POPULATION MORTALITY AND ASSURED LIVES' MORTALITY IN GREAT BRITAIN— A COMPARISON OF TRENDS

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AN investigation into the changes which had occurred in mortality rates since 1924, carried out in 1952–53, indicated that improvements had been proportionately greater at the younger than the older ages, had been more marked in the assured lives' data than in the national data above age 55, but had been more marked in the national data than in the assured lives' data at the younger ages since World War II.

2. It was thought that it would be interesting and useful if a regular routine were set up for examining continuously the changes in the two sets of mortality data, in such a way that a comparison between national and assured lives' mortality would always be available. A comparison of trends requires a base period to which subsequent years may be compared, and for this purpose the period 1929–33 was chosen, since dependable rates for both sets of data for that period could easily be calculated and graduated. The assured lives' data were already available for that quinquennium (though not for individual years), and the national data could be compiled from the 1931 census figures and the deaths for the 5 years in question, combining the figures for England and Wales with those for Scotland.

3. For the assured lives' statistics the data for all offices and classes combined, durations 5 and over, were employed; they were also subdivided into the medical and non-medical sections. To confine the investigation to data which would be sufficiently large and reliable, the ages 30 to 79 only were used.

4. It was considered that, rather than employ a complicated index, the trends and comparisons could best be indicated by showing the rates of mortality and expressing these as percentages of the corresponding rates for the base period. To minimize the possibility of the trends being masked by random errors, it was decided to group the data in quinary age groups. This causes no difficulty for the national data, but the composition of certain groups in the assured lives' data must not be overlooked; for example, the data at age 65 are approximately half the data at age 60, and a crude mortality rate for the group 60–64 would refer to a younger age, on the average, than a similar rate calculated from the national data (quite apart from the shift of half a year in the ages, which is considered in § 6). Accordingly, it was decided to calculate quinary group mortality rates for the assured lives' data by taking the unadjusted central rates at the five individual ages and weighting them by reference to the numbers in a standard population at these ages.

5. For the assured lives' experience rates of mortality were available for each individual year of age and comparable rates were available for the base period of 1929–33 from the national data, but for more recent years the

Table I. Central rates of mortality for 1929–33, age by age and in quinary age groups (group rates found by weighting according to a standard population based on the 1951 census 1% sample)

	Standard population		m_x Great Britain 1929–33	Assured lives, 1929–33, durations 5 and over $m_{x-\frac{1}{2}}$			Group central rates for ages last birthday				% of col. (9) to col. (8)	Age group
Age x	x last birthday	x nearest birthday		All classes	Medical	Non-medical	Great Britain	Assured lives, durations 5 and over				
								All classes	Medical	Non-medical		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
30	4094	—	·00357	·00236	·00237	·00234						
31	3867	3980·5	·00368	·00234	·00235	·00230						
32	2797	3332	·00382	·00234	·00235	·00229	·00383	·00240	·00241	·00236	63	30–34
33	2826	2811·5	·00400	·00238	·00240	·00233						
34	3267	3040·5	·00422	·00248	·00249	·00244						
35	3354	—	·00447	·00261	·00262	·00259						
36	3696	3525	·00474	·00277	·00278	·00278						
37	3708	3702	·00503	·00296	·00295	·00299	·00506	·00305	·00306	·00310	60	35–39
38	3659	3683·5	·00534	·00315	·00314	·00320						
39	3663	3661	·00567	·00335	·00333	·00341						
40	3716	—	·00601	·00335	·00354	·00363						
41	3733	3724·5	·00640	·00378	·00376	·00386						
42	3767	3750	·00684	·00403	·00402	·00412	·00689	·00420	·00421	·00428	61	40–44
43	3737	3752	·00734	·00433	·00432	·00440						
44	3690	3713·5	·00788	·00466	·00466	·00470						
45	3629	—	·00847	·00503	·00503	·00500						
46	3556	3592·5	·00908	·00542	·00545	·00534						
47	3473	3514·5	·00974	·00587	·00590	·00572	·00972	·00613	·00616	·00598	63	45–49
48	3375	3424	·01040	·00636	·00640	·00618						
49	3268	3321·5	·01108	·00688	·00693	·00668						
50	3155	—	·01181	·00744	·00749	·00721						
51	3045	3100	·01261	·00804	·00809	·00781						
52	2932	2988·5	·01353	·00874	·00878	·00852	·01354	·00916	·00920	·00901	68	50–54
53	2811	2871·5	·01453	·00954	·00958	·00937						
54	2691	2751	·01561	·01042	·01044	·01036						

