LIFE TABLE

FOR THE

CITY OF NORWICH

(*Decennium* 1891—1900).

PREPARED BY

ARTHUR W. TUXFORD, M.B., D.P.H.
(*Late of the Public Health Department*),

FOR

DR. H. COOPER PATTIN, M.A., D.P.H.,
(*Author of the "Ritual of Temperance and State Hygiene," etc.,*)
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PREFACE.

I had long wished to issue a Life Table for Norwich, and when, in 1904, Dr. Tuxford became associated with the Public Health Department, as my assistant and deputy, I suggested that he should aid me to get one out. Dr. Tuxford entered into the project with such enthusiasm and intrepidity that, beyond supplying him with counsel and with the materials for its construction, this preface virtually represents my contribution to the actual production.

It is much to be regretted that so few of the great towns have issued life tables; the comparisons given are restricted to those between England and Wales, as a whole, the County of London, the Borough of Brighton, and our own City.

I desire to express our thanks to Messrs. Deuchar and Paterson of the Norwich Union Life Insurance Society, and to Dr. Newsholme of Brighton for the cordial interest they displayed in the project; and expressly to mention our indebtedness to Dr. T. H. C. Stevenson for the trouble he took in going over the completed charts and workings. The Life Table is itself a monument to Dr. Tuxford's arduous and ungrudging labour.

I have also to thank the Health Committee of the City Council for its generosity in directing that this Life Table be printed.

H. COOPER PATTIN.

Municipal Buildings,
Norwich, January, 1905.

INTRODUCTION.

A life-table has been defined as a biometer, or instrument for the measurement of life. Definition of a life-table.

It consists of a series of calculations forming a measure of the longevity of any given community, and, consequently, it constitutes also a measure of the total effect of the influences of its environment on the vitality of that community.

The calculations, as given in the life-table, apply to a hypothetical population, consisting of an arbitrary number of individuals supposed to be born simultaneously, and to live out their lives in the same surroundings and under the same conditions as the given community.

The whole duration of this imaginary population's existence is divided into age-periods, for each of which the past and future effects on its individual members of their environment are indicated, in the table, by figures stating (1) the number of survivors of its earlier impressions, and (2) the average future life-time, or expectation of life, of each survivor in the same environment. Structure

Both these figures are derived from a third—the fraction representing the mathematical probability of survival, from beginning to end of each age-period, of every individual alive at the beginning of that period—and since this fraction is obtained from data supplied by the actual community, the hypothetical life-table population becomes a medium for the record of facts concerning the vitality of the given population.

This fraction is expressed as follows :—

$$\frac{\textit{Number of individuals alive at end of period}}{\textit{Number of individuals alive at beginning of period}} \text{ or } \frac{L-\frac{D}{2}}{L+\frac{D}{2}},$$

where L = the *mean* number living in an age-period and D = the total number dying in the same age-period, the deaths being assumed to be distributed equally through the period.

As the figures represented by L and D can be obtained, in this country, from the Census and Death Returns respectively, arranged in sex and age groups, these probabilities, denoted for any period x by the symbol p_x, can be readily determined. The formation of a column of these p_x values is essential for the construction of a life-table ; they form the link between a living people on the one hand, of whose vitality they are a mathematical expression, and a hypothetical life-table population on the other, which resembles the given population in every particular but that of simultaneous birth, and states the probabilities of life and death for its individual members with greater accuracy than can be attained by any other method.

p_x column.

It is evident that the smaller the age-periods, the fuller and more definite will be the table ; and in extended life-tables p_x values are estimated for every year of life. Further, the larger the environment, as regards both time and space, the more reliable will be the resulting figures, both on account of the larger numbers of the population involved, and because a longer period of time will afford data less likely to be seriously affected by transitory epidemic or climatic disturbances.

Construction of p_x column.

Hence it is convenient to calculate the p_x column from the accumulated data of an intercensal period : these consist in (1) the sum of the populations estimated, from two consecutive census returns, to exist during each of the ten years of the period, and (2) the sum of the death returns for the same period ; both are arranged in five and ten yearly age and sex groups, so that the lives and deaths of each age-group require to be distributed artificially to each year of age included in the group. The fact that more than one method may be adopted for this distribution is accountable for the chief divergences in construction of the various life-tables hitherto published.

In the following table the Graphic Method has been adopted for this purpose ; it consists, briefly, in so distributing the lives or deaths of an age-period on sectional paper that the line which joins the points representing the figures for individual years forms, with similar lines of adjoining age-periods, a curve as free from bends and irregularities as possible ; and the test of the accuracy of such distribution lies in the closeness of approximation to a single curve of the line formed by plotting out in a similar fashion the p_x values calculated from these distributed lives and deaths.

Satisfactory p_x curves having been constructed, the formation of a life-table is simple.

l_x column.

A population at its birth, consisting usually of 1,000,000 or 100,000 individuals whose sexes are in the same proportions as in the births of the given community, is assumed ; and the factors of probability for each year of age are applied successively to the members of either sex. By this means their numbers are gradually diminished to extinction, since each factor is necessarily less than unity. The l_x column of the life-table, shewing survivors at each age, is thus obtained.

E_x column.

The mean after-life time, or expectation of life, of all the survivors at any age x is the sum of the years remaining to be lived by the life-table population—that is, the sum of the *mean* number of survivors during age x and all successive ages ; and the mean after-lifetime, or expectation of life, of any individual at any age x is represented by this sum divided by the number of survivors at age x. In this way the final or E_x column of the table is formed. The following scheme shews roughly the method of construction of a life-table.

Data derived from the given community.	Arrangement of the data for construction of p_x column.		p_x column — Probability of living one year from each age x.	Life-Table Population.			
Two consecutive Census Returns.	Estimation of decennial population.	Distribution of lives in each age-group to each year of age.	Calculation of p_x values for each year of life and construction of p_x curves.	l_x column — Survivors at each age x.	P_x column. — Mean population during each age x.	Q_x column. — After lifetime of l_x individuals, or sum of years of life to be lived.	E_x column. — Mean after-lifetime or Expectation of life at each age x.
Death Returns for the intercensal period.	Distribution of deaths in each age-group to each year of age.			$l_x = l_{x-1} \times p_{x-1}$	$P_x = \frac{l_x + l_{x+1}}{2}$	$Q_x = P_x + P_{x+1} + \dots P_{x+n}$	$E_x = \frac{Q_x}{l_x}$

Functions of a life-table.

The chief uses of a life-table are :—

1. *Positive.* The determination, by the laws of probability, of the expectation of life of any member of a given community, provided that his environment remains unchanged.

2. *Comparative.* (*a*) *as to Time.* A comparison of the life-tables of a district, constructed for successive periods, affords a measure of the sanitary progress of the district. (*b*) *as to Place.* If two or more districts possess life-tables constructed for the same period, a comparison of the figures shewing the vitality of their inhabitants will be a measure of the relative healthiness of the districts. (*c*) Life-tables have further uses. One constructed recently by Dr. T. E. Hayward shows what would be the effect on the longevity of the population of this country of (1) the elimination of Phthisis as a cause of death, and (2) a continuance of the high Phthisis mortality of a former decennium.

CHART I. DECENNIAL MALE LIVES & DEATHS DISTRIBUTED TO EACH YEAR OF AGE.

