IRISH ACTUARIAL DATA.

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Actuarial science is mainly concerned with the estimation of future contingencies, particularly from the monetary point of view, and in this it utilises past experiences of the forces involved. These may find expression in the rates of mortality, rates of sickness, probabilities of marriage and of issue, trends of age-distributions, proportions married, sizes of families, relative ages of husbands and wives, rates of promotion in business, rates of secession and so on. Not every problem can of itself, however, throw up a sufficient volume of material to enable all the necessary factors to be calculated, so that it is desirable, if possible, to make available from time to time certain standard data, which could be used, at least as a guide, in the solution of such problems.

It is instructive to compare the position in regard to data in this country with that obtaining in Great Britain, our nearest neighbour. It has been the practice of British life assurance companies to make available at intervals the mortality experience under their assurance and annuity contracts, and in recent years they have, in fact, been publishing it more or less continuously. From this material numerous tables of monetary functions have been derived and are used extensively in the valuation of the companies' contracts and in all kinds of problems. There is, on the other hand, no published experience of Irish assurance companies.

In Great Britain, too, the sickness experiences of some of the larger friendly societies and of selected approved societies under the National Health Insurance Scheme have been published, whereas, so far as I am aware, there has been in this country only one sickness investigation about which information is available (although not published), namely, that of the National Health Insurance Society during the years 1935 to 1938. I refer to this investigation later.

The experiences of certain pensioners and life tenants and of a number of private pension and widows' and orphans' funds in Great Britain have also been published, not to speak of the Government Actuary's Reports on the valuations of the National Health Insurance Societies and on the Widows', Orphans' and Old Age Pensions Scheme.

Finally, there are the national statistics arising from the censuses. In Great Britain, the Government Actuary's Department makes a report on each census, presenting Life Tables for England, London and for certain groups of counties. These tables have been used extensively for valuing the contracts of industrial assurance companies and, in conjunction with the sickness rates of the Manchester Unity Friendly Society, for valuing the liabilities of friendly societies. The English Life Table No. 6 (Persons) is prescribed, under the Industrial Assurance Act, 1923, as the mortality basis to be used in the calculation of minimum surrender values and free paid-up policies. Tables containing the necessary functions for such valuations and calculations have been published by the Assurance Companies and others interested. Life Tables for Scotland and Northern Ireland are also available, but I am not aware that they are used very much in actuarial work. There is also a decennial occupational survey of mortality by age in Great Britain.

In Éire, we have had three National Life Tables, prepared in connection with the 1926 and 1936 Censuses and the 1941 Register of Population. In each case there are separate tables for males and females and, for 1941, tables (male and female) for Urban Areas. In a similar manner to Great Britain, the Insurance Act, 1936, prescribes the Éire Life Table No. 1 (Males) as the basis to be used in the calculation of free paid-up policies and of surrender values of industrial assurance policies, but no monetary functions have been published, except those given in a short illustrative paper of mine which was published in the *Journal of the Institute of Actuaries* (Vol. 68, p. 168). To complete the picture, I should mention the unofficial regional life tables presented to this Society by Mr. Colm A. Barry on the 31st October, 1941.

I now propose briefly to survey the existing material, and to present certain new statistics and functions.

Age Distribution of the Population.

I consider first the age-distribution of the population as it is a feature which has more than a technical interest and is, in fact, very much to the point in these days of planning social schemes for the future. Actuaries are interested in age-distributions for a number of reasons. They represent the resultant of various forces of mortality, migration and so on over a large number of years, and they are an important factor in population forecasting. They also, of course, affect the cost of insurance and pension schemes for the persons constituting the age-distribution.

From the published statistics, we may deduce the following table :

TABLE I

Percentage Distribution by Decennial Age-Groups of the Population of the Twenty-six Counties at intervals of forty years.

Age-Group	Census, 1861	Census, 1901	Register, 1941
	%	%	%
0— 4	11·9	9·7	9·2
5—14	20·6	20·5	18·0
15—24	22·5	20·9	17·1
25—34	12·9	14·5	14·4
35—44	10·4	10·6	12·1
45—54	9·6	9·2	10·1
55—64	7·5	8·1	8·8
65—74	3·1	4·3	7·2
75 and over	1·5	2·2	3·1
TOTAL	100·0	100·0	100·0

The table, which includes both males and females—there is no important difference between them—shows that the population is growing older. In 1861, 55 per cent. of the population was under 25 years of age as compared with 44 per cent. in 1941, whereas less than 5 per cent. was aged 65 or over in 1861 as compared with over 10 per cent. in 1941. A study of the figures for each of the intervening censuses shows that the trend has been pretty steadily in this direction all the time. It is also to be observed that, while the 15–24 age-group contained the largest number of persons in 1861 and 1901, the 1941 figures show that the 5–14 age group is now supreme.

In Table II, I have made what may be described as a socially significant age-grouping of the figures and I have set out the trend over roughly a half-generation and compared it with the corresponding movement in Great Britain and the U.S.A. The population is divided into four groups which may be described as (a) children, (b) the most active working population (which includes the whole of the female population of reproductive ages), (c) middle age and (d) old age.

TABLE II

Percentage Distribution of Populations in Broad Age-Groups—Some Comparisons

AGE-GROUP	ÉIRE		GREAT BRITAIN		U.S.A.†	
	1926	1941	1921	1939*	1920	1940
0—14	29·2	27·3	27·7	21·5	31·8	25·1
15—44	42·7	43·5	46·9	46·1	47·3	48·4
45—64	18·9	18·9	19·4	23·0	16·2	19·7
65 and over	9·2	10·3	7·0	9·4	4·7	6·8
TOTAL	100·0	100·0	100·0	100·0	100·0	100·0

* National Register—United Kingdom and Isle of Man—Statistics of Population on 29th September, 1939 (70—368*). The figures are exclusive of men in the Armed forces, and should be read with that in mind.

† Statistical Abstract of the U.S.A.

The main features of the table are that we have a higher proportion of old people than the British or Americans, and that while all three peoples are growing older, the British and Americans are doing so faster than we, our main strength apparently being in the proportion of children, which, however, is itself dwindling. The stronger " working " blocks— on which services for young and old depend—in the British and American figures should be noted. It is scarcely necessary to remark that, other things being equal, where such groups are strong, standards of living are higher. The falling populations in the youngest group and the maintenance of vitality standards point, however, to the likelihood that the strength of these groups will not be long maintained.

A recent British White Paper* makes the point that the increased proportion of old persons is directly due to the improvements in medical science and sanitary legislation, and that this trend was to be expected, and may not, in fact, be undesirable, since with lowered mortality goes increased vitality, and with it an increase in the age up to which economic productivity can, if necessary, be maintained. I feel that this argument is not very helpful in view of the insistent demands for more leisure and pensions at earlier ages. Moreover, the older a man gets the harder it is to learn a new job, so that the increasing average age of the working part of the population will not help the unemployment problem. Another point which may be made is that the direction of economic demand varies considerably with age,' and with a changing age-distribution changes in the direction of demand and supply must be expected. In this respect we may be affected to some extent, as regards our imports, by a changed character of supply in Great Britain, even though the changed force of demand may not be so strong here.

* Current Trend of Population in Great Britain (Cmd. 6358).

In business, too, recruitment may be necessary in due course at ages much above the normal entry age. This would affect private pension schemes by making necessary increases in the contributions required— apart altogether from any increasing burden due to greater vitality among pensioners. Life assurance companies, also, may experience a smaller volume of new business—which is mostly taken out at ages under 35—and when this occurs in conjunction with the maturing of policies to larger numbers of old persons, the invested funds of such companies may reach a peak and begin to fall. In this country, however, it may be that there is still a considerable degree of under-insurance, a fact which might tend to postpone such an eventuality. And it may be no harm to point out once again that the incurring of long-term liabilities, whether by the State or by local authorities or private interests, should be related to long-term movements of the population.