Table 1 (continued)

	Standard population		m_x Great Britain 1929-33	Assured lives, 1929-33, durations 5 and over m_{x-t}			Group central rates for ages last birthday					
								Assured lives, durations 5 and over				
Age x	x last birthday	x nearest birthday		All classes	Medical	Non-medical	Great Britain	All classes	Medical	Non-medical	% of col. (9) to col. (8)	Age group
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
55	2578	—	·01679	·01135	·01134	·01146	·01970	·01446	·01441	·01482	73	55–59
56	2480	2529	·01811	·01240	·01236	·01268						
57	2402	2441	·01964	·01361	·01355	·01403						
58	2339	2370·5	·02131	·01506	·01499	·01552						
59	2284	2311·5	·02310	·01671	·01665	·01714						
60	2229	—	·02508	·01854	·01849	·01888	·03007	·02415	·02417	·02393	80	60–64
61	2166	21975	·02734	·02056	·02054	·02075						
62	2098	2132	·02994	·02282	·02283	·02280						
63	2028	2063	·03285	·02536	·02540	·02503						
64	1956	1992	·03602	·02808	·02815	·02741						
65	1882	—	·03951	·03095	·03106	·02993	·04783	·03998	·04022	·03694	84	65–69
66	1806	1844	·04342	·03412	·03428	·03264						
67	1728	1767	·04783	·03772	·03793	·03559						
68	1647	1687·5	·05265	·04190	·04215	·03885						
69	1564	1605·5	·05785	·04667	·04698	·04181						
70	1480	—	·06354	·05193	·05233	·04444	·07676	·06657	·06700	·05717	87	70–74
71	1393	1436·5	·06989	·05766	·05815	·04763						
72	1303	1348	·07703	·06385	·06438	·05229						
73	1209	1256	·08498	·07047	·07097	·05932						
74	1114	1161·5	·09369	·07731	·07767	·06905						
75	1019	—	·10315	·08439	·08451	·08688	·12231	·10418	·10392	·11020	85	75–79
76	923	971	·11336	·09202	·09188	·09431						
77	824	873·5	·12431	·10051	·10015	·10883						
78	720	772	·13604	·11016	·10970	·12395						
79	618	669	·14859	·12123	·12084	·12973						
80	—	—	—	·13352	·13332	·13577						

national data were available in quinary age-groups only. This suggested that the 1 % sample of the 1951 census should be used as the standard population to which the rates of mortality for individual years of age should be applied, it being thought that the group rates so calculated would be reasonably comparable with the group rates yielded by the national data for the years around 1951. The use of a standard population also ensured that the group rates derived from the assured lives' experience for different calendar years would be comparable with each other.

6. For the assured lives' data, the individual ages for which central rates of mortality could be calculated were ages nearest birthday, but group rates were required for ages last birthday in order to be comparable with the national figures. It was considered that no significant error would ensue from taking the standard population from age $x-\frac{1}{2}$ to $x+\frac{1}{2}$ as being equal to half the population aged $x-1$ last birthday plus half the population aged x last birthday; these standard populations at half ages would give the required weighting for four out of each five ages—e.g. for the age group 30 to 35 last birthday they give the weights for ages 31 to 34 *nearest* birthday inclusive—and the group is completed by weighting the rate for age 30 nearest with half the standard population at age 30 last birthday, and the rate for age 35 nearest with half the standard population at age 34 last birthday.