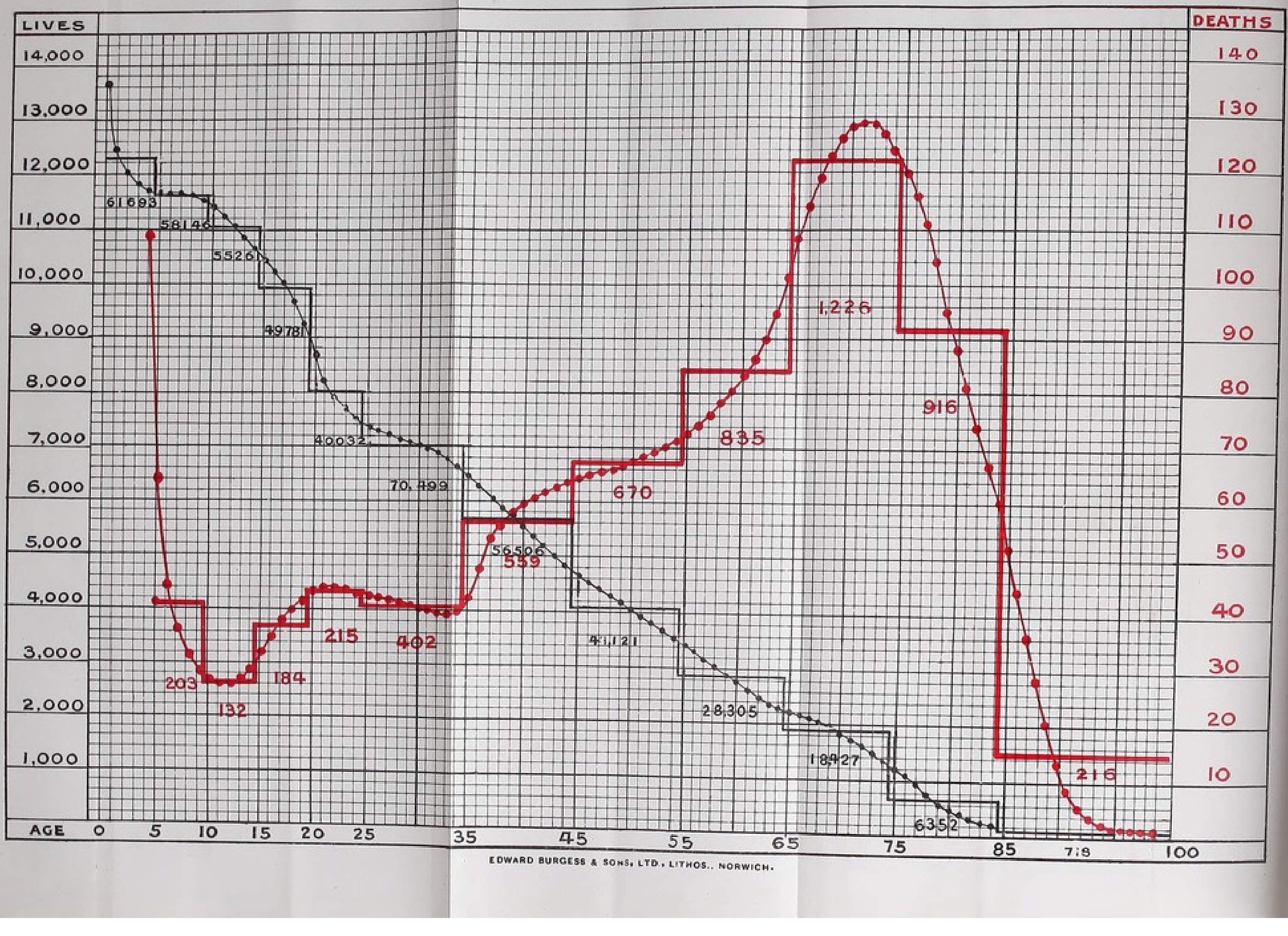

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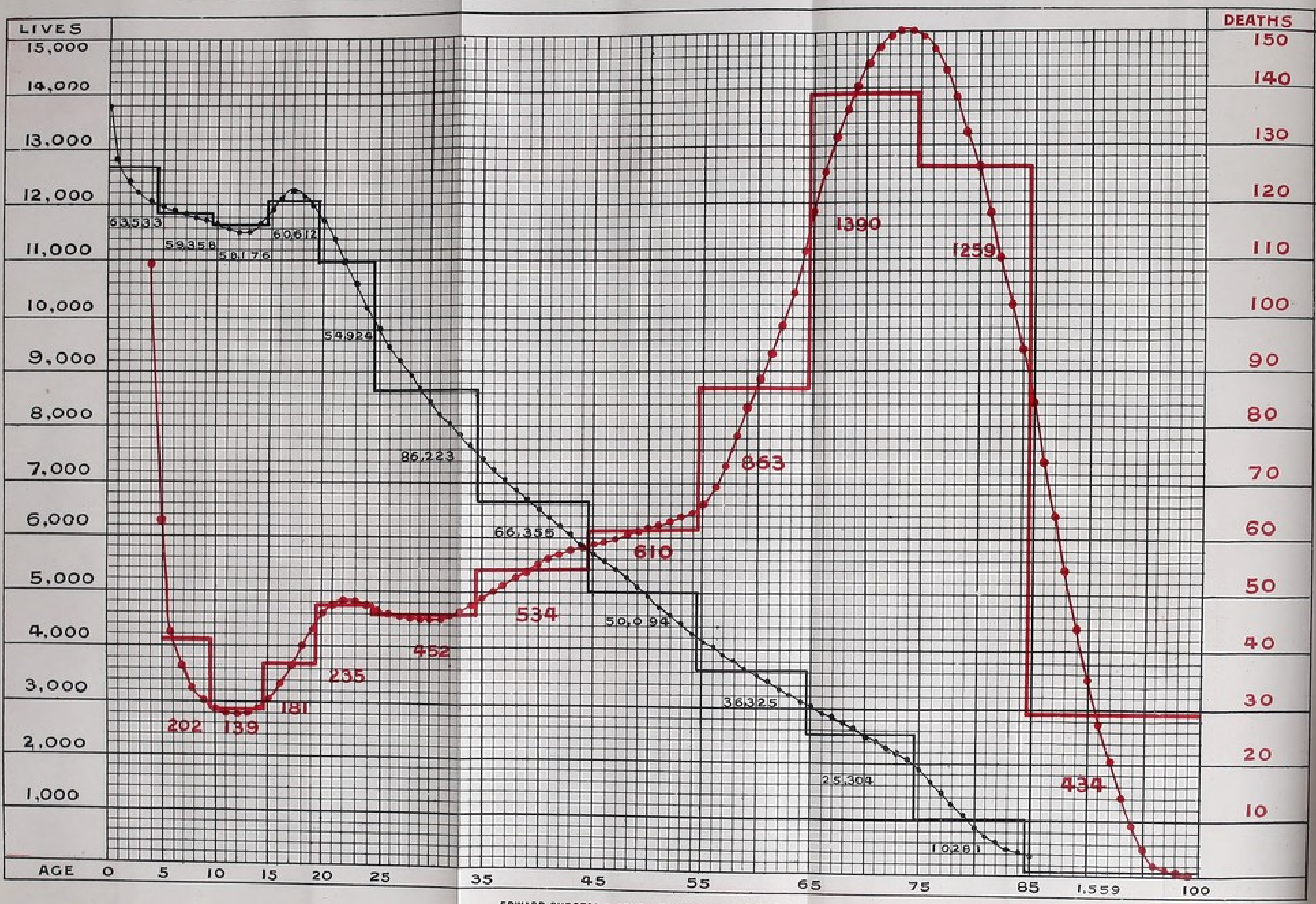
CHART II DECENNIAL FEMALE LIVES & DEATHS DISTRIBUTED TO EACH YEAR OF AGE.



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Construction of the Norwich Life Table.

It is not necessary to explain in detail the formation of this table since, with one important exception, it has been modelled on the plan of the Second Brighton Life Table, the method of construction of which is fully described by Drs. Newsholme and Stevenson in the Journal of Hygiene, Vol. III., Part 3.

A few points, however, may be referred to.

The data employed for this table are shewn below :—

TABLE I.

DATA USED IN THE CONSTRUCTION OF THE NORWICH LIFE TABLE, 1891—1900.

A—BIRTHS.

	Male.	Female.
1 Jan., 1891—31 Dec., 1900	16,574	16,172
1 July, 1890—30 June, 1900	16,585	16,157

B—CENSUS POPULATIONS.

Age.	Male.		Female.	
	1891	1901	1891	1901
0—4	6,120	6,224	6,239	6,481
5—9	5,737	5,901	5,803	6,085
10—14	5,263	5,827	5,546	6,128
15—19	4,666	5,339	5,709	6,467
20—24	3,811	4.223	5,118	5,927
25—34	6,906	7,211	8,137	9,181
35—44	5.193	6,187	5,981	7,413
45—54	3,749	4,540	4,676	5,396
55—64	2,745	2,927	3,544	3,732
65—74	1,785	1,908	2,480	2,587
75—84	573	709	943	1,128
85—99	75	69	171	143
	46,623	51,065	54,347	60,668

C—DEATHS.

