THE RECENT TREND OF MORTALITY IN ENGLAND AND WALES

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

of the Government Actuary's Department

IN continuation of the tables given in *J.I.A.* LXXVIII, 125–28, central death-rates in age-groups for males and females separately in the year 1951 and the ratios of these death-rates to the corresponding rates for the years 1930–32, are shown in Table 1. Up to 1949 both the deaths and the populations from which the death-rates have been derived were limited to civilians, though a few deaths due to war—mainly those of war-disabled ex-servicemen—were included. In 1950, however, the basis of the Registrar General's estimate of the population of the country was changed to that of the 'home' population, i.e. the total population, including English seamen on foreign-going ships and the armed forces in the country, but excluding the forces abroad. Thus the revised basis for 1950 and 1951 differs from that for earlier years by the inclusion of the armed forces stationed in England and Wales. Further minor alterations in the content of the 'home' population were made in 1951, but the effect of the changes in basis is only marginal, except (*a*) for the quinary age-group 15–19 last birthday for males, where the replacement of the healthy lives in the population observed in 1949 would reduce the rate for that year by about $7\frac{1}{2}\%$, and (*b*) for the broader age-group 15–44 last birthday for males, where the reduction would be about $1\frac{3}{4}\%$.

The estimated age distribution of the home population in mid-1951 eliminates the accumulated errors in the estimates for earlier years revealed by the tabulations from the 1% sample derived from the 1951 Census. These errors, which may perhaps be regarded as having in the main accumulated during the 12 years since the National Registration in 1939, result in adjustments of the projected population of less than $1\frac{1}{4}\%$, with the following exceptions:

Age-group l.b.d.	Males (%)	Females (%)
20–24	−4·2	—
30–34	−1·9	—
35–39	−2·1	—
70–74	—	+2·3
75–79	—	+2·6
85 and over	−11·9	−8·3

The effect on the mortality rates for 1950 and earlier years would be in a contrary direction to the adjustments to the population and would be progressively smaller for earlier years. For all but the age-group 85 and over the elimination of the errors would make little numerical alteration to the mortality rates and would have an insignificant effect on the mortality trend shown by the unadjusted rates.

The accumulated error in the age-group 85 and over is more considerable. The age-group is not an important one and, unlike earlier age-groups, the results of the National Registration in 1939 did not afford a check on the estimates, because the precise age was not tabulated in the case of persons aged 65 and over. Until the Registrar General has had an opportunity of formulating his views on the subject, the provisional assumption may be made that the difference accrued evenly over the twenty years since the 1931 Census, and on this hypothesis corrected death-rates for this age-group since 1933 are as follows:

Year	Corrected death-rates for ages 85 and over		Ratios to 1930–32 rates	
	Males	Females	Males	Females
1933	·290	·259	1·03	1·05
1934	·261	·230	·93	·93
1935	·276	·238	·98	·96
1936	·301	·259	1·07	1·04
1937	·303	·269	1·08	1·08
1938	·275	·236	·98	·95
1939	·295	·260	1·05	1·05
1940	·321	·278	1·14	1·12
1941	·275	·252	·98	1·02
1942	·249	·219	·88	·88
1943	·252	·225	·89	·91
1944	·230	·200	·82	·81
1945	·227	·203	·80	·82
1946	·255	·220	·90	·89
1947	·295	·235	1·04	·95
1948	·234	·198	·83	·80
1949	·279	·235	·99	·95
1950	·282	·236	1·00	·95

When this age-group is included in the age-group 65 and over for the purpose of obtaining Tables 2 and 3, the correction required is reduced to under 1% in each year, and its effect on the mortality trend is insignificant.

For the above reasons the mortality rates for the years prior to 1951 in Tables 2 and 3 have not been adjusted to allow for the gradual accumulation of the errors revealed by the 1951 Census.

In order that the trend of mortality rates since 1930–32 may be conveniently studied, the group death-rates and ratios to the 1930–32 standard since 1933 are set out in Tables 2 and 3 respectively, and the ratios to the 1930–32 standard are shown in graphical form on pp. 93, 94. 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 have taken place since 1930–32, the group death-rates and ratios have been standardized on the age distribution of England and Wales at the 1931 Census.

