

## THE RECENT TREND OF MORTALITY IN GREAT BRITAIN

By W. S. HOCKING, O.B.E., F.I.A.

*Of the Government Actuary's Department*

FOR the last twenty years or so a series of tables has appeared in the *Journal* showing the death-rates in age-groups of the general population of England and Wales in successive years and the ratios that those rates bore to the corresponding rates for the years 1930-32, which was the period on which the latest series of English Life Tables was based. This standard period has now become rather remote, and the taking of a Census in the year 1951 and the preparation of new National Life Tables based on that enumeration together with the deaths in adjacent years affords a convenient opportunity to change the standard period to the years 1950-52. At the same time, it is thought that the experience of the whole of Great Britain, rather than that of England and Wales alone, would be of value to British actuaries, though, because of the relative sizes of the two populations, the inclusion of Scottish mortality with that of England and Wales does not, in general, make the trend of mortality for Great Britain differ appreciably from that of England and Wales.

The rates shown in Table 1 are central death-rates for age-groups, viz. the ratios obtained by dividing the deaths recorded in the year in the specified age-ranges by the estimated population in the age-range at the middle of the year, as estimated by the Registrars General of England and Wales and of Scotland respectively. The deaths are those recorded as occurring in Great Britain and the population used is the 'home' population, i.e. the total population, including British seamen on foreign-going ships and the armed forces in the country, but excluding British forces abroad. For the years 1946-49, however, both deaths and populations were limited to civilians. The relatively high mortality rates of men in the age-groups 15-19 and 20-24 last birthday, particularly in the years 1946-49, is to be attributed to the exclusion from the experience of part, or the whole, of the armed forces at those ages, with the result that the remaining population, including as it does all those unfit for military service, is somewhat under-average in health. This feature has, however, only a very minor effect on the broader age-group 15-44 last birthday, and its effect on the trend from year to year is negligible, with the possible exception of the year in which the change of basis was made.

The populations used for the years 1950 onwards are revised estimates of the population in the middle of those years made when the age distributions shown by the full tabulation from the 1951 Census became available. In this respect, therefore, the data used differ somewhat from those employed for England and Wales for the years 1950-53 in the tables given in recent issues of *J.I.A.* The estimated populations for the years 1946-49 have not been revised by the Registrars General, but the errors revealed by the 1951 Census enumeration were not significant except for the age-group 85 and over, where it was found that the estimated population was 9% too large for men and 2½% for women. These errors have been assumed to have accumulated over the twenty years since the 1931 Census, and proportionate reductions have

accordingly been made to the estimated populations for that age-group made by the Registrars General for the years 1946-49. For other age-groups the previous estimates have been retained.

Table 1. Death-rates for age-groups in Great Britain in the years 1930-32 and in 1946-54

