demographic variables (such as urban/rural, for example) nor in some socio-economic indicators, but rather in the use of categories that identify the role of the individual in the social process of production. There are some studies in the nutrition field that provide information in this respect.

¹⁵ J. del Canto *et al.*, "Componentes de los problemas socioeconómicos y nutricionales y crecimiento demográfico en Centroamérica," submitted to the Conferencia sobre interacción entre agricultura, ciencia y tecnología de alimentos y nutrición, held at Guatemala City from 6 to 10 November 1978.

Hernández¹⁶ analysed the socio-economic and dietary nutritional changes that had taken place between 1958 and 1971 in the municipality of Conduacan (Mexico), owing to the implementation of a programme of agricultural development intended to increase export crops (sugar cane and bananas). Simultaneously, a health centre and a high school were set up and the electricity supply was extended. "The explosive economic growth of the area favoured only one sector of the population. While the privileged sector of the population began to consume greater quantities of meat, milk and other products, the agricultural working class remained more or less in the same situation. Undernourishment still continues, affecting the same proportion of children, with the same severity, and surely with the same consequences. Not only was the change in food production not able to prevent malnutrition but global economic growth brought about by the agricultural project was likewise incapable of doing so."¹⁷ On the other hand, Valverde *et al.*,¹⁸ in a study of four rural villages in Guatemala, found that the frequency of moderate malnutrition in children increased from 17 to 38 per cent, inasmuch as the area of land that a peasant owned was reduced from more than 5 manzanas to less than 2.

Beghin,¹⁹ of the Institute of Nutrition of Central America and Panama (INCAP), discussing the relation of malnutrition with development, says that, in general, it is accepted that malnutrition depends on "poverty" ("social deprivation"), which "is the product of a complicated and yet not too well understood set of conditions in which exploitation, injustice in the distribution of economic and political power, and the inequalities in the distribution of the product of the economic activity, play an important role". He adds: "There are no technocratic solutions for malnutrition. Nutritional interventions cannot be decontaminated, be free of political considerations. Nutrition is not aseptic".

It is interesting to point out that in studies of malnutrition in Central America, Teller²⁰ has found that in Panama and Guatemala, between 1965 and 1975, the prevalence of more severe second-degree and third-degree malnutrition has increased among children less than five years old, while mortality has decreased. In Hernández' paper, in spite of the conditions described, the rate of infant mortality showed a 50 per cent reduction during the observation period. These facts demonstrate the complexity of the mechanisms by which the socio-economic context affects the health-disease-

¹⁶ M. Hernández *et al.*, "Effect of economic growth on nutrition on a tropical community", *Ecology of Food and Nutrition*, vol. 3, 1974.

¹⁷ M. Hernández *et al.*, *op. cit.*

¹⁸ V. Valverde *et al.*, "Relationship between family land availability and nutritional status", *Ecology of Food and Nutrition*, vol. 6, No. 1 (1977).

¹⁹ I. Beghin *et al.*, "Malnutrition, national development and planning", submitted to the International Conference on Practical Proposals to Combat Malnutrition, held at Cairo from 25 to 29 May 1977.

²⁰ Charles Teller *et al.*, "Population and nutrition: implications of social-demographic dynamics for national food and nutrition policies", XI International Nutrition Conference, held at Rio de Janeiro from 27 August to 1 September 1978.

death process. They also point out that lethality changes may to a certain extent dissociate the mortality and morbidity trends. In general, they confirm that the development of the capitalist system is associated with the decline in mortality, a fact that is widely borne out by the experience of developed countries. Nevertheless, the intensity and timing of that decline will depend upon the historical and structural characteristics of a given society and its insertion in the world's economy. To ignore this situation or to simplify the explanations of a complex phenomenon are two errors which should be avoided in analysing the real determinants of mortality.

Let us now consider mortality in an urban environment. The findings presented in table 5 show that, although urban mortality is still high in Latin America, in general it is lower than rural mortality. What is the situation in the big cities of these countries? These cities, which as a rule are also the national capitals, are characterized by their great demographic growth resulting from heavy internal immigration. They are the centres of political and economic power, and a great part of the resources and social services of the public

sector (including medical care) is concentrated in them. The capitalist development of the economy began in these cities and is at a more advanced stage. The fact that the industries are usually established in these cities

TABLE 6. SOCIO-ECONOMIC DIFFERENTIALS OF INFANT MORTALITY, BUENOS AIRES, 1973

Groups	Rate (per 1,000 births)
Federal Capital	30
Geographical region	
I	45
VI	17
Socio-economic indicator	
1 (lowest)	68
4 (highest)	16
Marital status of the mother	
Single or in common-law marriage	42
Married	22
Migration	
Immigrants	39
Non-migrants	20

Source: M. Arruñada, A. Rothman and M. Segre, "Diferenciales socio-económicos de la mortalidad infantil en la Capital Federal, Argentina" (unpublished).

TABLE 7. MORTALITY UNDER TWO YEARS OF AGE, LATIN AMERICAN CAPITALS, AROUND THE PERIOD 1968-1970

Country and area	National total	Probability of death (per 1,000 births)				
		Total	In the capital city (per number of years of education of the mother)			
			None	One to three years	Four to six years	Seven or more years
Bolivia						
La Paz	202	179		199 ^a	202	96
Peru						
Metropolitan area	169	93		123 ^b	97 ^c	86 ^d
Guatemala						
Guatemala City	149	76	122	88	59	31
Nicaragua						
Managua, urban	149	103	164	131	99	34
El Salvador						
San Salvador, urban	145	118	184	136	98	37
Honduras						
Tegucigalpa	140	97	117	91	64	31
Ecuador						
Quito and Guayaquil	127	80	149	106	79	50 ^e
Dominican Republic						
National district	123	109	162	132	99	70
Chile						
Large cities ^f	91	72	138	83	77	52
Colombia						
Metropolitan area	88	51	78	60	46 ^g	32 ^h
Costa Rica						
San Jose, Heredia, urban	81	49		72	52	37
Paraguay						
Metropolitan area	75	64		97 ^a	57	25
Argentina						
Metropolitan area	58	43		70 ^a	48	30

^a Zero to three years.

^b Zero to four years.

^c Five years.

^d Six and more years.

^e Seven to nine years.

^f Of which 90 per cent are in Santiago and Valparaiso (urban populations).

^g Four to five years.

^h Six or more years.

has favoured an earlier and stronger development of workers' unions in them.

Arruñada *et al.*²¹ analysed the distribution of infant mortality in Buenos Aires in 1973, when the trend was tending to level off at around 30 per 1,000. The results of the analysis are summarized in table 6 and show considerable differences in mortality in a city that is highly developed and has a relatively low infant mortality. Higher rates are observed in region I, where slums predominate. They are also found at the lowest socio-economic level, and when the mother is not in a legal union or is an immigrant in the city. When some of these conditions coincide, subpopulations exposed to high risk can be identified. For example, in region I, children in the lowest socio-economic group have a mortality rate of 101 per 1,000, and children of unmarried women a rate of 70 per 1,000.

Table 7 shows mortality in the first two years of life in the capital cities of some Latin American countries around the period 1968–1970.²² These populations do not correspond exactly to the capital cities, but the figures do account for the majority of them.

The risk of death of a child living in the capital of these countries is lower (and often substantially lower) than in the country as a whole. Nevertheless, when the education of the mother is used to identify subpopulations with different standards of living, it is evident that mortality is very heterogeneous within the capital. The lowest-level sector has a considerably greater risk on a level with that of the rural population, which has just been analysed. It shows that the risk is associated more with the place that a family holds within the socio-economic structure rather than with its geographical residence. As will be shown further on, when we analyse differential mortality in Costa Rica by social class, the children of proletarian families form a part of this population at greater risk. Also included here are the so-called marginal populations, which do not participate effectively in the process of production, among other reasons because the labour market is unable to absorb a population of intensive growth. The conditions of unemployment or underemployment thus determined are associated with low standards of living and, consequently, with a greater mortality.

In short, the populations of the bigger cities in Latin American countries have a lower mortality than populations in the rest of the country, a circumstance that is related to the better conditions of life generated, in general, by capitalist development, which is mainly centred in these cities. Nevertheless, at the present stage, the contradictions of the system create within them important socio-economic differentials of mortality.

²¹ M. Arruñada, A. Rothman and M. Segre, "Diferenciales socio-económicos de la mortalidad infantil en la Capital Federal, Argentina" (1976, unpublished).

²² H. Behm, *et al.*, *Mortalidad en los Primeros Años de Vida en Países de América Latina* (various countries), CELADE Series A, Nos. 1024-1032 and 1036-1039 (1976-1978).

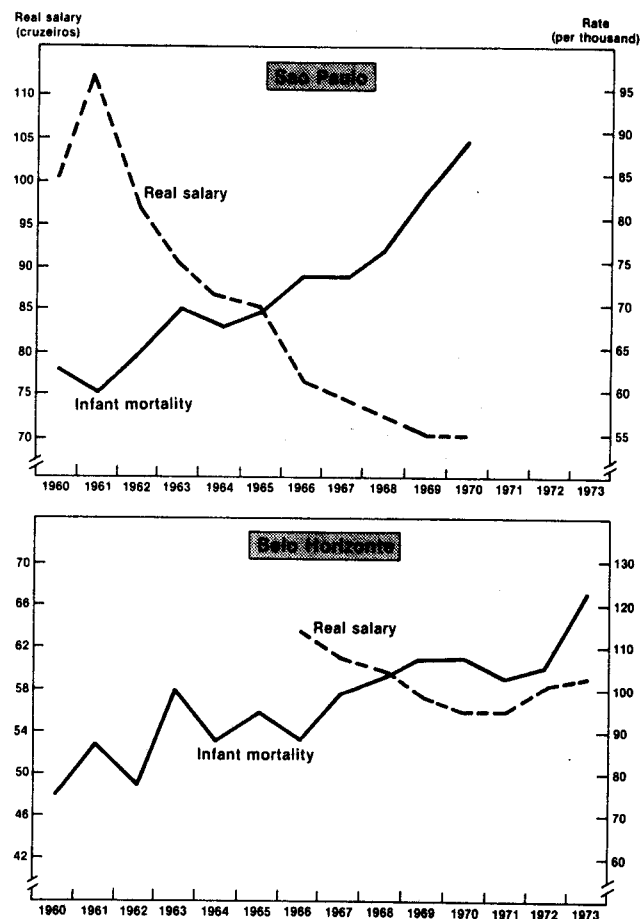
OTHER ASPECTS OF THE SOCIO-ECONOMIC DIFFERENTIALS OF MORTALITY

In this section, studies on differential mortality are examined according to levels of income, levels of education, ethnic groups and social classes.

Mortality and income level

Carvalho²³ has made estimates of the expectation of life at birth for Brazil by groups of income, based on child mortality estimated by the Brass method from the population census of 1970. The expectation of life of the lower-income group ($e=49.9$ years) is 12.1 years less than for the higher-income group ($e=62.0$ years). In spite of the heterogeneity of mortality among regions, it systematically decreases as income rises. In the regions, the differences among subpopulations are even bigger: the expectation of life goes from 42.8 years in the lower-income group in the north-east central region to 66.9 years in the better-off groups of the southern

Figure 1. Infant mortality and real salaries, São Paulo and Belo Horizonte, Brazil, 1960–1973



Source: Charles Wood, "Tendencia de mortalidade infantil e distribucao de renda: estudo sobre Belo Horizonte e São Paulo", submitted to the Simposio sobre o Progreso da Pesquisa demografica no Brasil, held at Rio de Janeiro from 7 to 9 June 1976.

²³ J. A. Carvalho *et al.*, *op. cit.*

region, which is one of the most progressive. The author points out that in the regions with low mortality, there is a tendency for greater absolute differences in the expectation of life to manifest themselves according to level of income.

Also in Brazil, Wood²⁴ has studied the course of infant mortality in two major cities (see figure I). The rates increased by 40 per cent in São Paulo between 1960 and 1970 and by 68 per cent in Belo Horizonte between 1960 and 1973. This increase persists even after the rates have been corrected for errors in the registration of residence. In both cities (except for São Paulo in 1961) a simultaneous decline is observed in the minimum real salary, which the author considers to be one of the causes of the increase in mortality. It is estimated that the proportion of the population earning less than the minimum salary is 46 per cent in Belo Horizonte and 43 per cent in São Paulo. Wood calls attention to the fact that the great economic development that took place in Brazil between 1960 and 1970 coincided with a regressive distribution of income: the wealthier 5 per cent of the population increased its share of the total income by 72 per cent, while the situation of the three quarters of the population with lower incomes showed no improvement.

²⁴ Charles Wood, "Tendencia de mortalidade infantil e distribuição de renda: estudo sobre Belo Horizonte e São Paulo", submitted to the Simposio sobre o Progreso da Pesquisa demografica no Brasil, held at Rio de Janeiro from 7 to 9 June 1976.

Mortality and level of education

The level reached by the individual in the formal system of education is another variable used at length in the study of mortality differentials. Among other investigators, Preston²⁵ has calculated a multiple regression based on the cross-sectional study of 120 countries around 1970, which shows that a rise of 10 per cent in the proportion of literate persons is associated with an increase of two years in the expectation of life at birth. Education has a direct effect on some determinants of mortality; the mortality of the child, for example, is influenced by the mother's beliefs and values with respect to care of her child in illness or in health. Yet, above all, education is correlated with other indicators of the level of life and its differences express the uneven distribution of resources and services in the population.

Behm *et al.*²⁶ have analysed the risk of death between birth and two years of age in 12 Latin American countries in terms of the education of the mother. Some of the results are summarized in table 8 and in figure II. The countries have very different levels of mortality, but in all of them it is observed that the risk of death in a child at this age declines steadily as the education of the mother increases. Thus, the children of illiterate wo-

²⁵ S. Preston, "Mortality, morbidity and development", presented to the seminar on population and development in the ECWA region, held at Amman in September 1978.

²⁶ Behm, *op.cit.*

TABLE 8. MORTALITY UNDER TWO YEARS OF AGE, BY NUMBER OF YEARS OF EDUCATION OF THE MOTHER, LATIN AMERICAN COUNTRIES, 1966-1971

Country	Total	Probability of death (per 1,000)					Ratio of col- umn (2) to column (5)
		Number of years of education of the mother					
		None (1)	One to three (2)	Four to six (3)	Seven to nine (4)	10 or more (5)	
Bolivia	202	245	209	176	110 ^a	—	—
Peru ^b	169	207	136	102	77	70	3.0
Nicaragua	149	168	142	115	73	48	3.5
Guatemala	149	169	135	85	58	44	3.8
El Salvador	145	158	142	111	58	30	5.3
Honduras	140	171	129	99	60	35	4.9
Ecuador	127	176	134	101	61	46	3.8
Dominican Republic	123	172	130	106	81	54	3.2
Chile	91	131	108	92	66	46	2.0
Colombia ^c	88	126	95	63	42	32	3.9
Costa Rica	81	125	98	70	51	33	3.8
Paraguay	75	104	80	61	45	27	3.9
Argentina	58	96	75	59	39	26	3.7
Cuba ^d	41	46	45	34	29	—	—

Source: H. Behm and D. Primante, *Mortalidad en los Primeros Años de Vida en América Latina*, Notas de Población, año VI, No. 16 (CELADE, 1978).

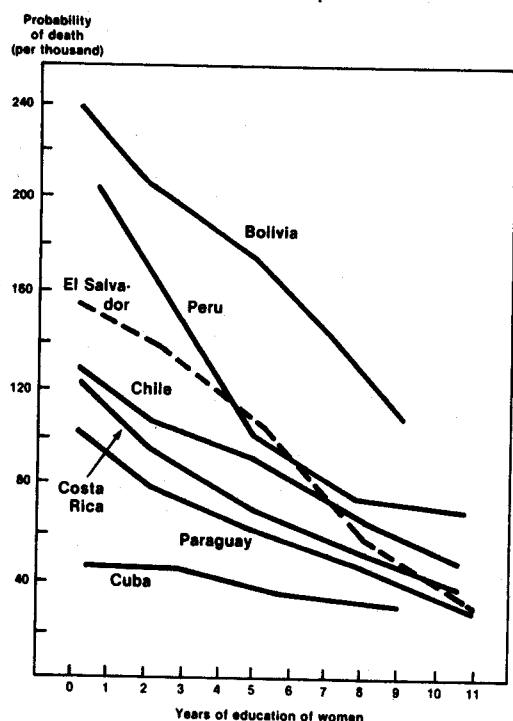
^a Seven or more years.

^b Columns (1)-(5) represent zero to two years, three to four years, six to nine years and 10 or more years respectively.

^c Columns (3)-(5) represent four to five years, six to eight years and nine or more years respectively.

^d Provisional figures.

Figure II. Mortality under two years of age, by number of years of education of the mother, Latin American countries, 1966-1971



Source: table 8.

men have a risk 3.5 to 5 times greater than that of children of women who have had 10 or more years of education. In countries with a high mortality rate, the absolute differences of mortality among education groups are greater than they are in countries with a lower mortality rate. There is also a trend in the reduction of mortality in terms of education, the differences being less marked between the higher education groups. For children of women with 10 or more years of education, the differences in mortality between countries tend to be smaller (ranging from 26 in Argentina to 70 per thousand in Peru). The children of illiterate and semi-literate women in the majority of countries have a death risk surpassing 100 per 1,000 live births. In 8 of the 14 countries, mortality is higher than

170 per 1,000 in the groups with no education and reaches its maximum in Bolivia, where one out of every four children born alive never reaches the age of two. The enormity of this is evident if it is considered that, in Sweden in 1970, the risk was only 11 per 1,000.

In figure II, provisional estimates for Cuba have been included, obtained from data of the Encuesta Nacional de Ingresos y Egresos in 1974. The figures show not only that the national level is very low (29 per 1,000) but that differences on account of education are also much lower, with a range of 29-46 per 1,000.

The significance of the mortality differentials described here depends on the distribution of births by educational groups in each country. In order to obtain an epidemiological view of child mortality under two years of age in each country, strata according to the level of that mortality were defined using geographical variables (regions, urban/rural population) and the level of education of the woman. In each stratum the annual number of live births was estimated (on the basis of the average number of children declared in the census), as was the number of expected deaths in the first two years of life according to the death risk of the group. The results for the set of 12 countries are shown in table 9.

The study identifies a stratum of the population of those countries that has a relatively low mortality rate for the region (27-37 per 1,000). It is composed of the children of women who have at least a middle-school or high-school education and can thus be considered privileged in a region where the levels of education are generally low. Almost all of these women live in urban areas and 72 per cent of them live in the capital of the country (or its surrounding areas). From their level of education, it may be assumed that they belong to the middle and high social groups, which have wide geographical and economic access to the resources and services, including medical care, that are concentrated in the large cities. Because of the educational structure of the group, these women have a low fertility rate, so that they account for only 3 per cent of the total number of births in these countries. Subject as they are to a low mortality rate, the children of this group account for barely 1 per cent of the total number of deaths under

TABLE 9. POPULATION LEVELS ACCORDING TO THE RISK OF DEATH UNDER TWO YEARS OF AGE IN 12 LATIN AMERICAN COUNTRIES, ^a AROUND THE PERIOD 1968-1970

Mortality level	Probability of death (per 1,000 births)	Percentage of total included in the level			Characteristics of live births in the level					
		Women 15-49 years old	Births	Deaths under two years of age	Percentage by number of years of education of the mother			Population		Percentage in the country's capital
					Seven or more	Four to six	Zero to three	Urban areas	Rural areas	
TOTAL		100	100	100						
Low	Less than 40	5	3	1	100	—	—	98	2	72
Middle	40-79	28	20	10	36	49	15	91	9	47
Moderately high	80-119	26	27	22	7	45	48	51	49	15
High	120-159	19	22	24	—	7	93	41	59	10
Very high	160 and more	22	28	43	—	4	96	27	73	6

Source: H. Behm and D. Primante, *La Mortalidad en los Primeros Años de Vida en la América Latina*. Notas de Población, Revista Latinoamericana de Demografía, año VI, No. 16 (Latin American Demographic Centre, 1978).

^a Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay and Peru.

two years. The importance of this group lies in the fact that it shows that children born into privileged social groups in Latin America have a chance of survival similar to that of children in more developed countries.

Unfortunately, this situation is an exception to the rule. The core of the problem of early child mortality in Latin America is to be found in the levels with high and very high mortality rates. Twenty-two per cent of the women of fertile age are to be found in the group with a mortality rate of over 160 per 1,000. The factors that determine a high mortality rate are also indicative of greater fertility, so that this group accounts for 28 per cent of the total number of births; 43 per cent of the total number of deaths of infants under two years occur among these births. There are no women with higher education in this level and most are illiterate or semi-literate. Seventy-three per cent live in rural areas and 6 per cent in the capital city of the country. The latter group probably corresponds to the marginal sectors in the urban population.

If the high and very high mortality levels are added up, we have a group which covers 41 per cent of the women of fertile age. These women procreate half of the total births, which are subject to a mortality rate at least 10 times higher than that prevailing in Sweden. This group thus generates two thirds of all the deaths under two years of age in this set of countries. The group is mainly composed of inhabitants of Bolivia, Ecuador, El Salvador, Guatemala, Honduras and Nicaragua. It should be pointed out that the study does not include the two biggest countries in the region: Mexico and Brazil. As already mentioned, in the latter country there are marked mortality differentials based on family income.

Mortality and ethnic groups

In several countries of the region (Bolivia, Ecuador, Guatemala and Peru) there is still a large indigenous population. After having been deprived of their best land at the time of the conquest, they laboured for a long period under a servile system of production. Nowadays, pre-capitalistic forms of production still prevail among them, and if they have joined the market it is under generally precarious conditions, a situation that the agrarian reforms have not basically changed.

In the aforementioned study by Behm *et al.*, it was possible to identify these populations, directly or indirectly, on the basis of information derived from the census (see table 10).

In all of the countries involved, the mortality rate under two years of age in the non-indigenous population is already high. Even so, the supposedly indigenous population has an excess mortality rate which varies between 35 and 73 per cent, with a probability of death as high as 173-258 per 1,000 births.

Mortality and social class

As already mentioned, mortality differentials in terms of diverse socio-economic variables cannot be

explained in a consistent and systematic way. On the hypothesis that the health-disease-death phenomenon is over-determined by the place occupied by the individual in the social productive process, the most logical approach in any analysis should be to identify the pre-

TABLE 10. MORTALITY UNDER TWO YEARS OF AGE, BY ETHNIC GROUPS, SELECTED LATIN AMERICAN COUNTRIES, 1968-1972

Country	Total	Probability of death (per 1,000)		
		Indigenous population	Non-indigenous population	Excess mortality of the indigenous population (percentage)
Guatemala ^a	149	173	128	35.2
Bolivia ^b	202	258	149	73.2
Ecuador ^c	—	197	143	37.8

Source: H. Behm *et al.*, *Mortalidad en los Primeros Años de Vida en Países de la América Latina* (various countries), CELADE Series A, Nos. 1025, 1031 and 1037. (1977-1978).

^a Condition specified in the census as "indigenous" or "non-indigenous".

^b Indigenous population: one that speaks only native languages (Quechua, Aymará). Non-indigenous population: one that speaks only Spanish.

^c Indigenous population: *cantones* of the highlands with a predominantly indigenous population in the 1950 census. Non-indigenous population: *cantones* of the highlands where the indigenous population was a minority.

vailing means of production in a given society and the social classes to which they give rise. This type of analysis is rarely found, among other reasons because of the difficulty of identifying the relevant variables in the population. In this section, two approximations of this line of analysis are summarized.

Taucher²⁷ has analysed infant mortality in Chile, 1972-1973, comparing the children of blue-collar workers with those of white-collar workers. Hence, it is a comparison between workers, separating those who are engaged in the production of goods and in manual functions from the non-manual salary-earners employed mainly in service sectors, which correspond to the middle-class groups. Even so, the contrasts are very marked (see table 11).

The rate of infant mortality in the group of blue-collar workers is double that in the white-collar group, and this differential is larger for post-neonatal mortality (3.2 times). Within each occupational group, the highest level of education is associated with a lower mortality, but in the case of blue-collar workers, the step from primary education to a higher level is not accompanied by an important reduction of the rate, suggesting that the effect of the social class carries more weight. The mortality of children of illiterate "blue-collar" workers (109 per 1,000) is 4.6 times higher than that of better-educated employees (23.8 per 1,000). In Chile, births to illiterate mothers amount to only 7 per cent of the total

²⁷ Erica Taucher, *Mortalidad Infantil en Chile: Tendencias, Diferenciales y Causas* (Santiago, Chile. Latin American Demographic Centre, 1978).

TABLE 11. INFANT MORTALITY BY FATHER'S OCCUPATION AND MOTHER'S EDUCATION, CHILE, 1972-1973

Education	TOTAL	Rates per 1,000 births					
		Infant deaths		Neonatal deaths		Post-neonatal deaths	
		Children of white-collar workers	Children of blue-collar workers	Children of white-collar workers	Children of blue-collar workers	Children of white-collar workers	Children of blue-collar workers
None	29.8	66.9	16.8	25.6	12.9	41.2	
Primary	86.2	108.6	35.0	38.0	51.3	70.6	
High school and more	38.1	62.7	18.3	24.1	19.7	38.6	
	23.8	59.9	15.6	26.4	8.2	33.5	

Source: E. Taucher, *Mortalidad Infantil en Chile: Tendencias, Diferenciales y Causas*. (Santiago, Chile, Latin American Demographic Centre, 1978).

TABLE 12. POST-NEONATAL MORTALITY: CAUSES OF DEATH ACCORDING TO FATHER'S OCCUPATIONAL GROUP, CHILE, 1972-1973

Group of causes of death	Rates per 100,000 births		
	Children of white-collar workers (1)	Children of blue-collar workers (2)	Ratio of column (2) to column (1)
Reducible mortality	937	3 243	3.5
Infectious aetiology	385	1 233	3.2
Respiratory diseases	462	1 683	3.6
Malnutrition	41	227	5.6
Accidents	49	100	2.0
Non-avoidable mortality	120	124	1.0
Ill-defined causes	136	589	4.3
Other causes	71	128	1.8
TOTAL	1 263	4 083	3.2

Source: Erica Taucher, *Mortalidad Infantil en Chile: Tendencias, Diferenciales y Causas* (Santiago, Chile, Latin American Demographic Centre, 1978).

TABLE 13. PROBABILITY OF DEATH BETWEEN BIRTH AND TWO YEARS OF AGE, BY SOCIAL CLASS, COSTA RICA, 1968-1969

Social class	Probability of death (per 1,000 births)
TOTAL	80
Middle and upper bourgeoisie	20
Farm owners; proprietors in the industrial and commercial sector; executive and managerial employees; higher-status professionals	
Middle class	39
Salaried employees in clerical work; salesmen; primary and high-school teachers; other professionals and technicians	
Proletariat	80
Wage-earners: craftsmen, manufacturing workers, labourers, service workers	
Probable skilled workers (7 and more years of education)	46
Probable semi-skilled and unskilled workers	
With 4-6 years of education	73
With 0-3 years of education	102
Agricultural workers	99
Small farmers; agricultural wage-earners; semi-proletarianized small farmers	
With 4-6 years of education	80
With 0-3 years of education	112

Source: H. Behm et al., *Resultados Provisorios de una Investigación sobre Fecundidad mediante el Método de Hijos Propios en Costa Rica* (Santiago, Chile, Latin American Demographic Centre, 1978).

number of births, although they account for 13 per cent of infant deaths. The most significant group is made up of children of blue-collar workers with some education;

60 per cent of the births and 69 per cent of the deaths in the first year of life occur in this group.

Taucher also analyses the causes of death with respect to post-neonatal mortality in the two occupational groups presented in table 12. It is observed that the greatest mortality among children of blue-collar workers is related to a clear excess of those causes which are totally or partially avoidable with current medical knowledge. They comprise infectious diseases (especially diarrhoea), acute respiratory disease and malnutrition.

Behm et al.²⁸ have obtained estimates of the probability of death between birth and two years of age for Costa Rica in the biennium 1968-1969, using the census information on occupation and occupational category of the head of the family. This information does not permit an exact identification of social classes and their subdivisions but it has been used to obtain as close an approximation as possible. Thirty-seven per cent of the households had to be discarded because the head of the family did not belong to the economically active population, because he was looking for work for the first time, or because the information on occupation was incorrectly given; some of those working on their own account were also excluded, because they could not be classified. The results are shown in table 13.

The "middle and upper bourgeoisie" category is not made up exclusively of owners of the means of production, but it does include the most important of them. Mortality among their children is 20 per 1,000, which was the level in the United States of America in 1970. Mortality in the "middle class", on the other hand, is double that rate.

The proletariat, which is mainly urban, comes closest to being a social class. Its mortality rate (80 per 1,000) is again double that of the previous group. The level of education, which is probably an indication of their degree of skill as a labour-force, differentiates the various subgroups, which have a mortality varying between 46 and 102 per 1,000; the subgroup to which the latter rate applies thus approaches the higher mortality level of rural workers.

Agricultural workers have a substantially lower level of education in comparison with the urban proletariat

²⁸ H. Behm et al., *Resultados Provisorios Obtenidos de una Investigación sobre Fecundidad mediante el Método de Hijos Propios en Costa Rica* (Santiago, Chile, Latin American Demographic Centre, 1978).

(22 per cent are illiterate and 38 per cent have only from one to three years of education). It has not been possible to identify the social categories that have the most significance for the analysis (small-farm proprietors, proletariat, marginal populations etc.). This group has the highest mortality rate in the country (99 per 1,000), increasing to 112 per 1,000 for those who are illiterate or semi-literate, a rate that is 5.6 higher than that of the middle and upper bourgeoisie.

The limitations of this system of classification of social classes notwithstanding, the results are significant. Costa Rica is a country with a relatively low mortality for the region, and it has shown big declines in recent decades. A large part of the population is covered by the benefits of social policies, especially in health and education. Even so, sharp contrasts are noticed in mortality in the first years of life, which are the most sensitive to living conditions. The working class has a mortality four to five times higher than that of the privileged group. The latter approaches the existing levels of mortality of the advanced world. The middle class has benefited more than manual workers. The proletariat has a lower mortality than the rural working class; they are favoured because they are predominantly residents of urban areas, where capitalist development is more advanced and where the working class for the most part has a more powerful labour organization than it does in the rural sector.

GENERAL COMMENTS

A comprehensive analysis of the socio-economic determinants of mortality in Latin America has several limitations. On the one hand, the countries of the region show marked differences in the historical stage of development of their socio-economic structures. On the other hand, mortality is very heterogeneous in the different countries and in different populations within each country. Lastly, a review of the information available reveals that it is neither systematic nor complete, particularly in the more important categories of analysis. Some important conclusions may nevertheless be reached.

Whatever index is used, the differentials that are detected show that, around 1970, marked socio-economic contrasts in mortality prevailed, so that the groups with a higher risk have rates that are from four to five times larger than those of less exposed groups. Differentials of this type have been described frequently, even in more advanced countries. The important fact is that in Latin America these differentials are much greater than those present in the industrial countries, and are closer to the differentials found in such countries in the past (Nizard and Vallin,²⁹ Antonovski³⁰). On the other hand, as these marked con-

²⁹ Alfred Nizard and Jacques Vallin, "Influence du développement sur la mortalité différentielle"; in International Union for the Scientific Study of Population, *International Population Conference, Mexico, 1977* (Liège, 1977), vol. I, p. 441.

³⁰ Aaron Antonovsky, "Social class, life expectancy and overall mortality", *Milbank Memorial Fund Quarterly*, vol. XLV, No. 2 (April 1967).

trasts exist in countries where a high mortality rate prevails, the more exposed groups are subject to very high levels of risk. This means that in the twentieth century, which has seen spectacular progress in the development of techniques to reduce mortality, these populations are living under conditions similar to those that prevailed in Europe almost a century ago. What is worse, these populations are not minorities: in many countries they include a considerable proportion of the total population.

This situation has marked influence on the determination of current levels of mortality in the region and future perspectives. In order to reduce the gap in mortality between Latin America and the more advanced world, these socio-economic contrasts of mortality must be reduced sharply and a substantial decline in mortality must be achieved in extensive sectors of the population exposed to greater risks.

Although, in the studies just analysed, the social class variable appears to be only exceptionally specified, everything seems to indicate that mortality is closely related to it. The groups with the greater risk of death are composed of the working classes, because of the unfavourable conditions in which they live. This situation has its origins in the social relations system of production prevailing in the area, which in some social sectors fosters a concentration and accumulation of the means of production, technical progress and value generated by the work, to the detriment of the working classes.

Nevertheless, there is no doubt that the development of the capitalist system in Latin America is related to the decline in mortality. This development is more advanced in the urban sector, where the mortality also tends to be lower. This process can have several explanations. The system needs to create an internal market and the reproduction of the labour-force is also vital. In this way, the development of the productive system and its modernization expand the supply and consumption of goods. At the same time, salary and social policies (social security, health and education) produce a relative improvement in the living conditions of the workers. On the other hand, workers' organisations enable workers to increase their participation in the wealth they produce.

In the rural sector, mortality is, in general, higher. As explained in the ECLA-FAO report,³¹ the agricultural capitalist development is associated with the concentration of productive means (especially land and technical modernization), to the detriment of small proprietors, thus ensuring their progressive proletarianization. On the other hand, the concentration of financial and technical means in the agro-exportation sector (which is important in the economic development of some countries) subtracts resources from the sector producing basic food for internal consumption, largely the middle and small farmers. This leads to a decrease

³¹ *El Desarrollo Social en las Areas Rurales de América Latina. Notas Sobre la Economía y al Desarrollo de América Latina*, No. 276 (Santiago, Chile, Economic Commission for Latin America, 1978).

in the domestic food supply and an increase in the need for imports and is another obstacle to the elimination of malnutrition in the rural population, which affects its mortality.

In the context of this complex and dynamic process, mortality in Latin America has shown a considerable but variable decline in the last decades. That this advance is still insufficient is shown by the levels and differentials of mortality already mentioned. There are other grounds for worry in this situation. The Pan American Health Organization³² evaluated the achievement of regional goals set up in order to reduce child mortality under 5 years of age for the decade 1961-1971. This achievement was found satisfactory for the 1-4-year age group, but only 21 per cent of the objective for infant mortality was reached in Middle America and only 36 per cent in South America. Montoya³³ projected the trends of infant mortality observed in Latin American countries in 1950-1971. He found that, in order to achieve a decline of 50 per cent, more than 25 years were needed in six countries and between 11 and 25 years in the other 11 countries. Accinelli and Muller³⁴ point out that the historical increase of life expectancy in Argentina stopped between 1960-1970, when life expectancy reached 66 years. An increase in the rate of infant mortality in important cities of Brazil for the same decade has already been mentioned.

Gwatkin³⁵ has analysed the historical course of the average annual increases of life expectancy at birth in the advanced world and in different regions of the third world, in relation to the level of life expectancy in various periods. When life expectancy is approximately 51-52 years, he finds that Latin America has increases of 0.60 years, greater than those observed in East and South Europe (0.54 years) and in West Europe (0.38 years). Yet while life expectancy rises in Latin America, the increase tends to decline (0.36 years when $e_0 = 57.7$), while in Europe it tends to increase, reaching 0.71 years when $e_0 = 62.4$ years in South-East Europe. In more advanced regions, the trend towards a lower rate of increase only occurs when an expectancy of 70 years is reached: Gwatkin infers that "mortality, particularly infant and child mortality, in large areas of the third world is now tending toward an increasingly slow rate of decline, very possibly, if not probably, en route toward stabilization at levels significantly higher than those now prevailing in the West". He also points out that the marked declines in mortality that have been observed in some countries seem to be the exception rather than the rule in the developing world.

³² Pan-American Health Organization, *Facts on Health Progress, 1971*, Scientific Publication No. 227 (Washington, D.C., 1971).

³³ C. Montoya, *Levels and Trends of Infant Mortality in the Americas*, World Health Statistics Report, vol. 27, No. 12 (Geneva, World Health Organization, 1974).

³⁴ Mario Accinelli et al., *Un Hecho Inquietante: la Evolución Reciente de la Mortalidad en la Argentina* (CENEP, 1977).

³⁵ D. Gwatkin, *The End of an Era: a Review of the Literature and Data concerning Third World Mortality Trends* (Overseas Development Council, 1978).

When comparing the third world countries with the advanced, industrial countries, the differences in the respective historical contexts should be pointed out. The advanced capitalist countries have achieved a spectacular decline in mortality, among other reasons because they have been able to make full use of their extraordinary technical progress in the prevention and treatment of diseases in the twentieth century. The rise in the level of living in those countries has been favoured because they dominated large colonial empires and, at present, they are the source of powerful central economies. In Latin America, on the contrary, the capitalist process is found in some countries at a stage in which the process of accumulation is developing with extreme hardness. Besides, they are dependent of central economics and have to share their process of accumulation with them. An ECLA report has underlined the role of the transnational corporations in this respect.³⁶

What contribution can health care make to the reduction of mortality in such conditions? The present paper will limit itself to a brief global picture. Since the second half of the 1940s, new and powerful means have become available for preventing and treating a number of diseases, especially infectious ones, and their advent opens up important possibilities for controlling mortality.

The decline observed in mortality in the third world since 1950 led to the general idea that mortality had freed itself of its socio-economic determinants and that the gap between developing and developed countries could be reduced substantially, although development would not progress as much in those areas. The subsequent course of events has not confirmed these optimistic predictions, although progress has unquestionably been made.

The reasons for this evolution may be found, in the first place, in the limitations upon the effectiveness of health techniques imposed by the persistence of unfavourable conditions affecting the health of man in his physical and social environment, such as the ones described earlier for Latin America. In addition, the effectiveness of the techniques for preventing and treating disease depends on the extent to which they can actually be applied and on their coverage of the population. The health sector in the Latin American countries cannot be immune from the restrictions imposed by the system as a whole. Consequently, in spite of the undoubted progress that has been made, the health systems of the region are concentrated on the larger urban sectors, hospital medicine receives priority and benefits are distributed unequally among social classes. In this way, populations that are more exposed to the risks of falling sick and dying receive tardy and deficient

³⁶ According to ECLA, the net balance for Europe and North America of its manufacturing trade with developing countries amounted to 100 billion dollars in 1976, equivalent to a net creation of 10 million jobs in the industrial economies (*Los Desafíos de América Latina en el Umbral de los Años 80*, Notas sobre la Economía y el Desarrollo de América Latina, No. 295 (Santiago, Chile, Economic Commission for Latin America, 1979)).

care, if any. The Ministers of Public Health of the Americas, at their Third Special Meeting, held at Santiago, Chile, from 2 to 9 October 1972, indicated that the problem consisted in providing services to the 37 per cent of the inhabitants who did not receive care of any kind and the great majority of whom lived in a rural environment or in marginal dwellings of the big cities. Without a substantial change in the traditional structures, it would not be possible to make real the coverage which implied the right to health. On the other hand, as Hansluwka has pointed out, once relative declines have been obtained from a high mortality by means of relatively low-cost health programmes, the maintenance of progress requires not only a more complex infrastructure, but also parallel improvements in the economic and social sectors. "If the underlying socio-economic environment reasserts itself, the rate of further reductions may diminish or cede to stagnation."³⁷

In sum, an analysis of the socio-economic determinants of mortality in Latin America shows that, in order

³⁷ Harald Hansluwka, "Health, population and socio-economic development", in International Union for the Scientific Study of Population, *Population Growth and Economic Development in the Third World* (Liège, 1977).

to improve the current situation, on the one hand, extensive and efficient use is required of the technology at present available, surpassing the barriers which today limit and discriminate against its use. But it shows as well that the modification of the present social and economic structures is a decisive step, since they are the root causes of the high mortality prevailing in large sectors of the Latin American population and of their unsatisfactory progress.

