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IRISH REGIONAL LIFE TABLES.

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There are three recognised measures of the mortality of a population, known as the *crude* death-rate, the *standardised* death-rate and the *life table* death-rate. Comparisons of the crude death-rate as between one people and another or one year and another, give no information, without further knowledge or further inquiry, as to whether one people is healthier than another or whether health conditions have improved over a period. The reason is that the crude death-rate is chiefly influenced by the age distribution of the people. In 1936 45 per cent. of all deaths in Éire were of persons aged 65 years and over, and infant mortality is also very high as compared with mortality at most other ages. Differences, therefore, in the birth-rate or in the proportion of old persons among the population will greatly affect the crude death-rate. I apologise for dwelling, however briefly, on these elementary facts concerning the crude death-rate. My reason for doing so is that far-reaching conclusions relative to public health are still being widely publicised by medical officers and others in this country, and these conclusions are based on nothing more than a comparison of crude death-rates. As standardised death-rates and the material for calculating them are published regularly in the Reports of the Registrar-General, there would seem to be little excuse for the continued use of the crude death-rate in such inquiries.

The standardised death-rate was devised to eliminate differences due to different age-distributions. In the calculation of the standardised death-rate the death-rates at different ages are weighted by the numbers of persons at these ages in a standard population, some actual population usually being chosen as the standard. The drawbacks of the standardised death-rate are that the choice of the standard population is somewhat arbitrary, the death-rate, except for the standard population, is notional and sometimes yields impossible or improbable expectations of life, standardised death-rates are not universally comparable, since there is no unique standard, while the age-distribution of an actual population is the result of many varying trends in mortality, the birth-rate, emigration and immigration over a long period, and bears little relation to the mortality conditions at the time for which the death-rates are constructed. For these reasons standardised death-rates, though generally serviceable, are far from ideal, and are unsuitable for many specific purposes such as the study of population trends and the close analysis of the incidence of particular diseases. A difference in death rates which is significant may be, and usually is, relatively small. The weighting of the standardised death-rate may obscure significant differences which the life table death-rate would reveal or may show marked differences where the life table death-rate would show none.

The life table death-rate is the most adequate at our disposal. The life table death-rate for any age-period is the difference between the number of entrants to that age period in a stationary (life table) population and the number surviving to the end of the age-period expressed per 1,000 of the life table population at that age-period.

A stationary (life table) population is one which is recruited by a constant annual number of births, and the life table traces the history of these births on the assumption that the persons born live from birth to death in the same mortality conditions as those which obtain at the place and time for which the table is constructed. The only reason why life table death-rates are not universally used is the considerable difficulty and tedium involved in their computation. For this paper a number of abridged regional life tables have been constructed for this country by a very short and rapid method which can readily be applied to other areas than those discussed here, which comprise: Aggregate Urban Districts, Aggregate Rural Districts, Dublin City, Rest of Leinster, Munster, Connacht and Ulster (3 counties).

Before proceeding to a description of this method the following comparison of the crude, standardised and life table death-rates over a period of seventy years will be of interest.

AVERAGE ANNUAL DEATH RATES PER 1,000 POPULATION

Period	Males			Females		
	Crude	Standardised	Life Table	Crude	Standardised	Life Table
1870-2 ...	17·33	19·40	20·16	16·39	18·57	19·65
1880-2 ...	18·10	20·75	20·24	17·45	20·11	20·04
1890-2 ...	17·83	21·06	20·37	17·99	20·90	20·33
1900-2 ...	17·85	20·38	20·28	17·65	20·31	20·16
1910-12	16·32	16·35	18·66	16·37	15·49	18·48
1925-7 ...	14·33	14·33	17·42	14·63	14·63	17·27
1935-7 ...	14·64	13·85	17·18	14·37	14·22	16·77

For the standardised rates the population as returned at the 1926 Census has been taken as the standard. During the period 1881–1901 and again in the period 1926–36 the trend in the crude death-rate was the reverse of the trends in the standardised and life table rates. During the years 1871–1901 the life table rate showed no significant change, but the standardised rate was more variable. The decline in the death-rate since 1901 is overstated by the standardised rate, and the standardised rate for 1936 would give an expectation of life at birth of 72.2 years, as compared with the life table expectation of 58.2 years. Over the whole period from 1871 to 1936 the standardised death-rate fell from 19.40 to 13.85 or by 28.6 per cent. for males, as compared with a decline of only 14.8 per cent. from 20.16 to 17.18 in the life table rate. Even, therefore, in the study of the population of the same area over a number of years, the advantages of using the life table rates are evident.

Construction of regional life tables.*

In the construction of a life table (as in the study of mortality) three age groups of the population require separate consideration, viz., children under 5 years, persons between the ages of 5 and 75 or 80 years,

* The notation used in this paper conforms to that used in the official Irish Life Tables. The following is a brief summary of the symbols used and of the relations between them :—

q_x = the rate of mortality, or the probability of dying in a year. It is the ratio of the number of deaths in the year of age x to $x+1$ to the number entering on the year.

and persons aged 75 or 80 years and over. In this paper I am not concerned with the calculation of the life table functions for age-groups over 75 years. If it is desired to study mortality at these later ages, the tables given in this paper, with the assistance of a Makeham graduation such as was used in the calculation of the official Irish Life Table or the simpler Gompertz graduation, could be used. It would be necessary however to obtain statistics of deaths for later age-groups from the Registrar-General as deaths in age-groups over 75 years are not shown in the Annual Reports.

Ages 0–4 years.

For ages under 5 years and particularly in the first year of life when mortality changes so rapidly, the only sound method of calculating the values of the life table functions is to have recourse to the statistics of births and deaths. It is advisable also to make separate calculations for each year of age.

The first function to be calculated for these ages is q_x, the probability of dying during the year of life x. This, for the present tables is the ratio of the average annual number of deaths in the year of life x to x+1 during the three years 1935–37, to the number who enter the year of life x to x+1, that is, who attain the exact age x. In the official Irish Life Tables the numbers of entrants were calculated by a somewhat elaborate formula derived from the quarterly statistics of births. Quite accurate values of q_0, however, are obtained if the number of entrants to the first year of life is calculated by the simple formula :

$\frac{1}{6}$ (Sum of births in 1934 and 1937) + $\frac{1}{3}$ (Sum of births in 1935 and 1936)

while the corresponding formula for the number of entrants to the second year of age is

$\frac{1}{6}$ (Sum of births in 1933 and 1936) + $\frac{1}{3}$ (Sum of births in 1934 and 1935) less $\frac{1}{3}$ (Deaths at age 1 year in 1935–37).