Population Forecasting.

I have said that the age-distribution of the population is an important factor in attempts at estimating the future trend of the population. Except, perhaps, for schemes of national ambit, actuaries are not particularly concerned with population forecasts, and I do not propose to do more than to draw the attention of those interested to the papers submitted to this Society by Dr. Geary in November, 1935, and March, 1941, which indicate that where an allowance is made for migration and/or declining fertility and mortality, the change in the age-distribution of the population may be expected to continue in the direction indicated in Table II. In Great Britain many estimates—official and unofficial —have been made. Of these I may mention that issued as a White Paper in May, 1942—Current Trend of Population in Great Britain— and that recently made by the Government Actuary's Department in connection with the Beveridge Plan and the White Paper on Social Insurance (Cmd. 6550). Practically all of these estimates—based on different assumptions—point to a continuance of the trend towards an aged population.

Other Age-distributions.

The age-distribution of a particular section of the community cannot be expected to be similar to that of the whole population if the group is subject to forces other than death. Thus, in a body like the Civil Service from which members fall out on permanent incapacity, on dismissal, or on transfer to other occupations, and to which new members are added at different ages, we find the following age-distribution which I am permitted to quote. It is that of established Civil Servants on the 1st January, 1940, who numbered 9,756 males and 3,853 females.

TABLE III

Percentage Distribution by Quinquennial Age-Groups of Established Civil Servants on 1st January, 1940.

Age-Group	16–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	60–65	Over 65	Total
	%	%	%	%	%	%	%	%	%	%	%	
Male	3·2	11·4	11·1	11·0	10·8	14·1	10·6	11·1	10·8	5·6	0·1	100·0
Female	6·3	40·3	20·6	8·2	6·8	7·7	4·2	2·9	2·1	0·9	—	100·0

The main points in this table are the fairly even spread of the males over the quinquennial age-groups from 20 to 60, and the considerable fall away in females after the early ages, due no doubt mainly to marriage —on which retirement is compulsory—but also, to some extent, to the fact that the influx of women into the established Civil Service has only taken place on a large scale within the past 20 or 30 years, so that the later age-groups have not yet received their full quota and the distribution is accordingly unstable. Practically one-half of the females are under 25 years of age, and the average age of all is 29·7 as compared with 40·4 for the males.

As a matter of interest, I give in Table IV the age-distributions of the male members of a Bank and of a large friendly society in comparison with the Civil Service. In the case of the Bank the change in the age-distribution over a period of only 15 years was so remarkable—and so significant as a warning when endeavouring to forecast the future —that I give the distribution as at two dates.

TABLE IV

Percentage Distributions by Quinquennial Age-Groups of Male Staffs—Some Comparisons.

Age Group	Bank		Friendly Society 1942	Civil Service, 1940
	1926	1941		
	%	%	%	%
16—20	12·5	3·5	1·8	3·2
20—25	42·6	8·4	4·8	11·4
25—30	14·4	15·3	6·3	11·1
30—35	9·1	21·2	6·3	11·0
35—40	5·3	26·8	11·8	10·8
40—45	4·7	9·8	20·7	14·1
45—50	3·0	5·6	19·0	10·6
50—55	3·4	3·0	12·9	11·1
55—60	2·0	2·4	8·5	10·8
60—65	1·1	1·4	4·9	5·6
Over 65	1·9	2·6	3·0	0·1
TOTAL	100·0	100·0	100·0	100·0
Average Age	29·5	36·7	44·7	40·4

The really interesting point about these figures is the way they differ from each other. They illustrate clearly the danger of using the experience of any one group for another or, indeed, for the same group at two different points of time.

With regard to the average ages quoted, it may be interesting to note that the average ages of the total male and female populations in 1936 were 31·5 and 31·7 respectively, and it may be recalled that, in a paper read to this Society on the 27th January, 1939, Mr. R. Ó Brolcháin gave the average ages of the members of the insured population on 31st December, 1934, as follows :—males—36·25 years ; single women—28·06 years ; married women—42·68 years ; both sexes— 34·18 years.

Mortality.

The contingency of death enters into all calculations relating to the future and, for this reason, the study of mortality rates is of prime importance to the actuary. Crude rates—so much per, say, 1,000 of the population—are of little or no use, since it is essential to have regard to age-distributions. Mortality rates by age have been extracted for the years surrounding the Census dates and have been used in the preparation of the Life Tables. The most recent table, Éire No. 3—issued last March—shows that there is a repetition of some of the features disclosed in the No. 2 Table. For instance, the male rates fall to about age 11 and then increase to the end of life, except for a slight recession round about the ages 24 to 27. Incidentally, the recession lasts until about age 30 in the Urban Areas Table. On the other hand, the female rates, while continuing to show the feature of falling to about age 10, introduce on this occasion a recession, as in the male table, between ages 25 and 28; this does not appear in the Urban Table.

In Table V, I have set out some specimen mortality rates which may help to fix ideas of the relative vitality in the different countries in these islands, bearing in mind, of course, the different periods to which they relate.

TABLE V

Specimen Values of the Rates of Mortality per 10,000 i.e. the probabilities of dying within one year after the age stated.

Age	Éire Life Tables				Northern Ireland Life Table 1925–7	English Life Table (No. 10) 1930–2	Scottish Life Table 1930–2
	No. 1 1925–7	No. 2 1935–7	No. 3 1940–2	Urban 1940–2			
Males							
20	40	35	35	41	38	32	33
40	70	62	56	71	67	56	68
60	243	241	234	337	265	242	252
80	1,139	1,063	1,235	1,280	1,217	1,450	1,510
Females							
20	45	37	38	37	45	27	29
40	75	63	58	59	78	44	55
60	239	224	216	252	258	177	202
80	1,005	966	1,091	1,068	1,045	1,186	1,258

The similarity between the Éire and the Northern Ireland rates, especially at the early ages, should be noted, as also the favourable male rates compared with the English and Scottish, particularly at the older ages. It is surprising, however, to observe that the Éire female rates at the important ages are rather less favourable than the British female rates, which, incidentally, are materially lower than the British male rates.

In Table VI I give some international comparisons of mortality rates by age-groups.

TABLE VI

Rates of Mortality per 10,000 in Certain Age-Groups— International Comparisons.

Age-Group	Éire 1935–7	England and Wales 1939*	U.S.A. (White Population) 1939†	Germany 1936†	France 1936†	Denmark 1940†
Males						
25–29	41	26	26	32	47	18
35–39	53	37	42	45	80	30
45–49	91	80	93	80	125	57
55–59	188	195	205	175.	229	138
65–69	407	445	441	421	486	364
Females						
25–29	49	24	21	28	38	19
35–39	57	30	33	38	48	31
45–49	85	58	64	65	75	54
55–59	175	123	140	138	139	121
65–69	370	316	331	367	320	332

*Journal of the Institute of Actuaries, Vol. 71, p. 411. The rates given here are central death-rates.

†Monthly Bulletin of Statistics published by the League of Nations—December, 1941.

In general these figures are more noteworthy for their similarity than for their differences. Irish male mortality is relatively heavy at the early ages but relatively favourable in later life, whereas Irish female mortality, while generally not unfavourable in comparison with Irish male mortality, is unfavourable for the age-groups given, as compared with all the other countries. The lightness of the Danish male rates and the heaviness of the French male rates are also noteworthy features.

Before passing from the rates of mortality, I should like to voice a plea for the recording of marital status at death. This would enable us to extract rates of mortality for married persons as distinct from single or widowed. In England the information is available for women, but it is available for both sexes in Scotland. It appears from the Scottish figures that married men are subject to much lighter mortality than single men or widowers, and that the mortality is heaviest amongst widowers. With regard to women, the rates of mortality for widows both in Scotland and England are much heavier than those for single or married women. For ages up to between 40 and 45 in Scotland, and 35 to 40 in England, the rates for single women are lighter than those for married women. After these ages the position is reversed, but the differences are not great at the older ages.