It is pertinent to recall here a quotation by Antonovsky.³⁸ When the *Titanic* was sunk, in 1912, 3 per cent of the female passengers in first class were lost, 16 per cent in second class and 45 per cent in third class. In an imaginary ship representing Latin America, there are 345 million passengers, subjected to differential risks, by social class, just as cruel as, or even more cruel than, those of the *Titanic*. Annually, almost a million bodies of children less than five years old are thrown overboard; they come mostly from the "third class" and, above all, they should not have died. Our responsibility is to show to those at the political levels of decision-making, and to the people themselves, with scientific objectivity, the magnitude of this monstrous genocide and the deep causes which lie behind it.

³⁸ Antonovsky, op. cit.

SOME ASPECTS OF SOCIO-ECONOMIC DETERMINANTS OF MORTALITY IN TROPICAL AFRICA*

S. K. Gaisie**

SUMMARY

Mortality is one of the major determinants of population growth and the modern drive to decrease the death rate is being blamed for the rapid expansion of population in tropical Africa. Yet measurements of mortality levels and trends are still inadequate in that region of the world, largely owing to the lack of reliable and adequate information on deaths. A series of estimates depicting mortality levels and trends has been prepared by demographers, using different kinds of data and employing different estimation procedures; nevertheless, knowledge about the "true" structure of mortality in tropical Africa is virtually non-existent. It is also important to point out that a very limited number of concrete studies have been conducted in respect of determinants of mortality in tropical Africa. Thus, one can scarcely do justice under these conditions to such a wide topic, covering the entire area of tropical Africa. In view of these difficulties, what is presented in the present article is a bird's eye view of the prevailing situation in tropical Africa, most of the discussion being based on secondary and fragmentary data. The article discusses mortality by sex and age, by residence and by cause. It also discusses socio-economic and cultural determinants of mortality.

INTRODUCTION

A lack of reliable and adequate information on deaths in most of Africa makes it extremely difficult to measure the state of health with some amount of certainty. A number of estimates depicting mortality levels and trends have, however, been prepared by national and international organizations and individual demographers, using different kinds of data and employing different estimation procedures. Although these mortality estimates tend to be too low rather than too high, they provide a relatively reasonable picture of the levels and magnitude of mortality. Nevertheless, the "true" levels and the magnitude of mortality decline may not be known in many parts of Africa for some time to come. Figures compiled by the World Health Organization (WHO) indicate that Western and Middle Africa exhibit the highest mortality levels; crude death rates range from more than 20 to more than 30 per 1,000. The estimates of crude death rates for the countries of Eastern Africa range between 18 and 20 per 1,000, the Southern African regions experiencing relatively moderate rates ranging from 14 to 17.¹ These

figures relate to the 1950s and early 1960s and the estimates prepared by the Population Division of the United Nations Secretariat for the early 1970s indicate that there has been some decline in the level of mortality in the African region during the past two decades. The estimated crude death rates for 1974 range from 13 to 14, 18 to 22, 21 to 24 and 23 to 26 for the Southern, Eastern, Western and Middle African regions respectively. The projected figures indicate that none of these regions would be experiencing crude death rates of more than 14 between 1995 and 2000 and the Southern African rates would decline to less than 10 during the same period. A sustained improvement in the mortality conditions in Africa is reflected in an approximate increase in the expectation of life at birth ranging from 30 years and a little over 40 years in the 1950s and early 1960s, to 45 years for the period between 1970 and 1975. The figures for Southern, Eastern, Western and Middle Africa during the latter period are 51, 44, 41, and 42 years respectively. Expectation of life at birth during the last five years of this century has been estimated to range from between 53 years in Western Africa to 62 years in Southern Africa. While the evidence is presumably good, enough to show convincingly that a decline in mortality has been under way in the majority of the African countries, it is not possible to be precise about the magnitude of change. The pace of decline is, however, presumed to have slowed down in the 1960s, when the improvement in living standards fell short of expectations. Also, in the opinion of many experts, less developed countries cannot for long continue to make

* This paper was presented to the United Nations/World Health Organization Meeting on Socio-Economic Determinants and Consequences of Mortality, held at Mexico City from 19 to 25 June 1979.

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¹ World Health Organization, "Recent levels, characteristics and trends of mortality in Africa" (E/CN.14/POP.39), presented to the African Population Conference held at Accra from 9 to 18 December 1971.

progress in reducing mortality through the intensification and extension of health technology unless great advances are made in other spheres of modernization and economic development. Thus, future trends of mortality in less developed countries may depend more than in the recent past on economic and social developments.

MORTALITY BY SEX AND AGE

The information that is available on male and female mortality indicates that the death rates for males are higher than they are for females. Whereas this phenomenon may also be observed in other parts of the world, the reasons for its existence are quite different in tropical Africa, where the difference between male and female mortality rates stems essentially from excess infant and early childhood mortality in males. It appears that, in some African countries, female mortality in the age group 15-49 years tends to be higher than male mortality, largely as a result of the considerable number of maternal deaths due to complications in pregnancy, delivery and puerperium. It is likely, however, that the effect of maternal mortality on the overall mortality index (e^0) has been more than offset by high male infant and child mortality rates, and a rapid and sustained decline in infant and child death rates will possibly reverse the present situation unless adequate measures are taken to combat high maternal mortality, especially in the rural areas.² In Ghana, for example, an analysis of the effects of mortality within a particular age group on the difference between the sexes in expectation of life at birth indicates that nearly 50 per cent of the difference is due to the relatively low rate of female infant and child mortality. The 45-65-year age group accounts for 28 per cent of the difference, whilst the 18 per cent contribution by the 15-45-year age group as compared with that of the former age group is suggestive of the existence of relatively high maternal mortality. A slightly different pattern is revealed by the differences in expectation of life among urban and rural residents of the same sex: among rural females, the 15-45 age group contributes more to the difference (27 per cent) than the 45-65-year age group, and the proportion attributable to the 5-15-year age group is nearly two thirds that of the child-bearing age group.² Zambian mortality statistics indicate a "higher proportion of female deaths through pregnancy and childbirth and higher proportion of male deaths due to violence".³ Similar observations have been made in other African countries, including the Sudan,⁴ and Uganda.⁵

² S. K. Gaisie, *Estimating Ghanaian Fertility, Mortality and Age Structure*, University of Ghana Population Studies, No. 5 (Legon, University of Ghana, 1976), p. 135.

³ K. A. Banda, "Levels, patterns and differentials of mortality in Zambia", Master of Arts thesis in population studies, University of Ghana, 1977.

⁴ M. K. Rizgalla, "Mortality levels, patterns and differentials in the Sudan", Master of Arts thesis in population studies, University of Ghana, 1977.

⁵ J. B. Musoke, "Indirect methods of estimating mortality in African conditions, with emphasis on life tables", Master of Arts thesis in population studies, University of Ghana, 1975.

It has been estimated that in much of tropical Africa, except for one or two small islands, at least 120 out of every 1,000 children born alive die within the first year of life. Estimates for Western and Central Africa range from 150 to 350 infant deaths per 1,000 live births. In Eastern Africa, a level of 150 per 1,000 is most common.⁶ It is important to note that, in general, infant mortality rates are underestimated and that the "true" rates may be higher than the estimates presented above. Nevertheless, it has been estimated that infant mortality in tropical Africa in the early 1970s must have been in the neighbourhood of 200 per 1,000 live births.⁶ Information on infant deaths compiled by the United Nations shows that the death rate is higher among older infants aged 28-364 days than among younger ones (1-6 days old); this is a pointer to environmental hazards and the diseases that accompany them.

Early childhood mortality (1-4 years) in tropical Africa is relatively high compared with the other age groups, including infants. Data from surveys in both English-speaking and French-speaking areas now lead one to believe that tropical Africa has long been marked by an enormously high mortality rate among toddlers. Deaths in the age group 1-4 years in much of rural Africa, and perhaps all of tropical Africa in the past, equal or exceed those under 1 year of age. Estimates for Ghana, for example, show that the mortality pattern in that country is characterized by high child mortality in relation to infant mortality, a feature that has also been observed in a number of other developing countries. The extent of excessive child mortality has been demonstrated in some tropical African countries.⁷ The incidence of relatively high child mortality and the strong influence exercised on it by the environment have cast some doubt on the efficacy of infant mortality as an index of the health standards of a community, since in most tropical African countries deaths in the first years of life are not heavily confined to the first year of life. An examination of child death rates by single years has shown that a high proportion of the deaths occur in the second year of life and that deaths belonging to this age group account for the bulk of the deaths within the age group 1-4 years. The observed proportions of deaths at age 1 among all deaths within the latter age group range from between 34 and 43 per cent in Ghana (1968-1969) to 53 per cent in Senegal (1962-1968).⁸ In fact, child deaths could at times exceed infant deaths: the findings of some studies indicate that the ratio of deaths within the 1-4-year age group to deaths at under 1 year could range from 1.05 in Ghana and 1.06 in Togo to 1.17 in Senegal. A second-year death rate of between 25 and 48 per 1,000 children is regarded as high and all the tropical African countries that have been studied, except Mauritius, fall into this range. Early childhood death rates of the order of 45.0, 44.9, 33.3, 27.4 and 39.3 have been reported for Benin, Togo, Madagascar, the Central African Republic and the United Republic of Came-

⁶ World Health Organization, *World Health Statistics Report*, vol. 29, No. 11 (1976).

⁷ S. K. Gaisie, *op. cit.*, pp. 109 ff.

⁸ *Ibid.*, pp. 121-122.

room during the early part of the 1960s.⁹ Death rates as high as those cited above have been estimated for Ghana, Ethiopia, Zambia, the Sudan, Sierra Leone and Kenya.¹⁰

MORTALITY BY RESIDENCE

Mortality differentials have also been noted among geographical and administrative units and subdivisions of populations within the various countries of tropical Africa. In Ghana, for instance, estimated expectation of life at birth reflects interregional differences, as revealed by the crude death rates and infant and child mortality rates, the northern and upper regions experiencing the highest mortality rates, while the western, central and Brong-Ahafo regions on the one hand, and the eastern, Volta and Ashanti regions on the other, exhibit progressively lower mortality rates. The Accra Capital District has the lowest mortality rate in the country.¹¹ In Zambia, the north-eastern and south-western regions, which are relatively less developed, exhibit higher mortality levels than the central and copperbelt regions.¹² In Sierra Leone, the level of mortality (measured by the proportion surviving to age 2) is lower in Greater Freetown than in the western area.¹³ The Kisumu, South Nyanza and Busia districts in western Kenya and the northern part of the Sudan are examples of higher mortality areas compared with other parts of Kenya and the Sudan.

In Ethiopia, mortality is relatively lower in most of the central and northern provinces than in provinces in the south and south-east.¹⁴ The rates for urban child mortality, measured by the probability of dying between age 0 and age 2 (2q_0), range from 0.125 in the province of Illubabor and 0.148 in the province of Shewa to 0.269 in the province of Welo; rural peoples in Gwejam, Illubabor, Shewa and Welega provinces enjoy the lowest mortality rates compared with rural Arusi, Gemu-Gwefa, Kefa and Welo.¹⁵

The mortality differentials have also been examined in relation to urban and rural populations. All the mortality statistics compiled by international organizations and agencies, national institutions and individual researchers show quite clearly that urban dwellers enjoy a higher expectation of life at birth than do their rural counterparts. The majority of the cities in tropical Africa have infant mortality rates of the order of 100 per 1,000

live births, whereas in rural areas the rate often exceeds 200 per 1,000 live births.¹⁶ In Ethiopia, child mortality, measured by 2q_0 , is higher in the rural areas than in the urban areas, although the difference is not as large as that observed among the Ghanaian population.¹⁷ The expectation of life at birth in urban areas of Ghana exceeds that in the rural communities by between 12 and 13 years and demographic data indicate substantial urban-rural differentials within the various regions. The rural infant and child mortality rates are generally higher than those in the cities and large towns; the overall difference in infant mortality is in the order of 34 per cent.¹⁸ In Sierra Leone, Tesfay observed that the "level of mortality is different for the two parts of the western area. Considering I_2 , it stands out clearly that mortality in Greater Freetown is less severe than in the western area." In fact, in Greater Freetown, on the average, about 6 per cent more males and 12 per cent more females, than in the western area live to celebrate their second birthday. "This implies that, as far as early childhood mortality is concerned, mortality in the western area is about 9 per cent higher than in Greater Freetown for the five to six years preceding the survey."¹⁹ In Kenya, according to Muganzi (1977), the urban dwellers' expectation of life at birth is, on the average, seven years longer than that of their rural counterparts. The Sudanese figures indicate that the rural mortality rates are 12 per cent higher than those for the urban areas,²⁰ the urban dwellers' life-span being four years longer than that of people living in rural areas.²¹ There are, however, big differences between urban areas in the Blue Nile and Baur Elghazal provinces, estimated child mortality rates (that is, q_2) being 140 and 253 respectively. Rizgalla also observed a negative relationship between the mortality rate and the size of the town concerned. The differences between the lowest and the highest levels of mortality among the different groups of towns were found to be quite substantial, the probability of dying before 2 years of age ranging from 0.152 in towns with 100,000 inhabitants to 0.200 in towns with 5,000 inhabitants. The residents of large towns (that is, towns with 100,000 or more inhabitants) would live, on the average, between five and seven years longer than their counterparts in the other towns.²² The findings of mortality studies undertaken in many parts of tropical Africa portray higher death rates in the rural areas than in the urban areas, the large metropolitan cities and/or capital cities exhibiting the lowest mortality levels.

Mortality differentials by socio-economic variables have also been noted among certain subpopulations. Gebretu observed that "education has a depressing

⁹ *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1).

¹⁰ See, *inter alia*, Gaisie, *op. cit.*, p. 122; Biadlegn Gebretu, "Mortality levels and differentials in Ethiopia", Master of Arts thesis in population studies, University of Ghana, 1977; Banda, *op. cit.*; Teklu Tesfay, "Some aspects of mortality indices in Sierra Leone, with special reference to the western area", Master of Arts thesis in population studies, University of Ghana, 1976; Rizgalla, *op. cit.*; and Z. S. Muganzi, "Some aspects of mortality levels and differentials in Kenya", Master of Arts thesis in population studies, University of Ghana, 1977.

¹¹ Gaisie, *op. cit.*, p. 134.

¹² Banda, *op. cit.*, p. 149.

¹³ Tesfay, *op. cit.*, p. 233.

¹⁴ Gebretu, *op. cit.*, p. 149.

¹⁵ *Ibid.*, pp. 148-149.

¹⁶ World Health Organization, *World Health Statistics Report*, vol. 29, No. 11 (1976).

¹⁷ Gebretu, *op. cit.*, p. 142.

¹⁸ Gaisie, *op. cit.*, pp. 114-134.

¹⁹ Tesfay, *op. cit.*, pp. 233 ff..

²⁰ Rizgalla, *op. cit.*, pp. 235.

²¹ *Ibid.*, p. 237.

²² *Ibid.*, pp. 242-244.

effect on mortality in Ethiopia": child mortality measured by 2q0 ranges from 0.012 to 0.179 among children born to women with secondary education and those with no formal schooling, respectively.²³ The children born to "own-account" workers and unpaid family workers were also found to be experiencing higher mortality rates than the children of home-makers and government employees. The probability of death from birth to age 2 ranges from 0.039 among white-collar workers to 0.135 among agricultural workers and 0.247 among blue-collar workers.²⁴ In Sierra Leone, early childhood mortality was found to be negatively related to the educational attainment of the mother. The proportion of male survivors from birth to age 2 ranges from 0.874 to 0.769 among children whose mothers were post-primary graduates and illiterates, respectively; the corresponding figures for females are 0.885 and 0.797. A cross-classification by ethnicity indicates that mortality is lower among the Creoles than among other groups, such as the Temne and Mende.²⁵ Similar observations regarding mortality differentials by education and occupation have been made in respect of the Sudan²⁶ and Zambia.²⁷ It is important to bear in mind the fact that virtually all the socio-economic groups with relatively low mortality rates are resident in areas where medical and health facilities are concentrated.

CAUSES OF DEATH

Hospital statistics and data obtained from epidemiological publications indicate that communicable diseases are the main killers in tropical Africa. Data compiled by the World Health Organization (WHO) Regional Office for Africa in 1973 show that the most common causes of death in 25 African countries are acute respiratory infection and pneumonia, malaria, diarrhoeal diseases and gastro-enteritis, measles and bronchitis. Yellow fever, typhus, smallpox, tetanus and tuberculosis periodically cause high mortality. Diseases of the respiratory system (that is, tuberculosis, pneumonia and bronchitis) are found in all age groups of the population, the infants and children dying mostly from enteritis, tetanus, congenital malformations and malaria. It has also been observed that synergistic combinations of infectious diseases and malnutrition are a major cause of a large proportion of child deaths in tropical Africa. Measles is also a leading cause of death, especially when it is complicated by such diseases as pneumonia, whilst malaria is noted to be the biggest killer on the African continent. Heart diseases, malignant neoplasms, maternal mortality and trypanosomiasis cause a sizeable number of deaths in the older age groups. In most areas of Africa, schistosomiasis (bilharziasis), hookworm and trachoma are still frequent causes of death in the nomadic areas.

The impact of the various diseases on mortality is

²³ Gebretu, *op. cit.*, p. 161.

²⁴ *Ibid.*, pp. 170-173.

²⁵ Tesfay, *op. cit.*, pp. 241-242.

²⁶ Rizgalla, *op. cit.*, pp. 246-273.

²⁷ Banda, *op. cit.* pp. 196-199.

illustrated with figures from three selected countries (Ghana, Uganda and Zambia).

The Ghanaian figures show that infectious and parasitic diseases and systemic disorders accounted for 66.8 per cent and 61.4 per cent of the certified deaths in 1967 and 1969 respectively. In both years, the third group of major killers consisted of prenatal disorders and pregnancy complications, followed by nutritional and metabolic disorders, claiming 13.2 per cent and 6.4 per cent of the deaths, respectively, in 1967²⁸ and 8.0 per cent and 10.2 per cent in 1969.²⁹ Among the infectious and parasitic diseases, the major killers are enteric fever and shigella (25 per cent) followed by malaria (23 per cent) and infective hepatitis pertussis. Bronchopneumonia, bronchitis and gastro-enteritis are the most deadly of the systemic diseases. It has been noted that "70 per cent of deaths occurring to children aged under 5 years are due to infectious and parasitic diseases, which are usually aggravated by malnutrition" and that although these children "make up 20 per cent of the Ghanaian population, they contribute at least 50 per cent of all recorded deaths".³⁰ The Ghanaian Ministry of Health has also observed that, apart from communicable diseases, "deaths due to prematurity and diseases of the newly born are also common. The major causes of death among women of the fertile span (15-45 years) are related to the complications of pregnancy and childbirth."³⁰

Virtually the same patterns are prevalent in Uganda, where nearly 47 per cent and 14.9 per cent of the certified deaths in the government hospitals were caused by respiratory, infectious and parasitic diseases and systemic disorders, respectively, during the period 1969-1970. The 1968/69 statistical records of the Ugandan Medical Services reveal the same pattern, the corresponding figures being 46.7 per cent and 14.8 per cent.

About 40 per cent of the certified deaths in Zambian medical institutions during the period 1973-1975 were caused by respiratory, parasitic and infectious diseases, while disorders due to pregnancy and childbirth, including congenital malformation, claimed 18 per cent of the deaths. Nutritional and other deficiencies were responsible for nearly 13 per cent of the deaths, and 10 per cent were attributed to intestinal and related diseases of the digestive system and the genito-urinary system.³¹

Data compiled by the United Nations also indicate that infectious and parasitic diseases, including bronchitis and pneumonia, are the major killers in Nigeria, Equatorial Guinea, Angola, Mozambique and Kenya and in virtually all the tropical African

²⁸ Gaisie, *op. cit.*, pp. 140-141.

²⁹ D. Benjamin Asare, "A seminar paper on some aspects of morbidity and mortality in some Ghanaian health institutions", issued by the United Nations Regional Institute for Population Studies at the University of Ghana (1975).

³⁰ *Annual Report of MCH and FP Activities for 1977* (Accra, Ministry of Health, 1977), p. 367.

³¹ Banda, *op. cit.*, p. 140.

countries.³² The causes-of-death patterns outlined above are, in general, characteristic of the populations of developing countries and it is important to bear in mind the fact that large numbers of people in tropical Africa die from preventable and curable diseases, often associated with environmental factors, including malnutrition. The following section of this article is therefore devoted to an examination of certain aspects of the determinants of mortality in the region.

SOCIO-ECONOMIC DETERMINANTS OF MORTALITY

The colonial legacy

The majority, if not all, of the tropical African countries are still maintaining the socio-economic and medico-institutional structures that were handed over to them by the former colonial régimes. Unfortunately, only a few of them have taken bold measures to eliminate the acute social injustices inherent in these structures. The introduction of modern medical services came with the penetration of the continent by Europeans, who established hospitals to cater for the needs of their own establishments. The colonial administration developed qualitatively different health-care systems, mainly benefiting the urban population, which was served by hospitals run by the central Government. Health services were virtually non-existent in large parts of the rural areas, whose population had to rely on traditional medicine and, in relatively small areas, on dispensary services provided by local government. A large proportion of the financial and human resources were also allocated to the urban-based hospitals and there was an unequal distribution of health services among the various administrative regions or provinces. A region's or province's share of the health services depended on its position within the country's economic structure. Thus, in many countries in tropical Africa almost all the hospitals were built in urban areas or at the headquarters of the local administration. It must be noted that it was the colonial expatriate élite who benefited most and this exclusive medical privilege was gradually extended to the indigenous people who were absorbed into the colonial administration, including the intellectual élite, and the army and police officers.³³ The rural population and the illiterate masses therefore had to depend on the traditional health-care system for their survival, a system which continues to play a vital role in the entire health-care system throughout tropical Africa.

One would have thought that, with a change in the political climate, the African Governments would evolve a comprehensive health-care system in order to redress the unfortunate situation or, at least, to extend the same medical privilege to the 70 per cent or more of

the people who reside in the rural areas. Instead, the ruling élite have improved the existing services and manipulated the opportunity structures to benefit mostly themselves and their families. In Ghana for example, only 189 doctors out of a total of 939 in 1975 were operating in localities with less than 20,000 inhabitants, compared with 525 servicing the nation's capital. The impact of scientific medicine is rarely felt by the rural population. Government and private hospitals are concentrated in the urban areas, whilst none of the health centres is permanently staffed by physicians and professional services are provided on a visiting basis, particularly in the rural areas. The health centres are mainly staffed by paramedical and/or auxiliaries.³⁴ Thus, although the number of rural health centres increased from 38 in 1969 to 48 in 1975, hardly any more medical specialist services became available to the rural population. Twumasi has noted that scientific medicine, in a relatively developing economy, has become a rare commodity, difficult for the poor person to purchase, particularly in terms of time and transportation.³⁵ The uneven distribution of health and medical facilities appears to be virtually the same in almost all the tropical African countries and it is important to note that in many instances the majority of the rural populations have no access to scientific medicine.

The impact of the environment and socio-economic conditions

The conditions prevailing in the tropics are known to be more difficult for man to bear. In West Africa, for instance, there is a north-south cross-section, which passes from the dryness of the Sahara to the saturating humidity of the dense forest, with the exception of the more favourable climates of the coastal strips and the plateau, such as Fouta Djallon and Adamawa. The Eastern African countries enjoy more favourable climatic conditions than those of Western and Central Africa. On the whole, however, the physical environment provides an abode for infectious diseases and their vectors. Besides infections commonly found in Europe, there are others, like malaria, trypanosomiasis and yellow fever. Industrial man has invested ways and means of controlling the natural environment in the process of satisfying his insatiable needs. He can now control the direction and volume of rivers to generate energy and to irrigate farmlands, level hills and valleys to construct highways and build cities and airports and extract ores from the earth to make tools and weapons. Tropical Africa has yet to develop and/or use modern technology to control the harsh environment which encourages infectious diseases and their vectors.

Urbanization and internal migration

Population growth is one of the fundamental causes

³² *Demographic Yearbook, 1975* (United Nations publication, Sales No. E/F.76.XIII.1).

³³ Francis Olu Okediji, "Socioeconomic status and attitudes to public health problems in the Western State: a case study of Ibadan", in John C. Caldwell, ed., *Population Growth and Socioeconomic Change in West Africa*, published for the Population Council (New York, 1975).

³⁴ P. A. Twumasi, *Medical Systems in Ghana: A Study in Medical Sociology* (Accra-Tema, Ghana Publishing Corporation, 1975), p. 86.

³⁵ *Ibid.*, p. 89.

of a high concentration of humans in cities and large towns.

Urban growth in less developed countries is determined by natural increases and immigration from rural areas. Rural-urban migration is accelerated not only by rapid population growth but also by agricultural stagnation of urban centres, that is to say, cities and towns, and the heavy population pressure on urban infrastructure, for example, housing, water supply, waste disposal, transportation etc., have a considerable impact on the environment. Inadequate water supply and/or waste disposal systems, congestion and a relatively low average urban income have, in most cases, given rise to infectious diseases and a worsening of the hygienic environment, while diseases have multiplied in certain depressed areas (slums and squatter settlements). High dependency ratios and relatively low employment opportunities have greatly impeded the raising of living standards in urban areas and have considerably slowed down the institution of measures for ameliorating the environment. A Nigerian author, writing in 1968, has described the conditions of Lagos as follows:

"By 1963, Lagos had burst through the confines of its municipal boundaries and like rapidly industrializing cities everywhere in the world was engulfing neighbouring small communities in a dramatic metropolitan explosion. . . Their combined population has increased from about 60,000 in 1952 to nearly half a million in 1963 [bringing] the total population of the continuous built-up area to well over a million. . . District Councils formerly concerned with overseeing the need of predominantly rural communities became suddenly faced with an entirely different problem of a restless urban group. Within a short time, the tolerable rural conditions are changed to the menacing squalor of an urban slum. . . access to many houses is by narrow footpaths which also serve as drains for household water. . . less than 35 per cent (of houses) have piped water and less than 70 per cent have electricity. In 40 per cent pit latrines are in use. . . There are no regulations as to density of houses, design and quality or even a minimum level of convenience in the houses, all of this makes the slum really squalid and unhealthy".³⁶

Acquah describes conditions in Accra during the late 1950s as follows:

"The poor provision of latrines, bathrooms and kitchens, poor drainage, inadequacy of refuse disposal, the dilapidated conditions of many houses, small unventilated rooms, leaking roofs, overcrowding, unhygienic habits and a good deal of ignorance and neglect of infant welfare all militate against good health. Spitting is a widespread habit. The many containers, open drains, uneven surface of household compounds for the malaria-carrying mosquito. . . The drainage system is one of open drains

which run along the side of the main roads, streets and behind dwellings. As they are open, all sorts of things are thrown into them, and they become very offensive in places. Some people and especially children, use them instead of the public latrines".³⁷

The findings of a survey which investigated the housing and household conditions in Labone, James Town and Nima in 1967 revealed that there had been no substantial changes in environmental conditions in the traditional areas of Accra which Acquah so vividly described in her book. The newly built up areas in cities like Nima, Zabon, Zongo, Lagos Town and other places have joined the traditional quarters. Their social and economic and particularly their environmental conditions constitute one of the urgent social and health problems in the capital city.³⁸ The situation in Sekondi-Takoradi in Ghana, during the 1940s and 1950s has been described as follows:

"The inadequacy of latrines, baths and washing facilities encourages insanitary habits, of which children are the worst victims. The public latrines being too far away, the mothers provide the children with newspapers and chamber-pots, or sometimes they defecate in the yard or rooms to be cleaned up later by the busy housewife. The yards are often wet or muddy with water, owing to lack of bathrooms or washing places. The public septic tank latrines so far provided are unpopular and offensive. This is because they are used by too many people. At the Zongo, for example, a latrine built for 600 is visited by about 2,000 daily".³⁹

The preliminary findings of the 1971 Sekondi-Takoradi survey indicate that "there are glaring examples of congestions in the municipality as evident from the analysis of persons per bedroom and number of beds per household. Furthermore, as observed by Busia, there are shortages of such basic housing facilities as lavatories, bathrooms and kitchens, to mention a few. But if we can reliably depend on the 1971 sample figures, a comparison with Busia's work indicates positive trends toward improvement in these facilities".⁴⁰

In fact, the environmental problem described above in respect of Accra and Sekondi-Takoradi is not peculiar to Ghana and Nigeria. Mabogunge has observed that "most West African cities have numerous districts where over-crowding is acute and standards of environmental sanitation have deteriorated to critical levels. In Lagos, for instance, a 1950 census showed that densities per square mile had increased on the island from

³⁷ I. Acquah, *Accra Survey: A Social Survey of the Capital of Ghana, Formerly Called the Gold Coast, Undertaken for the West African Institute of Social and Economic Research, 1953-1956* (London, University of London Press, 1958).

³⁸ N. O. Addo and G. M. K. Kpedekpo, "Survey into housing and household conditions in Labone, James Town and Nima" (mimeo.).

³⁹ K. A. Busia, *Social Survey of Sekondi-Takoradi* (Crown Agents for the Colonies, 1950).

⁴⁰ E. Brown, *Some Aspects of Demographic and Social Change in Sekondi-Takoradi* (Legon, Regional Institute for Population Studies, University of Ghana, 1976).

³⁶ A. L. Mabogunge, *Urbanization in Nigeria* (New York, N.Y., African Publishing Corporation, 1968).

50,039 in 1921 to 87,492 in 1950. In the two oldest wards, the respective densities in the latter year were 110,987 and 140,820 per square mile. Only improved public health measures, notably in the field of vaccination, have kept virulent epidemics at bay. In the 1920s, before this unfortunate development, most of the important West African cities, such as Dakar, Accra and Lagos, were ravaged by epidemics of one type or the other". Other problems of West African urbanization such as "traffic congestion, inadequate and inefficient infrastructural equipment and poor land-use and zoning regulations . . . emphasize the fact that the most serious problem of these cities is proper management. West Africa still needs to breed a class of urban administrators who take pride in the efficient performance of the city both as a place of work and a home for people, and who are able to plan the resources available to achieve these ends."⁴¹

The following are observations made by Okediji in 1975 regarding environmental sanitation in the core settlement of Ibadan:

"Most of the houses have no kitchens and cooking is done in the corridors. An observer can see beads of carbon on the walls of the corridors. Most of the clay pots used for cooking are unwashed, and often contain dirty water on the surface of which one can see dead flies and cockroaches. Cobwebs are common features of the corners of the dwelling units. In places where there are separate kitchens, these are usually unswept and full of obnoxious odors, aggravated by uncovered *salgas* (latrines) directly behind the kitchen. There are usually bits of dried excreta all over the *salgas*. In some houses the *salgas* is used by all members of the compound and responsibility for emptying it is not assumed by anybody. Standing water all over the place affords breeding grounds for flies and mosquitoes. Most of the gutters are uncemented and full of foul-smelling water."⁴²

In the majority of the Middle and Western African countries between 5 and 20 per cent of the population was living in urban areas between 1960 and 1968. The least urbanized region was Eastern Africa, where no country had more than 10 per cent of its population residing in urban areas, except Zambia, which had 16 per cent of its population living in towns of 20,000 or more inhabitants. There were about 500 such towns in Africa during the period 1960-1965. In the majority of the countries with localities of 100,000 or more inhabitants, the people were concentrated in one or two cities. Nigeria and South Africa had a number of such cities, which contained at least 10 per cent of the countries' population, and in most cases about half of the urban population lived in the cities or localities with 100,000 or more inhabitants. There was no country with less than one third of its urban population residing in the

⁴¹ John C. Caldwell, ed., *Population Growth and Socio-Economic Change in West Africa* (New York, N. Y., Population Council, 1975).

⁴² Francis Olu Okediji, "Socio-economic status and attitudes to public health problems in the western State: a case study of Ibadan" in John C. Caldwell, ed., op. cit.

cities, a strong indication of the existence of a high concentration of humans in cities and large towns in tropical Africa. It is important to note that major demographic and socio-economic changes have taken place since the mid-1960s and these may have intensified the drift from rural to urban areas, especially to the cities and large towns. A case in point is the doubling of the number of Ghanaian communities with 20,000 or more inhabitants between 1960 and 1970. The trend was towards a concentration of Ghanaians in larger communities, the migratory movements from rural to urban areas being the most significant phenomenon in the population development in the country.⁴³ There is no doubt that similar demographic developments have taken place in other parts of the continent since the first round of censuses during the 1960s. Thus, the rapid rate of population growth in African cities and towns exerts pressure on the already strained infrastructural facilities. Urban mortality rates are therefore presumably brought to bay by mass immunization programmes and the application of other types of health technology.

The rural scene

The problems in the rural areas of tropical Africa are not simply matters of inadequate infrastructural equipment but are largely due to the practical non-existence of the basic necessities of life. In most cases it is a matter of life and death. It has been estimated that only 21 per cent of the 1975 population of 21 African countries had reasonable access to safe water and 72 per cent had no adequate excreta disposal facilities. The proportions of the 1975 rural populations that had access to safe water either by house connections or public stand pipes ranged from 68 per cent in Rwanda to 14 per cent in Guinea. It must be noted that, with the exception of Rwanda and Mauritius, not more than 4.0 per cent of the rural populations in the 19 countries was provided with piped water. There is no information on the remainder of the countries in tropical Africa, but the situation may not be any better than that portrayed by the figures compiled for 21 countries by WHO.⁴⁴ Thus, the prevailing high mortality rates in tropical Africa are due largely to a lack of social amenities and health facilities, including water supplies, transport roads, waste-disposal facilities and health services. The basic health facilities are practically non-existent in many rural areas and the quality of both the physical and the social environment is largely responsible for a great number of the preventable deaths which occur in rural Africa, especially among infants and children.

Lack of skilled manpower and equipment

Some of the health problems facing tropical Africa are attributable to a general shortage of skilled medical

⁴³ S. K. Gaisie, "The impact of demographic changes in Ghanaian cities, towns and villages", paper submitted on the occasion of the seventeenth anniversary of the Ghana Academy of Sciences, celebrated at Accra in 1976.

⁴⁴ World Health Organization, *World Health Statistics Report*, vol. 29, No. 10 (1976).

and health staff and equipment. Although there has been a general improvement in the physician-population ratio since the late 1960s, there is still a formidable task ahead for many tropical African countries if they are to maintain even the prevailing levels of physician-population ratios, in the light of the rapid expansion of both urban and rural populations. For example, Ghana will have to produce about 576 doctors by 1990 or 1,103 by 2000 in order to maintain the 1971 physician-population ratio of 1:12,000. The physician-population ratios for the other West African countries ranged from 74,189 in The Upper Volta to 15,000 in Senegal and Sierra Leone in 1971. The ratios for the Congo, the United Republic of Cameroon and the Central African Republic in 1973 were 8,086, 21,720 and 44,745 respectively. The Eastern African countries also exhibited large differences in physician-population ratios ranging from 74,000 in Ethiopia to 8,000 in Zambia and 6,500 in Kenya in 1971.⁴⁵ The data show that there is a lack of qualified personnel, such as dentists, midwives, nurses and technicians. For instance, the *World Health Statistics Annual, 1972* showed that the 1,650,000 population of the Central African Republic had two dentists and the same number served Chad's population of 3.8 million in the same year. Ethiopia had 24 dentists serving the needs of about 26 million inhabitants. A similar situation has been observed in a number of tropical African countries, the majority of which, as noted earlier, lack both the fiscal and the human resources to provide adequate health services for the inhabitants, especially those residing in the rural areas.

SOCIAL-CULTURAL DETERMINANTS OF MORTALITY

Existing side by side in virtually all the tropical African countries are two medical systems: scientific medicine and traditional medicine. Both systems play important social functions in respect of diagnosis and treatment of diseases. The medical systems are not mutually exclusive and there is a tendency for people to use the services provided by both systems. It must be noted, however, that the financial scope of each system depends, to a large extent, on the availability of the services provided by the system and its ability to provide concrete results in cases of illness and/or uncertainty. Twumasi has observed that "in keeping with the pragmatic spirit characteristic of so many aspects of life, the sick person would show a willingness to take what each medical practice has to offer, accepting each practice to the degree that its usage appears to yield favourable results."⁴⁶ There have been many instances where people have resorted to the use of traditional medicine as a result of the failure of scientific medicine to yield favourable results. These situations have raised some doubt in the minds of many people as to the

efficacy of scientific medicine compared with traditional medicine. It has been noted that the latter has been much more successful in the areas of mental and psychosomatic ills and barrenness. On the other hand, scientific medicine has gone a long way towards suppressing the levels of mortality by providing effective cures for parasitic, infectious and respiratory diseases and other dangerous diseases. But since the scientific medicine is highly limited in its functional scope, for socio-political and financial reasons, the majority of the people in rural areas tend to rely on traditional medicine even when they are afflicted with the most fearsome diseases. The tendency to adhere to the traditional beliefs and practices is therefore more pronounced among rural people, the majority of whom possess limited access to the available medical and health facilities; it is therefore not surprising that rural mortality levels are higher than levels in the urban areas.

It is important to draw the attention of the reader to the fact that the culture of a people, which stems from that people's concerted efforts to control and manipulate its environment in order to meet its basic needs, including the promotion of good health, and the social organization which has emerged in the process, cannot be transformed overnight. And this is all the more so in the area of health, where the majority of the people are untouched by scientific medicine. Thus, unless social and economic developments are geared towards the satisfaction of the basic needs of both rural and urban people, the former will continue to suffer from high mortality levels and will also continue to look to traditional medicine in their quest for good health. In fact, an integration of the two systems has been recommended by some social scientists and medical doctors. In Nigeria, for example, Lambo "utilized the services of traditional medicine men in treating psychiatric patients as intermediaries in allaying the terms and anxieties of his psychiatric patients. The idea was simply this: the rural population (from which many of these patients came) live in large extended family houses. Traditional medicine is predominantly an art derived from cultural experience. Thus it was realized the medicine men understood the fears of these patients. In fact, Lambo found that co-operation developed between the psychiatrists and the medicine men. The medicine men looked after the social psychological aspects of the psychiatric patients whereas the physical symptoms were treated by the modern psychiatrists."⁴⁹ Ghana has been encouraging this line of approach and in the area of traditional medicine the "most recent development of note is the formation of a Ghana Psychic and Traditional Healing Association which purports to research into mysticism as employed by the traditional practitioners. The pharmaceutical values of known herbs are being investigated as well as some of the therapeutic claims of the practitioners."⁴⁸ It is

⁴⁵ *African Statistical Yearbook, 1974, Part 3, East Africa* (Addis Ababa, Economic Commission for Africa, 1976).

⁴⁶ Twumasi, op. cit., p. 112.

⁴⁷ *Ibid.*, pp. 127-128.

⁴⁸ *Ibid.*, p. 132.

perhaps important to reiterate the fact that, in so far as the rural areas are concerned, the traditional medicine will continue to be a more satisfying medium for diagnosing and healing psychosomatic and other mentally related ills, a function which scientific medical practice is less equipped to perform under the socio-economic conditions prevailing in most parts of tropical Africa.