A comparison of the values of q_0 and q_1 for the whole population resulting from these simplified formulae with the value given in Irish Life Table No. 2 gave the following correcting factors, which were applied to the values of q_0 and q_1 calculated as described, for the several regions.

	Correcting Factor	
	Males	Females
q_0	1·00057	1·00065
q_1	·99842	·99791

p_x = the probability of living a year, or the ratio of the number completing the year of age x to $x+1$ to the number entering on the year.

l_x = the number according to the life table surviving to exact age x.

L_y = the population according to the life table, or the years of life lived, in the years of age x to $x+1$, x to $x+5$, etc.

T_x = the population, or the years of life lived, above the moment of age x.

$\mathring{e}_x$ = the complete expectation of life in years, or the total future lifetime which on the average will be passed through by persons aged exactly x.

The following relations hold between these quantities :—

$$p_x = 1 - q_x; \quad L_x = \tfrac{1}{2}(l_x + l_{x+1})(x>0); \quad T_x = \Sigma L_y; \quad \mathring{e}_x = T_x - l_x$$

$y \geq x$.

The closeness of these factors to unity is an indication of the accuracy of the method.

For the years of age 2–4 years the values of q were calculated by the simple formula

$$q_x = \frac{d_x}{P_x + \frac{1}{2}d_x}.$$

where d_x is the annual average number of deaths during 1935–7 of children aged x to x+1 years, and P_x is the population aged x to x+1 years as returned at the Census of 1936.

As for the official Life Table the value of l_0, the constant annual number of births, was taken as 100,000 and the values of l_1 to l_5 were calculated from the equations

$$l_{x+1} = l_x p_x \; ; \; p_x = l_x(1 - q_x)$$

where P_x is the probability of surviving to the end of the xth year of age.

The values of L_x the life table population for x=1 to x=4 were then obtained in the usual way from the equations

$$L_x = \tfrac{1}{2}(l_x + l_{x+1})$$

To calculate the population under 1 year or the years of life lived in the first year of age by the 100,000 children born, a special method is necessary owing to the rapidly changing mortality, and a modification of the method used for the official Life Table was adopted. The annual average numbers of deaths of infants aged under 3 months, 3–5 months and 6–11 months were adjusted to give numbers D_{0-2}, D_{3-5}, D_{6-11}, such that $D_{0-2} + D_{3-5} + D_{6-11} = q_0 \times 10^5$ and, as may easily be verified, the years of life lived by infants who died during the year is given by the expression

$$\tfrac{1}{8}(D_{0-2} + 3D_{3-5} + 6D_{6-11}).$$

Adding to this the years of life lived by children attaining age 1, i.e., l_1, the value of L_0 is obtained.

Persons aged 5–74 years.

The calculation of the life table functions for ages between 5 and 75 years is the most onerous part of the work of constructing a life table when orthodox methods are used. The abridged and rapid method by which the life tables here reproduced were calculated is based on the discovery of a simple linear relationship between life table death-rates and standardised death-rates of a certain kind. This discovery was the result of an historical accident. It was found by Dr. Brownlee* of the Medical Research Council that for ten English life tables, the life table death-rates at x years of age could be derived with great accuracy in every case from standardised death rates, using the population of England and Wales in the decade 1891–1900 as the standard, by an equation of the form

$$D_x = as_x + b$$

where D_x is the life table death-rate at age x, s_x the standardised death-rate and a and b are constants. This raised the question whether it was possible to find a theoretical standard population such that the standardised death-rates calculated from it would always have such a relationship with the life table death-rates, and eventually he made the remarkable discovery that a population arranged in simple

* "The use of Death-rates as a Measure of Hygienic Conditions" by John Brownlee, M.D., D.Sc. (Medical Research Council, London).

arithmetical progression of the numbers in each age-group was such a standard. The results obtained by using the population of 1891–1900 as a standard were due to the fact that this population was roughly in arithmetical progression. As the numbers at each age in the theoretical population are constant, the life table death-rate (D_x) is related to the number of deaths (d_x) above age x in the standard population by the linear equation

$$D_x = md_x + c$$

The values of the constants m and c were calculated by Dr. Brownlee on the basis of ten English regional life tables. As Dr. Brownlee's brochure may be somewhat inaccessible, I reproduce them here for the convenience of medical officers and others who might wish to use the methods of this paper in the study of vital statistics.

Age Group	Population	Males		Females	
		m	c	m	c
0–	16	·0047986	10·052	·0046168	10·604
5–	15	·0036317	12·756	·0039159	12·460
10–	14	·0044503	13·210	·0043761	13·395
15–	13	·0050789	14·303	·0052281	14·202
20–	12	·0061455	15·254	·0063082	15·132
25–	21	·0076268	16·204	·0077535	16·154
35–	17	·012322	18·546	·012239	18·759
45–	13	·021530	22·017	·020931	22·606
55–	9	·044486	26·720	·043032	27·667
65–	5	·127236	31·954	·121408	34·123
75 and over	1	1·003635	2·823	·876036	20·901

The table is used as follows :—

The number of deaths of males above say, age 25, is obtained by multiplying the numbers in the second column by the appropriate death-rates per 1,000 population. This number is then multiplied by .0076268 and 16.204 is added to the product to give the life table death-rate per 1,000 population at ages 25 years and over. Dividing the life table rate so obtained into 1,000 the expectation of life at 25 years is obtained.

The following is the comparison between the expectations of life estimated as described for the whole population of this country and those given in Irish Life Table No. 2.

Age	Expectation of Life (in years)			
	Males		Females	
	Estimated	Life Table No. 2	Estimated	Life Table No. 2
0	58·69	58·20	59·23	59·62
5	59·93	60·11	60·29	60·40
10	55·93	55·75	56·03	56·10
15	51·24	51·19	51·58	51·59
20	46·83	46·83	47·25	47·26
25	42·71	42·70	43·15	43·21
35	34·39	34·38	35·05	35·21
45	26·21	26·25	26·96	27·18
55	18·74	18·85	19·38	19·59
65	12·36	12·48	12·90	13·14
75	8·51	7·87	8·73	8·41

The greatest differences between the estimated and life table expectations occur in the expectations at birth and at age 75. At all other ages the agreement is evidently close enough to warrant the use of this method in the computation of the expectations of life for regional life tables.