Life Tables and Age-distributions.

The life table can be regarded as the theoretical distribution of a population on the assumption that it remains stationary in numbers (i.e., is recruited annually by the requisite equal number of births and is not depleted by exits such as emigrants), and that it is subject constantly to the rates of mortality adopted in the construction of the table. The age-distribution of the population at any time, on the other

hand, is a fortuitous grouping of persons who have been subject to varying forces of mortality, varying degrees of accretion by births and varying forces of migration. While the two are, therefore, not comparable, it is instructive to place them side by side to see how far the existing population fails to conform with the life table assumptions.

TABLE VII

Age-Distribution of the Population in 1941 and that of the Eire Life Table No. 3.

Age-Group	Males		Females	
	1941 Register	No. 3 Life Table	1941 Register	No. 3 Life Table
	%	%	%	%
0–4	9·3	7·8	9·2	7·7
5–9	9·1	7·5	9·0	7·4
10–14	9·0	7·5	9·0	7·4
15–19	9·0	7·4	9·1	7·3
20–24	8·0	7·3	7·9	7·2
25–29	7·6	7·1	7·7	7·0
30–34	6·8	7·0	6·6	6·9
35–44	12·0	13·4	12·2	13·2
45–54	10·2	12·5	10·0	12·3
55–64	8·9	10·7	8·7	10·7
65–74	7·3	7·6	7·1	7·9
75 and over	2·8	4·2	3·4	5·0
Total	100·0	100·0	100·0	100·0
Average age	31·5*	35·1	31·7*	35·6

*1936 Census : Data not given in sufficient detail in 1941 for precise calculation.

Apart from the feature that the average age of males is almost the same as that of females in the general population, the difference of 4 years in each case between the population and the life table average ages gives some indication of the extent to which the assumptions implicit in the life table have not operated in the past.

The figures suggest interesting, if tentative, lines of argument. For instance, the point could, perhaps, be made that, while there is a sufficiency of births for the maintenance of a stable population, one of the effects of migration has been to bring about such a reduction of the early adult and middle-age groups that the known improvement in mortality rates has not been able to restore the average age of the population to normal. Having regard to the proportions in the later age-groups it might also be suggested that, despite the ageing of the population to which I have already referred, the position at present is not as bad as in a stable population subject to the 1940–2 forces of mortality.

Survivorship.

I now turn to a study of the numbers surviving to different ages in the life tables—a more unusual approach. In Table VIII I quote some figures taken from the recently-published Éire Life Tables, together with those from the latest available English Life Table, which relates to a period 10 years earlier.

TABLE VIII

Numbers Surviving to Ages Stated out of 1,000 Persons Born.

	Males			Females		
Attained Age	Éire 1940–2	Éire Urban Areas 1940–2	England and Wales 1930–2	Éire 1940–2	Éire Urban Areas 1940–2	England and Wales 1930–2
20	871	841	872	891	866	894
40	799	764	809	813	793	837
60	635	548	636	657	621	702
80	191	131	162	225	192	249

There is a striking similarity between the Éire male figures up to age 60 and the English figures, but the Éire female figures, while better than the Éire male figures, are less favourable than the English all through. The figures for urban areas indicate the considerably lower vitality of those areas, especially for males.

Other Forces of Decrement.

So far my remarks have dealt with the life tables for the whole country or for the urban areas. In the case of particular sections of the population such as the Civil Service, there are other forces of decrement as well as mortality, but there is very little published information on the point. The Society may, therefore, be interested to see the results of an examination which I made of the experience of established Civil Servants during the three years 1935–37. Although the data is not very extensive (because the period was short), it is possible to obtain a fairly useful picture of the way in which the decrements due to withdrawals, ill-health retirements, etc., affect the numbers surviving to different ages.

In Table IX I give numbers of such survivors and compare them with those from the Éire Life Table No. 3.

TABLE IX

Numbers Surviving to Ages Stated out of 100 Starting at Age 20.

Age	Males		Females	
	Civil Service	Éire	Civil Service	Éire
20	100	100	100	100
30	92	96	59	96
40	86	92	38	91
50	77	85	28	85
60	48	73	13	74
65	41	63	6	65

The decrements in the life table figures for the whole country arise, of course, from deaths only. In the Civil Service, we see that out of 100 males starting their official career at age 20, only 41 reach the compulsory

retirement age of 65. The " loss " of 59 arises from 27 retirements on grounds of ill-health, 15 resignations or dismissals, 15 deaths and 2 normal retirements after age 60. Out of 100 females starting at age 20, only 6 reach the compulsory retirement age of 65, the decrement of 94 being made up of 52 marriages, 23 retirements on grounds of ill-health, 6 resignations (otherwise than on marriage) and dismissals, 5 deaths, and 8 normal retirements after age 60.

Values of Annuities depending on Survival, etc.

In Appendix A I give the values of some functions derived from the Éire No. 3 Life Table, namely, the present values, at $2\frac{1}{2}$ per cent, 3 per cent. and $3\frac{1}{2}$ per cent interest, of an annuity of 1 (i.e. a unit) per annum to persons at each age, and the present values, at 3 per cent interest, to persons at each age, of a unit payable on death. Values are given separately for males and females, and it is seen that the annuity values for females are higher at all ages than for males and, of course, their assurance values are lower. A difference of only $\frac{1}{2}$ per cent. in the rate of interest makes a difference in the annuity values at the youngest ages of as much as 10 to 12 per cent., but this naturally becomes smaller as the age advances.

Although schemes of national ambit require national statistics as a basis for their costing (and the English Life Tables have, in fact, been used extensively for calculations required in connection with social insurance schemes in Great Britain), it should be remembered that the data for the national life tables comprises the sick-bed members of the population as well as the healthiest. The figures in the Appendix, therefore, being based on such a heterogeneous collection, could not be expected to be applicable to any particular class of the community such as the working or insured population, or the members of a profession or business, as selective forces of one kind or another are always operating to distinguish one class from another.

Having issued this warning, and, notwithstanding the risk involved in quoting figures which may be used without the necessary caution and qualifications, I venture to give a few illustrations. At 3 per cent. interest and assuming the mortality of the whole (male or female) population in the years 1940 to 1942 to continue throughout the remainder of life—

> (a) the capital value at its commencement—age 70—of an old age pension of 10/- a week is £207 for a man and £221 for a woman ;

> (b) the capital value on retirement at the age of 65 of a pension of £250 a year is £2,442 for a man and £2,577 for a woman.

These individual values are very interesting, but the social inquirer will be more interested in what pertains to the community as a whole or to certain sections of it. Now, the cost of any social measure may be looked at from different viewpoints, such as (a) the annual cost and how it is likely to vary from year to year, (b) the capital cost in respect of all existing beneficiaries, (c) the capital cost in respect of all existing persons (i.e. present and prospective beneficiaries in the existing population), or (d) the capital cost in respect of all persons, present and future. Although there is a tendency to-day to ignore the capital costs as of little or no concern, they do nevertheless, in my opinion, give a better measure of the real burden of any scheme which is undertaken than do the annual

outlay figures. If attention is focussed exclusively on the annual costs, it is to be feared that the full import of the matter cannot be appreciated. If a scheme, providing for benefits payable in the future, is enshrined in legislation, the extent of the burdens to which we are endeavouring to commit posterity, legally and morally, should be realised. In so far as the present generation is not expected to provide the necessary finance cumulatively to meet such benefits, it should be borne in mind that posterity may have no desire—may, in fact, not be able—to meet them, and it may alter the law to suit itself. Schemes of social security which proceed on the " pay as you go " plan, ignoring the gross burden and providing no trusteeship except the future community as a whole, should be recognised for what they are, that is to say, dependent on the good-will of the next generation.