1 Jan., 1891—31 Dec., 1900.

Age.	Male.	Female.
0—½	2,391	1,761
½—1	938	827
0	3,329	2,588
1	613	621
2	220	233
3	158	160
4	109	109
0—4	4,429	3,711
5—9	203	202
10—14	132	139
15—19	184	181
20—24	215	235
25—34	402	452
35—44	559	534
45—54	670	610
55—64	835	863
65—74	1,226	1,390
75—84	916	1,259
85—99	216	434
	9,987	10,010

The decennial populations, or years of life at risk during the ten years in each age-group, have been calculated both by the usual method as the sum of a geometric series (these being the figures adopted for the table), and also by Mr. A. C. Waters' method by which $S = 10\ (m\,P_1 + n\,P_2)$ where $P_1 + P_2$ are the two census populations for the age-period, and $m = {\cdot}5445944$ and $n = {\cdot}4564973$.

In the following table the differences in the results obtained by the latter and much less laborious process are shewn ; they are so small as to be practically negligible.

TABLE II.

Estimated Population, and Mean Annual Death Rate per 1000 for each Age Period during Decennium 1891—1900.

Age period.	Male.				Female.			
	Geometric series.	Mr. Waters' method.	Excess by latter method.	Mean Annual Death rate.	Geometric series.	Mr. Waters' method.	Excess by latter method.	Mean Annual Death rate.
0—4	61,693	61,741	48	71·79	63,533	63,563	30	58·41
5—9	58,146	58,181	35	3·49	59,358	59,380	22	3·40
10—14	55,261	55,262	1	2·39	58,176	58,177	1	2·39
15—19	49,781	49,782	1	3·70	60,612	60,613	1	2·99
20—24	40,032	40,032	0	5·37	54,924	54,929	5	4·28
25—34	70,499	70,528	29	5·70	86,223	86,225	2	5·24
35—44	56,506	56,524	18	9·89	66,355	66,412	57	8·05
45—54	41,121	41,142	21	16·29	50,094	50,098	4	12·18
55—64	28,305	28,311	6	29·50	36,325	36,336	11	23·76
65—74	18,427	18,431	4	66·53	25,304	25,306	2	54·93
75—84	6,352	6,357	5	144·21	10,281	10,285	4	122·46
85—99	718	718	0	300·84	1,559	1.559	0	278·38
Total	486,841	487,009	168	20·51	572,744	572,883	139	17·48

The decennial lives and deaths have been distributed to each year of age by the Extended Graphic Method. The resulting curves have, in the case of each sex, been included in one chart to show at a glance the two factors involved in the formation of each p_x value.

The decennial population for the first age-period (0—4) has been distributed by the former of the two methods described by Drs. Newsholme and Stevenson, which was not the method used for the Brighton Table.

The columns of distributed lives and deaths are affixed to the p_x column of the life-table, and the symbols L_x and D_x have been adopted as conveniently representing figures in these columns.

The construction of curves bearing even a remote resemblance to the ideal p_x curve has been a matter of considerable difficulty, owing to the irregular distribution of deaths in the Norwich age-groups. The decrease in the average number of deaths per year of age in the male age-period 25—34, as compared with the previous quinquennium, accompanied by a diminution of the yearly decrease of lives, as represented by the life-curve taking a more horizontal direction, led to a practically stationary p_x value during this decennium. This was followed by a sudden rise in the death-curve, with a more vertical tendency of the life-curve, causing a rapid depreciation of the p_x values during the next few years. Satisfactory p_x curves for both sexes during the age period 60—80, *i.e.* such that the difference between adjoining p_x values should increase for successive years, could only be obtained by repeatedly elevating the apices of the death-curves.

The l_x column was constructed for a population of 100,000—50,614 males and 49,386 females, the proportion of male to female births during 1891-1900 being the same in Norwich as in Brighton.

ANALYSIS.

The comparisons instituted below are with figures from the most recent Life Table for England and Wales by Dr. T. E. Hayward, published last June, the 2nd Brighton Life Table by Drs. Newsholme and Stevenson, and the London Life Table issued by the Medical Officer of Health to the London County Council ; all are constructed for the decennium 1891-1900. The decennial lives and deaths have been distributed to each year of age by the graphic process in the

Brighton table, which has served as a model for the present table, and by the method of ' finite differences ' in the other tables.

TABLE III.

Probability of Living One Year at certain Ages, 1891—1900.

MALE.

Age;	England and Wales.	Norwich.	London.	Brighton.
0	·8286	·7923	·8159	·8319
1	·9470	·9519	·9343	·9521
2	·9792	·9819	·9724	·9784
3	·9869	·9868	·9821	·9867
4	·9903	·9907	·9877	·9911
5	·9930	·9945	·9914	·9954
10	·9977	·9977	·9978	·9979
15	·9969	·9970	·9969	·9970
20	·9954	·9951	·9959	·9952
25	·9943	·9944	·9948	·9941
35	·9908	·9935	·9888	·9907
45	·9851	·9864	·9818	·9840
55	·9739	·9792	·9689	·9739
65	·9501	·9529	·9435	·9533
75	·8947	·9063	·8862	·9094
85	·7857	·7204	·7834	·7702
95	·6141	·4095	·6412	·5277

FEMALE.

Age.	England and Wales.	Norwich.	London.	Brighton.
0	·8596	·8352	·8457	·8589
1	·9506	·9528	·9391	·9520
2	·9799	·9814	·9730	·9801
3	·9867	·9870	·9821	·9878
4	·9905	·9910	·9875	·9935
5	·9931	·9948	·9913	·9952
10	·9976	·9976	·9976	·9973
15	·9969	·9975	·9972	·9973
20	·9958	·9961	·9968	·9974
25	·9949	·9953	·9960	·9968
35	·9919	·9935	·9914	·9938
45	·9883	·9899	·9866	·9892
55	·9793	·9843	·9768	·9819
65	·9581	·9614	·9556	·9650
75	·9068	·9230	·9037	·9191
85	·8069	·7711	·8034	·7912
95	·6510	·4965	·6518	·5735

CHART III PROBABILITY OF LIVING ONE YEAR. p_x CURVE—MALE.