DECLINES IN LEVELS OF MORTALITY: PROTECTIVE HEALTH TECHNOLOGY AND/OR IMPROVEMENT IN GENERAL STANDARDS OF HYGIENE

As noted earlier, mortality statistics indicate that there has been some decline in the level of mortality in the African region during the past two decades. The evidence is presumably enough to convince the observer that a decline in mortality has been under way in the majority of the African countries but it is not possible to be precise about the magnitude of the decline in Ghana, for example. It has also been noted, among other things, that mortality rates in the rural areas in tropical Africa are higher than those prevailing in the urban areas, a phenomenon that is largely attributable to the concentration of medical equipment and personnel in the urban areas. It is therefore quite possible that, in the urban areas, a large proportion of the decline in the level of mortality or an increase in the expectation of life may be due to factors exogenous to general social and economic development. Despite the unsanitary conditions prevailing in many cities and towns in tropical Africa, the estimated expectation of life at birth tends to be higher than it is in the rural areas. Although people in the rural areas lack the medical and health facilities enjoyed by urbanites, there is, however, evidence that rural mortality levels have been declining over the past two decades. In Ghana, for example, the estimated rural infant mortality rate declined from 205 in the late 1950s to 132 in 1970.⁴⁹ Much of this downward trend in infant mortality cannot be attributed to modern advances in the control of infectious diseases by immunization and antibiotic therapy, since health services scarcely reach the majority of the rural people. In 1977, the percentage of infants vaccinated with B.C.G. in maternal and child health centres ranged from 12.6 per cent in the Ashanti region in Ghana to 1.8 per cent in the upper region, and even if one adds the number of infants vaccinated by the medical field units, the total number of infants vaccinated was not more than 30 per cent. The number of infants offered oral poliomyelitis vaccine ranged from nearly 9,000 in the eastern region to 100 in the upper region, the proportion completing primary polio immunization ranging from 0.78 in the eastern region to 0.06 in the greater Accra region. It has also been noted that the

percentage of infants completing primary D.P.T. immunization against pertussis and tetanus is very poor in all the regions of Ghana.⁵⁰ The percentage of infants immunized against measles by both maternal and child health centres and medical field units ranged from 1.5 per cent in the Volta region to 8.4 per cent in the Brong Ahafo region. Thus, the proportion of Ghanaian infants vaccinated and immunized against the various diseases is very low and one can imagine the number of rural infants who are deprived of protection against some of the major killers. Ghana has been selected as an example of the extent to which the immunization programme reaches the infant and child population and, in fact, the entire population. The picture is virtually the same in many tropical African countries, but time and space do not permit the author to undertake an in-depth analysis in this regard. It will be deduced from the Ghanaian experience that a large proportion of the decline in infant and child mortality between the 1950s and 1960s is attributed to general improvements in the standard of living, including environmental or hygienic conditions, and this is likely to be the general situation in many African countries whose village dwellers have virtually no access to modern medical technology.

SUMMARY AND CONCLUSIONS

The existing fragmentary data indicate that mortality levels are relatively high in tropical Africa, especially in the rural areas, where health protective technology is virtually non-existent. Poor health conditions are self-perpetuating not only because of sluggish economic growth but also because of institutions and development policies that inhibit the spread of health and medical facilities to a large proportion of tropical Africans. Most African countries are still operating health programmes based on the "outmoded" institutions left behind by the colonialists, institutions which cater to the needs of a small number of people, to the detriment of a large segment of the population. It appears, therefore, that economic growth is not benefiting the needy and, with the growing size of the marginalized groups, the poverty gap is being widened and inequality and dehumanization are on the increase; the poor are finding it more and more difficult each day to have access to the basic necessities of life, including health facilities. Thus, policies aimed at correcting this urban-rural structural imbalance as regards the provision of health services will contribute a great deal to the formulation of a better health programme that aims at satisfying the health needs of a large section of the population.

Persistent poverty and malnutrition, poor housing, unhealthy conditions in the burgeoning cities, non-existence of health facilities in the rural areas, rapid expansion of population and low levels of education are among the factors which impede progress in reducing mortality in tropical Africa. There is a need, therefore,

⁴⁹ S. K. Gaisie and K. T. de Graft-Johnson, *The Population of Ghana* (Paris, Committee for International Co-ordination of National Research and Demography, 1976).

⁵⁰ *Five-Year Development Plan 1975/76-1979/80*, Part II (Accra, Ministry of Economic Planning, 1977).

to express development goals in terms of the progressive reduction and eventual elimination of malnutrition, disease, illiteracy, squalor and inequalities. Thus, future trends in mortality in tropical Africa may depend more than they have in the recent past on economic and social development, and a con-

certed effort should be made to extend preventive medicine and public health services to the majority of the population, especially people in rural areas. In the meantime, however, traditional medicine will continue to permeate the lives of many Africans until far beyond the year 2000.

SOCIO-ECONOMIC DETERMINANTS OF MORTALITY IN INDUSTRIALIZED COUNTRIES*

*Jacques Vallin***

SUMMARY

In the early 1950s, it was generally considered that social mortality differentials appeared during the first stages of industrialization and would be resolved with the socialization of health services. Admittedly, at that time, the spectacular progress achieved through antibiotics encouraged the belief that health was merely a matter of medicine and that the institution of a social security scheme would suffice for minimizing the risks of death that were not directly involved in the natural differences between individuals. Thirty years have passed and the expectation of life has lengthened (although less than anticipated), but the social differences remain. They are, in fact, by no means attributable to a lack of medical science. The elimination of the most discriminating causes of death (alcoholism, accidents, suicide, tuberculosis etc.) is less dependent on further scientific progress than on a complete change in living conditions and behaviour. The reduction of the excess mortality of the poorer classes from other causes (cancer, cardiovascular diseases etc.) again calls more for a thorough cultural transformation of the least privileged social categories than for the discovery of new therapies or increased expenditure on hospitals.

Faced with a morbidity that is already very unequal (selection, differential risks), the various social categories behave in basically different ways, which, while aggravating the real inequalities, lead to an apparent morbidity that is inversely proportional to true morbidity and to a more prompt and frequent use of medical care among the social categories in which true morbidity is lowest. Inequality with respect to death is only one dimension of social inequality. It was an illusion to imagine that the one could be eliminated without the other. Today that illusion has been destroyed. That does not mean that the present situation must be accepted. Inequality with respect to death is still one of the most disgraceful consequences of social inequality and its abolition must still be our aim. Obviously, however, this aim cannot be achieved through the health services alone.

The risk of dying depends, at any given moment, on many individual or collective characteristics. Age is the first determinant of differentiation. For each age, the risks of dying vary in response to many different factors, and the deviations are generally not homothetic. They modify not only the level of mortality but also its structure by age.

Death is part of the genetic heritage transmitted to each individual on conception and is undoubtedly first and foremost a biological phenomenon; genetic differences may therefore be expected to lead to different mortalities. Certain genetic disorders do, in fact, considerably increase the risks and greatly distort the dis-

tribution by age of the subjects concerned. It is probable that, even among the general population, the risks of dying at any age are a function of genetic heritage; but this hypothesis is much more difficult to prove, because each individual's death is considerably hastened or delayed by environment and behaviour.

Climate and natural resources (geological or biological) on the one hand, and economic and social patterns of behaviour and cultural heritage on the other, strongly influence the interplay of the biological determinants of human mortality, so much so that it is difficult to establish, even very roughly, the relative importance of any of these determinants.

Sex, for example, is a simple and well-defined criterion, by which a generally wide difference can be established between male and female mortality. In spite, however, of the strictly genetic character of this criterion, the results obtained with it in fact reflect, beyond

*This paper is a condensed version of the original in French that was presented to the UN/WHO Meeting on Socio-economic Determinants and Consequences of Mortality, held at Mexico City from 19 to 25 June 1979.

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the very probable biological differences, some decisive socio-economic differences; for sex is also a determinant of social, economic and even cultural differentiation. So what about "race" or such "superficial" criteria as colour of the skin, height, weight, etc.? What is the importance of biological, environmental and behavioural factors?

There is growing evidence that, within a framework of biological constraints (progressive aging of the body, limited life-span), and taking into account the geographical context that may modify these constraints, the main differences in mortality are of socio-economic and cultural origin.

As evidence of this, there is the enormous difference between mortality in western countries and mortality either in mediaeval Europe or in the least developed countries today. There have been no major climatic or geological changes in Europe over the last three centuries, nor has there been any significant modification of the genetic heritage. And yet the pattern of mortality has changed radically. Likewise, no one would claim that the difference in life expectancy today between a citizen of the Upper Volta and a Frenchman is essentially a question of climate or genes.

It is not surprising, therefore, that in a given society or population marked by socio-economic differences there should also be considerable inequality in terms of death.

This paper is exclusively concerned with socio-economic differences in the developed countries.

A review of the difficulties involved in measuring differentials is followed by a brief factual survey based on the available data and a description of the underlying mechanisms.

DIFFICULTIES ENCOUNTERED IN MEASURING DIFFERENTIALS

There are many obstacles to the successful measurement of mortality differentials, for example, the imprecise nature of the object to be measured, changes in the characteristics used for classification, discrepancies between the sources used for establishing numerator and denominator and the selection of individuals by status (marital, occupational etc.).

This list is not exhaustive, but each of these four points is worth developing individually.

Imprecise nature of the object to be measured

What is a socio-economic or cultural determinant? What is a social difference? There is no simple answer to these questions. When differences in mortality need to be measured, however, the only way to do so is to form clearly defined sub-sets, within which the risks of dying may be calculated. There is of course no single criterion for classifying the population by socio-economic or cultural factors. However, a whole range of criteria with an economic, social or cultural bias is

available, at least theoretically; but each criterion reflects the three aspects to varying extents and none is entirely satisfactory.

The procedure most frequently followed is to measure mortality within definite categories in terms of one of these relatively simple criteria: income, education, occupation, for example, was very popular at the end of the nineteenth century as a criterion for social class and many studies were carried out, particularly in England and subsequently in France, on differences in mortality by occupation.¹ When used alone, however, this criterion tends to emphasize certain distinguishing factors, such as occupational diseases or accidents, rather than more general factors connected with behaviour and varying with occupational status, education, income, access to care etc.

There has recently been a tendency, particularly in the United States of America, to make a series of classifications according to these various simple criteria and to derive from this a set of indices for social mortality.

Another procedure (used in France in the late nineteenth century and early twentieth century) is to classify not individuals but geographical clusters of individuals that are as homogeneous as possible in their socio-economic characteristics.

Mortality in Paris, for example, has been measured several times for the various districts of the city on the basis of affluence.² The idea here is very different from that underlying the study of geographical variations in mortality or the influence of urbanization. The object in choosing districts according to their degree of affluence is to evaluate the effect of the population's socio-economic situation, assuming identical geographical conditions and degrees of urbanization. This method offers the advantage of using only collective data for social classification, which are more easily accessible and are already available, irrespective of the measurement of actual mortality for each district. This kind of approach has been discarded in France, but many American researchers have revived it over the last few decades and have met with some success.

Nowadays, however, and particularly in France,³ socio-economic and cultural differences are more frequently studied by dividing the population into "socio-occupational categories". Such categories are formed on the basis of information showing the person's activity, occupation, status within the occupation and field of activity. Their advantage lies in the fact that they combine several characteristics which, for each individual, are in direct relation to his social, financial and cultural status. These categories are not entirely

¹ See, for example, M. Huber, "Mortalité professionnelle comparée en France et en Angleterre", *Annales d'hygiène publique et de médecine légale*, septembre 1913.

² See, in particular, L. Hersh, "L'inégalité devant la mort d'après les statistiques de la ville de Paris—effet de la situation sociale sur la mortalité", *Revue d'économie politique*, Nos. 3 and 4, 1920.

³ "Socio-economic groups" were also used in the United Kingdom in the last decennial survey.

satisfactory, however, because they are mainly concerned with employment and are therefore ill-suited to people not gainfully employed. Retired people are difficult to classify by their previous activity, for which information is generally inadequate. The other groups not gainfully employed are even more difficult to classify. Housewives, for example, form a socially heterogeneous category, and to classify them by their husbands' socio-occupational category is not entirely satisfactory.

Consequently there is still considerable progress to be made in this field. There is still no classification that can be used for mortality studies which at the same time closely reflects a country's social stratification, so how can comparisons be made at the international level?

At present, very few efforts are being made in this field. In recent years, greater emphasis has been placed on solving more technical problems.

Changes in characteristics used for classification

Sex and year of birth are constant characteristics; when they are known precisely, the study of mortality by sex and age does not present any serious problem. Deaths can safely be related to a population with identical characteristics.

Marital status, place of residence, occupation and socio-occupational category, on the other hand, are variable characteristics. Marital status is a good example: one cannot be married, widowed or divorced without having undergone a change in status (or even several changes in the case of divorce or widowhood). There are therefore three intermingled effects, which it is almost impossible to unravel: selection, the effect of the change in status, and the effect of the status itself. Although this problem is relatively simple in the case of marital status (few categories, sharp distinctions between categories, abrupt and infrequent changes in status) it has still not been solved.⁴ There can therefore be little chance of solving the problem in the case of place of residence (which is liable to change much more frequently and in gradual stages), in the case of occupation, income or socio-occupational category (in which the changes are almost imperceptible but heavily influence social stratification over a period of time), or indeed when there are changes not only in the individual's situation but also in the classification criterion itself under the influence of economic and social changes: urbanization, modifications in occupational structures etc.

Discrepancies between sources for establishing numerators and denominators

The modifications in the characteristics on which the classification is based are among the factors giving rise

⁴ Jacques Vallin and André Nizard, "La mortalité par état matrimonial: mariage sélection ou mariage protection?" *Population*, special issue entitled "Hommage à Louis Henry" (Paris, 1977), pp. 95-123.

to a third difficulty: the discrepancies between the sources for establishing numerators and denominators, or in other words the inconsistencies between census results and the data held by the public records office. The social status indicated by the information recorded on the death certificate may be very different from the status defined by the replies to the previous census questionnaire for the same individual. There are two reasons for this. The first is dealt with in the previous section (changes in status), and the risk increases with the length of time between the last census and death. The second is associated with the difference in behaviour at the time of declaration. The parameters used to characterize social status are so vague and flexible that they can sometimes lead to very different statements in different contexts.

In principle, this problem is easy to solve. All that needs to be done is to bring the records office document into line with the census return (or vice versa) for each individual and to keep to the social status associated with the census questionnaire alone (or the death certificate alone). This kind of procedure is expensive and awkward to carry out, however. So far only the United States and France have attempted it, and in very different ways.

In France a sample of individuals recorded in the 1954 census was classified once and for all into socio-occupational categories; from then on their mortality has been observed by consulting the public records.

In the United States a sample of death certificates completed between May and August 1960 was taken and compared with the 1960 census returns so as to classify them by various criteria (education, income, occupation etc.). The short period between census and death is a serious drawback, because there may be a strong correlation between an individual's situation as shown on the census return and the fact that he died a few months later. The approach of death generally brings with it a reduction (or even complete cessation) of activity, or less commonly a change of occupation, and almost always (in the United States) a reduction in income. In any case, this is the reason why the authors themselves in their analysis favour "education" as a criterion of social stratification, for if this criterion is assessed in terms of diplomas or years of schooling it cannot undergo any change on the eve of death.

The French method is much more satisfactory. It completely avoids the above difficulty and, in addition, it offers a much wider field of study, because the 1954 sample can be followed up at all ages until all the subjects concerned have died. On the other hand, the aging of this sample is an inconvenience (though there is no reason why fresh samples should not be taken at subsequent censuses); what is more of a problem is the fact that the social situation observed at the starting point is "frozen", whereas in all probability it changes.

Despite the difficulties, authorities in the United Kingdom are continuing to measure social mortality by comparing deaths recorded, by occupation, with the

census population. One of the main reasons for this choice is no doubt the influence and the value of tradition. In the United Kingdom, this kind of study has been carried out about every 10 years since the mid-nineteenth century, on the occasion of each census. This continuity, which makes it possible to follow trends over a long period, can be set against the imperfections of the system. The United Kingdom has, however, just undertaken a longitudinal survey, from the 1971 census, based on techniques very similar to those used in France.

Selection of individuals by status

The investigator seeking to measure the differences in mortality associated with certain statuses may be led into error by certain characteristics of the selection process. The real differences may be heightened or lessened (or even reversed) by the fact that possession of a given status itself results from a choice associated with the individual's health.

Marriage is one example, in that it selects "healthy" people. The same difficulty arises in connexion with certain socio-occupational classifications. Coalminers, for example, who are exposed to a high risk of occupational accident or disease, do not have as high a mortality rate as might be feared because they are subject to a strict selection process at the outset in respect of health and are assigned to less hazardous jobs if any deficiencies are revealed by preventive medicine.⁵

In France, mortality is on the whole lower in the public sector than in the private sector at all levels. This is due only in part to the higher risks incurred in the private sector: better initial health is required to enter the public sector on account of the medical examination on recruitment.

Of these four major problems in measuring social differences in mortality, only the third (disparities between numerator and denominator) has so far been solved in an acceptable way and then only in France and, less successfully, in the United States. In other words, if the vast area of study represented by social mortality is not actually virgin soil, it is still very unevenly explored, even in the developed countries.

SOCIAL INEQUALITY IN RESPECT OF DEATH

Even though the methods for measuring social mortality are as yet very imperfect, they are still good enough to show substantial differences. A more controversial question, on which expert opinion has shifted, is whether these differences have changed over a period of time.

During the 1960s, it was generally felt that social inequality in respect of death was a counterpart of the industrial revolution and was declining.

⁵ *Statistique générale de la France: table de mortalité des ouvriers mineurs, 1923-1928* (Paris, Imprimerie nationale, 1933).

The few authors such as Boisguilbert,⁶ Deparcieux⁷ or "Moheau",⁸ who as long ago as the eighteenth century had suggested that there was excess mortality among the poor, were out of step with contemporary thinking. It was only in the nineteenth century, when the industrial revolution was at its height, that collective awareness of the facts began to take shape, particularly as the result of the work of Benoiston de Chateauneuf⁹ and Villermé.¹⁰ The deplorable living conditions of the working class, recently born out of industrialization, came on the scene as a new factor capable of translating the glaring economic inequality produced by industrial capitalism into terms of mortality. And indeed, while it now seems incorrect to believe that social inequality in respect of death was created by the industrial revolution,¹¹ the inequality increased very substantially at that period: not so much through an increase in mortality among the poorer classes as through the rapid fall in mortality among the more privileged classes, which were the first to benefit from advances in medicine.

The industrial society, which generates new inequalities, has also endeavoured, under pressure from trade unions and political parties advocating socialism, to correct its most unacceptable effects, principally the inequality in respect of disease, accidents and death.

When first the courts, and later the law of the land, held employers responsible for occupational accidents (law of 1897 in England, 1898 in France) and occupational diseases, the first systems of sickness and disability insurance came into being. The assumption of joint responsibility then spread gradually to all diseases or accidents, first for certain social groups (civil servants) and later for the majority of wage-earners. The first compulsory insurances made their appearance at the end of the nineteenth century.¹² Immediately after the Second World War the Labour Government in Britain and the Socialist Government in France tried to take this trend to its logical conclusion by making the community at large responsible for all health expenditure

⁶ Supplement to *Détail de la France* (1707); see Pierre de Boisguilbert, *ou la naissance de l'économie politique* (Paris, Institut national d'études démographiques, 1966).

⁷ *Essai sur les probabilités de la durée de la vie humaine* (1746).

⁸ *Recherches et considérations sur la population de la France* (1778).

⁹ *Mémoire sur la durée de vie chez le riche et chez le pauvre* (Paris, Imprimerie A. Firmin Didot, 1830).

¹⁰ *Mémoire sur la mortalité dans la classe aisée et la classe indigente* (Paris, Académie royale de médecine, 1828) and *Tableau de l'état physique et moral des ouvriers* (1840).

¹¹ Alfred Perrenoud recently showed that the inequality was already very marked in Geneva in the seventeenth century ("L'Inégalité sociale devant la mort à Genève au 17^e siècle", *Population*, special issue entitled "Démographie historique" (1975), pp. 221-243). See also André Nizard and Jacques Vallin, "Influence du développement sur la mortalité différentielle", *Proceedings of the International Population Conference, Mexico City, 1977* (Liège, International Union for the Scientific Study of Population, 1977), pp. 441-481.

¹² First introduced by Bismarck from 1883 onward. Most industrial countries followed suit at the end of the nineteenth century or in the early years of the twentieth century (the Netherlands, Romania, Austria, the Scandinavian countries and the United Kingdom), France not until 1928.

TABLE I. ENGLAND AND WALES: INFANT MORTALITY RATES BY "SOCIAL CLASS"

Year	Social class						Total	Mortality rate index for class V, where the rate for class I equals 1
	I	II	III N	III M	IV	V		
1921	38.4	55.5		76.8	89.4	97.0	79.1	2.53
1930-32 . . .	32.7	45.0		57.6	66.8	77.1	61.6	2.36
1949-53 . . .	18.7	21.6		28.6	33.8	40.8	29.5	2.18
1970-71 . . .	11.6	13.6	14.5	16.9	19.5	30.7	17.6	2.65

Sources: For 1921 to 1949-1953, Office of Population Censuses and Surveys, *Occupational Mortality: the Registrar General's Decennial Supplement for England and Wales, 1951*, Part II, vol. I, Commentary (London, Her Majesty's Stationery Office, 1958); for 1970-1971, Office of Population Censuses and Surveys, *Occupational Mortality: the Registrar General's Decennial Supplement for England and Wales, 1970-1972*, Series DS, No. 1 (London, Her Majesty's Stationery Office, 1978).

The ratio between the rate for class V and the rate for class I fluctuated around 2.5, a very wide gap in view of the small number of classes used.

(National Health Service in the United Kingdom, Social Security in France). It was their explicit objective to eliminate in the long run the social inequalities in respect of disease and death. Both rich and poor should be able to enjoy the same medical services, and hence the same expectation of life.

In the United States of America, efforts have been made in the same direction, though in a much more liberal context, through the development of private insurance systems and poverty control programmes.

Consequently, in the early 1960s some authors were able to believe that inequality in respect of death was declining, or even disappearing.

This seemed particularly logical for infant mortality, the exogenous portion of which was subsiding and tending to merge with the endogenous portion, which by definition is less susceptible to social inequalities.¹³ However, the same trend was beginning to be accepted for mortality at all ages. The social variations in mortality seemed to be so dependent on such factors as the locality studied, the variables used or the methodology adopted that the existence of a general and lasting phenomenon of social inequality in respect of death seemed doubtful.¹⁴ It seemed clear that the middle classes were becoming less and less distinguishable from the upper classes, that excess mortality remained only in the least privileged group, and that this excess mortality was itself destined to disappear very shortly.¹⁵

The most recent and most reliable studies tend to

¹³ For the United States of America, for example, see Willie, "A research note on the changing association between infant mortality and socio-economic status", *Social Forces*, No. 37 (March 1959), pp. 221-227; Edward G. Stockwell, "Infant mortality and socio-economic status: a changing relationship", *Milbank Memorial Fund Quarterly*, No. 40 (January 1962), pp. 101-111; Avedis Donabedian, Allen Rosenfeld and Edward M. Southern, "Infant mortality and socio-economic status in a metropolitan community", *Public Health Reports*, No. 80 (December 1965), pp. 1083-1094; and Helen Chase, "International comparison of perinatal and infant mortality: the United States and six West European countries", *Vital and Health Statistics*, vol. 3, No. 6 (March 1967).

¹⁴ Edward G. Stockwell, "A critical examination of the relationship between socio-economic status and mortality", *American Journal of Public Health*, No. 53 (June 1963), pp. 956-964.

¹⁵ Aaron Antonovsky, "Social class, life expectancy and overall mortality", *Milbank Memorial Fund Quarterly*, No. 45 (April 1967), pp. 31-73; and C. Kadushin, "Social class and the experience of ill health", *Sociological Inquiry*, No. 24 (Winter 1964), pp. 87-90.

indicate that this is not the case, and that the hopes of an early disappearance of social inequality in respect of death are probably unfounded.

In view of the available sources, the brief survey that follows will be limited to three countries: the United States of America, France and the United Kingdom.

Infant mortality

Infant mortality (and possibly child mortality as well) is particularly valuable for the study of social mortality. Not only can it be considered a sufficiently faithful reflection of the health status of a population and hence of differences between subpopulations but also, when studied with reference to the father's characteristics, it largely avoids selection by recruitment for a particular type of activity.

The longest available series of records is for the United Kingdom. However, we shall not go back beyond 1921 (see table 2), because it is only since that date that social classification has been based on occupation.¹⁶ The social classes used are as follows:

- I. Professional occupations;
- II. Managerial and lower professional occupations;
- III. Skilled occupations;
- IV. Partly skilled occupations;
- V. Unskilled occupations.

In 1970-1972, class III was further divided into subclasses III M and III N, according to whether the occupation was manual or non-manual. This classification, which is simply a grouping of occupational units, has undergone changes over the years, but these do not seriously affect table 1. Despite a general and rapid decline in infant mortality, there has been no appreciable change in the gap between the social classes.

The same trend seems to be taking place in France, where a longitudinal study on infant mortality has been

¹⁶ Previously it had been based on sector of employment (see Office of Population Censuses and Surveys, *Occupational Mortality: the Registrar General's Decennial Supplement for England and Wales, 1970-1972*, Series DS, No. 1 (London, Her Majesty's Stationery Office, 1978)).

conducted since 1950, based on a linkage of birth certificates and death certificates (see table 2). This enables the Institut national de la statistique et des études économiques (INSEE) to calculate very accurately the infant mortality rates per generation for each socio-occupational category. The gap between the children of unskilled workers and the children of people in the professions and senior management hardly narrowed at all between 1950 and 1970, the rates for those two years being 2.76 and 2.49 respectively. Admittedly, the inequality now seems to be very much smaller for miners, but this is a quite small and very special category, which has been the subject of special measures.

TABLE 2. FRANCE: INFANT MORTALITY RATES BY SOCIO-OCCUPATIONAL CATEGORY OF THE FATHER

Socio-occupational category of the father	Generations			
	1950-1951 ^a	1956-1960	1961-1965	1966-1970
Legitimate children				
Professions and senior management	22.3	17.0	14.7	12.2
Lower management	29.1	19.7	16.1	14.1
Clerical staff		24.9	20.2	17.2
Employers in trade and industry	35.2	25.4	20.5	17.7
Farmers	44.9	31.2	23.1	18.7
Farm workers		35.3	27.7	23.9
Skilled workers	44.3	28.1	22.5	18.9
Semi-skilled workers		32.9	26.7	21.7
Miners	80.3	48.3	36.6	28.3
Unskilled workers	61.7	44.8	36.2	30.4
Illegitimate children	85.5	46.4	37.0	30.8
Ratio "unskilled workers" to "professional classes"	2.76	2.64	2.46	2.49

Sources: For 1950-1951, R. Croze, *Mortalité infantile des générations 1950-51 et 1955-60 suivant le milieu social et la résidence*, Etudes et documents démographiques, No. 9 (Paris, Institut national de la statistique et des études économiques, 1965); for 1956-1960 to 1966-1970, Solange Hémerly and Marie-Claude Gérard, "Mortalité infantile en France selon le milieu social", *International Population Conference, Liège, 1973* (Liège, International Union for the Scientific Study of Population, 1973), vol. III, pp. 171-184.

^a The rates for 1950-1951 do not include live-born children who died before their births were registered.

The trend in the United States is more difficult to assess because only one national survey is available, covering the period 1964-1966. It was carried out by the National Center for Health Statistics,¹⁷ using two official certificates (births, deaths under one year) supplemented by family questionnaires (see table 3). On the basis of a classification into five income groups and five educational groups, the infant mortality rate is found to vary by a ratio of 1 to 1.6 between the group with the highest household income and the group with the lowest income. The variation increases to 1.8 for the mother's education and 1.9 for the father's education. These differences are smaller than those separating the social classes in Britain or the socio-occupational

¹⁷ National Center for Health Statistics, "Infant mortality rates: socio-economic factors", *Vital and Health Statistics*, Series 22, No. 14 (Rockville, Maryland, 1972).

categories in France. However, a cross-analysis of the variables income and education shows that they are to some extent independent, and the mortality rate falls from 37.3 per 1,000 when the household income is below \$US 3,000 and the mother attended school for less than nine years to 16.7 per 1,000 when the household income is above \$5,000 and the mother had at least 13

TABLE 3A. UNITED STATES OF AMERICA: INFANT MORTALITY RATES, BY INCOME, 1964-1966

Household income	Mortality rate (per 1,000)
(1) Less than \$3,000	32.1
(2) \$3,000-\$4,999	25.1
(3) \$5,000-\$6,999	18.1
(4) \$7,000-\$9,999	19.9
(5) More than \$10,000	19.9
TOTAL	23.0
Ratio of (1) to (5)	1.61

TABLE 3B. UNITED STATES OF AMERICA: INFANT MORTALITY RATES, BY EDUCATION, 1964-1966

Number of years of education	Mortality rate (per 1,000)	
	Based on mother's education	Based on father's education
(1) Less than 8	35.2	33.0
(2) 9-11	27.7	27.4
(3) 12	19.5	19.0
(4) 13-15	15.9	20.6
(5) 16 and over	20.0	17.4
TOTAL	23.0	23.0
Ratio of (1) to (5)	1.76	1.90

Source: National Center for Health Statistics, "Infant mortality rates: socio-economic factors", *Vital and Health Statistics*, Series 22, No. 14 (Rockville, Maryland, 1972).

years of education, namely, a ratio of 2.2. The ratio rises to as much as 2.8 when black children of women with less than nine years of schooling¹⁸ (45.9 per 1,000) are compared with white children whose mothers had over 13 years of education and where the family income is over \$5,000 (16.4 per 1,000). Despite the difficulty of comparison, therefore, the gap is found to be just as wide as in Europe. Unfortunately only very fragmentary data are available on the way this gap is developing. The best known are those collected for Chicago (table 4), which show that there has been little change in the gap between the social classes.

This persistence of social inequality in the very special area of infant mortality is somewhat surprising. It has already been mentioned that on account of the decline in the exogenous component of infant mortality most authors writing during the 1960s regarded the early disappearance of social differences as inevitable. Neither of the two assumptions on which this hope was based—resistance to the decline and the slight social differentiation of endogenous mortality—was in keep-

¹⁸ Because of the small number of black children in the sample, it is not possible to make a cross-analysis of education and income.

TABLE 4. CHICAGO: INFANT MORTALITY RATES, BY SOCIO-ECONOMIC GROUP, 1940 AND 1960 (Per 1,000)

Socio-economic group	Males		Females	
	1940	1960	1940	1960
<i>Whites</i>				
5 (high)	26.5	25.1	25.4	19.2
4	27.5	23.1	20.6	17.1
3	28.8	23.6	22.6	17.7
2	31.1	28.7	26.8	20.5
1 (low)	34.8	33.0	27.9	23.5
Ratio of 1 to 2	1.3	1.3	1.1	1.2
<i>Non-whites</i>				
Ratio of non-whites to white socio-economic group 5	1.8	1.7	1.2	1.9

Source: United States Department of Health, Education and Welfare, Public Health Service, *Vital Statistics of the United States, 1950* (Washington, D.C., Government Printing Office, 1954), vol. 1, p. 257, table 8.49; and United States Department of Health, Education and Welfare, Public Health Service, *Vital Statistics of the United States, 1960*, vol. 11, Mortality (Washington, D.C., Government Printing Office, 1963), Part A, pp. 3-4, table 3-A.

ing with reality. Endogenous mortality has dropped sharply in recent decades, and as a result total infant mortality has continued to decline at the same pace as hitherto, while social inequality has been maintained.

In France, for example, mortality in the first month of life, which is essentially endogenous, fell from 18.4 per 1,000 in 1956-1960 to 13.4 per 1,000 in 1966-1970, whereas the gap between "unskilled workers" and "professions and senior management" widened slightly, from 1.86 to 2.02 (table 5).

TABLE 5. FRANCE: TRENDS IN INFANT MORTALITY, BY AGE IN TWO EXTREME SOCIO-OCCUPATIONAL GROUPS

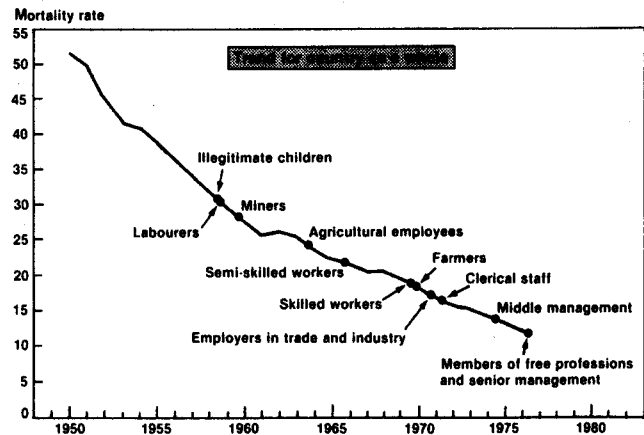
Socio-occupational group	Rate (per 1,000)			
	First month of life		Second to eleventh month	
	1956/1960	1966/1970	1956/1960	1966/1970
(1) Unskilled workers ...	23.1	18.4	21.7	12.0
(2) Professions and senior management	12.4	9.1	4.6	3.1
Ratio of (1) to (2)	1.86	2.02	4.7	3.9
Rate for all socio-occupational groups	18.4	11.2	13.4	5.5

It should be recognized, however, that the drop in mortality during the following 11 months was much more radical (from 11.2 per 1,000 in 1956-1960 to 5.5 per 1,000 in 1966-1970) and that the gap between extreme socio-occupational groups, much wider than in the case of endogenous mortality, became narrower (the ratio dropped from 4.7 to 3.9). The hoped-for reduction in the disparities, announced with excessive optimism 10 or 15 years ago, is perhaps still conceivable today, but great caution is needed. It is by no means impossible that exogenous infant mortality could be eliminated almost completely. In a country like Sweden, for example, the death of a newborn child from an infectious disease is already considered as an "accident". Further progress can still be made with endogenous mortality, but it is not unreasonable to suppose that it will result

mainly from better dissemination of the advanced techniques currently used in the best hospitals and will therefore benefit those social categories which at present are the least well covered by these techniques.

Figures I and II provide a good illustration of this possibility. If infant mortality for each socio-occupational group as observed in France in 1966-1970 is compared with the trend in the rate recorded for France as a whole from 1950 to 1976, the eventual disappearance of the inequalities does not seem absolutely impossible. Barely 20 years of progress separated the extreme groups in 1966-1970, and by 1976 the national average was already at the level observed for the professional classes in 1966-1970 (figure I).

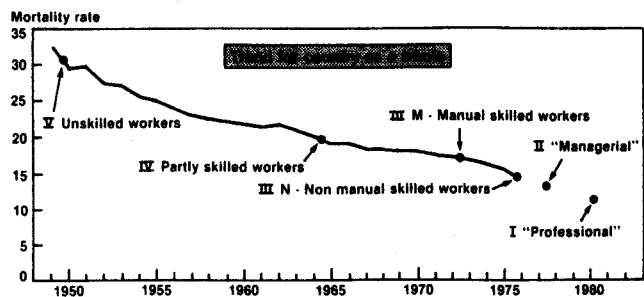
Figure I. France: infant mortality rate 1966-1970 by socio-occupational group, compared with the trend in the infant mortality rate for the country as a whole from 1950 to 1976



In England and Wales (figure II), despite the small number of social groups studied, the range is wider: in 1970-1971, classes I and V still seem to be separated by about 30 years. Progress in this country has been slower in recent decades. Nevertheless, it seems plausible to suppose that nationwide infant mortality will shortly reach the level observed in 1970-1971 for the most privileged class.

Further progress benefiting all social groups will certainly be made, and the inequality may be repeated at a lower average level, but it is quite conceivable that a more rapid reduction of infant mortality in the least privileged classes may open the way for a reduction of the inequalities.

Figure II. England and Wales: infant mortality rate 1970/71 by social class, compared with the trend in the infant mortality rate for the country as a whole from 1949 to 1976



The newborn child is increasingly being protected by the hospital system from the social conditions of its family, and its survival depends essentially on the quality of the health services. This quality is undoubtedly still linked to the social status of the parents, but the inequality may be reduced by an overall policy of providing all hospital services with the same equipment.

Child mortality

Very little information is available on child mortality by social group, apart from the data for England and Wales in 1970-71 (table 6).

TABLE 6. ENGLAND AND WALES, 1970-1971: CHILD MORTALITY RATES, BY SOCIAL CLASS AND SEX (Per 1,000)

Age (years)	Social class						Ratio of class V to class I
	I	II	III N	III M	IV	V	
Males							
1-4	0.61	0.62	0.75	0.76	0.93	1.29	2.1
5-9	0.28	0.31	0.39	0.42	0.44	0.69	2.5
10-14	0.28	0.31	0.35	0.35	0.40	0.56	2.0
Females							
1-4	0.57	0.54	0.62	0.62	0.84	1.09	1.9
5-9	0.26	0.24	0.27	0.27	0.33	0.43	1.6
10-14	0.21	0.21	0.20	0.21	0.26	0.33	1.6

Source: Office of Population Censuses and Surveys, *Occupational Mortality: the Registrar General's Decennial Supplement for England and Wales, 1970-1972*, Series DS, No. 1 (London, Her Majesty's Stationery Office, 1978).

The mortality differentials are considerable at all ages and for both sexes. It is interesting to note, however, that there is a marked difference between the sexes. For girls, the ratio between the rates for classes V and I drops substantially with increasing age. In this respect, child mortality continues the trend shown by infant mortality, for which an even greater gap was observed (table 1); in childhood, the risks of death decline with age, as do the social differences in mortality.

For boys, however, the reverse seems to be true. The social differences are smaller at one to four years of age than at under one year of age, but subsequently they remain at the same level or even show a slight increase. There are not enough data available to show whether or not this is indicative of a differential behaviour pattern on the part of children (or their parents) that would apply more particularly to the least privileged classes.

Adult mortality

Since the social classifications in use are based mainly on economic activity, they are more readily adaptable to males than to females; the studies of differential mortality are therefore mainly concerned with men and as a result only male mortality will be considered here.

In England and Wales, a long series of amalgamated

observations is available, in the form of a comparative index of mortality, expressed in terms of base 100 for the country as a whole (table 7).

TABLE 7. ENGLAND AND WALES: MALE MORTALITY BY SOCIAL CLASS^a (National average=100)

Period	Social classes					Ratio of class V to class I
	I	II	III	IV	V	
1921-1923 ^b	82	94	95	101	125	1.5
1930-1932 ^c	90	94	97	102	111	1.2
1949-1953 ^c	86	98	101	104	118	1.4
1959-1963 ^c	76	81	100	103	143	1.9
1970-1972 ^c	77	81	104	114	137	1.8

Source: Office of Population Censuses and Surveys, *Occupational Mortality: the Registrar General's Decennial Supplement for England and Wales, 1970-1972*, Series DS, No. 1 (London, Her Majesty's Stationery Office, 1978), p. 174.

^a Depending on the period, the data refer to ages 15 or 20 to 64 or 65 years and have not been adjusted to allow for changes in classification.

^b Index calculated on the basis of the comparative mortality figure.

^c Index calculated on the basis of the standardized mortality rate.

^d Results corrected by John Fox.

However, the ratio between the rates for class V and class I changes from 1.5 in 1921-1923 to 1.2 in 1930-1932 and to 1.8 in 1970-1972 (table 7); no clear conclusions can be drawn as to the real trend. These confusing results are partly due to changes in classification.

By recalculating the indices for 1960-1963 and 1970-1972 on the basis of the classification for 1950-1953, the Office of Population Censuses and Surveys makes a substantial adjustment to the index for class V (134 and 123 respectively, instead of 143 and 137). However, the ratio of class V to class I remains considerably higher than in 1953: 1.8 and 1.6 (instead of 1.9 and 1.8) as against 1.4.