I have applied the annuity values at 3 per cent. to the numbers in the population at the older ages in 1936 (the figures are not given for each year of age for 1941), and—again bearing in mind the limitations of the figures—find that the capital cost of granting an old age pension of £1 a week to all those over the age of 65 would be of the order of £105,000,000. If the commencing age were reduced to 60 the cost would be about £85,000,000 more. Again, I must point out that these costs do not cover those persons now living who are under these ages of 60 or 65, and who may hope to secure a pension in due course, nor do they cover generations still unborn.

Proportions Married.

Up to this point I have dealt mainly with the contingency of death. Contingency is perhaps not the happiest word because death is a certainty; only its incidence is contingent. I come now to marriage, which while not a certainty, has a high degree of probability for most people, and has a vital bearing on the future population of our country.

Marital status is recorded at each Census, and the numbers of persons married, widowed and single in certain age-groups are set out in the published volumes. The most recent figures are compared with those of the British Register of September, 1939, in the following table. The age-groups are not quite the same in the two cases as the British data was extracted by year of birth, so that the age-groups would be $14\frac{3}{4}$–$19\frac{3}{4}$, $19\frac{3}{4}$–$24\frac{3}{4}$, etc.

TABLE X

Proportions of the Population in Certain Age-groups who are Married

Age-Group	Males		Females	
	Éire 1941	Great Britain 1939	Éire 1941	Great Britain 1939
15–20 ...	·002	·006	·010	·026
20–25 . .	·032	·160	·123	·322
25–35	·255	·646	·445	·694
35–45	·534	·841	·643	·765
45–55	·625	·861	·633	·718
55–65	·607	·805	·522	·614
65 and over .	·516	·630	·306	·355

The proportions are substantially lower for Éire in all age-groups, and, it may be added, show little or no tendency to increase over a long period of years.

It is frequently useful when dealing with widows' and orphans' funds to have information as to the proportions of members who are married. For this reason, and also because I have used the figures in deriving the probabilities of marriage to which I refer in the next section of my paper, I have set out, unadjusted, the proportions married at each age up to 60, as derived from the 1936 Census data. It is a pity that similar information —i.e. as to marital status at each age—is not made available from the 1941 Register, and it is to be hoped it will be given for later Censuses. Beyond noting that the figures would require to be graduated before being suitable for monetary or other calculations, no comment seems to be called for, except perhaps that, as was to be expected, the female proportions are higher than the males at the earlier ages and lower at the later ages.

Probabilities of Marriage.

The probability of becoming married within a year at each age cannot be obtained directly because age is not recorded at marriage. The information may be available in certain funds or businesses where marriage brings about retirement, an increase in salary, a payment of a gratuity, or other change of status. This, however, would be of limited utility, and, for the country as a whole, it would be desirable to have a broader basis as, for instance, the data in a national insurance scheme. The last valuation regulations for the National Health Insurance Scheme* quote the marriage rates for spinsters and widows which were used at the inception of the Scheme in 1911, and were based on marriages in the United Kingdom in the ten years 1896 to 1906. There are no rates for males as there is no benefit payable to males on marriage. Incidentally, in the Report on the experience of the Scheme submitted by the British Government Actuary in 1939—to which I have already referred—the rates adopted are stated to have been based on the recorded experience of the Society during the three years 1935-37 ; the rates themselves were not, however, quoted.

I give in Appendix B the results which I obtained by applying the proportions married in the 1936 Census—graduated to remove minor fluctuations from age to age—to the functions of the Éire Life Table No. 3. The principle adopted was to obtain the numbers of unmarried (in the life table population) who marry within each year of age by equating the numbers married in the life table at each age with the survivors from those who were married at the previous age and the survivors of those who became married within the year, the assumption being made that marriages occur evenly over the year and, for purposes of approximate calculation, could therefore be regarded as all taking place at the middle of the year. The formula used is set out in the Appendix. As the probabilities derived in this way come abruptly to an end—at age 52 in the case of males and 41 in the case of females—the figures for the later ages are arbitrary, being based on the shapes of the curves leading up to these points.

Having regard to the necessarily rough basis of calculation adopted, including the fact that migration is a factor which tends to interfere with the relation between the marriage rates and the proportions married, it is not to be expected that the probabilities would be applicable to all years, or, indeed, to any year. The quite remarkable increase in marriages from 15,021 in 1941 to 17,470 in 1942, as compared with a yearly average from 1932 to 1941 of 14,548, would, in any event, make it

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* National Health Insurance (Valuation) Regulations, 1936 (S.R.O. No. 258).

impossible to provide a series of rates which would be appropriate for every year. The numbers of marriages obtained by applying the probabilities to the 1936 Census data are 13,472 from the male rates and 14,465 from the female, as compared with 14,336 actual marriages in 1935 and 14,763 in 1936. (It is not possible to calculate the expected marriages accurately from the 1941 data, as the population is not given for each age.) The female rates, therefore, appear to be quite satisfactory as appropriate to the period round about 1936. I am unable to explain why the male rates should give such a low figure, as they were calculated on precisely the same basis as the female, unless it be that the degree of accuracy in the recorded marital status is not the same in the two sexes.

While these features of the statistics indicate that too much cannot be claimed for the probabilities I have quoted, they are, at least, better than none, and whatever about their absolute amount—which could, perhaps, be graded up or down to suit circumstances, they do, it is suggested, give a fair idea of the progression of the probabilities from age to age.

It is interesting to observe that the greatest probability of marriage for both sexes is at age 30. This must not, of course, be confused with the average ages at marriage, which were given in Volume X of the 1926 Census (p. 84) as 34.9 for males and 29.1 for females, and which were deduced from statistics for marriages of under one year's duration. The female rates mount and fall away more quickly with age than the male rates, the highest point with the males (at age 30) being no greater than that for females at age 22.

I made no graduation of the rates after applying the formula, and therefore the minor fluctuations from age to age should not be regarded as in any way significant. It is possible, however, that the peculiar fall in the female rates at the important age of 24 may have some explanation which eludes me.

In the following table, I compare specimen probabilities from the Appendix with those adopted for the British (and Irish) National Health Insurance Scheme and those used in the German Social Insurance Scheme.

TABLE XI

Probabilities of Marriage within a Year—Women

Age	Éire	British National Health Insurance	German Social Insurance*
20	·0380	·0689	·0777
25	·0600	·1091	·1719
30	·0809	·0672	·1241
35	·0434	·0338	·0730
40	·0121	·0186	·0492
45	·0005	·0109	·0281

* *Actuarial Technique and Financial Organisation of Social Insurance*—Féraud. Published by the International Labour Office.

The high early and late rates for Britain as compared with Éire should be noted. The German rates, which were based on the population of Saxony, are much higher at all ages than either the Éire or the British figures.

Occasionally, we require annuity values depending on marriage as well as survival, for instance, in connection with contributions to a fund which cease on marriage. Combining the marriage rates with the death rates, I have prepared the table of 3 per cent. annuity values in Appendix B. Comparing the figures with those in Appendix A, we see that the effect of introducing the marriage element is to reduce, very considerably, the value of the annuities depending on survival only. The new values decrease, at first, to age 22—where they are almost as low as one-half of the ordinary annuity values—and they increase thereafter to age 40, after which they fall again, when the effect of the marriage probabilities is practically negligible.

Relative Ages of Husband and Wife.