The divergences at age 75 are surprisingly small when the size of the age-group 75 years and over, the great number of deaths which occur above 75 years of age and the misstatement of age so common at these late ages are taken into consideration. Dr. Brownlee, in fact, having extrapolated for later ages from similar estimates for the English Life Table of 1910–12, suggests that the rates he arrives at are more accurate than the official Life Table rates though he exonerates the compilers of the Life Table from all blame. In the regional tables given later, however, the expectations at age 75, calculated by this method, have been reduced in the ratio of estimated to Life Table expectations given above. A similar adjustment was made in the figures for females aged 65–74 years.

The expectation of 58.69 years at birth for males is not compatible with the expectation of 59.93 at 5 years, as it would involve a drop of over one year in the expectation of life from 4 years to 5 years of age, which is not possible. The expectation for females at birth, on the other hand, is evidently too low as compared with the expectation at 5 years. This tendency of Dr. Brownlee's method to give too high an expectation at birth for males and too low a figure for females was found to be accentuated with the regional populations, with the additional unlikely result that the male expectation at birth was frequently greater than the female, and accordingly the estimated expectations at birth were abandoned, and the calculations for the young ages were linked with those for ages 5 years and over by means of the expectation at 5 years of age. The population aged 5 years and over, $T_5 = e_5 \times l_5$. Adding L_4, L_3, etc., T_0 is obtained, and hence the revised expectation at birth after division by 100,000 (l_0).

As in the official Life Table the annual average numbers of deaths in the years 1935–37 for the population aged 5 and over were calculated by the formula $D = \frac{1}{9}(4D_{35} + 4D_{36} + D_{37})$.

The values of l_x for ages 5 to 55 years were obtained as follows :
From the equations

$$T_x - T_{x+n} = \frac{n}{2}\,(l_x + l_{x+n}) \text{ (approximately).}$$

$$T_x = \mathring{e}_x l_x$$

we obtain

$$l_{x+n} = l_x . \frac{\mathring{e}_x - \frac{n}{2}}{\mathring{e}_{x+n} + \frac{n}{2}}$$

where n is the number of years in the age group.

The first of these equations holds with great accuracy for the quinquennial (n=5) age-groups up to 75 years of age. For the decennial age-group 45–54 years, the calculation of l_{55} from l_{45} by this method for the whole country differed from the Life Table value by one-fourth of one per cent. both for males and females, and the formula cannot be applied with accuracy to decennial age-groups above this. The formula given was modified for l_{55} by substituting in the first of these equations 1.0025 l_{55} for l_{55} in the case of males and 1.0021 l_{55} for l_{55}

in the case of females to correct for the divergence just mentioned. The values of L_x (up to L_{45}) and T_x (up to T_{55}) are now speedily calculable. The preceding calculations can be checked by one multiplication, viz., that required to verify the equation $T_{55}=l_{55}\,\mathring{e}_{55}$.

For the calculation of l_{65} and l_{75} it would have been possible to deal with four quinquennial age-groups and so continue to apply the formula given above, thus arriving independently at the value of T_{75} and hence at a revised value for $\mathring{e}_{75}$ but on account of the tendency to "heap" at ages 60 and 70 this was considered undesirable, and a different method had to be adopted.

Assuming, with Dr. Brownlee,

$$l_{x+n}=l_x(1\ (\text{one})-nr+b\ n^2r^2)$$

where r is the death-rate (per unit of population) for the age-group x to x+n years, the values of the constant b were calculated for 55 and 65 years from Irish Life Table No. 2 for males and females separately, and (putting n=10) the values of l_{65} and l_{75} were obtained. The values of b were :—

x	Males	Females
55	.3907	.3909
65	.3994	.4082

The values of b do not differ greatly from one life table to another, lying, for six English life tables, within the range .35—.41.

The rest of the life table is completed in the usual way. Tables for the seven areas specified follow.

AGGREGATE URBAN DISTRICTS.

Age (x)	Males				Females			
	l_x	L_x	T_x	$\mathring{e}_x$	l_x	L_x	T_x	$\mathring{e}_x$
0	100,000	92,734	5,313,503	53 14	100,000	94,440	5,702,664	57·03
1	89,529	88,514	5,220,769	58 31	91,874	90,981	5,608,224	61·04
2	87,500	86,993	5,132,255	58·65	90.088	89,689	5,517,243	61·24
3	86,486	86,222	5,045,262	58·34	89,290	88,972	5,427,554	60·79
4	85,958	85,712	4,959,040	57 69	88,655	88,461	5,338,582	60·22
5—	85,467	423,712	4,873,328	57·02	88,267	437,902	5,250,121	59 48
10—	84,018	418,192	4,449,616	52·96	86,894	432,075	4,812,219	55·38
15—	83,259	413,432	4,031,424	48·42	85,936	426,706	4,380,144	50·97
20—	82,114	406,265	3,617,992	44·06	84,747	419,825	3,953,438	46·65
25—	80,392	785,380	3,211,727	39·95	83,183	801,100	3,533,613	42·48
35—	76,684	736,980	2,426,347	31·64	77,037	761,600	2,732,513	35·47
45—	70,712	656,075	1,689,367	23·89	75,283	713,080	1,970,913	26·18
55—	60,352	528,548	1,033,292	17·12	67,192	588,762	1,257,833	18·72
65—	43,663	317,913	504,744	11·56	51,866	409,899	669,071	12·90
75+	22.924	—	186,831	8·15	30,348	—	259,172	8·54

AGGREGATE RURAL DISTRICTS

Age (x)	Males l_x	Males L_x	Males T_x	Males $\mathring{e}_x$	Females l_x	Females L	Females T_x	Females $\mathring{e}_x$
0	100,000	95,330	6,047,471	60·47	100,000	96,206	6,097,820	60·98
1	93,618	93,180	5,952,141	63 58	94,795	94,350	6,001,614	63·31
2	92,743	92,479	5,858,961	63·17	93,905	93,664	5,907,264	62·90
3	92,215	91,933	5,766,482	62·53	93,424	93,255	5,813,600	62·23
4	91,652	91,475	5,674,549	61·91	93,086	92,935	5,720,345	61·45
5 –	91,376	453,010	5,583,074	61 10	92,785	461,362	5,627,410	60 65
10 –	89,828	448,607	5,130,064	57·11	91,760	456,605	5,166,048	56·30
15 –	89,615	444,965	4,681,457	52 24	90,882	451,365	4,709,443	51·82
20 –	88,371	437,657	4,236,492	47·94	89,664	443,935	4,258,078	47 49
25 –	86,692	848,735	3,798,835	43·82	87,810	856,590	3,814,143	43 44
35 –	83,055	809,985	2,950,100	35·52	83,508	810,290	2,957,553	35·42
45 –	78,942	754,560	2,140,115	27·11	78,550	748,850	2,147,263	27·34
55 –	71,790	658,067	1,385,555	19·30	71,072	635,577	1,398,413	19·68
65 –	57,783	461,183	727,488	12·59	57,616	469,593	762,836	13·24
75 +	34,098	—	266,305	7·81	35,035	—	293,243	8 37