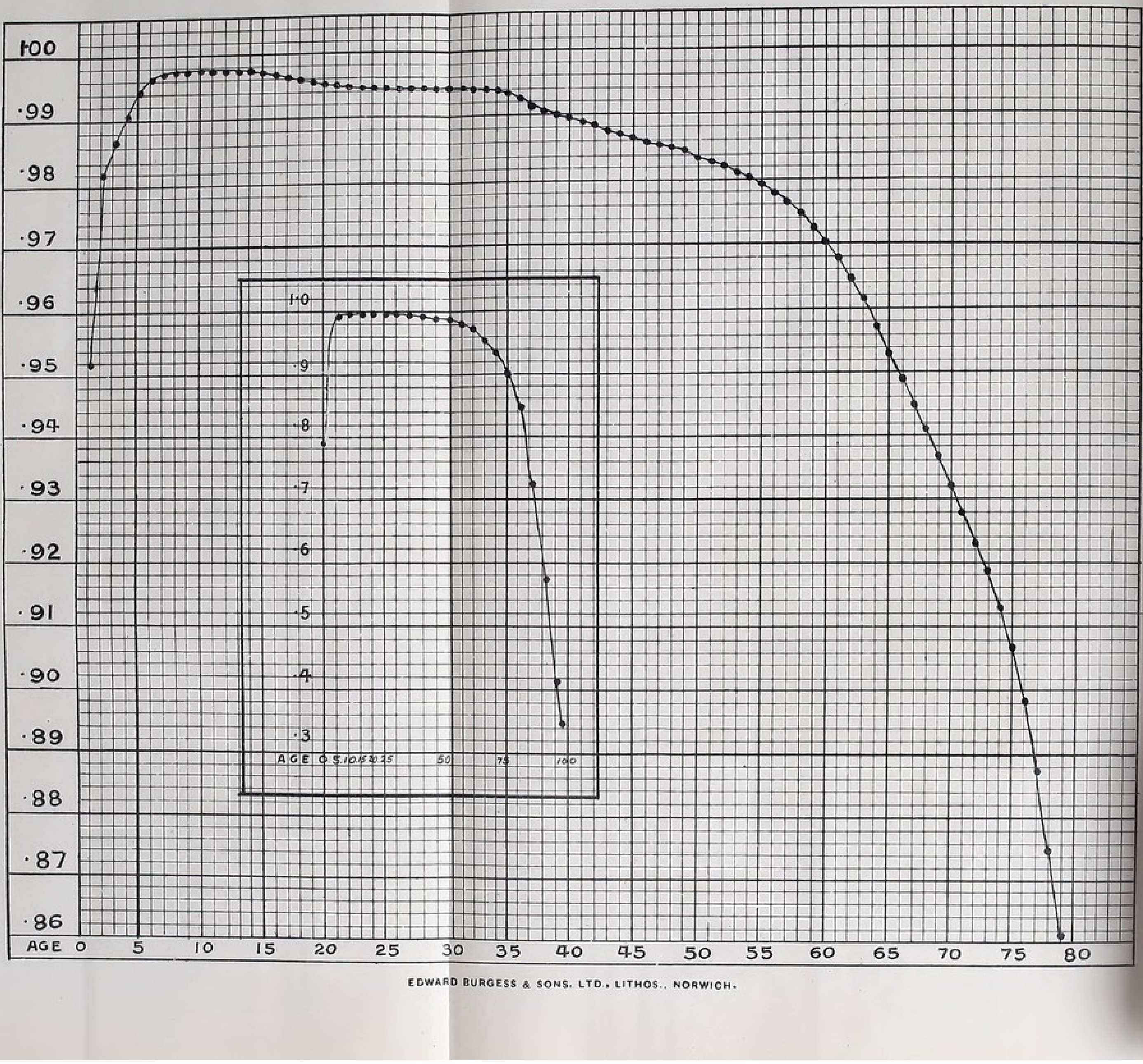

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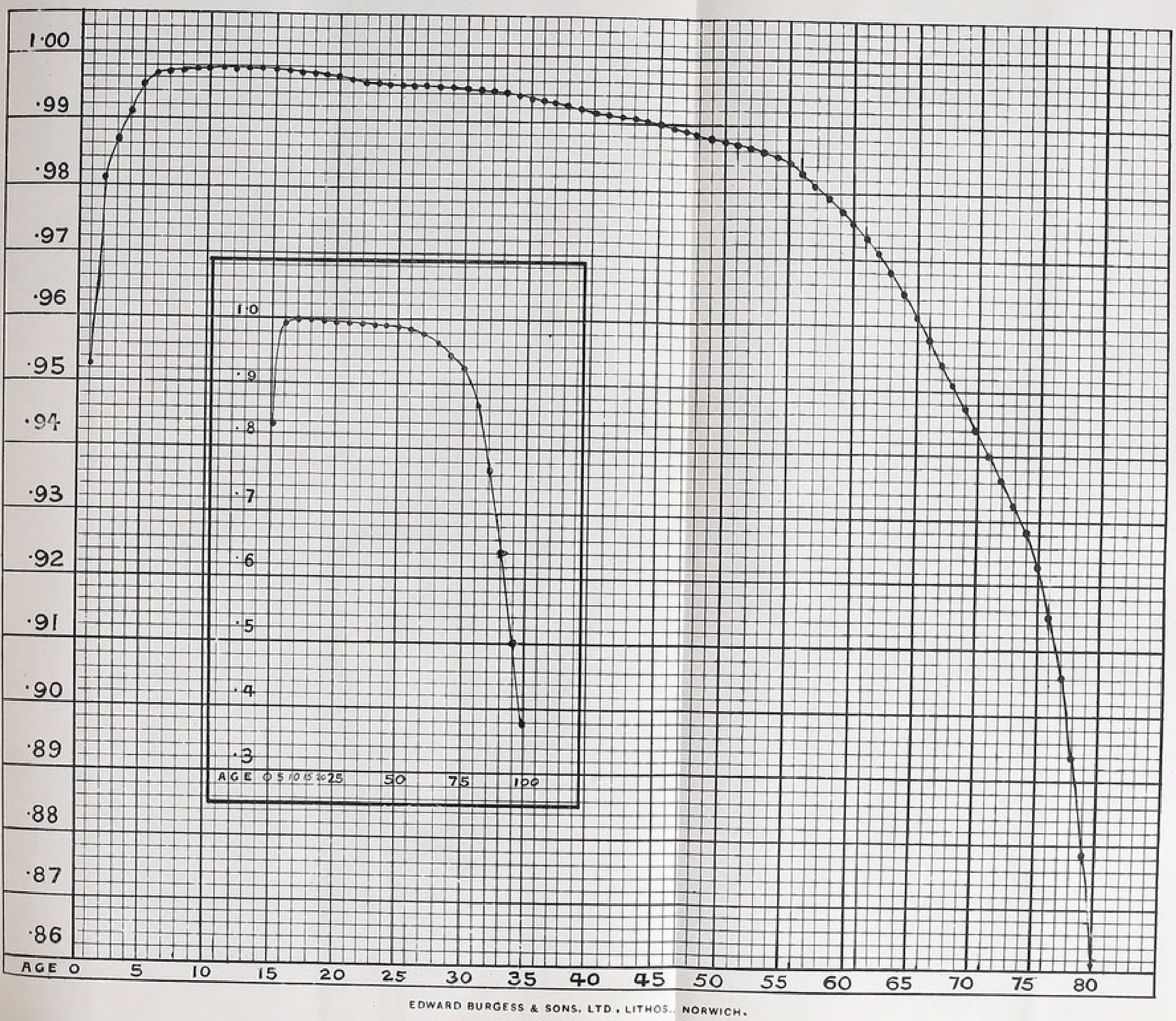
CHART IV PROBABILITY OF LIVING ONE YEAR. p_x CURVE—FEMALE.



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On comparing the four tables, the following broad differences appear :—

Males. The probability of living through the first year of life is less in Norwich than elsewhere : the p_o value is ·023 less in Norwich than in London ; in other words, the probability of living to be one year old is 3% less in Norwich than in London.

During the second year of life the probability improves relatively, and for the 3rd year (age 2) it is the highest in the tables compared.

The relative values fluctuate between the ages of 3 and 25, after which latter year Norwich leads up to the age of 64, when the Brighton values become the highest. The figures for London and for England and Wales do not exceed those for Norwich until the 80th year is reached, after which the Norwich figures are the worst.

Females. The results of comparison are very similar to those for males. The p_o value is worst in Norwich, but the deficiency compared with London is only about one-half that for Males. The probabilities of living through the 2nd and 3rd years are greatest in Norwich. Up to the age of 79, Norwich p_x values are better than for the country generally ; between ages 29 and 80 they are better than in London. They vary compared with Brighton, the only lengthy excess of Norwich figures being during the 5th and 6th decades.

After 80, Norwich has the lowest values.

Sex. The female p_x values are greater than the male, except for ages 2, 8—12, 33 and 34.

General conclusions may be stated as follows :—

(*a*) Lowness of p_o values, or a high infant mortality.

From a consideration of the l_x column, it can be inferred that of every 100,000 children born 18,656 (10,515 boys and 8,141 girls) will not survive to the end of their first year.

To obtain more precise information, the value p_o may be split up into two factors representing respectively the probability of surviving during the first and second half-years of life, since :—

$$p_o = \frac{L_o - D_{\frac{1}{2}-1}}{L_o + D_{0-\frac{1}{2}}} = \frac{L_o}{L_o + D_{0-\frac{1}{2}}} \times \frac{L_o - D_{\frac{1}{2}-1}}{L_o} = p_{0-\frac{1}{2}} \times p_{\frac{1}{2}-1}$$

These factors are, for Norwich:—

	MALE.	FEMALE.
Probability of living through 1st half-year ...	·8508	·8878
,, ,, ,, 2nd ,, ...	·9312	·9406

Thus, out of 1,000 boys born, 150 die before the age of six months.

The superiority of the London p_0 values to those for Norwich, is noteworthy

(*b*) The sudden increase, both absolute and relative, in value of p_x factors. During the third year the Norwich figures are the best.

(*c*) The average superiority of the Norwich figures between ages 25 and 80.

TABLE IV.