The present occasion is a convenient one to summarize in broad outline the changes in mortality rates that have taken place in the twenty years since the starting point of the present series of tables. (The trend of the ratios, rather than the actual value for 1951, has been used in these comparisons.) Infantile mortality rates during the first year of life have fallen to about 45% of those

of 1930–32, whilst for ages 1–4 the rates are less than one-fifth, and for the school ages 5–14 less than one-third of the E.L.T. No. 10 standard. In early adult life (ages 15–44) mortality rates have fallen by rather more than one-half in the twenty years, but in later adult life (ages 45–64) the improvement has been barely one-eighth for males, and less than one-third for females. At the older ages of 65 and over, there has been a net improvement of under 10% for men and some 15% for women since 1930–32, but there was a period, in the

Table 1. Death-rates for age-groups in England and Wales in the year 1951, and ratios of these rates to the rates for 1930–32

Age-group	Death-rates in 1951		Ratios to 1930–32 rates	
	Males	Females	Males	Females
0–4	·00737	·00568	·343	·337
5–9	·00066	·00045	·288	·222
10–14	·00057	·00037	·380	·257
15–19	·00089	·00064	·349	·278
20–24	·00139	·00090	·424	·320
25–29	·00150	·00117	·454	·382
30–34	·00174	·00146	·478	·437
35–39	·00231	·00192	·484	·487
40–44	·00354	·00269	·549	·549
45–49	·00631	·00424	·678	·631
50–54	·01125	·00652	·860	·688
55–59	·01851	·01011	·968	·727
60–64	·03064	·01635	1·050	·766
65–69	·04799	·02815	1·031	·834
70–74	·07378	·04791	·992	·862
75–79	·11748	·08455	·997	·909
80–84	·17941	·14749	·998	·998
85 and over	·31827	·26416	1·128	1·066
All ages: Crude rates	·01339	·01176	1·054	1·046
Standard- ized*	·01028	·00817	·809	·727

* Standardized on 1931 Census age distribution.

middle 1940's, when the improvement was over 15% for men and 20% for women. Apart from the rates for young adult male civilians, which were affected by the withdrawal of a large proportion of the healthy lives to the forces, and a temporary hump in the curve for males in the later middle ages that was discussed in a note in *J.I.A.* (LXXVIII, 354), this is the only significant deterioration in vitality that has occurred during the last two decennia: it is shown in each quinary age-group over 65 and by each sex. For all ages combined, and standardizing on the age distribution at the 1931 Census, mortality has fallen by 25% for males and 30% for females.
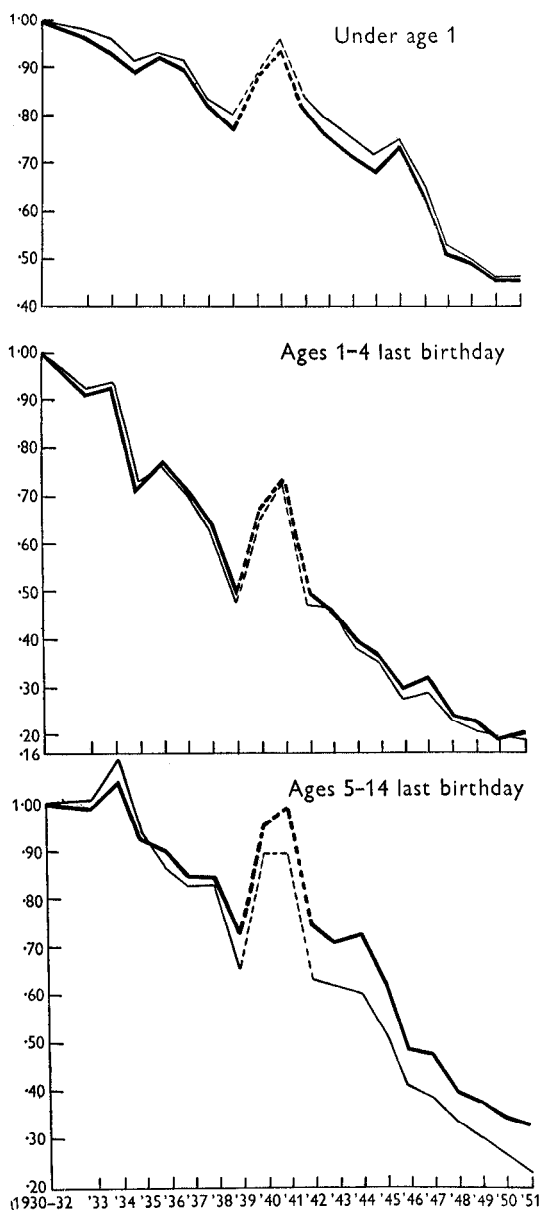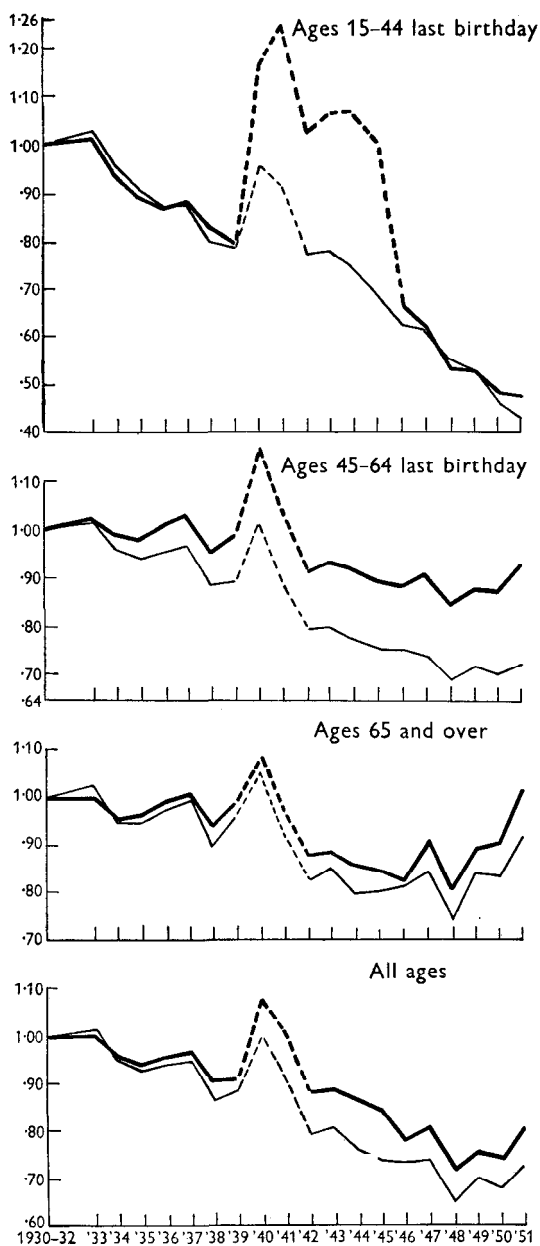
Fig. 1