Was there really a reduction in the inequalities during the 1930s compared with the beginning of the century, followed by a rise in the 1950s and 1960s? It would certainly be unwise to state this unreservedly because, apart from the changes in classification, the results are also affected by changes in economic structures and the composition of the social classes. Nevertheless, it is fairly safe to say that the inequalities have by no means been reduced during the last two decades.

The results obtained in France show a similar pattern. The linkage carried out by INSEE of individual census returns in 1954 for a sample of French males born in France and aged 30-69 years, with official death certificates, not only shows no reduction in the social disparities but, on the contrary, suggests a worsening of the inequality (table 8). These results are not affected by most of the difficulties that made comparison uncertain in the previous case. They therefore deserve our special attention.

Over a 10-year period from 1955-1960 to 1966-1971, the ratio of the risk of death for unskilled workers to the risk of death for teachers, senior management and professions increased from 2.75 to 3.27 between 40 and 55 years and from 1.75 to 1.88 between 55 and 70 years. The

TABLE 8. FRANCE: RECENT TREND IN PROBABILITY OF DEATH IN MALES BETWEEN 40 AND 55 YEARS AND BETWEEN 55 AND 70 YEARS, BY SOCIAL GROUP
(French males born in France only)

Social group	Probability of death					
	Between 40 and 55 years			Between 55 and 70 years		
	1955-1960	1961-1965	1966-1971	1955-1960	1961-1965	1966-1971
Teachers, senior management and professions	6.1	5.6	5.1	24.5	24.0	23.9
Lower management, technicians, Catholic clergy	7.5	7.2	7.2	28.0	29.3	27.1
Farmers, craftsmen and tradesmen, foremen, skilled workers in the public sector, and office workers . . .	9.6	9.2	9.3	32.1	32.8	30.5
Skilled workers in the private sector, semi-skilled workers, and farm workers	12.2	12.3	11.6	37.2	38.8	38.5
Unskilled workers	16.8	16.2	16.7	43.0	43.1	45.0
France as a whole	11.7	10.9	11.8	35.6	35.4	35.0
Ratio of the rate for unskilled workers to the rate for teachers, senior management and professions	2.75	2.89	3.27	1.75	1.80	1.88

already wide gap (especially between 40 and 55 years) is therefore tending to widen still further. It should also be stressed that the method used tends to underestimate both the gap and the widening of that gap.

First, the study covers only French males born in France and excludes certain social groups that are too small or too specific. Thus, one quarter of the total population is excluded from the sample. It has been calculated by subtraction that, for the period 1955-1965, the probability of death for the population outside the sample was higher at all ages than the probability of death for unskilled workers.¹⁹ As the subpopulation outside the sample does not consist solely of underprivileged groups (naturalized Frenchmen are not all unskilled workers, still less the citizens repatriated from Algeria), the size of the real gap separating the "immigrant unskilled worker" from the French senior manager can readily be imagined.

Secondly, the recent widening of the inequality is probably itself underestimated. The sample formed in 1954 was "frozen" in the socio-occupational structure of 1954 for the entire period under observation. On average, however, there is some degree of social ascent with age, through changes in category that provide a proportion of the least privileged categories with better living conditions. Consequently, the mortality observed in the most recent period no longer relates to such homogeneous

categories as it did at the start of the period, and this tends to underestimate the true mortality of the least privileged categories.

Although smaller than the first, this second bias should be taken into consideration when examining the trend in mortality within each social group in table 8. At 40-55 years, only the teachers, senior managers and professional classes saw any substantial improvement. Their risk of death fell from 6.1 per 1,000 in 1955-1960 to 5.1 per 1,000 in 1966-1971, namely, a drop of 16 per cent in 11 years, whereas the intermediate groups made little progress and unskilled workers almost none.

At 55-70 years, the most privileged group had made less progress, but at the same time the two least privileged groups saw their risk of death increase (for unskilled workers in particular, the risk rose from 43 per 1,000 in 1955-1960 to 45 per 1,000 in 1966-1971). Since these results tend to underestimate the mortality of the two last-mentioned groups, it does seem that the health conditions of the least privileged social categories deteriorated during the period, whereas those of the most privileged improved.

It is known that during the 1960s there was some resistance to the decline in mortality in most developed countries. In France this was reflected by a renewed risk of death in males at certain ages, especially between 50 and 60 years.²⁰ As we have seen, this phenomenon really

¹⁹ Guy Desplanques, "A 35 ans les instituteurs ont encore 41 ans à vivre, les manoeuvres 34 seulement," *Economie et statistiques*, No. 49 October 1973, pp. 3-19 (over 11 years from 1955 to 1965, the "prospective" rate for the age group 45-49 years rose to 17.1 per 1,000 for the population outside the sample, compared with 16.1 per 1,000 for unskilled workers and 6.6 per 1,000 for teachers).

²⁰ For France, see "La table de mortalité française 1966-70", *Population*, 1974, No. 3, pp. 553-577; for the other developed countries see "Evolution récente de la mortalité en Europe, dans les pays anglo-saxons et en Union Soviétique 1960-70", *Population*, 1974, Nos. 4-5, pp. 861-898.

TABLE 9. CHICAGO: COMPARATIVE MORTALITY RATES FOR MALES BY SOCIO-ECONOMIC GROUP FROM 1929-1931 TO 1960

Socio-economic group	1929-1931	1940	1950	1960
White population				
5 (high)	11.6	11.0	8.7	9.6
4	12.4	10.8	9.4	9.2
3	13.6	11.5	9.7	10.1
2	15.4	13.4	11.6	11.3
1 (low)	18.8	16.6	14.6	16.0
TOTAL	14.4	12.6	11.4	11.0
Ratio of group 1 to group 5	1.76	1.50	1.68	1.67
Non-white population				
3	21.7	18.5	12.5	9.8
2	27.9	19.9	14.7	13.5
1	30.6	25.9	17.7	16.7
TOTAL	26.1	20.7	15.4	13.1
Ratio of group 1 to group 3	1.41	1.12	1.41	1.70
Ratio of non-white group 1 to white group 5	2.6	2.4	2.0	1.7

Source: Evelyn M. Kitagawa and Philip M. Hauser, *Differential Mortality in the United States: a Study in Socio-economic Epidemiology* (Cambridge, Massachusetts, Harvard University Press, 1973).

affected only the least privileged categories. Since the nationwide trend since 1970 has been more favourable,²¹ this recrudescence of mortality among the poorest²² has probably given way to a slight improvement. There is no reason, however, to suppose that the "richest" have not continued to progress more quickly than the others.

Whenever accurate and reliable measurements were made of social inequality in respect of death, this process, far from slowing down, actually appeared to have increased during the 1960s and might well continue to increase in the years to come.

In the United States of America, as it is not possible to assess the trend from national data, reference can be made to the series available for the city of Chicago (table 9). Since the 1930s, the gap between social groups has been maintained in the white population and has increased in the non-white population, a certain section of the latter having managed to rise to higher social categories than in the past. However, it should be noted that the gap between the least privileged non-whites and the most privileged whites has narrowed, particularly from the 1950s onward. Should this be seen as the effect of a general reduction in racial segregation or as a phenomenon peculiar to the city of Chicago?

But for this last exception, no trace is found either in the United States or in the United Kingdom of any reduction in social inequality in respect of death; moreover, this inequality seems to have clearly worsened in France, where the method of observation is the most reliable.

As for infant mortality, the possible future trend can be determined by comparing the current spread of life

²¹ For France, see "Evolution récente de la mortalité en France", to be published in *Population*.

²² The terms "poor" and "rich" are used here only figuratively, because income is by no means the only variable concerned.

TABLE 10 A. UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND: LIFE EXPECTANCY BY SOCIO-ECONOMIC GROUP, COMPARED WITH THE NATIONAL TREND IN THE SAME INDEX SINCE 1930

Socio-economic group	Life expectancy at age 15	Nationwide trend	
		Years	Life expectancy at age 15
Farmers: own-account	58.6	1931-1935	51.5
Professional workers: self-employed	58.1	1936-1940	51.9
Foremen and supervisors: non-manual ..	58.0	1941-1945	53.4
Own-account workers	57.5	1946-1950	54.4
Foremen and supervisors: manual	57.4	1951-1955	54.8
Artists and ancillary workers	57.3	1956-1960	55.3
Professional workers: employees	57.0	1959-1961	55.3
Employers in industry etc.	56.2	1961-1963	55.2
Junior non-manual workers	55.7	1963-1965	55.4
Farmers: employers and managers	55.7	1966-1968	55.6
Agricultural workers	55.7	1967-1969	55.6
Skilled manual workers	55.3	1968-1970	55.5
Semi-skilled manual workers	55.0	1969-1971	55.6
Personal service workers	53.9	1970-1972	55.7
Unskilled manual workers	53.3	1972-1974	56.0
Members of armed forces	50.4	1973-1975	56.2

Sources: For life expectancy by socio-economic group, Office of Population Censuses and Surveys, *Occupational Mortality 1970-72, Decennial Supplement*, DS Series No. 1 (London, Her Majesty's Stationery Office, 1978); for the national trend, 1931-1935 to 1956-1960, Chester Beatty Research Institute, *Serial Abridged Life Tables* (London, 1962); for the national trend, 1959-1961 to 1973-1975, Office of Population Censuses and Surveys.

expectancy by social category with the nationwide trend in the same index over the last 50 years or so. Here only France and the United Kingdom will be considered as insufficient data are available for the United States.²³

In England and Wales (table 10 A), life expectancy at age 15 ranges from 53.3 years²⁴ for unskilled workers to 58.6 years for farmers (own-account), while the national average rose from 51.5 years in 1931-1935 to 56.2 years in 1973-1975 as a result of a fairly rapid increase up to the end of the 1950s, which has since given way to a much slower advance (figure III).

The most optimistic extrapolation of the curve offers no hope that the national average will in the near future reach the level of the professions or farmers (own account) in 1970-1972 (if it ever does reach that level).

In France (table 10 B and figure IV) even less progress is being made. The gap observed (for the period 1954 to 1971) between "unskilled workers" and "teachers" amounts to eight years (32.9 years as against 40.9). This corresponds to roughly 80 years of progress, because we have to go back to the late nineteenth century to find a life expectancy at 35 years, which is eight years less than the current national average.

Since the end of the Second World War, the national average has increased by only two years. To put the country as a whole in an average situation equivalent to that enjoyed by teachers in 1954-1970, would require

²³ Only the classification by level of education is really valid in the 1960 survey by the National Center for Health Statistics, but it does not provide sufficient detail about the privileged groups (those who attended college).

²⁴ It is advisable to eliminate as too specific the category of "armed forces", for which life expectancy at age 15 is only 50.4 years.

Figure III. England and Wales: life expectancy at age 15 years, by socio-economic group (or social class), compared with the national trend in the same index since 1930 (I-V=social classes)

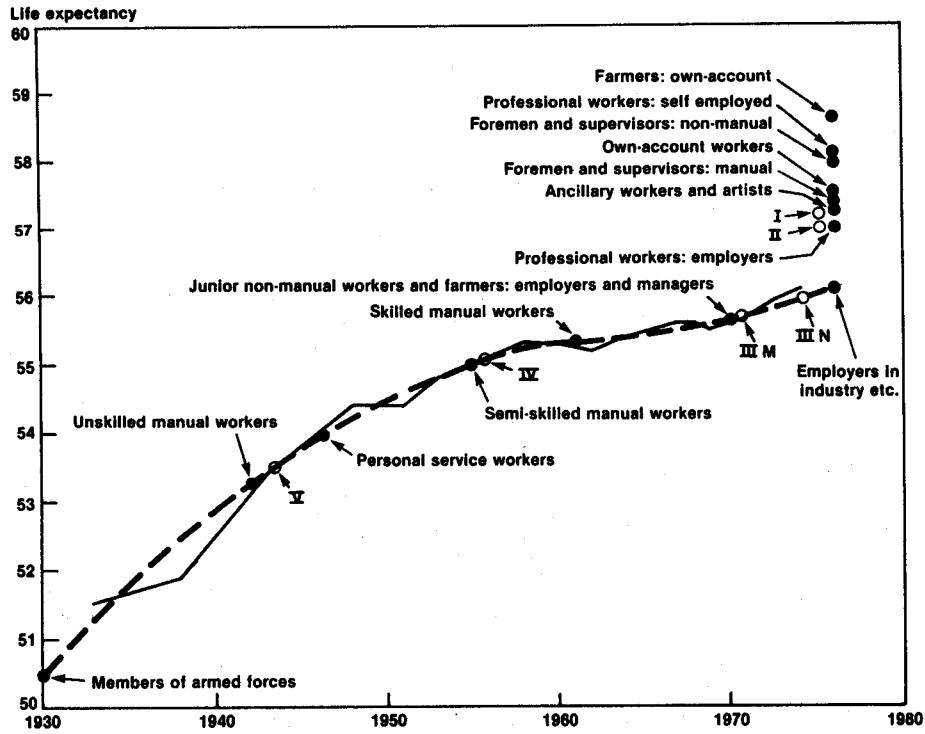


Figure IV. France: life expectancy at age 35 years, by socio-occupational group, compared with the national trend in the same index since 1930

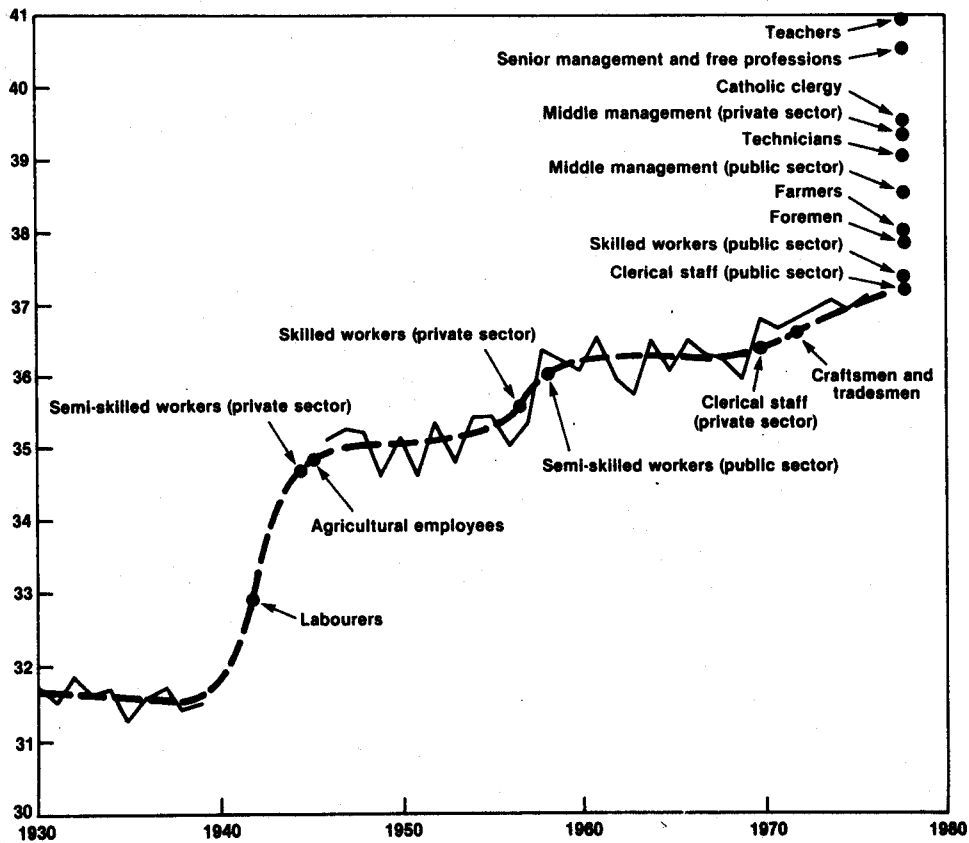


TABLE 10 B. FRANCE: LIFE-EXPECTANCY BY SOCIO-OCCUPATIONAL CATEGORY COMPARED WITH THE NATIONAL TREND IN THE SAME INDEX SINCE 1930

Socio-occupational category	Life expectancy at age 35	National trend	
		Year	Life expectancy at age 35
Teachers	40.9	1930	31.7
Senior management and professions	40.5	1931	31.5
Catholic clergy	39.5	1932	31.8
Lower management (public sector)	39.3	1933	31.6
Technicians	39.0	1934	31.7
Lower management (private sector)	38.5	1935	31.3
Farmers	38.0	1936	31.6
Foremen	37.8	1937	31.7
Skilled workers (public sector)	37.3	1938	31.4
Clerical staff (public sector)	37.2	1939	31.5
Craftsmen and tradesmen	36.6	(1940)	(28.2)
Clerical staff (private sector)	36.4	(1941)	(30.4)
Semi-skilled workers (public sector)	36.0	(1942)	(31.0)
Skilled workers (private sector)	35.6	(1943)	(31.1)
Farm workers	34.8	(1944)	(28.0)
Semi-skilled workers (private sector)	34.7	(1945)	(32.6)
Unskilled workers	32.9	1946	35.1
France as a whole	36.1	1947	35.2
		1948	35.2
		1949	34.6
		1950	35.1
		1951	34.6
		1952	35.3
		1953	34.8
		1954	35.4
		1955	35.4
		1956	35.0
		1957	35.3
		1958	36.3
		1959	36.2
		1960	36.1
		1961	36.5
		1962	35.9
		1963	35.7
		1964	36.4
		1965	36.0
		1966	36.5
		1967	36.3
		1968	36.2
		1969	35.9
		1970	36.8
		1971	36.6
		1972	36.8
		1973	36.9
		1974	37.0
		1975	36.9
		1976	37.1

Source: For life expectancy by socio-occupational category, Guy Desplanques, *La Mortalité des adultes suivant le milieu social, 1955-71 les Colloques de l'INSEE, Series D, No. 44* (Paris, Institut national de la statistique et des études économiques, 1978).

double this increase. Assuming that progress can be made at the pace maintained since 1946, this would take about 50 years. Even so, it does not seem realistic to hope for any such achievement.

On the basis of mortality for 1974, we present below the gains in life expectancy at age 35 that would be

obtained for males if the following causes of death could be completely eliminated:²⁵

Hereditary or congenital causes	0.10 years
Infectious diseases	0.79 years
Tumours	3.59 years
Malnutrition, allergies, immunological disorders	0.97 years
Accidents	0.93 years
Suicides	0.33 years
Degenerative processes	7.24 years

Apart from degenerative processes, which are unlikely ever to be eliminated, only the disappearance of cancer would provide a decisive increase. It should also be emphasized that its disappearance would also benefit the most privileged social groups and would be insufficient to bridge the gap separating them from unskilled workers. This gap can only be bridged if the degenerative processes are tackled effectively. Can there be any reasonable hope of rapid success in this area? Moreover, if different living conditions lead to different degenerative processes, can we hope to eradicate such differences without calling in question the very structure of society?

AN ATTEMPT TO EXPLAIN SOCIAL INEQUALITY IN RESPECT OF DEATH

Social inequality, in so far as death is concerned, does not yield readily to improvements in the health services and is, indeed, deeply rooted in the social structures themselves. In order to have a clearer understanding of the reasons for this, the first step is to consider the medical causes of the inequality. It will then be possible to identify the determinants of differentiation more readily and to ascertain whether these determinants can be scaled down by the distortions between true and felt morbidity that are imposed by the social structure.

The following analysis is mainly based on French data.

The medical causes of death

For the sake of convenience we shall limit ourselves to a comparison of the situation of "unskilled workers" with that of "senior management and professions", as shown in the results of the INSEE survey.²⁶

These results, which cover three adult age groups and eight groups of causes of death,²⁷ reveal excess

²⁵ This list is based on the aetiological classification of causes of death put forward in Jacques Vallin and André Nizard, "Les causes de décès en France, I. Pour une typologie simple et homogène; application à la période 1968-74," *Population*, 1978, No. 3. The figures given will shortly be published by the same authors.

²⁶ Guy Desplanques, *La Mortalité des adultes suivant le milieu social, 1955-71, Les Colloques de l'INSEE, Series D, No. 44* (Paris, Institut national de la statistique et des études économiques, 1976).

²⁷ Corresponding to the following headings in the detailed list of the eighth revision of the International Classification of Diseases: 40-45—cardiovascular diseases; 20-27—cancer; 72—suicides; 70—traffic accidents; 71—other accidents; 04-06—tuberculosis; 34-52—alcoholism and cirrhosis of the liver; all other code numbers—other causes and ill-defined causes.

TABLE 11. FRANCE: ANNUAL PROBABILITY OF DEATH FOR MALES BY AGE GROUP AND CAUSE OF DEATH FOR SENIOR MANAGERS AND UNSKILLED WORKERS, 1966-1971 (Per 100,000)

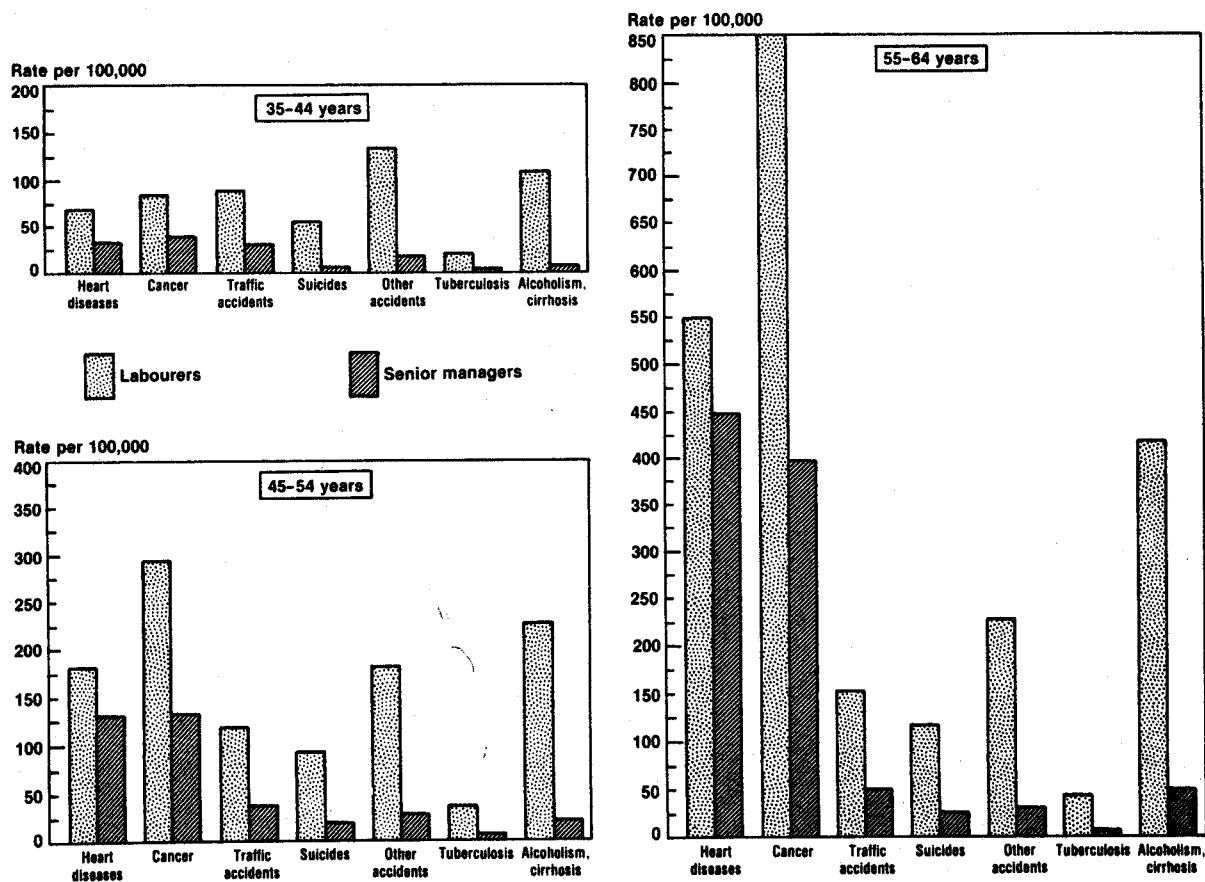
Age group/ category	Cause of death								Total for all causes
	Cardio-vascular diseases	Cancer	Suicides	Traffic accidents	Other accidents	Tuberculosis	Alcoholism and cirrhosis of the liver	Other causes and undeter- mined causes	
35-44 years:									
Unskilled workers (1)	59.2	76.1	55.4	76.8	136.5	18.8	113.1	146.0	681.9
Senior management (2) and professions	31.0	36.4	9.2	31.1	20.4	1.2	5.0	34.7	169.0
Ratio of (1) to (2)	1.91	2.10	6.02	2.48	6.74	15.7	22.6	4.2	4.0
45-54 years:									
Unskilled workers (1)	183.6	291.9	93.7	112.2	178.3	36.7	227.2	319.3	1 442.9
Senior management (2) and professions	132.3	127.1	18.7	34.8	31.5	3.9	20.8	106.8	475.9
Ratio of (1) to (2)	1.39	2.30	5.01	3.29	5.59	9.41	10.90	2.99	3.03
55-64 years:									
Unskilled workers (1)	548.7	844.6	111.9	139.8	219.2	70.4	418.3	685.2	3 038.1
Senior management (2) and professions	448.4	407.6	21.7	44.5	34.4	8.3	46.4	321.7	1 333.0
Ratio of (1) to (2)	1.22	2.07	5.16	3.06	6.21	8.49	9.02	2.13	2.28

mortality for unskilled workers at all ages and for all causes, although there are very wide variations in degree.

As the different causes of death make varying contributions to total mortality, their role in the excess mortality of unskilled workers is complicated, depending both on their susceptibility to social inequality and on their specific weighting.

Some causes are responsible for extreme excess mortality. At 35-44 years, for example, the risk of mortality from alcoholism and cirrhosis of the liver is 22 times as great for unskilled workers as for senior management, and in the case of tuberculosis the risk is 16 times as great. The ratio between the probabilities of death for these two causes is still around 10 at 45-54 years and 55-64 years (table 11 and figure V):

Figure V. France: probability of death, by age group and cause of death, for labourers and senior managers, 1966-1971



The example of tuberculosis is revealing. Despite the resources used and the degree of success achieved in the control of this disease, the prevention and treatment of which have become simple matters, it is still a disease of the poor, just as it was in the nineteenth century. This anachronism is proof that, even with effective medical services, there is still glaring social inequality in respect of death. Perhaps we should say "even because of the effectiveness of medical services" because it is for the most "avoidable" causes that excess mortality is highest.

However, because of the small contribution which tuberculosis makes today to total mortality, the excess mortality it causes is not really decisive.

Alcoholism and cirrhosis of the liver and accidents other than traffic accidents, which have a lower but still very pronounced excess mortality, have a decisive influence, especially at 35-44 years, when all other causes are of less importance. This should not be surprising, because these are two groups of essentially social problems. Alcoholism, one of the greatest burdens on French society, almost exclusively affects the poorest social categories. As for accidents other than transport accidents, at these ages they are almost always occupational accidents, and here again it is the least privileged social categories that bear the brunt.

Suicides are also very susceptible to social inequality. Unskilled workers, at all ages, make six times as many suicide attempts as senior managers.

It might be imagined that traffic accidents would be more common among the privileged categories, which are more likely to own a car. On the contrary, at all ages such accidents cause from two to three times as many deaths among unskilled workers as among senior managers.

None of these categories—accidents, suicides, alcoholism and tuberculosis—can be avoided simply by advances in medicine. Medicine may be able to delay the consequences or lessen their severity, but the origin of these conditions lies essentially in the organization of society itself and in the individual or group behaviour that society produces or fails to prevent.

The last two groups of causes of death—heart disease and cancer—are less discriminating by social category and contribute only slightly to total excess mortality at 35-44 years. However, when their weight increases with age (or even becomes predominant at 55-64 years) their relatively low excess mortality weighs very heavily in the balance of total excess mortality. Moreover, it is somewhat paradoxical to refer to low excess mortality when the risk of death from cancer is known to be twice as great for an unskilled worker as for a senior manager. It is only by contrast with other conditions that this excess risk can be regarded as low.

Excess mortality in the less privileged social categories is therefore due either to genuinely social diseases, the elimination of which depends not on advances in medicine but solely on the modification of social structures and behaviour (these diseases, virtually negligible in the mortality of the privileged

categories, are highly discriminating and at some ages may dominate the mortality of the under-privileged categories) or to diseases that make a very large contribution to total mortality, whatever the social stratum, and which, although less discriminating, account for a substantial proportion of the excess mortality in the least privileged groups at advanced ages.

Determinants of differentiation

Selection

One of the initial determinants of differentiation is the selection process. Less healthy individuals are less likely than others to marry, to migrate, to obtain qualifications etc., and for this reason alone, bachelors, people living in unfavourable geographical areas, those engaged in unskilled occupations and others have higher mortality rates.

The situation may even be deliberately accentuated by legislation or social practices. On the pattern of the civil service regulations, which require every civil servant to meet minimum physical fitness requirements and to undergo a medical examination on recruitment, many companies take health into consideration when selecting new employees.

Selection may magnify social inequality in respect of death or even create inequality where none existed before. (For example, there may no longer seem any reason to look for other causes of mortality differentials between public-sector and private sector employees.) Care should be taken, however, not to attach undue importance to the selection process. It may, in fact, reduce or even conceal social inequality in respect of death. Some high-risk occupations, for example, actually require strength and good physical health and individuals who practise those occupations may have below-average mortality. On the other hand, selection is by no means the only determinant of differentiation.

Status

Membership of a particular social category, possession of a particular status (occupational, marital), residence in a particular area and other factors may have direct or indirect effects on mortality. The direct influence is very pronounced in the case of occupational accidents or diseases.

The consequences may be immediate (fatal accidents) or delayed, as in the case of occupational diseases. In the latter case they supplement the other causes of premature aging of the organism.

In general, this aging is closely linked to conditions of work. The physical environment (lighting, temperature, noise), the job (rhythm of work, apportionment of tasks etc.), the length of the working week (ranging from three hours for university professors to 56 hours or more for some building workers or tradesmen) and the time of work (day or night, regular or irregular weekly resting pattern) are further factors which add to

the arduousness of work and have very different effects on workers' health. In many cases it is the more arduous jobs that are carried out under the worst conditions.

Membership of a particular socio-occupational group also has indirect effects *via* the behaviour which it induces. Alcoholism is only one particular aspect of a very general phenomenon, which we shall consider later: the attitude towards health and disease, man's relationship to his own body.

Change in status

Change in status is a third determinant of differentiation. Not only does a move from one status to another tend to be accompanied by a change from the mortality pattern of the previous status to that of the new status (although any debit already built up can scarcely be entirely eliminated), but changes in status can in themselves also play an additional role.

For example, loss of employment may be followed by greater disruption than would be expected from the simple change in status from employed to unemployed. More generally, the feeling of success or failure in an individual career (true or only felt), can have some influence on mortality conditions. These phenomena have been given very little study and should be explored further.

The individual who is selected, who is subject to the conditions associated with his status, and who is possibly undergoing a change in status, is very unevenly exposed to the risk of death according to his social category; this category also leads to basically different forms of behaviour, which in turn aggravate the inequality.

*True morbidity and felt morbidity*²⁸

According to recent surveys carried out by the French Consumer Research and Documentation Centre (CREDOC), the more privileged the social category, the higher and more sophisticated the medical consumption. At the same time, variations in medical consumption follow a similar pattern to variations in notified morbidity.²⁹ The latter, which can be assimilated to "felt morbidity", is of course simply a distorted reflection of true morbidity, which only a thorough medical examination could detect with any degree of objectivity. The effect of the filter of awareness is that felt morbidity, as a function of socio-occupational category, varies inversely with true morbidity. If mortality is taken as an indicator of true morbidity, it is found that the higher the individual's socio-occupational category, the more true morbidity and mortality decline and the more felt morbidity, and hence medical consumption, increase.

²⁸ This section is largely based on the work of P. Surault, *L'Inégalité devant la mort: analyse socio-économique de ses déterminants* (Paris, Economica, 1979).

²⁹ M. Magdelaine, A. Mizrahi and G. Rösh, "Un indicateur de la morbidité appliqué aux données d'une enquête sur la consommation médicale", *Consommation*, No. 2 (1967), p. 14.

Even with equal morbidity, and assuming the direct effects of selection and social status to be zero, social status would lead to a difference in mortality simply as a result of the gap between true morbidity and felt morbidity.

A morbid condition may or may not be perceived, depending on the culture and education given by the group. When perceived, it may be played down or exaggerated according to the importance assigned to it by the group.

So, disease, which does not really start until the patient behaves as a patient, does not depend only on people's perception of it but also on the behaviour associated with it. The symptoms (pain, malaise, temperature) may be perceived as morbid signs. They do not become a disease until the patient begins to treat himself and, even more, to reduce or discontinue his activity, thus modifying his behaviour as a social being.

These behavioural features differ sharply from one social group to another. In the least privileged categories the perception of the symptoms and of their organization into a disease comes later. Because of this the disease is all the more feared and keenly felt, on the pattern of the sudden unforeseeable accident. In the most privileged social categories, on the other hand, the symptoms are perceived very early and are also tackled very quickly by the most appropriate possible treatment. Disease is regarded as a gradual deterioration in health status, which must be prevented or halted as soon as possible.

As P. Surault indicated, there are two essential routes whereby the differences in behaviour with regard to disease take shape: the tendency to talk about the body and role attributed to the body.

In western civilization, because of the prevailing pre-conceptions, utterances about the body have long been the monopoly of the physician. Consequently, such utterances are governed by a "learned" language, which requires an extensive and precise vocabulary. This language is needed for identifying and understanding sensations related to ill-health. Admittedly, people have increasing opportunities to learn from popular articles or books or from television programmes, but the chief interpreter is still the physician.

The dialogue between physician and patient for many reasons mainly benefits the most privileged categories. Not only do frequent consultations and a shared cultural level make it easier but, paradoxically, the physician uses simpler language with patients in the most privileged social categories, who accept that medicine may be fallible and are more ready to accept the scientific legitimacy of the doctor's treatment, even in the event of failure.

The least privileged classes are therefore the classes least able to improve their medical knowledge and to learn to identify promptly any sensations of ill-health.

They are also influenced by the role assigned to the body in their own culture. Depending on the social category, this role differs fundamentally in all areas: strength, beauty, nutrition, sexuality, health. Many

psychosocial surveys show that the attitude towards slimming diets, the properties attributed to alcohol or red wine, the practice of sports etc. change completely with social category.

Furthermore, in the least privileged categories the body is above all a tool, something to be used for work. So when, after being denied and rejected, the disease eventually has to be acknowledged, it will be seen as a catastrophe. The risk of aggravation and a fatal outcome, already increased by the lateness in seeking treatment, will be strengthened by the psychological consequences of the significance attached to the disease.

CONCLUSION

Expressing the view that was most widespread at the time, Léon Tabah wrote in 1950: "We can already catch a glimpse of a time when high economic power will no longer be a marked advantage from the viewpoint of mortality in the highly developed countries. The social mortality which appeared with the industrial era seems to be fading, and soon the differences in mortality will once again reflect only the natural differences between individuals."³⁰

Admittedly at that time the spectacular progress achieved through antibiotics encouraged the belief that health was merely a matter of medicine, while the extension of social security systems to the entire population suggested a socialization of health services whereby everyone would be able to benefit fully and equally from the advances in medicine.

Thirty years have passed and we must bow to the facts. Life expectancy has lengthened (although less than anticipated), but the social differences remain. Wherever they can be measured, they remain equal in size to the differences that existed at the start of the century. The most reliable survey, carried out in France by INSEE, even reveals some deterioration during the 1960s.

The differences are by no means attributable to the state of medical science. The removal of the most discriminating causes of death (alcoholism, accidents, suicides, tuberculosis etc.) requires no further scientific progress but rather a thorough change in living condi-

³⁰ "La mortalité sociale, enquête nouvelle en Angleterre," *Population*, 1950, No. 1, p. 77.

tions and behaviour. The reduction of the excess mortality of the poorer classes from other causes (cancer, cardiovascular diseases, etc.) again calls more for a thorough cultural transformation of the least privileged social categories rather than for the discovery of new therapies or increased expenditure on hospitals.

Certainly the development of health services has a substantial effect on the trends in mortality at both ends of life. We have seen that if the social differences in infant mortality cannot be eliminated, they can at least be reduced, because the child is to some extent taken out of his social environment and his survival depends largely on the quality of the hospital services. Probably much the same could be said for very old people, for whom substantial progress has in fact been recorded in recent years.

The situation regarding adult mortality is quite different. True morbidity is already very unequal (selection, differential risks) and the social categories behave in basically different ways, which, while aggravating the real inequalities, produce a felt morbidity that is inversely proportional to true mortality and lead to more prompt and frequent use of medical care among the social categories where true mortality is lowest.

For example, at the age of 35, teachers and senior managers in France have a life expectancy eight years longer than unskilled workers. This gap is just as great as the gap separating the national average at the present time from that at the end of the nineteenth century.

It must also be pointed out that the least privileged section of the population, immigrant workers, was not covered by the INSEE survey. The difference measured is therefore an underestimate of the true difference.

The gap, which is the result of a vicious circle inherent in the social structures themselves, can only be bridged if the very foundations of modern societies are called into question.

Inequality in respect of death is only one dimension of social inequality. It was an illusion to imagine that the one could be eliminated without the other. Today that illusion has been destroyed. That does not mean that the present situation must be accepted. Inequality in respect of death is still one of the most disgraceful consequences of social inequality. Its disappearance must remain our aim. Obviously, however, this aim cannot be achieved by the health services alone.

IMPLICATIONS OF SOCIO-ECONOMIC DIFFERENTIALS IN MORTALITY FOR THE HEALTH SYSTEM¹

Aaron Antonovsky*

SUMMARY

The paper starts from the premise that a systematic, continuous monitoring system is needed to assemble data on the social indicator "socio-economic differentials in mortality". Five particular types of data are noted: secular trends, class differentials and age, linearity *versus* dichotomy, cross-cutting variables, and downward mobility and biological selection.

Two fundamental questions are then discussed: (a) Does the health care system really have any relevance to mortality differentials? (b) Can a health care system have any degree of meaningful autonomy from the overall social system? These questions are both answered with a cautious, qualified "yes".

The policy implications of the foregoing analysis are examined in terms of the value content of medical education, the organization of the health care system, the emphasis on health, and the focus on the community, and implications for resource allocation. In the final section, the concepts of control and power are analyzed as the key to socio-economic differentials. The emphasis on differential exposure to "stressors" is rejected in favour of what is called "a sense of coherence", a global orientation which emerges (or, among lower classes, does not emerge) against the background of a high level of generalized resistance resources. The fundamental problem, then, is that the constricted, emergency, powerless and unpredictable character of lower social class existence prevents lower-class persons and groups from being able to cope with stressors. The final issue posed is: How can the health care system strengthen the sense of coherence of the lower classes?

INTRODUCTION

Cochrane, one of the authors of the well-known Bristol study of home treatment versus treatment in intensive care units of patients suffering from heart attacks, tells the instructive story of his first report to the cardiologists who had reluctantly agreed to the study. Prematurely pressed to report results, he circulated a table, before the meeting had started, showing more home than hospital deaths after six months. As can be imagined, there was an immediate demand to halt the study. The data had, however, been intentionally reversed. There is no way of knowing whether the cardiologists who "knew" that coronary care units marked a major step forward, and hence needed no randomized controlled trials, were led by this experience to become somewhat more open in their thinking. The fact of the matter is that, as far as this

author knows, policy decisions continue to be made in favour of coronary care units without any evidence one way or the other.

