OHE briefing
No 3 December 1975 15p

INFANT & CHILD HEALTH

In 1901 approximately 127,000 infants and 81,000 children aged 1-14 died in England and Wales. By 1973, the corresponding figures were 11,500 and 4,500, representing falls of 91 per cent and 94 per cent respectively. During this period the total number of persons aged 0-14 rose, albeit unsteadily, from 10.5 million (32 per cent of the total population) to 11.6 million (23 per cent).

Table 1 illustrates the immense and unparalleled improvements in mortality rates for both infants and children which have occurred primarily during the last 70 years[1]. This trend was, however, becoming gradually evident during the latter stages of the nineteenth century as a result of the changes in the economic and social environment (housing improvements, better sanitation, nutrition and clothing–factors, among others, which resulted in the elimination of many sources of infection and increased resistance to disease). During the late 1930s the decline in mortality rates began to accelerate markedly as a result of the introduction of the sulphonamides. Since then the rapid development of new and effective antibiotics in addition to the establishment of the NHS, the evolution of the welfare services and the significant advances in the medical speciality of paediatrics have all contributed to the vast post-war improvements in infant and child health.

Infant mortality

The turn of the Century marked the beginning of a steady decline in infant mortality. In 1901, 1 in every 7 live-born infants died; by 1930 this had dropped to 1 in 15 and in 1973 the proportion was 1 in 59[2]. This 88 per cent reduction in the infant mortality rate since 1901 can be attributed, inter alia, to the advances in obstetric practice, ante and post-natal medical care and to general improvements in the living environment.

Figure 1 shows the infant mortality rate per 1000 births and the number of live births per 1000 population. A positive statistical correlation (0.93 ± 0.02) exists between these two variables although this does not mean that there is a direct causal relationship. But it is evident that the birth rate is strongly influenced (in the same direction) by improvements in survival as reflected in a falling infant death rate.

Table 2 shows that the major infant killers in 1911-20 were bronchitis along with pneumonia and 'immaturity' which together accounted for 17,700 (38%) male deaths and 13,400 (38%) female deaths. In 1973, the single major cause of infant mortality was congenital malformation which accounted for 1,305 (20%) male infant deaths and 1,247 (26%) female infant deaths. Of all the infant deaths ascribed to congenital malformation, 22 per cent resulted from spina bifida and 36 per cent from congenital anomalies of the heart. Bronchitis and pneumonia still constitute the second most important cause of infant mortality, being responsible for nearly 1 in 8 infant deaths compared to 1 in 5 in 1911.

Child mortality

Between 1901 and 1930 the average death rate for children aged 1-14 fell by about 58 per cent and by 88 per cent during the period from 1930 to 1973 (Table 1 and Figure 2). Alternatively, in 1901, 1 in every 112 children aged 1-14 died compared to 1 in 263 in 1930 and 1 in 2,326 in 1973.

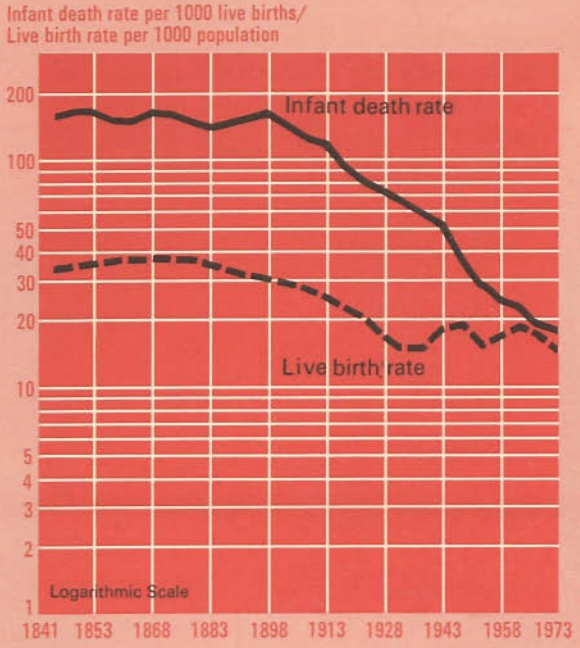
Table 3 and Figure 3 set out the major causes of childhood mortality since 1931. Nearly 60 per cent of the fall in the childhood death rate between 1931 and 1973 was due to the reduction in the mortality attributable to pneumonia, tuberculosis, diphtheria, measles and whooping cough. These five diseases, which accounted for 1 in every 2 childhood deaths in 1931 and 1 in every 12 in 1973, have, with the exception of pneumonia, been virtually eliminated as childhood killers by the use of antibiotics, both to fight the disease and to reduce complications, and by prevention through immunisation. In Figure 2, a simple projection of the declining trend in mortality for the 5-9 age group (based on the period 1861-5 to 1931-5) illustrates the effect produced by the introduction of new medicines in the late 1930s and 1940s.