Information in regard to the relative ages of husbands and wives is also very useful in the valuation of widows' funds and in other circumstances. In Vol. IX of the 1926 Census, particulars are given of the age-distributions of husbands and wives in quinquennial age-groups ; the information is not available in respect of any later date. The figures disclose features almost exactly similar to those of the British 1921 Census—as perhaps one might expect* from general considerations. While very young wives had husbands considerably older, the difference in age narrows with advancing age of wives, until at about age 77 the average age of husbands is about the same ; after this, the average age of husbands is less than that of wives. Conversely, young husbands are married to wives older than themselves—although the difference is not so great as it is in the case of young wives—but equality in age is reached about age 27, after which the difference in age widens gradually up to the highest ages.

Probabilities of Issue.

We seem to have no information in regard to the probabilities of birth to men or women at each age. The age of parents is not recorded on the Birth Register, and there is, therefore, no possibility of securing direct information. At the inception of the National Health Insurance Scheme in 1911, it was necessary to obtain some rates in order to assess the value of the maternity benefits, and recourse had to be made to certain New Zealand statistics of families left by fathers who had died ; the rates were subsequently modified to accord with the experience of selected approved societies in Great Britain, but the experience in Éire is not available.

The statistics in regard to births in Dublin City which Mr. Stanley Lyon presented to the Society on the 6th May, 1943, include the numbers of legitimate births in Dublin City during the year 1942, according to the age of mothers. I have used these figures, in conjunction with the numbers of married women in Dublin City in November, 1941, to produce group-rates of legitimate issue—particulars for each age not being available—and I have obtained individual values by graduation, and abated the results evenly at all ages from the data given in the Registrar-General's Report, to make the correction necessary to relate the births to parents residing in the City only. In order to test the general utility of the results, I applied them to the 1936 Dublin City population of married women and obtained a total of 11,833, which compares with 11,182 registered births in 1936—quite a fair result, especially in view of the high rates for 1942 which are revealed in the Registrar-General's Report. It is unfortunate, in point of fact, that the only year for which the data is available was one of exceptionally high birth rates. It is clear, also,

from the high rate of births in Dublin City (a crude rate in 1942 of 25·0 legitimate births per 1,000 of the population, as compared with 21·5 for the whole country), that the probabilities for the City are not applicable to the country in general. It is suggested, however, that reasonable rates for the whole country might be obtained by adjusting the City rates to produce the lower proportion of total births.

Specimen values from the Appendix are reproduced in the following table, which gives also the corresponding rates in the National Health Insurance (Valuation) Regulations, 1936, i.e. rates based on the experience of the British insured population.

TABLE XII

Probabilities of Issue within a Year—Married Women

Age	16	20	25	30	35	40	45
Dublin City, 1942 ...	·660	·606	·486	·349	·227	·108	·024
British Insured Population, 1936 ...	·400	·603	·359	·261	·194	·106	·022

Probabilities of issue for married men might be obtained by using the information available in respect of the ages of husbands and wives.

Size of Families.

In 1926—but not in 1936—information was obtained as to the number of dependents under age 16 left by married men, married women, widowers or widows, according to the age of the deceased. The particulars are set out in detail in Vol. IX of the Census, and some comparisons with corresponding British figures are given in the General Census Report (p. 144). For actuarial purposes, the information is defective, as it ignores the ages of the children, a point of importance in connection with the duration of orphan benefits.

In this connection, it is an interesting question whether the sizes of families left by persons dying at any age are much different from those of persons living at the same age. There is evidence to show—as one might expect—that the families left by parents dying are somewhat smaller than those of parents living. For instance, New Zealand Census statistics of the families of fathers show, for children under age 16, differences of from 5 to 7 per cent.

Sickness Experience.

Finally, I think it well to say a few words about a contingency, the measurement of which differs from those previously dealt with in that it requires the additional factor of duration to fix it with any precision. I refer to sickness. As I stated in my opening remarks, the only investigation in this country of claims to sickness benefit, of which I am aware, was that conducted by the British Government Actuary's Department into the experience of the National Health Insurance Society during the years 1935–38. The reports dated 19th June, 1939, and 28th March, 1941, covering this investigation were presented to the Dáil in the Summer of 1939 (P. No. 3712) and in February, 1942 (P. No. 5222), respectively. As they do not appear to have been made available otherwise to the public, I reproduce the following table from the Second Report :—

<div align="center">TABLE XIII</div>

Average Number of Weeks of Incapacity per Member during the Year.

ÉIRE : Experience of the National Health Insurance Society, 1936–38.
GREAT BRITAIN : Rates adopted in the National Health Insurance Valuations, 1938.

Age Group	Men		Spinsters and Widows		Married Women	
	Éire	Gt. Britain	Éire	Gt. Britain	Éire	Gt. Britain
16–20	·62	·86	1·16	·99	*	—
20–25	·85	·85	1·91	1·38	4·11	3·95
25–30	1·04	·94	2·47	1·72	5·90	3·69
30–35	1·24	1·06	3·23	1·96	7·52	3·58
35–40	1·52	1·26	3·78	2·20	7·20	3·70
40–45	1·94	1·57	5·15	2·58	8·20	4·12
45–50	2·65	1·95	6·75	3·13	9·17	4·88
50–55	3·58	2·74	8·75	3·92	12·87	6·08
55–60	5·11	4·08	11·68	5·18	16·80	7·92
60–65	9·03	6·60	18·39	7·47	21·01	10·86
65–70	19·46	†	29·24	†	31·60	†

* The rates for married women for age-group, 16–20, are omitted, as the data on which they are based is too small to enable reliable conclusions to be drawn.
† Benefits cease at age of 65 (the pension age) in Great Britain.

The rates of sickness in Éire are so much higher than the British rates (which are based on the experience of representative approved societies there) as to constitute a matter of some concern.

As a further demonstration of this point, I give in Table XIV a comparison of the Éire male rates with those of the 1893–7 experience of the Quarry, Iron and Steel, etc., Workers group of the Manchester Unity Society of Oddfellows—one of the largest friendly societies in Britain (then with almost 600,000 members). This group—known as the E.F. Group—had the worst sickness experience of any group in the Society.

<div align="center">TABLE XIV</div>

Sickness Rates in Age-Groups—Éire National Health Insurance Society and Manchester Unity Quarry, Iron and Steel Workers.

Age-Group	16–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	60–65	65–70
Éire (1936–38) ...	·62	·85	1·04	1·24	1·52	1·94	2·65	3·58	5·11	9·03	19·46
Manchester Unity E.F. Group (1893–97)	1·32	1·20	1·31	1·46	1·73	2·16	2·55	3·36	5·19	8·78	15·09

On the whole, I find that this group of the Manchester Unity Society gives sickness rates more nearly akin to those of the Éire Insurance Society than any of its other groupings. It is really a serious matter to find that we, in 1936–38, have as heavy a sickness experience as a representative group of the Quarry, Iron and Steel Workers in Great Britain had forty years ago.

It would doubtless be of assistance, in studying the causes of this unsatisfactory state of affairs, if the sickness experience of a large representative body of workers such as the Civil Service (clerical and industrial) were investigated and published.

APPENDIX A

Monetary Functions based on the Éire Life Tables No. 3.