DUBLIN CITY

Age (x)	Males l_x	Males L_x	Males T_x	Males $\mathring{e}_x$	Females l_x	Females L_x	Females T_x	Females $\mathring{e}_x$
0	100,000	91,806	5,144,566	51·45	100,000	93,537	5,576,495	55·76
1	88,233	87,080	5,052,760	57·27	90,875	89,822	5,482,958	60·34
2	85,927	85,432	4,965,680	57·79	88,769	88,355	5,393,136	60·75
3	84,937	84,659	4,880,248	57·46	87,941	87,613	5,304,781	60·32
4	84,382	84,152	4,795,589	56·83	87,285	87,081	5,217,168	59·77
5 –	83,923	416,115	4,711,437	56·14	86,877	430,610	5,130,087	59·05
10 –	82,523	410,555	4,295,322	52·05	85,367	424,465	4,699,477	55·05
15 –	81,699	405,545	3,884,767	47·55	84,419	418,985	4,275,012	50·64
20 –	80,519	398,335	3,479,222	43·21	83,175	411,967	3,856,027	46·36
25 –	78,815	769,540	3,080,887	39·09	81,612	798,790	3,444,060	42·20
35 –	75,093	719,320	2,311,347	30·78	78,146	756,725	2,645,270	33 85
45 –	68,771	634,420	1,592,027	23·15	73,199	692,560	1,888,545	25·80
55 –	57,968	503,070	957,607	16·52	65,176	571,473	1,195,985	18·35
65 –	41,284	307,609	454,537	11·01	50,041	397,023	624,512	12·48
75 +	21,080	—	146,928	6·97	28,615	—	227,489	7·95

REST OF LEINSTER

Age (x)	Males l_x	Males L_x	Males T_x	Males $\mathring{e}_x$	Females l_x	Females L_x	Females T_x	Females $\mathring{e}_x$
0	100,000	94,228	5,816,861	58·17	100,000	95,297	5,885,989	58·86
1	92,171	91,602	5,722,633	62·09	93,570	93,086	5,790,692	61·88
2	91,034	90,751	5,631,031	61·86	92,603	92,332	5,697,606	61·53
3	90,469	90,270	5,540,280	61·24	92,062	91,856	5,605.274	60·89
4	90,072	89,898	5,450,010	60·51	91,650	91,441	5,513,418	60·16
5 –	89,724	444,617	5,360,112	59·74	91,233	453,315	5,421,977	59·43
10 –	88,123	439,095	4,915,495	55·78	90,093	448,052	4,968,662	55·15
15 –	87,515	435,042	4,476,400	51·15	89,128	442,362	4,520,612	50·72
20 –	86,502	428,337	4,041,358	46·72	87,817	434,200	4,078,250	46·44
25 –	84,833	830,600	3,613,021	42·59	85,863	836,860	3,644,050	42·44
35 –	81,287	790,530	2,782,421	34·23	81,509	789,650	2,807,190	34·44
45 –	76,819	729,205	1,991,891	25·93	76,421	724,670	2,017,540	26·40
55 –	68,850	621,223	1,262,686	18·34	68,369	605,193	1,292,870	18·91
65 –	53,814	412,501	641,463	11·92	53,851	429,033	687·677	12·77
75 +	29,774	—	228,962	7·69	31,427	—	258,644	8·23

MUNSTER

Age (x)	Males				Females			
	l_x	L_x	T_x	$\mathring{e}_x$	l_x	L_x	T_x	$\mathring{e}_x$
0	100,000	94,622	5,842,156	58·42	100,000	95,883	6,031,110	60·31
1	92,395	91,799	5,747,534	62·21	94,183	93,573	5,935,227	63·02
2	91,203	90,837	5,655,735	62·01	92,964	92,710	5,841,654	62·84
3	90,471	90,266	5,564,898	61·51	92,456	92,238	5,748,944	62·18
4	90,061	89,881	5,474,632	60 79	92,021	91,894	5,656,706	61 47
5 –	89,701	444,710	5,384,751	60·03	91,768	456,072	5,564,812	60·64
10 –	88,183	439,727	4,940,041	56·02	90,661	451,095	5,108,740	56·35
15 –	87,708	435,925	4,500,314	51·31	89,777	446,057	4,657,645	51·88
20 –	86,662	429,195	4,064,389	46·90	88,646	439,217	4,211,588	47·51
25 –	85,016	831,340	3,635,194	42 76	87,041	850,070	3,772,371	43·34
35 –	81,252	789,290	2,803,854	34·51	82,973	805,555	2,922,301	35·22
45 –	76,606	727,670	2,014,564	26·30	78,138	743,970	2,116,746	27·09
55 –	68,756	621,550	1,286,894	18·72	70 508	628,210	1,372,776	19·47
65 –	53,874	421,413	665,344	12·35	56,535	448,684	744,566	13·17
75 +	30,995	—	243,931	7·87	33,738	—	295,882	8·77