7. Table 1 shows details of the standard population, the central rates age by age (each set graduated by King's method of osculatory interpolation) for the national data, the assured lives' combined data, and the medical and non-medical sections separately; and finally, the quinary group rates found by use of the standard population. The group rates for the assured lives' combined data are also shown expressed as percentages of the national rates.

8. The routine suggested in § 2 has been completed for each of the years 1948–52 inclusive. For the assured lives' data, similar group rates to those found for the base period have been calculated from the data available. For the national data, the estimated populations for England and Wales in quinary age groups are available in the Registrar General's Annual Reviews, and the deaths are published in these Reviews both for England and Wales and for Scotland; for the Scottish populations, however, the published data amalgamate all ages from 70 onwards; full particulars were kindly supplied by Mr W. S. Hocking, and in order to obtain consistency with the statistics he made available, the data taken from the Reviews were the civilian populations and deaths for the years 1948 and 1949, and the home populations and all registered deaths for the years 1950 onwards. The national group rates are simply the deaths at the five ages divided by the estimated population.

9. Table 2 shows the quinary group rates for each of the years in question, for both the assured lives' combined data and for the national data; and also the assured lives' rates expressed as percentages of the national rates. These percentages, when compared with the similar percentages shown in Table 1 for the base period, show that although they still rise with age, the rise is neither so rapid nor so marked as it was in 1929–33.

10. Table 3 shows the quinary rates for the assured lives' combined data and for the national data expressed as percentages of the corresponding rates for the base period. This bears out the conclusions described in § 1, i.e. that the improvements are more marked in the national data up to age group

Table 2. Central rates of mortality, 1948–52. C.M.I. assured lives' data, all classes, durations 5 and over, and Great Britain national male data

Ages l.b.d.	1948			1949			1950			1951			1952		
	Assured lives (1)	G.B. popn. (2)	(1)÷(2) (%)	Assured lives (1)	G.B. popn. (2)	(1)÷(2) (%)	Assured lives (1)	G.B. popn. (2)	(1)÷(2) (%)	Assured lives (1)	G.B. popn. (2)	(1)÷(2) (%)	Assured lives (1)	G.B. popn. (2)	(1)÷(2) (%)
30–34	·0013	·0021	61	·0014	·0019	74	·0012	·0018	67	·0013	·0018	72	·0011	·0016	68
35–39	·0018	·0026	67	·0018	·0026	71	·0016	·0024	70	·0015	·0024	63	·0016	·0022	71
40–44	·0026	·0039	66	·0024	·0039	62	·0025	·0036	70	·0024	·0036	66	·0025	·0033	74
45–49	·0046	·0067	68	·0045	·0068	67	·0045	·0066	69	·0044	·0064	68	·0041	·0059	70
50–54	·0072	·0105	69	·0078	·0108	73	·0079	·0107	74	·0083	·0114	73	·0076	·0106	71
55–59	·0125	·0171	73	·0125	·0177	70	·0130	·0178	73	·0133	·0187	71	·0127	·0176	72
60–64	·0201	·0272	74	·0216	·0287	75	·0214	·0286	75	·0227	·0308	74	·0203	·0278	73
65–69	·0329	·0400	82	·0325	·0431	75	·0316	·0434	73	·0362	·0478	76	·0347	·0437	79
70–74	·0488	·0613	80	·0521	·0669	78	·0561	·0671	84	·0595	·0735	81	·0552	·0663	83
75–79	·0814	·0936	87	·0865	·1030	84	·0849	·1045	81	·0938	·1176	80	·0861	·1057	81

50–54 (the assured lives' percentage being higher than the national percentage in all but one of the twenty-five sets of group rates), and more marked in the assured lives' data in all the age groups over age 54 (the assured lives' percentage being the lower in all but two of the twenty-five sets). The fact that the percentages have been calculated simply from rates of mortality makes it difficult to illustrate this point clearly, and the use of a 25-year group mortality rate has little appeal; it is thought the position might be made clearer by calculating, for the age groups 30–54 and 55–79, 'average percentages', being averages of the five percentages shown in the table for the five quinary groups, as shown below:

Calendar year	'Average percentage' for ages 30 to 54		'Average percentage' for ages 55 to 79	
	Assured lives	Great Britain population	Assured lives	Great Britain population
1948	65	62	80	84
1949	67	61	83	89
1950	65	59	85	90
1951	64	59	91	98
1952	61	54	85	89

11. For both sets of data the improvements, when expressed in the form of the percentages shown in Table 3, are progressively less as age increases.