Fig. 2

Table 2. Standardized death rates for age-groups in England and Wales
(Standardized on 1931 Census age distribution)

Year	Age-group						All ages
	Under 1	1–4	5–14	15–44	45–64	65 and over	
	MALES						
1930–32	·07650	·00755	·00190	·00385	·01653	·08063	·01271
1933	·07354	·00688	·00189	·00390	·01687	·08075	·01272
1934	·07109	·00697	·00198	·00356	·01629	·07687	·01216
1935	·06791	·00535	·00175	·00342	·01613	·07755	·01192
1936	·07042	·00580	·00171	·00332	·01658	·08013	·01220
1937	·06845	·00536	·00161	·00338	·01701	·08102	·01230
1938	·06257	·00483	·00161	·00315	·01572	·07588	·01145
1939	·05874	·00367	·00137	·00304	·01628	·07947	·01158
1940	·06631	·00511	·00181	·00447	·01923	·08729	·01368
1941	·07111	·00557	·00188	·00479	·01701	·07774	·01285
1942	·06150	·00372	·00142	·00393	·01503	·07089	·01122
1943	·05746	·00348	·00136	·00407	·01542	·07146	·01132
1944	·05428	·00298	·00138	·00409	·01517	·06891	·01102
1945	·05194	·00275	·00119	·00385	·01477	·06849	·01071
1946	·05559	·00220	·00092	·00254	·01467	·06713	·00996
1947	·04748	·00236	·00091	·00238	·01496	·07346	·01025
1948	·03843	·00179	·00076	·00205	·01398	·06557	·00915
1949	·03694	·00166	·00072	·00201	·01451	·07227	·00966
1950	·03378	·00142	·00066	·00184	·01439	·07277	·00951
1951	·03403	·00149	·00062	·00180	·01528	·08189	·01028
	FEMALES						
1930–32	·05705	·00677	·00174	·00333	·01197	·06839	·01124
1933	·05587	·00625	·00176	·00342	·01219	·07011	·01142
1934	·05486	·00633	·00190	·00314	·01143	·06469	·01069
1935	·05207	·00490	·00162	·00301	·01126	·06467	·01043
1936	·05286	·00519	·00150	·00289	·01139	·06682	·01058
1937	·05235	·00477	·00145	·00292	·01156	·06785	·01068
1938	·04738	·00424	·00145	·00264	·01058	·06137	·00970
1939	·04566	·00322	·00114	·00260	·01071	·06547	·00992
1940	·05000	·00444	·00156	·00318	·01208	·07194	·01121
1941	·05462	·00499	·00156	·00302	·01067	·06323	·01021
1942	·04752	·00318	·00111	·00254	·00951	·05633	·00890
1943	·04478	·00317	·00108	·00256	·00958	·05847	·00905
1944	·04254	·00254	·00105	·00247	·00921	·05462	·00854
1945	·04063	·00235	·00090	·00224	·00899	·05485	·00834
1946	·04229	·00185	·00071	·00205	·00895	·05582	·00829
1947	·03676	·00194	·00068	·00203	·00881	·05782	·00833
1948	·02955	·00155	·00059	·00182	·00821	·05110	·00742
1949	·02817	·00139	·00053	·00174	·00850	·05758	·00793
1950	·02569	·00128	·00047	·00152	·00836	·05722	·00772
1951	·02576	·00129	·00041	·00141	·00857	·06298	·00817