CONNACHT

Age (x)	Males				Females			
	l_x	L_x	T_x	$\mathring{e}_x$	l_x	L_x	T_x	$\mathring{e}_x$
0	100,000	96,231	6,231,897	62·32	100,000	96,727	6,257,651	62·58
1	94,741	94,302	6,135,666	64·76	95,395	95,000	6,160,924	64·58
2	93,863	93,594	6,041,364	64·36	94,605	94,323	6,065,924	64·12
3	93,326	93,145	5,947,770	63·73	94,042	93,860	5,971,601	63·50
4	92,964	92,828	5,854,625	62·98	93,679	93,546	5,877,741	62·74
5 –	92,693	459,682	5,761,797	62·16	93,414	464,775	5,784,195	61·92
10 –	91,180	455,125	5,302,115	58·15	92,496	460,357	5,319,420	57·51
15 –	90,870	451,830	4,846,990	53·34	91,647	455,235	4,859,063	53·02
20 –	89,862	444,850	4,395,160	48·91	90,447	447,725	4,403,828	48·69
25 –	88,078	862,660	3,950,310	44·85	88,643	865,140	3,956,103	44·63
35 –	84,454	824,165	3,087,650	36·56	84,385	819,705	3,090,963	36·63
45 –	80,379	769,370	2,263,485	28·16	79,556	762,335	2,271,258	28·55
55 –	73,312	680,762	1,494,115	20·38	72,758	657,467	1,508,923	20·74
65 –	60,698	505,473	813,353	13·40	60,645	521,938	851,456	14·04
75 +	38,437	—	307,880	8·01	39,701	—	329,518	8·30

ULSTER (part of)

Age (x)	Males				Females			
	l_x	L_x	T_x	$\mathring{e}_x$	l_x	L_x	T_x	$\mathring{e}_x$
0	100,000	95,751	6,058,645	60·59	100,000	96,609	6,061,740	60·62
1	94,015	93,604	5,962,894	63·42	95,257	94,810	5,965,131	62·62
2	93,193	92,909	5,869,290	62·98	94,363	94,078	5,870,321	62·21
3	92,625	92,470	5,776,381	62·36	93,793	93,576	5,776,243	61·59
4	92,315	92,187	5,683,911	61·57	93,360	93,183	5,682,667	60·87
5 –	92,060	456,415	5,591,724	60·74	93,006	462,355	5,589,661	60·10
10 –	90,506	451,327	5,135,309	56·74	91,936	457,037	5,127,306	55·77
15 –	90,025	447,610	4,683,982	52·03	91,047	452,287	4,670,269	51·29
20 –	89,019	440,882	4,236,372	47·59	89,868	444,587	4,217,982	46·93
25 –	87,334	855,480	3,795,490	43·46	87,967	857,410	3,773,395	42·89
35 –	83,762	815,605	2,940,010	35·10	83,515	808,975	2,915,585	34·91
45 –	79,359	756,530	2,124,405	26·77	78,280	745,185	2,106,610	26·91
55 –	71,768	654,577	1,367,875	19·06	70,609	627,218	1,361,425	19·28
65 –	57,247	443,716	713,298	12·46	56,218	451,442	734,207	13·06
75 +	33,037	—	269,582	8·16	33,503	—	282,765	8·44

The actual expected test is satisfactory. For Dublin City, which may be considered the acid test, deaths of males at ages 0–74 years, estimated from the grouped data, were 3,068 as compared with the actual figure of 3,066, and the comparison for the separate age groups was also satisfactory.

The expectations of life at different ages for the seven regions and for the whole of Éire are brought together for comparison in the following table :—

MALES

Area	Ages										
	0	5	10	15	20	25	35	45	55	65	75
Eire*	58·20	60·11	55·75	51·19	46·83	42·70	34·38	26·25	18·85	12·48	7·87
Aggregate U.Ds.	53·14	57·02	52 96	48·42	44·06	39 95	31·64	23·89	17·12	11·56	8·15
,, R Ds.	60·47	61·10	57·11	52·24	47·94	43 82	35·52	27·11	19·30	12·59	7·81
Dublin City	51·[illegible]	56·14	52·05	47·55	43·21	39·09	30·78	23·15	16·52	11·01	6·97
Rest of Leinster	58·17	59·74	55·78	51·15	46·72	42·59	34·23	25·93	18·34	11·92	7·69
Munster	58·42	60·03	56·02	51·31	46·90	42·76	34·51	26·30	18·72	12·35	7·87
Connacht	62 32	62·16	58·15	53 34	48·91	44·85	36·56	28·16	20·38	13·40	8·01
Ulster (part of)	60·59	60·74	56·74	52 03	47·59	43·46	35·10	26 77	19 C6	12·46	8·16

FEMALES

Area	Ages										
	0	5	10	15	20	25	35	45	55	65	75
Eire*	59·62	60·40	56·10	51·59	47 26	43·21	35·21	27·18	19·59	13·14	8 41
Aggregate U.Ds.	57·03	59·48	55·38	50·97	46·65	42·48	35·47	26·18	18·72	12·90	8·54
,, R.Ds.	60·98	60·65	56·30	51·82	47·49	43 44	35·42	27·34	19·68	13·24	8·37
Dublin City	55·76	59·05	55·05	50·64	46·36	42·20	33·85	25·80	18·35	12·48	7·95
Rest of Leinster	58·86	59·43	55·15	50·72	46·44	42·44	34·44	26·40	18·91	12·77	8 23
Munster	60·31	60·64	56·35	51·88	47·51	43·34	35·22	27·09	19·47	13·17	8·77
Connacht	62·58	61·92	57·51	53·02	48·69	44 63	36·63	28·55	20 74	14·04	8·30
Ulster (part of)	60·62	60 10	55 77	51·29	46·93	42·89	34·91	26·91	19·28	13·06	8·44

The expectation at birth varies from 62.32 years in Connacht to 51.45 years in Dublin City for males and from 62.58 years in Connacht to 55.76 years in Dublin City for females. At 45 years of age that convenient myth, the average man in Connacht will live 5 years longer than the average man in Dublin City under present conditions, and the average woman of 45 in Connacht $2\frac{3}{4}$ years longer than the average woman of 45 in Dublin City. Again, from the l_x column it appears that 16.9 per cent. more males and 8.7 per cent. more females survive to the age of 45 in Connacht than in Dublin City. It will be observed that the divergences between the different areas are much less marked at ages 75 and over.

If the death-rate in Connacht at and above each year of age be taken as 1,000, the relative death-rates for Dublin City are as follows :—

* Official Irish Life Table No. 2.

AGES

	0	5	10	15	20	25	35	45	55	65	75
Males	1,211	1,107	1,117	1,122	1,132	1,147	1,188	1,216	1,234	1,217	1,149
Females	1,122	1.049	1,045	1,047	1,050	1.058	1,082	1,107	1,130	1,125	1,045

The differential effect of the City environment on mortality is most marked for males, not at birth, but at ages 45–55. From age 10 up to age 55 City conditions have an increasing effect on mortality. Somewhat similar observations are true of females, but the effect of the City environment on female death-rates is much less than for males. At 55 years of age 23.4 per cent. more males and 13.0 per cent. more females in every thousand die in Dublin City than in Connacht.