Age-group	Year									
	1930-32	1946	1947	1948	1949	1950	1951	1952	1953	1954
MALES										
0	0.07953	0.07888	0.04955	0.04006	0.03813	0.03511	0.03524	0.03203	0.03139	0.02992
1-4	0.07791	0.02339	0.02248	0.01195	0.0175	0.0149	0.0148	0.0135	0.0128	0.0110
5-9	0.0234	0.0102	0.0108	0.0090	0.0083	0.0075	0.0068	0.0050	0.0058	0.0049
10-14	0.0153	0.0089	0.0081	0.0068	0.0064	0.0057	0.0056	0.0050	0.0047	0.0043
15-19	0.0255	0.0160	0.0165	0.0134	0.0128	0.0105	0.0092	0.0091	0.0086	0.0083
20-24	0.0330	0.0282	0.0217	0.0163	0.0166	0.0146	0.0137	0.0134	0.0119	0.0114
25-29	0.0333	0.0223	0.0209	0.0180	0.0170	0.0166	0.0153	0.0131	0.0127	0.0119
30-34	0.0370	0.0243	0.0228	0.0208	0.0195	0.0183	0.0179	0.0162	0.0154	0.0146
35-39	0.0487	0.0298	0.0289	0.0262	0.0258	0.0242	0.0230	0.0224	0.0212	0.0208
40-44	0.0656	0.0441	0.0424	0.0393	0.0388	0.0368	0.0366	0.0335	0.0321	0.0326
45-49	0.0930	0.0730	0.0721	0.0672	0.0676	0.0653	0.0646	0.0591	0.0574	0.0560
50-54	0.1309	0.1135	0.1158	0.1047	0.1075	0.1087	0.1136	0.1062	0.1043	0.1040
55-59	0.1920	0.1793	0.1811	0.1706	0.1773	0.1783	0.1884	0.1780	0.1748	0.1742
60-64	0.2610	0.2774	0.2867	0.2715	0.2805	0.2892	0.3103	0.2802	0.2832	0.2812
65-69	0.468	0.409	0.423	0.400	0.431	0.435	0.470	0.438	0.440	0.437
70-74	0.748	0.625	0.666	0.613	0.669	0.671	0.731	0.660	0.670	0.667
75-79	1.182	1.008	1.069	0.936	1.030	1.057	1.173	1.052	1.050	1.046
80-84	1.81	1.56	1.69	1.43	1.59	1.63	1.81	1.61	1.63	1.64
85 and over	2.83	2.53	2.90	2.31	2.67	2.77	3.05	2.65	2.57	2.53
All ages: Crude rates	0.1284	0.1350	0.1364	0.1105	0.1267	0.1251	0.1340	0.1228	0.1225	0.1227
Standardized*	0.1588	0.1285	0.1318	0.1175	0.1247	0.1246	0.1336	0.1211	0.1204	0.1192
FEMALES										
0	0.05073	0.04416	0.03813	0.03057	0.02922	0.02681	0.02668	0.02556	0.02461	0.02272
1-4	0.07712	0.02200	0.02206	0.0166	0.0148	0.0131	0.0130	0.0107	0.0112	0.0085
5-9	0.0207	0.0079	0.0079	0.0065	0.0058	0.0053	0.0047	0.0042	0.0042	0.0035
10-14	0.0146	0.0060	0.0067	0.0049	0.0051	0.0044	0.0039	0.0035	0.0036	0.0032
15-19	0.0213	0.0127	0.0133	0.0123	0.0105	0.0084	0.0068	0.0068	0.0048	0.0046
20-24	0.0284	0.0100	0.0103	0.0168	0.0158	0.0121	0.0096	0.0080	0.0070	0.0066
25-29	0.0311	0.0210	0.0205	0.0185	0.0169	0.0144	0.0123	0.0102	0.0095	0.0088
30-34	0.0343	0.0214	0.0208	0.0193	0.0186	0.0162	0.0151	0.0127	0.0125	0.0119
35-39	0.0405	0.0249	0.0242	0.0218	0.0221	0.0205	0.0198	0.0171	0.0169	0.0170
40-44	0.0501	0.0325	0.0321	0.0290	0.0291	0.0278	0.0278	0.0259	0.0258	0.0251
45-49	0.0683	0.0492	0.0470	0.0437	0.0439	0.0436	0.0430	0.0398	0.0392	0.0387
50-54	0.0962	0.0702	0.0702	0.0664	0.0670	0.0657	0.0665	0.0615	0.0597	0.0600
55-59	0.1412	0.1052	0.1045	0.0971	0.1016	0.0995	0.1029	0.0949	0.0913	0.0894
60-64	0.2163	0.1691	0.1653	0.1553	0.1626	0.1605	0.1663	0.1514	0.1484	0.1474
65-69	0.341	0.270	0.269	0.251	0.271	0.265	0.284	0.251	0.248	0.245
70-74	0.561	0.461	0.474	0.428	0.476	0.455	0.490	0.430	0.423	0.417
75-79	0.938	0.770	0.799	0.711	0.790	0.755	0.854	0.739	0.748	0.718
80-84	1.487	1.231	1.286	1.117	1.274	1.293	1.447	1.234	1.239	1.215
85 and over	2.48	2.16	2.29	1.90	2.24	2.25	2.50	2.14	2.18	2.12
All ages: Crude rates	0.1141	0.1104	0.1138	0.1027	0.1119	0.1107	0.1180	0.1057	0.1066	0.1060
Standardized*	0.1519	0.1161	0.1174	0.1046	0.1131	0.1104	0.1174	0.1032	0.1025	0.0999

\* Standardized on 1951 Census age distribution.