If one is to be scientific, and base policy recommendations on solid data (as well as specifying value assumptions), a review of the data must be taken as a starting point. Unfortunately, such data are scarce. There has, it would seem, been so much enthusiasm about the truly remarkable reduction in mortality in the twentieth century that there is a tendency to assume that, as mortality goes down, so do socio-economic differentials in mortality. A quite different assumption—that such differentials have been well-established—leads to the same conclusion: there is no need to assemble data systematically. A rather intensive search of *Index Medicus* and other sources since 1972 turned up almost no material beyond a few studies presenting data largely for the United States of America.²

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¹ This article intentionally focuses on the data and issues that are most pertinent to industrialized countries.

² Reference to the data contained in the decennial supplement on occupational mortality published by the United Kingdom Office of Population Censuses and Surveys will show a good deal of consistency between the present analysis and the conclusions reached there. Other data have been gathered, but unfortunately they have been circulated in unpublished form and are not readily available.

A first policy recommendation would be to urge the establishment of a systematic, continuous monitoring programme to assemble appropriate data. Facts, however, are not data. They only become such when they are gathered with clear questions in mind. The purpose of the first section of this paper is to propose five central issues; data relating to these are essential to intelligent policy formulation.

There are also serious methodological problems in definition and measurement. Policy based on poor data may do more damage than action based on no data. But we are sometimes witness to interminable methodological quibbling, which, seeking the best, prevents attainment of the reasonable, if not the good.

Secular trends

Since the purpose of the present paper is not to present and analyse the existent data, it would not be appropriate to review an earlier paper by this author.³ It was there that the question of secular trends in class differentials in mortality was raised. It was suggested that, referring primarily to western countries, "class differences prior to the eighteenth century were relatively limited". Thereafter, class differences began to emerge, reaching a very sizable magnitude in the second half of the nineteenth century, a trend which was reversed thereafter. This narrowing of the gap, however, may well have been checked by the 1940s, by which time, very crudely, an excess mortality of some 30 to 40 per cent was found among the lowest when compared with the highest class.

A later study by the writer, on social class and the major cardiovascular diseases,⁴ suggested the plausibility of an "increasing emergence of an inverse gradient, at least with regard to (heart disease) mortality". Given the increasing role of heart disease in overall mortality, this suggests the possibility of a reversal of the trend towards a closing of the gap.

That this speculation was not entirely unwarranted is suggested by a few pieces of evidence. Lerner and Stutz (1977) compared the overall age-adjusted mortality rates of the 10 states with the highest and the 10 states with the lowest *per capita* income in the United States in 1959-1961 and 1969-1971. They found that, whereas in the former years the low-income states had an excess mortality of 5.0 per cent, a decade later this had risen to 9.6 per cent. Similar increases in "wasted deaths" were found by Yeracaris and Kim (1978), in a study of three suburban and central city pairings of United States census tracts. In 1960, the lower-class central city tracts in Birmingham, Alabama, had a mortality excess of 5.67 per cent; by 1970 this had risen to 10.26 per cent. The parallel figures for Buffalo were 8.5 and 15.25 per cent, and for Indianapolis, 19.49 and 22.73 per cent. It

³ Aaron Antonovsky, "Social class, life expectancy and overall mortality", first published in *Milbank Memorial Fund Quarterly*, vol. 45, 1967, pp. 31-73; reprinted in E. G. Jaco, ed., *Patients, Physicians and Illness*, 2nd ed. (New York, Free Press, 1972).

⁴ See *Journal of Chronic Diseases*, vol. 21, 1968, pp. 65-106.

should be noted that both these studies are ecological rather than individual, a technique which, though useful, tends to obscure class differences.

A similar pattern is shown in data from Scotland⁵ in a different area. In 1939, the stillbirth ratio between class I (highest) and class V (lowest) was 100:125; by 1963 it had climbed to 100:232. The parallel figures for neonatal mortality were 100:154 and 100:235. As stillbirths and first-week mortality come to make up an increasingly larger component of infant loss (perinatal plus postnatal mortality), one can anticipate the possibility of growing class differences. Comparative data from 1952-1954 and 1961-1962 from Holland⁶ show a similar picture. The ratios for first-week mortality of classes I:V were 100:120 in the earlier years; in the later years they were 100:133. While these data refer to developed countries, which have reached low rates of infant loss, the trend certainly has implications for the developing societies.

In a very recent paper, Stockwell, Wicks and Adamchak arrive at a very similar conclusion, with respect to the United States. "The evidence from our work to date suggests that there has indeed been a major shift away from what appeared 10 to 15 years ago to be a weakening association back to a clearcut and very pronounced inverse relationship."⁷ Thus, they cite data on the age-standardized annual death rates in Chicago from 1930 to 1960. The male class V:I ratio had been 1.62 in 1930, had fallen to 1.51 in 1940, but had risen to 1.68 in 1950 and 1.67 in 1960. An early review of their own data on infant mortality in Ohio metropolitan areas leads them to conclude that "the relationship of socio-economic status to total infant mortality was more pronounced in 1970 than in 1950 for all three socioeconomic indicators".⁸

The point here has not been to demonstrate that socio-economic differentials in mortality have begun to increase in recent decades in western countries. It has, rather, been to challenge the assumption that secular trends are invariably linear. Once we begin to appreciate this, two things can happen. First, we become alerted to the continuing need to obtain sound data. Secondly, changes in trend suggest clues for the identification of causal factors and hence, in turn, provide directions for policy formation. The latter issue will be considered subsequently.

Class differentials and age

The days are gone, it is to be hoped, when social class mortality comparisons were presented without age

⁵ C. A. Douglas, "Infant and perinatal mortality in Scotland", *Vital and Health Statistics*, Series 3, No. 5 (Rockville, Maryland, United States Department of Health, Education and Welfare, 1966).

⁶ J. H. De Haas-Posthuma and J. H. De Haas, "Infant loss in the Netherlands", *Vital Health and Statistics*, Series 3, No. 11 (Rockville, Maryland, United States Department of Health, Education and Welfare, 1968).

⁷ E. G. Stockwell, J. W. Wicks and D. J. Adamchak, "Research needed on socioeconomic differentials in U.S. mortality", *Public Health Reports*, vol. 93, 1978, p. 671.

⁸ *Ibid.*, p. 670.

standardization. Unfortunately, however, standardization often obscures crucial elements of the picture, which emerge when age-specific data are considered. In his 1967 study of overall mortality, this writer wrote:

"The data reviewed lead to a further conclusion. With amazing consistency, the class differentials are largest in the middle years of life. This is no less true in the latest than in the earliest studies. Over and over again, the greatest gap is found in young and middle adulthood. The predominant pattern characterizing class differentials by age is that in which class differences are moderately high in the younger ages, rise to a peak at ages 30 to 44, begin to decline at that point and tend to disappear beyond age 65."⁹

This pattern was attributed to a general assumption that biological factors play a more decisive role than do sociocultural and psychological factors in earlier and later life, whereas in the middle years of life there is more room, as it were, for variables related to social class differences to emerge. A second look at the data, however, and particularly some of the more recent data, sharpens this general consideration. There seems to be some evidence, as can be seen in the table opposite, to suggest that the greatest class mortality differences are found in the age group, among males, from 25 to 34, rather than through all the middle years of life.

This raises two possibilities, which are not necessarily incompatible. First, it may be that this is the stage in the life-cycle when class differences in factors related to mortality, for example, accidents, work-role strains and frustrations, unemployment and financial difficulties, are greatest. Secondly—and this is a consideration which escaped in the earlier discussion—we may be witness to a cohort phenomenon. That population group, which was aged 25 to 34 in 1960, has had different historical experiences from the group aged 25 to 34 in 1970. The former were born and raised in the depths of the depression in the western world and, when they were adolescents, by and large their fathers were involved in the Second World War, while their mothers bore the brunt of raising a family. Social class differences may have been sharper in this cohort than in other cohorts.

The point here is not to argue the substantive case, but to suggest that, without adequate data and understanding of the data, policy formulation will inevitably be hindered.

It will be noticed that the data presented in this section refer exclusively to males. The scarcely adequate data on social class that do exist largely refer to males. Yet sex is no less a significant variable in the consideration of socioeconomic differentials in mortality. In recent years, increasing attention has been paid to sex differences in mortality (Waldron, 1976), but it is difficult to think of a work which, while focusing on class differences, pays serious attention to the differential

life experiences and life chances of men and women in different social classes.¹⁰

Lowest to highest socio-economic strata, age-specific mortality ratios, males, selected studies

Grouping (by study)	Age (years)	Ratio	
California, 1949-1951 ^a	20-34	2.95	
	35-44	2.48	
	45-54	1.57	
	55-59	1.16	
	60-64	1.13	
United States of America, white males, 1950 ^b	20-24	2.79	
	25-34	2.92	
	35-44	2.26	
	45-54	1.53	
	55-64	1.16	
United States of America, white males, 1950 ^c	25-29	2.33	
	30-34	2.40	
	35-44	2.03	
	45-54	1.54	
	55-59	1.26	
United States of America, males, 1950 ^d	20-24	2.89	
	25-34	2.91	
	35-44	2.24	
	45-54	1.53	
	55-64	1.16	
England and Wales, males, 1959-1963 ^b	20-24	2.53	
	25-34	2.48	
	35-44	2.62	
	45-54	2.08	
	55-64	1.72	
United States of America, low-income and high-income states ^e			1960
	25-34	1.42	1.40
	35-44	1.28	1.25
	45-54	1.10	1.19
United States of America, males, 1962-1963 ^f			1970
	25-34	1.05	1.10
	45-54	1.05	1.10
	55-64	1.05	1.10

^a Data derived from L. Breslow and P. Buell, "Mortality from coronary heart disease and physical activity of work in California", *Journal of Chronic Diseases*, No. 11 (1960).

^b Data derived from Metropolitan Life Insurance Company, "Socio-economic mortality differentials", *Statistical Bulletin*, No. 56 (January 1965), pp. 2-5.

^c Data derived from L. Guralnick, "Mortality by occupation and industry among men 20 to 64 years of age, U.S., 1950", *Vital Statistics, Special Reports*, Nos. 53, 59, 61 and 84-86.

^d Data derived from L. Guralnick, "Socio-economic differences in mortality by cause of death: United States, 1950, and England and Wales, 1949-1953", in *International Population Conference, Ottawa, 1963* (Liège, International Union for the Scientific Study of Population, 1964).

^e Data derived from M. Lerner and R. N. Stutz, "Have we narrowed the gaps between the poor and the nonpoor?" Part II, "Narrowing the gaps 1959-61 and 1969-71: mortality", *Medical Care*, No. 15 (1977), pp. 620-635.

^f Data derived from National Center for Health Statistics, "Socio-economic characteristics of deceased persons: United States, 1962-1963 deaths", *Vital and Health Statistics, Series 22*, No. 9 (Rockville, Maryland, United States Department of Health, Education and Welfare, 1972).

¹⁰ For a very recent study dealing with social class by marital status and sex, see M. Koskenvuo, S. Sarna and J. Kaprio, "Mortality by marital status and social class in Finland during 1969-1971", *Scandinavian Journal of Social Medicine*, No. 6 (1978), pp. 137-143.

⁹ Antonovsky, "Social class, life expectancy and overall mortality . . ."

Linearity or dichotomy?

The data would seem to suggest that whereas, in earlier years, socio-economic differentials in mortality showed a fairly smooth gradient, by the second half of the century, in the western world, the only really striking difference was between the lower class and the rest of the population. This seems to be true whatever conceptualization and index of social class is used. There is certainly enough evidence to warrant the rejection of any classification scheme so broad (for example, blue-collar workers, or less than university education) as to make it impossible to specify the mortality rates of the lowest stratum of the population. This is not to argue that for other purposes of social research an alternative classification may not be useful; but for the purpose of studying mortality, it is imperative to identify that segment of the population whose conditions of life are substantially different—so much so that one may speak of qualitative differences—from adjacent strata.

It is beyond the scope of this paper to analyse fully the hallmarks of the life-chances and life-styles of the lower class in western societies as they relate to health fate. Kosa, Antonovsky and Zola¹¹ have done so elsewhere. There are, however, two particular fundamental themes which are of major import in the present context. First, lower-class people live a life of emergencies. No planning is possible, not so much because of a cultural block but because the physical and social environment in which they live continually presents contingencies which cannot be foreseen. The roof begins to leak; one is fired from a temporary job; the grocer refuses to extend more credit; one's daughter becomes pregnant; the cooking pot falls over, scalding the baby. Energies are exhausted in simply trying to keep one's head above water.

Intimately related to this characteristic is the both objective and subjective phenomenon of powerlessness. Emergencies occur at all class levels, though the incidences may differ. Lower-class people, however, simply have far fewer resources—material, intellectual, physical, social or psychological—to cope with these emergencies, or, for that matter, with the normal life crises inherent in human existence (see the section below on control and power).

If our concern is with overall mortality, then it may well be that a dichotomous classification of socio-economic status is adequate for purposes of policy formation, although it is certainly premature to conclude that this is the case, and that a linearity model is no longer needed. Further, as suggested above, even if the trend over recent decades has been to blur class differences beyond the dichotomy, there is no reason to assume that this trend will not be reversed. If, however, our concern is with cause-specific mortality, such a dichotomy might well be highly misleading. Thus, for example, there seems to be some evidence that mortal-

ity from cardiovascular disease is best described as curvilinearly distributed in terms of social class. Other diseases may show different patterns. For these reasons, then, it would be misleading to focus our attention on a model representing the lower classes *versus* all other classes.

Cross-cutting variables

In a sense, this issue has already been dealt with above under "Class differentials and age". Age and sex, like ethnicity, race and area of residence, are variables which affect mortality rates, and cannot be ignored in studying socio-economic differentials in mortality. They have, however, been separated in this presentation because they differ in one important sense. There is no correlation between sex and social class. There is, indeed, generally some relationship between age and class, in that one often finds a considerable number of older persons disproportionately located in the lower class. In so far as the lower class often has a higher fertility rate, the children are also disproportionately poor. One cannot, however, make any prediction from the age of an adult as to his social class.

This is not the case for ethnicity, race and area of residence. In many, if not most, multicultural societies, one can make a prediction that a member of a given ethnic or racial group, or a resident in a given area, is statistically likely to be in a given social class. Having said this, one must immediately add that this is only part of the story. Both social class and minority group membership interact, each contributing to differential mortality. Thus, for example, the whites aged 25-44 in the United States in 1962-63 with an elementary education or less had a death rate 1.8 times higher than those with a college education. The comparable non-white ratio was precisely the same. But the less well educated non-whites had a death rate 2.5 higher than the less well educated whites. The same was true for the college-educated.¹²

The point, then, is that if a strategy is to be developed aimed at equalizing the life-chances of socio-economic groups, one must gain an understanding of the extent to which class differentials are related to factors directly involved in social class and the extent to which they are confounded by other variables.

Downward mobility and biological selection

The final issue in this discussion of inadequate data and understanding is one which, for good reason, we tend to avoid. In former times, there was a tendency among the more fortunate to see the poor as congenitally inferior, in health as in other matters. In the liberal world of today, it is regarded as impolite (and sometimes impolitic) to suggest the possibility that people in

¹¹ J. Kosa, A. Antonovsky and I. K. Zola, *Poverty and Health: a Sociological Analysis* (Cambridge, Massachusetts, Harvard University Press, 1969).

¹² National Center for Health Statistics, "Socioeconomic characteristics of deceased persons, United States: 1962-1963 deaths", *Vital and Health Statistics*, Series 22, No. 9 (Rockville, Maryland, United States Department of Health, Education and Welfare, 1972).

a lower social class start out with a biological handicap. I do not wish to deny the danger of a self-fulfilling prophecy, namely, the assumption that this is the case, leading to the conclusion that there is nothing to be done in the direction of equalization, which in turn would maintain the differential. Such a danger, however, should not blind one to the issue, which is not a fantasy.

The "drift hypothesis", a concept developed in the study of the relationship between social class and mental illness, raises the issue clearly. As Butler and Bonham put it in their study of perinatal mortality,¹³ "The selective reshuffle creates a permanent tendency for class rates to diverge." Thus, for example, the perinatal mortality rates of women born and marrying in social class III in an Aberdeen study was 34; for those born in class III and marrying upward into classes I-II, the rate was 17; for those who moved from class III downward into classes IV-V, the rate was 56. The suggestion is that less healthy people are likely to be downwardly mobile. Their initial handicap is then exacerbated by more difficult environmental conditions. Illness and lower-class status, then, come to perpetuate a vicious cycle.

It would, indeed, be sad were we to become involved in the obsolescent, futile and sterile dispute of environment versus heredity. The question, rather, is that of the interaction between the two.

THE RELEVANCE OF THE HEALTH CARE SYSTEM TO MORTALITY DIFFERENTIALS

The first question in this section is whether what goes on in the delivery of health services in industrialized countries — whatever the care system may be — makes any significant difference in mortality levels. Our starting point will be Illich's thesis that it does indeed make a difference . . . in a negative direction.¹⁴ We will next consider the arguments and data which question any casual correlation, and then turn to those who suggest that it does and can make a contribution under certain conditions. This view, finally, leads to the consideration of the relationship between the health care system and the overall social system.

Health services and health levels

Illich sharply attacks some of the would-be critics of the iatrogenic "institutional structure of the medical-industrial complex", whose proposals only increase "the dependence of people on medical bureaucracies because they deal with health care as a form of therapeutic planning and engineering" (p. 253). He first directs his attack at four major categories of criticism and proposed schools of reform of the current organiza-

tion of health services: consumer control; equalization of access to services; changes in licensing and in modes of financing; and higher scientific standards in medical practice. Illich grants that "these proposed remedial policies could control to some degree the social costs created by overmedicalization. . . . But all these policies, unless carefully qualified, will tend to reduce the externalities created by medicine at the cost of a further increase of medicine's paradoxical counter-product, its negative effect on health".¹⁵

In his explicit consideration of socio-economic differentials in access to health care, Illich distinguishes between poor and rich countries. In the former, allocating resources to the poor for the same kinds of medical services the rich receive would only be possible for a "demonstration model" few. In the latter countries, "the base line at which such (health) care turns iatrogenic has long since been passed." Thus, in either case, Illich's implied solution to the problem of socio-economic differentials in mortality (though, in a profound sense, he is not at all concerned with the problem) is: break out from the domination of the iatrogenic medical care system.

Even if Illich's profound and extremely significant tripartite concept of clinical, social and cultural iatrogenesis is separated from his distorting, prophetic, black-and-white diatribe, which leads him to claim that modern medicine is a nemesis that expropriates health, the issue raised by critics must be confronted: does modern medicine indeed have anything to do with health, or in the present context, with lowering mortality? For, if the data point to a lack of causal correlation between the health services and mortality, then indeed this should have a profound impact on the strategy adopted to deal with socio-economic differentials in mortality.

The McKinlays have recently examined this question with respect to the United States,¹⁶ following the lead of McKeown's work in the United Kingdom.¹⁷ They note that between 1900 and 1973 there was a 69.2 per cent decrease in overall age- and sex-adjusted mortality. Superimposed on the graph showing this decline, they show the increase in the proportion of the gross national product expended for medical care. "It is evident," they write, "that the beginning of the precipitate and still unrestrained rise in medical care expenditures began when nearly all (92 per cent) of the modern decline in mortality this century had already occurred."

Since most of the decline in mortality is attributable to the disappearance or decline of the major infectious diseases, the McKinlays' analysis focuses on the extent to which medical measures, both chemotherapeutic and prophylactic, have played a role in this decline. The

¹³ Neville R. Butler and Dennis G. Bonham, *Perinatal Mortality: the First Report of the 1958 British Perinatal Mortality Survey under the Auspices of the National Birth Trust Fund* (Edinburgh, E. and S. Livingstone, 1963).

¹⁴ Ivan Illich, *Medical Nemesis, the Expropriation of Health* (Toronto, Bantam Books, 1976).

¹⁵ *Ibid.*, p. 226.

¹⁶ John B. McKinlay and Sonja M. McKinlay, "The questionable contribution of medical measures to the decline of mortality in the United States in the twentieth century", *Milbank Memorial Fund Quarterly, Health and Society*, vol. 55, No. 3 (summer 1977).

¹⁷ Thomas McKeown, *The Role of Medicine: Dream, Mirage, or Nemesis?* (London, Nuffield Provincial Hospitals Trust, 1976).

analysis leads them to conclude that "perhaps 3.5 per cent of the fall in the overall death rate can be explained through medical intervention in the major infectious diseases considered here". They are fully aware that, by the 1970s, chronic diseases have come to play the major role in mortality in industrially developed countries. Any analysis of medical measures and of these diseases is, however, beyond the scope of their paper.

McKeown does deal with the issue. His thesis is summed up in the following:

"Those fortunate enough to be born free of significant congenital disease or disability will remain well if three basic needs are met: they must be adequately fed; they must be protected from a wide range of hazards in the environment; and they must not depart radically from the pattern of personal behaviour under which man evolved, for example by smoking, overeating, or sedentary living."¹⁸

McKeown's primary stress is on very concrete changes in behaviour on the individual level. He would have us change our eating, smoking and exercise habits. "As these are now the main determinants of health it is hard to believe that society will not wish to create conditions under which such practices are encouraged."¹⁹

Winkelstein shares the scepticism of the McKinlays and McKeown. "In fact," he writes, "I believe that in the United States the incidence and prevalence of all the ten diseases and conditions responsible for the highest mortality and morbidity are unaffected by the most vigorous application of the disease or medical care system." His emphasis, however, unlike McKeown's, is ecological. He argues that the overwhelming part of expenditures for "so-called 'health services'" in both developing and developed countries goes to personal medical service, in hospitals or individually delivered. These services, which should be called "medical" or "disease" care, are "unrelated in a causal sense to the health status of the population." On the other hand, true "health care" is very largely neglected. He uses "health care" in two senses: the traditional modalities of public health, e.g., immunization, fluoridation, etc.; and ecology, or the general interaction of man and his environment. As an example of the latter, he cites data on stomach cancer mortality in Buffalo in 1959-1961. The male death rate was more than three times higher in the lowest economic level census tracts than in the highest level. The poor, further analysis showed, lived in industrial areas, which exposed them to large-particle soot.²⁰

Winkelstein's proposal to shift the emphasis of the expenditure relating to health to a "health care system", and, at least by implication, McKeown's stress on changes in personal behaviour and the role of physi-

¹⁸ Ibid., p. 100.

¹⁹ Ibid., p. 164.

²⁰ W. Winkelstein, "Epidemiological considerations underlying the allocation of health and disease care resources", *International Journal of Epidemiology*, vol. 1 (1972).

cians in changing such behaviour, lead us back to Illich. He reserves his most extreme language for people like McKeown and Winkelstein, who see health care as "environmental hygienic engineering." Such writers assert, Illich claims, "that medical strategies fail because they concentrate too much effort on sickness and too little on changing the environment that makes people sick."²¹ "The time has come," he adds, "not only for public assessment of medicine but also for public disenchantment with those monsters generated by the dream of environmental engineering."²²

Illich's views have been stressed above not because his central claim that modern medicine is more iatrogenic than reparative is supportable, but rather because this writer's own position is consistent with that of McKeown and Winkelstein (though it goes beyond theirs). Illich does have a germane point in this respect. A major issue of which Illich reminds us is what might be called "medical imperialism". If, indeed, personal behaviour and ecological factors are the crucial issues with regard to mortality (and hence with regard to socio-economic differentials in mortality), the question arises: Who is to have responsibility and control in dealing with these issues? There is indeed a dilemma here. On the one hand, an excellent case can be made for arguing that a health care system which ignores environmental pollution and smoking is avoiding the major factors leading to mortality. On the other hand, are doctors to become the high priests, on the societal and on the individual levels, of all of life? Winkelstein pushes the issue even further (as this writer will subsequently do too), when he says that "a strong case can still be made that... poverty remains among the most powerful determinants of altered health states and clinical disease today." Are doctors, then, to be made responsible for the elimination of poverty?

The above exposition of what is certainly an important discernment, namely, that the availability and functioning of health services as represented in contemporary modern medicine have limited relevance to mortality levels, may perhaps have overstated the case. McDermott (1977) has most cogently argued that "that part of our health care system that is operated by individual doctors and their hospitals" indeed has quite demonstrable influence on the health status of society. Though he directs attention to the caring aspects of the work of the doctor, for the present purpose, his major claim is that "Death is a sooner-or-later affair, but the personal-encounter physician can have a considerable influence on when it happens." He argues that for heart disease, diabetes and most of the other major chronic diseases, supportive care "can keep patients alive and fully effective for decades or longer." He grants that at present this significant prolongation of life is not measurable, but that some data indicate the validity of the argument. Thus, in 1937, with the introduction of sulphonamide, the line showing the steady fall in the tuberculosis death rate from 1900 broke suddenly. He

²¹ Illich, op. cit., p. 254.

²² Ibid., p. 257.

cites a study in Baltimore comparing the significant drop in rheumatic fever in a census tract area with a comprehensive care programme compared with a control district. Most importantly, he points out that the death rate from coronary heart disease in the United States fell by 4 per cent from 1963 to 1968 and another 14.5 per cent from 1968 to 1974. Similarly, the infant mortality rate fell from 20 in 1970 to 16.1 in 1975. McDermott explicitly does not argue that these declines (as well as declines in most other diseases except cancer) are attributable to the personal encounter physician system. He does claim that the evidence points to the role it does have.²³

Over and above the fact that McDermott's position is a useful antidote to an over-ideologized tendency to dismiss medicine, his theoretical reasoning is germane here. He argues that every disease, infectious or chronic, is multifactorial in origin. But this does not mean that, in order to prevent mortality, the entire pathogenetic chain has to be understood and controlled. On the contrary, it is sufficient to control one link, provided that it is important enough to the pathogenic process. Without at all arguing that public health measures, or changes in personal behaviour, or changes in socio-economic status are unimportant, his claim is that medicine, as it is today, can make a major contribution to lowering mortality.

The purpose, in this section, has not been to argue the case for one or the other position presented. The intention, rather, is to suggest the range of serious positions that confront us. Each one has fairly different implications for policy formulation. What all positions share, however, with the exception of that of Illich, is the conviction that the overall "health and disease care system" have considerable relevance to mortality. The question of the nature of such systems and the allocation of priorities remains, however, and this will be covered in the following section.

Health services and the social system

Whatever one might think of Navarro's adherence to Marxism, few serious scholars would dispute his contention that any study of "the health sector without analyses of the socioeconomic system that differentiates it, assumes an autonomy and near independence of the health sector that is both unempirical and unhistorical."²⁴ It would take us too far afield to consider in detail Navarro's analysis of the medical care institution and its relationship to the nature of the social system in which it operates and which it reflects;²⁵ but surely we must at least consider the fundamental question he raises, namely, can there be any meaningful

²³ W. McDermott, "Medicine: the public good and one's own", *Perspectives in Biology and Medicine*, Spring 1977.

²⁴ Vicente Navarro, *Social Security and Medicine in the U.S.S.R.: a Marxist Critique* (Lexington, Massachusetts, Lexington Books, 1977).

²⁵ Vicente Navarro, "Social class, political power and the State, and their implications in medicine", *Social Science and Medicine*, vol. 10, No. 9/10 (September/October 1976).

degree of autonomy of the health care system from the overall social system?

In the present context, this question has two concrete aspects. First, assuming that major inroads into mortality can only be achieved, as McKeown and Winkelstein argue, by major changes in the health care system, under what social conditions or system of social organization can such changes be achieved? Secondly, since even a decline in mortality levels, as the data clearly show, does not necessarily involve a decline in socio-economic differentials, and may even be associated with a rise, what are the conditions under which the functioning of a health care system will indeed be related to such a decline?

The question can be considered both at the aetiological and therapeutic levels. Navarro would argue that socio-economic differentials in mortality are but one expression of socio-economic differentials in all other areas of life. In a capitalist society, the working class is relatively deprived of health and life, just as it is relatively deprived of all other resources and rewards. In a society ruled by a party bureaucracy, the same would be true of those segments of society which are the underdogs in all areas. The deprived classes are, he would contend, both subject to far greater exposure to pathogenic factors and far less in control of those human resources, including health services, available to counteract the pathogens, than are the ruling classes.

There is little doubt that power relations in the broader society shape the allocation of resources and the establishment of priorities. The history of occupational health and industrial safety in capitalist societies, or in non-capitalist societies hellbent on industrialization, is a living and bitter testimony to this. Or, to cite a concrete example, Illich reports the case of a former colony in which about twice as much is spent in government expenditure to transport a few sick people for hospitalization in the former ruling country as is spent on all medical services.²⁶

But one must go beyond this to the ideological level as well. As Susser²⁷ points out, the way medical problems are defined and the way strategies are implemented are determined by the prevailing ideology of the country, invariably internalized by the dominant elements of the medical establishment. In a culture that stresses individualism, it is the individual who will be seen as responsible for his illness, and prevention and therapy will be individualized. Where docile subservience to authority is highly valued, such hierarchical relations will be duplicated in the health services.

If, then, we accept the view that the health care system does not function in a vacuum, but is intimately related to the overall social system in which it operates, must we then conclude that, until an egalitarian social system is established somewhere on earth, there is no possibility for the elimination of socio-economic differ-

²⁶ Illich, op. cit., p. 234.

²⁷ Mervyn Susser, "Ethical components in the definition of health", *International Journal of Health Services*, vol. 4, No. 3 (1974), pp. 437-457.

entials in mortality? This may well be the case. This conclusion, however, does not only lead to despair; it is, for two reasons, profoundly misleading.

First, what may well be a utopian goal, if it is related to an accurate analysis, can be extremely functional. True, those who have no real concern for human beings but only for the abstract goal, whether couched as such or in terms of future generations, are disdainful of "mere amelioration"—and invariably bloody when they do achieve power. But the vision of a goal can also point to a constant struggle against those factors which are seen as preventing goal achievement. Thus, if, as seems likely, Navarro is correct in saying that "the lack of control felt by our citizenry over their own work and over societal institutions" is "responsible for a large majority of the psychosomatic conditions seen in medical practices",²⁸ and if this is disproportionately the case in the lower social classes, then we become aware of the possibility of a short-range, intermediate goal which can make a difference. If we recognize that type A personality structure is intimately related to a society which places a supreme stress on production, measures might be taken to modify this. The relationship, then, between the nature of the social system and health matters is never a one-to-one relationship. There is always some room for autonomy and change, even short of a reconstruction of society.

Secondly, there is always some room for autonomy within the health care system. One cannot expect that doctors, in all societies well within the dominant social classes, will engage in radical social reconstruction, as individuals or in groups. But it is quite possible—and, as a matter of fact, a reality—that individual doctors and groups of doctors, as well as other health care personnel, can be deviants. They can, within the realm of control at their disposal, engage in activities which make a difference.

THE BASIS FOR POLICY

In the previous pages it has been argued that it would be an illusion to think that, in any society, the availability and functioning of the health services is the sole or even the decisive variable in modifying mortality levels or socio-economic differentials in mortality. It would likewise be an illusion to think that a health-care system exists in a vacuum and can be modified without particular reference to the social system in which it exists. These reservations notwithstanding, it is this author's belief that, first, the nature of the health services can make some meaningful difference and, secondly, that there is room, at least in non-totalitarian societies, for these services to be modified so that potential inroads into diminishing mortality differentials can indeed be realized. What must next be considered are the policy implications of all that has gone before.

²⁸ Vicente Navarro, "Social class, political power and the State . . .", p. 447; see also Aaron Antonovsky, *Health, Stress and Coping* (San Francisco, California, Jossey-Bass, 1979).

Relevant values and commitments

As Gunnar Myrdal long ago pointed out in his classic study on black-white relations in the United States, social values and aspirations, while not decisive, do make a difference in the possibility of effecting social change. Unfortunately, most of the people engaged in medical education care little about socio-economic differentials in mortality. Students are overwhelmingly chosen on the basis of their grades and test scores, particularly in the natural sciences. They are trained in hospitals using a strict biomedical model. Their socialization is based on identification with authority figures primarily concerned with the scientifically interesting case. The orientations shaped by their largely middle-class origins are reinforced by such identification. Emerging into the real world of practice—assuming that their bent is not towards academic medicine and research—they are drawn to the material and symbolic rewards luring them away from actions that might be related to reducing socio-economic differentials in mortality.

Starting in the 1960s, however, in the context of the student revolt in the western world, there were indications of change. Students began to press for changes in their own education. Medical schools were opened in Kentucky and Michigan State, in Tromsø and Maastricht and Beersheba, which claimed a new orientation. There were some signs that the decades-long decline in family practice was being reversed. Different criteria for admissions were considered. All these signs bear some relation to the issue at hand.

The arena of medical education, then, is one starting point that may contribute to the effect of the health-care system on socio-economic differentials in mortality. If at least some students are selected who would be predisposed to care about this problem, and if they and others are trained in a way which would equip them with some understanding, one realistic potential inroad will have been made. Jefferys has posed the issue very clearly. Though her paper²⁹ is based on United Kingdom data, her statement of the issue—whether the doctor of the future is to be a supertechnologist or an applied behavioral scientist—is relevant for other industrialized societies as well. Though not optimistic at all, she suggests the possibility that "newer speciality groups within medicine, such as the psychiatrists and the community physicians, as well as revitalized general practitioners, are determined to broaden their medical horizons but remain within the medical world."

It may well be asked why primary attention is given to the doctors, rather than to other health professionals. The answer is simple. In the foreseeable future, for very good sociological and cultural reasons, physicians will continue to be the dominant group in the health professions. Parts of their role may be taken over by nurse practitioners; social workers and nurses may acquire

²⁹ M. Jefferys, "Social science and medical education in Britain: a sociological analysis of their relationship", *International Journal of Health Services*, vol. 4, 1974, pp. 549-563.

control over considerable resources devoted to the care of the chronically sick and disabled (as Jefferys points out); the concept of the health team may be increasingly realized; the weight of epidemiologists who are not medical doctors may grow. But the physician, in the eyes of both patients and practitioners, is likely to be, at the very least, a *primus inter pares*. Thus, while it may be true that other health professions are by their nature more amenable to a concern with actions related to socio-economic differentials, I believe that the physician must be the focus of attention.

But no matter how much the values, commitments and competencies of individual physicians push them in the direction of such concern, a far more crucial question is the nature of organizational and system commitment. On this level, four major issues may be identified (see below), the resolution of which will determine whether the physicians as individuals or speciality groups within the profession will indeed be able to make any contribution to achievement of egalitarianism in health care.

Entrepreneurship. As long as the delivery of health services is shaped by the market model, one cannot expect any degree of equalization of such services. A few idealists may go to work in urban ghettos or deprived rural areas, but their impact will be minuscule. The rewards are simply far greater, and the work-load simpler, for those who work in pleasant middle-class or upper-class communities. Work in charity hospital wards may provide useful material for research, but this has little to do with equalizing health levels.

The emphasis on disease. Suppose that some form of health insurance with coverage of the entire population does allow equal access. The dominant medical model, which sees diagnosis and therapy as the core of medical action, prevents any genuine attack on the sources of socio-economic differentials in morbidity and mortality. In an era in which chronic diseases constitute the core of the health problems, this model makes it impossible to focus on a serious allocation of resources to prevention, on the one hand, and to rehabilitation, stabilization and prevention of deterioration, on the other. An example of what would seem to be the essential direction is found in the Kaiser-Permanente conceptualization of its role. Using a well-developed system of multiphasic testing, this organization divides people into (a) the well; (b) the worried-well (significant medical complaint or problem but no clinically significant findings); (c) the asymptomatic sick (clinically significant findings but no complaints); and (d) the sick (significant complaint and significant abnormality). For each group, an appropriate strategy and personnel are assigned.³⁰

Responsibility for the community. Such changes, essential though they may be, would be inadequate, for they retain the focus on the individual patient. As such, they cannot even conceptually begin to touch the core

³⁰ S. R. Garfield, *et al.*, "Evaluation of a new ambulatory medical care delivery system", *New England Journal of Medicine*, vol. 294 (1976), pp. 426-431.

of the problem. The health-care delivery system, which is divorced from concern with the workplace (field, factory, office or home), housing and the physical and social environment, cannot begin to deal with the factors that are decisive in determining socio-economic differentials. This is not to suggest that the health-care system must become an over-arching social agency. What it does mean is that, at the local, regional and national levels, the system must be committed to involvement in the sources of pathogenesis. The social system of the community, rather than that of the individual patient or family, must be a major focus of attention.

Resource allocation. The above three issues relate to value orientations, commitments and structuring of the health-care delivery system. The final issue derives from the approach taken. These orientations would remain void of meaning if not expressed through a re-ordered set of priorities with respect to resource allocation. A system whose personnel and material resources are expended primarily upon hospital care, biomedical research and acute therapy will make few inroads on socio-economic differentials. This is not the place for a detailed discussion of appropriate allocation; but clearly the criteria must be in terms of the factors relevant to the key sources of socio-economic mortality differentials. This brings us to the central argument of the present article.

Control and power

An earlier work³¹ was focused mainly on the stressors³² to which the lower classes are disproportionately subjected. Over the course of the intervening years, the author has shifted his position considerably. Although I do not dismiss the significance of socio-economic differentials in exposure to stressors. But my emphasis has overwhelmingly come to be on what I have called the differential distribution of generalized resistance resources. Systematic observation on the individual or group level will reveal that it is not only the lower class which is subjected to a high level of stressors. Middle and upper class people are not much less exposed to threats to their health. The fundamental distinction among social classes, I suggest, is rather the differential wherewithal which makes for the ability to cope successfully with stressors.

This problem has been explored at great length in a recent study by the author.³³ The fundamental concept advanced in this study is called "a sense of coherence", a global orientation which emerges against the background of a high level of generalized resistance resources. In extreme brevity, the concept refers to the extent to which one's internal and external environments are predictable, make sense, or, in the language

³¹ Kosa, Antonovsky and Zola, *op. cit.*

³² The concept of "stressors" and, subsequently, that of "resistance resources" refer explicitly to microbiological, physicochemical and psychosocial phenomena.

³³ Aaron Antonovsky, *Health Stress and Coping* (San Francisco, Jossey-Bass, 1979).

of information theory, stimuli are perceived as information rather than as noise.

Kohn³⁴ portrays the orientational system of lower-class persons in much the same language:

“ . . . fearfulness and distrust, and by a fatalistic belief that he is at the mercy of forces beyond his control and often beyond his understanding . . . An orientational system predicated on conforming to the dictates of authority results in a perception of social reality that is too simplistic and fearful to allow the individual to take advantage of options that might present themselves. It is too inflexible to permit effective coping with precisely those problematic and stressful circumstances that most require subtlety, flexibility, and a perceptive understanding of larger social complexities.”

The fundamental problem, then, is that the constricted, emergency, powerless and unpredictable character of lower social class existence produces this orientation. There is extensive evidence³⁵ that it is in this direction that the central clue to socio-economic differentials in morbidity and mortality is to be found.³⁶ If this line of reasoning is correct, the crucial question, in the present context, becomes: What kind of health care system is most likely to contribute to combating the weak sense of coherence characteristic of lower-class persons?

As suggested earlier, it is scarcely likely that any kind of health-care system can be decisive in transforming the social conditions of the lower class, but this is not to say that nothing can be done. The crucial question is that of the structure of social relations within the system. In other words, on the institutional as well as on the personal level, who has power? Health professionals must ask themselves whether the system in which they work, and the relations they maintain with members of the lower social class, are such as to duplicate and reinforce the weak sense of coherence, or whether they work in a contrary direction. It is even more important that lower-class persons should ask themselves the same question.