At all ages up to 45 years mortality is considerably greater in this country than in England and Wales. In the following table the values of ${}_{10}q_x$, i.e. the probability, at age x, of dying in the next ten years, is compared for the aggregate Rural Districts in this country and certain Rural Districts in England and Wales, for Dublin City and Greater London. The figures for England are for the year 1931.

Area	${}_{10}q_x$							
	0		10		25		45	
	Males	Females	Males	Females	Males	Females	Males	Females
Irish Rural Districts	·10172	·08240	·01622	·02284	·04195	·04899	·09060	·09520
East Region Rural Districts England	·08029	·06551	·01655	·01684	·02756	·03188	·06988	07104
Dublin City	·17477	·14633	·02428	·02568	·04722	·04247	·15709	·10961
Greater London	·09995	·08183	·01850	·01627	·03224	·02766	·10858	·07288

The comparison between the two cities is even more unfavourable to this country than the comparison between the country regions. For males, mortality in the first ten years of life is 75 per cent. greater in Dublin City than in Greater London.

The values of q_0 for the same areas were as follows :—

Area	q_0	
	Males	Females
Irish Rural Districts	·06382	·05205
East Region Rural Districts, England	·05749	·04456
Dublin City	·11766	·09125
Greater London	·06481	·04928

In comparing infantile mortality in this country and in England and Wales the rapid decline in the birth-rate in the latter country since the middle of the last century should be borne in mind. As the birth-rate declines facilities for clinical treatment become more adequate and greater attention can be devoted to each maternity case, with the result that infant mortality is reduced. The increase in the English expectation of life at birth in the present century was probably due to this more than to any other cause.

The following is the comparison between 1926 and 1936 for Connacht and the whole of Éire, and between 1921 and 1931 for England and Wales and for London.

EXPECTATION OF LIFE AT CERTAIN AGES

Area	Age 5	Age 15	Age 25	Age 55
MALES :				
Éire 1926 ...	59·5	50·7	42·4	19·1
Éire 1936 ...	60·1	51·2	42·7	18·9
Connacht 1926 ...	62·0	53·4	45·2	21·1
Connacht 1936 ...	62·2	53·3	44·9	20·4
England and Wales 1921 ...	58·8	50·1	41·6	17·7
England and Wales 1931 ...	60·1	51·2	42·5	17·9
Greater London 1921 ...	58·3	49·7	41·2	17·5
Greater London 1931 ...	60·3	51·3	42·6	17·8
FEMALES :				
Éire 1926 ...	59·2	50·5	42·4	19·6
Éire 1936 ...	60·4	51·6	43·2	19·6
Connacht 1926 ...	61·4	52·6	44·5	21·2
Connacht 1936 ...	61·9	53·0	44·6	20·7
England and Wales 1921 ...	61·7	53·1	44·5	19·9
England and Wales 1931 ...	63·2	54·3	45·6	20·2
Greater London 1921 ...	62·2	53·7	45·0	20·2
Greater London 1931 ...	64·4	55·4	46·5	20·8

In all these areas there were increases in the expectation of life at the youngest ages. The improvement was more marked in Greater London than elsewhere, while the improvement in Connacht was relatively slight. The English figures show increases in the expectation of life at all ages, but there were decreases at the later ages in this country, particularly in Connacht. A remarkable feature of the table is the relatively unfavourable female expectation of life in this country, and this is true of the country as a whole when compared with England, and still more true of Connacht, even when compared with other areas of this country. For three of the ages shown the female expectation of life is actually less than the male expectation in Connacht, though it is greater than the male expectation in all the other areas. In England and Wales the female expectation of life at birth exceeded the male by 4.1 years in 1931 ; in this country the excess was only 1.4 years in 1936. This much smaller figure would seem to be related to the fact that our population is mainly rural. In the aggregate Urban Districts in this country the female expectation at birth exceeded the male by 3.9 years in 1936 as compared with an excess of 3.6 years in the aggregate Urban Districts of England and Wales in 1921, while in the aggregate Rural Districts in this country the excess was only 0.6 years in 1936, as compared with an excess of 2.7 years in the aggregate Rural Districts of England and Wales in 1921.

In constructing life table death-rates, populations, etc., for areas smaller than a county, a broader basic period of five or even ten years should be adopted for the calculation of the age mortality rates, as in a small area abnormalities may not be averaged out in a shorter period.

It is not always necessary to construct the life table functions for every age shown in the tables of this paper. If, for instance, it is desired to calculate the life table death rate for a particular disease, the ages at which the disease is prevalent need alone be considered. As an example, suppose it is desired to find the death-rate for tuberculosis of the respiratory organs in Wexford County, it is sufficient to consider ages 15–54 years and, using the methods already described, the following table for males may be rapidly constructed. It is assumed that 100,000 males reach the exact age 15. It could, of course, equally be assumed that, say, 87,555 males reach exact age 15, as in Irish Life Table No. 2.

AGE	l_x	L_x	T_x	$\mathring{e}_x$
15	100,000	496,947	5,105,000	51·05
20	98,779	488,695	4,608,053	46·65
25	96,699	944,785	4,119,358	42·60
35	92,258	895,835	3,174,573	34·41
45	86,909	824,055	2,278,738	26·22
55	77,708	701,077	1,454,683	18·72
65	60,628	—	753,606	12·43

Obtaining, now, the death-rates from tuberculosis of the respiratory system (per unit of population) from the data given in the Registrar-General's Reports for age-groups 15–24 years, 25–34 years, etc., multiplying them into the life table populations (L) as given above, and dividing by the total population aged 15–54 years, i.e. $T_{15}-T_{65}$, the life table death-rate for this disease is obtained. The resulting rate is 1.57 per 1,000 population, as compared with 1.26 for Connacht and 2.11 for Dublin City.

In conclusion, I wish to express my indebtedness to the Registrar-General for the facilities he so kindly placed at my disposal.

DISCUSSION.

Mr. **Honohan** proposing the vote of thanks said that Mr. Barry's paper would have a lasting value. It filled a gap in our statistics which had been filled by official action in Great Britain and Scotland for some decades. The sub-division of a country for the consideration of its regional death rates was usually guided by some principle such as treatment on a purely geographical basis or by density of population or by occupation. Here there was apparently a simple geographical sub-division of the country without regard to other considerations.