Table 3. Ratios of standardized death-rates for age-groups in England and Wales to the rates for 1930–32. (Standardized on 1931 Census age distribution)

Year	Age-group						All ages
	Under 1	1–4	5–14	15–44	45–64	65 and over	
MALES							
1930–32	1·000	1·000	1·000	1·000	1·000	1·000	1·000
1933	·961	·911	·995	1·013	1·021	1·001	1·001
1934	·929	·923	1·042	·925	·985	·953	·957
1935	·888	·709	·921	·888	·976	·962	·938
1936	·921	·768	·900	·862	1·003	·994	·960
1937	·895	·710	·847	·878	1·029	1·005	·968
1938	·818	·640	·847	·818	·951	·941	·901
1939	·768	·486	·721	·790	·985	·986	·911
1940	·867	·677	·953	1·161	1·163	1·083	1·076
1941	·930	·738	·989	1·244	1·029	·964	1·011
1942	·804	·493	·747	1·021	·909	·879	·883
1943	·751	·461	·716	1·057	·933	·886	·891
1944	·710	·395	·726	1·062	·918	·855	·867
1945	·679	·364	·626	1·000	·894	·849	·843
1946	·727	·291	·484	·660	·887	·833	·784
1947	·621	·313	·479	·618	·905	·911	·806
1948	·502	·237	·400	·532	·846	·813	·720
1949	·483	·220	·379	·522	·878	·896	·760
1950	·442	·188	·347	·478	·871	·903	·748
1951	·445	·197	·326	·468	·924	1·016	·809
FEMALES							
1930–32	1·000	1·000	1·000	1·000	1·000	1·000	1·000
1933	·979	·923	1·011	1·027	1·018	1·025	1·016
1934	·962	·935	1·092	·943	·955	·946	·951
1935	·913	·724	·931	·904	·941	·946	·928
1936	·927	·767	·862	·868	·952	·977	·941
1937	·918	·705	·833	·877	·966	·992	·950
1938	·831	·626	·833	·793	·884	·897	·863
1939	·800	·476	·655	·781	·895	·957	·883
1940	·876	·656	·897	·955	1·009	1·052	·997
1941	·957	·737	·897	·907	·891	·925	·908
1942	·833	·470	·638	·763	·794	·824	·792
1943	·785	·468	·621	·769	·800	·855	·805
1944	·746	·375	·603	·742	·769	·799	·760
1945	·712	·347	·517	·673	·751	·802	·742
1946	·741	·273	·408	·616	·748	·816	·738
1947	·644	·287	·391	·610	·736	·845	·741
1948	·518	·229	·339	·547	·686	·747	·660
1949	·494	·205	·305	·523	·710	·842	·706
1950	·450	·189	·270	·456	·698	·837	·687
1951	·452	·191	·236	·423	·716	·921	·727

NOTES ON THE TRANSACTIONS OF THE
FACULTY OF ACTUARIES

VOL. XX, PART 3 (No. 176), 1952

Mortality of Life Office Annuitants, pp. 263–354. The Report of the Joint Mortality Committee, and a report of the discussion at the Faculty with an abstract of that at the Institute. See also *J.I.A.* LXXVII, 27–98.

Thirteenth International Congress of Actuaries, pp. 355–59. A brief summary of the Scheveningen Congress of 1951.

VOL. XXI, PART I (No. 177), 1952

Loyal Address to HER MAJESTY THE QUEEN, *on her accession.*

TUTT, L. W. G. *The mortality aspect of population projections*, pp. 3–50. Discusses the mortality assumptions adopted by the Statistics Committee of the Royal Commission on Population, and concludes that they lead to reasonable estimates of future population, but that the Committee extended its projections too far into the future. The author considers that a method making allowance for 'generational' influence would have been a suitable alternative basis providing for reasonably light future mortality. Methods assuming an ultimate irreducible level of mortality are discussed but considered to be impracticable at the present time. It is suggested that the analysis of deaths according to cause of death may be of value as a check on the results of other methods and that there should be more research on this subject, with medical co-operation. The author also feels that more information as to trends in other countries would have been valuable.

Memoir of G. J. LIDSTONE, pp. 51–60.

PHILIP, G. C. and ROBSON, W. I. S. *Valuation of group pension schemes*, pp. 61–91. Discusses the characteristics of group pension business so far as they necessitate a different approach to valuation problems from that appropriate to private pension funds. The relative advantages of valuation at the normal office valuation date or the anniversary of each scheme are considered. Theoretical formulae for the reserves in respect of individual members are developed for a wide variety of cases, followed by practical considerations including approximate methods using groups of attained ages; a numerical example illustrates the reduction of arithmetical work using Trachtenburg's formula.