If health care is to be efficacious, there is indeed a large core of esoteric knowledge which inevitably provides the basis for professional dominance; but one should distinguish between functional, specialized legitimated authority and power cloaked in the shroud of mystery. In very simple terms, some significant degree of control must be vested in the hands of the doctor if he is to be of help. There is, however, a world of difference between much of current reality and the

requisite degree of control. The experience of the lower-class person, entering the health-care system, is overwhelming and bewildering, alien and frightful.

It will not be at all easy to disentangle this web, or to persuade health practitioners to change the dominant ambience of their practice. The initiative is much more likely to come—if it comes at all—from those whom the system is presumed to serve: from trade unions, consumer organizations, community groups, and the like. If it does not come—and there seem to be no historical guarantees of this—no significant closing of the mortality differential may be expected.

Some implications of the relevant data

In the above pages, the fundamental lines of an appropriate policy strategy aimed at diminishing socio-economic differentials in mortality have been outlined. The translation of such policy into operative procedures requires specific familiarity with the relevant data in each country. In this final section, a few considerations involved in translating strategy into tactics will be referred to briefly.

First and foremost, the importance must be stressed of a formal monitoring system in each society. In the last decade or so, the field of social indicators has proliferated. But while health indices have certainly been prominent in this field, there would appear to be no case in which socio-economic differentials in mortality have been explicitly taken as a major indicator. The general assumption seems to have been made that, as mortality rates decline, so do class differentials. As suggested earlier, this is not necessarily the case.

Secondly, the utmost caution should be observed in assuming that technological advances, environmental control, health education and the like are egalitarian in their consequences. In fact, there is good evidence in a wide variety of fields, such as education, that the investment of social resources in broadside fashion disproportionately favours the middle and upper classes. If such investment is to be relevant to the problem, it must be particularly directed to the benefit of the lower classes.

Thirdly, and linked to the second point, is the need to identify high-risk groups within the lower classes. Thus, the evidence might suggest that, in one society, young adult males are a particularly vulnerable group. Accidents, violence, alcoholism, unemployment, disrupted family relations and the precursors of coronary heart disease are particularly characteristic of their life conditions. In another society, aging rural residents, left behind and isolated from family and society, might be the group most strikingly subject to early death. Widowers, overwhelmed housewives, or children in large, disintegrated families are often the most vulnerable. Particular communities can be identified which, for a complex of reasons, show remarkably high mortality rates. Instead of adopting broadside programmes aimed at “reducing lower-class mortality”, it is, then, crucial to identify specific target groups.

³⁴ M. L. Kohn, “The interaction of social class and other factors in the etiology of schizophrenia”, *American Journal of Psychiatry*, vol. 133 (1976), pp. 179-200.

³⁵ Aaron Antonovsky, *Health Stress and Coping* (San Francisco, Jossey-Bass, 1979), chap. VI.

³⁶ A similar position has been taken by Syme and Berkman. In their succinct review of a wide variety of data, they say: “In summary, persons in lower class groups have higher morbidity and mortality rates of almost every disease and illness.” Their central concept is that of a generalized vulnerability to illness. (See S. M. Syme and L. F. Berkman, “Social class, susceptibility and sickness”, *American Journal of Epidemiology*, vol. 104, pp. 1-8.

In this regard, it is important to stress that the health services are not equipped to make any significant inroads in any project, no matter how well designed, unless they operate in co-ordination with other social institutions. The Columbia Point project at Boston was a case in point. Dedicated, sophisticated and armed with reasonable resources, the project staff was nonetheless hopelessly inadequate to cope with the impossible social conditions of the community in which it worked.

Finally, it will be noted that the issue of cause-specific mortality has been disregarded throughout. This is not because of any ignorance of the particularly striking socio-economic mortality differentials on some causes of death. The author has, in fact, called attention to the myth that cardio-vascular diseases are a particular affliction of the affluent and is fully aware that the current downturn in coronary disease mortality in some societies may well mask opposite class trends. (This may not necessarily be the case; one would have to see the thus-far unavailable data.) Accidents and violence are, obviously, major contributors to differentials. Nonetheless, the problem is, as Syme has put it, the general vulnerability of the lower classes; an attack on one cause of death is analogous to plugging up one hole in a dike whose very foundations are constantly crumbling.

This is not to say that plugging holes in dikes is a useless activity. Concrete human lives may be saved. The question, rather, is one of the cost-benefit ratio. If, for example, on the local level, the choice is between the investment of resources in a hypertension control program and community involvement in designing and building a neighborhood clinic, the latter would be preferable, using the criterion of ultimate health benefit. On the regional or national level, priority should be as-

signed to the training of what have elsewhere been called (Antonovsky, 1972) community resistance resource enhancers³⁷ over the training of high-level practitioners. In the present state of affairs, there is little danger that the overwhelming investment of health resources in the more traditional areas, and especially in tertiary care, will be overturned.

We must all die, sooner or later. The crucial question is not the prolongation of life or the avoidance of death but, rather, unnecessary death. The fact of socio-economic differentials in mortality means that success has been achieved in one segment of the community which is not available to other segments. Though the concentration has been on mortality, this must be set in the context not only of when one dies but of how one lives.

In the last analysis, from the point of view of those in the health services, the issue is a moral one. They can choose to go on, as they have done in large measure, disregarding the issue, in the calm consciousness that they are doing their best for the individual patient. They can oppose or acquiesce to pressures from without to change. Or they can actively take part in seeking to transform the health services so that they do not continue to live in a society where the ratio of infant mortality in the highest social class to that in the lowest social class is 100:233 (Italy, 1955-1960) or even 100:132 (Netherlands, 1961-1962).³⁸ It would be gratifying to think that more than a few will choose the latter alternative. Once the choice is made, one can confront the very complex problem of what to do.

³⁷ Aaron Antonovsky, "Breakdown: a needed fourth step in the conceptual armamentarium of modern medicine", *Social Science and Medicine*, vol. 6, 1972, pp. 537-544.

³⁸ Aaron Antonovsky and Judith Bernstein, *Social Science and Medicine*, vol. 11 (1977), pp. 453-470.

TRENDS IN FERTILITY LEVEL IN THE UNION OF SOVIET SOCIALIST REPUBLICS DURING THE YEARS OF SOVIET RULE

B. T. Urlanis*

SUMMARY

This article reconstructs the birth rates of the Union of Soviet Socialist Republics within its present boundaries for the period 1918–1940 on the basis of incomplete data and taking into consideration several changes in frontiers. It also derives estimates for the years 1941–1945 from data on school attendance during the period 1949–1954, as well as from data provided by the censuses of 1959 and 1970 regarding cohort survival. Deriving an "effective fertility rate", which adjusts for the mortality wastage of young children, the article discusses fertility trends until 1976 and the changes in age patterns of reproduction at the national level as well as in the various republics. The article also comments on births by order and the spreading practice of birth control.

The fertility level in the Union of Soviet Socialist Republics since the Great October Socialist Revolution has been significantly affected by the different historical conditions that the country has experienced. The Civil War and the Intervention, the New Economic Policy, industrialization and collectivization, the Great Patriotic War, the period of reconstruction, the post-war five-year plans—the past six decades have been crowded with great events, which, naturally, have also had an effect on the important process of fertility.

The number of births that take place reflects how families live, how they begin and how they develop. When married couples elect to have children, the decision takes into account all the potential, assumptions and expectations, the traditions, customs and features that characterize the peoples of the USSR. From various standpoints, therefore, it is very interesting to determine how the number of births and the fertility level in the country have varied. The study of fertility trends for this entire period is important not only from a purely historical standpoint but also from the standpoint of solving current sociological, economic and demographic problems, since such a study can be used to draw conclusions that will provide a basis for various kinds of calculations and hypotheses for the future.

Unfortunately, the study of fertility trends in the USSR is hampered by difficulties that are due to a lack of appropriate statistical materials. For many years there are no data at all, while for others the data cover different territories and cannot, therefore, be compared. These circumstances should not, however, serve as an excuse for not attempting to reconstruct a

pattern of variation, even if it is not a completely accurate reflection of reality.

Birth rates for the USSR within its present boundaries were published for only 37 of the 59 years from 1918 to 1976: for 1926, 1928, 1937, 1938, 1939 and 1940 and from 1946 on. For a number of years, the data published relate only to the European part of the USSR. For the period 1918–1922, computations were made in an earlier study, using the aggregates of the 1926 census for the USSR within the frontiers existing prior to 17 September 1939.¹ The data for two years (1932 and 1935) are given in an article by S. G. Strumilin.² There are no publications whatever that relate directly to birth rates for the remaining years.

For the pre-war period, no birth rate is available for 1931, 1933, 1934 and 1936. The rate for 1936 can be obtained, however, if it is recalled that it exceeded the 1935 rate by 18 per cent (within the frontiers existing prior to 17 September 1939).³ For 1931, 1933 and 1934, the 1932 rate can be taken, since the data of the 1959 and 1970 population censuses, in which persons born during the years 1929–1933 and 1930–1934 were in the 25-to-29-year-old and 35-to-39-year-old age groups respectively, indicate that the number of births in 1931, 1933 and 1934 did not differ greatly from those given for 1932.

Changes in frontiers must also be taken into account. The birth rate for the years 1918–1925 relates to the population of the USSR within the frontiers existing prior to 17 September 1939. In both Poland, which for a

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¹ See B. T. Urlanis, *Rozhdaemost' i prodolzhitel'nost' zhizni v SSSR* (Moscow, Gosstatizdat, 1963), p. 25.

² See S. G. Strumilin, *Problemy ekonomiki truda* (Moscow, Gospolitizdat, 1957), p. 194.

³ See A. Y. Boyarsky, *Statistika naselenia* (Moscow, 1938), p. 174.

TABLE 1. VARIATION OF THE BIRTH RATE IN POLAND AND THE BALTIC REGION (Per 1,000)

Years	Poland	Latvia	Lithuania	Estonia
1918	—	—	15.6	—
1919	30.5	—	19.4	17.3
1920	32.2	17.0	22.7	18.4
1921	32.8	19.7	24.6	—
1922	35.5	21.8	27.2	20.2
1923	36.0	21.9	28.2	20.1
1924	35.0	22.3	29.2	19.2

Sources: P. I. Kurkin, *Rozhdaemost' i smertnost' v kapitalisticheskikh gosudarstvakh Evropy* (Moscow, 1938), p. 19; P. P. Zvidrin, *sh "Uroven' i dinamika rozhdaemosti i smertnosti v Latvii v periodo Sovetskoi vlasti (1840-1940 gg.)"*, *uchenyie zapiski Latvii Rego gosudarst venogo universita imeni P. Stuchki*, Vol. 177; *Voprosy statistiki*, vol. III, p. 65; *Population Studies*, vol. xxvi, No. 3 (1972).

time included Western Ukraine and Western Byelorussia, and the Baltic region, the figures were different.

Bearing in mind the fact that most of the population of the territories that subsequently became part of the USSR lived in the territory of Poland, where the birth rate was higher, we can take the total birth rate for that entire population in the years 1918-1921 to be close to 30 per 1,000. The total population of the territory now within the frontiers of the USSR numbered 163 million persons in 1917, while there were 143.5 million persons in the territory within the frontiers as they existed prior to 17 September 1939.⁴ Using the appropriate weighting (see table 1), we arrive at a birth rate for 1918-1921 for the USSR within its present frontiers that is 0.2 per 1,000 lower than the rate calculated for the territory within the 1939 frontiers.

For the period 1922-1924, the birth rate for Poland and the Baltic regions (taking into account the weighting of the rates given) is taken to be the following:

Years	Birth rate in Poland and the Baltic region (per 1,000)
1922	31.8
1923	32.3
1924	31.7

Assuming the same population ratio as in 1917, we can compute the birth rate within the present frontiers of the USSR for the years indicated. These birth rates are somewhat lower than those for the territory within the earlier frontiers.

For subsequent years, the birth rate relates to the European part of the country within the old frontiers, but for 1926 and 1928 birth rates were published for the USSR within its present frontiers. A comparison yields the results shown in table 2.

The difference of 0.3 between group (1) and group (2) for 1926 will be assumed to be valid for 1925 and 1927. The comparatively small excess of the birth rate within the present frontiers over the rate within the frontiers prior to 17 September 1939 is explained by the fact that

⁴ See Tsentral'noe statisticheskoe upravlenie, *Itogi vsesoyuznoi perepisi naselenia 1959 goda: SSSR (svodny tom)* (Moscow, Gosstatizdat, 1962), p. 13.

TABLE 2. BIRTH RATES IN THE UNION OF SOVIET SOCIALIST REPUBLICS IN 1926 AND 1928 (Per 1,000)

Years	European part of the USSR within the frontiers existing prior to 17 September 1939 (1)	USSR within the present frontiers (2)	Ratio of group 2 to group 1 (3)
1926	43.7	44.0	1.007
1928	42.2	44.3	1.049

the influence of the Asian part of the USSR, with its high birth rate, seems to be offset to a significant extent by the inclusion of re-incorporated territory with a lower birth rate than the European part of the USSR within the previous frontiers. In making the transition to the territory within the present frontiers of the USSR, the ratio between the rates which was established for 1928 will be assumed.

In accordance with these calculations, the variation of the birth rate of the USSR within its present frontiers during the pre-war period can be expressed by the figures given in table 3.

TABLE 3. VARIATION IN THE BIRTH RATES OF THE UNION OF SOVIET SOCIALIST REPUBLICS, 1918-1940 (Per 1,000)

Years	European part of USSR within the frontiers existing prior to 17 September 1939 ^a	USSR within the present frontiers	Effective fertility rate ^b
1918	32.0	31.8	19.1
1919	31.0	30.8	18.5
1920	31.2	31.0	18.6
1921	35.5	35.3	21.2
1922	37.3	36.8	22.1
1923	43.9	42.8	30.0
1924	42.0	41.0	28.8
1925	44.7	45.0	30.9
1926	43.7	44.0	32.1
1927	43.4	43.7	30.7
1928	42.2	44.3	31.7
1929	39.8	41.8	29.9
1930	39.2	41.2	29.3
1931	(31.0)	(32.6)	(23.0)
1932	31.0	32.6	23.0
1933	(31.0)	(32.6)	(23.0)
1934	(31.0)	(32.6)	(23.0)
1935	30.1	31.6	22.3
1936		34.3	24.9
1937		38.7	28.1
1938		37.5	27.8
1939		36.5	26.7
1940		31.2	22.1

Note: Figures in parentheses represent an estimate.

^a The figures for 1918-1924 relate to the whole of the USSR within the frontiers existing prior to 17 September 1939.

^b For an explanation of this indicator, see below, pp. 13-14. Sources: *Statisticheskii spravochnik SSSR za 1928 god* (Moscow, 1929), p. 74; B. T. Uralis, *Rozhdaemost' i prodolzhitel'nost' zhizni v SSSR* (Moscow, Gosstatizdat, 1963), p. 25; B. Y. Smulevich, *Burzhuaiznye teorii narodonaselenia v svete marksistsko-leninskoi kritiki* (Moscow, Partiinoe izdatel' stvo, 1936), p. 146; S. G. Strumilin, *Problemy ekonomiki truda* (Moscow, Gospolitizdat, 1957), p. 194; A. Y. Boyarsky, *Statistika naselenia* (Moscow, 1938), p. 174; *Zhenshchiny v SSSR* (Moscow, Statistika, 1975), p. 101; *Naselenie SSSR, 1973* (Moscow, 1975), p. 69; *Narodnoe khozyaistvo SSSR v 1969 Statistika* (Moscow, Godu, 1970), p. 31; *Narodnoe khozyaistvo SSSR v 1975 Godu* (Moscow, Statistika, 1976), pp. 40-41.

The figures given in table 3 for the variation of the birth rate cannot, of course, be termed "exact", owing to the incompleteness of the original data, the difficulty of monitoring the natural movement of the population in many years of this period, and the changes that have taken place in the frontiers. They do, however, undoubtedly give a general picture of the variation of the birth rate in the USSR within its present frontiers during the first 23 years of Soviet rule. On the basis of these data, it can be concluded that the birth rate never fell below 30 per 1,000 and never exceeded 45 per 1,000. The maximum level was attained in 1925, when the country's economy, which had been undermined by war and intervention, was gradually recovering.

A significant drop in the birth rate can be observed in the period 1931-1936. This is attributable to the difficulties of the period of collectivization and to the large-scale processes of migration involved in the country's industrialization, which had just begun. The rise in the birth rate during the period 1936-1939 can be explained partly by the fact that abortions were prohibited in 1936 and partly by the increase in the numbers of women in the maximum-fertility age group (25-29 years)—the cohorts born in the years preceding the First World War were conspicuously large.

Towards the end of the 1930s, the influence of these two factors began to wane (in particular, the small cohorts of women born during the war years began to enter the maximum-fertility age group, and the birth rate showed a tendency to fall. The sharp drop in the birth rate in 1940 is also attributable in part to the outbreak of the Soviet-Finnish war and the mobilization of certain military contingents.

In determining the fertility level during the years 1941-1945, we can take as a basis the variation of the number of pupils in the first four grades during the years 1949-1954.⁵

School years	Number of pupils (in millions)
1949/50	22.6
1950/51	19.7
1951/52	16.4
1952/53	13.4
1953/54	12.1

Bearing in mind the fact that the number of pupils in the first four grades in the academic year 1949/50 includes some children born before the war, and that the number of pupils in the year 1953/54 includes some children born after the war, we can conclude that the birth rate in the war years fell to less than half of the pre-war level. This is confirmed, in particular, by the changes in fertility in the Armenian Soviet Socialist Republic, where the birth rate in the years 1941-1945 was 23.0 per 1,000, as against 43.5 per 1,000 in 1936.⁶ During the first year of the war (1941), the birth rate probably differed little from the rate for the preceding year. The effects of the war became discernible only in

⁵ See *Kul'turnoe stroitel'stvo SSSR* (Moscow, 1956), p. 122.

⁶ See B. Urtanis, *Wars and Population* (Moscow, 1971), p. 262.

the second quarter of 1942, nine months after it had begun.

Valuable information regarding changes in the birth rate in the first half of the 1940s can be obtained by analysing the data from population censuses. Thus, the following data are available from the 1959 census concerning the number of persons born in given years who attained specific ages:⁷

Years	Number of persons born who survived until 1959 (millions)
1934-1938	20.3
1939-1943	16.5
1944-1948	15.3

The 1970 census gives the following information:⁸

Years	Number of persons born who survived until 1970 (millions)
1935-1939	21.1
1940-1944	13.8
1945-1949	17.1

Additional information regarding changes in the birth rate can be obtained from calculations carried out after the 1970 census by the Central Statistical Office of the USSR.⁹

Years	Number of persons born who survived until 1 Jan. 1973 (millions)
1933-1937	17.8
1938-1942	19.0
1943-1947	12.6

Although each of the given groups of cohorts includes both war years and non-war years, the data from the two censuses and the calculation give an idea of the nature of the changes in the birth rate during the war years and confirm the conclusion drawn earlier regarding the sharp drop that occurred during that period.

Starting with 1946, published birth rates are available,¹⁰ and from 1950 onwards, the number of births is also obtainable.¹¹ After the late 1940s, the overall birth rate in the USSR stabilized at a level of 25-27 per 1,000, but from 1960 onwards, there was a steady decline in the rate. The level reached its lowest in 1969, after which the birth rate rose somewhat. However, this increase is not enough to justify talking in terms of the appearance of new trends in the birth rate; rather, it reflects the transient influence of changes in the age-marriage structure of the population and in the "time-table" of births.¹²

A comparison of the present fertility level with the level in the 1920s indicates that the birth rate has declined by a factor of approximately 2.5. However, in evaluating this decline, it would be incorrect to base an interpretation solely on the birth rate. The sharp decline

⁷ See Tsentral'noe statisticheskoe upravlenie, *Itogi vsesoyuznoi perepisi naselenia 1970 goda*, vol. II (Moscow, Gosstatizdat, 1972), p. 12.

⁸ *Ibid.*, p. 13.

⁹ See *Narodnoe khozyaistvo SSSR v 1972 godu* (Moscow, Statistika, 1973), p. 34.

¹⁰ See *Zhenshchiny v SSSR* (Moscow, Statistika, 1975), p. 101.

¹¹ See *Naselenie SSSR, 1973* (Moscow, 1975), p. 69.

¹² For details, see V. A. Borisov, *Perspektivy rozhdaemosti* (Moscow, 1976), pp. 77-96.

in mortality, especially infant mortality, must also be taken into account.

From the economic and sociological standpoints, a high birth rate accompanied by high infant mortality takes on the character of "useless fertility" and constitutes a loss both to the family and to society at large: the outlay and care involved in looking after the child are wasted. This mortality must therefore be taken into account in considering the variation of the birth rate when there are marked shifts in child mortality. Attention should not be confined to infant mortality (up to 1 year), since a large number of children died between the ages of 1 and 5 years. After this age, child mortality becomes insignificant and may be completely disregarded in making these calculations.

What was the mortality level for children up to the age of 5? No direct data are available for every year, so that here too there is a need for calculations, that would make it possible to reconstruct the variation in child mortality, although with some degree of approximation.

It is well known that the child mortality level in pre-revolutionary Russia was very high. Of all children born in 1913, 26.9 per cent died before the age of 1 year. Many children also died between the ages of 1 and 4 years. In all, before the Revolution, 43 per cent of all children died before the age of 5 years.¹³ Thus, while the overall birth rate in 1913 was 45.5 per 1,000, the "useful", or, more accurately, the "effective" birth rate was only 25.9 per 1,000.

Immediately after the Great October Socialist Revolution, energetic steps were taken to reduce mortality generally, and child mortality in particular. Special organizations came into being to look after the welfare of mothers and infants. In the difficult conditions of civil war and economic dislocation, however, all these measures could not produce any appreciable effect. The overall mortality rate for the 20 provinces of European Russia in 1920-1922 was 33.2 per 1,000, namely, one quarter higher than it was before the Revolution.¹⁴ The years 1918 and 1919 were also very difficult ones for the young Soviet Republic.

Naturally, infant mortality also remained very high.

This can be seen in the infant mortality level in Moscow and Leningrad:¹⁵

Years	Infant mortality (as percentage of births)	
	Leningrad	Moscow
1906-1910	28.0	25.8
1911-1915	26.8	23.8
1918	26.7	26.4
1919	33.2	28.4
1920	23.3	20.4
1921	20.6	17.3
1922	24.7	22.8

¹³ See *Narodnoe khozyaistvo SSSR v 1975 godu* (Moscow, Statistika, 1976), p. 600.

¹⁴ See *Narodnoe khozyaistvo v tsifrakh* (Moscow, 1924), p. 33.

¹⁵ J. C. Whipple and S. A. Novosel'sky, *Osnovy demograficheskoi i sanitarnoi statistiki* (Moscow, 1929), p. 608.

On average, infant mortality in the capitals in 1918-1922 was 10 per cent lower than before the Revolution.

For 1924-1927 we have the following data on the level of infant mortality in the European part of the USSR.¹⁶

Years	Deaths before the age of one year (per 1,000 births)
1924	191
1925	201
1926	174
1927	191

In 1923, the infant mortality level was no higher than in 1924, since the 1926 census shows that the number of children born in 1923 and surviving until the end of 1926 exceeded the number born in 1924 by 31 per cent, a percentage equal to the excess of the 1923 birth rate over the 1924 rate. In subsequent years, infant mortality continued at a high level: it was 18.2 per cent in 1928, 17.0 per cent in 1937, 16.1 per cent in 1938, 16.7 per cent in 1939 and 18.2 per cent in 1940.¹⁷ Since there was no downward trend in infant mortality in this period, the mean calculated for the years for which data are available can be taken for the years for which there are no data.

Infants who die before reaching the age of 1 year constitute the majority of all children dying before the age of 5 years. There is a fairly stable ratio between the number of those dying before the age of 1 and those dying between the ages of 1 and 4 years, a ratio which can be computed on the basis of mortality tables (see table 4).

The ratios obtained can be used to calculate the approximate numbers of deaths up to the age of 5 in those years for which we do not have published data. For the most recent years, we can take as a basis data from the Central Statistical Office, which show that at the present time 3.2 per cent of all children born die before

TABLE 4. RELATION BETWEEN THE NUMBERS OF DEATHS OF CHILDREN AGED LESS THAN 1 YEAR AND OF CHILDREN AGED BETWEEN 1 AND 4 YEARS

Years	Number of deaths according to mortality tables as a percentage of the number of births		Ratio of the number of deaths at less than 1 year and between 1 and 4 years (percentage)
	Less than 1 year old	Between 1 and 4 years old ^a	
1926-1927	18.7	10.4	56
1958-1959	4.1	1.5	37
1962-1963	3.2	1.1	34
1963-1964	3.0	1.0	33
1964-1965	2.8	1.0	36
1966-1967	2.6	1.0	38
1968-1971	2.5	0.9	36

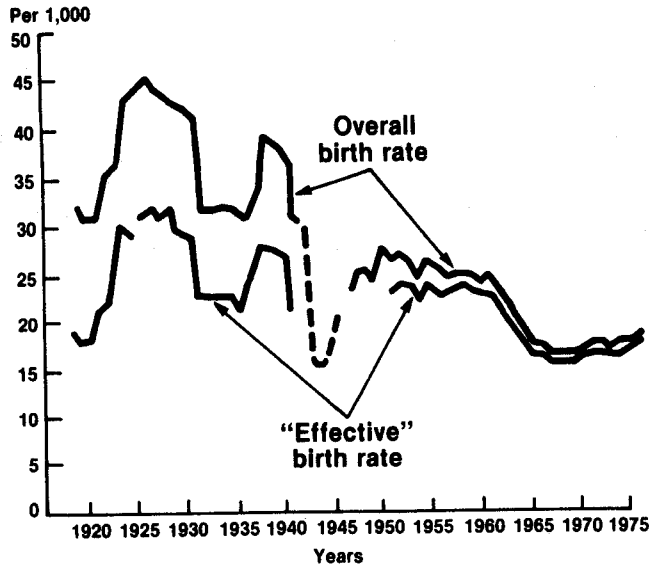
Sources: *Narodnoe khozyaistvo SSSR v 1963 godu* (Moscow, Statistika, 1964), p. 32; *v 1964 godu*, p. 37; *v 1965 godu*, p. 45; *v 1967 godu*, p. 39; Tsentral'noe statisticheskoe upravlenie, *Itogi vse-soyuznoi perepisi 1959 goda: SSSR (svodny tom)* (Moscow, Gosstatizdat, 1962), p. 262; *Vestnik statistiki*, 1974, No. 2, p. 94; *Naselenie SSSR, 1973* (Moscow, 1975), p. 141.

^a These figures are derived from summary mortality tables, using the infant mortality rate.

¹⁶ See *Statisticheskii spravochnik SSSR za 1928 god* (Moscow, 1929), p. 75.

¹⁷ See *Narodnoe khozyaistvo SSSR, 1922-1972 gg.* (Moscow, Statistika, 1972), p. 40.

Figure I. Variation of the overall birth rate and the "effective" birth rate in the Union of Soviet Socialist Republics



reaching the age of 5 years.¹⁸ The corrected birth rates, taking into account mortality up to the age of 5 years, give an indication of the variation in "effective" fertility. The corresponding indicators for 1918-1940 are given in table 3.¹⁹ It can be seen that in the pre-war period the "effective" birth rate was much lower than the overall birth rate.

In the last 25 years the situation has changed significantly. Mortality in children under 5 years of age has sharply declined, and the gap between the overall birth rate and the "effective" birth rate has been appreciably reduced. In 1976 the overall birth rate was 18.5 per 1,000 and the "effective" birth rate was 18.0 per 1,000.

The variation of the two birth rates for all the years of the period is shown in the graph (see figure I). The graph clearly illustrates the narrowing gap between the two rates. By comparing them it is possible to gain a better understanding of the decline in birth rate in the years of Soviet rule, and in a certain sense to make the general estimate of that decline more accurate. The level of the "effective" birth rate (which is of prime importance) is seen to be only one third lower than the pre-revolutionary level (17.5 per 1,000 in 1975 as against 25.9 per 1,000 in 1913), while the overall rate is lower by a factor of 2.5.

The patterns of fertility bear the imprint of all the events that have taken place in the country: the Civil War, the famine in the Volga region in the years 1921-1922, the period of the reconstruction of agriculture and, of course, the Great Patriotic War. The first "wave" of the effects of the war was felt in the 1940s, while the second occurred more than 20 years later. We can get an idea of this second "wave" from the total number of births in the years 1960-1976.

¹⁸ See *Narodnoe khozyaistvo SSSR v 1975 godu* (Moscow, Statistika, 1976), p. 600.

¹⁹ In calculating these indicators, we assumed that the child mortality levels of contiguous cohorts do not differ much from each other.

The pronounced sag in figure II, however, reflects not only the second "wave" of the effects of the war but also a steady downward trend in the number of births to each married couple, a trend which became particularly marked in the early 1960s, although, as we have seen, it can also be observed before that time. Both government statistics and the research of many Soviet demographers indicate that in each succeeding female generation the average number of children born to a woman over the period of her reproductive life is steadily declining. This decline in the average number of births is taking place simultaneously with the change in their "timetable".

Each female cohort of a particular year of birth finds itself in specific historical circumstances and meets the need for children in its own way, not only in the number of children but also in the timing of their birth and in the age at which it plans to have them. This applies, of course, to those women who regulate the number of their children.

Using birth rates by age for the years 1954-1955, 1959-1960, 1964-1965, 1969-1970 and 1974-1975 for quinquennial age groups, we can trace the demographic "history" of a series of female generations with regard to birth rate. This "history" can be clearly seen from the graph (see figure III).

The graph shows a leftward displacement in the

Figure II. Variation of the number of births in the Union of Soviet Socialist Republics

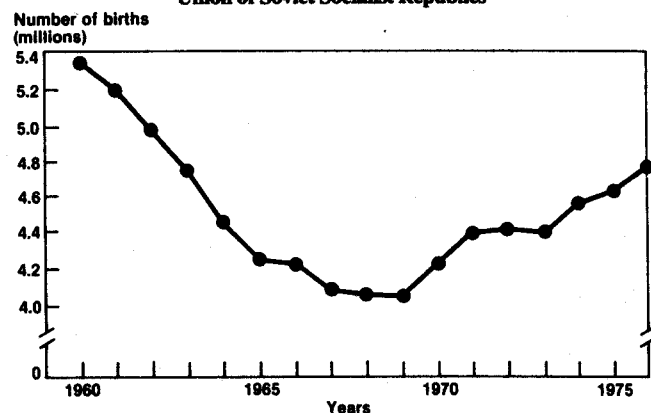
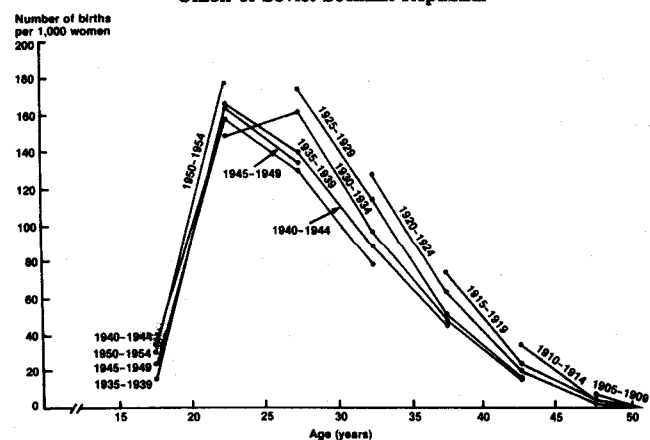


Figure III. Fertility level in women of specific generations in the Union of Soviet Socialist Republics



curves of fertility by age, indicating that there is a tendency for women to bear children at an increasingly early age. At age 32-33 years, women in the 1945-1949 reproductive cohort had already attained the fertility level of women in the 1915-1919 cohort at age 37-38 years. The fertility level in women of the 1920-1924 generation at age 32-33 years is comparable to that of women in the 1940-1944 generation at age 27-28 years.

At the same time, there is a discernible rise in fertility at age 20-24 years. From the 1935 generation on, no female generation has had as high a fertility level at that age as women born in the 1950s.

The increase in fertility at an early age is the result of earlier marriage, which in turn is largely attributable to the demobilization of conscripts from the army at the age of 20 instead of 23 years, as had been the case until 1967. Some influence should also be attributed to acceleration: the rise in fertility in this age group should therefore not be seen as a break in the overall trend. There are better grounds for regarding this increase as a shift to child-bearing at earlier ages.

It will be permissible to speak of a break in the trend of the fertility level only if the birth rate, by age, of women aged 25-29 years goes up. This may occur if factors encouraging the birth of a second or third child come into play. The reproductive behaviour of the 1945-1949 cohorts provides some justification for supposing that such factors may already have begun to exert their influence. It is this increasing proportion of families with two or three children, together with isolated urban and rural families with many children, that can provide the population reproduction needed to avert the threat of depopulation.

Important as the indicators of fertility for the country as a whole are, the picture would be incomplete without a discussion of the geographical differences in the levels and dynamics of the birth rate. In the USSR these differences are extremely significant.

In 1975, for example, the birth rate in the Tadzhik Soviet Socialist Republic was 2.7 times as high as the birth rate in the Latvian Soviet Socialist Republic. If, instead of the entire population of the Union Republics, we take only their indigenous population, the differences become even greater. Thus, for the period 1959-1969, we have computed the following birth rates for the various nationalities.²⁰

Nationality	Average birth rate	Nationality	Average birth rate
Estonians	12.3	Armenians ...	28.4
Latvians	12.3	Kazakhs	41.2
Ukrainians ...	15.8	Azerbaijanis .	43.7
Russians	19.0	Kirghiz	44.0
Byelorussians .	19.2	Tadzhiks	45.2
Lithuanians ...	20.6	Uzbeks	45.2
Georgians	24.0	Turkmens	45.6
Moldavians ...	24.8		

So if the fertility level is considered from the ethnic standpoint, the differences are still more conspicuous.

²⁰ See B. T. Uralis, *Problemy dinamiki naseleniia SSSR* (Moscow, 1974), p. 132. A misprint in the figure for the Armenian nationality has been corrected.

Fertility among the Central Asian peoples is almost four times as high as among the Baltic peoples. This results from the influence of traditions and customs, which are very slow to change. Among the indigenous population of the Central Asian republics, family planning is beginning to spread, as a practical matter, only in towns; in the rural population, fertility is at a level corresponding to the physiological potential of the female organism.

During their younger years, Central Asian married women living in rural localities are in a condition either of pregnancy or of lactation, when the likelihood of conception is slight. It is only in the most recent period that the first signs of the beginnings of family planning have become detectable in Central Asia among women over 40. In the future, family planning will probably be extended to younger age groups, but owing to the persistence of national traditions handed down from one generation to another, it appears that this will not happen very soon.

It should be noted that in the Transcaucasian republics, family planning has been widely practised over the last 10-15 years. Birth control has long been practised in the Georgian Soviet Socialist Republic, but in the Azerbaijan SSR and the Armenian SSR the transition to family planning is taking place, so to speak, under our very eyes. This is shown by the data in table 5.²¹

TABLE 5. BIRTH RATES BY AGE IN THE ARMENIAN SOVIET SOCIALIST REPUBLIC (per 1,000)

Age group	1967-1968	1974-1975	Decline (percentage)
15-19	44.2	40.2	9.1
20-24	222.6	214.2	3.8
25-29	194.6	164.0	15.7
30-34	137.9	80.4	41.7
35-39	73.7	45.5	36.6
40-44	29.4	15.3	48.0
45-49	6.8	2.1	69.1

TABLE 6. BIRTH RATES BY AGE IN THE AZERBAIDJAN SOVIET SOCIALIST REPUBLIC (per 1,000)

Age group	1967-1968	1974-1975	Decline (percentage)
15-19	47.1	21.4	54.6
20-24	226.2	219.2	3.1
25-29	255.1	233.4	8.5
30-34	236.7	156.7	33.7
35-39	143.0	111.2	22.2
40-44	57.9	41.6	28.2
45-49	19.8	6.0	69.7

After the age of 25 the birth rate of Armenian women markedly declines. Taking a more extended period, we can see that the birth rate in the Armenian SSR has been cut almost in half from 40.3 per mille in 1960 to 22.4 per mille in 1975.

A similar trend can also be seen in the Azerbaijan SSR, where there is a sharp decline in fertility among women over the age of 30, i.e. at a slightly older age than in the Armenian SSR (see table 6).

²¹ *Vestnik statistiki*, 1971, No. 12, p. 75; 1976, No. 11, p. 86.

The practice of birth control in families is spreading in various ways. In some cases the proportion of married couples turning to family planning is increasing, while in other cases couples already practising birth control are beginning to use it after the birth of a child lower in birth order than previously. The decline in the birth rate in the Armenian SSR and the Azerbaijan SSR is probably a result of the combined effect of these two processes which lead to a smaller number of children per family. In general, it can be assumed that while married couples in the Armenian SSR began to prefer limiting themselves to two or three children, in the Azerbaijan SSR control of family size is still operating at the level of the third or fourth child in birth order.

At the same time, in most areas of the country birth control is being practised predominantly in such a way as to keep families down to one or two children (see table 7).

First and second children thus make up three quarters of all births; if, however, those areas of the country where birth control is not widely used are excluded, the proportion of first and second children is close to 90 per cent. This is shown, for example, by the following distribution of birth rates by regions, territories and autonomous republics of the Russian Soviet Federative Socialist Republic, the Ukrainian SSR and the three Baltic republics in 1974:²²

Birth rate (per 1,000)	Number of administrative units with the birth rate indicated
Up to 13.9	26
14.0-15.9	29
16.0-17.9	26
18.0-19.9	13
20.0 or more	8
TOTAL 102	

It can be assumed that in those regions of the Russian Soviet Federative Socialist Republic and the Ukrainian SSR, where the birth rate is 12-14 per 1,000, there is a prevailing tendency towards one-child families, and such administrative units constitute a substantial proportion of all units. In those regions and territories where the birth rate is 15-17 per 1,000, families tend to be composed of one or two children. Such a fertility level, however, does not even guarantee population replacement. The overall level of this replacement is characterized by a gross population reproduction rate,

²² Compiled from *Vestnik statistiki*, 1975, No. 12, pp. 81-84.

which in 1974-1975 was expressed in the following figures:²³

Republic	Gross population reproduction rate	Republic	Gross population reproduction rate
Russian Soviet Federative Socialist Republic	0.98	Lithuanian SSR	1.08
Ukrainian SSR	1.00	Moldavian SSR	1.26
Byelorussian SSR	1.08	Latvian SSR	0.97
Uzbek SSR	2.79	Kirghiz SSR	2.33
Kazakh SSR	1.62	Tadzhik SSR	3.07
Georgian SSR	1.24	Armenian SSR	1.38
Azerbaijan SSR	1.93	Turkmen SSR	2.83
		Estonian SSR	1.03

For the whole of the USSR in 1973-1974, the gross population reproduction rate was 1.178, while the net rate was 1.118. Thus, while in the country as a whole there is ample population replacement, in a number of republics, including such major ones as the Russian Soviet Federative Republic and the Ukrainian SSR, even mere replacement is under threat.

Such a situation inevitably gives rise to some concern among demographers and prompts them to make a more intensive study of the fertility process, the factors affecting it and the causes which make these factors operative. By revealing the specific causes which bring about particular number of live births, we can come closer to an understanding of the whole fertility process. This is especially important in providing the basis for an effective demographic policy; the task entrusted to science by the Twenty-fifth Congress of the Communist Party of the Soviet Union is to work out such a policy.