Mr. Barry need scarcely have made an apology for referring to the weakness of the crude rate. Its continued use, in fact, made it advisable to emphasise this point. It should be remembered, however, that any single figure was a poor instrument for representing the inherent characteristics of a country and it was much better to look at indices at various ages—as Mr. Barry has done—before forming conclusions. In reading the figures of expectations of life, however, one should remember that they represented the mortality *after* the ages specified and not the mortality *at* those ages. The Brownlee method appeared to give satisfactory results but he doubted whether the condensed explanation of it would be adequate to enable medical officers of health and others to utilise it as Mr. Barry hoped.

As further use has been made of the formula adopted in the preparation of the Éire Life Table No. 2 for the average deaths in the period 1935–7 he took the opportunity to congratulate the compilers of the table on the neat way in which they had overcome the disturbing feature of the exceptionally heavy mortality which was experienced in the year 1937.

The comparisons which the author made between the mortality in Great Britain and Ireland did not appear to the speaker to be quite fair to Ireland. In the first place, the statement that mortality in Ireland was substantially heavier at all ages under 45 than in Great Britain could be questioned on the basis of the relative q's where, in addition to the rates at age 0, the Irish male rates at ages 5 to 10 and 17 and 18 were lower than in Great Britain. Incidentally it might be added that the Irish male rates from age 58 to 99 are also lower than the British rates. It should be borne in mind that the East Region Rural Districts represented the lightest mortality in Great Britain and might preferably be compared with the Connaught rates rather than with the aggregate Irish Rural rates. Similarly, the Dublin City rates were the heaviest Irish rates whereas the Greater London rates were not by any means the worst in Great Britain.

Using Mr. Barry's expectations of life, the order of relative mortality of the provinces (excluding Dublin) was in the case of males : Connaught, Ulster, Munster and Rest of Leinster. In the case of females the positions of Ulster and Munster were reversed after age 15. It was noteworthy that even after the exclusion of Dublin City the Rest of Leinster was consistently the worst province. Munster might be taken as best representing the country as a whole.

Professor R. A. Q. O'Meara in seconding the vote of thanks to Mr. Barry congratulated him on providing regional life tables. Tables were already available for the country as a whole and for Éire and the addition of the regional life tables to those already in existence was a very valuable contribution. Mr. Barry had rendered a service to medical men in bringing into prominence Dr. Brownlee's method of filling in the values of q in the main part of the tables. The usual methods available were King's, which was too mathematical for most doctors to apply successfully, and Milne's as used for the construction of the original Carlisle table which, being a simple graphical method, was more suitable for those with a limited mathematical training. He questioned Mr. Barry's suggestion that the decline in infant mortality in England was attributable to the decline in the birth-rate. Many factors had contributed to the decline in the infant mortality rate among which the increased care of mothers was one but a study of the principal causes of infant death revealed several major causes in which such measures could not have been operative. The decline in diarrhœa and enteritis, for example, was more likely to be attributable to external circumstances such as the increased use of motor transport which reduced the number of horses and hence the quantity of horse manure which formed the most suitable breeding-ground for flies. Flies were definitely associated with diarrhœa and enteritis in infants and their limitation in this indirect manner must have had a beneficial influence on infant mortality.

Professor O'Meara said that he would like to see more use made of analysis of mortality tables as to cause of death and suggested that valuable information might be obtained from such analysis to help in combating tuberculosis, which was on the increase in this country despite the measures adopted to bring about its limitation. In the present state of our knowledge the application of available methods to eradicate tuberculosis would require so vast an expenditure of money as to appear impracticable. An apparently hopeless situation would, of course, be remedied if an effectual chemotherapeutic agent for the treatment of tuberculosis became available, similar to the agents which had been developed for the treatment of other bacterial infections in recent years. Money could, in practice, rarely be made available in the amounts needed for such important purposes.

He invited Mr. Barry's opinion as to the relatively unfavourable expectation of life for females as compared with males in Connacht. He had been inclined to attribute such unfavourable female expectations to the exceptionally high rate of female emigration. The speaker concluded by enquiring as to the possibility of analysing the tables from the point of view of mortality in different occupations.

Mr. Ó Brolchain said that the tables prepared by Mr. Barry were an extremely useful indication of the difference between the various parts of Ireland. They were particularly interesting in view of the correlation between the experience in the areas and the experience in connection with National Health Insurance. As health insurance benefits are only payable whilst a member is alive, it might be expected that where the death-rate is high, the benefits would be low, as the members would not survive long enough to draw substantial benefits. In fact, however, the National Health Insurance Society's experience showed that the same areas had a good record both as regards the death-rate and the sickness rate, Connaught being notably the area of lowest claims and Leinster being the highest. The sickness experience in Dublin is not relatively bad.

The comparison with England showed this country in an adverse position for which there did not appear to be any reasonable excuse, other than the absence of proper medical services. This would seem to be particularly true as regards Dublin, the inhabitants of which undoubtedly have better access to fresh air than the inhabitants of London—even Greater London.

Doctor O'Meara had raised the question of the need for greater attention to tuberculosis. This was a disease that always attracted notice because of its fatal effects and it required every attention. But there was another disease which was much more prevalent but which had received scant consideration because though it maimed it did not kill its victim at an early age— namely rheumatism. There were no facilities in this country for modern treatment of this disease on a large scale.

The money to combat these illnesses could be made available as there were sources from which it could be and should be obtained. It was necessary that attention be directed to the great need for adequate medical service—Mr. Barry's paper was a very important contribution in the lessons it taught and in the conclusions to be drawn from it.

Professor G. O'Brien said that on the question of the relation between infantile mortality and the falling birth-rate in Great Britain he was of opinion that the falling birth-rate was responsible for many of the social services which had the indirect result of reducing infantile mortality. During the nineteenth century the birth-rate was so high that society could endure a substantial loss of life in the early years, but with the fall in the birth-rate every life was becoming more precious. In future the increase in the supply of labour would be qualitative rather than quantitative. Referring to Dr. O'Meara's statement on the increase in the death-rate from tuberculosis, Professor O'Brien expressed the view that this increase is very alarming from the national point of view. The increase of a disease which causes death in years of early adolescence is socially very wasteful and may be compared in its effects with emigration. In either case a considerable investment is made in the production of labour which yields no return to the national income.