Survivors at certain Ages out of 100,000 Born, 1891—1900.

MALE.

Age.	England and Wales.	Norwich.	London.	Brighton.
0	100,000	100,000	100,000	100,000
1	82,861	79,226	81,588	83,194
2	78,467	75,415	76,229	79,212
3	76,836	74,049	74,123	77,503
4	75,826	73,069	72,794	76,472
5	75,093	72,393	71,898	75,790
10	73,482	71,141	70,152	74,550
15	72,592	70,295	69,295	73,785
20	71,235	69,001	68,072	72,430
25	69,446	67,168	66,555	70,551
35	64,716	63,443	61,742	65,732
45	57,655	57,360	53,471	58,260
55	47,424	48,652	42,224	47,535
65	33,163	35,883	27,764	33,836
75	15,813	18,059	12,197	17,655
85	3,121	3,102	2,217	4,012
95	104	12	84	95

FEMALE.

Age.	England and Wales.	Norwich.	London.	Brighton.
0	100,000	100,000	100,000	100,000
1	85,963	83,516	84,569	85,894
2	81,717	79,570	79,415	81,775
3	80,074	78,092	77,269	80,148
4	79,008	77,077	75,888	79,173
5	78,255	76,386	74,937	78,656
10	76,558	75,100	73,050	77,272
15	75,585	74,208	72,151	76,272
20	74,245	73,108	71,089	75,306
25	72,563	71,556	69,876	74,273
35	68,114	67,877	65,944	71,045
45	61,869	62,578	59,196	65,449
55	53,099	55,327	49,722	56,984
65	39,732	43,378	36,173	44,767
75	20,997	24,702	18,592	25,837
85	4,978	5,818	4,235	6,442
95	244	74	202	162

Two prominent features of the l_x column are the relatively rapid diminution of the Norwich life-table population up to the end of the fifth decade, and its "staying power" between the ages of 50 and 80.

Male, The survivors are less numerous than in the country generally at all ages, except between the years 49 and 84. As compared with Brighton the interval in favour of Norwich is between the ages of 50 and 79, and as compared with London it is between 4 and 88.

Female. Compared with England and Wales survivors are fewer in Norwich except between ages 38 and 85. London has fewer survivors throughout except for the 1st year and after age 88. Brighton has more survivors at all ages.

Sex. The female survivors are more numerous than the male throughout.

TABLE V.

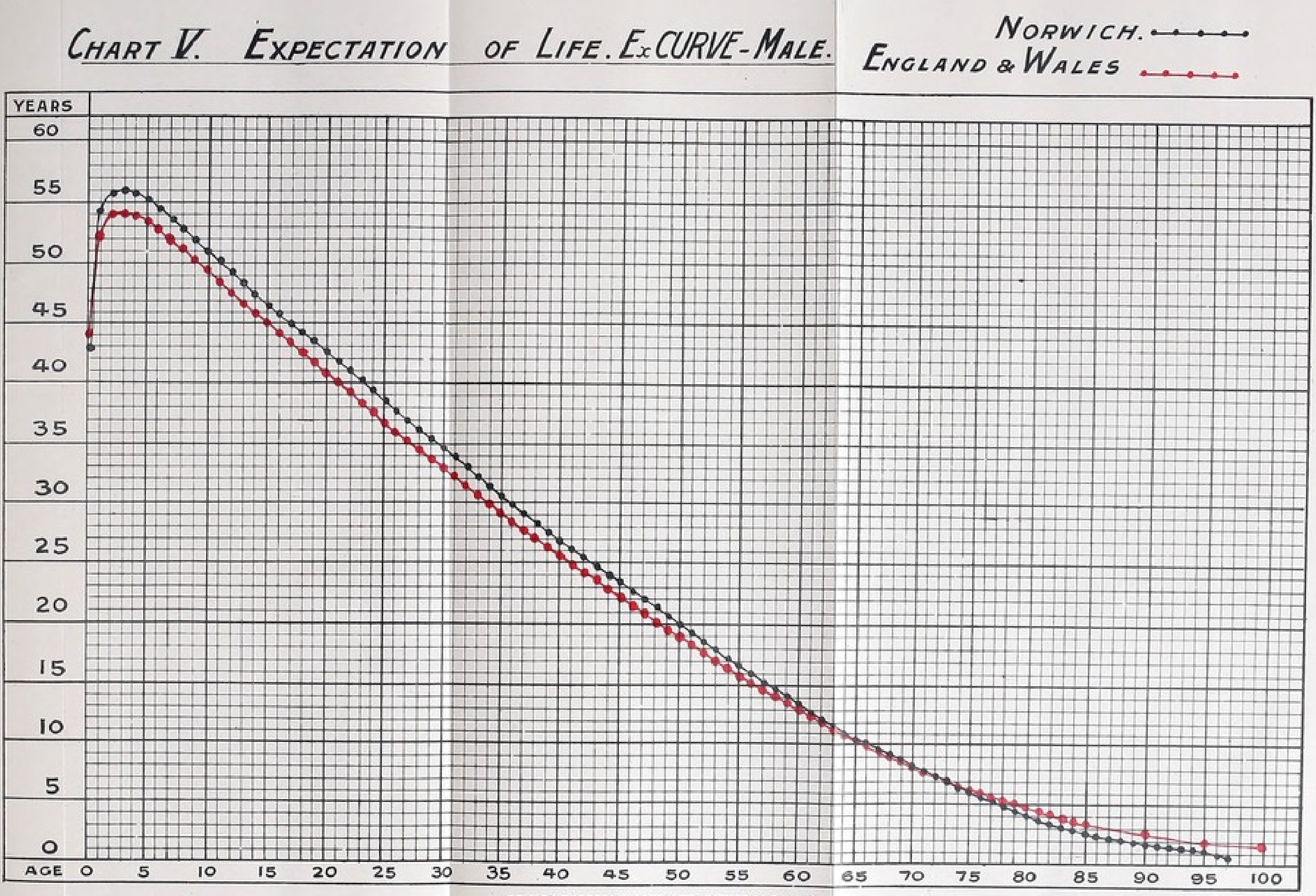
Expectation of Life at certain Ages, 1891—1900.

MALE.

Age.	England and Wales	Norwich.	London.	Brighton.
0	44·11	43·87	40·98	44·92
1	52·15	54·25	49·15	52·90
2	54·04	55·96	51·57	54·53
3	54·18	55·99	52·02	54·75
4	53·89	55·73	51·96	54·46
5	53·41	55·24	51·60	53·94
10	49·54	51·18	47·84	49·80
15	45·12	46·77	43·40	45·29
20	40·93	42·59	39·13	41·09
25	36·91	38·69	34·96	37·12
35	29·22	30·66	27·25	29·45
45	22·16	23·33	20·65	22·54
55	15·79	16·58	14·76	16·44
65	10·33	10·54	9·76	11·01
75	6·14	6·00	5·91	6·49
85	3·44	2·52	3·48	3·01
95	1·92	1·17	2·11	1·50

FEMALE.

Age.	England and Wales.	Norwich.	London.	Brighton.
0	47·73	48·41	45·33	50·19
1	54·45	56·87	52·53	57·35
2	56·26	58·66	54·91	59·22
3	56·40	58·76	55·42	59·41
4	56·16	58·53	55·42	59·13
5	55·69	58·05	55·12	58·52
10	51·88	54·01	51·49	54·53
15	47·52	49·63	47·10	50·21
20	43·33	45·34	42·77	45·82
25	39·27	41·26	38·46	41·42
35	31·49	33·22	30·42	33·06
45	24·14	25·58	23·29	25·42
55	17·25	18·25	16·72	18·41
65	11·26	11·75	11·01	11·98
75	6·70	6·76	6·57	6·91
85	3·79	3·03	3·75	3·36
95	2·15	1·35	2·16	1·69