The death-rates up to age 65 have been shown to five places of decimals, but because of the fall in the size of the population over that age (which is estimated by the Registrars General only to the nearest thousand) and the rapid increase in the death-rate itself, the reliability of the final places of decimals diminishes progressively. For ages 65-79, therefore, only four places of decimals have been tabulated, and at ages 80 and over for men and 85 and over for women the number of decimal places has been limited to three.

Table 2. Ratios of death-rates for age-groups in Great Britain in the years 1930-32 and in 1946-54 to the rates for 1950-52

Age-group	Year									
	1930-32	1946	1947	1948	1949	1950	1951	1952	1953	1954
MALES										
0	2.31	1.68	1.44	1.16	1.11	1.02	1.02	.96	.91	.87
1-4	5.61	1.70	1.76	1.38	1.24	1.06	1.05	.96	.91	.78
5-9	3.44	1.50	1.59	1.32	1.22	1.10	1.00	.87	.85	.72
10-14	2.78	1.62	1.47	1.24	1.16	1.04	1.02	.91	.85	.78
15-19	2.66	1.67	1.72	1.40	1.33	1.09	.96	.95	.90	.86
20-24	2.37	2.03	1.56	1.17	1.19	1.05	.99	.96	.86	.82
25-29	2.21	1.48	1.38	1.19	1.13	1.10	1.01	.87	.84	.79
30-34	2.11	1.39	1.30	1.19	1.11	1.05	1.02	.93	.88	.83
35-39	2.09	1.28	1.24	1.12	1.11	1.04	1.01	.96	.91	.89
40-44	1.84	1.24	1.19	1.10	1.09	1.03	1.03	.94	.90	.92
45-49	1.49	1.16	1.15	1.07	1.07	1.04	1.03	.94	.91	.89
50-54	1.19	1.03	1.05	.95	.97	.98	1.05	.96	.94	.94
55-59	1.05	.98	.99	.94	.97	.98	1.03	.98	.96	.96
60-64	1.00	.95	.98	.93	.98	.99	1.06	.96	.97	.96
65-69	1.04	.90	.94	.88	.95	.96	1.06	.97	.97	.97
70-74	1.09	.91	.97	.89	.97	.97	1.06	.96	.97	.97
75-79	1.08	.92	.97	.85	.94	.96	1.07	.96	.96	.95
80-84	1.06	.91	.99	.84	.93	.95	1.06	.94	.95	.96
85 and over	.99	.88	1.01	.80	.93	.97	1.06	.92	.90	.88
All ages: Crude rates	1.009	1.060	1.071	.939	.995	.983	1.053	.965	.962	.964
Standardized*	1.247	1.009	1.035	.923	.980	.979	1.049	.951	.946	.936
FEMALES										
0	2.26	1.67	1.45	1.15	1.10	1.01	1.01	.97	.93	.86
1-4	5.93	1.67	1.72	1.38	1.23	1.09	1.08	.89	.93	.71
5-9	4.31	1.65	1.65	1.35	1.21	1.10	.98	.87	.87	.73
10-14	3.74	1.77	1.72	1.51	1.31	1.05	1.00	.90	.92	.82
15-19	3.38	1.84	1.93	1.78	1.52	1.22	.99	.80	.70	.67
20-24	2.87	1.92	1.95	1.70	1.58	1.22	.97	.81	.71	.67
25-29	2.51	1.69	1.65	1.49	1.36	1.16	.99	.82	.77	.71
30-34	2.35	1.47	1.42	1.32	1.27	1.11	1.03	.87	.86	.82
35-39	2.12	1.30	1.27	1.14	1.16	1.07	1.04	.90	.88	.89
40-44	1.85	1.20	1.18	1.07	1.07	1.03	1.03	.96	.95	.93
45-49	1.63	1.17	1.12	1.04	1.04	1.04	1.02	.95	.93	.92
50-54	1.49	1.09	1.09	1.03	1.04	1.02	1.03	.95	.93	.93
55-59	1.42	1.06	1.05	.98	1.02	1.00	1.04	.96	.92	.90
60-64	1.36	1.06	1.04	.97	1.02	1.01	1.04	.95	.93	.92
65-69	1.28	1.01	1.01	.94	1.01	.99	1.06	.94	.93	.92
70-74	1.22	1.00	1.03	.93	1.04	.99	1.07	.94	.92	.91
75-79	1.18	.96	1.00	.89	1.00	.98	1.07	.93	.94	.90
80-84	1.11	.92	.96	.83	.95	.96	1.08	.92	.92	.91
85 and over	1.06	.92	.98	.81	.96	.96	1.07	.91	.93	.91
All ages: Crude rates	1.023	.990	1.021	.921	1.004	.993	1.058	.948	.956	.951
Standardized*	1.362	1.041	1.053	.938	1.014	.990	1.053	.926	.919	.896