Dr. Geary : I have some things to say about Mr. Barry's very useful paper but having heard the interesting discussion I should prefer to open with some comments on that Mr. Honohan would like to have regional life table functions for ages over 75. I am afraid I cannot agree. In most countries, and in this country in particular, the basic data (population and deaths classified by ages) for rural areas are unreliable at the later ages. One must have a good deal of sympathy with the official life table computer in an overseas country who interpolated the q_x at the later ages by means of a free-hand curve drawn through the few " known " points.

Irish life experience has two outstanding characteristics (1) unfavourable mortality at the young adult ages and (2) relative longevity at the later ages. The former is due almost entirely to tuberculosis which as Dr. O'Meara has stated has recently shown a tendency to increase. During the past ten years the rate has declined only very slightly in this country while in the neighbouring countries it has decreased by 30 per cent. This accounts for our poor showing in the middle table on page 11 and in the table on page 12. I am not sure that I quite agree with Dr. O'Meara that the selectivity of emigration (characterised as he said by a high proportion of females) is responsible for the unfavourable expectation of life of females in this country : actually the western countries with the highest expectation of life of females have also the highest female emigration rate.

In regard to Mr. Barry's opening paragraph, statisticians cannot be satisfied with the extent to which statistics are used by Irish public health authorities. For this no one is particularly to blame. M.O.H.'s. are busy men and statistical work is onerous. At the same time one cannot help feeling disappointed at the fact that so little use has been made of the vast amount of statistical material published at the last two Censuses and by the Registrar-General primarily for public health work. If the material compiled is not suitable or is not made available in suitable form I am sure that the statistical authorities would be only too glad to have and to meet representations from M.O.H.'s. on the subject. It might be possible, for instance, to compute index numbers of "expected numbers of deaths" which, divided into the crude death-rates for each of the 800 Registrars' Districts, would give standardised (or comparable) death rates for these areas.

I am inclined to deprecate somewhat the use as a health measure of the expectation of life *at birth* because it is so influenced by the infantile mortality which is a somewhat arbitrary concept in that there is so little difference between still-born and the large numbers who die in the first week of life. The expectation of life *at 5 years of age* (or its inverse the life table death-rate) is to be preferred. I would ask Mr. Barry if much work would be required to compute expectations at, say, the ages 5, 25, 45 and 65 for males and females for each of the 26 counties using Brownlee's formula.

I share Mr. Barry's admiration for Brownlee's book which should be on the bookshelves of every M.O.H. whose normal equipment in future must include a slide-rule ! Even judged by the high literary standards of men of science Brownlee was an accomplished writer and his work contains many fruitful suggestions as to the causes of diseases, as well as *caveats* against common misinterpretations of vital statistics.

With other speakers I heartily congratulate Mr. Barry on his very competent piece of work.

The President said that before putting to the meeting the vote of thanks which had been proposed by Mr. Honohan and seconded by Dr. O'Meara he would like himself to congratulate Mr. Barry on the paper which he had read. The statistics of death-rates to which he referred and the expectation of life tables were the best means available to-day for studying the value and effectiveness of public health efforts and measures. These life tables must remain the best means until we can get careful and accurate morbidity statistics. He thought Mr. Barry should have extended his footnote reference to the Irish Official Life Tables by stating that they had been published in Volume V Part 1 of the Report on the Census of Population of 1926 and in the Report for the Census of 1936. He hoped Mr. Barry would not mind his paying a tribute to Mr. Symonds, the first Managing Director actuary of the Irish Amalgamated Insurance Company, for the guidance and help which he gave the compilers of the Irish official life tables for 1935–37. With reference to Mr. Barry's remarks about the population being bunched at the ages of 60 and 70 the President informed the Society that with a view to obviating this blemish on statistics of the ages of the population it was intended in future to ask at Census and such like inquiries for "year of birth" instead of "age" of each individual. It is hoped that these will result in the making of a smooth curve for the age distribution of the population.

Mr. Earry : As the time is well advanced I will only refer briefly to points raised by some of the speakers. Mr. Honohan suggests that other considerations than simple geographical divisions should underlie the selection of the regions. In this country, however, vital and economic statistics show that the provincial divisions correspond very closely with divisions which might be made from other considerations. The present tables, as Mr. Honohan's useful observations indicate, confirm this. Munster for instance, is representative of average conditions for the country as a whole in many other respects besides mortality.

I agree that the Greater London rates are by no means the worst in Great Britain, but the environment of Dublin City is surely more comparable with that of Greater London than with that of the slum areas in, say, Liverpool or Glàsgow. Despite Mr. Honohan's remarks on the geographical divisions selected, I observe that he himself prefers to compare the population of Connaught with that of the English Rural Districts rather than the Irish rural population, which was selected from those other considerations to which Mr. Honohan referred.

I am inclined to agree with Dr. O'Meara's suggestion that the relatively unfavourable female expectation of life in Connaught is related to the exceptionally high rate of female emigration. The numbers of females in the stream of emigration exceed the numbers of males in recent years and emigration was heaviest from Connaught.

I do not say, I think, in the paper that the decline in infant mortality in England and Wales was due solely to the fall in the birth-rate but I would certainly consider this the most important cause of the decline. The other causes which Dr. O'Meara deduces from his study of the statistics of the causes of deaths of infants are extremely interesting, but would they not have operated in this country also ? or does Dr. O'Meara suggest that our national love of horses is the cause of our relatively high infant mortality ?

Unfortunately no statistics are available for a study of mortality in different occupations. Such statistics would be highly desirable.

Professor O'Brien is always most interesting to listen to and I am not sorry if this discussion has been the occasion of supplying fresh ammunition to him for one of his favourite contentions.

I endorse fully Dr. Geary's observations on mortality statistics at late ages. He has outlined the considerations which led me to abandon the idea of including these ages in the tables. I would add that mortality at late ages has not the same importance as mortality at young ages nor can the same significance be attached to it.

I rather think Dr. Geary is missing Dr. O'Meara's point about emigration. It is true that female expectation of life is highest in Connaught, because the population is rural, but *relative to the male expectation* it is worst in Connaught, where, as he says, the female emigration rate is highest.

Dr. Geary's remark on the somewhat arbitrary concept of mortality in the first year of life is of great importance. I do not recall having ever seen an infant death-rate in which still-births were included and I wonder whether such death-rates would give very different comparative results from the present rates. The work required to calculate the expectations for the ages Dr. Geary suggests and for each county would be fairly considerable, but could be accomplished in three or four days.

The President's suggestion of a reference to Volume V Part I is one which I will bear in mind. I am very glad to associate myself with the President in his tribute to Mr. Symonds.