In 1973, accidents of all kinds caused one-third of childhood deaths (compared to just under one-tenth in 1931) and half of these resulted from road accidents. The significance of accidental fatalities during childhood has, therefore, more than trebled in spite of a 40 per cent reduction in the actual number of these deaths between 1931 and 1973.

1 There are no clear-cut alternatives to the use of mortality statistics in gauging changes in the level of health; morbidity statistics, which are hampered by changes in definitions and uncertainties over the levels of reporting in the community as a whole, simply do not exist in a good and comprehensive form.

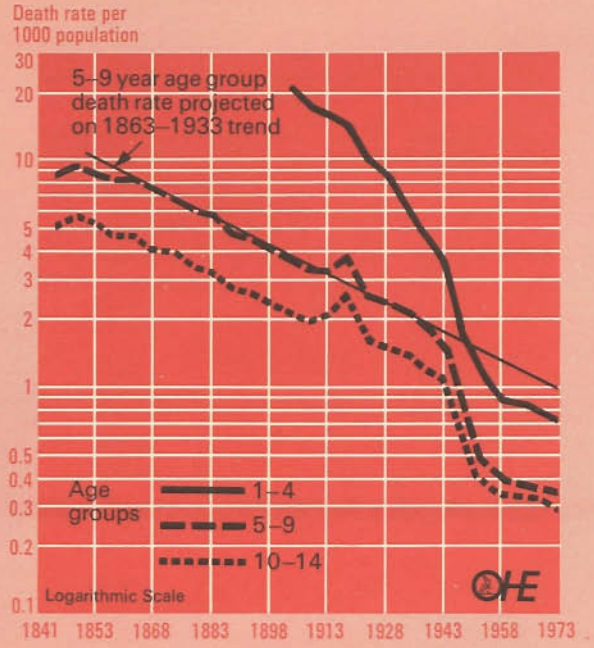
2 The usefulness of statistics of such a general nature is necessarily limited–for example they do not distinguish between neonatal deaths (during the first 4 weeks of life) postneonatal mortality (4 to 52 weeks) and peri-natal deaths (comprising deaths within 7 days of birth and stillbirths). Furthermore, they do not reflect the significance of variables such as the mother's age, the number of pregnancies already experienced and social class. During the twentieth century, infant mortality has been consistently higher in social classes 4 and 5 than in groups 1 and 2.

Figure 1 *Death rate of infants under 1 year per 1000 live births and live birth rate per 1000 population, England and Wales, 1841 to 1973.*



Source Registrar General, Part 1.
Note Quinary averages for 1841 to 1970 plotted at mid-point of each period. Value for 1973 is an average of 1971, 1972, 1973.

Figure 2 *Death rates of children aged 1-4, 5-9 and 10-14 per 1000 population in each age group. England and Wales, 1841 to 1973.*



Source Registrar General, Part 1.
Note Quinary averages for 1841 to 1970 plotted at the mid-point of each period. Value for 1973 is an average of 1971, 1972, 1973.