\* Standardized on 1951 Census age distribution.

Table 2 shows the ratios of the central death-rates in Table 1 to the average rates for the three years 1950, 1951 and 1952, taken as the standard.

In order that the trend of mortality rates may be conveniently studied, the group death-rates and the ratios to the 1950-52 standard are set out in Tables

3 and 4 respectively, and the ratios to the 1950-52 standard are shown in graphical form on pp. 142-3. In these tables and graphs the age-groups have been reduced to six, viz. under age 1 (infants), 1-4 (young children), 5-14 (children of school age), 15-44 (younger adults), 45-64 (older adults) and 65 and over (elderly). Further, so as to eliminate the effect of the considerable changes in the age distribution of the population that are taking place, the group death-rates and ratios have been standardized on the age distribution of Great Britain at the 1951 Census.

*Table 3. Standardized death-rates for age-groups in Great Britain (standardized on 1951 Census age-distribution)*

Year	Age-group						All ages
	Under 1	1-4	5-14	15-44	45-64	65 and over	
MALES							
1930-32	·07953	·00760	·00196	·00412	·01637	·0873	·01588
1946	·05788	·00230	·00096	·00279	·01466	·0749	·01285
1947	·04955	·00238	·00095	·00260	·01491	·0801	·01318
1948	·04006	·00183	·00080	·00228	·01393	·0711	·01175
1949	·03813	·00168	·00074	·00222	·01445	·0782	·01247
1950	·03511	·00146	·00067	·00206	·01448	·0796	·01246
1951	·03524	·00149	·00062	·00199	·01528	·0877	·01336
1952	·03293	·00134	·00055	·00184	·01404	·0787	·01211
1953	·03139	·00127	·00053	·00174	·01392	·0790	·01204
1954	·02992	·00108	·00046	·00170	·01382	·0787	·01192
FEMALES							
1930-32	·05973	·00686	·00178	·00351	·01243	·0735	·01519
1946	·04416	·00191	·00074	·00223	·00934	·0607	·01161
1947	·03833	·00197	·00073	·00220	·00918	·0628	·01174
1948	·03057	·00154	·00062	·00199	·00860	·0555	·01046
1949	·02922	·00140	·00055	·00191	·00888	·0625	·01131
1950	·02681	·00128	·00047	·00169	·00874	·0617	·01104
1951	·02668	·00130	·00043	·00156	·00895	·0674	·01174
1952	·02556	·00106	·00039	·00136	·00822	·0584	·01032
1953	·02461	·00110	·00039	·00131	·00801	·0585	·01025
1954	·02272	·00083	·00034	·00127	·00794	·0572	·00999

As a link with the earlier series of tables, showing the trend of mortality in England and Wales since 1930-32, figures for Great Britain for the average of those three years have been included in Tables 1-4.

Some salient features of the tables are as follows:

(i) The fall in the mortality rates of children during the last twenty years or so has been startling, the group death-rates for 1954 being from one-third to one-eighth of those of 1930-32, and less than one-half of the corresponding rates eight years earlier. The fall shows no sign of ceasing, the 1954 rates being from 15% to 30% below the 1950-52 standard. The death-rates are, however, now so low that a relatively small absolute change is magnified when it is shown as a percentage variation. Thus, at ages 5-14 the death-rate for girls is now only one-thirtieth of 1%, and that of boys is not much higher.