Table 3. Central rates of mortality, 1948–52, expressed as percentages of the corresponding rates for the period 1929–33. C.M.I. assured lives' data, all classes, durations 5 and over, and Great Britain national male data

Age group (l.b.d.)	1948		1949		1950		1951		1952	
	Assured lives %	G.B. popn. %	Assured lives %	G.B. popn. %	Assured lives %	G.B. popn. %	Assured lives %	G.B. popn. %	Assured lives %	G.B. popn. %
30–34	52	54	60	51	50	47	53	46	46	42
35–39	58	52	60	51	54	47	49	47	52	44
40–44	62	57	57	56	60	53	57	52	59	48
45–49	75	69	74	70	74	67	71	66	67	60
50–54	79	77	85	79	87	79	91	84	83	78
55–59	86	87	86	90	90	90	92	95	88	89
60–64	83	90	89	95	89	95	94	102	84	92
65–69	82	84	81	90	79	91	91	100	87	91
70–74	73	80	78	87	84	87	89	96	83	86
75–79	78	77	83	84	81	85	90	96	83	86

12. Although the rates shown in Table 2 are expressed to four decimal figures, the fifth figure (not shown) has been retained in calculating the percentages.

13. Table 4 shows the group rates for each of the years 1948–52 inclusive, for the medical and non-medical sections of the assured lives' data. These rates are not, however, expressed as percentages of the base period rates since such percentages would be misleading; they would measure changes in the constitution of the data in the two sections, rather than showing true changes in mortality rates.

14. This note gives an indication of the work which has been completed on this subject up to the present. It will shortly be possible to bring the work up to date by publishing similar figures for the years 1953–55, inclusive, and also combined figures for each of the 4-year periods 1948–51 and 1952–55. It will also be possible to improve the national figures for 1948–50 inclusive, if the Registrar General publishes revised estimates of the populations for these years based on the 1951 census.

Table 4. Central rates of mortality, 1948–52. C.M.I. assured lives' data, all classes, durations 5 and over; medical and non-medical separately

Age group (l.b.d.)	1948		1949		1950		1951		1952	
	Med.	Non-med.	Med.	Non-med.	Med.	Non-med.	Med.	Non-med.	Med.	Non-med.
30–34	·0012	·0013	·0013	·0015	·0012	·0012	·0013	·0013	·0011	·0011
35–39	·0018	·0018	·0018	·0019	·0017	·0016	·0012	·0017	·0014	·0018
40–44	·0026	·0026	·0024	·0024	·0023	·0027	·0024	·0024	·0024	·0026
45–49	·0046	·0046	·0045	·0045	·0045	·0046	·0042	·0045	·0039	·0043
50–54	·0071	·0073	·0078	·0079	·0073	·0086	·0080	·0087	·0070	·0081
55–59	·0120	·0133	·0121	·0129	·0124	·0137	·0128	·0140	·0122	·0131
60–64	·0199	·0202	·0208	·0232	·0213	·0215	·0218	·0246	·0198	·0214
65–69	·0338	·0278	·0318	·0354	·0313	·0338	·0360	·0373	·0346	·0350
70–74	·0488	·0493	·0520	·0542	·0553	·0635	·0590	·0643	·0546	·0606
75–79	·0803	·0986	·0861	·0931	·0839	·0986	·0934	·1008	·0858	·0901

15. All references in this note to population and national mortality relate to male lives only.