Table 1 *Birth and death rates for selected age groups, 1841–45 to 1973, England and Wales*

	Live birth rate per 1000 population	*Crude death rate (all ages) per 1000 living*	*Death of infants under one year per 1000 live births*			*Death rates of children in different age groups, per 1000 population*		
			Males	*Persons*	*Females*	*1 to 4*	*5 to 9*	*10 to 14*
1841-45	32.3	21.4	162	148	133		8.69	5.01
1846-50	32.8	23.3	172	157	142		9.39	5.56
1851-55	33.9	22.7	172	156	141		8.64	5.23
1856-60	34.4	21.8	166	152	137		8.33	4.72
1861-65	35.1	22.6	166	151	136		8.39	4.72
1866-70	35.3	22.4	170	157	142		7.62	4.28
1871-75	35.5	22.0	167	153	138		6.86	3.97
1876-80	35.3	20.8	159	145	130		6.10	3.47
1881-85	33.5	19.4	152	139	125		5.76	3.23
1886-90	31.4	18.9	159	145	131		4.86	2.84
1891-95	30.5	18.7	165	151	135		4.56	2.65
1896-1900	29.3	17.7	170	156	141		4.12	2.36
1901-05	28.2	16.0	151	138	124	20.90*	3.74	2.19
1906-10	26.3	14.7	129	117	105	17.80*	3.38	2.03
1911-15	23.9	14.3	121	110	97	16.50*	3.39	2.08
1916-20	21.5	14.4	101	90	79	14.90*	3.81	2.48
1921-25	19.9	12.1	86	76	66	10.20*	2.48	1.71
1926-30	16.7	12.1	77	68	59	8.70*	2.37	1.57
1931-35	15.0	12.0	70	62	54	6.56*	2.18	1.41
1936-40	14.9	12.5	62	55	48	4.70	1.84	1.20
1941-45	17.6	12.8	56	50	44	3.50	1.50	1.08
1946-50	18.4	11.8	41	36	32	1.77	0.77	0.62
1951-55	15.2	11.7	30	27	23	1.14	0.47	0.41
1956-60	16.4	11.6	25	23	20	0.91	0.41	0.34
1961-65	18.1	11.8	23	21	18	0.86	0.39	0.33
1966-70	16.9	11.7	21	18	16	0.79	0.36	0.32
1971	16.0	11.6	20	18	15	0.70	0.37	0.30
1972	14.8	12.1	19	17	15	0.75	0.35	0.28
1973	13.7	11.9	19	17	15	0.69	0.33	0.28

Source The Registrar General's Statistical Review of England and Wales, medical tables

Note *These quinary estimates are calculated on the assumption that the population of the 1-4 age group is roughly equivalent to the 0-4 population less the number of live births

Table 2 *Infant mortality by selected causes. Rates per 1000 live births, 1911–20 to 1973, England and Wales*

Cause		*1911-20*[1]	*1921-30*[1]	*1931-9*[1]	*1940-9*[1]	*1951*	*1955*	*1960*	*1970*	*1973*
Whooping cough	M	3.31	2.61	1.35	0.74	0.38	0.10	0.03	0.017	0.006
	F	3.85	2.92	1.64	0.87	0.43	0.08	0.03	0.016	–
Tuberculosis	M	2.88	1.39	0.80	0.47	0.16	0.03	0.01	–	0.003
	F	2.26	1.09	0.65	0.41	0.13	0.05	0.02	0.003	–
Measles	M	2.57	1.40	0.78	0.27	0.13	0.05	–	0.015	0.012
	F	2.21	1.13	0.66	0.25	0.16	0.06	0.01	0.008	0.006
Bronchitis and Pneumonia	M	21.33	17.34	13.62	10.35	6.37	4.65	3.99	3.33	2.47
	F	16.43	13.12	10.28	8.07	5.10	3.32	3.05	2.56	1.81
Gastro-enteritis	M	*	8.55	6.22	5.05	1.42	0.75	0.52	–	–
	F	*	6.12	4.31	3.64	1.00	0.55	0.35	0.003	–
Congenital anomalies	M	4.29	5.00	6.03	5.43	4.38	4.80	4.58	3.88	3.74
	F	3.56	4.08	5.22	4.87	4.02	4.47	4.46	3.54	3.81
Immaturity	M	21.48	20.19	16.40	11.16	6.45	5.21	4.41	2.20	1.61
	F	17.48	16.18	13.32	8.94	4.90	4.26	3.37	1.80	1.35
Injury at birth	M	1.34	1.96	3.02	3.17	3.58	3.36	2.85	1.51	1.31
	F	0.91	1.27	1.82	2.01	2.12	2.07	1.77	0.99	0.86
Haemolytic disease	M	*	*	*	0.85	0.91	0.56	0.49	0.29	0.17
	F	*	*	*	0.55	0.56	0.52	0.45	0.25	0.14
Accidental mech-anical suffocation	M	*	0.66	0.34	0.53	0.48	0.33	0.19	0.16	0.083
	F	*	0.59	0.25	0.37	0.38	0.20	0.15	0.14	0.040
Other causes	M	*	*	*	12.41	9.30	8.26	7.43	9.10	9.52
	F	*	*	*	9.29	6.75	5.90	5.28	6.42	6.68
Infant death rate per 1000 live births	M	111.70	81.46	66.17	50.43	33.56	28.09	24.52	20.50	18.93
	F	88.66	62.66	51.03	39.27	25.55	21.47	18.92	15.74	14.69
Number of infant deaths	M	46191	29678	20640	18543	11699	9653	9911	8269	6599
	F	35117	21842	15122	13615	8404	6960	7207	5998	4808
Number of live births	M	413530	364325	311927	367700	348604	343673	404150	403371	348678
	F	396091	348582	296339	346703	328925	324138	380855	381115	327275