Age	Present value of annuity of 1 per annum commencing at the age stated						Present Value of 1 payable on the death of a life now of the age stated	
	Male			Female			Male	Female
	2½%	3%	3½%	2½%	3%	3½%	3%	3%
0	28·322	25·234	22·679	29·030	25·844	23·210	·25410	·23607
1	30·550	27·241	24·496	30·741	27·390	24·613	·19479	·19038
2	30·648	27·352	24·614	30·781	27·448	24·683	·19150	·18867
3	30·565	27·304	24·590	30·680	27·384	24·645	·19292	·19056
4	30·433	27·212	24·527	30·543	27·288	24·578	·19564	·19340
5	30·274	27·096	24·443	30·384	27·171	24·493	·19907	·19686
6	30·100	26·969	24·348	30·203	27·001	24·392	·20283	·20188
7	29·911	26,826	24·241	30·005	26·884	24·276	·20705	·20534
8	29·703	26·667	24·119	29·788	26·718	24·146	·21175	·21025
9	29·479	26·497	23·982	29·563	26·543	24·008	·21678	·21542
10	29·241	26·308	23·835	29·329	26·359	23·863	·22236	·22086
11	28·994	26·112	23·680	29·087	26·168	23·711	·22816	·22650
12	28·740	25·911	23·519	28·838	25·973	23·555	·23410	·23227
13	28·481	25·706	23·354	28·590	25·775	23·396	·24016	·23812
14	28·222	25·499	23·187	28·339	25.575	23·236	·24628	·24403
15	27·962	25·292	23·020	28·087	25·375	23·075	·25240	·24994
16	27·705	25·086	22·855	27·837	25·176	22·915	·25849	·25583
17	27·450	24·883	22·691	27·587	24·977	22·755	·26449	·26171
18	27·198	24·685	22·530	27·343	24·783	22·599	·27034	·26744
19	26·946	24·481	22·369	27·100	24·590	22·444	·27637	·27315
20	26·695	24·280	22·207	26·859	24·398	22·290	·28231	·27882
21	26·444	24·080	22·046	26·620	24·208	22·138	·28822	·28444
22	26·192	23·878	21·883	26·382	24·018	21·986	·29419	·29005
23	25·937	23·673	21·718	26·141	23·826	21·833	·30025	·29573
24	25·677	23·464	21·548	25·896	23·630	21·674	·30643	·30152
25	25·410	23·247	21·372	25·644	23·427	21·511	·31284	·30752
26	25·134	23·023	21·188	25·384	23·217	21·340	·31947	·31373
27	24·849	22·789	20·977	25·115	22·999	21·159	·32638	·32018
28	24·556	22·549	20·800	24·839	22·774	20·978	·33348	·32683
29	24·257	22·303	20·595	24·556	22·541	20·787	·34075	·33371
30	23·953	22·050	20·384	24·265	22·302	20·588	·34823	·34068
31	23·642	21·791	20·169	23·968	22·056	20·385	·35588	·34805
32	23·324	21·526	19·945	23·665	21·805	20·175	·36372	·35547
33	23·001	21·255	19·717	23·356	21·547	19·959	·37173	·36309
34	22·669	20·977	19·481	23·038	21·282	19·735	·37994	·37093
35	22·331	20·690	19·239	22·712	21·007	19·504	·38843	·37906
36	21·984	20·396	18·988	22·378	20·725	19·264	·39712	·38739
37	21·630	20·094	18·729	22·035	20·434	19·017	·40604	·39599
38	21·268	19·784	18·464	21·685	20·136	18·762	·41521	·40480
39	20·898	19·467	18·191	21·328	19·832	18·501	·42458	·41379
40	·20·521	19·141	17·909	20·966	19·521	18·234	·43421	·42298
41	20·137	18·809	17·620	20·599	19·205	17·961	·44403	·43232
42	19·747	18·470	17·324	20·227	18·884	17·682	·45405	·44181
43	19·351	18·124	17·021	19·849	18·556	17·396	·46428	·45151
44	18·951	17·774	16·714	19·463	18·219	17·102	·47462	·46147
45	18·547	17·418	16·400	19·067	17·873	16·799	·48514	·47169
46	18·138	17·058	16·081	18·661	17·517	16·485	·49579	·48222
47	17,728	16·696	15·758	18·248	17·153	16·163	·50649	·49298
48	17·313	16·327	15·431	17·830	16·782	15·832	·51739	·50394
49	16·895	15·956	15·099	17·409	16·409	15·501	·52836	·51497
50	16·473	15·578	14·761	16·991	16·036	15·167	·53953	·52599
51	16·047	15·196	14·417	16·573	15·663	14·833	·55082	·53702
52	15·618	14·810	14·068	16·158	15·291	14.499	·56223	·54802
53	15·186	14·420	13·717	15·742	14·918	14·163	·57376	·55904
54	14·754	14·028	13·361	15·323	14·540	13·823	·58535	·57022

APPENDIX A—*(continued.)*

Age	Present value of annuity of 1 per annum commencing at the age stated						Present Value of 1 payable on the death of a life now of the age stated	
	Male			Female			Male	Female
	2½%	3%	3½%	2½%	3%	3½%	3%	3%
55	14·321	13·635	13·004	14·899	14·157	13·476	·59697	·58154
56	13·889	13·241	12·645	14·471	13·768	13·123	·60861	·59304
57	13·457	12·847	12·285	14·038	13·374	12·764	·62026	·60468
58	13·027	12·454	11·923	13·604	12·978	12·401	·63188	·61639
59	12·600	12·063	11·561	13·173	12·585	12·040	·64343	·62800
60	12·176	11·671	11·201	12·750	12·196	11·682	·65502	·63950
61	11·755	11·281	10·841	12·334	11·813	11·329	·66655	·65082
62	11·339	10·896	10·484	11·921	11·432	10·977	·67793	·66209
63	10·925	10·513	10·128	11·511	11·053	10·626	·68925	·67329
64	10·518	10·134	9·773	11·104	10·675	10·275	·70045	·68446
65	10·113	9·757	9·420	10·697	10·299	9·924	·71160	·69558
66	9·712	9·380	9·069	10·296	9·924	9·575	·72273	·70666
67	9·314	9·007	8·718	9·898	9·552	9·226	·73376	·71766
68	8·920	8·637	8·368	9·505	9·182	8·880	·74469	·72858
69	8·533	8·272	8·023	9·115	8·817	8·536	·75548	·73937
70	8·152	7·911	7·683	8·733	8·457	8·196	·76615	·75001
71	7·778	7·557	7·347	8·359	8·103	7·862	·77662	·76048
72	7·415	7·211	7·019	7·993	7·758	7·535	·78685	·77061
73	7·064	6·879	6·701	7·641	7·423	7·217	·79666	·78058
74	6·729	6·558	6·395	7·302	7·103	6·912	·80615	·79004
75	6·409	6·253	6·102	6·981	6·796	6·619	·81517	·79911
76	6·106	5·962	5·826	6·676	6·505	6·342	·82377	·80772
77	5·820	5·688	5·562	6·389	6·230	6·080	·83187	·81585
78	5·551	5·431	5·314	6·117	5·972	5·832	·83946	·82347
79	5·298	5·188	5·080	5·863	5·728	5·600	·84665	·83069
80	5·060	4·958	4·861	5·624	5·498	5·379	·85345	·83749
81	4·835	4·740	4·650	5·400	5·281	5·169	·85989	·84390
82	4·618	4·532	4·449	5·179	5·072	4.969	·86604	·85008
83	4·412	4·333	4·256	4·971	4·871	4·776	·87192	·85602
84	4·213	4·141	4·070	4·771	4·680	4·591	·87760	·86167
85	4·022	3·956	3·891	4·578	4·495	4·412	·88307	·86714
86	3·837	3·775	3·716	4·393	4·315	4·239	·88841	·87246
87	3·707	3·651	3·596	4·212	4·140	4·071	·89208	·87763
88	3·543	3·491	3·441	4·036	3·971	3·908	·89681	·88263
89	3·384	3·337	3·290	3·863	3·803	3·745	·90136	·88758
90	3·228	3·185	3·144	3·690	3·636	3·584	·90585	·89252
91	3·073	3·035	2·997	3·516	3·467	3·420	·91029	·89752
92	2·918	2·883	2·850	3·336	3·293	3·251	·91478	·90266
93	2·759	2·728	2·699	3·147	3·109	3·073	·91937	·90810
94	2·590	2·564	2·539	2·943	2·910	2·879	·92421	·91398
95	2·403	2·382	2·360	2·714	2·686	2·661	·92960	·92061
96·	2·189	2·171	2·155	2·447	2·426	2·406	·93582	·92829
97	1·928	1·915	1·902	2·125	2·109	2·095	·94239	·93766
98	1·591	1·582	1·575	1·719	1·710	1·701	·95324	·94946
99	1·129	1·126	1·122	1·189	1·185	1·189	·96672	·96498

NOTES : (1) The annuity values which assume that payments are made evenly over each year, were calculated by means of the formula—

$$\frac{1}{l_x}\left\{ \sum_{t=1}^{100-x} l_{x+t}\,(1+i)^{-t} \right\} + \tfrac{1}{2} - \frac{1}{12}\left\{ \frac{1}{2l_x}\,(d_{x-1}+d_x) + \delta \right\}$$

where l_x and d_x are the usual functions of the life table ; i is the rate of interest per unit per annum ; and δ is the force of interest and is equal to $\log_e(1+i)$.