(ii) At the younger adult ages the reduction in mortality is also spectacular, the experience during 1954 being little more than one-third of that during 1930-32 and not much over one-half of the mortality in 1946. The fall in mortality rates among young women has been somewhat more rapid than that among men. There has been some slackening in the rate of improvement during the last two years, but the rates of mortality at these ages are now so low (about  $\frac{1}{8}\%$  for men and  $\frac{1}{8}\%$  for women for the whole group 15-44 last birthday) that the field for further improvement is limited.

Table 4. Ratios of standardized death-rates for age-groups in Great Britain to the rates for 1950-52 (standardized on 1951 Census age distribution)

Year	Age-group						All ages
	Under 1	1-4	5-14	15-44	45-64	65 and over	
MALES							
1930-32	2.307	5.390	3.161	2.102	1.120	1.054	1.247
1946	1.679	1.631	1.548	1.423	1.003	.905	1.009
1947	1.437	1.688	1.532	1.327	1.020	.967	1.035
1948	1.162	1.298	1.290	1.163	.953	.859	.923
1949	1.106	1.191	1.194	1.133	.988	.944	.980
1950	1.018	1.035	1.081	1.051	.990	.961	.979
1951	1.022	1.057	1.000	1.015	1.045	1.059	1.049
1952	.955	.950	.887	.939	.960	.950	.951
1953	.910	.901	.855	.888	.952	.954	.946
1954	.868	.766	.742	.867	.945	.950	.936
FEMALES							
1930-32	2.256	5.716	4.046	2.279	1.439	1.163	1.362
1946	1.668	1.592	1.682	1.448	1.081	.960	1.041
1947	1.447	1.642	1.659	1.429	1.062	.994	1.053
1948	1.154	1.283	1.409	1.292	.995	.878	.938
1949	1.103	1.167	1.250	1.240	1.028	.989	1.014
1950	1.012	1.067	1.068	1.097	1.012	.976	.990
1951	1.008	1.083	.977	1.013	1.036	1.066	1.053
1952	.965	.883	.886	.883	.951	.924	.926
1953	.929	.917	.886	.851	.927	.926	.919
1954	.858	.692	.773	.825	.919	.905	.896

(iii) In the twenty-year age group 45-64 the mortality rates of men have fallen since 1930-32 by about 15% and those of women by about 35%; since 1946 the fall has been only 5% for men and 15% for women. Indeed, for ages 55-64 in the case of men the improvement over the last eight years has been only marginal, made up of a slight worsening during the first half, and a slightly greater improvement in the second half.

(iv) The elderly show a 10% improvement since 1930-32 in the case of men and one of about 22% in the case of women. Since 1946-47 there has been a slight deterioration in the case of men but an improvement of some 7% for women. At these advanced ages the experience of both sexes has been a slight worsening in the late nineteen-forties, followed by a fall in mortality since 1950-52 of some 5% for men and some 10% for women. This