Sources 1. The Registrar General's Statistical Review of England and Wales, medical tables, various years
2. Annual Report of The Chief Medical Officer on the State of the Public Health, various years

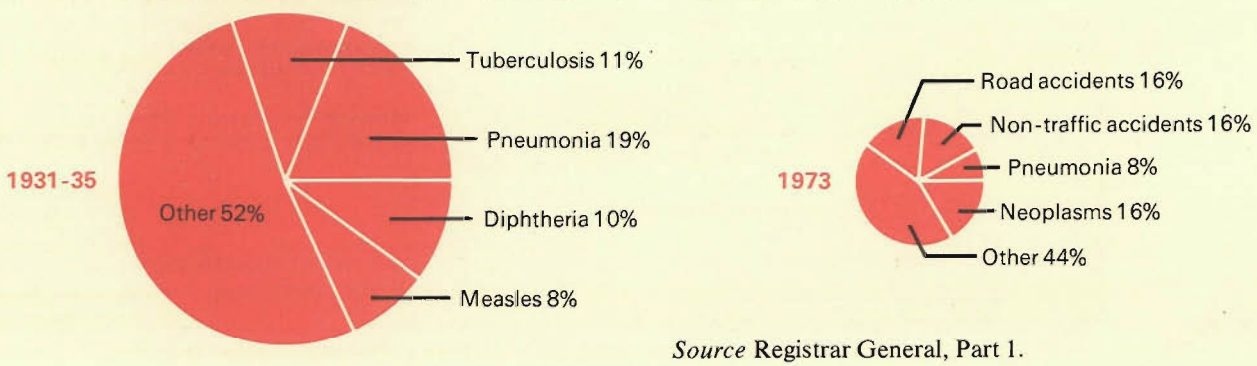
Notes 1. Annual averages *Not available

Table 3 *Childhood mortality by selected causes. Annual death rates per million living aged 1 to 14, 1931–35 to 1973, England and Wales.*

Cause	*1931-5*	*1936-40*	*1941-5*	*1946-50*	*1951-5*	*1956-60*	*1970*	*1973*
Pneumonia	561	376	220	111	63	53	36	32
Tuberculosis	332	231	256	149	38	6	2	1
Diphtheria	304	299	160	18	2	–	–	–
Measles	241	118	48	24	13	4	3	2
Non-traffic accidents	142	168	187	120	92	83	73	67
Road accidents	134	118	145	99	73	62	68	65
Whooping cough	132	81	65	27	8	1	–	–
Bronchitis	79	58	47	23	16	14	4	1
Appendicitis	71	65	48	30	15	8	3	3
Influenza	67	42	24	11	6	11	3	1
Neoplasms	64	67	74	82	86	85	71	67
Mastoiditis	61	36	22	9	3	2	1	1
Rheumatic fever	51	40	27	18	9	3	–	–
Meningitis	49	38	28	13	7	6	7	5
Scarlet fever	49	24	10	2	–	–	–	–
Meningococcal infections	49	46	49	17	12	6	6	8
All other causes	631	561	522	294	211	179	160	159
Total death rate per million children	3017	2368	1932	1047	654	523	437	412