(2) The assurance values were calculated by means of the formula. $1 - \delta\bar{a}_x$, where $\bar{a}_x$ is the corresponding annuity value.

APPENDIX B

Functions based on Marriage and Issue Data

Age	Proportions Married		Probabilities of Marriage within a year		Probabilities of Issue within a year	Age	P.V. of Ann. of 1 per ann. ceasing on Death or Marriage 3°/₀
	Males	Females	Males	Females	Wives		Females
15	·000	·000	—	·00199	—	0	19·677
16	·000	·002	—	·00299	·660	1	20·596
17	·000	·005	·00100	·00702	·652	2	20·387
18	·001	·014	·00199	·01515	·639	3	20·078
19	·003	·029	·00501	·02770	·624	4	19·735
20	·008	·056	·01006	·03798	·606	5	19·372
21	·018	·092	·01525	·04496	·586	6	18·957
22	·033	·131	·02064	·05167	·564	7	18·572
23	·053	·176	·02529	·05813	·539	8	18·143
24	·078	·224	·02919	·05658	·513	9	17·698
25	·111	·268	·03342	·06000	·486	10	17·237
26	·137	·312	·03803	·06235	·458	11	16·760
27	·171	·355	·04314	·06652	·430	12	16·270
28	·210	·400	·05134	·06961	·402	13	15·766
29	·262	·456	·05280	·07482	·375	14	15·249
30	·283	·481	·05296	·08091	·349	15	14·720
31	·342	·544	·05151	·05867	·324	16	14·206
32	·363	·548	·04966	·04456	·300	17	13·694
33	·404	·583	·04736	·04427	·275	18	13·224
34	·412	·589	·04456	·04392	·251	19	12·850
35	·445	·607	·04304	·04337	·227	20	12·629
36	·480	·627	·04127	·04001	·202	21	12·537
37	·518	·649	·03910	·03614	·178	22	12·536
38	·520	·659	·03664	·02884	·154	23	12·631
39	·559	·677	·03594	·01778	·130	24	12·827
40	·526	·662	·03507	·01211	·108	25	13·019
41	·598	·688	·03405	·00613	·086	26	13·281
42	·589	·670	·03197	·00350	·066	27	13·603
43	·615	·681	·02918	·00200	·049	28	14·025
44	·613	·681	·02503	·00100	·035	29	14·542
45	·588	·656	·02052	·00050	·024	30	15·207
46	·614	·653	·01575	—	·015	31	16·062
47	·635	·658	·01061	—	·007	32	16·609
48	·619	·653	·01075	—	—	33	16·952
49	·634	·646	·01090	—	—	34	17·318
50	·590	·618	·01098	—	—	35	17·709
51	·634	·626	·00831	—	—	36	18·125
52	·635	·616	·00563	—	—	37	18·506
53	·649	·617	·00450	—	—	38	18·842
54	·631	·603	·00330	—	—	39	19·059
55	·622	·595	·00240	—	—	40	19·070
56	·634	·580	·00150	—	—	41	18·975
57	·643	·570	·00065	—	—	42	18·764
58	·629	·555	—	—	—	43	18·498
59	·632	·541	—	—	—	44	18·196
60	·606	·507	—	—	—	45	17·867

NOTES : (1) The proportions married are the crude figures calculated from the 1936 Census data.

(2) The probabilities of marriage are calculated by means of the formula—

$$\{h_{x+1}\, l_{x+1} - h_x\, l_x\,(1 - q_x)\} \big/ \{(1 - h_x)\, l_x\,(1 - \tfrac{1}{2}q_x)\}$$

where l_x and q_x are the usual functions of the life table and h_x is the proportion married at age x − graduated figures.

(3) The derivation of the probabilities of issue is explained in the paper.

(4) The annuity values are calculated by means of the formula given under note (1) in Appendix A except that the functions l_x and d_x are taken from a table of double decrement—mortality and marriage—instead of from the life table.

DISCUSSION ON MR. HONOHAN'S PAPER

Mr. D. H. Shaw, proposing the vote of thanks, said that until recently all life assurance business was written by Offices outside the country, but following official support given to the establishment of a strong foundation for this business within Ireland the volume of new business written has increased considerably. It will be possible soon to take out the Irish experience but the body of data available will be very small compared with that obtained for the British Offices' experience 1924 to 1929 and subsequently. The business available relating to life tenants is negligible. A considerable volume of ordinary life assurance business relates to lives entered over age 35 and the average age at entry is nearly 35.

The distribution of Male Staffs in the Banks reflects the influx some 20 years ago and this will have the effect of raising the charge for pensions outgo in the future to over $2\frac{1}{2}$ times the present figure. The Civil Service Staff over age 65 would not appear to include pensioners whereas these seem to be included in the Bank Staffs under Table IV. It would be interesting to know the number of cases of retirements on permanent ill-health pensions included in the ill-health retirements of the Civil Service Staff given on page 389 within age groups.

Referring to the national statistics he thought that following the improved results obtained from the dates of birth for the live population it would be a great advance if something could be done to get correct ages in the registration of deaths. It is a difficult matter but the mis-statement of ages at present presents a real problem in extracting the death rates as it is not just a question of redistribution. Very valuable information would also be obtained if particulars of parents' ages, dates of marriage, and previous children were supplied in the registration of births. The possibility of a card system for the whole population might be worth consideration.

The figure of capital liability for pensions, which would be very much greater if persons under age 60 were included, is important for the calculation of contributions but in considering the cost of such schemes estimates of future income and outgo would be essential. Under the recent British scheme figures based on projected rates were mentioned but the estimates supplied by the Government Actuary assumed constant (pre-war) fertility and mortality rates. In Ireland a change in the proportion married at the younger ages under Table X could make a very considerable difference in the future population. He thought that projected rates of fertility and mortality should be taken into account in estimates of the cost of any schemes, and certainly this should be done in calculating contribution rates. The problem in this country as regards schemes of national insurance might, however, be one requiring quite different treatment, and this should receive careful thought before we assume that our most pressing needs are met by schemes similar to those adopted in other countries.

Mr. Patrick Lynch : As one entirely innocent of the principles of actuarial science, I should like to add a word of appreciation to Mr. Honohan for what even to a layman is a useful and most interesting paper. To begin, I should like to support his plea that more elaborate and more detailed statistics should be compiled and made available for treatment of the kind we have seen exemplified this evening. In an age such as this, when State-directed planning is so widely regarded as the panacea for all the ills of a community, it is impossible to distinguish the practicable and the desirable from the impossible and the

fantastic without comprehensive and accurate statistical data. Mr. Honohan's paper shows conclusively that statistics are a necessity and not a luxury in an age of increasing governmental intervention in social and economic life. And to a layman, perhaps the most valuable contribution of the early part of the paper is the demonstration that the inaccurate interpretation of reliable statistics can be even more deplorable in its results than the complete absence of data. This issue is first indicated in page 385 and the emphasis is maintained throughout by the paper's preoccupation with the supreme importance of age-distribution as a feature of census returns. It is indeed true that this feature is of " more than technical interest . . . in these days of planning social schemes for the future," so much so, that by disregarding age-groups, and overlooking their implications by concentrating on mere aggregates of total population, many popular publicists have solemnly prescribed as " cures " for unemployment and under-education the reduction by half in the size of a community.