TABLE 7. DISTRIBUTION OF THE NUMBER OF CHILDREN BY BIRTH ORDER IN THE USSR IN 1975

Order of birth	Number of births	
	Thousands	Percentage of total
1	2 084	45.2
2	1 316	28.5
3	453	9.8
4	228	4.9
5	160	3.5
6	116	2.5
7	94	2.1
8	70	1.5
9	44	1.0
10 or more	43 ^a	1.0
TOTAL	4 612	100.00

Source: *Vestnik Statistiki*, 1976, No. 11, p. 85.

^a Including 3,000 without indication of birth order.

²³ Calculated from *Vestnik statistiki*, 1976, No. 11, p. 86.

UNITED NATIONS/WORLD HEALTH ORGANIZATION MEETING ON SOCIO-ECONOMIC DETERMINANTS AND CONSEQUENCES OF MORTALITY, MEXICO CITY, 19-25 JUNE 1979

United Nations Secretariat and World Health Organization*

INTRODUCTION

Background

In 1965, the Economic and Social Council recommended that the United Nations and relevant specialized agencies intensify and extend the scope of their work on population questions. In 1968, in response to this recommendation, the United Nations and the World Health Organization (WHO) convened a Joint Meeting on Programmes of Analysis of Mortality Trends and Levels.¹ In order to implement the Meeting's recommendations and guide-lines for future collaboration in the area of mortality studies, the United Nations and WHO carried out a series of joint activities, such as the organization of an interregional seminar on mortality analysis in 1972, a joint work programme for the formulation of mortality assumptions in demographic projections, the preparation of relevant documents for the World Population Conference, held in 1974, and the follow-up reports for monitoring the implementation of the World Population Plan of Action. A collaborative study of the levels and trends of mortality since 1950 is currently being finalized. As part of this collaborative programme, it was agreed in 1977 to sponsor jointly, at the earliest feasible opportunity, a meeting on socio-economic determinants and consequences of mortality. A number of discussions took place with other international and non-governmental organizations working in the area of mortality studies, in order to ensure broad multidisciplinary participation. El Colegio de México and the Instituto de Investigaciones Sociales de la Universidad Nacional Autónoma de México, as well as the International Review Group of Social Science Research on Population and Development, agreed to act as hosts to the meeting. In addition to the hosts, the following organizations and agencies sponsored and funded the meeting:

The committee for International Co-ordination of National Research and Demography (CICRED);

* Population Division of the Department of International Economic and Social Affairs.

¹ See "Report of the United Nations/WHO Meeting on Programmes of Analysis of Mortality Trends and Levels" (E/CN.9/221) and *Programmes of Analysis of Mortality Trends and Levels: Report of a Joint United Nations/WHO Meeting*, World Health Organization Technical Report Series No. 440 (Geneva, 1970).

The International Labour Organisation (ILO);
The International Union for the Scientific Study of Population (IUSSP);
The Organisation for Economic Co-operation and Development (OECD);
The United Nations Fund for Population Activities (UNFPA);
The World Bank.

The Meeting on Socio-Economic Determinants and Consequences of Mortality was held at Mexico City from 19 to 25 June 1979 at El Colegio de México. Dr. J. Laguna, Under-Secretary of the Ministry of Health and Public Welfare, opened the Meeting and welcomed the participants on behalf of the Government of Mexico.

Opening statements were made by Dr. L. Unikel, Director of the Centre for Economic and Demographic Studies of El Colegio de México; Mr. Léon Tabah, Director of the Population Division of the Department of International Economic Affairs of the United Nations Secretariat; Dr. E. del Cid, Assistant Director of Pan American Health Organization; and Mr. Julien Condé, Chief of Statistical and Demographic Studies, Organisation for Economic Co-operation and Development.

The following officers were elected: Professor Carmen A. Miró, Chairman; Professor Jean Bourgeois-Pichat, Vice-Chairman; Dr. E. Arriaga and Professor L. Ruzicka, Rapporteurs. Mr. Samuel Preston (Population Division of the Department of International Economic and Social Affairs (United Nations Secretariat) and Dr. H. Hansluwka (WHO) acted as Technical Secretaries of the Meeting.

The list of participants is given in annex I below and the agenda is reproduced in annex II.

This Meeting was convened in the spirit of the World Population Plan of Action and of the striving toward a new international economic and social order. The World Population Plan of Action stated that:

"The reduction of morbidity and mortality to the maximum feasible extent is a major goal of every human society. It should be achieved in conjunction with massive social and economic development. Where mortality and morbidity rates are very high, concentrated national and international efforts should be applied to reduce them as a matter of highest priority in the context of societal change."²

The Plan called for

"Reduction or, if possible, elimination of differential mortality within countries, particularly with regard to differentials between regions, urban and rural areas, social and ethnic groups, and the sexes."³

In this context, differential mortality, and inequality in the health status of the people among and within countries, are unacceptable and intolerable politically, socially and economically, and are of concern to all countries.

Objectives of the Meeting

Owing to the rapid rise of population growth during the past quarter of a century and the perceived effects of this rapid growth on social and economic development, demographic research has concentrated in recent years on fertility and the determinants of family limitation, while neglecting the study of mortality and health. With the new direction of national and international development efforts, however, it has become clear that a more balanced approach, which would include in its scope fertility, mortality and migration, is necessary to the study of the interaction between demographic processes and socio-economic change. The convenors and sponsors of the Meeting hoped to draw public attention, as well as the interest of policy-makers and researchers, to the political, social and economic problems posed by the inequality of death. It was especially timely because the 1980 round of national censuses (particularly censuses of population, housing and agriculture) offered an important and vital opportunity to collect data relevant to the study of differential mortality.

The Meeting was convened with the following main objectives in mind:

- (a) To review the knowledge of differential mortality, and to identify the major gaps in the understanding of its socio-economic determinants and consequences;
- (b) To discuss the methodological and technical problems associated with data collection and analysis;
- (c) To consider the policy implications of the findings presented and to promote studies on the implications of socio-economic differentials in mortality on social policy and international development strategies;
- (d) To formulate recommendations and guide-lines for the utilization of the 1980 round of population censuses for in-depth studies of mortality differentials;
- (e) To stimulate national and international research on differential mortality, with particular emphasis on the current situation and trend in developing countries, and to promote among policymakers and the general public alike an awareness of the extent of the existing inequality of death, so as to encourage action to rectify this inequality.

² Report of the United Nations World Population Conference, 1974, Bucharest, 19-30 August 1974 (United Nations publication, Sales No. E.75.XIII.3), chap. I, para. 20.

³ Ibid., para. 24 (c).

The reasons for measuring differentials in mortality

The study of differentials in mortality, whether they be differentials by socio-economic status or by time, place or any other characteristic, aids epidemiologists' and demographic researchers' search for the determinants of mortality and ill health. At the same time, a knowledge of differentials in mortality provides a basis for measuring health inequalities among and within communities and for identifying those population groups whose lives can be improved by changes in government policy.

An aid to the identification of mortality determinants

All societies are to some extent differentiated into social groups, distinguished by such characteristics as occupation, education, income, ethnicity and residence. Each social group may exhibit different characteristics in terms of the individual endowments of people in the group, their personal behaviour, and the relationships among individuals in the group as well as with society at large. Such social divisions structure human relations and form the background against which the biological processes that lead to illness and death operate. Both personal characteristics (such as birthweight, nutrition and cigarette consumption) and community or environmental characteristics (such as water quality and sewage disposal), which directly affect an individual's health, are often found to be differentially distributed by social groups. The measurement of mortality differentials and the study of these differentials within the context of the personal and environmental characteristics of social groups may form an important contribution to the discovery of various factors which determine the levels and trends of mortality.

A measure of social inequalities

Health inequalities are merely one facet of overall social inequalities. Just as the economist recognizes the importance of supplementing measures of average income with information about income distribution, so medical researchers and social scientists recognize Governments' needs for indicators of the distribution of illness among their populations. Even if socio-economic differentials provided no information about the determinants of sickness and mortality, they would cause extreme concern because of their implications for the extent of social and economic inequality within the society. Recent developments suggest that, at a time of relatively scarce resources, Governments are becoming increasingly aware of the importance of distributing available resources according to some measure of "need".

The measurement of differentials is thus necessary to identify those population groups (possibly people living

in certain geographical areas or in certain types of housing) whose mortality is high but reducible by changes in government policy and a redistribution of available resources.

SOCIO-ECONOMIC DIFFERENTIALS AND DETERMINANTS OF MORTALITY

The participants discussed the state of knowledge of socio-economic differentials and determinants of mortality, describing the socio-economic measures available, the methods of data collection and analysis used, and the findings themselves. The discussions on socio-economic measures and methods of data collection and analysis are outlined in this section and the findings are summarized in the following section. The direction of the discussion on mortality differentials and determinants in each geographical region was greatly influenced by two factors—the level of mortality in the region and the degree to which vital registration schemes had been developed.

As participants pointed out, in a number of countries, mortality levels were particularly high and programmes to reduce the level of mortality had not always had the greatest potential for decreasing the socio-economic differentials in mortality. The participants believed, however, that in high mortality countries, it was essential to reduce the overall level of mortality as well as socio-economic differentials and that it was generally possible to develop programmes designed to do both.

The lack of a developed vital registration scheme in some countries meant that measures of differentials were based on the application of indirect methods to national or subnational census information or, more often, on *ad hoc* studies, which were of necessity limited in size and scope. Data collected in those countries were often of questionable quality and were treated with a degree of suspicion by the participants in the Meeting. Data based on small areas, although they could rarely be used with confidence as the basis for generalization to the country as a whole, were often seen, however, to provide invaluable insights into the mortality process.

At the opposite end of the spectrum, countries with long histories of vital registration schemes were seen to differ in the uses they had made of these schemes in studies of differential mortality. Whereas some countries were actively exploring the advantages of record linkage, others had only limited data and were reduced to using more traditional approaches, such as calculation of mortality rates specific for certain socio-economic groups from vital registration and census data.

Socio-economic characteristics and variables

Variables used so far and their further development

The selection of variables for measuring socio-economic characteristics of individual households or

families at the micro level of analysis or of larger aggregates, such as regional subdivisions at the macro level, had largely been beyond the control of the analyst. The researcher generally had to make secondary use of data previously tabulated for other purposes from such sources as censuses, surveys, and administrative statistics. That was especially true for macro-level studies.

Data often came in the form of national or subnational averages and gave no information on the distributions around those averages. Even surveys conducted for the special purpose of the study of mortality and other demographic variables might have the relatively limited objective of ascertaining the overall levels of mortality rather than the exploration of social, economic, cultural or other differentials.

Nevertheless, a number of characteristics had been employed in the study of differential mortality, with varying degrees of success. Those characteristics could be grouped under the following headings:

(a) Occupation (including own, husband's, father's, head of family's, that of chief economic supporter etc.);

(b) Education (own or mother's, specifying years of schooling, whether or not literate, or qualifications);

(c) Housing (number of rooms, crowding, quality of housing—for example, material of roof and walls—amenities, tenure etc.);

(d) Income, wealth (own or family's, number of dependents);

(e) Family (size of family, structure of family, relationship to head of household);

(f) Place of residence (degree of urbanization and geographical characteristics).

In addition, *ad hoc* studies had brought into prominence the potential importance of data concerning family, household and community characteristics. Information on such characteristics as how decisions were taken in the case of illness, by whom and on what grounds, might be difficult to obtain but might throw light on some of the causes of differential mortality. Others, concerning the availability of food, the seasonality of food supply and the distribution of food within the family, might explain to some extent the differential levels of undernutrition and malnutrition.

As the environment in which individuals and families lived and worked determined to some extent the health risks to which they were exposed, as well as the remedies available, community variables should be part of the analysis of differential mortality. The following examples of community variables were mentioned: the source and availability of drinking water, how sewage was disposed of, the availability of schooling, the existence and location of health centres and other health care services, transportation, and climatic variation.

Economists had recently pointed to the correspondence between social amenities, such as those listed above, and personal incomes, in that amenities withdrawn as a community service must subsequently be

paid for by the individual. In many countries, social amenities might consequently be expected to taken on more importance.

Special considerations in the choice of socio-economic measures

An important consideration in the study of differential mortality by socio-economic status was the time reference involved. Some socio-economic characteristics of an individual at the time of his death (for example, income, occupation and place of residence) could be partially due to the prolonged process of health deterioration, begun years earlier. The disease process, once started, did not proceed independently of changing socio-economic circumstances; there was a synergistic relationship, in which not only health deterioration might bring about changes in certain socio-economic characteristics of an individual and his family but also those changes in socio-economic situation and environment might contribute to a further deterioration in health.

Other socio-economic characteristics, such as education, were not affected to the same extent by health itself. For most people, the level of education was determined by the age of 20 or 25 years. Those variables could be more clearly thought of as determinants rather than as partial consequences.

It would be desirable to collect data on both types of characteristics, through longitudinal histories of working life and health. That would allow researchers to study the socio-economic determinants of health status, as well as the continuous and dynamic interrelationship between an individual's health and his socio-economic circumstances.

The participants also noted that the socio-economic characteristics of an individual must be considered within the socio-economic context of the country itself. The significance of a certain level of education or a certain income changed as the availability of education or the national income of the country changed. It was therefore necessary to find a way of separating the direct effects on health of changes in individual or family characteristics from the effects associated with changes of the position in the social hierarchy measured by that characteristic.

The choice of socio-economic measure might also depend on the position of the deceased person in the family. For example, occupation-based classifications had required the development of special rules to code children (usually according to father's occupation), married women (usually according to husband's occupation) and the elderly who were no longer employed (usually according to last or main occupation). Studies indicated that, in many countries, the mother's education was of more relevance than the father's as a basis for studying socio-economic differentials in the mortality of children.

Housing-based measures might have certain advantages over measures based on occupation and edu-

cation. Children or married women could be thought of as "belonging to" the house in which they lived, whereas they could not be thought of as "belonging to" a husband's occupation or mother's education. Housing characteristics could usually be applied with meaning to males and to females, young and old. At the same time, housing reflected the changing socio-economic circumstances of the individual and, in many countries, denoting as it did the family's most valuable possession, could provide one measure of wealth.

Finally, the participants emphasized that the choice of characteristics might differ in studies focusing on individuals and in those focusing on families or households. Studies based on groups of households, small areas or even larger geographic units are usually based on less detailed information. Even in individual-based studies, however, the length of questionnaire, and hence the detail that can be collected, must usually be balanced with the sample size, in order to keep the costs of the study within budgetary limits.

Quality of the information

Deciding on the topics to be covered in a particular study was often easier than choosing the appropriate questions to be asked. That was especially true of characteristics that changed with time, particularly those subject to seasonal or even daily variations. Considerable reservations were expressed about the quality of information on income, wealth, assets and landholding. Information on diet and employment might be subject to frequent fluctuations when affected, for example, by seasonal patterns in supply.

A warning was also given that care should be taken in the use of retrospective histories, which were often subject to "loss of memory". For example, in answering occupational questions, there was a tendency for respondents to report "most prestigious" occupation rather than "main" or "last" occupation and, in answer to fertility questions, there was a tendency to underreport births of children who had already died.

Composite indices of social status

It was pointed out that social status was a multidimensional concept. The terms "upper class" or "lower class" called to mind a whole series of images related to education, occupation, style of life, housing conditions, and so on. In view of that multidimensional character, many sociologists had recommended measuring social status or class by composite indices based on combinations of specific variables.

There were also statistical advantages to be gained by using a composite index. Those advantages related to:

- (a) Sample size, which might not be large enough to allow analysis by single characteristics;
- (b) Reliability of individual characteristics: individual measures might be subject to errors which, it was hoped, would be self-cancelling when indices were combined.

(c) Individual characteristics, which were closely interrelated.

The composite index approach, however, rendered impossible the identification of the relative importance of the given variables constituting the index. Education, for example, was one consideration which undoubtedly influenced occupation and way of life, and, through them, income and housing conditions; they, in turn, might influence mortality. If, to characterize socio-economic status, education was used in combination with other socio-economic variables as part of a "social status index", it was impossible, in the analysis, to determine whether education itself played an independent role in determining mortality differentials or merely contributed indirectly through such variables as income and occupation. The critical role, for example, of maternal education in certain communities would not have been found had the relevant studies relied on composite indices.

In addition, composite indices might prevent the explicit identification of target groups for specific social and health programmes. It was difficult for policymakers to know what types of facilities or programmes were necessary for a geographical area if all that was available was the area's "score" on some composite index.

Methodology

The techniques or methods used to analyse mortality data could be divided into two major groups, namely direct methods and indirect methods. The choice of a direct method or indirect method would generally be determined by the type and quality of data available. Direct methods, whether used to measure levels or differentials, generally combined information from sources such as censuses, population and vital statistics registers, and *ad hoc* surveys to calculate directly the probabilities or rates of dying for population groups from recorded deaths and population at risk. Indirect methods relied upon data collected from censuses or surveys, in which the interviewer had solicited information closely related to but more easily obtainable than the chance of dying, from which, however, the chance of dying itself could be inferred.

Direct Methods

Cross-sectional unlinked studies

The cross-sectional unlinked study approach, also called the census-death registration comparison approach, was the simplest of all the direct methods. Death rates were calculated, usually from census and vital registration data: the former provided the denominator (that is to say, the population at risk), and the latter the numerator (the events). The usual groupings by sex, age and cause of death were extended to subdivide the population according to other characteristics, such as occupation and area of residence, recorded both on the census form and on the death registration certificate.

Although the approach was a simple one and made proper use of information routinely collected, it had two major limitations. First, since census and death records were classified independently, analyses were restricted to characteristics recorded both at death and at the time of the census. Therefore, in most countries, the method could not be used in the analysis of mortality by, for example, education, housing or income—characteristics that were not generally recorded on the death certificate. Secondly, even for characteristics such as last occupation, which were often recorded on the death certificate, differences in accuracy in the recording of those characteristics in censuses and death certificates might result in major biases, which differentially affected individual social groups.

In the United States of America, an extension of that was used (called "follow-back"), which alleviated some of the problems. Relatives of a sample of the recently deceased population were interviewed to obtain more information about the deceased than was available on the death certificates. Death rates could then be constructed by comparison with a contemporaneous census or survey.

Cross-sectional linked studies

It was suggested that the main limitations of cross-sectional unlinked studies could to a certain extent be overcome by linking death records to census schedules. In principle, the scope of analysis would thus be broadened to cover all characteristics recorded at the time of the census and inconsistencies would be eliminated in the recording of characteristics, because analyses could only be based on characteristics noted in the census records.

The two ways in which linkage was achieved might be described as (a) the retrospective approach and (b) the prospective approach.

In the retrospective approach, deaths that had taken place shortly after a census were matched with census records, using identification details on the death record. The method was restricted to such deaths because linkage was based on the address and other points of identification recorded on the death certificate, which, it was assumed, were the same as those recorded on the census form. Even with that restriction, considerable difficulties were usually encountered in achieving a high rate of linkage.

The prospective approach was similar to the retrospective approach, but the linkage was in the opposite direction. Whereas in the retrospective approach a sample of death records was linked to the records of the previous census, in the prospective approach a sample of persons enumerated in the census was matched with their death records as they subsequently died. That approach had been used with some success throughout Scandinavia, in France and in the United Kingdom.

The two approaches had a great advantage over the cross-sectional unlinked approach. Unless, however, the knowledge of the address of the deceased was used to interview the family for further information, the re-

searcher was still limited in his material to characteristics appearing on the census form.

Longitudinal studies

Using the cross-sectional linked approaches, the researcher was still limited to the characteristics of the deceased at one specific time, namely, when the census was held. As already noted, it was often advantageous to have a full history of the deceased person's socio-economic life, so that the full interrelationship between health and socio-economic conditions could be studied. Longitudinal studies collected and recorded information on how characteristics changed with time. The appropriate data could be obtained from censuses or surveys which collected historical data, such as complete occupational histories or complete migration histories or, alternatively, from administrative records by linking the various records collected throughout people's lives. Whereas the former approach (historical data collected in a census or survey) relied heavily on the memory of respondents, the latter relied on the ability to link accurately census, administrative and vital records, as well as on the accuracy and consistency of the data within those records.

Although there would still be gaps in any social history constructed by linking administrative records (the circumstances would be known only at the time the record was made and not between the dates of the records), the approach represented a move towards the use of the most complete histories available as the basis of studies.

Indirect methods

Indirect methods were the ones most widely used to estimate mortality levels and differentials in countries without well-developed vital registration systems. Such methods might make use of information on children "ever born" and children "surviving", by age of mother or duration of mother's marriage, to estimate child mortality, or information on orphanhood status by age or widowhood status by age to estimate adult mortality. Tabulations of such data by specific socio-economic characteristics (of mother, father, household etc.) allowed an analysis of infant, childhood and adult mortality differentials.

In practice, the data most commonly available are the tabulations for children "ever born"/children "surviving", allowing only the estimation of childhood mortality. The methods for estimating adult mortality were newer and less well-tested. The techniques based on widowhood currently appeared more promising for the study of mortality techniques than those based on orphanhood. The participants emphasized the following weaknesses of indirect methods:

- (a) Different groups of the population might report with different degrees of accuracy to the interviewer;
- (b) Characteristics of the household or individual

interviewed at the time of the census might not correspond to those relevant at the time of death;

(c) Some of the techniques made assumptions (for example, about migration) that might not apply equally to each of the subgroups;

(d) The same reference models and assumptions might not be equally applicable to all population subgroups.

Of course, points (a) and (b) might apply equally to the direct methods of mortality estimation.

Despite such criticisms, it was recognized that for a large part of the world, where vital registration schemes had not been well developed, the indirect approaches provided a major and invaluable source of knowledge.

Ecological studies

In the ecological approach (also called macro-level studies or aggregate-level studies) mortality rates were calculated for geographical areas and those rates were then compared with known socio-economic characteristics of persons living in the areas. The mortality rates might be calculated using any available sources—censuses, surveys and/or vital registration—and using direct or indirect methods. Socio-economic characteristics could be available from censuses, surveys or administrative records. The approach might use correlation, multivariate analysis or other statistical techniques to relate the mortality rates in a given area to known socio-economic characteristics of persons living there.

The main advantages of the ecological approach lay in its ability to deal with infrequent events at relatively low cost and the ease with which community-based measures could be introduced. There were certainly other reasons for pursuing aggregate-level studies. Factors such as health systems were truly systemic in scope and macro-level cross-national studies might provide some understanding of the different roles of these factors within various economic, social and cultural contexts. Also, the international comparative studies might often point to significant "outliers"—nations that had achieved a much higher expectation of life than was typical at their levels of economic development—such as Sri Lanka or Cuba. An intensive investigation of such areas might identify the factors underlying their superior performance. Macro-level studies could sometimes demonstrate whether significant influences on mortality lay outside the set of factors being examined (for example, if the relation between mortality and a particular factor shifted substantially over a period of time). In all of those cases, macro-level studies provided useful clues about the factors influencing mortality, although they did not achieve the precision offered by micro-level studies. The participants in the discussion emphasized, however, the caution required in interpreting the findings of macro studies in particular, since each individual residing in a given area was assigned the average characteristics for the area as

a whole and the results at one level of aggregation might not be comparable with those at another level.

Perhaps the most important lesson from macro studies was the advantage of introducing community-level variables into micro-level data sets. That approach, which combined both macro-level and micro-level studies, might perhaps allow the researcher the best opportunity to measure the interrelated roles of personal characteristics and the community environment in determining levels and trends in mortality.

MAIN FINDINGS AND IMPLICATIONS FOR THE SOCIAL SYSTEM

The preceding section outlined the discussion of the various types of data and methods of data collection and analysis that had been employed in studies of socio-economic differentials in mortality. The present section summarizes the main findings of the Meeting and discusses their implications for the social system.

Main findings

In historical perspective, mortality levels had been declining throughout the world, although at an uneven pace and not equally for all countries. In most of the low-mortality developed countries, death rates during the 1970s had continued to decline at almost all ages, though there had been some notable exceptions for males at the older ages. In high-mortality countries, mortality had also generally declined during the 1970s, in some cases independently of their economic level and development. Although inadequate data made it difficult to establish the point beyond doubt, it could be inferred from observations documented for the developed world, South Asia and Latin America that the uneven progress towards a reduction of mortality had resulted in mortality variations within regions that were wider than had ever previously been recorded. The same might also be true of Africa.

Even within the low-mortality developed countries, major regional differences in levels of mortality persisted, the inequality often being considerably greater for males than for females. In a study of regional variation in mortality among selected countries of Western, Northern and Southern Europe, variations did not appear to be correlated with the national level of life expectancy. Some countries, like Sweden and the Netherlands, exhibited a high life expectancy at birth but small regional differences, whereas others, such as West Germany and Austria, also exhibited small regional differences, in spite of comparatively low life expectancy. Norway, on the other hand, combined large regional differences with a high life expectancy. Among the countries considered, a range of 11 years in national levels of expectation of life at birth was found, with the highest level being in Norway and Sweden and the lowest in Portugal.

Although personal characteristics of the people living in the regions, as well as the natural environment of the

regions themselves, probably explained (in the statistical sense) most of the mortality variations found within those countries, migration had also been suggested as a contributing factor to intra-country variations in mortality. Evidence from a number of studies suggested that migrants tended to be healthy and to move to healthier parts of countries. The impact of migration might consequently be the addition of healthy people to regions with already low mortality levels, leaving a residue of less healthy people in regions with high mortality levels.

In the developed countries, strikingly large differentials in mortality had been found for many socio-economic variables, including occupation, education, income, family or marital status and place of residence, as well as by various composite indices of social class or socio-economic status. Differentials similar in direction and size have been found from studies in France, the United Kingdom, and the United States of America.

In many of the low-mortality countries, an interest in the direct effects of occupation—from exposure to particular hazards at work—had been extended to provide a basis for measuring the indirect effects associated with the way of life of people with particular occupations. That extension of the scope of occupational mortality studies had led to the development and use of occupation-based socio-economic classifications in studies of mortality differentials. Studies in France, the Scandinavian countries, the United Kingdom and the United States of America all demonstrated marked differentials, in which high mortality was found for the unskilled and low mortality for the professional groups. There were differences at all ages studied, but they were particularly large for post-neonatal mortality and then again for young adults. They tended to narrow in the older age groups. Nevertheless, in the United Kingdom simple life-table models suggested that, among males aged 15, 77 per cent of those subject to the rates pertaining to the professional classes would survive to retirement age, compared with only 64 per cent of those subject to the rates for the unskilled.

From the limited amount of data available, it appeared that the gap in the developed countries between those in the highest and those in the lowest socio-economic groups (for nearly all variables) had remained nearly constant over the past quarter of a century, in spite of secular mortality declines within each group. In fact, evidence collected in France and the United Kingdom suggested that social class differentials might have increased in recent years.

While the importance of education, particularly maternal education, was most apparent in studies of high-mortality countries, a number of participants believed it would similarly be found important in low-mortality countries. The evidence of studies conducted in the United States of America was cited in support of the suggestion that education should be recorded routinely on death certificates. It was recognized, however, that unless substantial differences in educational level were seen within individual societies, the classification might

be of limited value. In the United Kingdom, for example, the number of years of schooling for most of the population was determined by the legal minimum school-leaving age, and would therefore result in almost 90 per cent of the population being included in the minimum-education category.

Many of the same variables responsible for socio-economic differentials in the developed countries were also responsible for differentials in the developing countries. The independent contributions of educational and occupational characteristics to differentials in mortality levels among population groups in high-mortality countries were noticeable, however. For example, data presented for Chile showed that the post-neonatal mortality rates of children of blue-collar workers were more than six times as high among mothers who had received no education as among those whose mothers had been to high school. Even among the children of mothers who had been to high school, the post-neonatal mortality rates were more than four times as high if the father was a blue-collar worker than if he was a white-collar worker.

In a study of the Yoruba tribe in Nigeria, which thoroughly examined the interactions between a number of socio-economic characteristics and infant and child mortality, maternal education had stood out as the strongest influence on mortality throughout the analysis, suggesting how, in many situations, the survival of children rested firmly on the ingenuity of the mother. The study had hypothesized three explanations for the role of maternal education in the health of her children. First, mothers with some education became less "fatalistic" about illness and took advantage of available alternatives in child-care and health-care. Secondly, an educated mother was more able to find health facilities, communicate with doctors and nurses and demand their help. Thirdly, and possibly more important than the previous two explanations combined, the education of women had a considerable effect on the traditional relationships within the family, with profound effects on child-care.

During the discussions of socio-economic differentials in mortality in developing and developed countries, differentials by sex were repeatedly mentioned, even though a person's sex was usually not considered a socio-economic variable. It was suggested at the Meeting that in some communities, particularly in Asia and North Africa, the traditionally recognized sex differentials in mortality were reversed and, at some ages, females were reported to have higher mortality than males. While the evidence was questioned, it was clear that, if it was substantiated, those communities might shed some light on how different attitudes to male and female children and the role of women could affect relative chances of survival. Also, in many low-mortality/low-fertility countries, the gap between male and female mortality levels had continuously widened, to the advantage of females, from the latter part of the last century onwards. Women in those areas had suffered less from the immediate risks associated with

pregnancy and childbirth but that offers only a partial explanation of a fairly widespread phenomenon. If the explanation did not lie in biological differences between the sexes, the differentially lower female mortality indicated the presence of a potential for further reduction in male mortality.

Rather than question the interpretation of particular results, however, it was perhaps simply worth emphasizing that data were limited and that the failure to collect the appropriate information had left Governments and the community at large powerless to evaluate the impact of social and health policies on the health of different socio-economic groups and, therefore, without any way of knowing whether their societies were becoming more or less egalitarian in the distribution of health.

Implications for policy planning

Mortality decline and mortality differentials

All Governments were at least verbally committed to improving the health and lowering the mortality level of their populations, but not all people enjoyed a long life; differentials in mortality occurred within countries as well as between countries, and were also found in both high-mortality and low-mortality countries.

At the beginning of the historical decline of mortality in the western world, mortality differentials among population groups had initially widened. It was only later during the mortality transition, after the middle of the nineteenth century, that differentials had begun to narrow. Recently, however, a new phenomenon had become apparent. Mortality levels in the western world were declining at much slower rates than previously and there was no further narrowing of mortality differentials. Indeed, evidence from some countries pointed to a possible widening of the mortality gap. That the historical relationship between mortality change and mortality differentials paralleled that between economic growth and income inequality was unlikely to be an accidental occurrence and it might very well indicate the significant role of income and other social factors in explaining mortality differentials.

For the developing countries where mortality was still relatively high, evidence of wide differentials was presented at the Meeting. Unfortunately, no data on trends in differentials were available. It was clear, however, from the experience of the developed world that a narrowing of mortality differentials could not automatically be assumed to occur concomitantly to a secular mortality decline. Differentials could be expected to vary not only with the portion of the mortality transition completed but also with the structure of and changes in the social and economic situation. Hence, when mortality rates were high, an urgent and unremitting effort must be made to reduce them. The goal of policy-makers was to develop a strategy to narrow differentials among groups at the same time as the overall level of mortality was being reduced.

Implications in the public health system

Traditionally, the greater part of health expenditure in both developed and developing countries had gone towards individual medical treatment. Such care might not, however, be closely related to the general health status of the population. In fact, the concentration of health resources on individual medical treatment could increase differentials in mortality, as the treatment might be enjoyed only, or primarily, by those who could afford it or who know how to benefit from it. Other factors, such as nutrition and health care, were clearly more important causes of variations in mortality; adverse environmental conditions emphasized the role of those factors. Attempts by Governments or medical services to divert funds from individual care to community health care and nutrition programmes might be strongly opposed not only by some sectors of the population but also by professional politicians and physicians. Health-care systems, being integral parts of the social systems under which they operated, did not function in a vacuum. They were likely to be truly egalitarian only if they existed in an egalitarian society.

Both health services and primary health care programmes contributed to the reduction of differentials in mortality rates by actively ensuring that care was provided to the whole population. However, it was not enough for care merely to be available; for those belonging to the most disadvantaged groups were the least likely to seek it. Public-health systems needed to develop new strategies to make health care readily available and accessible to all strata of the community. Health care should be taken to the community rather than the community being expected to go in search of it. Incentives could encourage communities to take advantage of available health-care facilities. For example, a scheme had been implemented in France whereby pregnant women received benefits for hospital attendances.

A whole range of allied programmes could make an important contribution not only to the reduction of mortality rates *per se* but also to the differentials in those rates that were determined by social or economic factors. Such programmes included rehabilitation and education programmes, as well as programmes to enhance a sense of cohesiveness within the community.

It was evident that community services should be designed to serve real community needs rather than being organized centrally according to some theoretical model. Similarly, health research should be oriented towards evident needs within the community and multidisciplinary teams should be trained to deal with questions and problems arising within the community. In that context, emphasis had rightly been placed on the primary-health-care concept.⁴

⁴ *Primary Health Care: Report of the International Conference on Primary Health Care, Alma-Ata, 6-12 September 1978, Jointly Sponsored by the World Health Organization and the United Nations Children's Fund* (Geneva, World Health Organization, 1978), recommendations.

In high-mortality countries, the problem of differentials in mortality could not be considered in isolation from the urgent need to remove the major causes of premature death. Therefore, strategies for dealing with specific diseases or for providing adequate sanitation had an extremely important role to play. Attention had rightly been drawn to the necessity for implementing water supply and other environmental health programmes in deprived areas.

Implications for the social and economic structure

The questions concerning the implications of differentials in mortality rates for the social and economic structures of society should ideally be studied taking the whole of society into consideration. Orphanhood, widowhood, a death in a family, when multiplied from household to household, had far-reaching consequences for a society. And the centralized actions of the society equally impinged on the lives and deaths of its individual members. An increase in spending on formal or non-formal education as part of a health programme might affect differentially the probability of dying from different diseases. If education, for example, affected the probability of dying from diarrhoea more than from cancer, it would lead to a relative increase in the allocation of resources to children.

The distribution of ill health pointed to a variety of unfulfilled economic and social needs in different sections of the community. Although increased health services to the population of need might be sufficient in some cases, it was probable that a multisectoral approach would frequently be necessary.

The populations of low-mortality countries were aging. As the proportion of economically inactive to economically active members of a society increased, so did the burden of dependence on the latter. New health and social care systems might be required to deal with the problems of the aged; for it might not be sufficient simply to expand existing systems in order to accommodate increasing numbers of old people.

A lowering of mortality rates in what were currently high-mortality countries would have two possibly very important economic consequences. First, a potentially valuable natural resource of those countries would increase, their labour force. Secondly, lower mortality might ensure a greater return on investment in education and nutrition, since more children would live to become active working members of society and workers would be productive for more years. Thus, consideration should be given to the implications of a longer life expectancy for the economic development of those countries. Governments must prepare to absorb into the development process the future increased productive capacity of a larger and more healthy labour force. Otherwise, unemployment and disillusionment would be likely to follow.

In summary, inequalities in mortality were closely associated with inequalities in social and economic conditions. Any attempt to reduce or remove those in-

equalities must be based on a clear understanding of their causes and interrelationships in order to succeed.

MECHANISMS FOR FUTURE RESEARCH

At the last formal session before the adoption of the draft report, the various international organizations represented at the meeting outlined their interests and proposed programmes of work in the area of mortality research in general and socio-economic differentials in particular. They included the Population Division of the United Nations Secretariat, WHO, OECD, CICRED, the IUSSP Working Group, and the International Review Group of Social Science Research on Population and Development of El Colegio de México. In addition, CICRED presented a catalogue of proposed and ongoing research activities among the centres with which it was associated. Participants in the meeting expressed their desire to see a resurgence of mortality research after so many years of neglect. On the basis of those presentations, future research might be expected to take the directions outlined below.

Research in countries without developed vital registration systems

In those parts of the world where vital registration systems were either deficient or non-existent, there was a need for movement in two directions. The first should be towards the development of vital registration systems and of national survey capabilities. While the development of a vital registration system was a vital goal, it must be recognized that the achievement of a system with acceptable levels of coverage and reliability would take a generation or more. In the meantime, therefore, countries would rely upon surveys as the source of data for analytical and planning purposes. In the past, however, demographic surveys had not always given sufficient attention to mortality to be able to produce data that could be used for a reliable estimation of general mortality levels, much less for an evaluation of mortality differentials. A greatly expanded survey programme, preferably internationally co-ordinated, was strongly recommended by the participants as the most logical direction for research activity in the near future and the medium term.

In order to allow analyses of levels, trends and differentials in mortality through the survey instrument, surveys of a substantially larger sample size than those undertaken previously would be needed, covering significantly longer periods of time and using newly developed data-collection and analysis techniques.

To provide a more specific indication of how that survey programme in mortality might be achieved, it was suggested that the study of differential mortality might be carried out through the mechanism of special surveys on infant, early childhood and maternal mortality, perhaps similar to those currently being sponsored by WHO in a number of developing countries. There were several reasons for using that mechanism. Morbidity and mortality surveys in those age groups

commonly provided the most sensitive indicators of levels, trends and differentials in mortality. That mechanism also provided a large core of experience upon which to draw, either for additional surveys or for extending those surveys to the collection of data on the sex and age patterns of mortality over the entire life-span. At the same time, it should be possible to incorporate important questions about morbidity and causes of death.

The rate of progress towards developing national vital registration schemes and high-quality survey systems would depend greatly on the training of national personnel and the development of national household survey capabilities. That direction of activity was integral to all research activities. It would be recalled that the Statistical Commission, the Economic and Social Council and the General Assembly of the United Nations, and the World Health Assembly, had all given the highest priority to the achievement of national statistical capabilities.

Research in countries with developed vital registration systems

At the opposite end of the spectrum, namely, for countries with reliable vital registration systems, developments could also be expected on a number of fronts. For example, a variety of ways of using vital registration systems were described at the Meeting and those systems could be applied in countries which had so far devoted little attention to differentials in mortality. In many cases, that would not involve the collection of new data but would result from a more effective use of data that had been collected previously.

A number of countries, particularly France, the United Kingdom and the United States of America, as well as some Scandinavian countries, would in the short term be studying more efficient ways of using available data. While measures of the direction and overall magnitude of the relationships between socio-economic status and mortality were available, research methods had not provided a basis for measuring trends in differentials and had provided only a limited understanding of the underlying mechanisms affecting the relationships observed. Research could therefore be expected on methods of reliably measuring trends in mortality differentials. The application of such methods, if they incorporated a range of socio-economic characteristics at the individual and the group level, might shed light on the interrelationship of mortality and socio-economic change.

An important contribution to research technology might be expected from the various attempts at record linkage, particularly those which included a number of socio-economic characteristics at different stages of individuals' lives.

Clearly, it would be helpful if the international community could be kept informed on the progress of research activities of the various countries. The participants expressed the hope that the Meeting had

stimulated researchers currently working in the field of socio-economic differentials in mortality to exchange experiences and ideas and new researchers and national Governments who were only just developing their capabilities to begin work in that important area.

RECOMMENDATIONS

Since high mortality and wide socio-economic differentials in mortality within a country were problems of a general nature, with implications for all spheres of society, priority must be given to programmes aimed at measuring and understanding the extent, causes and implications of such differentials. The following recommendations were made to facilitate the development of suitable programmes for: (a) broadening the base of data collection; (b) advancing research into methodologies of data collection and analysis, into causes and consequences of differentials and into the assessment of strategies for simultaneously reducing overall levels of mortality and socio-economic differentials; (c) ensuring that national and international activities were suitably co-ordinated; and (d) providing adequate funding of research and training activities.

Data collection and processing

High priority should be given to the initiation or expansion of the collection and tabulation of data that reveal the magnitude of socio-economic differentials in mortality.

The recommendation was expanded by the following specific proposals for action to be taken by countries according to the potential of their vital registration schemes.