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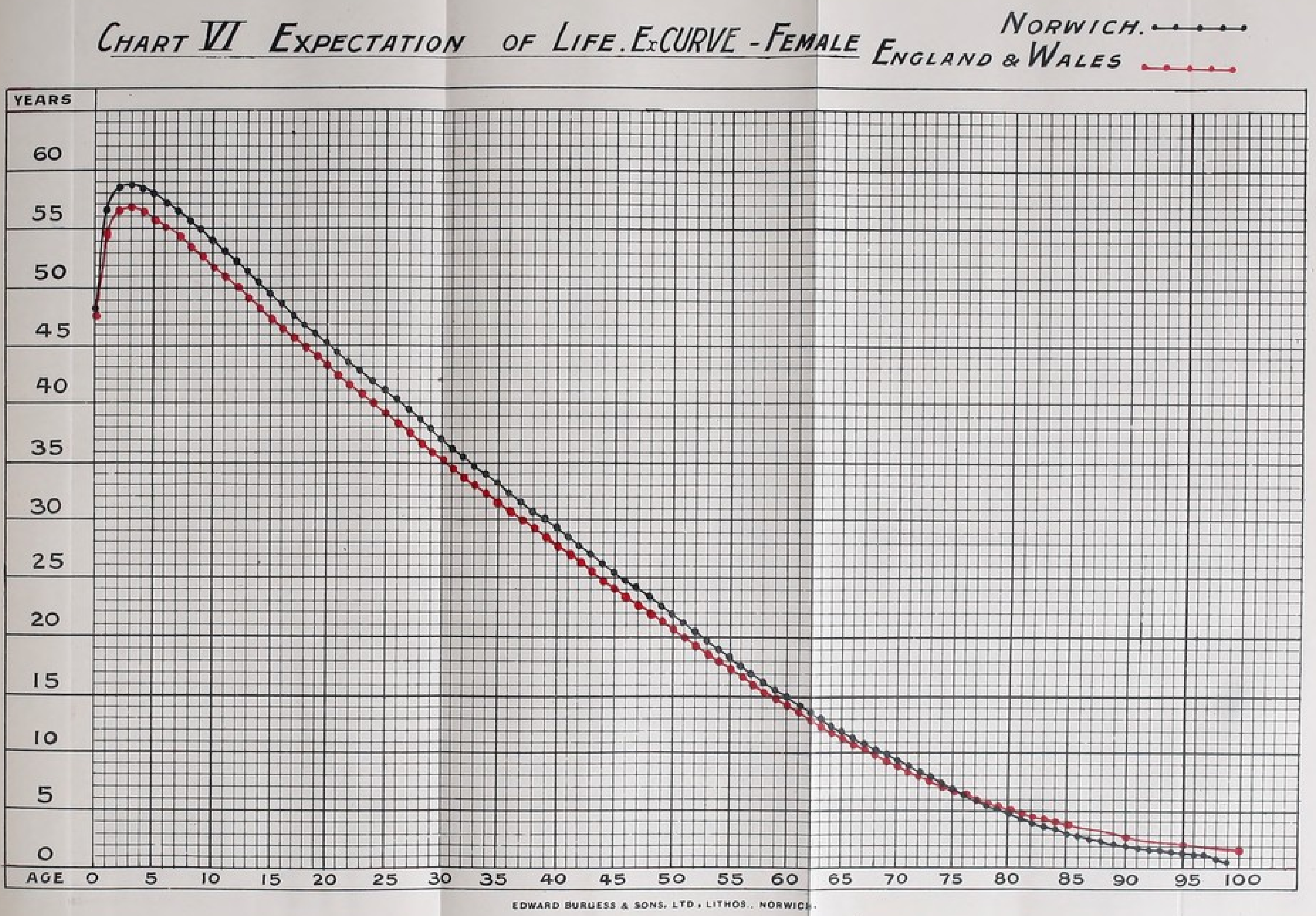

CHART VI EXPECTATION OF LIFE. Ex CURVE - FEMALE
NORWICH.
ENGLAND & WALES
YEARS
60
55
50
45
40
35
30
25
20
15
10
5
0
AGE 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
EDWARD BURGESS & SONS, LTD., LITHOS., NORWICH.

The expectation of life at birth is less for males in Norwich than in England and Wales (—·24 years) and in Brighton (—1·05 years), but is greater than in London (+2·89 years); for females it is greater in Norwich than in the country generally (+·68 years) and in London (+3·08 years), but less than in Brighton (—1·78 years).

During the first few years of life the Norwich figures are, generally, considerably better than any others. With one exception (Brighton Females) they continue highest until the sixth decade, when the Brighton mean after-lifetime is the longest. During the eighth decade the expectation of life becomes least in Norwich.

Sex. The expectation of life at birth in Norwich is 4.54 years more for females than for males. It remains higher for females through out life, being between two and three years more for the first 50 years of life, after which the difference gradually diminishes.

NORWICH LIFE TABLE

For Decennium 1891—1900.

MALES.

Age.	Decennial Lives. L_x	Decennial Deaths. D_x	Probability, at each Age, of Living One Year p_x	Survivors, at each Age, of 100,000 of both sexes born. l_x	Years of Life lived during each Year of Age. P_x	Sum of Years of Life lived during and after each Year of Age. Q_x	Mean After-Life-time or Expectation of Life at each Age. E_x
0	13,634	3,329	·7922622	50,614	43,827	2,219,054	43·87
1	12,435	613	·9518895	40,099	39,135	2,175,227	54·25
2	12,039	220	·9818915	38,170	37,824	2,136,092	55·96
3	11,857	158	·9867627	37,479	37,231	2,098,268	55·99
4	11,728	109	·9907490	36,983	36,812	2,061,037	55·73
5	11,680	64	·9945355	36,641	36,541	2,024,225	55·24
6	11,660	44	·9962335	36,441	36,372	1,987,684	54·55
7	11,640	36	·9969119	36,303	36,247	1,951,312	53·75
8	11,606	31	·9973325	36,191	36,143	1,915,065	52·92
9	11,560	28	·9975810	36,095	36,051	1,878,922	52·05
10	11,420	26	·9977258	36,007	35,966	1,842,871	51·18
11	11,261	25·5	·9977381	35,925	35,885	1,806,905	50·30
12	11,060	25·5	·9976970	35,844	35,803	1,771,020	49·41
13	10,860	26·5	·9975627	35,762	35,718	1,735,217	48·52
14	10,660	28·5	·9973300	35,674	35,626	1,699,499	47·64
15	10,460	31·5	·9969930	35,579	35,526	1,663,873	46·77
16	10,260	34·5	·9966440	35,472	35,412	1,628,347	45·91
17	10,041	37·5	·9962722	35,353	35,287	1,592,935	45·06
18	9,700	39·5	·9959361	35,221	35,150	1,557,648	44·23
19	9,320	41	·9956105	35,078	35,001	1,522,498	43·40
20	8,700	42·5	·9951268	34,924	34,839	1,487,497	42·59
21	8,200	43·5	·9947091	34,754	34,662	1,452,658	41·80
22	7,900	43·5	·9945087	34,570	34,475	1,417,996	41·02
23	7,700	43	·9944312	34,380	34,284	1,383,521	40·24
24	7,532	42·5	·9943732	34,189	34,093	1,349,237	39·46
25	7,430	42	·9943632	33,996	33,900	1,315,144	38·69
26	7,340	41·5	·9943620	33,805	33,710	1,281,244	37·90
27	7,250	41	·9943610	33,614	33,519	1,247,534	37·11
28	7,175	40·6	·9943572	33,425	33,331	1,214,015	36·32
29	7,090	40·2	·9943462	33,236	33,142	1,180,684	35·52
30	7,015	39·8	·9943424	33,048	32,954	1,147,542	34·72
31	6,930	39·4	·9943307	32,861	32,768	1,114,588	33·92
32	6,850	39	·9943227	32,675	32,582	1,081,820	33·11
33	6,770	39	·9942557	32,489	32,396	1,049,238	32·30
34	6,649	39·5	·9940767	32,303	32,207	1,016,842	31·48
35	6,460	42	·9935195	32,111	32,007	984,635	30·66
36	6,270	47	·9925320	31,903	31,784	952,628	29·86
37	6,120	52·4	·9914742	31,665	31,530	920,844	29·08
38	5,960	55	·9908140	31,395	31,251	889,314	28·33
39	5,770	57·6	·9900670	31,107	30,953	858,063	27·58
40	5,560	59	·9894444	30,798	30,635	827,110	26·86
41	5,360	60	·9888682	30,473	30,303	796,475	26·14
42	5,180	61	·9882929	30,133	29,957	766,172	25·43
43	5,000	62	·9876764	29,781	29,598	736,215	24·72
44	4,826	63	·9870303	29,414	29,223	706,617	24·02