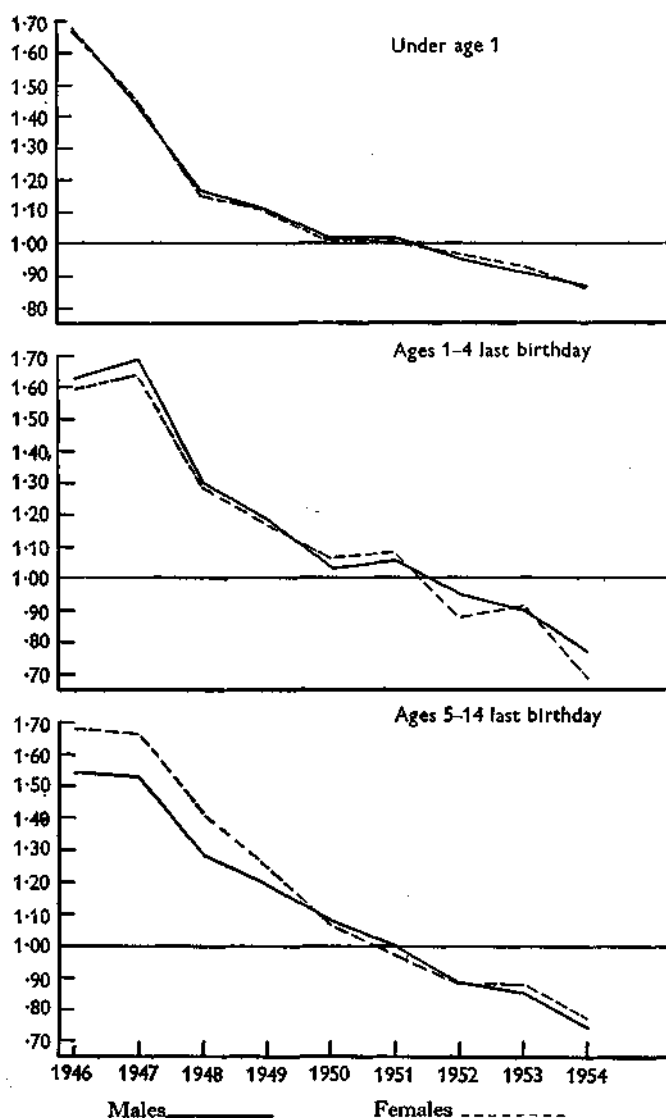
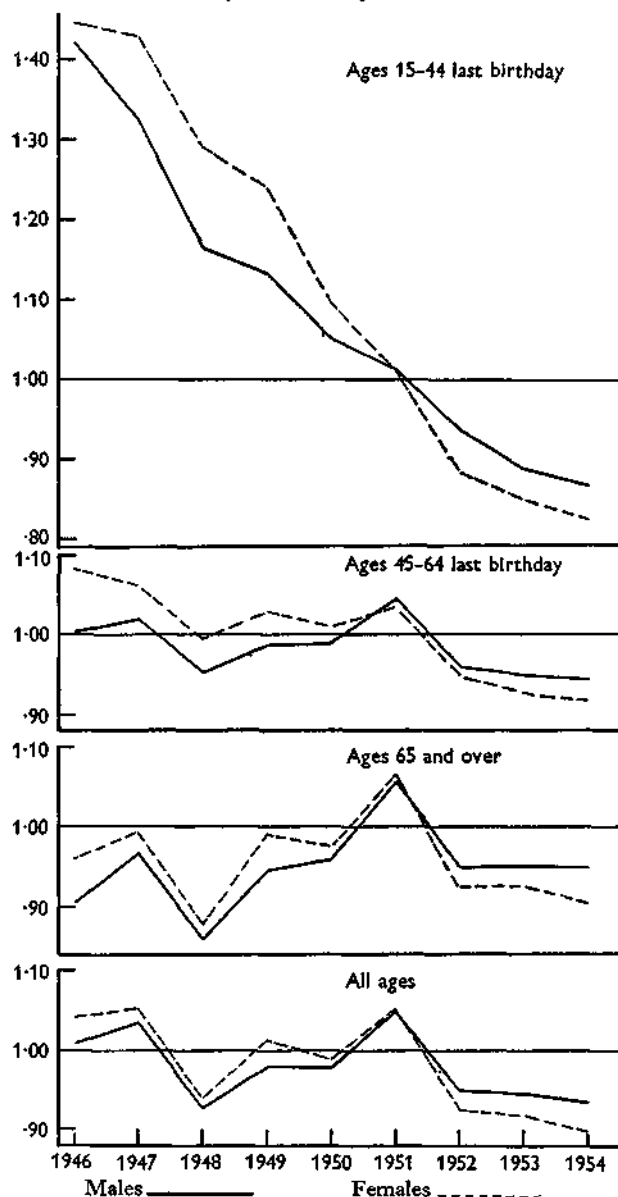


Fig. 1. Ratios of group death-rates (standardized) to 1950-52 rates.

has been the experience of the quinquennial age-groups as well as of the age range 65 and over as a whole.

(v) For the population as a whole (using the standardized ratios as a measure) there has been a fall of one-quarter since 1930-32 in the case of males and one-third in the case of females. Since 1946-47 there has been an



Note: the scale on this page is  $2\frac{1}{2}$  times as large as that on page 142.

Fig. 2. Ratios of group death-rates (standardized) to 1950-52 rates.

over-all fall of about one-twelfth for males and more than one-eighth for females. Since 1950-52 male mortality rates have fallen by some 6% and female rates by about 10%.