Countries without adequate vital registration schemes

(a) In order to monitor the progress achieved by implementing health and social programmes on a continuous basis, efforts should be made by Governments to improve and upgrade existing vital registration systems.

(b) In order that the prevalence of major disease processes can be studied and appropriate health programmes implemented, in countries where medical certification of cause of death is inadequate alternative approaches to the collection of cause-of-death information should be explored. Current experiments relying on lay certifiers or retrospective surveys of families of decedents are examples of the types of approaches that may be useful.

(c) Despite the urgent need for high-quality death registration systems in all countries, it is recognized that many national registration systems are highly deficient or even non-existent. Since for some countries it will be many years before reliable civil registration is available, single or multi-round surveys should be organized in the interim, in order to provide national development planning agencies and public health authorities with needed information for health planning.

(d) In *ad hoc* surveys, emphasis should be given to collecting information not only on individuals but also on families and households. Community characteristics, such as water sources and sewage disposal, as well as local availability of or access to educational and health facilities, should also be given particular attention.

Countries with adequate vital registration schemes

Four approaches to the study of socio-economic differentials in mortality were explored at the Meeting, namely:

(a) The traditional method of separately tabulating census data and deaths, by socio-economic and other variables;

(b) The retrospective approach;

(c) The prospective approach;

(d) The longitudinal approach.

Those procedures should be considered for adoption in all countries which, to date, have not analysed their data by socio-economic characteristics; the appropriate approach would depend on the potential of the individual vital registration system;

Since a major purpose of mortality analysis is the design of policies to reduce mortality levels and differentials, researchers should investigate not only socio-economic differentials but also geographical patterns;

In order to understand better the role of socio-economic class in the hierarchy of factors which influenced mortality, ways should be found of simultaneously introducing characteristics of the individual, the household and the community into the analysis (see under "*Research*" below);

Countries should measure socio-economic differentials in mortality at regular intervals in order to secure a measure of trends;

Countries with special health-monitoring schemes should consider regularly including socio-economic characteristics in the information collected.

Research

High priority should be given to the promotion of methodological and substantive research activities in the area of socio-economic differentials in mortality in order to further knowledge on the extent, causes and consequences of such differentials. Methods that are developed should take into account the need to relate changes in social policy to trends in health differentials.

The above recommendation was expanded so as to consider specific proposals for the methodological and conceptual (substantive) components of research.

Methodological issues

The following proposals for research on methodological problems were made:

(a) In the previous section, alternative approaches

to deriving estimates of socio-economic differentials were enumerated. Work is required to define in broad terms the circumstances under which each approach is appropriate.

(b) Similarly, many factors may affect the choice of socio-economic characteristics used in the analysis of mortality differentials. While simple studies based on single measures are an important step forward, methods that introduce more characteristics about the individual, the household and the local community should be explored. Studies which incorporated information from population, housing and agricultural censuses *via* record linkage would have the greatest potential.

(c) Research is urgently required into the methods of measuring and analysing patterns of social change and their relationship to mortality levels and socio-economic differentials.

Conceptual issues

The following types of research into the causes and consequences of mortality differentials were proposed:

(a) Theoretical frameworks of the determinants of mortality levels, trends and differentials need to be developed. Such frameworks should take into consideration the historical development of the social structure. A theoretical framework would not only permit a better selection of socio-economic variables related to mortality, but would also improve understanding of the interrelationships among the variables.

(b) Studies are necessary on the effects of maternal education on the survival of children (separating factors such as maternal care, maternal income, power structures within the family, attitudes and priorities); diet (separating questions of food distribution and food preparation from the basic nutritional values of certain foods); local resources and practices in the community (separating questions related to access to education, access to health facilities, local services etc.); and social practices and customs in those select communities where traditional sex differentials in mortality may be reversed.

(c) In low-mortality countries, research into the direct effects on mortality of particular social habits, such as drinking and smoking, or of exposure to particular chemicals at the work-place or in the home environment, should be encouraged. The implications of these social habits for socio-economic differentials should be considered.

(d) In many low-mortality countries, substantial proportions of the population are now in the older age groups. For many years, mortality levels in these age groups have declined only a little. A better understanding of the causes of death in these age groups, namely degenerative diseases, is necessary, as are studies (both biological and sociological) of the aging process itself.

(e) Attention should be paid to the role of health intervention programmes in the study of mortality

levels and differentials. Carefully developed health intervention in selected areas is often relatively inexpensive and can provide valuable information on the impact of various health programmes on mortality. The results of health intervention programmes need to be summarized and synthesized, particularly with respect to the relative cost-effectiveness of alternative programmes. Intervention studies should also attempt to single out the differential impact on mortality among the social classes. Finally, socio-economic intervention studies are a promising vehicle for identifying the effect of social programmes on mortality.

(f) So far, only limited attention has been given to the consequence of alternative mortality levels. It is recommended that social and medical scientists should address themselves to the social, economic and demographic implications of changes in mortality levels and of socio-economic differences in mortality.

(h) Most of the research activities outlined above are, by their very nature, interdisciplinary. The use of methodological techniques and expertise of a number of disciplines is encouraged.

International co-ordination, training and data dissemination

International organizations should co-ordinate the activities of countries embarking on programmes to measure mortality differentials and should offer technical advice and support. They should encourage and facilitate the exchange of experience among countries and should participate in the design and planning of suitable training materials and programmes.

The above recommendation was expanded to consider specific proposals for action under the headings of international co-ordination, training and data dissemination.

International co-ordination

(a) In order to be able to monitor on a continuous basis the effects of health and social programmes, efforts should be made by Governments to improve and upgrade the existing systems of registration of vital events. International organizations should give a high priority to encouraging Governments to undertake such activities where inadequate registration systems exist and assist in establishing such systems where they are still lacking.

(b) International organizations should provide co-ordination for, and technical assistance in, the initiation or expansion of the collection and tabulation of data that reveal the magnitude of socio-economic differentials in mortality. In particular, these organizations should initiate collaboration with, and encourage collaboration among, national organizations by preparing suitable core questionnaires and modules containing information required for the use of indirect methods of mortality estimation. Coding and tabulation programmes should be formulated and simple manuals pre-

pared to instruct users on the processing and analysis of such data. These activities should be given a high priority because of the opportunities to be provided by the 1980 round of population censuses.

(c) More information relevant to the study of socio-economic differentials could be obtained from existing systems of data collection if attempts at data linkage prove successful. The United Nations and its specialized agencies should draw the attention of both Governments and researchers to this largely untapped information potential. International organizations should also encourage individual countries experimenting with different approaches to exchange their experiences.

(d) Among the issues raised by the large number of characteristics potentially relevant to the study of socio-economic differentials in mortality is the selection of characteristics to be used in national and international comparisons. This is particularly problematic, as the relevance of many characteristics varies as social structures and mortality levels change. Internationally sponsored research is needed in order to establish the data requirements for standardized international comparison.

(e) In some instances where surveys were conducted but mortality data were not fully analysed, analysis should be encouraged and assistance provided from national and, where required, international organizations.

Training

(a) In view of the importance that Governments and individuals attach to the improvement of health and the reduction of mortality, mortality study programmes should receive higher priority than is given at present in demographic and social science curricula.

(b) Health administrators and medical and public health students often receive insufficient training in the tools necessary for the study of socio-economic differentials in mortality. The appropriate divisions of the World Health Organization and other bodies should prepare materials which can be used throughout the world to overcome such deficiencies.

(c) The United Nations and the World Health Organization should organize and promote short-term training courses to be attended by health statisticians and other government statisticians, in particular those working in the less developed countries, on the collection, processing and analysis of mortality data. Particular attention should be given in the curriculum to estimation procedures based on indirect methods and the analysis of mortality differentials by social, economic, community and other characteristics.

Data dissemination

(a) The exchange of information on methodological, conceptual and other issues concerning data collection and analysis pertinent to the study of mortality

levels, trends and differentials should be expanded. Dissemination of information on the results of national studies on mortality and its differentials should be part of the international information exchange systems and suitable mechanisms at the international and national levels should be developed to set up such systems.

(b) In view of the interest of research organizations and researchers outside official government agencies in studying the effects of social class on mortality, and given the importance of such studies for improving health conditions, Governments should consider making relevant existing data sets available whenever practicable. The data sets may be in the form of cross-tabulations or, if legislation permits, in the form of data tapes. Collaboration between government agencies and research institutions in the collection and analysis of the data should be promoted.

(c) The presentation of analytic results should include the following stages: a discussion of limitations in the data and techniques being used; a presentation of the number of observations on which estimates are based; and a presentation of standard errors of the estimates. Although these requirements are elementary, they are occasionally disregarded because of high publication costs. In view of their fundamental importance, however, publication costs should not be reduced at the expense of the scientific value and rigour of the study.

Financing

Finally, recognizing that mortality had received low priority in allocation of funds for research and training, the Meeting called upon bilateral and multilateral funding agencies in the area of population and public health to rectify that deficiency and to expand substantially the funding of projects and programmes in the areas of mortality levels and differentials.

ANNEX I

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ANNEX II

Agenda

1. Public health aspects of differential mortality
2. Methodological aspects of measuring differential mortality
3. Socio-economic determinants of mortality in sub-Saharan Africa
4. Socio-economic determinants of mortality in Latin America
5. Socio-economic determinants of mortality in Asia
6. Socio-economic determinants of mortality in developed countries and in Arab countries
7. Consequences of policy implications of socio-economic differentials in mortality:
 - (a) Interpretation of relations between mortality and socio-economic development
 - (b) Implications of socio-economic differentials in mortality for the health system
8. Prospects for change in differential mortality
9. Planned research activities
 - (a) Plans for international research
 - (b) Plans for national research
10. Recommendations
11. Adoption of the draft report

UNITED NATIONS SYMPOSIUM ON INTERRELATIONS AMONG RESOURCES, ENVIRONMENT, POPULATION AND DEVELOPMENT, STOCKHOLM, 6-10 AUGUST 1979

United Nations Secretariat

BACKGROUND

The Symposium on Interrelations among Resources, Environment, Population and Development, held at Stockholm from 6 to 10 August 1979, dealt with some of the most vital issues the world has to face; it brought together a group of participants who were greatly concerned and involved in today's manifold and urgent problems of economic and social development. The names and addresses of participants are listed in the annex below.

The Government of Sweden was host to the Symposium and the Minister for Foreign Affairs of Sweden co-chaired the meetings, together with the Director-General for Development and International Economic Co-operation of the United Nations Secretariat.

A report on the proceedings of the Symposium has been issued by the United Nations Secretariat.¹ The participants issued a statement, which is reproduced below.

STATEMENT OF VIEWS OF PARTICIPANTS IN THE SYMPOSIUM²

Increasingly, in recent years, the world community has been concerned with the manifold problems of development. Although not all the underlying intricacies of the complex development process are fully understood as yet, the world's perceptions of its numerous facets and the intimate links permeating them are becoming sharper. Analyses of and policy prescriptions for these problems have emerged at a time when the world community is engaged in the urgent and comprehensive task of establishing a new international economic order conducive to accelerating the economic and social progress of the developing countries.

From intense international discussions has come the realization that development problems need to be tackled not separately but in an interrelated manner, so as to yield realistic policy conclusions for action. We feel

¹*Interrelations: Resources, Environment, Population and Development: Proceedings of a United Nations Symposium Held at Stockholm from 6 to 10 August 1979* (United Nations publication, Sales No. E.80.11.A.8).

²The views expressed in the statement are those of the participants in their personal capacity and not necessarily those of the Governments or organizations with which they are associated.

gratified and encouraged by the initiative of the Government of Sweden in convening, under the auspices of the United Nations, this Symposium on Interrelations Among Resources, Environment, Population and Development at Stockholm from 6 to 10 August 1979. In the present statement, we have set out our comments and views, based on our deliberations at the Symposium. Although we may not necessarily have identical opinions on every point, the statement reflects our consensus on general trends and policy implications concerning the interrelated issues discussed by us.

Interrelations: some examples

Interrelations among resources, environment, population and development are evident in numerous processes in the complex socio-economic, technological and ecological systems of which modern society is composed. Some of these are as follows. Rapid population and economic growth stimulate the demand for scarce resources and intensify resource use that leads to environmental degradation and diminished resource productivity, among other things. Loss of land and increased poverty related to population pressures will lead not only to a reduction of the resource base but also to further environmental degradation. Migration flows from mostly rural areas of poor countries to the largest urban areas may create new ecological disruptions and social imbalances. An understanding of these flows and the interactions between rural and urban sectors is not complete without concurrent appreciation of the determinants and consequences, at both the national and international levels, of industrialization.

A specific example is provided by fuelwood, which is the principal source of energy in many developing countries. The effect of rapid population increase and inadequate development of other sources of energy is to intensify the demand for wood, widen the gap between demand and supply and leave more intensive wood-cutting as the only alternative for the poor. Given the localized character of wood supply, intensive wood-cutting exerts concentrated pressure on tree cover and other woody vegetation, which leads to deforestation and, therefore, a decline in agricultural productivity through landslides, flooding, soil erosion and even desertification.

Negative effects are not necessarily inherent in inter-

relations. A simple example of positive impact is provided by the process through which human development by education and training leads to improved use of natural resources and to higher productivity. It also contributes to declines in fertility and to diminished population pressure.

A greater understanding of such interactions would help to identify points of leverage for the acceptance and application of appropriate policies, thereby making patterns of resource use, consumption and population growth and distribution more apparent. Continuing research is needed to enhance our understanding, but policy action should not await the outcome of new research.

We touch on some aspects of the interactions among resources, environment, population and development in the following four sections under the headings of carrying capacity, human development, disparities and life styles, and resource use. Development is also closely interrelated with trade, monetary and financial questions, a subject which was not within the purview of the Symposium but which was referred to in connexion with the requirements of a more equitable and rational economic order. With this in mind, a new impetus to a North-South dialogue, covering all the critical issues of international economic co-operation, has become more urgent than ever.

Carrying capacity

The concept of carrying capacity connotes the potential to support growing populations at increasing standards of living. Although we are still unable to establish where the "outer limits" are, we note with concern that certain patterns of production and consumption are straining the carrying capacity, globally, regionally and nationally.

A dramatic instance of this danger is the potential long-term effect of man's activities on climate. The World Climate Conference, held in February 1979, has pointed out that, as a consequence of the continued combustion of fossil fuels and possibly also deforestation throughout the world, the amount of carbon dioxide in the atmosphere is increasing by about 4 per cent every 10 years. Should this trend accelerate, or even continue, a gradual warming of the lower atmosphere might occur, which could lead to changes in temperature and rainfall patterns globally, with highly important implications for many aspects of the world economy, including agriculture and the production of energy.

We believe that carrying capacity is not a static but a dynamic concept. It can be improved or expanded by the adoption of development strategies encompassing interrelated sets of goals and measures, by advance of technology and by sound management and an equitable use of resources.

A new and encouraging development has been a broad acceptance of the relevance of population issues in development policy. For the first time in the post-war

period, the rate of growth of world population has started to decline, although the number of people added annually to the world's population is still likely to be more than the present figure of 80 million.

Instances of international migration are often symptoms of differential population pressure. The potential of voluntary international migration to alleviate such pressure on resources, environment and development remains untapped, owing to political and other factors.

The availability of resources can be enhanced and expanded with advances in technology, and by the sound management of resources. In the long run, resources are not given but are determined by human activity. There are plenty of potential resources available. In particular, consideration and realization of the potential benefits of the development of renewable sources of energy are urgent.

In agriculture it appears necessary to define and promote a third agricultural revolution, following that of the seventeenth and eighteenth centuries, which was based essentially on natural and biological inputs, and that of the twentieth century, which was based on abundant and cheap energy. The techniques of this new revolution should be adapted to each environment, but they would all have in common the fact that they would be based to a much greater extent on renewable inputs, such as natural nitrogen-fixing, more effective utilization of photosynthesis, plants and animal breeding and the association of crops with forestry and aquaculture.

We attach great importance to the intensification of international co-operation for the global management of resources. This must be fully in keeping with the principle of the exercise of permanent national sovereignty over natural resources. It is necessary to develop a system for monitoring and helping in the management of these resources on a rational basis. Such a system must provide for the acquisition by the developing countries of an equitable share in the world use of natural resources. For this purpose, an adequate international policy should include norms and commitments; it should accord special treatment to the development needs in the distribution of supplies.

Human development

Human development must be viewed in a wide perspective. Man is both an agent of development and the object of development.

Man is not distinct from nature but is one component of a total system. Any other view of man's relationship with nature would be arrogant and likely to reduce the carrying capacity of the earth. Learning is a process for equipping man to understand and respect this relationship. However, learning can be effective only if there is an improvement in the social and living conditions of the poor.

The capacity of mankind to manage resources properly depends primarily on technology and economic and social structures. Education, formal and informal learning, the development of skills, training and com-

munication are, however, equally important. The post-war reconstruction of European countries was possible in a relatively short period because they still had the major ingredients of human-resource structure. Once trained, man sustains himself more easily and is apt to earn his own living.

There are interlinks between human development and social conditions. Declines in mortality and fertility due to improvement in education and primary health care have been demonstrated. It has also been demonstrated that appropriate human-settlement policies promote more balanced geographical distribution of population and economic activities. Improved capabilities of people help them to achieve better participation and to anticipate future change. The irreplaceable human capacity and function of problem-solving is enhanced, and value systems are enriched and more closely integrated. Equality between men and women is an integral element of human development.

Disparities and life-styles

The question of consumption patterns and life-styles provides one of the most basic sources of conflict in the world today. It is a critical manifestation of stratification in the world, both internationally and domestically. It fuels a major confrontation in the world, the developed countries wanting to maintain—and indeed enhance—the standard of living attained by them, and the developing countries seeking to achieve tolerable living standards for their people.

Three aspects of growing conflict are involved. The first is the global structure of relations between resources and human beings, in which a minority of countries has, in pursuit of a wasteful style of life, pre-empted a large part of the world's resources. The second aspect is the spread of the same style of life to the dominant strata of the third world, which has accentuated divisions within and among these societies. The third aspect arises out of the first two and takes the form of a growing conflict over the access, distribution and control over the world's resources for maintaining and raising standards of consumption of the industrialized world and of the privileged strata of developing countries.

The issue of equity is thus central to our consideration of population, resources, environment and development. It is clear that basic change in the North, accompanied by a fundamental modification in international relations, is critical for overall structural change in the world. Indeed, such change is a prerequisite for stable and sustainable human development and the economic progress of developing countries, since this process involves competition for the resources that have been in large part appropriated by developed countries.

New patterns of consumption and development are urgently needed in both the North and the South—patterns that are less wasteful, environmentally sound and socially responsible. For the reasons adduced

earlier, the major responsibility rests in this regard on developed countries. New patterns should help to alleviate the ailments that affluence has brought in its wake.

If a change in life-styles in developed countries is to contribute to the mitigation of world poverty, it must be organically linked with measures for establishing the New International Economic Order. As an integral part of, and simultaneously with, changes in life-styles in developed countries, there should be a fundamental restructuring of international economic relations. The aim should be to remove the present inequities and imbalances, to ensure full and effective participation of developing countries in international decision-making and, through energetic deliberate steps, to enlarge substantially the transfer of resources to them and to organize the flow of those resources on a more assured and automatic basis.

In this connexion, we note with deep concern the present unfavourable climate of international development co-operation. It is a tragic irony of our times that, while the interdependence inherent in the world economy is becoming a fact of life, co-operation among nations has suffered a setback and is being retarded. A wide gap has developed between what appears to be manageable on the basis of scientific and technological considerations and what is acceptable at the intergovernmental level. Mass communication media, activities of transnational corporations and other features of international relations cause developing countries to adopt patterns, strategies and methods of development which are not necessarily appropriate to meet their genuine needs. Changes in developed countries are taking place irrespective of international requirements and objectives, with the result that their impact is quite often unproductive and invariably less than optimal. Steps must, therefore, be taken to forge a global movement aimed at reasserting the development priority. The contribution of like-minded countries (both developed and developing), the United Nations system, non-governmental organizations and various social groups should be dovetailed into a vigorous thrust for bringing about a just world society.

Resource use

The development capability of nations depends on their potential for using natural resources, which in turn is determined by their ability to apply technology. Many countries are rich in natural resources but are still underdeveloped because they do not yet possess the capability to apply technology in order to transform such resources. This is largely owing to constraints imposed by social, economic, power and institutional structures both within and among nations.

The availability of cheap energy has led to the development of energy-intensive technologies, to changes in the patterns of consumption and, through wasteful use, to the deterioration in environment. These tendencies have been accentuated by population

growth and the disparities in levels of living between the North and the South.

The energy problem affects in more than one way the interrelations among resources, environment and development. In the short run, strict conservation measures are necessary in all countries, particularly developed countries. In the medium term, improvements in technological efficiency and development and application of new technologies in energy production and use are needed. In the long run, increasing utilization of new and renewable sources of energy is required.

These will, above all, call for massive efforts of international co-operation in undertaking appropriate research and development activities, in providing developing countries with access to the latest knowledge and technologies and in mobilizing resources in order to increase investment in this sector substantially. International co-operation in the field of energy will be an essential element of the New International Economic Order. It is particularly important that new measures of co-operation and mutual assistance among developing countries in this field should be undertaken. The urgent adoption and implementation of such measures have become indispensable for maintaining unity and cohesion among developing countries, which are crucial for the success of their role in the establishment of the New International Economic Order and for strengthening their collective self-reliance.

A rational use of natural resources is essential for the expansion of agriculture, and will remain a major issue for many years to come. The application of science and technology should be coupled with the wide appreciation of time-tested traditional conservation and recycling practices, particularly in developing countries. This is an imperative in the face of rapid change and increasing population densities. The use of the seas for both new and additional resources, to maintain equitable life support for all peoples of the earth, is a joint responsibility of both developed and developing countries. To miss the opportunity of international action for wisely monitoring and equitably distributing the bounties of the seas is an affront to the declared basic principles affirmed by Member States of the United Nations.

The repercussions of the prevailing patterns of production and consumption on the future supply of both renewable and non-renewable resources are not only a direct result of the increasing use of these resources but will depend also on the impact of environmental changes. Such changes in environment affecting future supply are, for example, the accumulation of chemical wastes and residues in the soil resulting from the over-application of inorganic fertilizer and the dumping of chemical wastes, deforestation and soil erosion due to excessive felling of trees, and the possible changes in climate induced by a decrease in the forest cover and the accumulation of carbon dioxide in the atmosphere. These environmental changes can lead to contractions in the supply of arable land and reductions in the productivity of land.

Disarmament measures are of crucial importance for

the development of human and material resources and for the improvement of the quality of life, for the promotion of the accelerated development of the developing countries and for the establishment of a system of international relations based on equity and justice.

Nuclear arms constitute a direct threat to human survival, to the environment and to the development process. The possibility of nuclear war is increasing because of the continuing build-up of stockpiles and the growing sophistication of both strategic and tactical nuclear weapons.

In order to reverse the present ominous trend in armament expenditure, at present approaching 450 billion dollars per year, it seems particularly important to bear in mind the following circumstances. First, there is in the present era an increasing vulnerability of national economies arising from new interdependencies in the international system. The tendency of the leading military Powers to pursue certain national-security interests with military means is dangerous. Secondly, the still prevailing East-West tensions play a significant role in legitimating the ongoing arms race between the super-Powers. A de-escalation of these tensions seems to be necessary to lessen the dangers inherent in the present situation. This would also make it possible for the industrialized countries to engage more constructively in the North-South dialogue and also to free resources—which are now directed to potentially destructive ends—for constructive purposes of development.

ANNEX

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- Hans BLIX, Minister for Foreign Affairs, Sweden (*Co-Chairman*)
- G. ARTHUR BROWN, Deputy Administrator, United Nations Development Programme
- K. K. S. DADZIE, Director-General for Development and International Economic Co-operation, United Nations (*Co-Chairman*)
- Philippe DE SEYNES, Director, Project on the Future, United Nations Institute for Training and Research (*Rapporteur*)
- Muchkund DUBEY, Joint Secretary, Ministry of External Affairs, India
- Paul-Marc HENRY, Centre de la recherche pour le développement, France
- A. H. JAMAL, Minister for Communications and Transport, United Republic of Tanzania
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UNITED NATIONS/UNITED NATIONS FUND FOR POPULATION ACTIVITIES EXPERT GROUP MEETING ON POPULATION-DEVELOPMENT MODELLING, GENEVA, 24-28 SEPTEMBER 1979

*United Nations Secretariat**

INTRODUCTION

An underlying theme of the 1970s has been the recognition that development is a complex, multidimensional process, in which population factors play a major and sometimes decisive role. This recognition implies a need for the economic and social co-ordination of action if population is to achieve its promise as an inexhaustible source of creativity.

In the years since the United Nations World Population Conference, held at Bucharest in 1979,¹ a number of different types of research in the areas of population-development modelling have emerged. These models range from single-sector to multi-sectoral in scope, covering a single country or the whole world. They also vary widely in the degree to which population components are treated endogenously. While many researchers and modellers have continued their past work on the socio-economic consequences of alternative demographic projections, there has been a growing tendency to treat population variables as endogenously determined and to investigate the feed-back effect on socio-economic paths. Nevertheless, although the understanding of these past and present population-development interrelationships has been increasing, the nature of the linkages still remains largely unknown. Furthermore, the usefulness of such models as a means of development planning has been challenged.

The Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat and the United Nations Fund for Population Activities (UNFPA), which have had long-standing interests in this area of work, are fully aware of the need to pursue a new direction of research on population and development and its model-building. One aspect of the problem was discussed in the meetings of the Task Force on Interrelationships between Population and Development, held at Geneva in May and September 1979 and in June 1978.² An "interrelations matrix" ap-

proach has also been developed by this Task Force to identify the major interrelations among 61 selected variables, classified into three major categories, namely, objectives of development, population variables, and other variables with the inclusion of economic factors, instruments and socio-cultural and exogenous factors.

Subsequently, the Population Division and UNFPA jointly organized an Expert Group Meeting on Population-Development Modelling, held from 24 to 28 September 1979 at Geneva. It brought together 19 international experts, including national planners and scholars from both developing and developed countries and representatives of the United Nations Secretariat and UNFPA. A list of participants is annexed to the present report. The full report of the meeting, together with the documentation submitted to it, will be published separately.

OBJECTIVES AND SCOPE OF THE MEETING

The objective of the meeting was to make a critical review of existing population-development models and to assess their practical value in policy-making and planning. Of special concern was the treatment of population-related issues in these models and their adaptability to the needs of developing countries in terms of such factors as conceptual and methodological problems and the availability of accurate and diverse data and technical and computer infrastructure.

A number of aspects of the problems were examined at the meeting, covering the following six areas: the value of population-development model-building; achievements of existing population-development models; population-development sub-models; the identification of research priorities concerning population-development interrelationships; perspective and alternative approaches to integrating demographic components into existing development planning frameworks; and an institutional framework for building and using population-development models. On the basis of its discussion, the Working Group developed and adopted a set of recommendations for future research and action, which are reproduced in the following section. The conclusions and recommendations drawn from the meeting are intended to assist the Population Division and UNFPA in developing guide-lines for the formulation and implementation

* Population Division of the Department of International Economic and Social Affairs.

¹ *Report of the United Nations World Population Conference, 1974, Bucharest, 19-30 August 1974* (United Nations Publication, Sales No. E.75.XIII.3), Chapters, I and II.

² See "Report of the meetings of the Sub-Committee Task Force on Interrelationships between Population and Development, Geneva, 12-16 September 1977 and 5-9 June 1978", prepared for the ACC Sub-Committee on Population at its fourteenth session (POP/SC/WP/96, 25 June 1978).

of future support in the area of population-development modeling. It is also hoped that the work of this meeting will provide guide-lines to national planners and model-builders in this important area.

RECOMMENDATIONS

Role of population-development models

In recent years there has been an increasing interest in constructing population-development models, which may be useful in the planning and policy-making process. Though the variety and quality of these models have increased markedly over this period, they are still in an early stage of development and are not yet widely used for planning or policy-making.

Demographic variables should be considered in development planning and policy formation because they are central to the development process itself. For example, the age structure of the population will have a profound effect on consumption, the size of the labour force and the demand for health, education and other services. It follows from this that effective planning and policy-making in these areas will require accurate and appropriately disaggregated projections of the population in order to ensure that these social services will be provided in an effective and efficient manner. Conversely developmental variables will have a profound effect on fertility, mortality and migration and hence on the age structure of particular areas. It is thus possible to influence demographic events by means of appropriately designed developmental policies.

Efforts to develop population-development models should continue, since carefully crafted and well validated models of this type could be of significant value in integrating demographic factors into planning and policy formulations. When population development models of sufficient quality become available, they should provide a framework in which economic and demographic projections are mutually consistent. They could also be used to analyse issues and policies involving the interface between population and development and to improve projections of demographic and socio-economic variables.

These models can serve to enhance planners' appreciation of the interdependence between patterns of population growth, structure, distribution and patterns of development. This is particularly important when the connexions between changes in the population and changes in the economy are complex, non-linear and subject to lags and when they run in both directions. Under such circumstances, well-formulated and well-validated economic-demographic models are needed for calculating the quantitative and qualitative importance of both the direct and indirect effects of changes in policies and programmes. In particular, such models would help decision-makers to assess the relative costs and benefits of alternative demographic policies and to assess the developmental consequences of developmental policies.

Economic demographic models can be used by planners and policy-makers to conduct experiments on the computer to determine the possible consequences, both direct and indirect, of their decisions before they are taken. They can also be used as a tool in basic research by providing new insights into the interrelationships between diverse phenomena and by clarifying the dynamics of socio-economic and demographic change.

The fact that currently available economic demographic models have not been widely used for these purposes shows how recent they are and reflects the problems that exist with regard to the availability and quality of appropriate data and computational facilities. Considerable work remains to be done in the development of economic demographic models. Efforts to contrast and apply models of various types relating to social, economic and demographic processes should therefore be encouraged.

Types of population-development models

Since population-development models can serve a wide variety of purposes, there are many valid approaches to building models of this type. Two broad classes of such models can be distinguished, namely, analytic or research models, and models intended for direct application in policy making and planning. The continued development of both types of model should be encouraged.

Since analytic models can be used to improve our understanding of underlying socio-economic/demographic interactions, they provide a basis for building quantitative planning and policy-making models in the future. It is thus necessary to support the development of these research-oriented models.

Modelling research should proceed along a variety of paths. An extremely promising approach involves the construction of models of economic-demographic behaviour at the family level. Therefore, emphasis should be given to micro models of households, since such models will be useful both for policy-making and for enhancing our understanding of socio-economic/demographic processes.

In addition to encouraging the development of household-level models, it could be useful to explore techniques for modelling demographic processes as they relate to social, political and economic processes, taking into account the perceptions and aspirations of individuals and groups, as well as their actual status. This is especially important in relation to models with a long-run time-frame, since people's attitudes and aspirations change *pari passu* with their behaviour. Thus, increased levels of education and employment opportunities for women may alter their aspirations with regard to family size and levels of consumption.

In the formulation of planning and policy-oriented models, efforts should be made to provide as many control variables as would be consistent with achieving a relatively simple model structure. Partial models

should be developed where concern is focused on the specific effects of policies or planning decisions. To understand the direct and indirect impact of policy instruments on target variables, comprehensive models would be appropriate. This is particularly true if the object of the exercise is to analyse questions where indirect linkages are of primary importance. At the present time, priority should be given to model-building at the partial level. Comprehensive models can serve as co-ordinating devices, so that partial models may ultimately become blocks of a coherent overall model.

The construction of models should also be guided by historical analysis and the institutional settings.

In constructing models, the degree of endogeneity should be suited to the purpose for which the model has been designed. In general, demographic processes, such as fertility, mortality and migration, should be treated as separate and endogenous factors. The development of micro-analytic simulation models is a promising approach, which should be extended to models of other demographic and economic processes. These submodels could then be linked to form a more comprehensive model.

The degree of disaggregation should be determined by the purposes to be served by the model. Normally, it will be necessary to disaggregate demographic submodels by age, sex and location. It will often be necessary to disaggregate the population into agricultural and non-agricultural, as well as rural and urban, components.

In order that population-development models will be a valid representation of the system within which planners and policy-makers must work, econometric techniques should be used in the estimation of parameter values. In particular, the interrelated nature of economic and demographic decisions within the household would call for the use of simultaneous equation models and corresponding parameter estimation techniques. Whenever possible, these estimates should be based on country-specific data. It is also important that the possibility of non-linear relationships or constraints should be considered in the specifications of these models. Finally, it is essential that these models should be properly validated.

The choice of an economic component of an economic demographic model should be consistent with the time-frame of the planning exercise. In the case of economy-wide models used in the context of prospective planning exercises with a time horizon of several decades, an appropriate economic submodel should capture the influence of both supply and demand forces, particularly in view of the long-term effects of population factors on both these variables.

Promising lines of advance in the development of appropriate economic submodels relate to investment in human capital, migration and urbanization, economic-demographic interrelations at the micro level and the behaviour of the labour market. In particular, education should be modelled as a productive investment activity and a specific instrument of public policy.

Models of migration should be developed, linking the economic and demographic aspects of population movement with models relating to urban demographic structures. Micro-level studies relating demographic, economic and human resource status variables should be encouraged. Labour-market submodels should be developed, reflecting institutional relationships, non-market mechanisms and the effects of changing technology.

It is equally important that demographic submodels should be developed which would provide a causal explanation of fertility behaviour and the labour-force participation of women. In constructing these submodels, greater consideration should be given to the role of education.

Since improved population projections are a basic requisite for integrating demographic factors into the planning process, partial models focusing on the incorporation of expected changes in social and economic variables and their effects on demographic rates should be developed.

Institutional framework

The process of building and applying population-development models should be facilitated by the provision of an appropriate institutional setting. Aspects of this setting would include the composition of the model-building team, the institutional location of the model-building effort and the linkages between model-builders, policy-makers and planners.

The greater the contribution made by country personnel, the greater the possibility that the model-building effort will prove useful in policy-making and planning. Since, however, economic demographic model-building is in the developmental stage, it may be necessary to undertake international efforts in the construction of models that are applied to a specific country. The national research and planning community should be involved to the greatest extent possible in the construction and application of population-development models. International co-operation can be most useful in the areas of training and demonstration.

Specialists in economics and demography often lack sufficient training in the area of interface between the two disciplines. A serious effort should be directed towards augmenting the number of persons in developing countries with training in economic demography who can serve as effective producers and consumers of population development models. A wide variety of mechanisms should be employed for this purpose. They would include seminars, short courses and longer periods of specialized education for policy-makers and economic demographic modellers. International support can be instrumental in initiating such activities in developing countries and in encouraging national universities to develop facilities for providing these seminars, courses and specialized education.

If economic demographic models are to prove useful in planning and policy-making, they must be under-

stood and appreciated by potential users. Thus, it is necessary for model-builders, planners and policy-makers to be in agreement as to the nature of the problems to be tackled, the goals to be pursued, the priorities to be assigned and the alternative strategies to be considered. In this early phase of collaboration, the assumptions of the model should be clearly stated and the implications of those assumptions for policy-making and planning carefully considered. The mechanisms that link the different variables must be clearly exposed and discussed. And, above all, the policy-control variables available to the planner must be highlighted. A variety of means, including locally organized workshops and seminars, should be used to achieve a high degree of co-ordination between model-builders, planners and policy-makers. These efforts could be enhanced by using international prototype models for demonstration purposes.

In addition to a series of subject-oriented manuals, manuals should be prepared for several existing comprehensive population-development models and certain prototype partial models. The documentation should include a specification of the purposes of the model, its assumptions and their implications, data requirements, institutional factors, computer software requirements and computer hardware requirements.

An alternative strategy for introducing economic demographic models into the planning and policy-making process would be to introduce demographic components into those models which are currently being used for planning and policy-making. This would help to focus discussion between model-builders, planners and policy-makers on the demographic components and their linkages to the overall model.

The model-building process itself should be conducted under the auspices of the planning agency, either in some branch of the Government or in a university or research foundation working in close co-operation with the planning agency. This will tend to ensure a close co-ordination between model-producers and model-users.

In order to derive the maximum benefit from research and development on population-development modelling taking place throughout the world, an initiative should be undertaken at the international level to prepare a series of manuals relating particular areas of concern to development planners and policy-makers, such as education or housing. These manuals could deal with the potential application of existing models in the areas of concern, the technical nature of currently available models, a brief description of their application and relevant country experiences.

In order to facilitate the preparation of these two series of manuals, a technical meeting of international specialists may be convened to provide a technical evaluation of models currently available for international transfer and to specify in detail the information that would be required for possible international transfer of these models.

An important limiting factor both for the construction

and the empirical verification of economic demographic models is the unavailability of data at the level of the household, community and socio-economic group. The lack of such data is due in part to the absence of a standardized framework, such as the national accounts framework, that can be used for data definition, standardization and measurement of this level of disaggregation. In order to facilitate the construction and application of population-development models, an international initiative should be undertaken to construct a consistent accounting framework for data collection at the level of the household, community and socio-economic group.

Priorities for future research

An important factor limiting the actual utilization of economic demographic models in planning is the weak empirical basis for many key relationships between demographic and socio-economic variables. High priority should therefore be given to more intensive research on these relationships. A better understanding of the linkages between socio-economic and population variables should materially assist countries in planning and policy decisions.

Since it is becoming increasingly evident that economic and demographic decisions at the household level are both important and interrelated, empirical research should be directed towards the study of these relationships at the micro level, using household survey data.

Existing household survey data in most developing countries have been collected for a single purpose or on a single topic, such as labour force, fertility or household expenditure. To investigate the interrelationships between demographic and socio-economic decisions at the household level, multiple-purpose household sample surveys are necessary. At a minimum, these surveys should attempt to collect reliable information on household composition, fertility and recent family planning use, educational level of members of the household, regularity of school attendance by children, economic activity and earnings of all household members, migration and remittances, households assets, land ownership and utilization and the availability of services and facilities in the community.

Data used in empirical work at the micro level should include, whenever possible, community-level data on the availability of public and private services as potentially related to household economic-demographic behaviour, as well as on other relevant social, economic and demographic characteristics of the community. Effort needs to be devoted to specification of the content of such community data and how they are collected. Empirical research should, when available data permit, use individual, household and community variables. This is particularly important in exploring policy issues, since government decisions on expenditure are directly related to the level, quality and location of public

services: education, health, family planning, housing and other social services.

Given the importance of fertility in determining the growth-rate of the population and its structure and the potential for altering fertility by means of government policy, it is important that a better conceptualization should be formulated and further research should be carried out on the determinants of fertility, using individual, household and community data.

Since the magnitude of family-planning expenditure is a potential planning instrument, research on developing functions that relate expenditure on family-planning inputs to the use of family planning and its impact on fertility should be intensified. Such research might, for example, include the estimation of cost or production functions relating to family-planning activity.

Since an increasing number of developing countries are experiencing a decline in fertility, research should be undertaken to analyse such declines.

Internal migration is an important consideration in both short-term and long-term planning and research on the determinants and the consequences of internal migration, using both macro and micro data, should therefore be encouraged. A better conceptualization of the decision to migrate or not to migrate is needed, as are micro-level data on individuals, households and communities in both the areas of origin and the areas of destination.

Research is needed on the effects of nutrition and health levels on the mortality and physical development of young children and the economic productivity of adults.

Since technological change is an important part of the development process, research should be undertaken on the interrelationship between technological change and demographic variables.

For the purposes of long-term perspective study purposes, attention should be directed towards the need to investigate the long-run association between population size and density, level of development, and the depletion of non-renewable resources and other effects. When considering long-term effects, it is equally important to encourage research on the interrelationship between demographic change and changes in the distribution of income.

ANNEX

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