Age.	Decennial Lives. L_x	Decennial Deaths. D_x	Probability, at each Age, of Living One Year p_x	Survivors, at each Age, of 100,000 of both sexes born. l_x	Years of Life lived during each Year of Age. P_x	Sum of Years of Life lived during and after each Year of Age. Q_x	Mean After-Life-time or Expectation of Life at each Age. E_x
45	4,680	64	·9864176	29,032	28.835	677,394	23·33
46	4.540	64·5	·9858931	28,638	28,436	648,559	22·65
47	4,420	65	·9854014	28,234	28,028	620,123	21·96
48	4,300	65·5	·9848825	27,822	27,611	592,095	21·28
49	4,180	66	·9843342	27,401	27,187	564,484	20·60
50	4,040	67	·9835522	26,972	26,750	537,297	19·92
51	3,920	68	·9828022	26,528	26,300	510,547	19·25
52	3,800	69	·9820055	26,072	25,837	484,247	18·57
53	3,680	70	·9811575	25,603	25,362	458,410	17·90
54	2,561	71	·9802585	25,120	24,872	433,048	17·24
55	3,440	72·4	·9791727	24,624	24,368	408,176	16·58
56	3,300	74	·9778244	24,112	23,844	383,808	15·92
57	3,160	76	·9762351	23,577	23,297	359,964	15·27
58	3,020	78	·9745015	23,017	22,724	336,667	14·63
59	2,880	80	·9726027	22,430	22,122	313,943	14·00
60	2,740	82·6	·9703017	21,815	21,491	291,821	13·38
61	2,600	86	·9674612	21,167	20,823	270,330	12·77
62	2,480	90	·9643564	20,479	20,114	249,507	12·18
63	2,385	95	·9609455	19,749	19,363	229,393	11·62
64	2,300	101	·9570304	18,977	18,570	210,030	11·07
65	2,240	108	·9529207	18,162	17,734	191,460	10·54
66	2,170	114	·9488100	17,307	16,864	173,726	10·04
67	2,100	119	·9448946	16,421	15,969	156,862	9·55
68	2,020	123	·9409080	15,516	15,057	140,893	9·08
69	1,920	126	·9364599	14,599	14,136	125,836	8·62
70	1,820	128	·9320594	13,672	13,207	111,700	8·17
71	1,710	128·6	·9275207	12,743	12,281	98,493	7·73
72	1,600	128·4	·9228458	11,819	11,363	86,212	7·29
73	1,490	127	·9182491	10,907	10,462	74,849	6·86
74	1,357	124	·9126145	10,016	9,578	64,387	6·43
75	1,220	120	·9062500	9,140	8,711	54,809	6·00
76	1,080	116	·8980668	8,283	7,861	46,098	5·57
77	930	111	·8873668	7,439	7,020	38,237	5·14
78	780	104	·8750000	6,601	6,189	31 217	4·73
79	635	95	·8608059	5,776	5,374	25,028	4·73
80	505	88	·8397086	4,972	4,573	19,654	4·33
81	410	81	·8201998	4,175	3,800	15,081	3·95
82	325	74	·7955801	3,424	3,074	11,281	3·61
83	260	67	·7717206	2,724	2,413	8,207	3·29
84	207	60	·7468354	2,103	1,837	5,794	3·01
85	160	52	·7204301	1,570	1,350	3,957	2·76
86		44	·690	1,131	956	2,607	2·52
87		36	·660	781	648	1,651	2·31
88		28	·630	515	420	1,003	2·11
89		20	·600	325	260	583	1·95
90		14	·570	195	153	323	1·79
91		8	·539	111	86	170	1·66
92		5	·507	60	45	84	1·53
93		3	·474	30	22	39	1·40
94		2	·441	14	10	17	1·30
95		1·5	·40949	6	4·5	7	1·21
96		1	·377	3	2	2.5	1·17
97		·7	·344	1	·5	·5	·83
98		·5					·50
99		·3					

NORWICH LIFE TABLE

For Decennium 1891—1900.

FEMALES.

Age.	Decennial Lives. L_x	Decennial Deaths. D_x	Probability, at each Age, of Living One Year p_x	Survivors, at each Age, of 100,000 of both sexes born. l_x	Years of Life lived during each Year of Age. P_x	Sum of Years of Life lived during and after each Year of Age. Q_x	Mean After-Life-time or Expectation of Life at each Age. E_x
0	13,939	2,588	·8351592	49,386	44,336	2,389,779	48·41
1	12,834	621	·9527559	41,245	40,271	2,345,443	56·87
2	12,423	233	·9814187	39,297	38,932	2,305,172	58·66
3	12,234	160	·9870066	38,567	38,316	2,266,240	58·76
4	12,103	109	·9910343	38,065	37,895	2,227,924	58·53
5	12,000	62	·9948466	37,724	37,627	2,190,029	58·05
6	11,940	42	·9964886	37,530	37,464	2,152,402	57·35
7	11,868	36	·9969712	37,398	37,341	2,114,938	56·55
8	11,810	32	·9972941	37,285	37,235	2,077,597	55·72
9	11,740	30	·9974479	37,184	37,136	2,040,362	54·87
10	11,680	28·2	·9975885	37,089	37,044	2,003,226	54·01
11	11,616	27·6	·9976268	36,999	36,956	1,966,182	53·14
12	11,560	27·4	·9976326	36,912	36.868	1,929,226	52·27
13	11,580	27·6	·9976194	36,824	36,780	1,892,358	51·39
14	11,740	28:2	·9976008	36,737	36,693	1,855,578	50·51
15	11,980	30	·9974989	36,648	36,602	1,818,885	49·63
16	12,180	33	·9972943	36,557	36,508	1,782,283	48·75
17	12,232	36	·9970612	36,458	36,404	1,745,775	47·88
18	12,180	39·5	·9967622	36,351	36,292	1,709,371	47·02
19	12,040	42·5	·9964763	36,233	36,169	1,673,079	46·18
20	11,744	45·5	·9961332	36,105	36,036	1,636,910	45·34
21	11,420	47	·9958928	35,966	35,892	1,600,874	44·51
22	10,980	47·8	·9956561	35,818	35,740	1,564,982	43·69
23	10,600	47·7	·9955101	35,662	35,582	1,529,242	42·88
24	10,180	47	·9953937	35,502	35,420	1,493,660	42·07
25	9,800	46	·9953171	35,339	35,256	1,458,240	41·26
26	9,500	45·4	·9952324	35,173	35,090	1,422,984	40·46
27	9,220	45	·9951312	35,006	34,920	1,387,894	39·65
28	8,920	44·6	·9950124	34,835	34,748	1,352,974	38·84
29	8,680	44·4	·9948978	34,661	34,573	1,318,226	38·03
30	8,423	44·2	·9947662	34,485	34,395	1,283,653	37·22
31	8,200	44·4	·9945999	34,304	34,211	1,249,258	36·42
32	8,020	45	·9944047	34,119	34,024	1,215,047	35·61
33	7,820	46	·9941349	33,928	33,828	1,181,023	34·81
34	7,640	47	·9938670	33,729	33.626	1,147,195	34·01
35	7,440	48·2	·9935424	33,522	33,414	1,113,569	33·22
36	7,240	49·4	·9931999	33,306	33,192	1,080,155	32·43
37	7,080	50·6	·9928785	33,079	32,962	1,046,963	31·65
38	6,900	52	·9924921	32,844	32,720	1,014,001	30·87
39	6,700	53·2	·9920911	32,597	32,468	981,281	30·10
40	6,520	54·4	·9916911	32,339	32,205	948,813	29·34
41	6,360	55·4	·9913271	32,070	31,931	916,608	28·58
42	6,200	56·2	·9909764	31,792	31,648	884,677	27·83
43	6,035	57	·9905995	31,505	31,357	853,029	27·08
44	5,880	57·6	·9902518	31,209	31,057	821,672	26·33

FEMALES (*continued*).