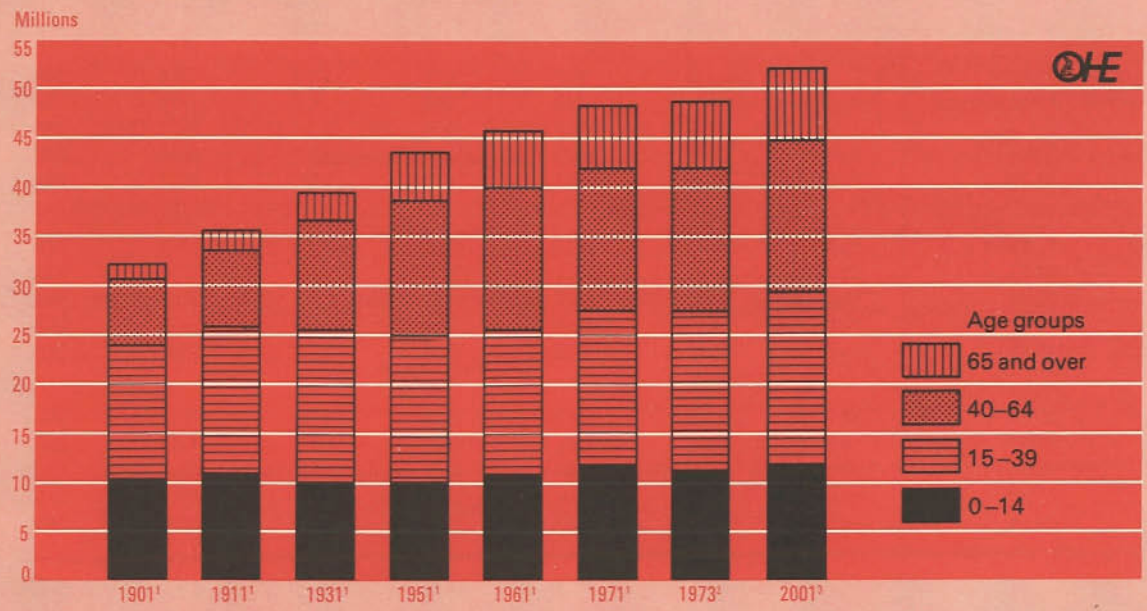
Source Registrar General's Statistical Review of England and Wales, medical tables, various years

Figure 3 *Childhood (ages 1-14) deaths by selected causes, 1931-35 and 1973, England and Wales.*



Source Registrar General, Part 1.

Figure 4 *The Age Structure of the home population of England and Wales, 1901 to 2001.*



Source Annual Abstract of Statistics.
Notes 1. Census figures. 2. Mid-year estimate. 3. Projection based on estimates by Registrar General of the total population at mid-1973.

By 1973 cancer had become the joint top cause of childhood mortality, accounting for one death in six. More specifically, 38 per cent of these cancer deaths were attributable to leukaemia. Cancer is one of the few areas where medicine has yet to achieve a significant breakthrough. The aetiological aspects of child cancer are disputable: for example, reports have suggested possible links with abdominal X-rays and viral infections during pregnancy. In any event, a 'cure' for cancer would result in a saving of more than 700 child lives a year.

The medical advances of the twentieth century have played a major part in the elimination of certain diseases which represented, for many children, forbidding if not insurmountable obstacles to the attainment of maturity. This has, of course, had an effect on the age structure of the population (Table 4, Figure 4). But increasing survival rates are more influential in this respect through the indirect effect they have on fertility rates. Better chances of survival and improved health care services and the social and economic consequences of these developments reduce the perceived need and the desire to have large numbers of children.