As Mr. Whitaker has stated, it is unfortunately a fact that due to the big percentage of persons in our over-65 age group, the labour force under that age must be prepared to shoulder an increasing burden. It is a pity that so many unthinking advocates of social security measures omit to take adequate account of this phenomenon, and to realise that the greater the proportion of people who have retired from productive employment the greater are demands on the labour force of the community who are responsible for the maintenance of the national income. There is, I suppose, some consolation in the knowledge that this phenomenon of an ageing population is common to all Europe, but that the rate is faster in the West than in the East. It has been said that to move Eastwards is to go back in time. This is supported by considering the demographic circumstances of Soviet Russia, where the inevitability of an ageing population has been demonstrated in recent projections. It is of interest, however, to note that this problem is more serious for an industrial economy than for an agricultural one. Industrialism, with all its complex mechanization, requires the freshness, vitality and adaptability of youth to maintain efficiency and high output. In agriculture, however, thanks to the simplicity of the processes involved, the labour force can be expected to maintain its productive capacity to an age much greater than 65. It is true, I suppose, that in an industrial economy the disadvantage of a decline in the earlier age-groups can be offset, temporarily, by an increase in mechanization, but the law of diminishing returns sets a limit to the extent that this substitution of technical innovation is possible.

There is one aspect of Mr. Honohan's paper with which I disagree. I shall not have the temerity to criticise, but with diffidence I would suggest that he has over-emphasised the desirability of capitalising the money-cost of social measures. I should like to ask him whether he doesn't agree that the real cost of such measures is more important than the money cost. It seems rather pedantic to speak about passing a burden on to posterity when we know that in reality every generation must pay its own way out of the resources available contemporaneously with its existence. Thus at any one time, one section of the community may forgo a certain part of its real income to provide social measures for the other part : this is a current cost, and it requires a sacrifice of real things here and now. It is scarcely justifiable to imply that resources redistributed to-day must be sacrificed by a new generation to-morrow. The analogy of war finance suggests itself ; it is fallacious to assert

that by adopting a policy of borrowing money from the community instead of obtaining it by taxation, a government is enabled to pass the cost of a war on to posterity ; the truth is that the money cost merely represents the real cost which must be borne by the generation fighting the war. I exclude, of course, all questions of external borrowing, which are not relevant to the matter under discussion. If there is a flaw in this analysis, no doubt the lecturer will refer to it in his reply. In the meantime, I want to reiterate my appreciation of a timely, significant and a most suggestive paper.

Dr. Geary said that he had slight—but only slight—qualms about the propriety of computing, as the lecturer had done for Appendix B, marriage probabilities from census data. He (Dr. Geary) assumed that, had the figures been available, Mr. Honohan would have preferred to base the probabilities on the number of marriages in the years from the census year, classified by ages of persons married, in conjunction with the census statistics of numbers of bachelors of these ages ; in other words, that the marriage table should be computed exactly on the lines of the Life Table. He (Dr. Geary) agreed with Mr. Shaw that it would be very desirable that the statistics of marriages should be compiled in this manner and that the statistics of births should, on a national scale, be classified by age of mother, order of birth, etc., as Mr. Lyon had done for his well-known Statistical Society paper. His (Dr. Geary's) qualms were, he confessed, to some extent allayed by the convincing check which Mr. Honohan had given at the top of page 393. Actually the comparison even for males was very good, and the slight discrepancy was perhaps due more to the abberations of smoothing and to the fact that at the 1936 Census the number of married men were slightly fewer than the number of married women, than to inaccuracy in the census data.

Dr. Geary said that some time ago he had occasion to prepare tables for certain younger ages purporting to indicate the life-migration-marital-occupational history of females at prevailing rates, as the Life Table does, taking account of mortality alone. This inquiry showed, for example, that of 1,000 females living at age 13½ there would be left about 900 at age 34 ; of this 900, 400 would have emigrated, and of the 500 remaining in the State, 300 would have married, and of the 200 unmarried, 50 would be occupied and 150 would be unoccupied.

As to the question of the ageing of the population, Dr. Geary said that his estimates of the future trend, to which Mr. Honohan had referred, did not indicate a serious increase in the proportion of elderly people in the population, though there would probably be an increase for a decade or so to come.

Replying to the discussion, **Mr. Honohan** said : The question of capitalising the cost of social measures gives rise to many debatable points. Mr. Lynch suggested, for instance, that the present generation were sacrificing real things here and now to pay their own current social services, and that, therefore, it was rather pedantic to speak about passing a burden on to posterity. But that surely cannot be the whole story. The customary approach in financing measures which have a long-term aspect, such as a pension benefit, is to try to mitigate the burdens in the early years and to pass on more than their due share to later years (and particularly to the Exchequer). Unless the whole fabric of modern commerce is to be undermined, and in particular the principles of insurance and thrift, we must continue to have regard

to the value of things in terms of money, both now and in the future. Whether or not, as Mr. Lynch seems to suggest—although I find it hard to agree—it will all work out more or less the same in the long run, it is primarily the aspect of rights and obligations which I have in mind. In this connection two points seem to be clear enough, first, that the children born to-day are being saddled with more and more obligations to the community and, so burdened, are being prevented from developing free and unfettered lives, and, secondly, that the present generation is being placed in the position of having moral claims, while the provision of means to meet those claims is being left to an entirely different generation. The following passages from the British White Paper on Social Insurance (Part I Cmd. 6550) are significant as indicating the modern feeling towards these matters :—

(i) " . . . the Government feel that, although accruing rights under existing schemes need not be preserved in all cases . . . " (par. 121) and

(ii) " in the preparation of a nation-wide scheme of social insurance, which must of necessity undergo many changes in its development, it would be neither practicable nor desirable to lay down a hard and fast rule that all accruing rights must be safeguarded on each occasion of change " (par. 182).

The ill-health retirements from the Civil Service were all medically-certified cases, but would not all qualify for pension. For instance, there is a 10-year period after recruitment during which no pension is granted for retirement on health grounds. Their apparently large numbers should be read in conjunction with the small numbers of deaths in service as compared with the deaths in the population. Many of the ill-health retirements presumably result in early deaths, thus helping to restore the balance.

There is no intention to criticise the Irish Insurance Companies or anyone else for not publishing their experiences ; the paper simply gave a summary of the facts of the situation. The reference to new business being taken out mostly at ages under 35 was based on British experience, and it was interesting to hear from Mr. Shaw that the average age for His Company's business was just under 35. The statement was, therefore, probably applicable to Irish business also, but, if there was a much larger proportion of business taken out in Great Britain under age 35 than in Ireland, is this not an argument in favour of giving great publicity to the features of Irish business ?

With regard to Dr. Geary's remarks about the preparation of the marriage probabilities, it is undoubtedly the case that better rates would be obtained if we had the ages at marriage. The proportions married, which reflected the marriage rates of various years in the past, were the next best thing available. As these had remained fairly stationary over a long period, it is suggested, especially having regard to the satisfactory results of the test made, that reasonably good probabilities had been constructed. The trivial effect of graduating the proportions married would hardly account for the differences shown in the test between the male and female rates.

As regards Mr. Keady's point that the sickness rates quoted were really sickness claim rates and did not necessarily represent real sickness, it should be remembered that this applied also to the British figures with which they were compared. Lax medical certification was, no doubt, one of the causes of the heavy rates.