Age.	Decennial Lives. L_x	Decennial Deaths. D_x	Probability, at each Age, of Living One Year p_x	Survivors, at each Age, of 100,000 of both sexes born. l_x	Years of Life lived during each Year of Age. P_x	Sum of Years of Life lived during and after each Year of Age. Q_x	Mean After-Life-time or Expectation of Life at each Age. E_x
45	5,720	58·2	·9898767	30,905	30,749	790,615	25·58
46	5,580	58·8	·9895176	30,592	30,432	759,866	24·84
47	5,400	59·4	·9890602	30,272	30,106	729,434	24·10
48	5,260	60	·9886578	29,940	29,770	699,328	23·36
49	5,100	60·6	·9881878	29,601	29,426	669,558	22·62
50	4,920	61·2	·9876378	29,251	29,071	640,132	21·88
51	4,774	61·8	·9871381	28,890	28,704	611,061	21·15
52	4,600	62·4	·9865262	28,518	28,326	582,357	20·42
53	4,440	63·4	·9858219	28,134	27,934	554,031	19·69
54	4,300	64·2	·9851804	27,735	27,530	526,097	18·97
55	4,160	66	·9842595	27,324	27,109	498,567	18·25
56	4,040	69	·9830654	26,894	26,666	471,458	17·53
57	3,920	73	·9815493	26,438	26,194	444,792	16·82
58	3,800	78	·9796822	25,950	25,686	418,598	16·13
59	3,680	83	·9776972	25,423	25,140	392,912	15·45
60	3,580	88	·9757174	24,856	24,554	367,772	14·80
61	3,460	93	·9734778	24,253	23,931	343,218	14·15
62	3,345	98	·9711255	23,609	23,269	319,287	13·52
63	3,220	104	·9682152	22,928	22,563	296,018	12·91
64	3,120	111	·9650449	22,199	21,811	273,455	12·32
65	3,000	118	·9614253	21,423	21,010	251,644	11·75
66	2,900	125	·9578059	20,597	20,163	230,634	11·20
67	2,800	131	·9542837	19,728	19,277	210,471	10·67
68	2,700	136	·9508671	18,826	18,363	191,194	10·16
69	2,600	140	·9475655	17,901	17,432	172,831	9·65
70	2,490	144	·9437939	16,962	16,485	155,399	9·16
71	2,380	147	·9400856	16,009	15,530	138,914	8·68
72	2,270	149	·9364470	15,050	14,571	123,384	8·20
73	2,150	150	·9325843	14,093	13,618	108,813	7·72
74	2,014	150	·9281953	13,143	12,671	95,195	7·24
75	1,860	149	·9229775	12,199	11,730	82,524	6·76
76	1,660	147	·9152005	11,260	10,782	70,794	6·29
77	1,450	143	·9060138	10,305	9,821	60,012	5·82
78	1,230	138	·8937644	9,336	8,840	50,191	5·38
79	1,020	132	·8784530	8,344	7,837	41,351	4·96
80	850	126	·8619934	7,330	6,824	33,514	4·57
81	710	118	·8465540	6,319	5,834	26,690	4·22
82	590	110	·8294574	5,349	4,893	20,856	3·90
83	500	102	·8148820	4,437	4,026	15,963	3·60
84	411	94	·7947598	3,615	3,244	11,937	3·30
85	325	84	·7711172	2,873	2,545	8.693	3·03
86		74	·744	2,216	1,932	6,148	2·77
87		64	·720	1.649	1,418	4,216	2·56
88		54	·694	1,187	1,006	2,798	2·36
89		44	·667	824	686	1,792	2·17
90		35	·640	549	451	1,106	2·01
91		27	·612	352	283	655	1·86
92		20	·584	215	171	372	1·73
93		14	·556	126	98	201	1·60
94		9	·526	70	53	103	1·47
95		5	·49646	37	28	50	1·35
96		2	·464	18	13	22	1·22
97		1	·432	8	6	9	1·12
98		·7	·400	4	2·5	3	·75
99		·3	·365	1	·5	·5	·50

APPENDIX A.

Survivors at each Age of 100,000 born of each Sex.

Age.	Male.	Female.	Age.	Male.	Female.
0	100,000	100,000	55	48,652	55,327
1	79,226	83,516	56	47,638	54,456
2	75,415	79,570	57	46,582	53,534
3	74,049	78,092	58	45,475	52,546
4	73,069	77,077	59	44,315	51,478
5	72,393	76,386	60	43,101	50,330
6	71,997	75,992	61	41,821	49,108
7	71,726	75,726	62	40,460	47,806
8	71,505	75,496	63	39,018	46,425
9	71,314	75,292	64	37,494	44,950
10	71,141	75,100	65	35,883	43,378
11	70,979	74,919	66	34,194	41,705
12	70,819	74,741	67	32,444	39,945
13	70,656	74,564	68	30,656	38,119
14	70,484	74,386	69	28,844	36,246
15	70,295	74,208	70	27,011	34,346
16	70,084	74,022	71	25,176	32,415
17	69,849	73,822	72	23,352	30,473
18	69,588	73,605	73	21,550	28,537
19	69,306	73,367	74	19,788	26,613
20	69,001	73,108	75	18,059	24,702
21	68,665	72,826	76	16,366	22,799
22	68,302	72,526	77	14,698	20,866
23	67,927	72,211	78	13,042	18,905
24	67,548	71,887	79	11,412	16,896
25	67,168	71,556	80	9,823	14,843
26	66,789	71,221	81	8,249	12,794
27	66,412	70,881	82	6,766	10,831
28	66,037	70,536	83	5,383	8,984
29	65,665	70,184	84	4,154	7,321
30	65,297	69,826	85	3,102	5,818
31	64,932	69,461	86	2,235	4,487
32	64,569	69,086	87	1,542	3,338
33	64,203	68,699	88	1,018	2,403
34	63,828	68,296	89	641	1,668
35	63,443	67,877	90	385	1,113
36	63,021	67,439	91	219	712
37	62,553	66,981	92	118	436
38	62,025	66,504	93	60	254
39	61,454	66,004	94	28	141
40	60,848	65,482	95	12	74
41	60,206	64,938	96	5	37
42	59,536	64,375	97	2	17
43	58,839	63,794	98	1	7
44	58,114	63,194	99		3
45	57,360	62,578	100		1
46	56,581	61,945			
47	55,783	61,296			
48	54,969	60,625			
49	54,138	59,937			
50	53,289	59,229			
51	52,413	58,497			
52	51,512	57,745			
53	50,585	56,967			
54	49,631	56,159			

APPENDIX B.

LIFE CAPITAL.

The Total Life-capital, or sum of the average future lifetimes of the population of Norwich for 1891—1900, is shewn in the following table. It is obtained for each age-group by calculating the E^x value for the group and multiplying by the mean population of the group during the decennium.

Age Group.	Male.			Female.		
	Mean Expectation of Life.	Mean Population during 1891—1900.	Total Life Capital.	Mean Expectation of Life.	Mean Population during 1891—1900.	Total Life Capital.
0—4	54·367	6,169·3	335,406	57·245	6,353·3	363,695
5—9	53·302	5,814·6	309,930	56·112	5,935·8	333,070
10—14	48·973	5,526·1	270,630	51·830	5,817·6	301,526
15—19	44·661	4,978·1	222,327	47·470	6,061·2	287,725
20—24	40·642	4,003·2	162,698	43·300	5,492·4	237,821
25—34	34·745	7,049·9	244,949	37·265	8,622·3	321,310
35—44	26·964	5,650·6	152,363	29·414	6,635·5	195,177
45—54	20·027	4,112·1	82,353	21·971	5,009·4	110,062
55—64	13·591	2,830·5	38,469	14·995	3,632·5	54,469
65—74	8·460	1,842·7	15,589	9·425	2,530·4	23,849
75—84	4·523	635·2	2,873	5·105	1,028·1	5,249
85—100	2·048	71·8	147	2·510	155·9	391
Total	37·75	48,684·1	1,837,734	39·01	57,274·4	2,234,344

The average life-capital of each individual, male or female, is found by dividing the total life-capital by the total mean population. This is compared below with corresponding figures from other Life-Tables.

AVERAGE LIFE-CAPITAL 1891—1900.

	Male.	Female.
Norwich	37·75	39·01
Brighton	35·88	37·80
London	34·59	36·80
England and Wales	36·13	37·59