Figures 5 and 6 illustrate the extent to which life expectancy has improved, for both sexes, since the late nineteenth century. Survival rates for young children have increased considerably more than for other age groups and those born in 1973 can expect a life-span well over 50 per cent greater than that faced by their peers at the beginning of the twentieth century.

But the rate of improvement in childhood death rates and life expectancy has been decelerating in the last two decades and this has inevitably raised questions about the ability to achieve further progress, especially in view of the current limited availability of health care resources. Whilst significant advances have still to be made in certain areas it is increasingly acknowledged that some medical interventions can bring diminishing returns–the risks catching up with the benefits. For example, the value of immunisation in some areas has been questioned because the risks of serious side-effects have become more significant as the danger of infection has diminished.

International comparisons

The infant mortality rate has frequently been employed as an indicator of the general level of health of a community but a number of problems arise in the use of these statistics for comparative purposes in an international context. First, there are significant variations (especially amongst the developing countries) in the completeness of registration and, second, the figures do not satisfactorily reflect important social and cultural differences.

All of the 25 countries in Figure 7 experienced a decrease in infant mortality between 1951-55 (when there were ten countries with more than 50 infant deaths per 1,000 live births) and 1972 (when the corresponding figure had fallen to three). Sweden still has the lowest infant mortality rate in the world and the explanation for this may lie in a combination of factors, including a high per capita expenditure on health care as well as differences in life-style, social environment and possibly those of a genetic nature in comparison to other advanced nations. Finally, there are clear dissimilarities in the levels of infant mortality between developed and developing countries. Although the latter can benefit from the former's experience, the existence of widely divergent social, economic and environmental conditions restricts the extent to which the concepts and methods of medical care evolved in the richer countries of the world can be applied to the problems of the developing nations without creating a misallocation of health care resources.

Office of Health Economics

The Office of Health Economics was founded in 1962 by the Association of the British Pharmaceutical Industry. Its terms of reference are:
To undertake research on the economic aspects of medical care.
To investigate other health and social problems.
To collect data from other countries.
To publish results, data and conclusions relevant to the above.
The Office of Health Economics welcomes financial support and discussions on research problems with any persons or bodies interested in its work.

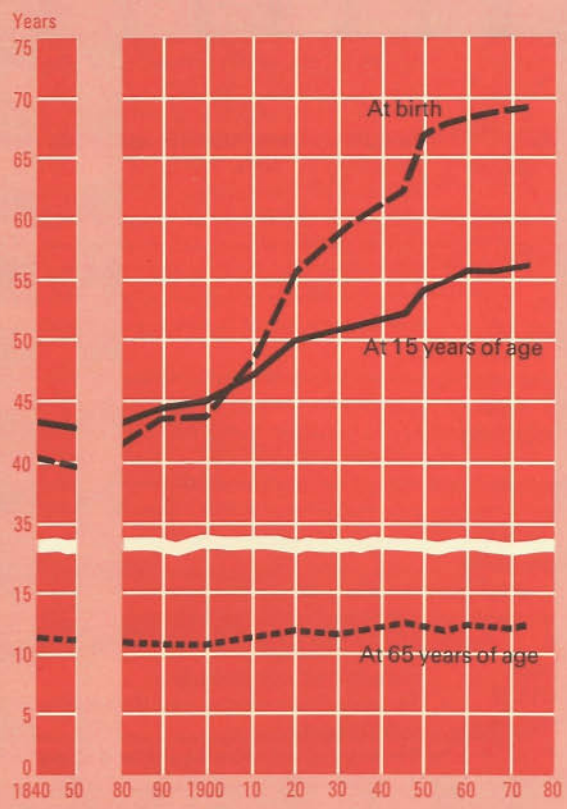
Table 4 *Age distribution of the home population of England and Wales, 1000s*

	1901[1]	*1911*[1]	*1931*[1]	*1951*[1]	*1961*[1]	*1971*[1]	*1973*[2]	*2001*[3]
All ages	32527	36070	39952	43758	46105	48750	49175	52384
under 1	3717	1523	602	659	764	774	690	3701
1 and under 2			593	689	725	761	735	
2-4	(32%)	2330 (31%)	1796 (24%)	2370 (22%)	2107 (23%)	2370 (24%)	2308 (23%)	(22%)
5-9	3487	3697	3323	3162	3262	4044	4036	3931
10-14	3342	3500	3207	2812	3725	3627	3834	3996
15-19	3246	3337	3435	2704	3201	3314	3423	3812
20-24	3121	3176	3494	2927	2878	3731	3449	3271
25-29	2825 (42%)	3079 (42%)	3357 (40%)	3280 (35%)	2846 (33%)	3191 (33%)	3626 (33%)	3232 (34%)
30-34	2431	2877	3055	3079	2984	2871	2929	3790
35-39	2145	2613	2803	3323	3242	2786	2818	3951
40-44	1851	2233	2663	3365	3037	2935	2862	3533
45-49	1573	1926	2554	3172	3229	3135	2983	3178
50-54	1329 (21%)	1603 (22%)	2381 (28%)	2825 (32%)	3221 (32%)	2897 (30%)	3162 (30%)	3468 (30%)
55-59	1053	1278	2068	2423	2928	2976	2734	2903
60-64	891	1020	1657	2143	2458	2841	2831	2427
65-69	630	807	1271	1829	1979	2400	2472	2130
70-74	446	553	870	1428	1542	1778	1885	1892
75-79	264 (5%)	310 (5%)	500 (8%)	924 (11%)	1069 (12%)	1185 (13%)	1225 (14%)	1540 (14%)
80-84	129	144	226	446	605	707	724	957
85 and over	51	64	97	198	302	425	448	672

Source Annual Abstract of Statistics

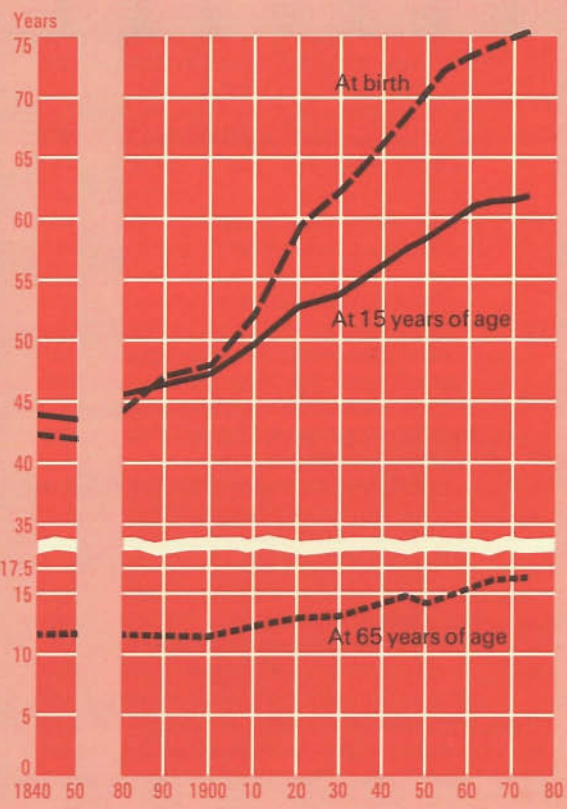
Notes 1. Census figures
2. Mid-year estimates
3. Projections based on estimates by Registrar General of the total population at mid 1973

Figure 5 *Life expectancy at birth, at 15 years and at 65 years of age for MALES, 1840-1973. England and Wales.*



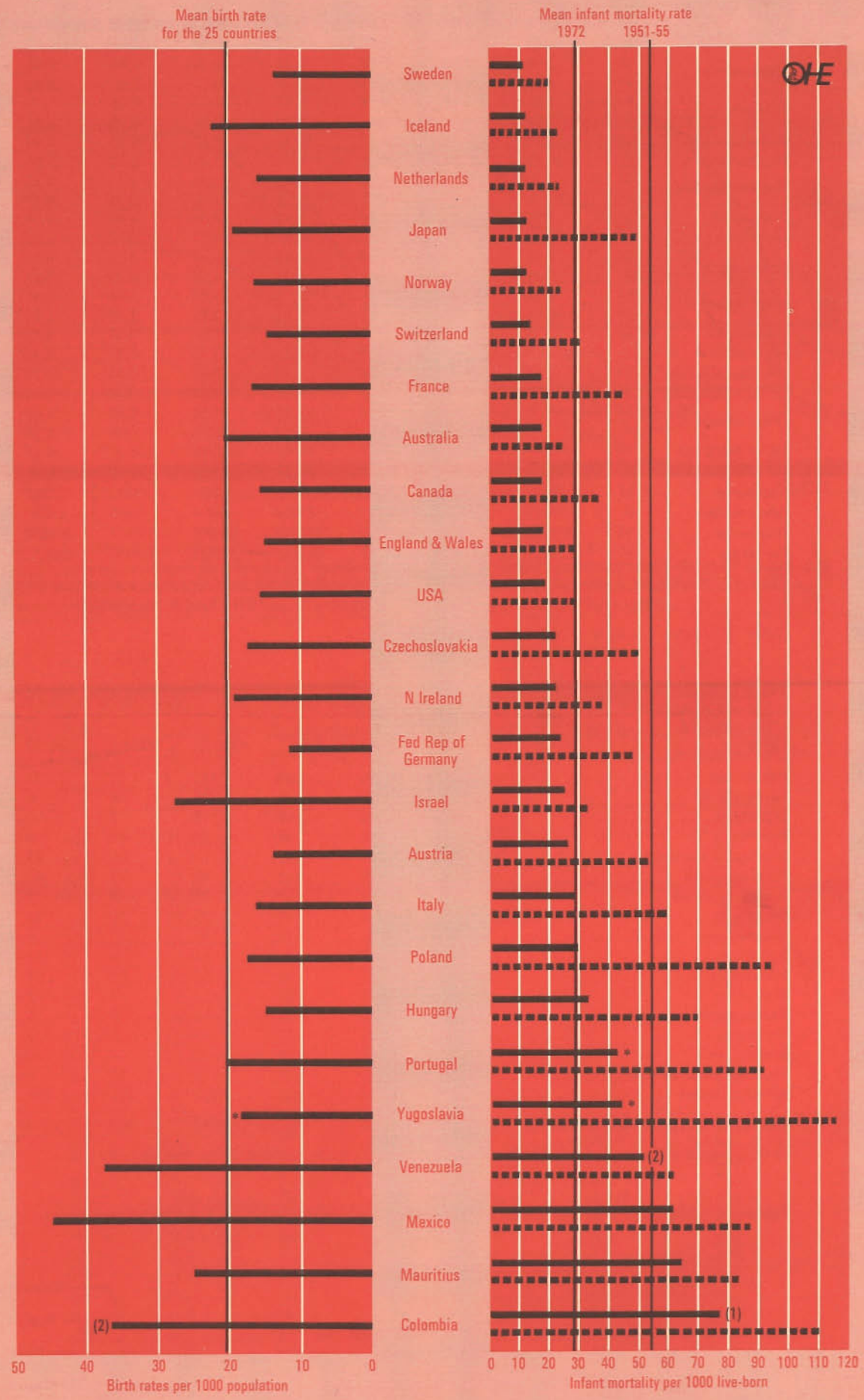
Source Registrar General, Part 11.
Note Figures between 1850-1880 not available.

Figure 6 *Life expectancy at birth, at 15 years and 65 years of age for FEMALES, 1840-1973. England and Wales.*



Source Registrar General's Statistical Review of England and Wales, Part 11.
Note Figures between 1850–1880 not available.

Figure 7 *International comparison of birth rates 1972 and infant mortality 1951-55 (▪▪▪) and 1972 (▬)*



Sources 1. World Health Statistics Report, Vol 27, No 10, 1974. 2. World Health Statistics Report, Vol 23, No 9, 1970.
Notes 1. 1970. 2. 1971. *Estimated.

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